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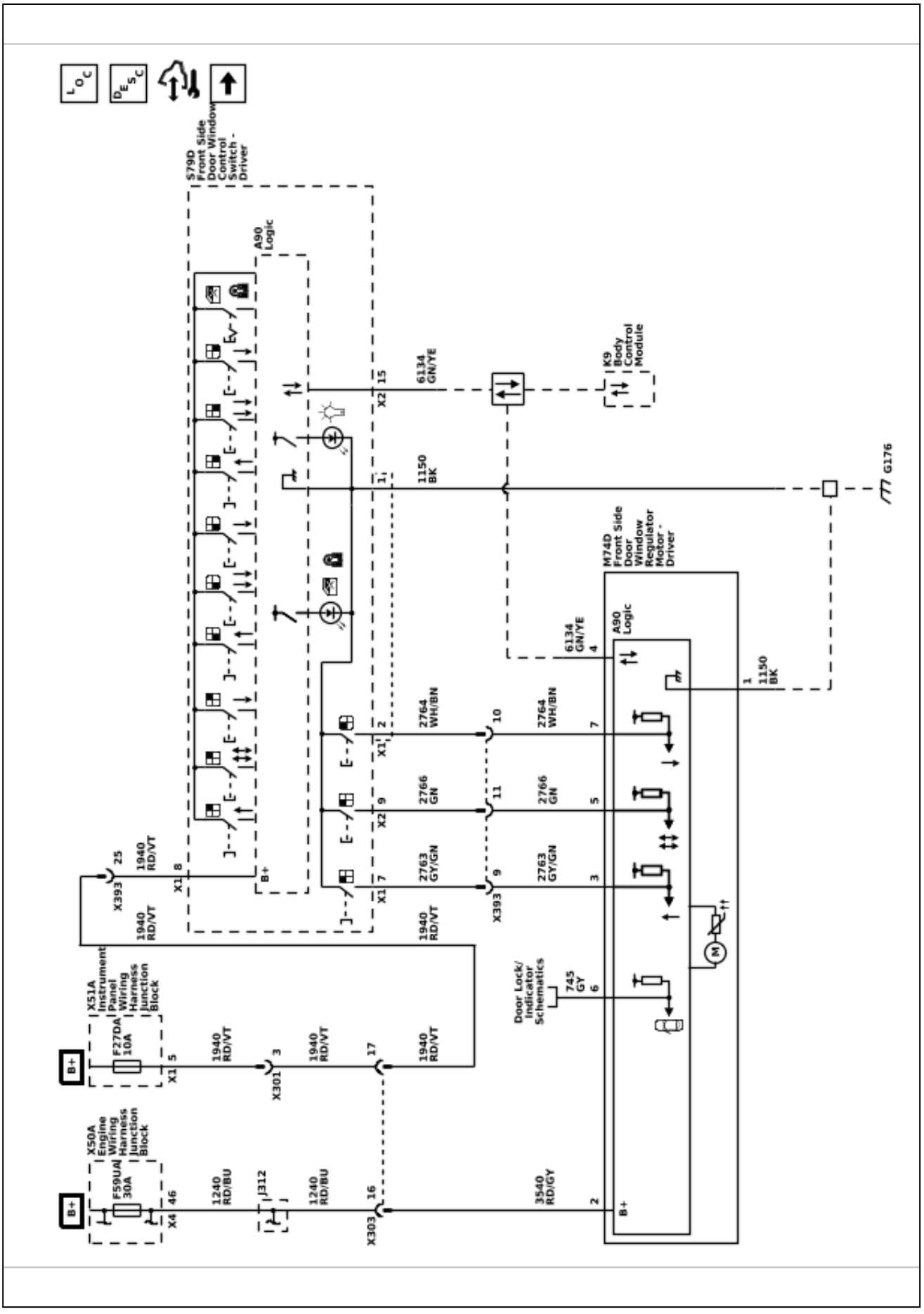
Body Systems

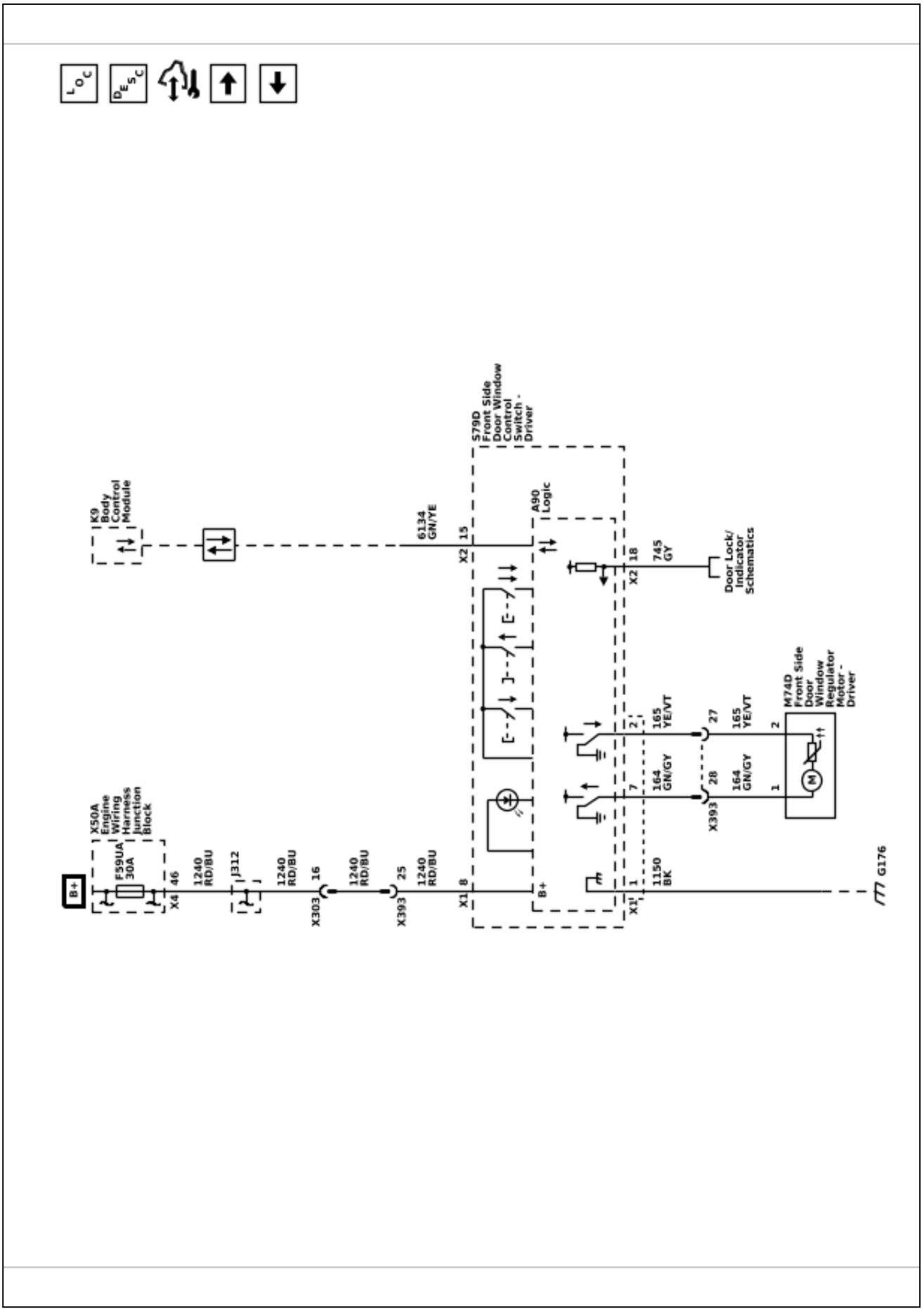
Fixed and Moveable Windows

Schematic and Routing Diagrams

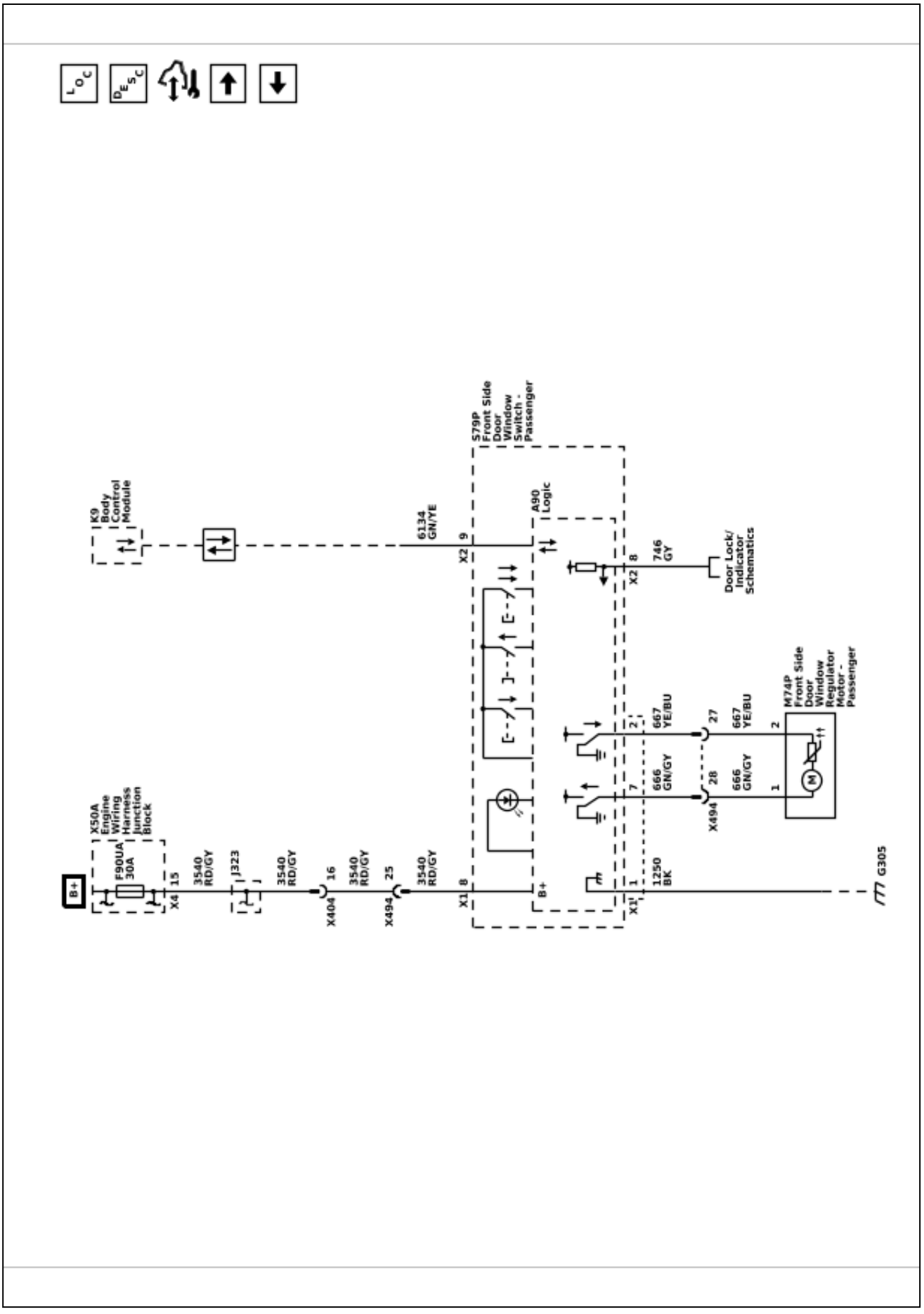
Moveable Window Schematics (Driver Window (AXG))



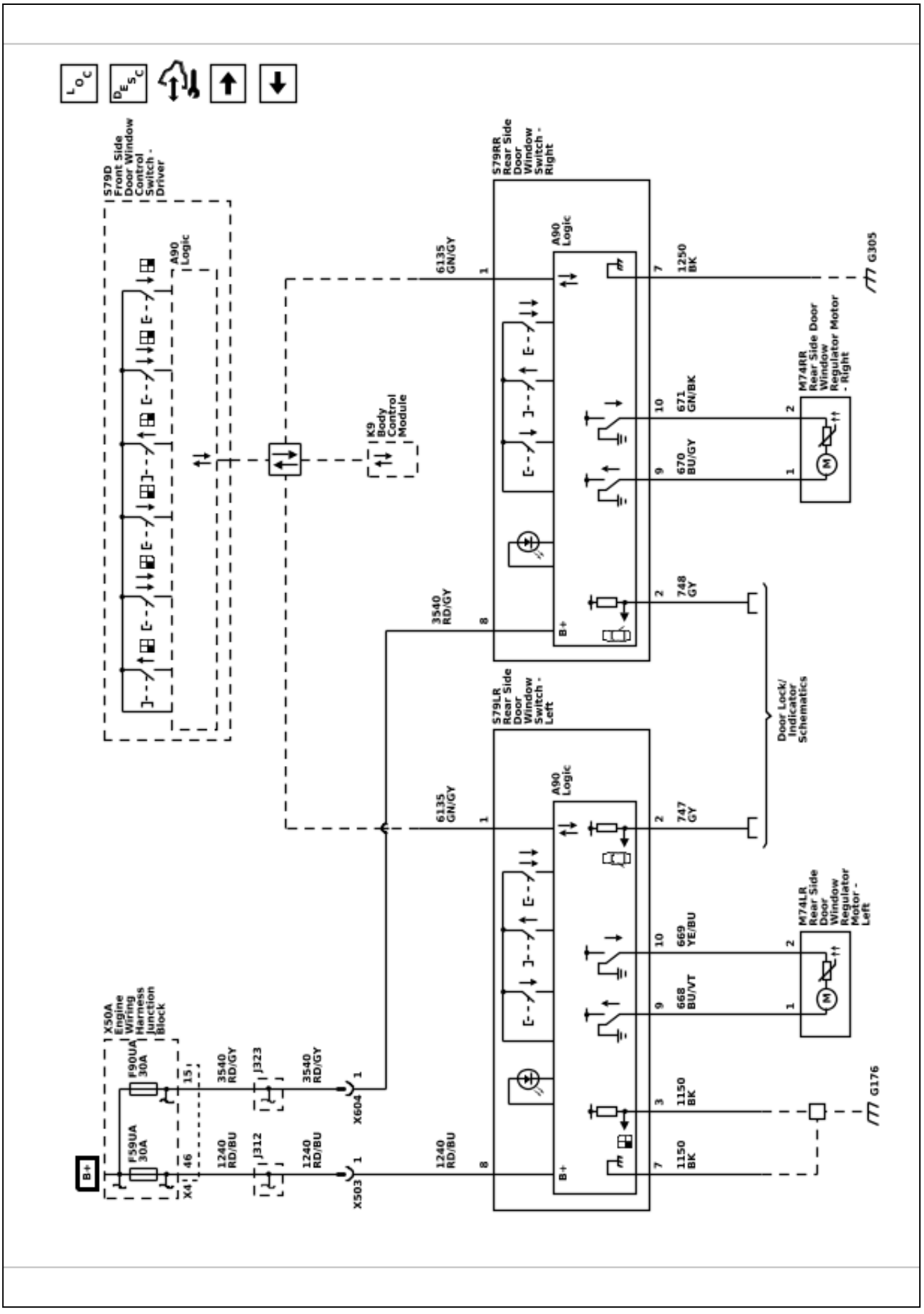
Moveable Window Schematics (Driver Window (AEC))



Moveable Window Schematics (Passenger Window)



Moveable Window Schematics (Rear windows)



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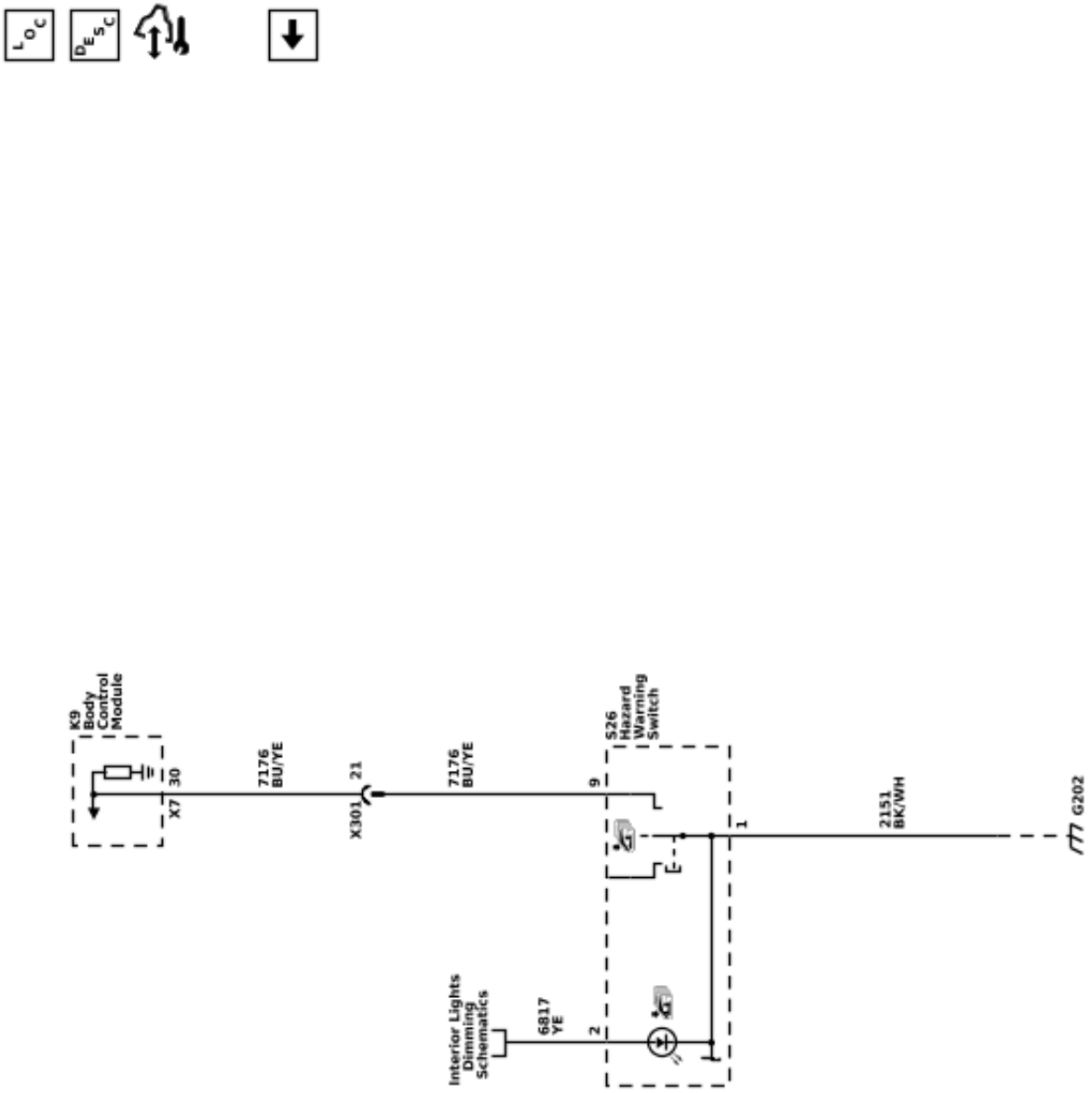
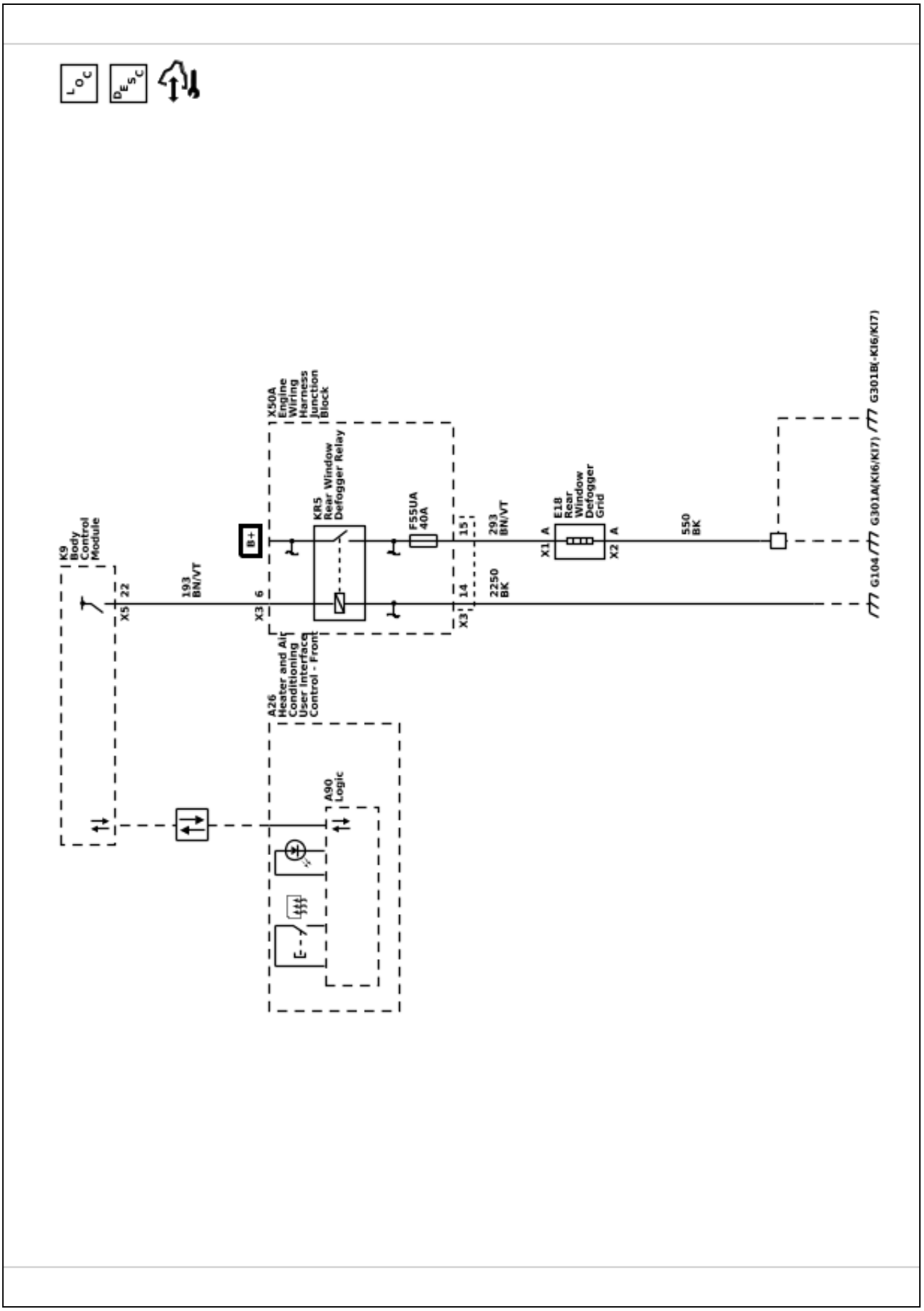
Moveable Window Schematics (Global Window Express Down Switch (WLD))



Defogger Schematics (Defogger (C49))



Description and Operation

Power Windows Description and Operation

Power Windows System Components

The power window system consists of the following components:

- Driver front side door window control switch
- Passenger front side door window control switch
- Left rear side door window switch
- Right rear side door window switch
- Global window down switch
- Window motors in each of the doors
- Body control module (BCM)

Driver Express Up and Express Down Power Window Motors

The driver door contains a smart window motor that will detect excessive resistance while performing the express up function and automatically reverse direction to prevent injury to any occupants that may become trapped between the closing window and the door frame. The automatic reverse safety feature can be overridden by pulling and holding the window switch.

The logic circuit within the window motor monitors the up, down and express signal circuits which are normally equal to B+ voltage. When a switch is used on the front side door window control switch, the contacts close causing a voltage drop within the appropriate signal circuit. The window motor will detect the voltage drop and will command the window to move in the direction requested.

The driver front side door window control switch communicates to the BCM by a serial data circuit. When the driver wishes to control the passenger windows, the driver will use the appropriate switch on the driver front side door window control switch. When this switch is used, a serial data message is sent to the BCM requesting the passenger window motor command, the BCM will then send a serial data message to the passenger window motor which will then move in the direction requested.

Passenger, Left Rear, Right Rear Express Down Window Motors

For the passenger, and rear doors, when their window switch is pressed in the down position, battery positive voltage is applied to their respective window motor control circuit and ground to the other window motor control circuit causing that window to open. When the individual window switch is pulled in the up position, voltage and ground is applied to the window motor in the opposite direction causing that window to close. The return path to ground is supplied through the inactive control circuit being normally grounded through the window switch.

Each of the passenger window switches communicates to the BCM by a serial data circuit. When the driver wishes to control the left rear or right rear window, the driver will use the appropriate switch on the driver front side door window control switch. When this switch is used, a serial data message is sent to the BCM requesting a window motor command, the BCM will then send a serial data message to the appropriate rear side door window switch which will then command that window to move in the direction requested.

Window Lockout

This feature stops the rear passenger window switches from working.

There is a button on the infotainment display used to enable or disable this feature.

Rear Window Defogger Description and Operation

Rear Window Defogger System Components

The rear window defogger system consists of the following components:

- Body Control Module
- Front Heater and Air Conditioning User Interface Control
- Engine Wiring Harness Junction Block (Contains PCB Rear Defogger Relay)
- Rear Defogger Grid
- 40A Fuse

Rear Window Defogger Operation

The rear defog control system utilizes a single zone backlight design, driven with a single relay configuration. A switch for the customer to control the system is provided within the front heater and air conditioning user interface control. Also included in the front heater and air conditioning user interface control is an indicator to inform the customer with the current state of the system. The system is only operational when engine is running or during remote start.

Pressing the heated rear window switch causes the front heater and air conditioning user interface control to send a serial data message to the body control module requesting rear window defog operation. The body control module upon receipt of the serial data message will provide voltage to the coil side of the rear defogger relay, this will energize the relay causing the relay switch contacts to close allowing B+ voltage to flow through the rear defogger grid control circuit to the rear defogger grid.

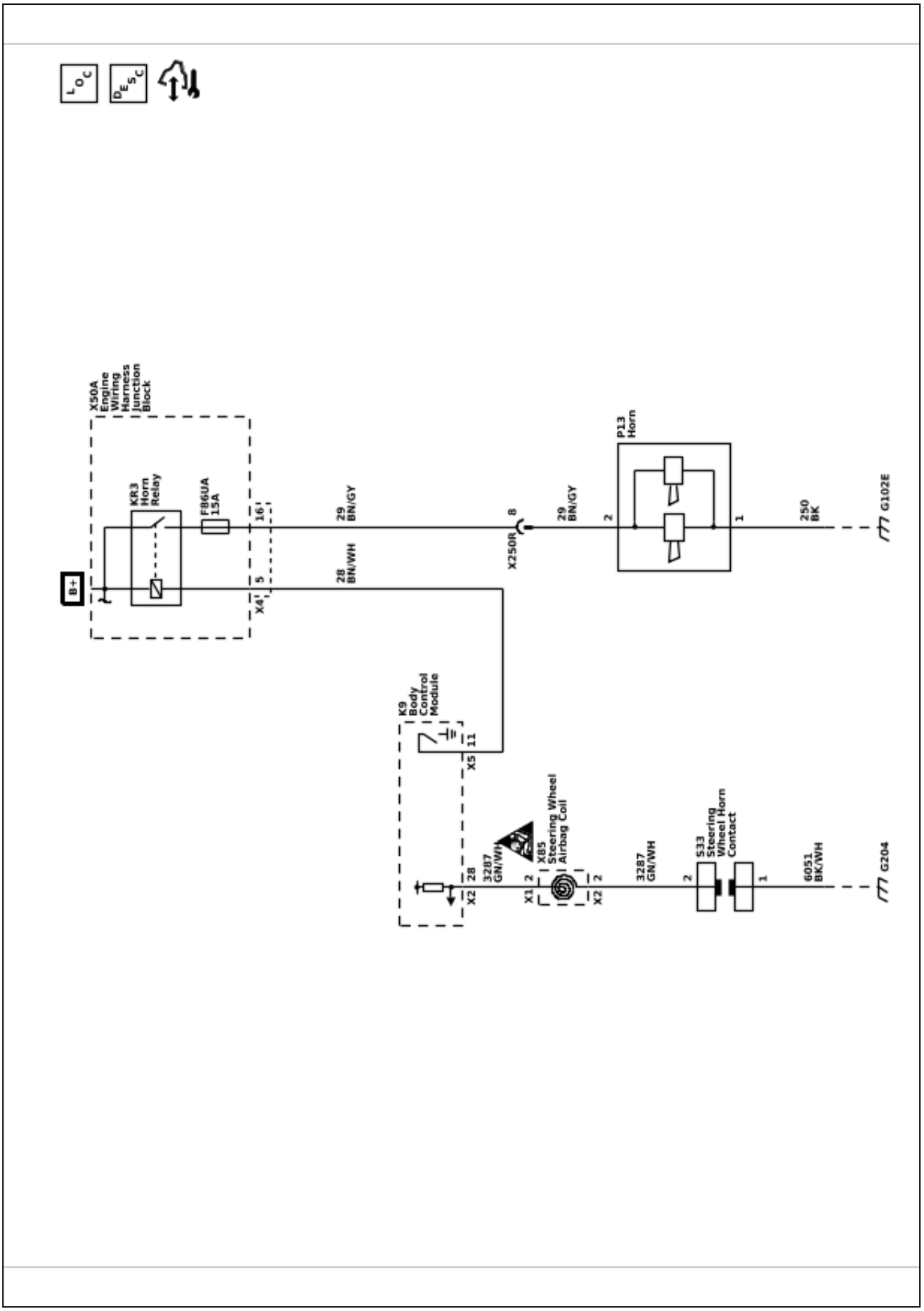
The rear window defogger grid is split into three sections on vehicles equipped with a sliding rear window. The left and right rear window grids are connected to the main E18 Rear Window Defogger Grid X1 and X2 connectors through internal wiring within the rear sliding window assembly. The center sliding window connects to the rest of the E18 Rear Window Defogger Grid through a wiring connector that is hard-wired into the rear sliding window assembly.

When the rear heated rear window switch is pressed and the engine is running, the rear window defogger grid will activate and will turn off automatically depending upon the vehicle speed (refer to owner's manual for rear window defogger operation cycles)

Horns and Pedestrian Alerts

Schematic and Routing Diagrams

Horn Schematics (Horns)



Description and Operation

Horns System Description and Operation

System Description

The horn system consists of the following components:

- HORN fuse
- Engine wiring harness junction block (contains horn PCB relay)
- Steering wheel horn contact
- Steering wheel airbag coil
- Horn
- Body control module (BCM)

System Operation

The vehicle horn system is activated under the following conditions:

- When the horn switch is depressed
- The BCM commands the horns ON under any of the following conditions:
  - When the content theft deterrent system detects a vehicle intrusion.
  - When the panic button is depressed on the remote control door lock transmitter—For further information refer to *Keyless Entry System Description and Operation 9-31*.
  - When the keyless entry system is used to lock the vehicle, a horn chirp may sound to notify the driver that the vehicle has been locked. The notification feature may be enabled or disabled through personalization. For further information refer to *Keyless Entry System Description and Operation 9-31*.
  - When the OnStar® system is used to sound the horns if equipped—For further information, refer to *OnStar Description and Operation 4-12*.

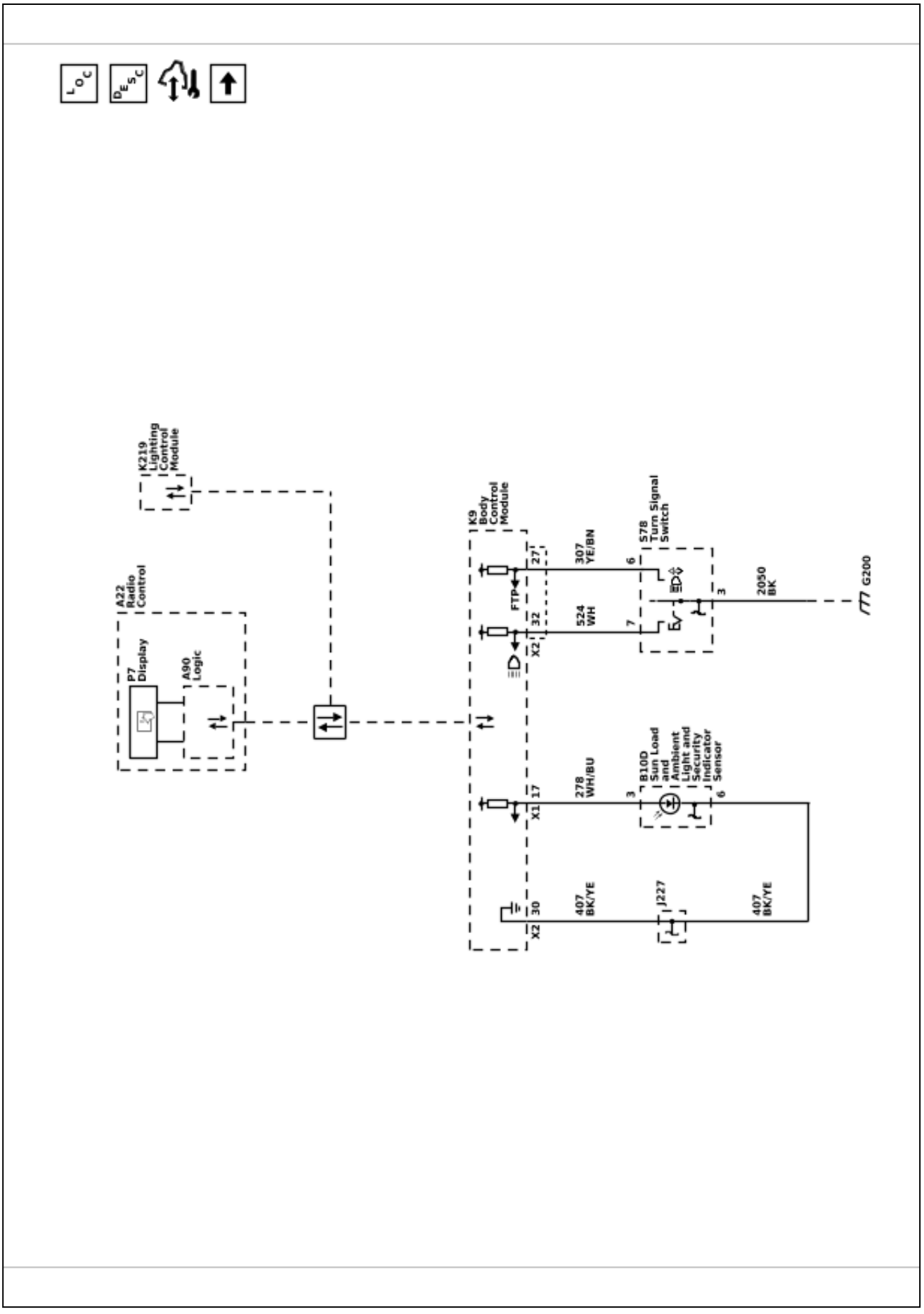
Circuit Operation

Battery positive voltage is applied at all times to the horn relay coil and the horn relay switch. Pressing either of the horn switches applies ground to the horn relay control circuit. The BCM may also apply ground to the horn relay control circuit as described above. When the horn relay control circuit is grounded, the horn relay is energized and battery positive voltage is applied to the horns through the horn control circuit. The horns sound as long as ground is applied to the horn relay control circuit.

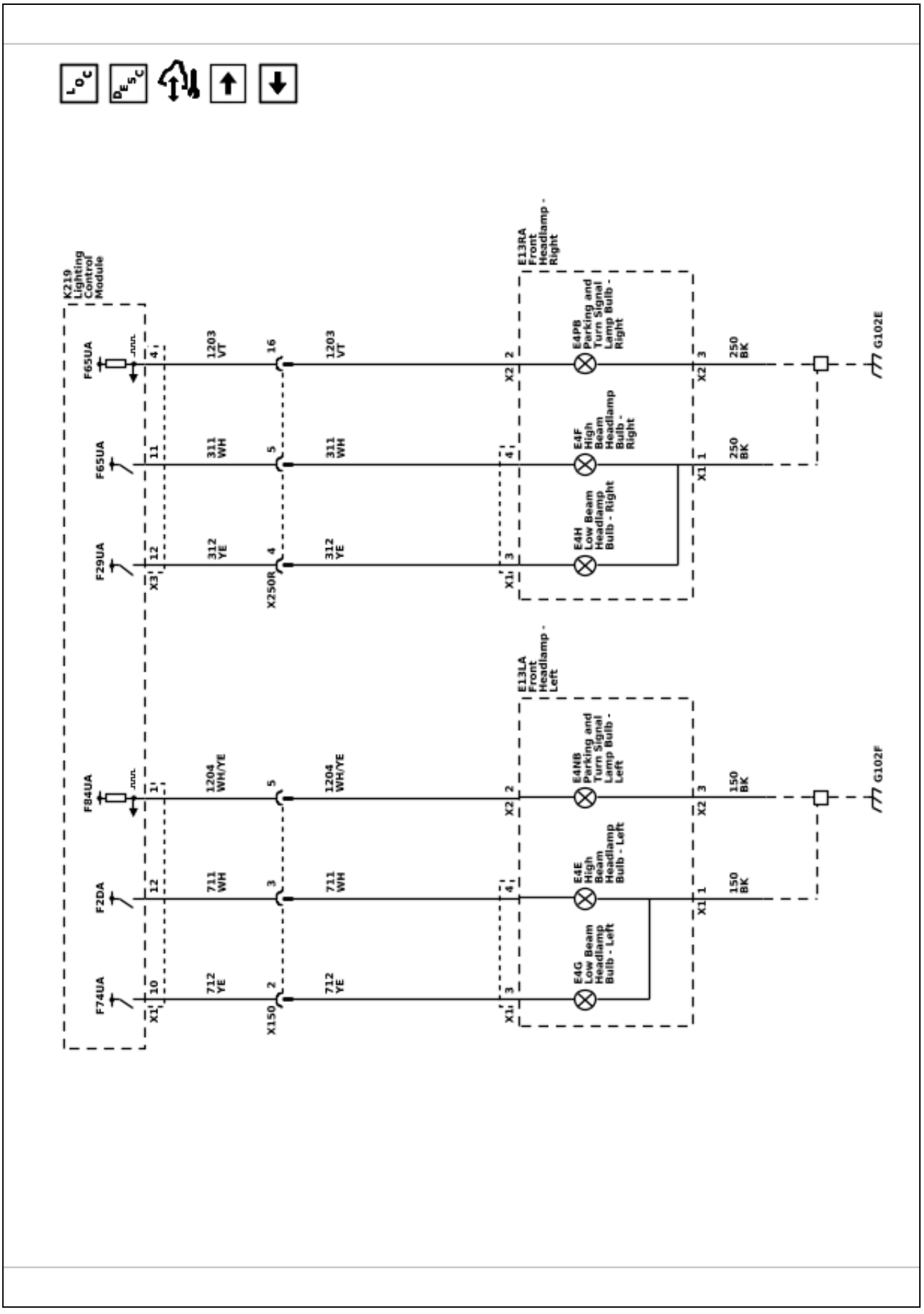
Lighting

Schematic and Routing Diagrams

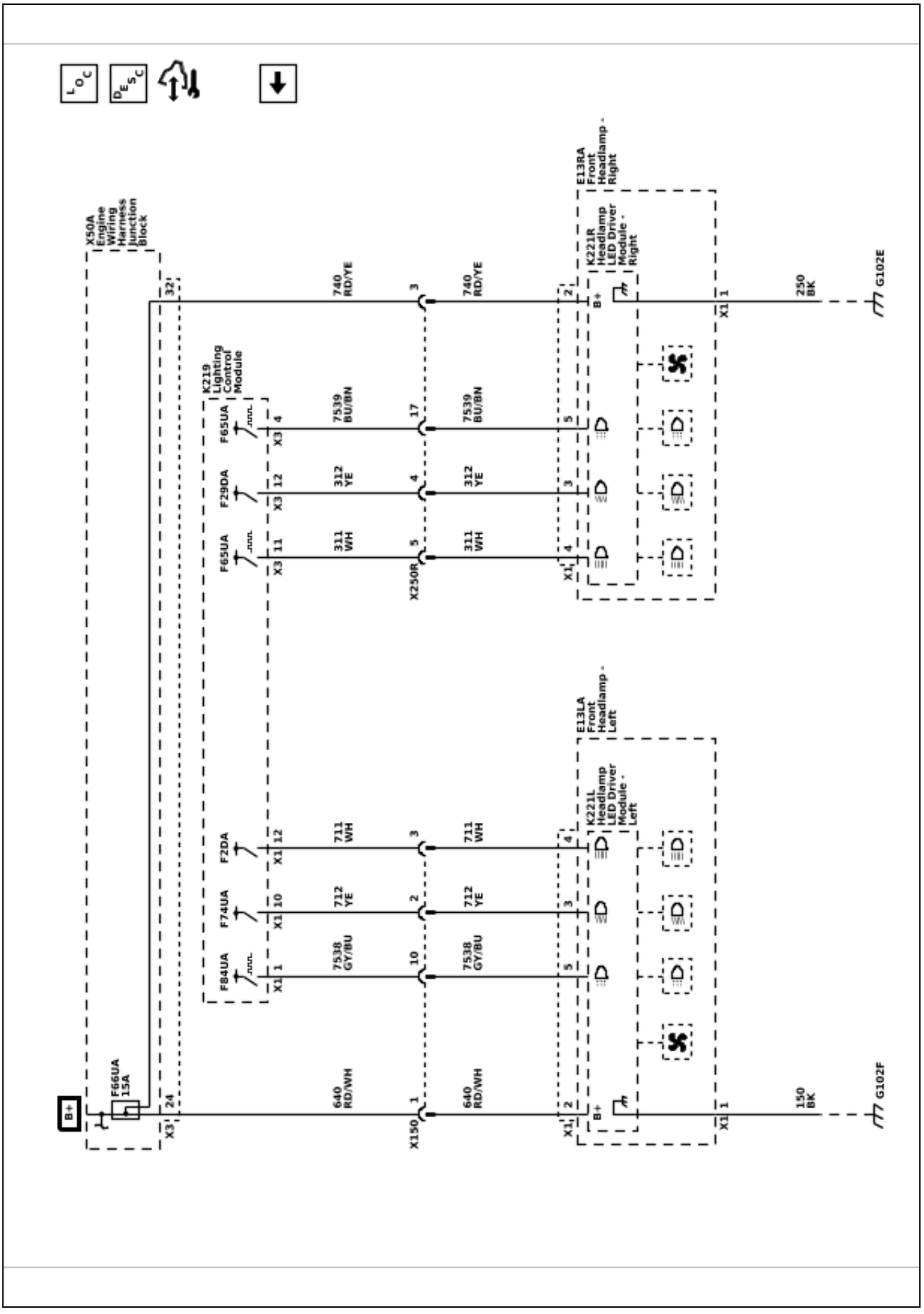
Headlights/Daytime Running Lights (DRL) Schematics (Controls and Indicators)



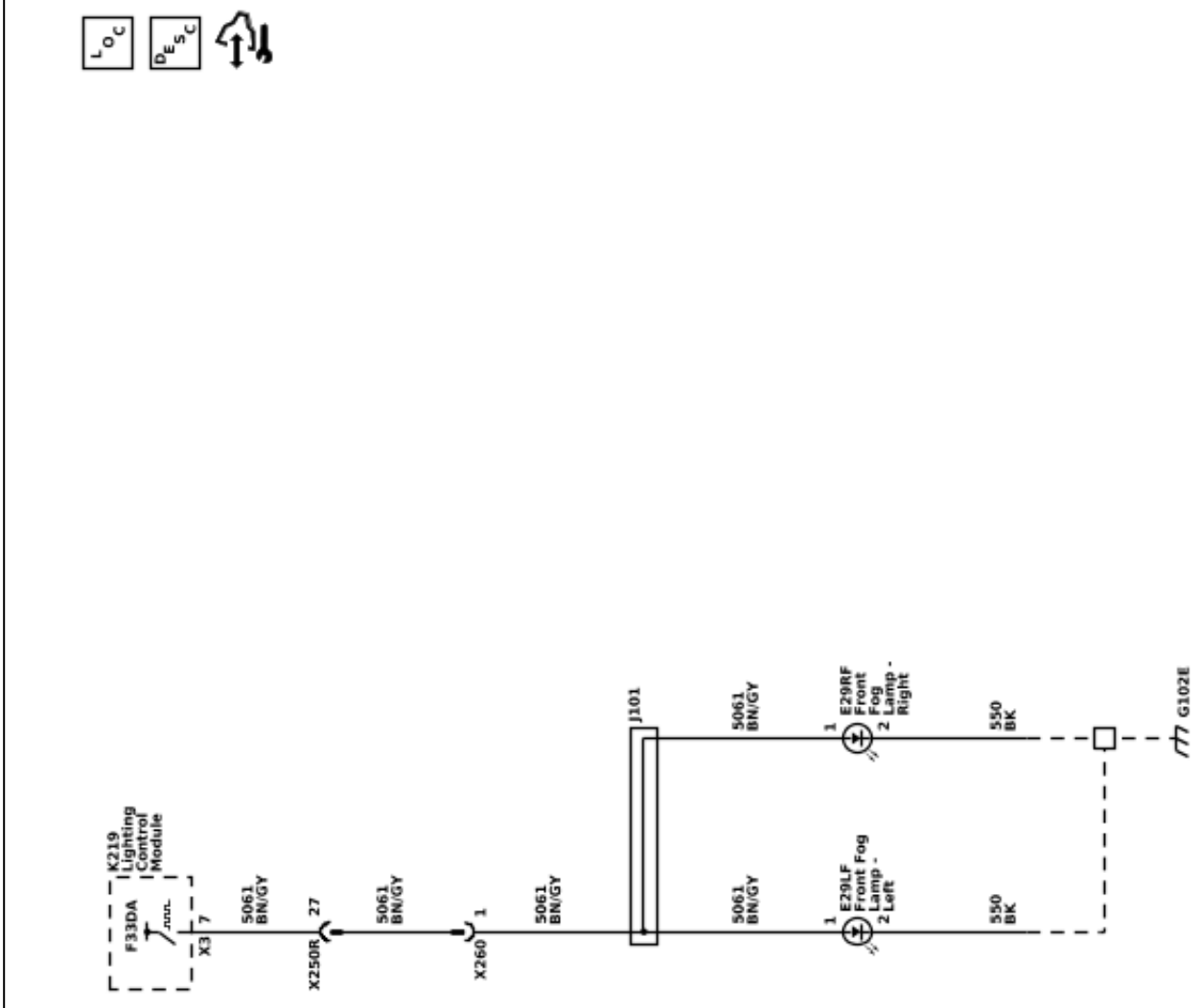
Headlights/Daytime Running Lights (DRL) Schematics (Low Beam, High Beam, and Daytime Running Lights (T4A))



Headlights/Daytime Running Lights (DRL) Schematics (Low Beam, High Beam, and Daytime Running Lights (T4L))



Fog Lights Schematics (Fog Lamps (T40))



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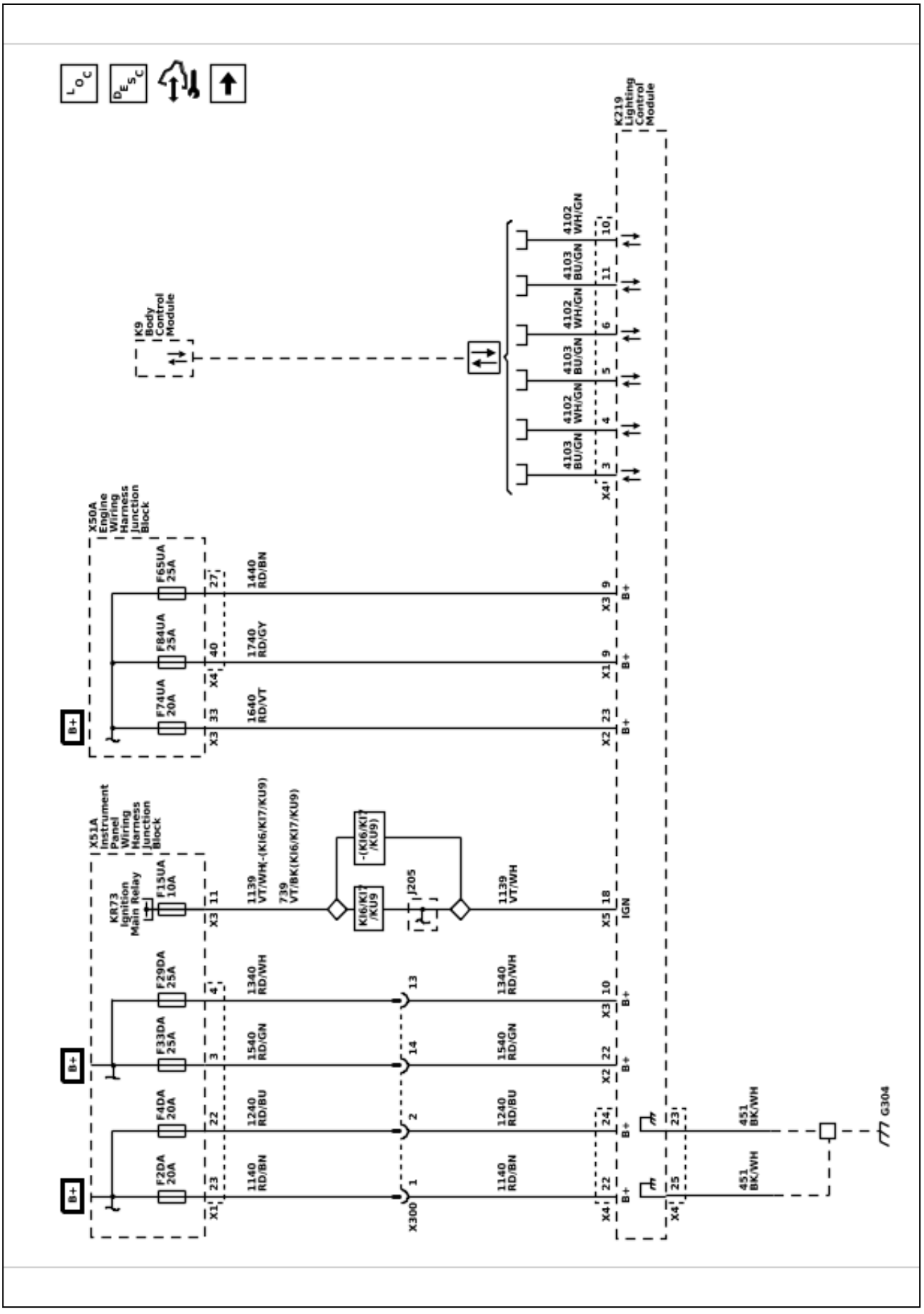
Exterior Lights Schematics (Lighting Control Module Power, Ground, and Serial Data)



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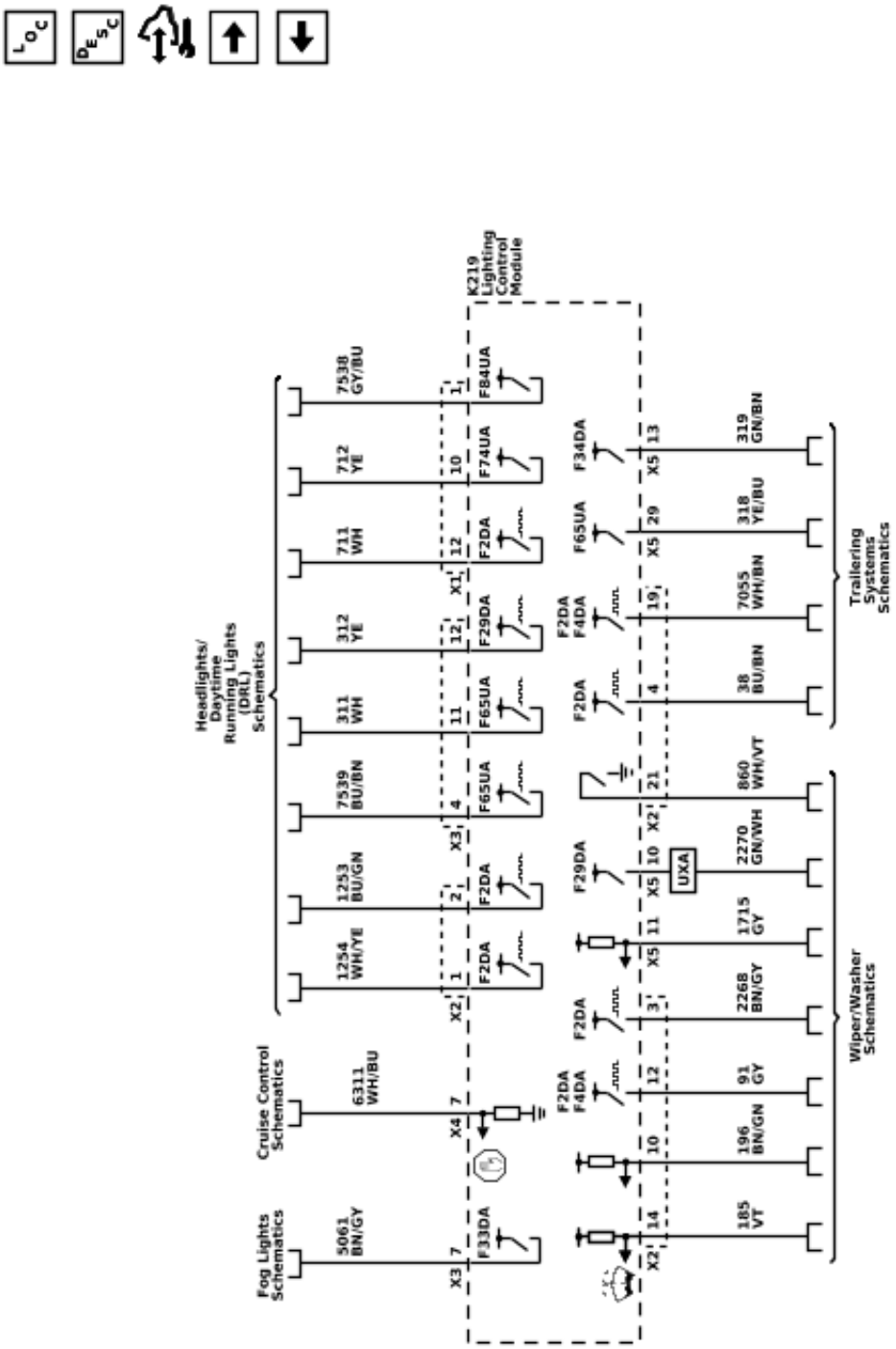
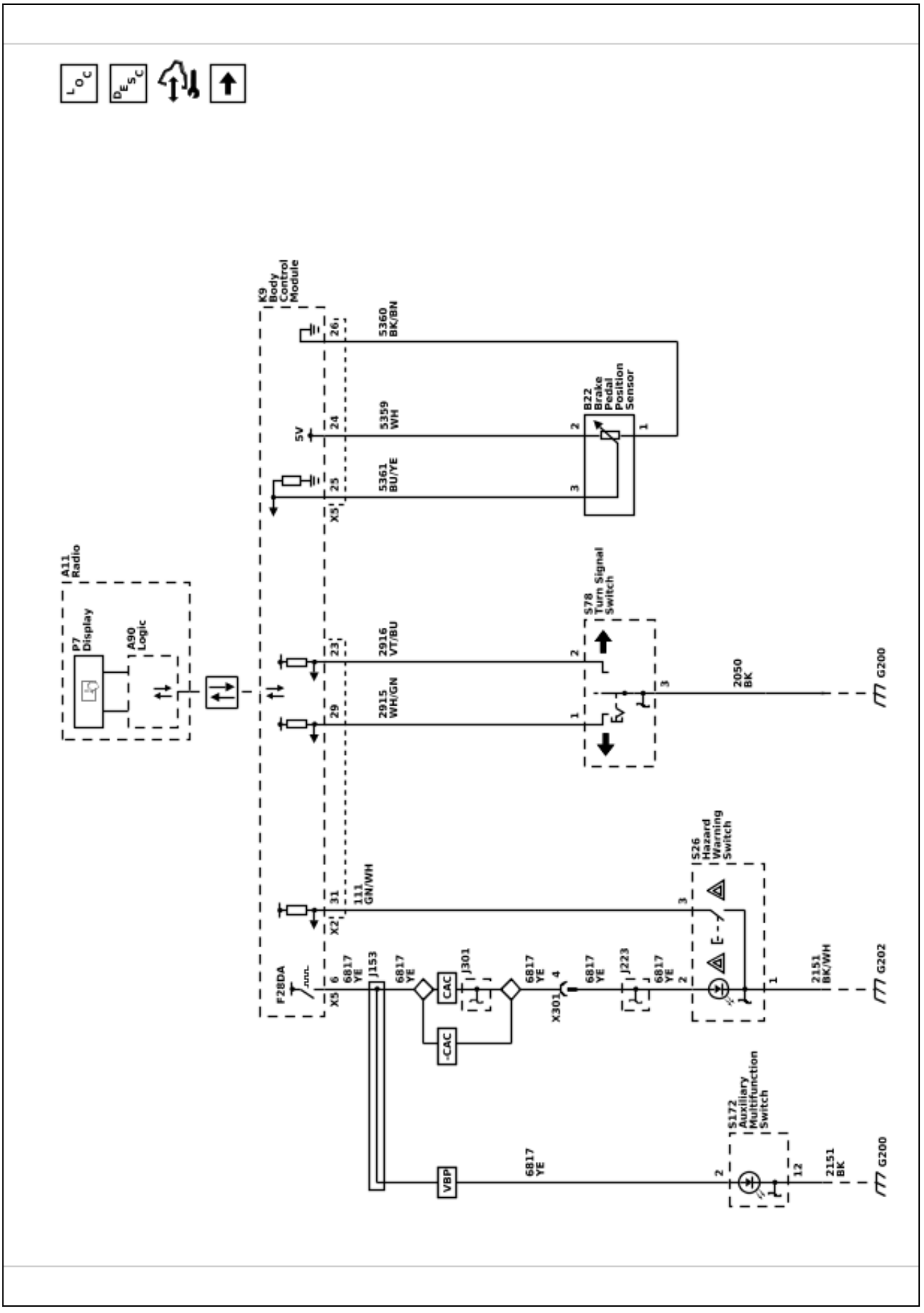
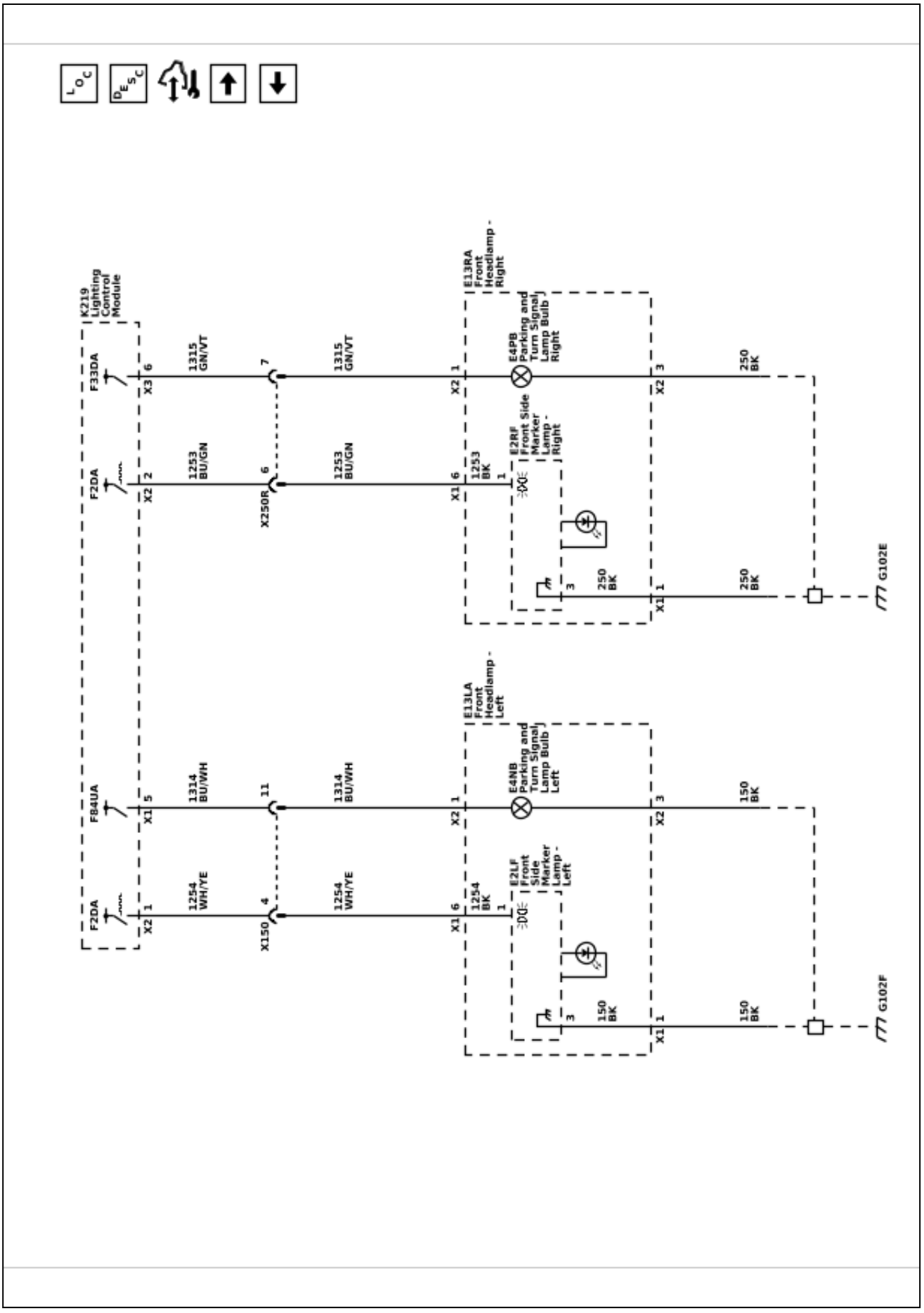
Exterior Lights Schematics (Lighting Control Module Subsystem References)



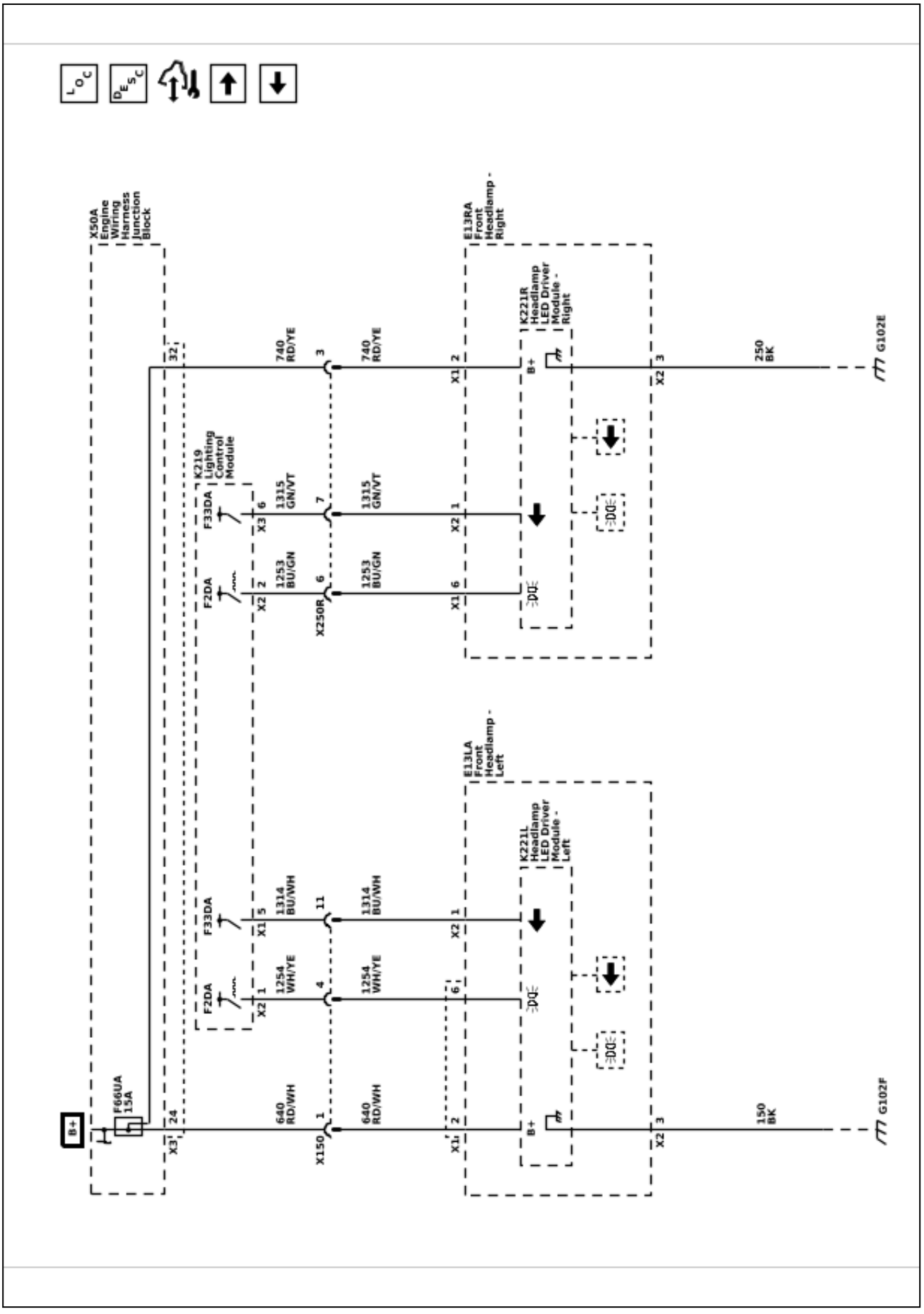
Exterior Lights Schematics (Exterior Light Controls and Indicators)



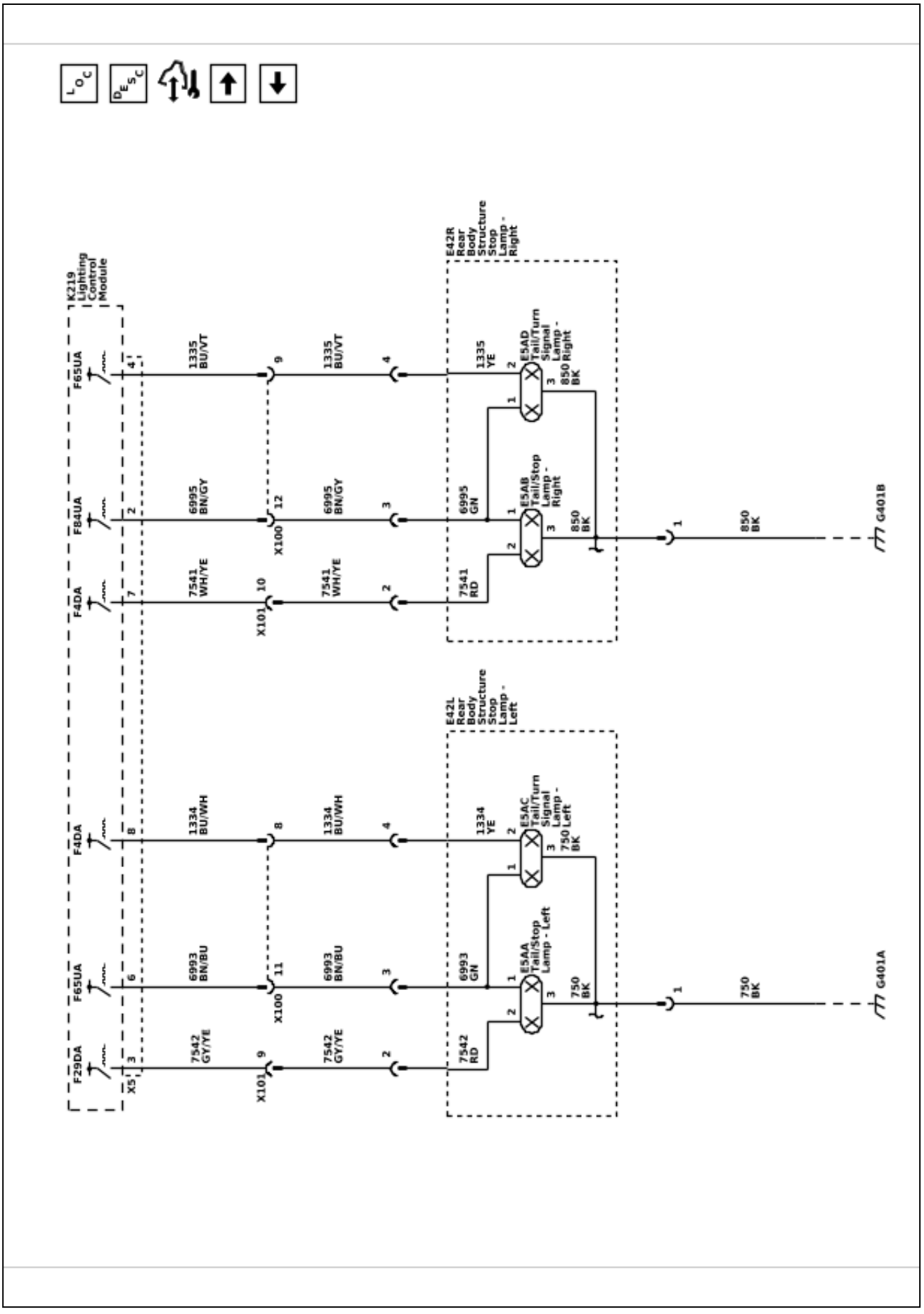
Exterior Lights Schematics (Front Turn and Park Lamps (T4A))



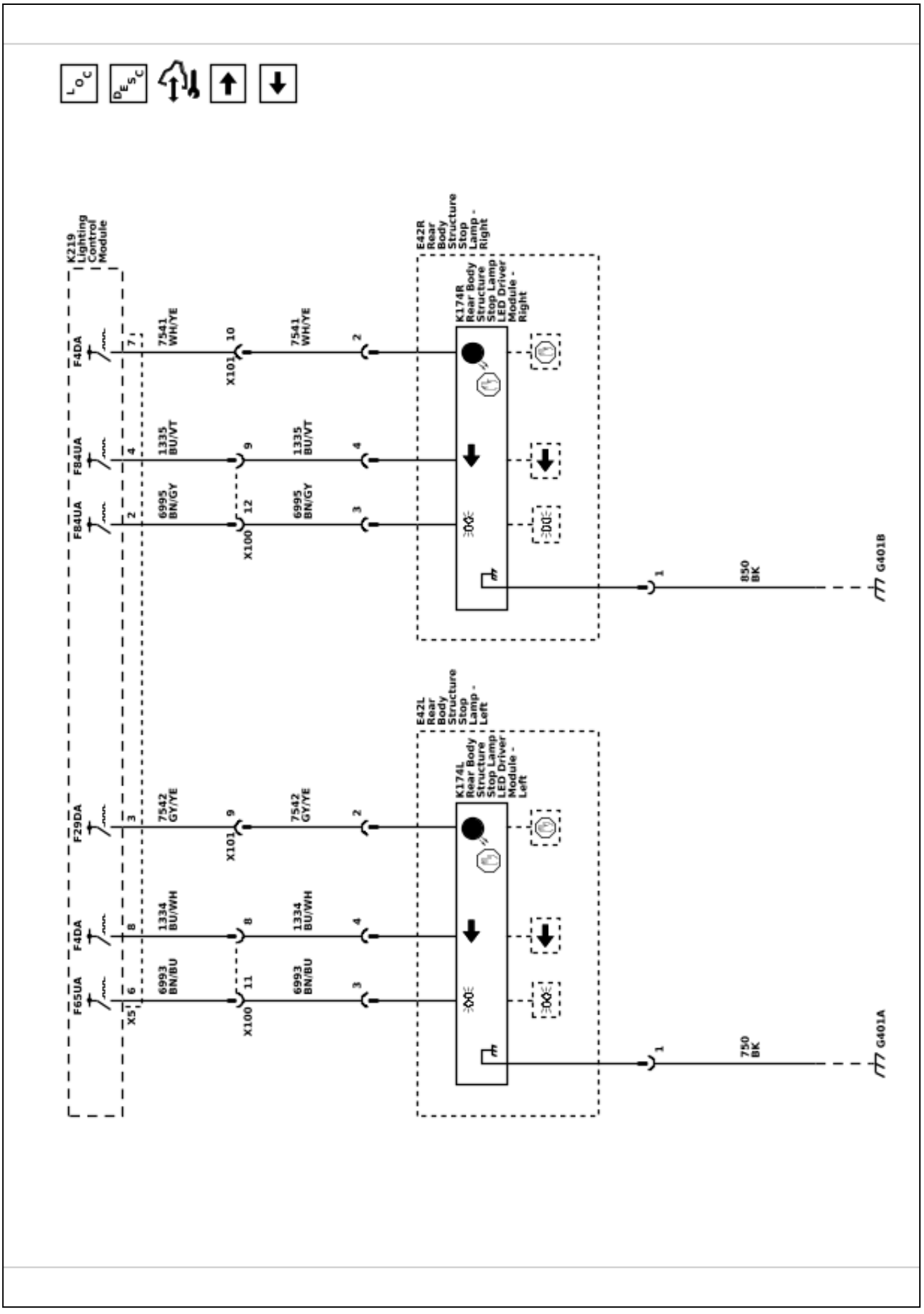
Exterior Lights Schematics (Front Turn and Park Lamps (T4L))



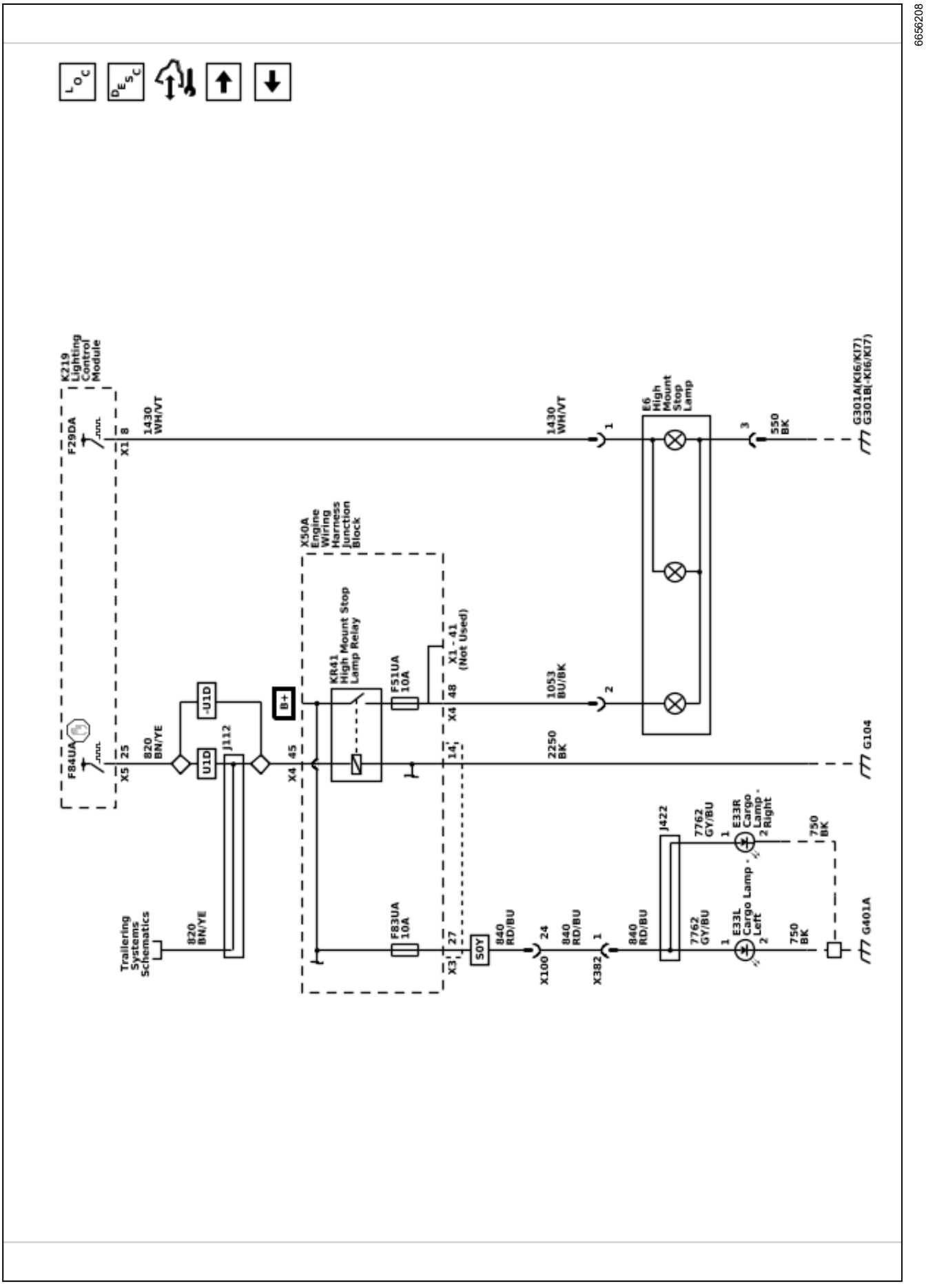
Exterior Lights Schematics (Rear Body Structure Stop, Turn, and Running Lamps (- T93))



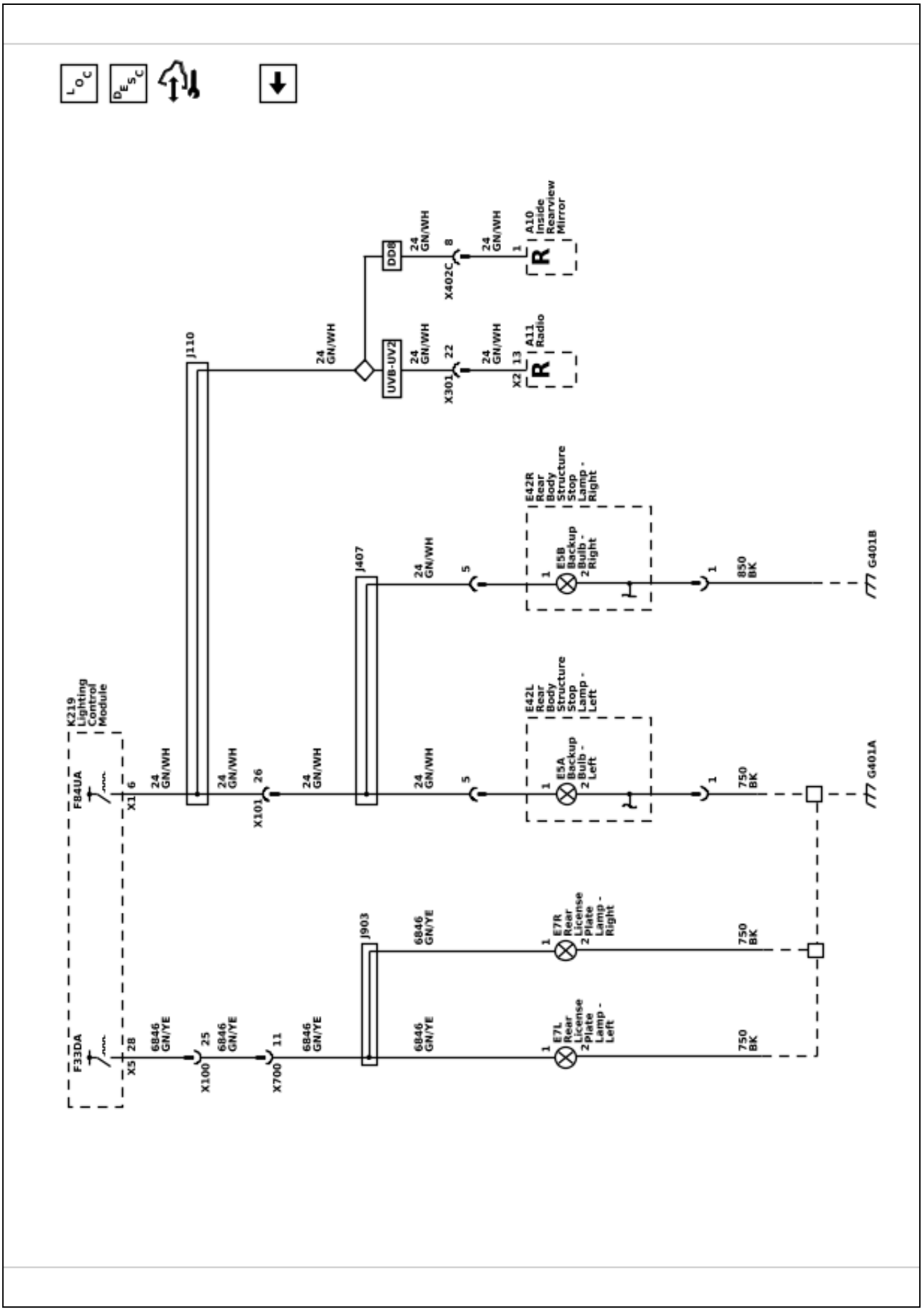
Exterior Lights Schematics (Rear Body Structure Stop, Turn, and Running Lamps (T93))



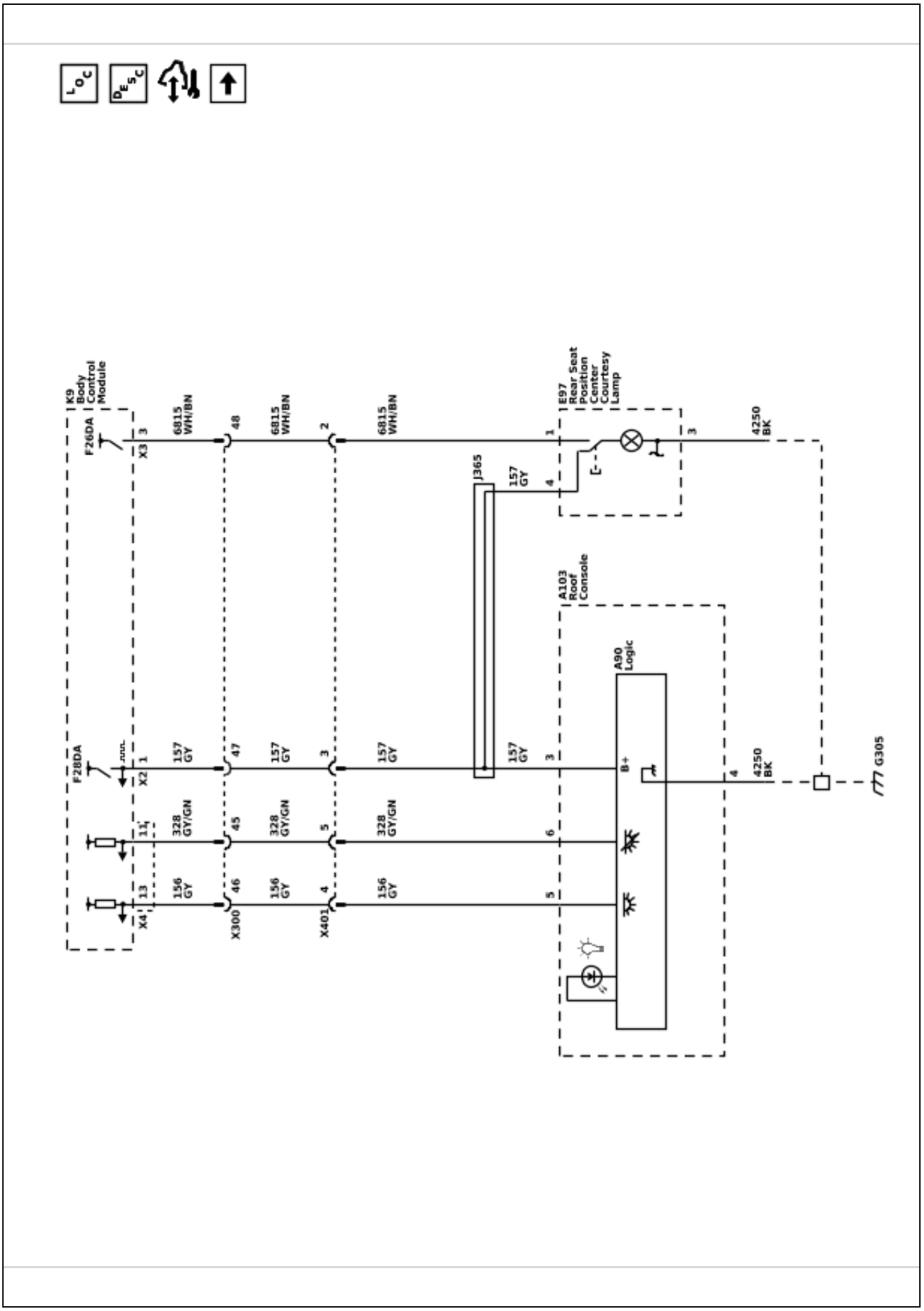
Exterior Lights Schematics (Center High Mount Stop and Cargo Lamps)



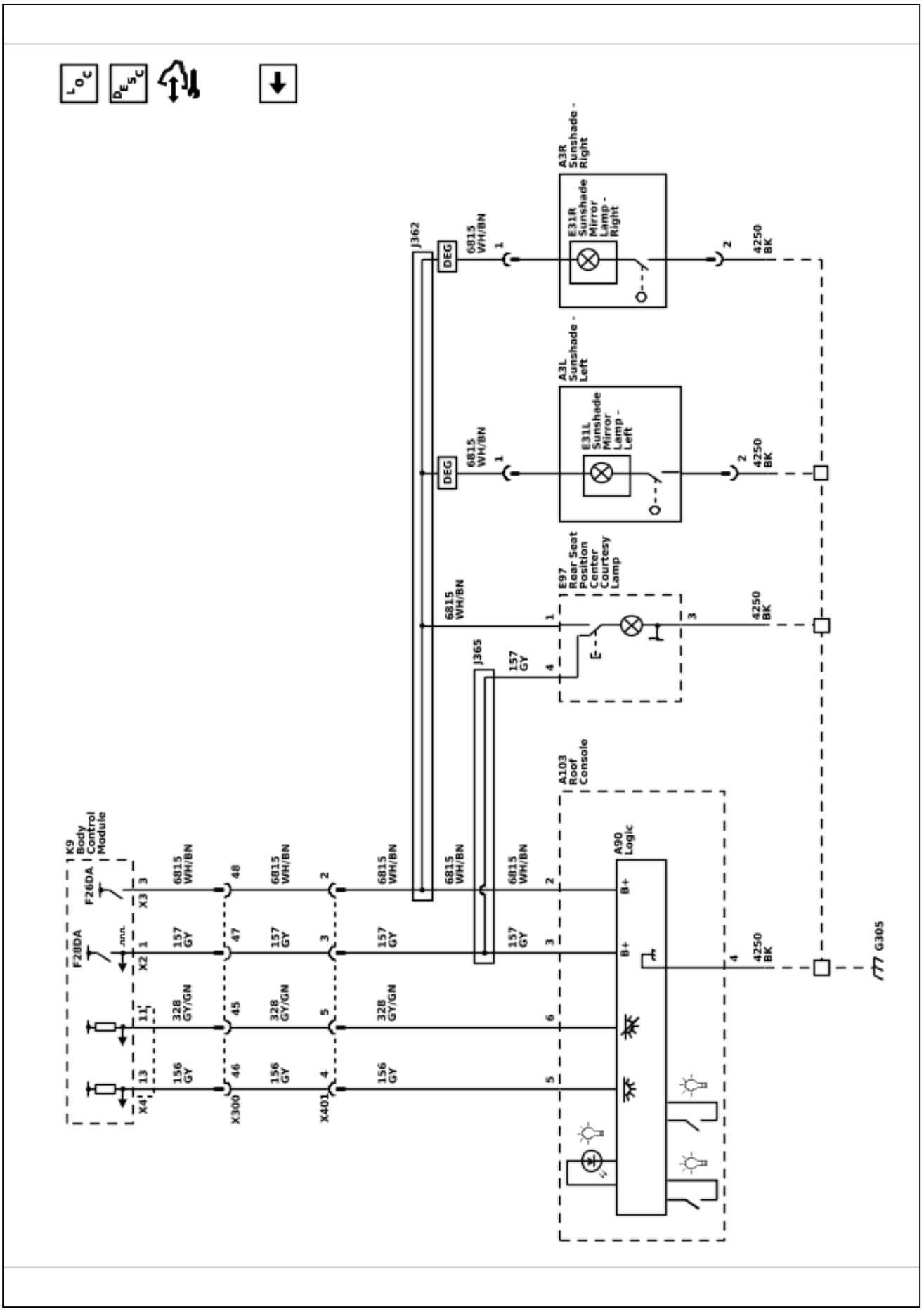
Exterior Lights Schematics (Backup and License Lamps)



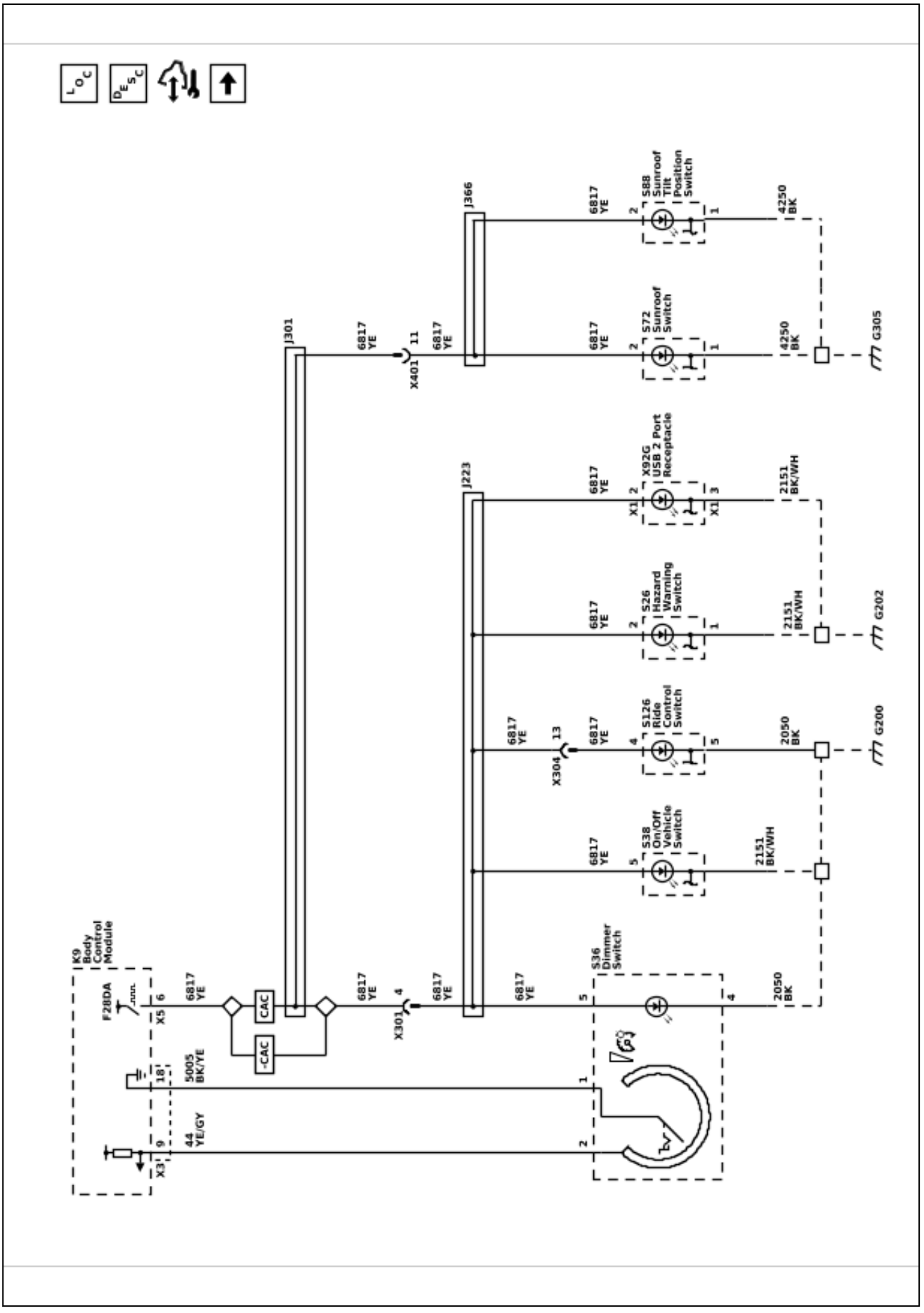
Interior Lights Schematics (Dome Lamps (C91))



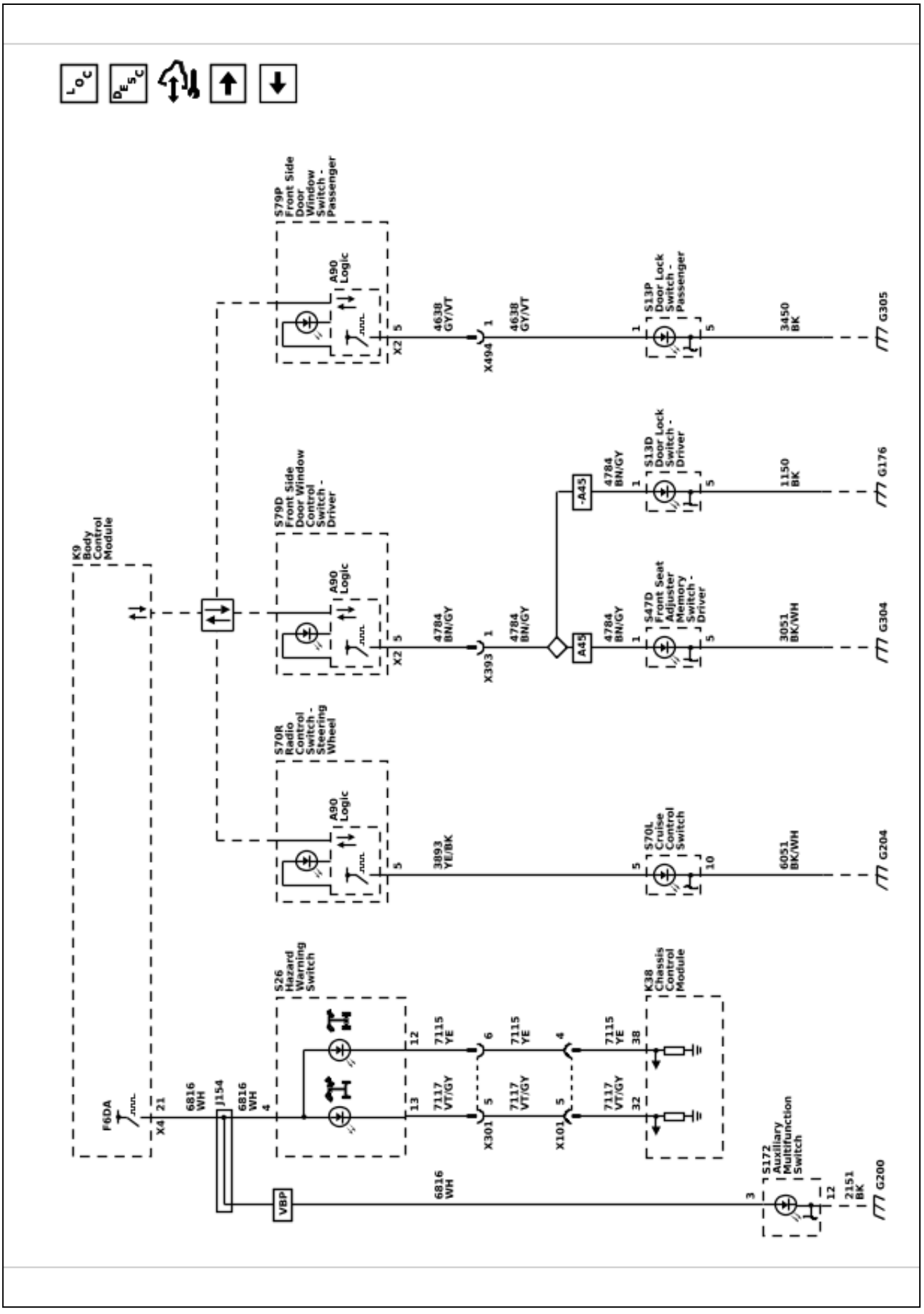
Interior Lights Schematics (Dome/Reading, and Sunshades (C75 / DEG))



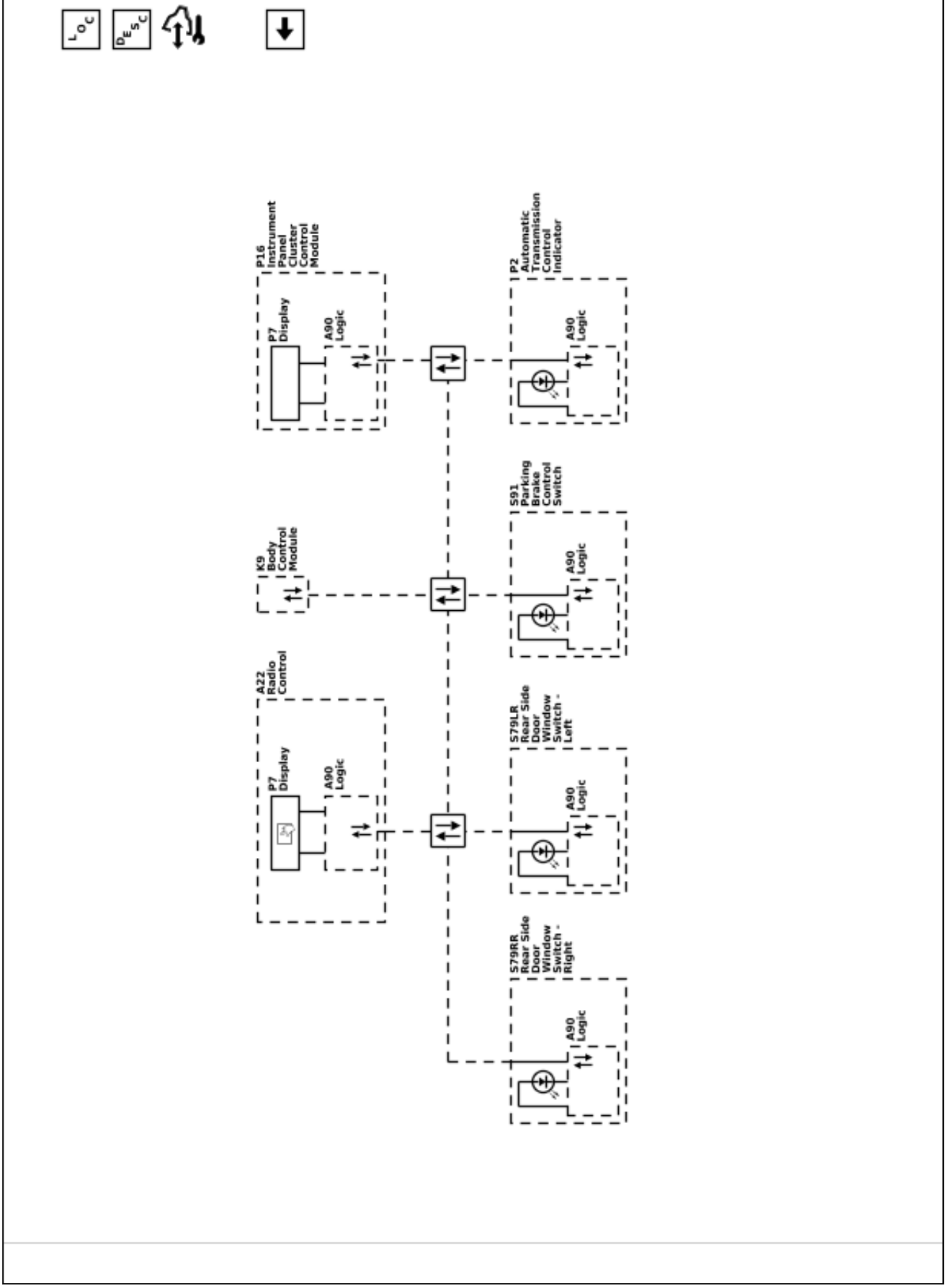
Interior Lights Dimming Schematics (Dimming Control, Instrument Panel, and Sunroof Lights)



Interior Lights Dimming Schematics (Door, Component, and Steering Wheel Switch Lamps)



Interior Lights Dimming Schematics (Serial Data Dimming)



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Description and Operation

Exterior Lighting Systems Description and Operation

The exterior lighting system consist of the following lamps:

- Backup lamps
- Cargo lamps
- Daytime running lamps (DRL)
- Exterior courtesy lamps
- Hazard warning lamps
- Headlamps
- Park, tail, license, and marker lamps
- Front fog lamps (T3U)
- Stop lamps
- Task lamps
- Turn signal lamps
- Trailer lighting, refer to *Trailering Description and Operation 0-50* for more information.

Headlamp Controls

The Infotainment Display is used to determine headlamp mode between AUTO, ON, Park, and OFF. When the user selects the desired headlamp mode, the Radio sends out a serial data message to multiple modules containing headlamp mode status information. The modules that receive the serial data message respond accordingly. The headlamps may be turned ON in 3 different ways utilizing the Infotainment Display controls:

- When the headlamp mode is placed in the ON position, for normal operation
- When the headlamp mode is placed in the AUTO position, for automatic lamp control during low ambient light conditions
- When the headlamp mode is placed in the AUTO position, with the windshield wipers ON in daylight conditions, after a 6 second delay

Low Beam Headlamps

The K219 Lighting Control Module responds to low beam requests by applying pulse width modulated (PWM) voltage to both headlamp low beam control circuits, illuminating the low beam headlamps. When the Lighting Control Module commands the low beam headlamps ON, the operator will notice the interior backlighting for the instrument cluster and the various other switches dim to the level of brightness selected by the instrument panel dimmer switch.

High Beam Headlamps

The high beam and flash to pass (FTP) functions are contained within the S78 Turn Signal Switch. The K9 Body Control Module (BCM) provides the turn signal/multifunction switch with two signal circuits, the high beam signal circuit and the FTP signal circuit. When the low beam headlamps are ON, and the turn signal/multifunction switch is placed in either the high beam position or FTP position, ground is applied to the BCM through the high beam/FTP signal circuit. The BCM responds to the high beam request by sending a serial data message to the K219 Lighting Control Module. The Lighting Control Module responds by applying pulse width modulated (PWM) voltage to both headlamp high beam control circuits, illuminating the high beam headlamps. The status of the high beam lamps is shown by a blue indicator located on the instrument cluster. When high beams are commanded on, the indicator will be illuminated continuously. If the driver turns the high beams off, the indicator will also turn off.

Flash to Pass

When the S78 Turn Signal Switch is momentarily placed in the flash to pass position, ground is applied to the turn signal/multifunction switch. The turn signal/multifunction switch applies ground to the K9 Body Control Module (BCM) through the flash to pass switch signal circuit. The BCM responds to the flash to pass request by sending a serial data message to the K219 Lighting Control Module. The Lighting Control Module responds by applying pulse width modulated (PWM) voltage to both headlamp high beam control circuits, illuminating the high beam headlamps. This causes the high beam headlamps to illuminate at full brightness until the turn signal/multifunction switch is returned to the at rest position.

Automatic Headlamp Control

When the headlamp mode is in the AUTO position, the BCM relies on the B10D Sun Load and Ambient Light and Security Indicator Sensor input to determine if headlamps are required or if daytime running lamps will be activated based on outside lighting conditions. During automatic lamp control, the headlamps will be off during daylight conditions but will turn on when the ambient light sensor detects low ambient light conditions. The ambient light sensor is a light sensitive transistor that varies the voltage signal to the BCM. The BCM provides a 5 volt reference signal and a low reference ground to the ambient light sensor. During low light conditions the BCM will request the low beam headlamps ON by sending a serial data message to the K219 Lighting Control Module. The Lighting Control Module responds by applying pulse width modulated (PWM) voltage to both headlamp low beam control circuits, illuminating the low beam headlamps.

Automatic High Beam Assist – IntelliBeam (TQ5)

The IntelliBeam system is activated by selecting the automatic high beam assist with the Infotainment Display while the exterior lamp control is in AUTO mode and the engine running. The IntelliBeam system consists of a front camera module that detects light, and is able to identify approaching vehicles on an even, straight road at a distance of greater than 0.4 km (0.25 mi). The front camera module analyzes light color, intensity, and movement. The IntelliBeam system will turn OFF the high beam headlamps when approaching vehicle headlamps or preceding vehicle taillights are detected by the front camera module. On vehicles equipped with Side Blind Zone Alert, IntelliBeam will proactively turn OFF the high beam headlamps when a vehicle is passing on the left or right side. The IntelliBeam system is turned off anytime the headlamp mode is out of the AUTO position.

IntelliBeam System Activation

- Vehicle ON
- Headlamp mode placed in the AUTO or ON position
- Outside lighting conditions must be dark
- Vehicle speed greater than 25 mph (40 km/h)

IntelliBeam System Operation

The following are conditions that the IntelliBeam system will turn the high beam headlamps off during operation:

- The system detects approaching traffic headlamps
- The system detects preceding traffic tail lamps
- The system detects a vehicle passing to the right or left (SBZA equipped only)
- Ambient light level too high due to towns or twilight situations
- The vehicle's speed drops below 13 mph (22 km/h)
- Delay

Note: IntelliBeam may not operate properly if any of the following conditions exist:

- Approaching and preceding vehicles lamps are undetectable due to dirt, snow, road spray, smoke, fog, or any other airborne conditions.
- The front camera and/or side object sensor module(s) is covered with ice, dirt, snow, haze, or is obstructed.
- The vehicle is being driven on winding or hilly road conditions which would make any on coming vehicle headlamps undetectable by the IntelliBeam.

IntelliBeam System Deactivation

- Manually operating the high beam headlamp mode from neutral to high beam position
- IntelliBeam is deactivated automatically when the front or rear fog lamps are turned ON

IntelliBeam System Indicator

The status of the IntelliBeam system is shown by a green indicator located on the instrument panel cluster. When IntelliBeam is active, the indicator will be illuminated continuously. If the operator deactivates the IntelliBeam system, the indicator will turn off.

Daytime Running Lamps

The daytime running lamps (DRL) will illuminate continuously when the following conditions are met:

- Engine running
- The headlamp mode is in the AUTO position
- Ambient light conditions are daytime conditions

The B10D Sun Load and Ambient Light and Security Indicator Sensor is used to monitor outside lighting conditions. The ambient light sensor provides a voltage signal that will vary between 0.2 and 4.9 volts depending on outside lighting conditions. The K9 Body Control Module (BCM) provides a 5 volt reference signal and a low reference ground to the ambient light sensor. The BCM monitors the ambient light sensor signal circuit to determine if outside lighting conditions are correct for either daytime running lamps (DRL) or automatic lamp control when the headlamp mode is in the AUTO position. In daylight conditions the BCM will send a serial data message to the K219 Lighting Control Module to command the DRLs ON, the Lighting Control Module responds by applying pulse width modulated (PWM) voltage to both DRL control circuits, illuminating the DRLs. During low light conditions the Lighting Control Module will command the low beam headlamps ON.

Hazard Lamps

The hazard flashers may be activated in any power mode. The Hazard Warning Switch signal circuit is momentarily grounded when the hazard switch is pressed. The K9 Body Control Module (BCM) responds to the hazard switch signal input by sending a serial data message to the K219 Lighting Control Module. The Lighting Control Module responds by supplying battery voltage to all turn signal lamps in an ON and OFF duty cycle. When the hazard switch is activated, the BCM also sends a serial data message to the instrument cluster requesting both turn signal indicators to be cycled ON and OFF.

Park, Tail, and License Lamps

When the headlamp mode is placed in the HEAD or PARK position, the K219 Lighting Control Module responds by applying battery voltage to the park lamps, tail lamps, and license lamps control circuits illuminating the park, tail, and license lamps.

Stop Lamps

The B22 Brake Pedal Position Sensor is used to sense the action of the driver application of the brake pedal. The K9 Body Control Module (BCM) provides the brake pedal position sensor with low reference, signal, and 5 volt reference circuits. When the variable signal reaches a voltage threshold indicating the brakes have been applied, the BCM will respond by sending a serial data message to the K219 Lighting Control Module requesting the stop lamps to be turned ON. The Lighting Control Module responds by applying battery voltage to the left and right stop lamp control circuits as well as the center high mounted stop lamp control circuit illuminating the left and right stop lamps and the center high mounted stop lamp. If serial data communication is lost between the BCM and the Lighting Control Module, the Lighting Control Module will receive a serial data message from the Electronic Brake Control Module indicating that the brakes have been applied. If serial data communication is lost between all three modules, the Lighting Control Module also receives a hard wired voltage signal from the BCM to signal the brake lamps ON.

Turn Signal Lamps

Turn Signals

The K9 Body Control Module (BCM) provides the S78 Turn Signal Switch with left and right turn signal switch signal circuits. Ground is applied at all times to the turn signal/multifunction switch. The turn signal lamps may only be activated with the ignition switch in the ON or START positions. When the turn signal/multifunction switch is placed in either the turn right or turn left position, ground is applied to the BCM through either the right turn or left turn signal switch signal circuit. The BCM responds to the turn signal switch input by sending a serial data message to the K219 Lighting Control Module. The Lighting Control Module responds by applying a pulsating voltage to the turn signal lamps through there respective control circuits. When a turn signal request is received by the BCM, a serial data message is also sent to the instrument cluster requesting the respective turn signal indicator be pulsed ON and OFF.

Turn Signal Outage Detection

Vehicles with LED turn signals require additional turn signal outage detection circuits that provide turn signal feedback to the K219 Lighting Control Module. The Lighting Control Module uses the feedback information to send a serial data message to the instrument cluster to alert the driver anytime a turn signal fault is detected. If a fault is detected on a turn signal circuit or a turn signal feedback circuit, the turn signals will flash in a rapid manner to alert the driver of the fault.

Backup Lamps

With the engine running and the transmission in the reverse position, the transmission control module (TCM) sends a serial data message to the multiple control modules. The message indicates that the gear selector is in the reverse position. The K9 Body Control Module (BCM) responds to the reverse position message by sending a serial data message to the K219 Lighting Control Module to request the backup lamps on. The Lighting Control Module responds by applying battery voltage to the backup lamps control circuit(s) illuminating the backup lamps. The applied voltage is also sent to the A11 Radio and A10 Inside Rearview Mirror for rearview camera purposes. Once the driver moves the gear selector out of the reverse position, a serial data message is sent by the TCM that the transmission is no longer in the reverse position. The BCM responds to the reverse position message by sending a serial data message to the Lighting Control Module to request the backup lamps off. The Lighting Control Module responds by removing battery voltage from the backup lamp circuits. The engine must be running for the backup lamps to operate.

Cargo Lamps

When the K219 Lighting Control Module receives a cargo lamp request from the Infotainment Display, the lighting control module responds by applying pulse width modulated (PWM) voltage to the cargo lamp control circuits illuminating the cargo lamps. In the event that the cargo lamps were to remain illuminated for more than 20 minutes with the ignition switch in the OFF position, the lighting control module will deactivate the cargo lamp control circuits to prevent total battery discharge.

Approach Lighting

Approach lighting is commanded ON when the unlock button is pressed on the keyless entry transmitter during dark ambient light conditions. When the keyless entry transmitter unlock button is pressed, a serial data message is sent by the K9 Body Control Module (BCM) that the vehicle is being unlocked. The K219 Lighting Control Module responds to the serial data message by applying voltage to the approach lamp control circuit illuminating the LED lighting located under each outside rearview mirror as part of approach lighting.

Battery Run Down Protection/Inadvertent Power

To provide battery run down protection, the exterior lamps will be deactivated automatically under certain conditions. The K9 Body Control Module (BCM) monitors the state of the S30 Headlamp Switch. If the headlamp switch is in the park or headlamp position when the ignition switch is ON and then the ignition switch is placed in the OFF position, the BCM initiates a 10 minutes timer. At the end of the 10 minutes, the BCM will send a serial data message to the K219 Lighting Control Module to deactivate the exterior lamps to prevent total battery discharge. This feature will be cancelled if any power mode other than OFF becomes active.

The BCM will disable battery run down protection if any of the following conditions exist:

- The park or headlamp switch is changed from the ON to OFF position, and back to the ON position during battery run down protection.
- The BCM determined that the park or headlamp switch was not active when the ignition was turned OFF.

Interior Lighting Systems Description and Operation

Interior Lamps

Dome Lamps Control

The K9 Body Control Module (BCM) sends the A103 Roof Console a dome lamp ON signal circuit and a dome lamp OFF signal circuit. The ON/OFF signal circuit becomes grounded with the switch in the appropriate position. The BCM responds to the dome lamp ON request by applying PWM voltage to all dome lamp control circuits when the switch is in the ON position and removes voltage when the switch is in the OFF position. When the switch is in the DOOR position, both signal circuits remain open and the BCM relies on door ajar inputs to control the dome lamps ON as part of DOOR mode. When any door is opened, the door ajar switch contacts close and the BCM receives a door-open input and responds by applying voltage to the dome lamp control circuits. In the event that a dome/reading lamp were to remain illuminated for more than 10 minutes with the ignition switch in the OFF position, the BCM will deactivate the dome/reading lamp control circuit to prevent total battery discharge.

Keyless Entry Interior Illumination

When the operator uses the keyless entry transmitter in order to unlock the doors, the K9 Body Control Module (BCM) receives a door-unlock signal. The BCM must receive inputs from various systems that indicate that the ignition switch is OFF, the courtesy lamp switch is OFF, and all doors are closed before the BCM will activate the interior lamps. After all doors have been closed, the courtesy lamps will turn OFF immediately if the ignition switch is turned to the ON position, the door locks are LOCKED, or approximately 20 seconds after the last door closes. The BCM will turn off the courtesy lamps through the theater dimming feature. The BCM keeps the courtesy lamps on for 40 seconds after an alarm event is completed.

Reading Lamps

When a reading lamp button is pressed, the switch contacts close providing a path to ground for the signal circuit from the A103 Roof Console. The roof console responds by applying battery voltage to the appropriate reading lamp control circuit illuminating the reading lamp. If the operator inadvertently leaves a reading lamp ON, the BCM will send a serial data message to turn all interior lighting off after 10 minutes has passed to prevent total battery discharge.

Sunshade Mirror Lamp

The inadvertent power supply voltage circuit from the K9 Body Control Module (BCM) provides battery voltage to the passenger side sunshade mirror lamp. When the sunshade mirror cover is opened, a switch closes providing ground and the sunshade lamp illuminates. If the operator inadvertently leaves the sunshade mirror cover open with the lamp ON, the BCM will turn all interior lamps OFF after 10 minutes has passed to prevent total battery discharge.

Interior Lamps Dimming

With the headlamp mode in the PARK or HEAD position, the K9 Body Control Module (BCM) responds by applying voltage to the backlight dimming control circuits illuminating all components with interior backlighting. All interior backlighting turns on at the dimming level set by the dimmer switch. The dimmer switch is used to increase and decrease the brightness of the interior backlighting components. The BCM provides a signal circuit and a low reference circuit to the dimmer switch for backlight dimming. When a dimming setting is selected, the signal circuit becomes grounded through the variable resistor internal to the dimmer switch and voltage from the BCM will decrease accordingly. The BCM interprets the signal and responds in two ways. The BCM applies a pulse width modulated (PWM) voltage through the LED dimming control circuits illuminating the interior backlighting to the requested level of brightness. The BCM also sends a serial data message to the appropriate control modules requesting all dimming components to be illuminated to the same level of brightness.

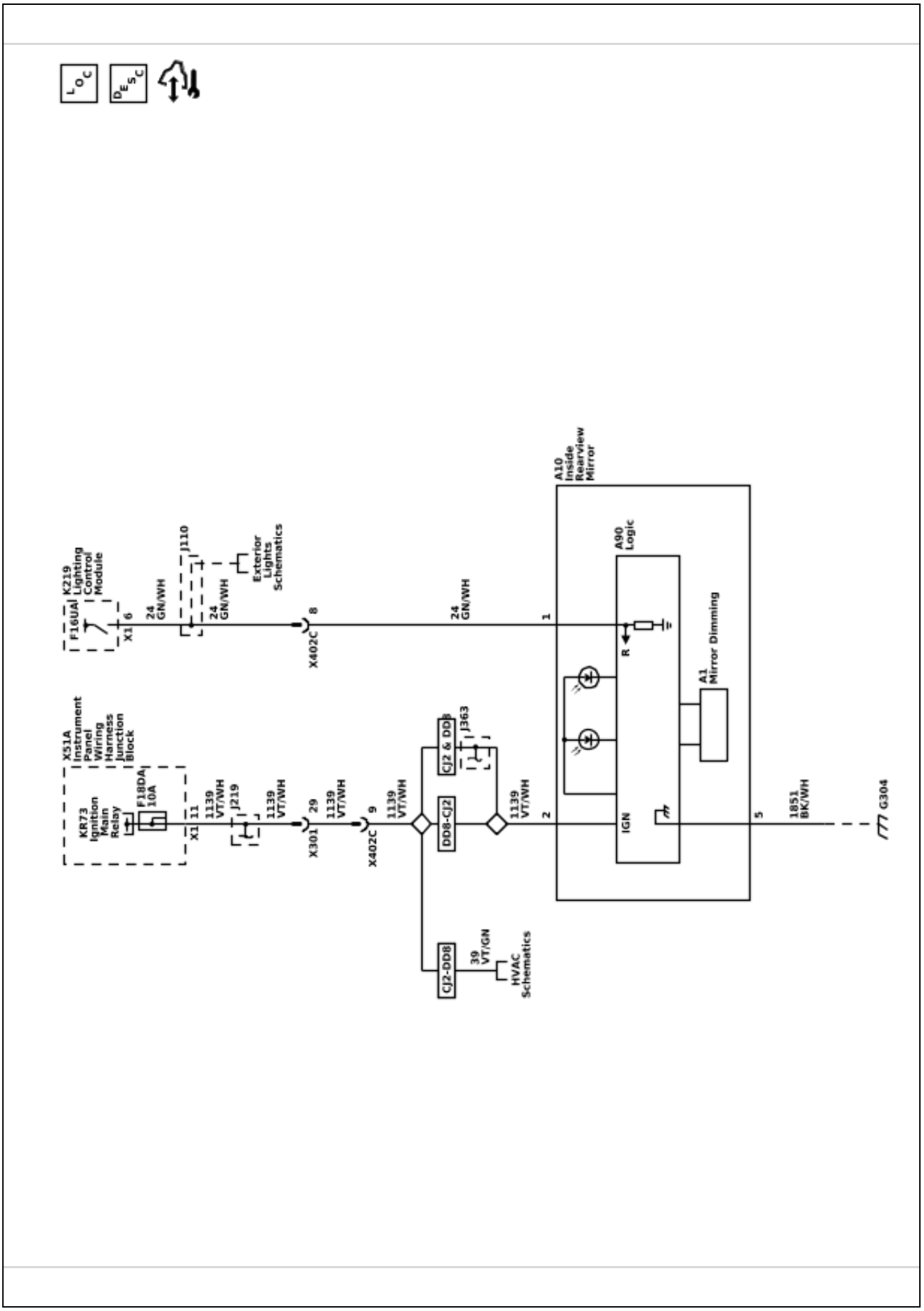
Battery Rundown Protection/Inadvertent Power

The K9 Body Control Module (BCM) inadvertent power supply voltage circuit provides battery voltage to all of the interior courtesy lamps. In the event that any of these lamps were to remain illuminated for a period of more than 10 minutes with the ignition switch in the OFF position, the BCM will deactivate the inadvertent power supply voltage circuit to prevent total battery discharge. If the ignition switch is turned to any position other than OFF, or if a lamp switch is activated during this 10 minute period, the timer resets for another 10 minutes.

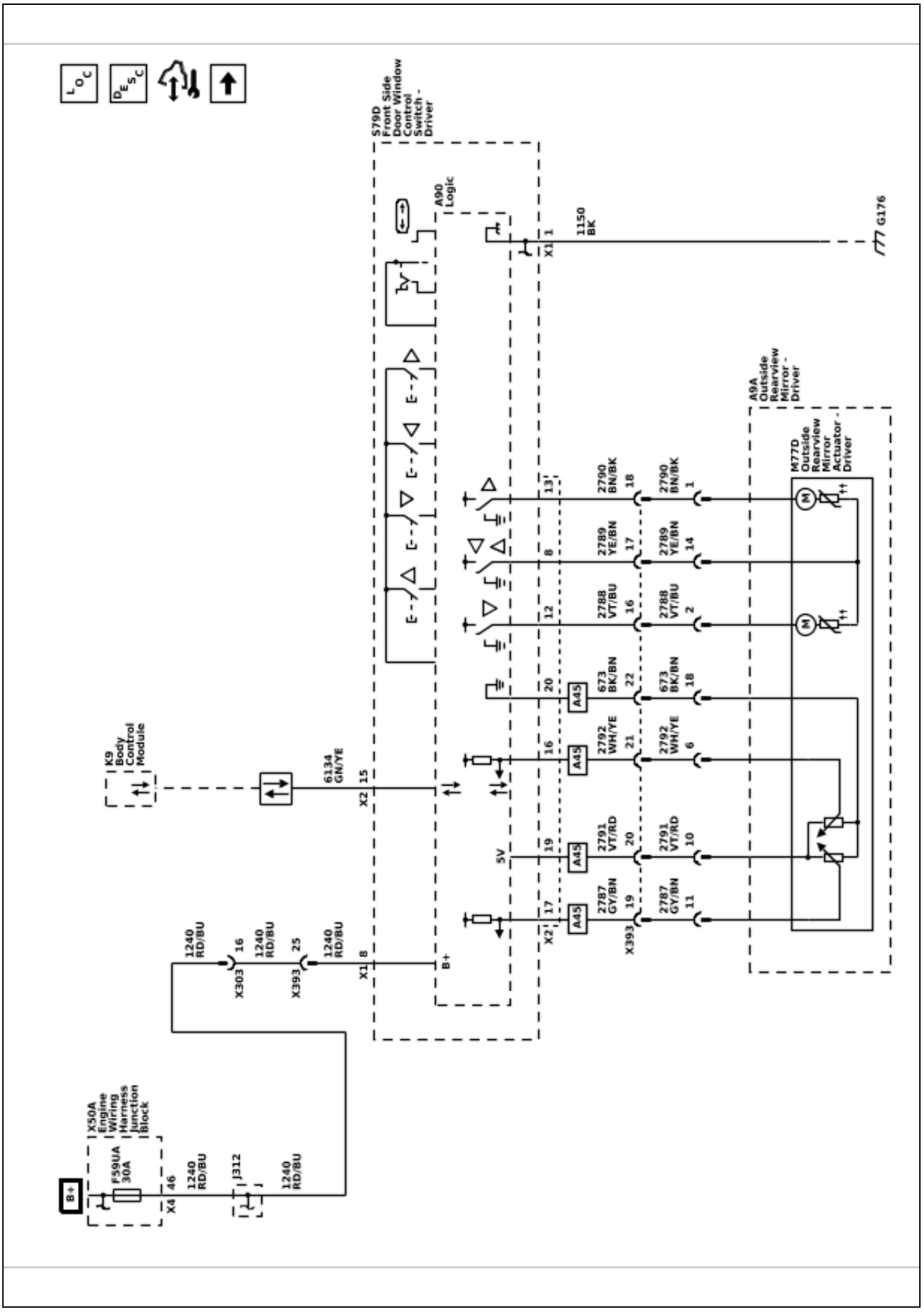
Mirrors

Schematic and Routing Diagrams

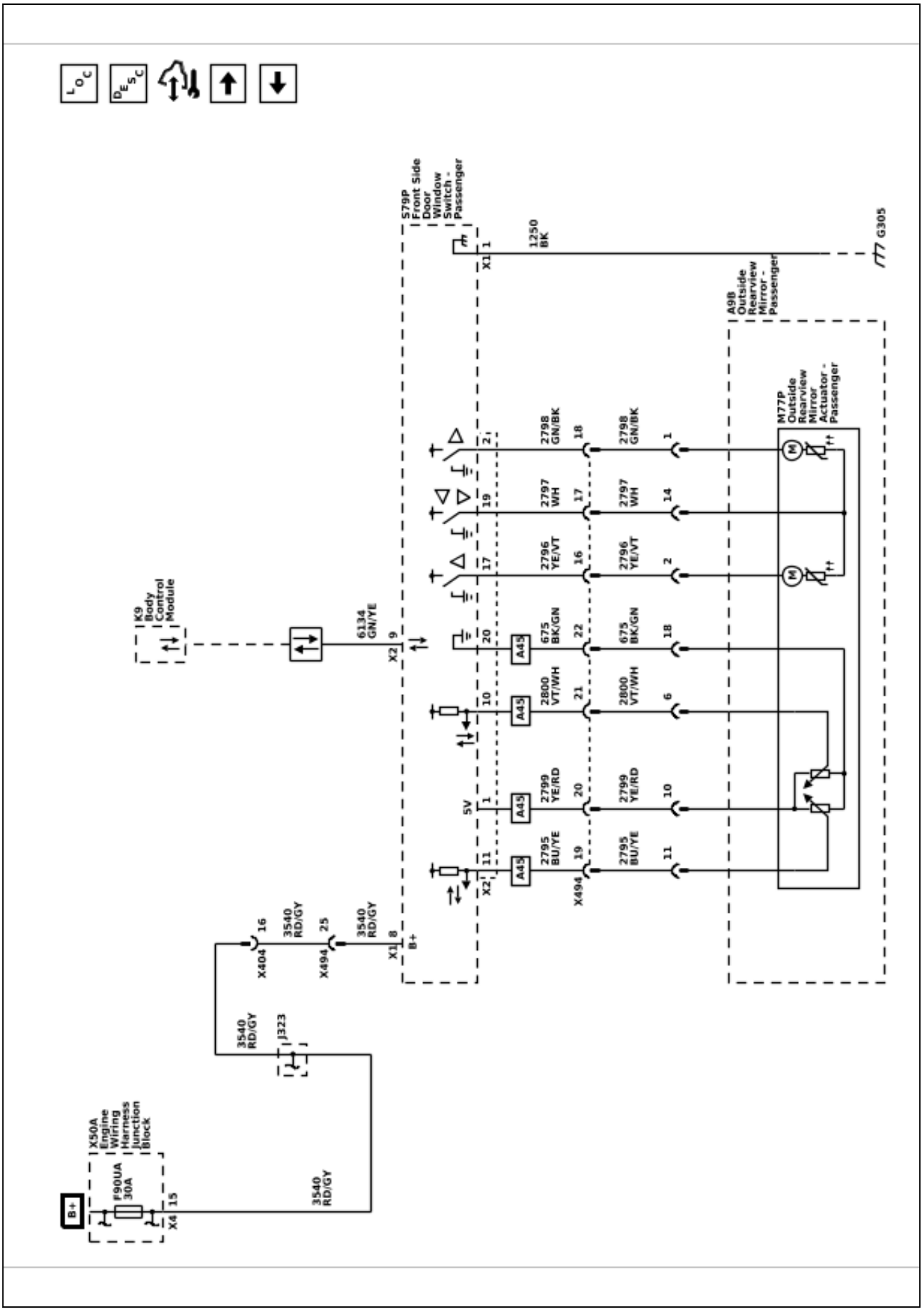
Inside Rearview Mirror Schematics (Auto-Dimming Mirror (DD8))



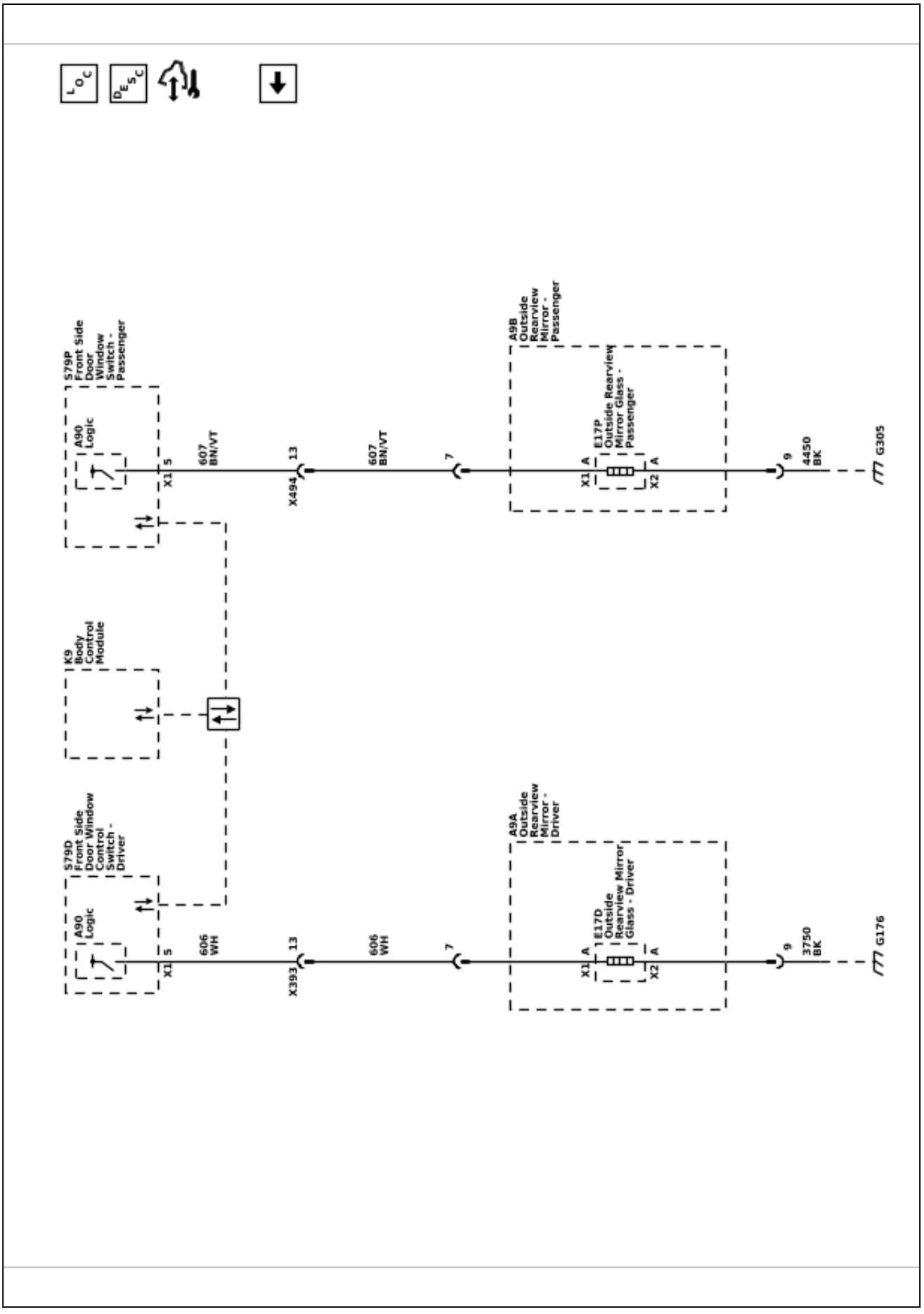
Outside Rearview Mirror Schematics (Driver Controls and Position)



Outside Rearview Mirror Schematics (Passenger Controls, and Position)



Outside Rearview Mirror Schematics (Heating)



Description and Operation

Automatic Day-Night Mirror Description and Operation

Inside Rearview Mirror with the Automatic Day-Night Feature System Operation

The inside rearview mirror uses 2 photocell sensors. One sensor is the headlight sensor, located on the face side of the mirror. The headlight sensor is used to determine light conditions present at the mirror face. The other sensor is the ambient light sensor, located on the rear of the mirror or windshield side. The ambient light sensor is used to determine the exterior light conditions. With a low exterior light condition detected, and a high light condition from behind the car, at the headlight sensor, the inside rearview mirror will automatically darken the face of the mirror.

In the daytime, the mirror is in a normal state because of the high exterior light condition that is indicated by the ambient light sensor. With the gear selector lever in the REVERSE position and the Ignition ON/Vehicle in Service Mode, backup lamp supply voltage is supplied as an input to the inside rearview mirror. The mirror monitors this input to disable the automatic day-night feature. This allows the driver to see objects in the mirror clearly when backing up, even during the night.

Driver Outside Rearview Mirror with Automatic Day-Night System Operation (If Equipped)

The automatic day-night feature of the driver outside rearview mirror is controlled by the inside rearview mirror. The inside rearview mirror supplies control and low reference to the driver outside rearview mirror. At night, with the automatic day-night feature enabled, the driver outside rearview mirror will automatically darken with the inside rearview mirror to reduce glare from headlamps behind the vehicle.

Outside Mirror Description and Operation

Power Mirror System Components

The power mirror system consists of the following components:

- Body Control Module
- Driver Seat Adjuster Memory Module
- Outside Mirror Switch
- Passenger Window Switch
- Left Outside Rearview Mirror
- Right Outside Rearview Mirror

Power Mirror System Controls

The outside rearview mirror switch is part of the S79D Driver Front Side Door Window Control Switch and uses serial data to control the passenger mirror through the S79P Passenger Front Side Door Window Control Switch. Each S79 Side Door Window Control Switch has it own 12V, ground and data communications circuit along with mirror directional control and mirror fold circuits.

Driver Mirror Controls

The S79D Driver Front Side Door Window Control Switch has internal connections for the driver mirror. When the mirror position switch is active the driver mirror is commanded to move through bi-directional motor control circuits. The motor control circuits are floating while in an inactive state and the switches will apply power and ground to the control circuits as necessary to move the mirror in the commanded direction.

Passenger Mirror Controls

The S79D Driver Front Side Door Window Control Switch uses serial data circuits to communicate the active states for the passenger mirror switch to the S79P Passenger Front Side Door Window Control Switch. The S79P Passenger Front Side Door Window Control Switch has internal connections for the passenger mirror. When the mirror position switch is active the passenger mirror is commanded to move through bi-directional motor control circuits. The motor control circuits are floating while in an inactive state and the switches will apply power and ground to the control circuits as necessary to move the mirror in the commanded direction.

Mirror Position

Mirror position is determined by both horizontal and vertical position sensors in each of the power mirrors. Each S79 Front Side Door Window Control Switch supplies a 5 V reference, low reference, and horizontal and vertical position signal circuits to these sensors. The signal circuits are referenced from 5 V by the S79 Front Side Door Window Control Switch and the signal circuit voltage levels represent the mirror positions. The mirror positions are stored in each S79 Front Side Door Window Control Switch for memory mirror operation. When the memory seat module receives a memory recall command, the memory seat control module will send the go to position to the S79 Front Side Door Window Control Switch. The S79 Front Side Door Window Control Switches will then drive the appropriate mirror motors to the commanded position sensor settings.

Mirror Select

The S79D Driver Front Side Door Window Control Switch has internal connections for the mirror select switch. When the mirror select switch is active the S79 Front Side Door Window Control Switch will either control the driver mirror or send a serial data message to control the passenger mirror.

Folding Mirrors

The S79D Driver Front Side Door Window Control Switch sends the mirror fold/unfold inputs to the K9 Body Control Module (BCM) through serial data. When the BCM receives a fold/unfold signal it will send a fold/unfold command to the S79 Driver Front Side Door Window Control Switch which will send a serial data message to the S79P Passenger Front Side Door Window Control Switch. The outside mirrors will fold or unfold depending on their current state. The BCM will also send a serial data message to unfold the mirrors when the vehicle reaches 20 km/h (12 mph). The S79 Front Side Door Window Control Switches control the fold/unfold motors through bi-directional control circuits

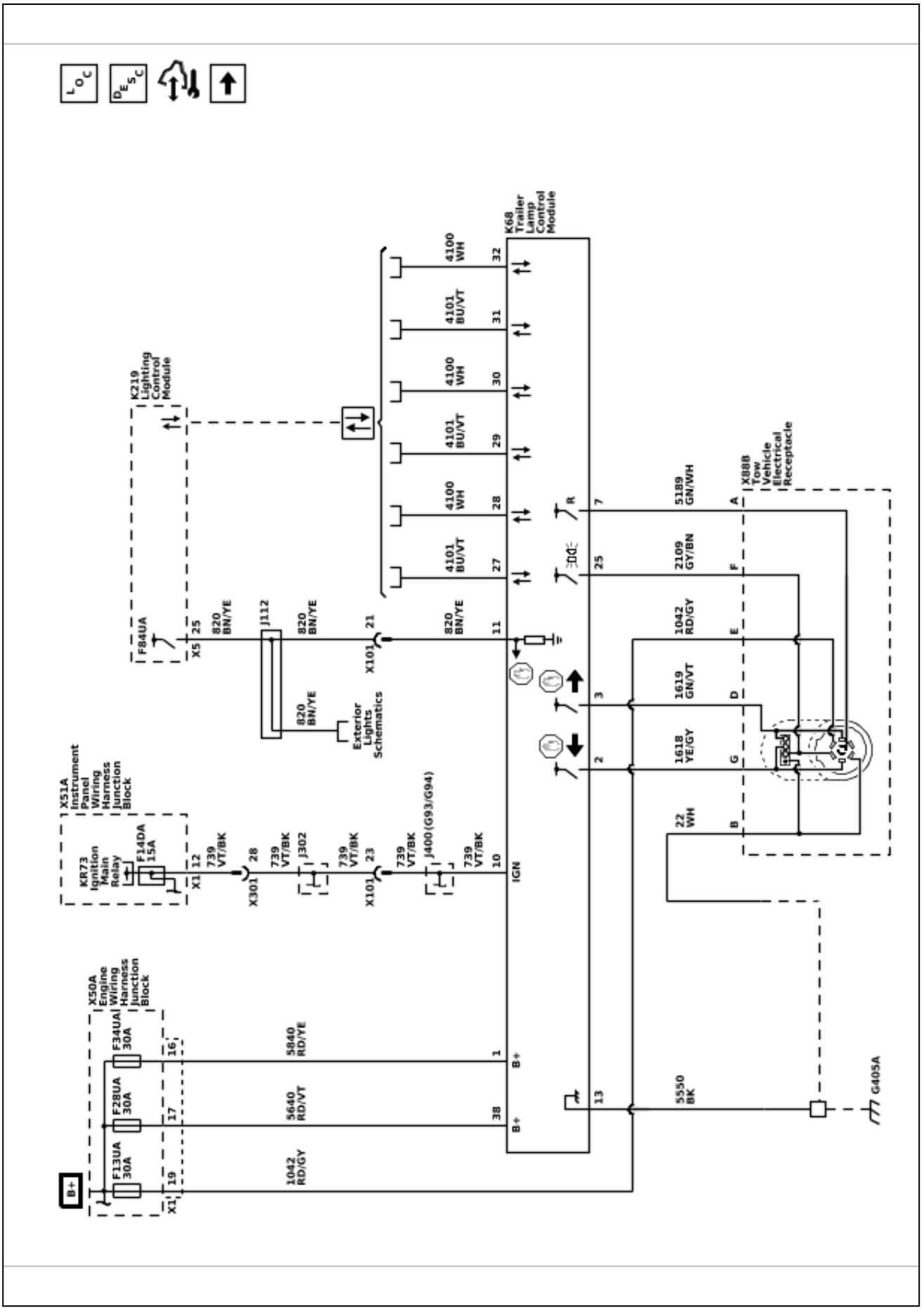
Heated Mirrors

The heated mirrors are controlled through each S79 Front Side Door Window Control Switch. When the vehicle is running and the HVAC control module receives a rear window defog request from the radio/HVAC controls, the HVAC control module will send a serial data message to the S79D Driver Front Side Door Window Control Switch and S79P Passenger Front Side Door Window Control Switch. Each S79 Front Side Door Window Control Switch provide B+ voltage to the driver and passenger outside rearview mirror heating elements.

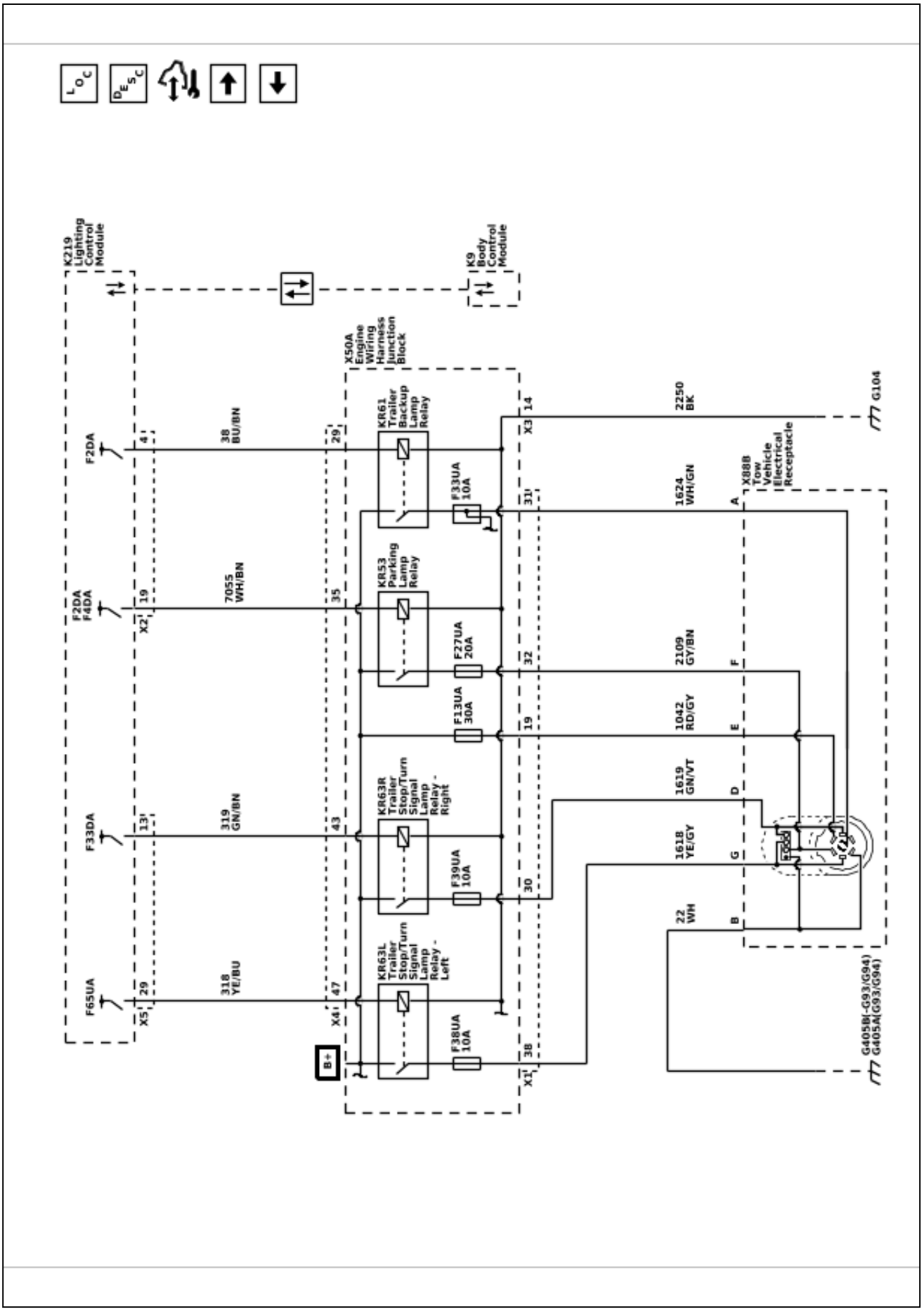
Trailering Systems

Schematic and Routing Diagrams

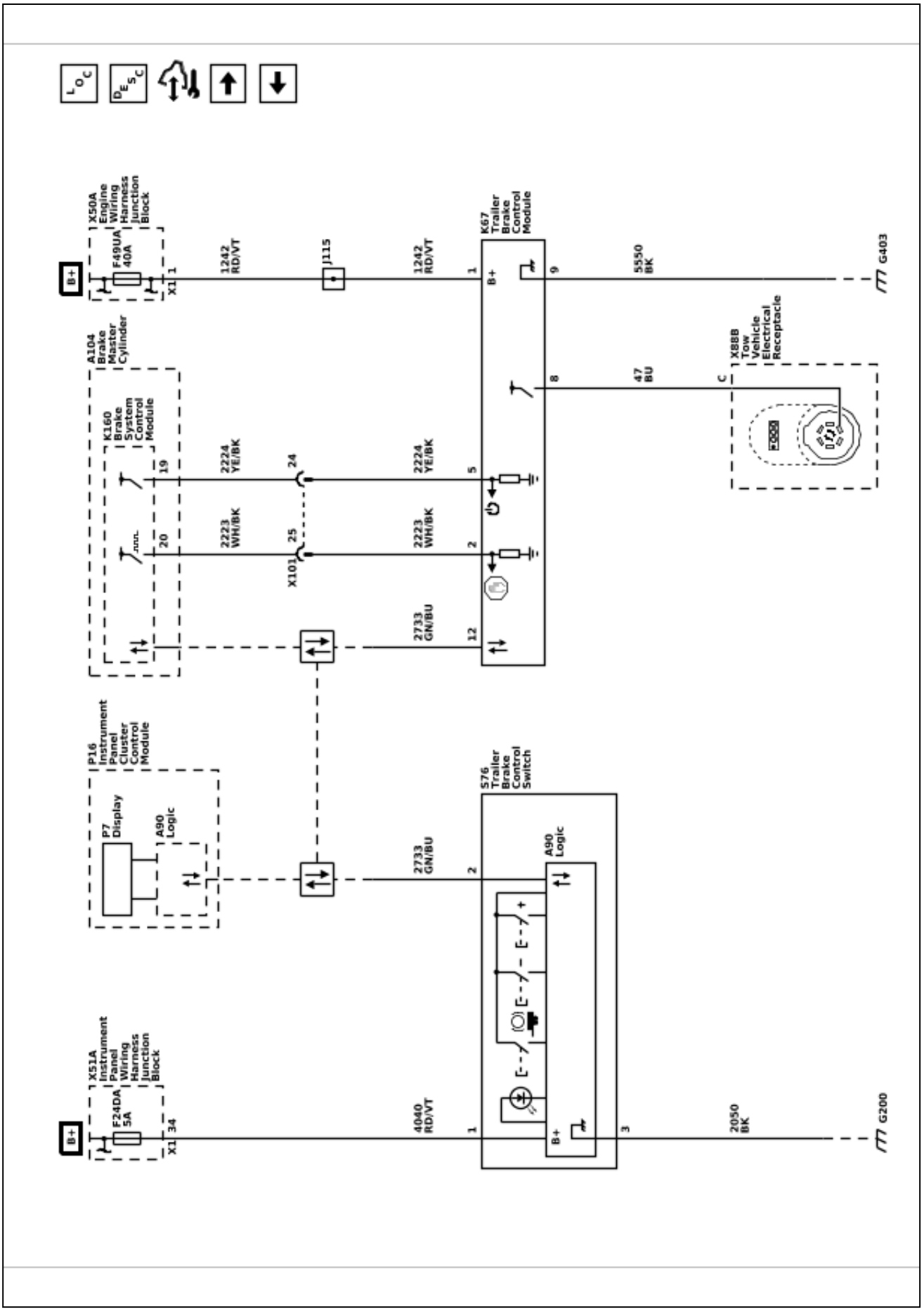
Trailering Systems Schematics (Trailer Lamp Control Module and Trailer Connector Pins: A, B, D, E, F, G (Z82 & U1D))



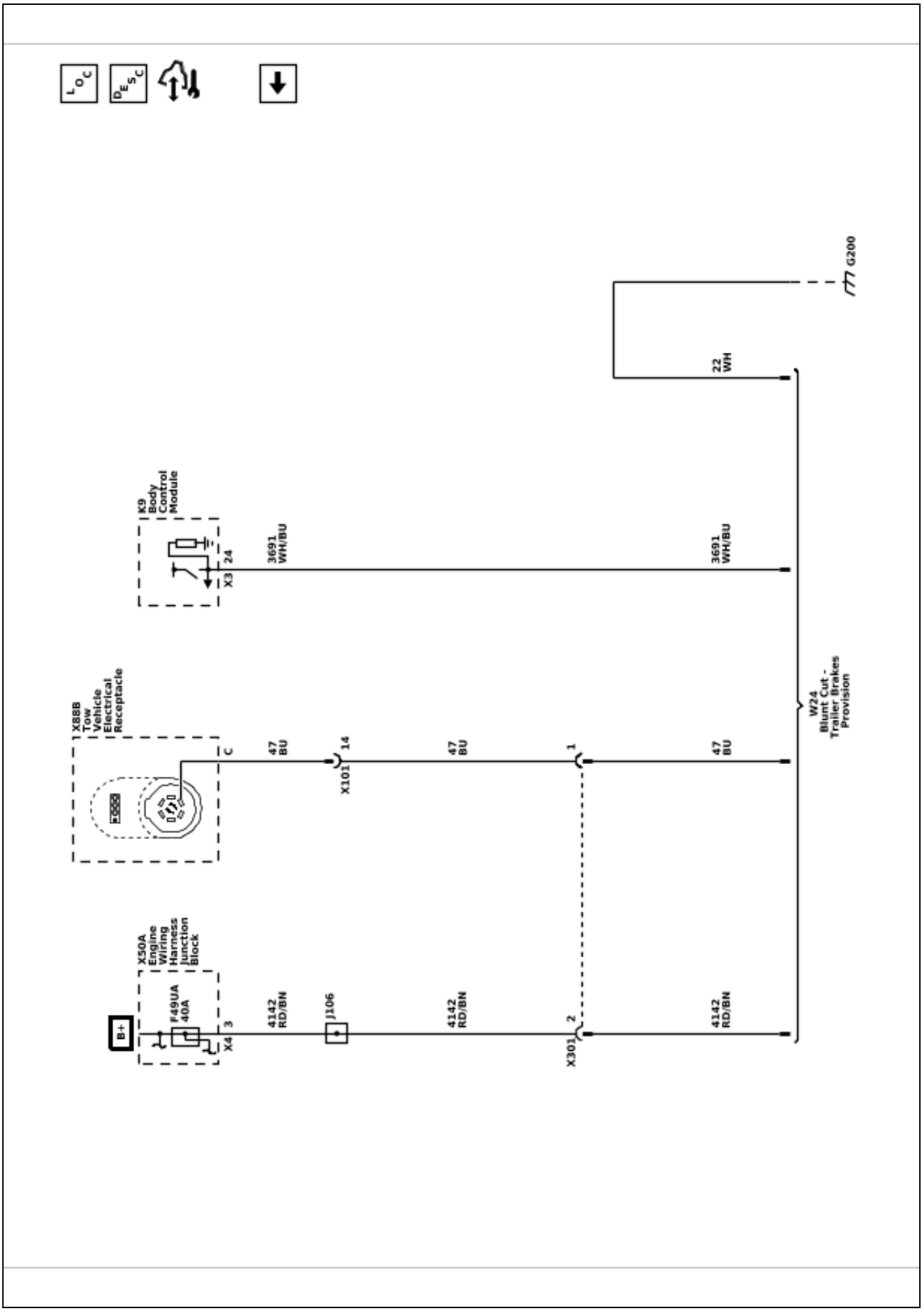
Trailering Systems Schematics (Trailer Connector Pins: A, B, D, E, F, G (Z82 - U1D))



Trailering Systems Schematics (Trailer Brake and Trailer Connector Pin: C (JL1))



Trailering Systems Schematics (Trailer Brake Provisions (Z82 - U1D))



Description and Operation

Trailering Description and Operation

Trailering System Overview

Begin the trailering system diagnosis with [Link target (target-id 325938-) not found] . The Diagnostic System Check - Trailering will provide a complete strategy to locate and repair a vehicle trailering electrical fault. Not following this strategy may cause additional diagnostic time and/or misdiagnosis.

The trailering system consists of the following:

- Trailer Lighting, refer to [Link target (target-id 326023-) not found] for additional diagnostic information.
- {JL1} Trailer Brakes, refer to [Link target (target-id 326020-) not found] for additional diagnostic information.
- Trailer Battery Charging System, refer to [Link target (target-id 326019-) not found] for additional diagnostic information.
- Trailer Detection, refer to [Link target (target-id 326022-) not found] for additional diagnostic information.
- Trailer Theft Detection.

7–Terminal Tow Vehicle Electrical Receptacle Pinout

- Terminal A – Trailer Backup Lamp Control
- Terminal B – Ground
- Terminal C – Trailer Brake Control
- Terminal D – Right Trailer Stop/Turn Signal Lamp Control
- Terminal E – B+
- Terminal F – Trailer Park Lamp Control
- Terminal G – Left Trailer Stop/Turn Signal Lamp Control

Connecting Aftermarket Accessories

- Some aftermarket accessories that connect to the X88B Tow Vehicle Electrical Receptacle will be recognized by the vehicle as a trailer connected, even if the accessory is not a trailer. As a result, side blind zone detection, rear park assist, and/or rear cross traffic alert will be turned off anytime the vehicle detects a trailer/accessory is connected.
- Vehicles equipped with U1D/UET have trailer theft detection that constantly monitors trailer connected status when enabled. This is done by randomly pulsing the lighting circuits of the trailer when the vehicle is parked. As a result, some aftermarket accessories may be turned ON/OFF when connected to the vehicle with theft detection enabled.
- Vehicles equipped with U1D/UET use pulse width modulation voltage (PWM) for trailer lighting functions. Some aftermarket accessories are incompatible with PWM and may not function correctly when connected to the trailer lighting circuits of the vehicle.

Trailer Battery Charging System

Trailer battery charging is accomplished through constant battery voltage from the X50A Engine Wiring Harness Junction Block to the X88B Tow Vehicle Electrical Receptacle. Battery voltage is supplied to terminal E at the X88B Tow Vehicle Electrical Receptacle at all times. If equipped, the trailer battery will constantly be charged by the vehicle's electrical system anytime the trailer is connected. Some trailers require the B+ circuit to the X88B Tow Vehicle Electrical Receptacle for the trailer brakes to function.

Trailer Lighting and Detection With U1D/UET

Note:

- Some trailers utilize a trailer mounted control module to operate some or all of the trailer lights. These trailers may use the B+ circuit from the trailer connector to power the trailer lighting circuits. These trailers may not always be detected by the Trailer Lamp Control Module and may set faults.
- When a trailer is detected on a vehicle equipped with side blind zone detection, rear park assist, and/or rear cross traffic alert, the vehicle will automatically turn these features off. These features are turned off to prevent false detections due to the trailer obstructing the view of the sensors.
- Vehicles equipped with IOR/1FL do not come equipped with the trailering APP however may still be equipped with a K68 trailer Lamp Control Module.

The K68 Trailer Lamp Control Module is responsible for controlling the trailer lighting on vehicles with U1D/UET. The combined trailer stop/turn signal lamps of the trailer must draw at least 55mA of total current to be detected as a trailer or the Trailer Lamp Control Module will not control the lighting circuits. The Trailer Lamp Control Module receives serial data messages from the K9 Body Control Module (BCM) indicating what lamps have been activated on the vehicle. The Trailer Lamp Control Module responds by applying pulse width modulated voltage (PWM) to the appropriate control circuits for the requested lamps illuminating the lamps on the attached trailer. The Trailer Lamp Control Module constantly monitors for trailer connection status, trailer lighting faults, and trailer theft deterrent purposes. This is accomplished through the lighting circuits of the trailer to determine if a trailer is connected. When a trailer is connected, the Trailer Lamp Control Module senses the trailer connection and alerts the driver by requesting a trailer profile setup through the Trailering App, which is displayed on the infotainment screen. If a trailer is disconnected with the ignition ON, the vehicle will display multiple trailer lighting messages until a trailer is reconnected or the message is dismissed by the user. With the key OFF, the Trailer Lamp Control Module will periodically pulse the lighting circuits of the trailer to verify it is still connected. The lights on the trailer may flash at different intervals with the key OFF depending on which type of lights the trailer is built with. If a trailer is disconnected with the key ON, the vehicle will display a trailer disconnected message until a trailer is reconnected or the ignition is cycled.

Trailer Lighting Without U1D/UET

The K219 Lighting Control Module is responsible for controlling the trailer lighting on vehicles without U1D/UET. The lighting control module receives serial data messages from the K9 Body Control Module (BCM) indicating what lamps have been activated on the vehicle. The lighting control module responds by applying voltage to the appropriate relay control circuits for the requested lamps anytime the vehicle lamps are commanded ON. With the relay coil energized, the relay contacts close and allow voltage to flow through the relay illuminating the appropriate lamps on the attached trailer.

Trailer Messages

The driver information center (P16 Instrument Cluster) or infotainment screen (P17 Info Display Module) may display one or more of the following messages to the user related to trailering:

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Trailering Message	Description
Check Trailer Left Turn Signal Lamp	The K68 Trailer Lamp Control Module detects a fault on the left trailer stop/turn lamp control circuit
Check Trailer Right Turn Signal Lamp	The K68 Trailer Lamp Control Module detects a fault on the right trailer stop/turn lamp control circuit
Check Trailer Rear Lamp	The K68 Trailer Lamp Control Module detects a fault on the trailer park lamp control circuit.
Check Trailer Reversing Lamp	The K68 Trailer Lamp Control Module detects a fault on the trailer backup lamp control circuit.
Check Trailer Brake Lamps	The K68 Trailer Lamp Control Module detects a fault on the left and/or right trailer stop/turn lamp control circuits
{JL1} Check Trailer Wiring	The K67 Trailer Brake Control Module detects a fault on the trailer brake control circuit or the trailer was disconnected.
Lane Change Alert Off	Reminder to the user that lane change alerts are turned off anytime a trailer is detected.
Rear Cross Traffic Alert Off	Reminder to the user that rear cross traffic alerts are turned off anytime a trailer is detected.
Rear Park Assist Off	Reminder to the user that rear park assist is turned off anytime a trailer is detected.
Remember to turn On Tow/Haul Mode	Reminder to the user to turn ON Tow/Haul Mode when towing.
{JL1} Service Trailer Brake System	The K67 Trailer Brake Control Module detects a fault on the trailer brake control circuit.
Trailer Detected	The K68 Trailer Lamp Control Module detects a trailer has been connected to the X88B Tow Vehicle electrical Receptacle.

Trailering Message	Description
{JL1} Trailer Brakes Detected	The K67 Trailer Brake Control Module detects a trailer with trailer brakes has been connected to the X88B Tow Vehicle electrical Receptacle.
Trailer Disconnected Check Connection	The K68 Trailer Lamp Control Module detects a trailer has been disconnected from the X88B Tow Vehicle electrical Receptacle.

Trailer Theft Detection (With U1D/UET Only)

Trailer theft monitoring can be turned ON and OFF through the vehicle Trailer App. When enabled, any time the trailer theft deterrent system is armed, the trailer lighting circuits are constantly monitored to determine if a trailer is connected for trailer theft deterrent purposes. With the key OFF, the K68 Trailer Lamp Control Module will randomly pulse the lighting circuits of the trailer to verify it is still connected by monitoring the voltage drop of the circuit. Depending on the configuration of the trailer lights, the trailer lights may randomly flash as part of the trailer theft deterrent function. These flashes correspond to when the K68 Trailer Lamp Control Module pulses the lighting circuits to ensure the trailer is still connected and is considered normal. If the trailer is disconnected while the trailer theft deterrent system is armed, the vehicle will flash the exterior lights and cycle the horn to alert of a trailer theft event. Refer to *Theft Systems Description and Operation 9-52* for more information on the content theft deterrent system.

Trailer Brakes (JL1)

The vehicle is equipped with the following trailer braking components:

- K160 Brake System Control Module
- K67 Trailer Brake Control Module
- S76 Trailer Brake Control Switch
- Trailer Brake Driver Information Center Display

Trailer Brake Circuits

- Circuit 2223 is the trailer brake apply signal circuit. The K160 Brake System Control Module receives vehicle braking force data and/or data from the application of the manual trailer brake slide lever. The brake system control module responds by applying the appropriate amount of pulse width modulated (PWM) voltage based on the amount of trailer brake application desired. The K67 Trailer Brake Control Module responds to the signal circuit by applying the appropriate amount of PWM voltage to the trailer auxiliary control circuit 47.
- Circuit 2224 is the trailer brake enable signal circuit. The K160 Brake System Control Module applies voltage to the enable circuit anytime a LIN data communication fault is not present, a trailer is connected, and the vehicle brakes are being applied. The enable circuit must have voltage applied to it before the K133 Trailer Brake Control Module applies the appropriate amount of pulse width modulated (PWM) voltage to the trailer auxiliary control circuit 47.
- Circuit 2733 is the brake system control module LIN bus 2 circuit. The K160 Brake System Control Module, K67 Trailer Brake Control Module, and the S76 Trailer Brake Control Switch all communicate through the brake system control module LIN bus 2 circuit. If the LIN bus has a fault on the circuit, trailer braking will be disabled until the fault is repaired.
- Circuit 47 is the trailer auxiliary control circuit. The K133 Trailer Brake Control Module responds to signal circuit 2223 and enable circuit 2224 by applying the appropriate amount of PWM voltage to the trailer auxiliary control circuit. A properly functioning trailer will apply the appropriate amount of braking force to the brakes of the trailer.

The Trailer Brake Control System is compatible with two types of Trailer Brake Systems as listed below:

1. **Electric Brakes** A controlled electrical output signal energizes an electric-magnet/lever arm assembly that directly actuates the brake mechanism. The GDS name for this system is “Electromagnetic Brakes”.
2. **Electric Over Hydraulic Brakes** A controlled electrical output signal energizes a remote, trailer mounted hydraulic pump to build brake pressure in a closed hydraulic system on the trailer. The hydraulic fluid pressure actuates the brake mechanism. The GDS name for this system is “Electrohydraulic Brakes”.

Trailer Brake Output Versus Trailer Brake Type

- The trailer brake system characterizes the trailer brakes as either Electric Brake or Electric Over Hydraulic Brake automatically. This characterization may be affected by the number, type, and age of the trailer brake magnets, as well as any other devices installed on the trailer brakes (i.e. adapters for Electric Over Hydraulic brake functionality).
- The trailer brake system is fully operational with either characterization.

- Sliding the manual trailer brake apply lever will produce output at zero speed for either characterization.

The user gain allows the driver to adjust the amount of trailer brake output to match the trailer load and road surface. The controller determines the desired trailer brake output and provides a control signal to the K67 Trailer Brake Control Module (TBPM). The K67 Trailer Brake Control Module amplifies the signal and provides the output required to activate the Electric or Electric Over Hydraulic trailer brakes.

The trailer brake control can support up to a maximum of four axles with electric trailer brakes (8 brake magnets).

Connecting a trailer that is not compatible with the trailer brake system may result in reduced or complete loss of trailer braking. There may be an increase in stopping distance or trailer instability which could result in personal injury or damage to the vehicle, trailer or other property. An aftermarket controller may be available for use with incompatible trailer brake systems.

To determine the type of brakes on your trailer and the availability of controllers, check with your trailer manufacturer or dealer. Do not power up an aftermarket controller with the factory brake controller at the same time.

Trailer Brake Control Panel

The S76 Trailer Brake Control Switch contains the trailer gain and manual apply switches. It is located in the vehicle center stack. Refer to the owner's manual for more information on the location. The control panel and switches allows you to adjust the amount of output, referred to as trailer gain, available to the Electric or Electric Over Hydraulic brakes. It also allows you to manually apply the trailer brakes. The trailer brake control switch is used along with the trailer brake display page on the driver information center to adjust and display power output to the trailer brakes.

Manual Trailer Brake Apply

The manual trailer brake apply lever is located on the S76 Trailer Brake Control Switch and is used to apply the trailer's Electric or Electric Over Hydraulic brakes independent of the vehicle's brakes. This lever is used in the trailer gain adjustment procedure to properly adjust the power output to the trailer brakes.

Sliding the lever will apply only the trailer brakes. The power output to the trailer is indicated in the trailer brake display page in the Driver Information Center (DIC). If the vehicle's service brakes are applied while using the manual trailer brake apply lever, the trailer brake control output power will be the greater of the two.

The trailer and the vehicle's brake lamps will come on when either the vehicle's braking or manual trailer brakes are applied.

Trailer Brake Gain Adjustment

Trailer gain should be set for a specific trailering condition and must be adjusted any time vehicle loading, trailer loading or road surface conditions change. It is important to re-adjust trailer gain any time the tow vehicle, trailer loading or road surface conditions change or if you notice trailer wheel lock-up at any time while you are towing.

Setting the trailer gain properly is needed for the best trailer stopping performance. A trailer that is over-gained may result in locked trailer brakes. A trailer that is under-gained may result in not enough trailer braking. Both of these conditions may result in poor stopping and stability of the vehicle and trailer.

Trailer Gain Adjustment Procedure

- Adjust trailer gain in 0.5 step increments up to 10 gain setting by using the gain adjustment +/− buttons on the trailer brake control panel switch. Pressing and holding a gain button will cause the trailer gain to continuously increment or decrement. To turn the output to the trailer off, set the gain to zero.
- Drive the tow vehicle and trailer combination on a level surface representative of the towing condition and free of traffic at approximately 32–40 km/h (20–25 mph) and fully apply the manual trailer brake apply lever mechanism located on the trailer brake control panel switch. Adjusting the trailer gain at slower speeds may result in an incorrect gain setting.
- Adjust the trailer gain to just below the threshold of trailer wheel lock-up . Trailer wheel lock-up may not occur if towing a heavily loaded trailer. In this case, adjust the trailer gain to the highest allowable setting for the towing condition.

Trailer Brake Gain and Output Display
This display menu can be accessed by scrolling through the DIC menu, or any time the trailer gain +/− button is depressed, or the manual trailer brake apply lever is actuated. The trailer output is displayed from 0 to full output and indicates the output power provided to the trailer brakes, relative to the gain setting.

After the electrical connection is made to a trailer equipped with electric brakes or electric over hydraulic brakes, the TRAILER CONNECTED message will be displayed momentarily on the DIC. The Trailer Brake Display Page can be selected on the DIC showing TRAILER GAIN and OUTPUT, after all vehicle related service messages are acknowledged by the driver. Depending on which instrument panel cluster is in the vehicle, the DIC may display dashed lines, a greyed out display, or it may be blank signifying a disconnected trailer or a trailer brake fault condition.

Tow/Haul Mode

Tow/Haul mode is selected through the hazard warning switch for hauling heavy loads to provide increased performance and vehicle control. Tow/Haul Mode adjusts the transmission shift pattern, steering, and Electronic Stability Contol (ESC) performance.

If the vehicle is turned off with Tow/Haul mode active and then restarted within four hours or less Tow/Haul will remain active. Otherwise, the vehicle will start in Normal mode.

Trailer Brake Driver Information Center Indicators and Messages

Trailer Brake Detection
The K67 Trailer Brake Control Module constantly monitors the trailer auxiliary control circuit from Terminal C at the X88B Tow Vehicle electrical Receptacle. When a trailer is connected with trailer brakes, the K67 Trailer Brake Control Module senses the connection and alerts the driver with a Trailer Connected message. If the K67 Trailer Brake Control Module senses a fault, or the trailer becomes disconnected, the vehicle will alert the driver with a Check Trailer Wiring message.

The following indicators are used to inform the driver of several different conditions:

Trailer Connected
This message will be briefly displayed when a trailer with Electric or Electric Over Hydraulic brakes is first connected to the vehicle. This message will automatically turn off in about ten seconds. The driver can also acknowledge this message before it automatically turns off.

Check Trailer Wiring
This message will be displayed if:

- The system detects that a trailer with Electric or Electric Over Hydraulic brakes is connected to the vehicle and then the trailer harness becomes disconnected from the vehicle.
- The trailer connection is recognized initially and then a disconnect occurs while the vehicle is stationary. This message will automatically turn off in about thirty seconds. This message will also turn off if the driver selects to turn this message off or if the trailer harness is reconnected.
- A disconnect of the trailer wiring harness occurs while the vehicle is moving. The Check Trailer Wiring message will continue until the ignition is turned off. The message will also turn off if the driver selects to turn this message off or it the trailer harness is re-connected.
- There is an electrical fault in the wiring to the electric trailer brakes. The Check Trailer Wiring message will continue as long as there is an electrical fault in the trailer wiring. This message will also turn off if the driver acknowledges this message off.
- A poor connection at the 7–way connector may cause the Check Trailer Wiring message. Some aftermarket 7–way trailer side connector adapters or plugs may cause deformation or excessive wear to the vehicle's trailer terminals. It is recommended that you use an OEM or Pollak heavy duty 7–way trailer side connector adapter.

Service Trailer Brake System
This message will be displayed when there is a problem with the trailer brake control system. The trailer brake system may not be fully functional, or may not be functioning at all. The trailer brake system is designed to provide trailer braking, if possible, even when faults prevent it from being fully functional. This reduced functionality includes:

1. Providing trailer braking when the master cylinder pressure or brake pedal switch are faulted.
2. Providing trailer braking when hill start assist and trailer sway control communication is faulted.
3. Providing trailer braking when certain manual trailer brake apply lever faults are present.

Trailering Diagnostic Tools

In some situations when diagnosing trailer tire pressure monitoring, trailer lighting, or integrated trailer brakes, it may be necessary to connect the vehicle to a trailer to confirm proper operation. Performing this activity may prove difficult in the service environment since trailers are not often available for diagnostic use, may have existing electrical issues outside of the issues a technician is attempting to diagnose, or simply may be too unwieldily to connect for diagnosis.

With all this in mind, it may be helpful to build or create a tool that can be plugged into the vehicle's trailer connector and simulate a connected trailer. This tool would include park lamps, stop lamps, and a reverse lamp for lighting and trailer tire pressure monitoring diagnosis. It can be expanded to include trailer brake magnets to diagnose integrated trailer brake concerns. Also, an additional lamp can be included to diagnose the B+ circuit to the trailer.

Trailer issues are NOT covered under warranty, but these tools may be used to verify the vehicle is functioning properly and to help the customer understand and correct any trailer related issues if they so choose.

Available Trailer Presence Simulator Tool

Illustration	Tool Number/Description
5166189	*EL-52641* Trailer Presence Simulator Tool

Simulated Trailer Lighting

Creating a tool to simulate a connected trailer can be used to diagnose issues with trailer lighting, trailer brake (if equipped), the Trailering App (if equipped), and trailer tire pressure monitoring system (if equipped).

If the vehicle is equipped with a K68 Trailer Lamp Control Module (U1D/UET), the module monitors the current on the lighting circuits to determine a trailer has been connected. The Trailer Lamp Control Module pulses current on the trailer lighting circuits every 42 minutes to monitor for a connected trailer. If a current draw greater than 55mA is detected, the Trailer Lamp Control Module recognizes this as a connected trailer. This will enable any trailer lighting controlled by the Trailer Lamp Control Module. The Center Stack Module will also use this trailer detection as a cue to enable the Trailering App and trailer tire pressure monitoring functions.

Creating a Simulated Trailer Lighting Tool
Parts needed:

- 7-way RV trailer connector Qty: 1

Note: The combination trailer stop/turn, and backup lamps must draw at least 55mA of total current to be detected as a trailer. Some LED combination lamps will not draw enough current. If an LED combination lamp is used, make sure it draws at least 55mA. A load resistor can be added to the circuit if necessary to obtain the correct load.

- Combination trailer park/stop/turn lamp (greater than 55mA drawn when on) Qty: 2
- Reverse lamp Qty: 1
- 12 gauge wire and terminals/connectors Qty: As needed
- 18 gauge wire and terminals/connectors Qty: As needed
- Mounting board Qty: 1

1. Connect a 12 gauge wire to the ground terminal of the 7-way trailer connector and the ground circuit of each combination trailer park/stop/turn lamp and the reverse lamp in parallel.
2. Connect an 18 gauge wire between the park lamp terminal of the 7-way trailer connector and the park lamp circuit of each combination trailer park/stop/turn lamp in parallel.
3. Connect an 18 gauge wire between the left turn/stop lamp terminal of the 7-way trailer connector and the turn/stop lamp circuit of left trailer park/stop/turn lamp.
4. Connect an 18 gauge wire between the right turn/stop lamp terminal of the 7-way trailer connector and the turn/stop lamp circuit of right trailer park/stop/turn lamp.
5. Connect an 18 gauge wire between the reverse lamp terminal of the 7-way trailer connector and the reverse lamp.

Note: A combination trailer lighting and trailer brake tool can be created on the same mounting board.

6. Mount the left combination trailer park/stop/turn lamp, right combination trailer park/stop/turn lamp, and reverse lamp to the mounting board.
7. Plug the 7-way RV trailer connector to the vehicle and verify functionality.

Simulated Trailer Brakes

Creating a tool to simulate trailer brakes can be used to diagnose trailer brake issues.

The trailer brake control system is compatible with two types of trailer brake systems: electromagnetic or electro-over hydraulic trailer brakes. The Brake System Control Module must determine which type of brakes the trailer is equipped with so the system can output correctly for the trailer's brake system. Because the Brake System Control Module has to determine the type of trailer brake system that is being used, it can be sensitive to a variety of trailer wiring issues.

The Trailer Brake Control Module continuously sends a test pulse out on the trailer brake control circuit (circuit 47) to determine if a trailer with trailer brakes has been connected. How the pulse reacts when a trailer is connected is how the Trailer Brake Control Module determines which type of braking system the trailer is equipped with.

Even after the system detects the trailer, Trailer Brake Control Module will continue to send this test pulse on the trailer brake control circuit, which now is monitoring both the truck and trailer circuitry. The trailer brake control circuit continues to be monitored for any faults so the driver can be notified of any issues that may occur within the truck or trailer, as well as, to determine when the trailer is disconnected from the truck.

Creating a Simulated Trailer Brake Tool
Parts needed:

- 7-way RV trailer connector Qty: 1
- Electric trailer brake magnets Qty: 2, 4, 6, or 8
- Reverse lamp Qty: 1
- Mounting board Qty: 1
- 12 gauge wire and terminals/connectors Qty: As needed

1. Connect a 12 gauge wire to the ground terminal of the 7-way trailer connector.
2. Connect a 12 gauge wire to the brake controller output terminal of the 7-way trailer connector.

Note: The trailer brake magnets must be connected in parallel. Connecting in series will create an excessive current draw and disable the trailer brake system.

3. Connect the trailer brake magnets to the 12 gauge wires from the 7-way trailer connector in parallel.

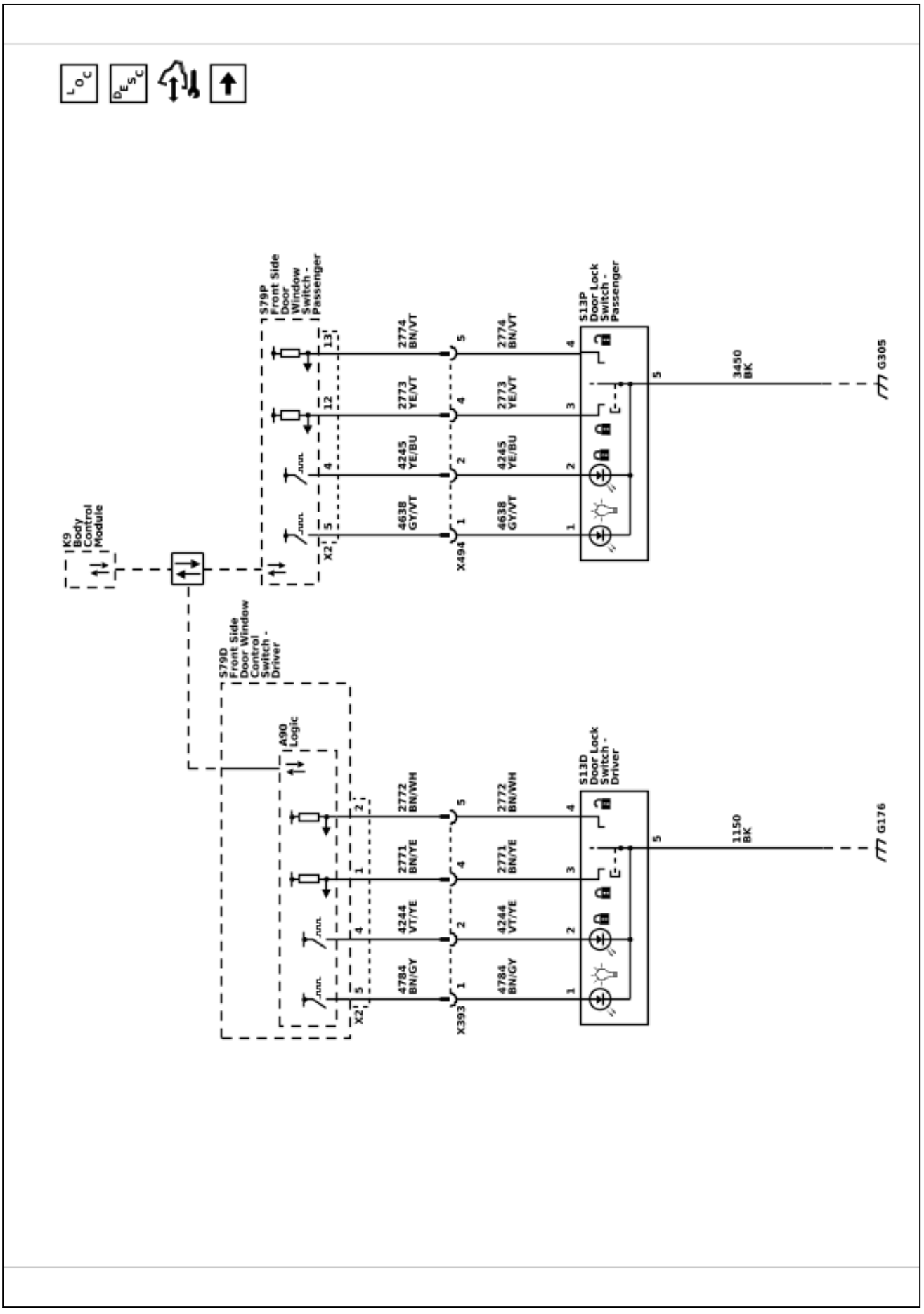
Note: A combination trailer lighting and trailer brake tool can be created on the same mounting board.

4. Mount the trailer brake magnets to the mounting board.
5. Plug the 7-way RV trailer connector to the vehicle and verify functionality.

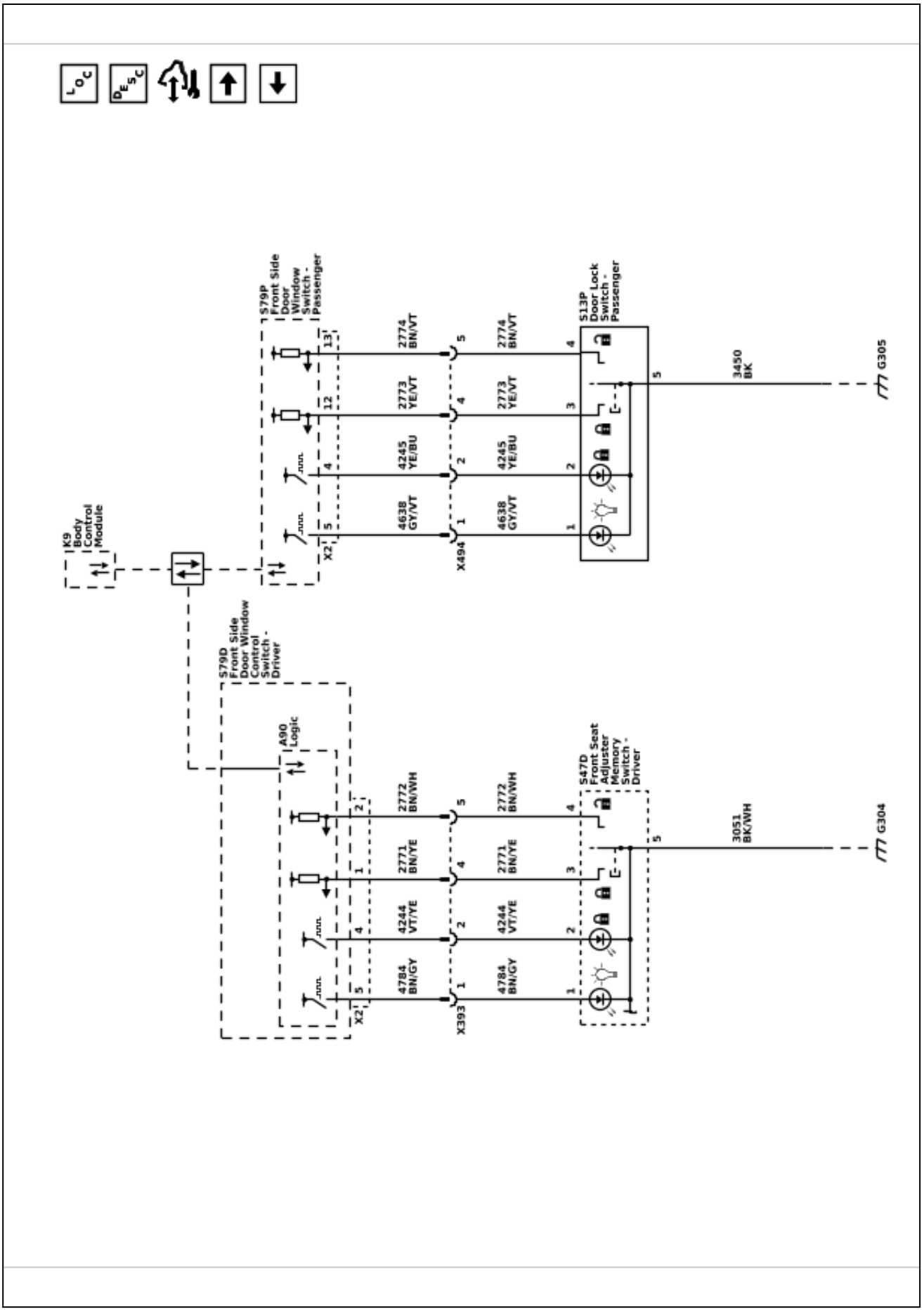
Vehicle Access

Schematic and Routing Diagrams

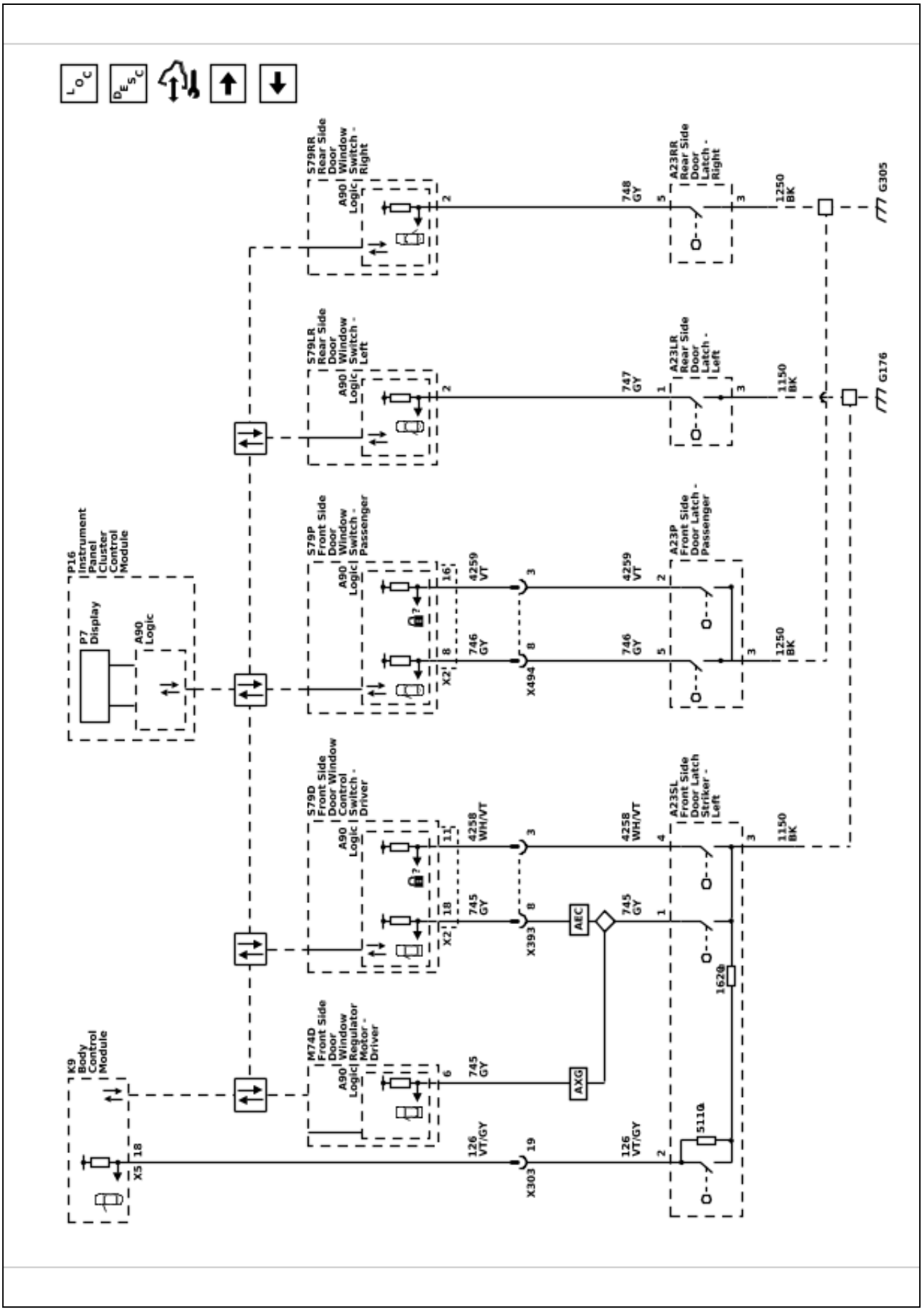
Door Lock/Indicator Schematics (Interior Control Switches and Indicators (- A45))



Door Lock/Indicator Schematics (Interior Control Switches and Indicators (A45))



Door Lock/Indicator Schematics (Ajar Switches and Lock Status)



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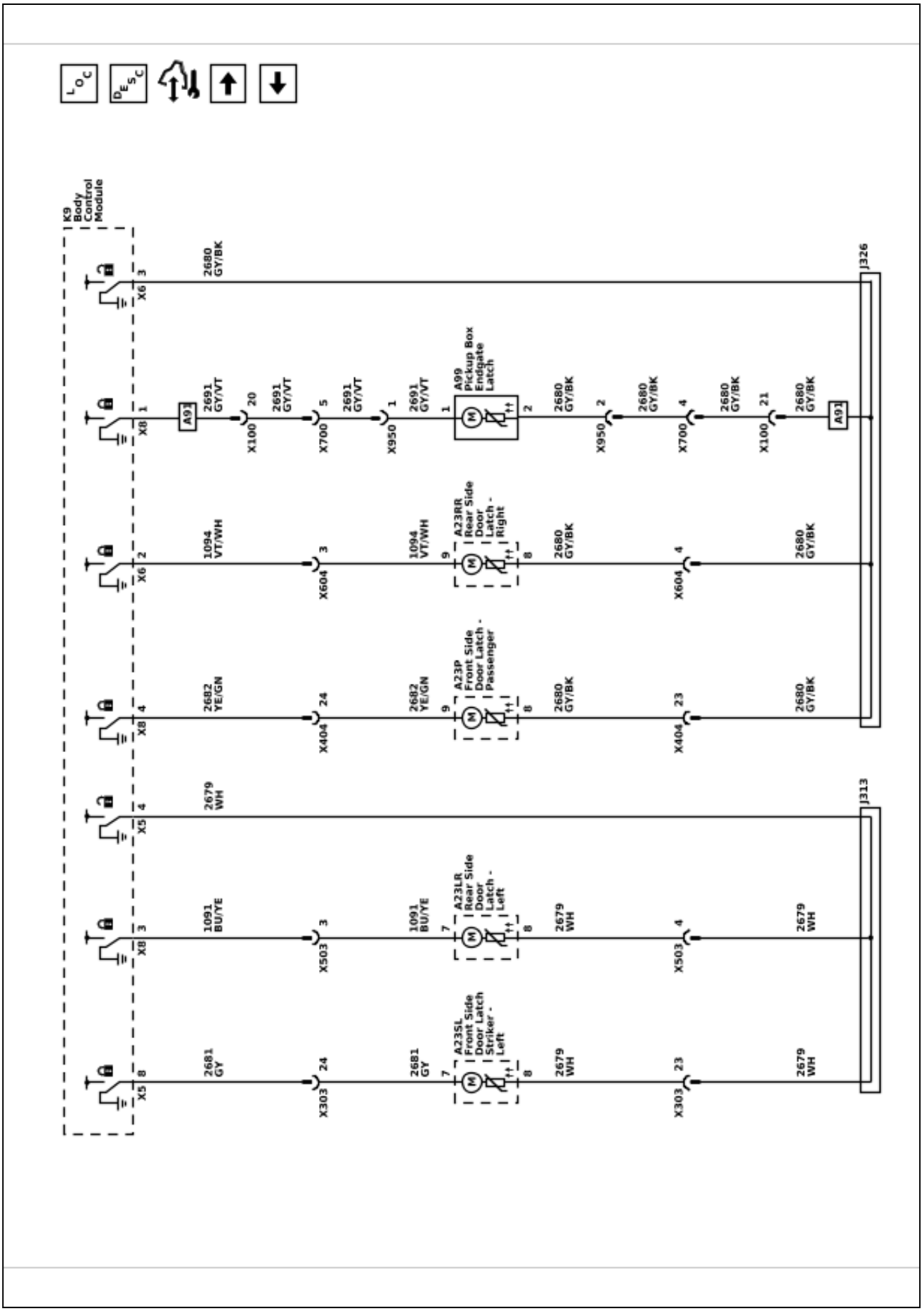
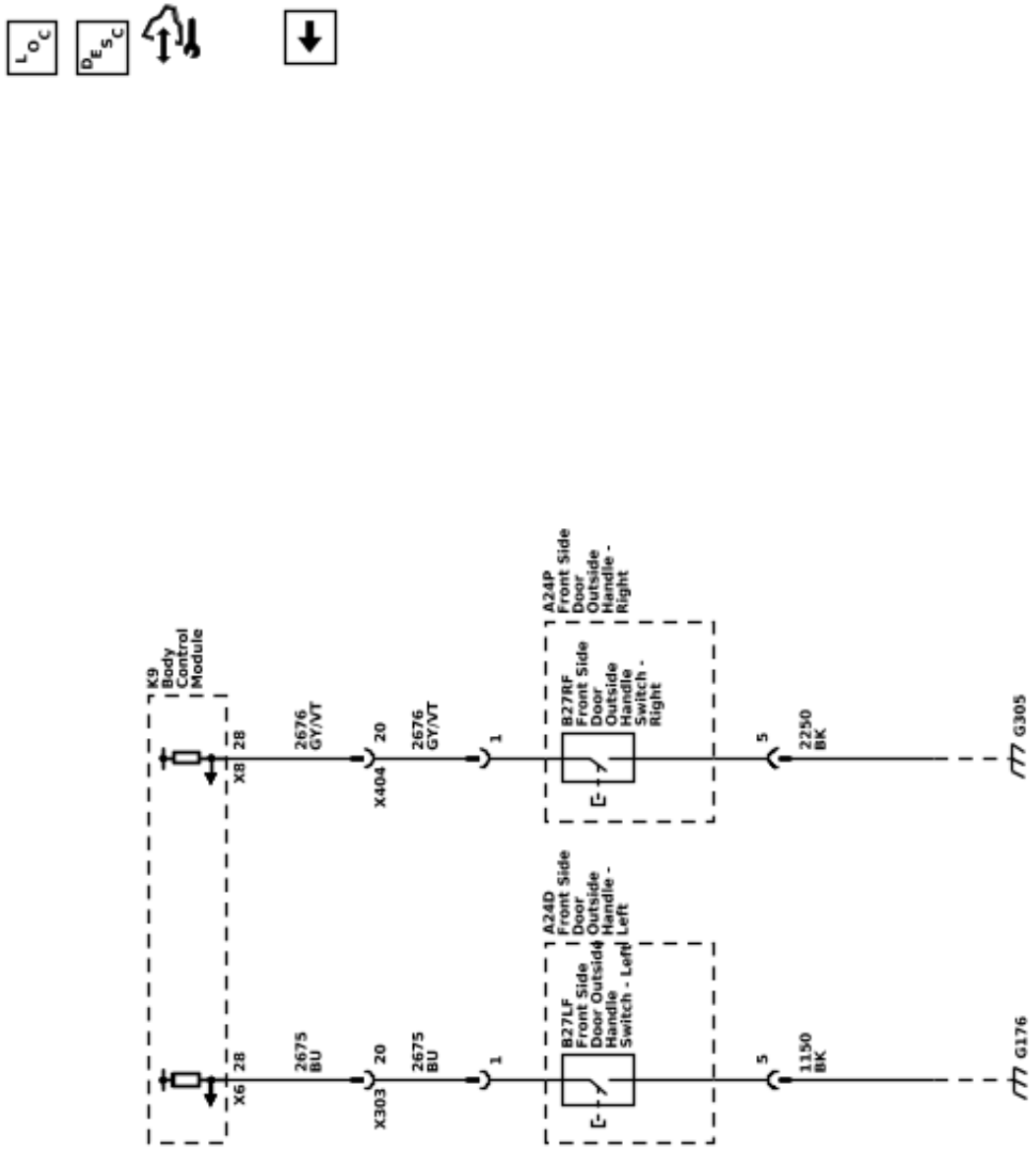
Door Lock/Indicator Schematics (Actuators)



Door Lock/Indicator Schematics (Door Handle Switches (AVJ))



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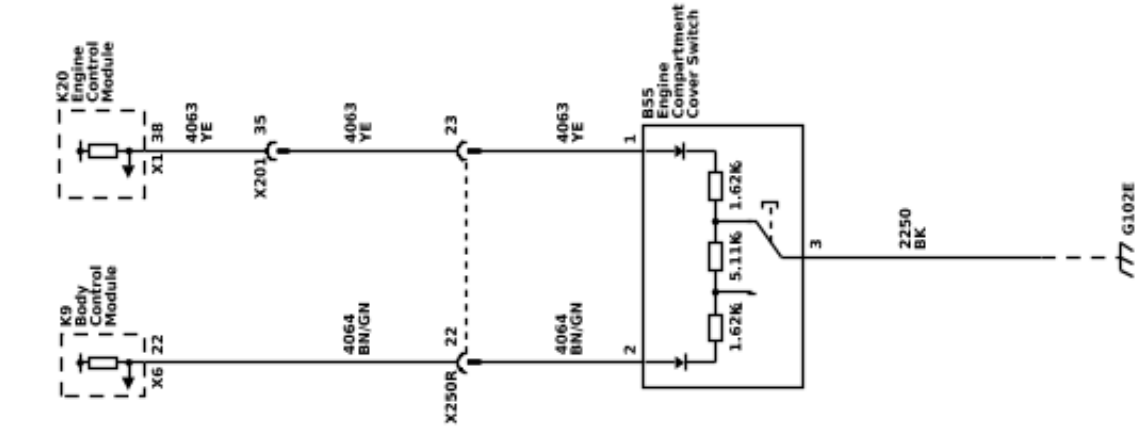
Hood Latch Schematics (Engine Compartment Cover Switch)



Description and Operation

Door Ajar Indicator Description and Operation

Door Ajar Indicator System Components

The door ajar indicator system consists of the following components:

- Body control module (BCM)
- Instrument cluster
- Driver door latch
- Passenger door latch
- Left rear door latch
- Right rear door latch
- Driver side door window switch
- Passenger side door window switch
- Left rear side door window switch
- Right rear side door window switch

Door Ajar Indicator Operation

The side door window switches each provide a 7.5 V signal to their respective door ajar switch signal circuits. The door ajar switches are integral to each door latch assembly. When a door is opened, the normally open door ajar switch closes. With the door ajar switch closed, ground is provided to the door ajar switch signal circuit and the voltage within the signal circuit drops. The appropriate side door window switch will detect the voltage drop and will send a serial data message to the body control module which will then send a message to the instrument cluster to command the door ajar message

Door Ajar Indicator Description and Operation

Door Ajar Indicator System Components

The door ajar indicator system consists of the following components:

- Body control module (BCM)
- Instrument cluster
- Driver door latch
- Passenger door latch
- Left rear door latch
- Right rear door latch
- Driver window motor
- Passenger side door window switch
- Left rear side door window switch
- Right rear side door window switch

Driver Door Ajar

The window motor supplies a 12V signal to the door ajar switch within the door latch, when a door is open the door ajar switch closes pulling the 12V signal low. When the window motor detects the drop in the 12V signal circuit, it will then communicate this status to the BCM via local interconnect network (LIN) bus. The BCM communicates with the instrument cluster via serial data message. The instrument cluster, upon receipt of this serial data message, will illuminate the door ajar indicator and also send a serial data message to the radio to activate the door ajar audible warning when the vehicle speed is greater then 8 km/h (5 mph).

Passenger and Rear Doors Ajar

The passenger and rear side door window switches each provide a 12V signal to their respective door ajar switch signal circuits. The passenger and rear door ajar switches are integral to each door latch assembly. When the passenger door or a rear door is opened, the normally open door ajar switch closes. With the door ajar switch closed, ground is provided to the door ajar switch signal circuit and the voltage within the signal circuit drops. The passenger or rear side door window switches will detect the voltage drop and will send a serial data message to the body control module which will then send a message to the instrument cluster to command the door ajar message

Endgate Description and Operation

Endgate Lock System Components

- Body control module (BCM)
- Pickup box endgate latch

If equipped, the locking and unlocking of the endgate is a function of the power door lock system. The pickup box endgate latch unlock control is supplied by the passenger door unlock control circuit and the rear closure actuator lock control circuit. The BCM, upon receipt of a lock switch lock or unlock signal, will supply battery voltage to the passenger door lock actuator unlock or rear closure actuator lock control circuits. Since the opposite side of the lock actuator is connected to ground through the other lock actuator control circuit, the passenger door and endgate will then lock or unlock as commanded.

Hood Ajar Indicator Description and Operation

Hood Ajar Switch

The body control module (BCM) applies approximately 5V to the hood ajar signal circuit and monitors the voltage to determine the position of the hood. The hood ajar switch contains a multiplexed resistor. When the hood is open, the switch is open and voltage remains high. When the hood is closed, the switch is closed and the voltage is pulled low.

The BCM uses the hood ajar switch as a content theft deterrent alarm trigger.

Hood Ajar Indicator/Message

When the hood is ajar, a message is displayed on the DIC or the hood ajar indicator will be illuminated.

Power Door Locks Description and Operation

Door Lock System Components

The power door lock system consists of the following components:

- Driver door lock switch
- Passenger door lock switch
- Driver front side door window control switch
- Passenger front side door window switch
- Driver front side door latch
- Passenger front side door latch
- Left rear side door latch
- Right rear side door latch
- Pickup box endgate latch (A91)
- Exterior door handle switches (AVJ)
- Body control module

Door Lock System Controls

The power door lock system can be controlled by any of the following:

- Power door lock switch activation
- Keyless entry lock or unlock command
- Delayed locking command
- Automatic door lock command
- When the OnStar® system is used to unlock the driver door

Door Lock and Unlock Operation

The driver or passenger front side door window control switch will monitor the voltage of their respective door lock switches, when the driver or passenger door lock switch is activated in the lock or unlock position the signal voltage will be pulled low, the corresponding front side door window control switch will detect the voltage drop in the signal circuit and will send a serial data message to the body control module requesting the door lock or unlock command.

The body control module upon receipt of a lock or unlock request, will supply battery voltage to the door lock actuator and if equipped the endgate latch lock or unlock control circuits. Since the opposite side of the lock actuator is connected to ground through the other lock actuator control circuit, the doors, and fuel filler door will then lock or unlock as commanded.

The following control circuits are used to operate the door lock actuators:

- Driver door unlock only
- Passenger and rear door unlock
- All door lock

This sequence and be modified through the personalization settings

Passive Door Lock/Unlock Operation (AVJ)

The exterior door handle switch signal circuits provide inputs to the body control module when the exterior door handle switches are activated. These inputs allow the body control module to detect a door lock or a door unlock request. The body control module provides a 7 V signal to each exterior door handle switch via the door handle switch signal circuits. When a door handle switch is pressed, the switch closes and the voltage signal within the signal circuit is pulled to ground. The body control module will detect the voltage drop and a low frequency antenna will transmit a challenge to the keyless entry transmitter. If the challenge is met, the keyless entry transmitter will respond, and the body control module will command the door(s) to be locked or unlocked

Wipers and Washers

Schematic and Routing Diagrams

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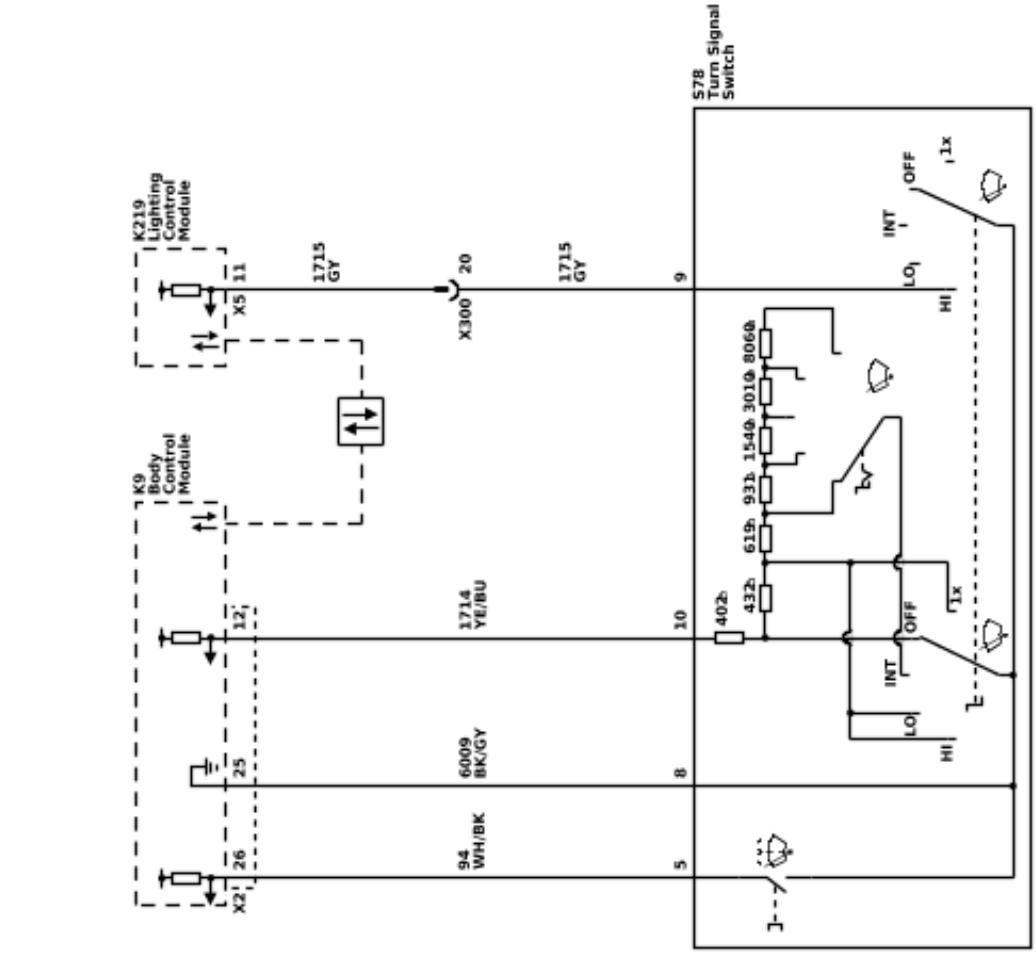
Wiper/Washer Schematics (Wiper/Washer Control)



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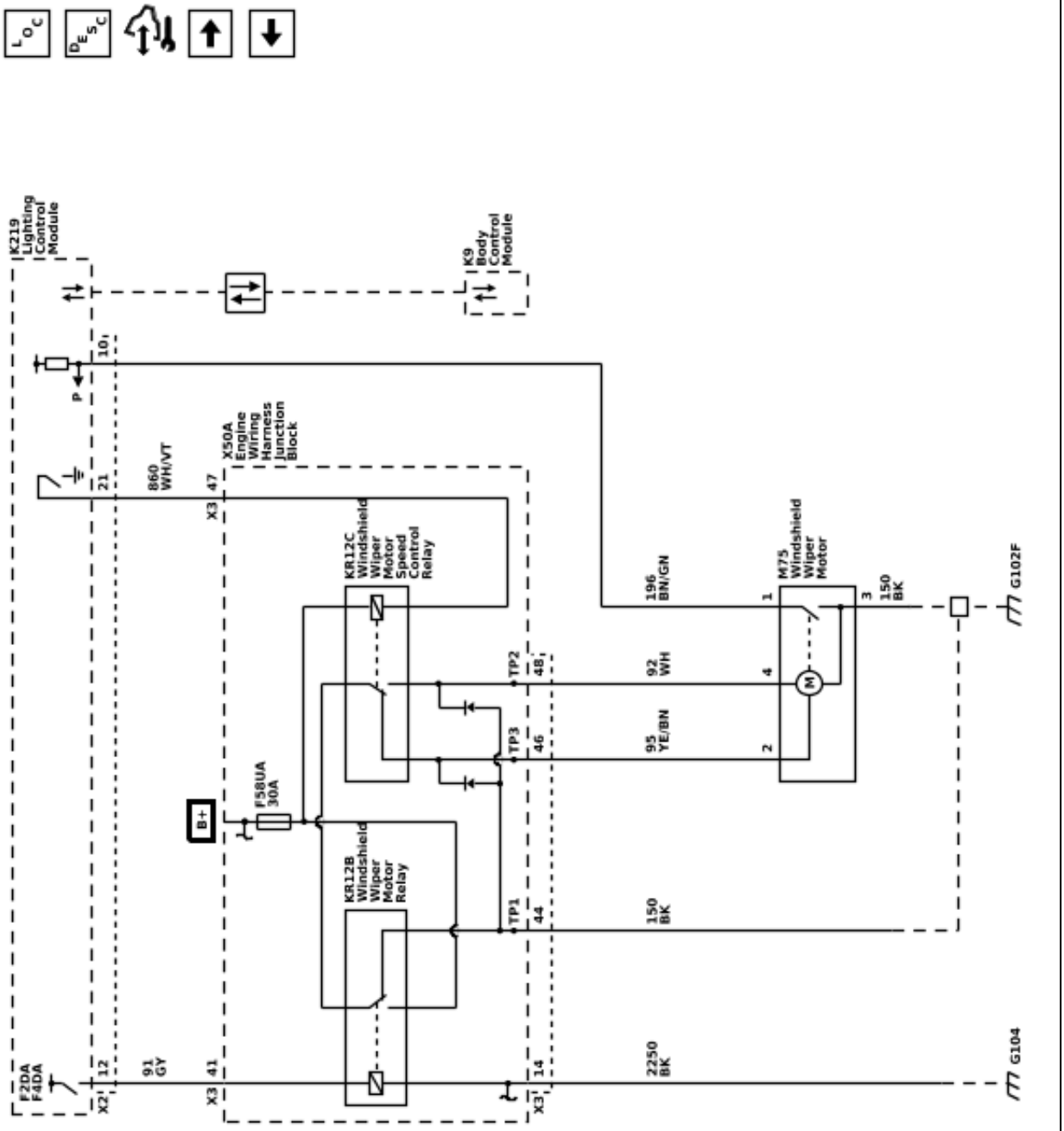
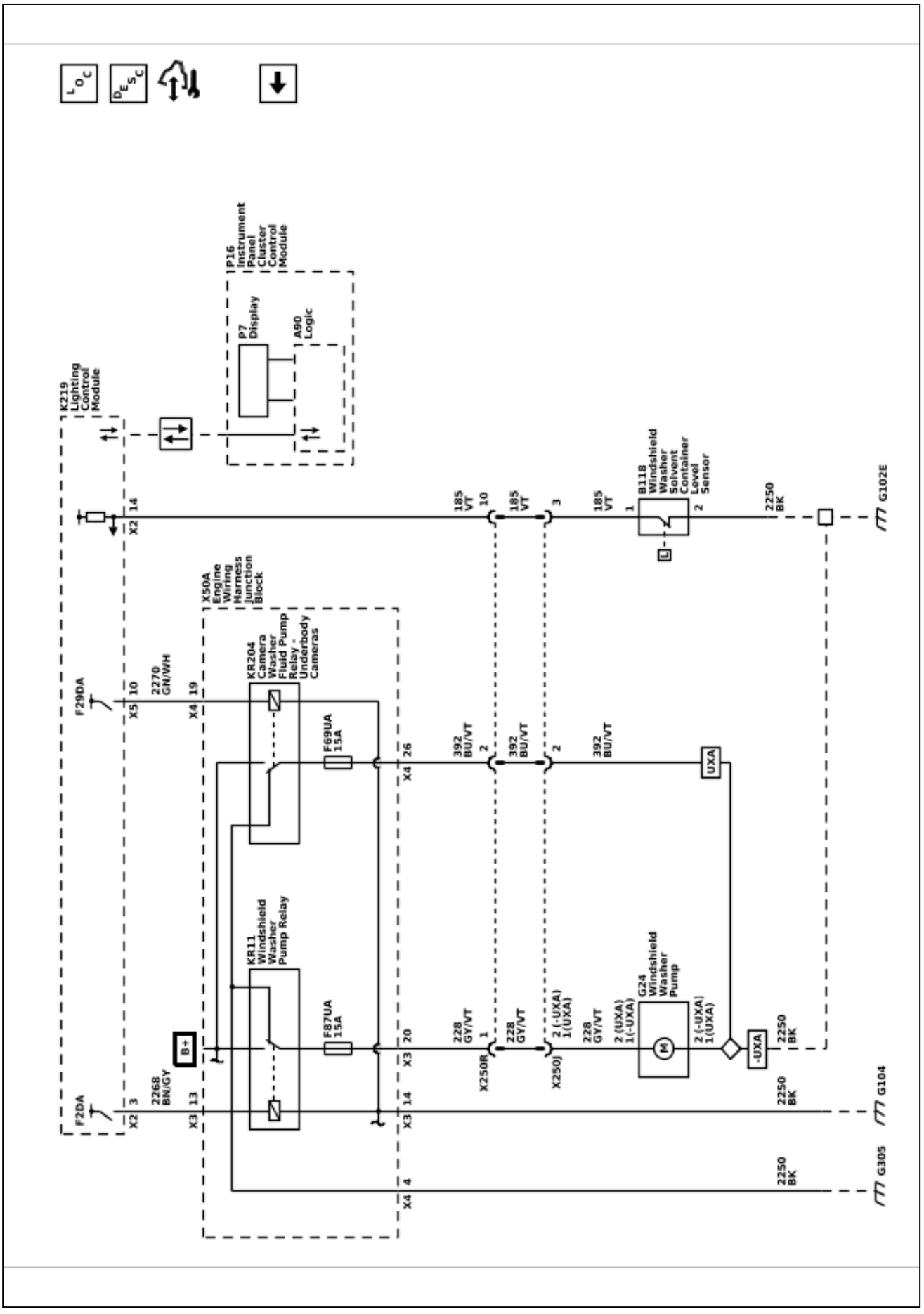
Wiper/Washer Schematics (Wiper Motor)



Wiper/Washer Schematics (Washer Pump)



Description and Operation

Wiper/Washer System Description and Operation

Windshield Wiper Operation

The windshield wipers system allows the driver to clear the vehicle's windshield using a discrete switch or through an automatic rain sensing system. The windshield wiper system functions through a primary control, but also allows redundant high speed-only operation in the event of a system fault. The wiper systems uses the S82 Windshield Wiper/Washer Switch as the primary means of driver control, along with the B117A Windshield Outside Moisture/Ambient Light and Humidity Sensor to modulate intermittent wiper operation. The S82 Windshield Wiper/Washer Switch is a discrete input to the K9 Body Control Module. The K9 Body Control Module communicates with the K219 Lighting Control Module over CAN, and with the B117A Windshield Outside Moisture/Ambient Light and Humidity Sensor over LIN, to control wiper activation.

Low Speed Wiper Operation
With the S82 Windshield Wiper/Washer Switch in the low speed position, the discrete signal circuit to the K9 Body Control Module is pulled down through two resistors in a resistor ladder to a low reference provided by the K9 Body Control Module. The K9 Body Control Module communicates with the K219 Lighting Control Module over CAN, requesting consistent low speed wiping operation. To initiate low speed operation, the K219 Lighting Control Module energizes the KR12B Windshield Wiper Relay. This allows battery voltage from the wiper fuse to be applied through the switched contacts of the KR12B Windshield Wiper Relay, through the normally closed contacts of the KR12C Windshield Wiper Speed Control Relay, to the windshield wiper low speed control circuit of the M75 Windshield Wiper Motor.

Intermittent Wiper Operation
With the S82 Windshield Wiper/Washer Switch in the intermittent position, the discrete signal circuit to the K9 Body Control Module is pulled down through a number of resistors within a resistor ladder to a low reference provided by the K9 Body Control Module. The number of resistors the signal travels through is dependent on the intermittent selection made on the S82 Windshield Wiper/Washer Switch. The K9 Body Control Module interprets this range of voltage pull-down as a request for intermittent wiper activation, with each pull-down voltage value equating an intermittent delay (sensitivity) level. If the rain sense is enabled the K9 Body Control Module communicates with the B117A Windshield Outside Moisture/Ambient Light and Humidity Sensor via LIN. The B117A Windshield Outside Moisture/Ambient Light and Humidity Sensor utilizes windshield optics to determine the amount of water on the windshield and will communicate this info to the K9 Body Control Module, which will vary wiping cadence based on the intermittent sensitivity selection on the S82 Windshield Wiper/Washer Switch and the amount of water on the windshield. If the rain sense is disabled the K9 Body Control will vary the wiping cadence based on a preset amount of time determined by the intermittent delay selection on the S82 Windshield Wiper/Washer Switch. To initiate wiper operation, the K219 Lighting Control Module energizes the KR12B Windshield Wiper Relay. This allows battery voltage from the wiper fuse to be applied through the switched contacts of the KR12B Windshield Wiper Relay, through the normally closed contacts of the KR12C Windshield Wiper Speed Control Relay, to the low speed control circuit of the M75 Windshield Wiper Motor.

High Speed Wiper Operation
With the S82 Windshield Wiper/Washer Switch in the high speed position, the discrete signal circuit to the K9 Body Control Module is pulled down through two resistors in a resistor ladder to a low reference provided by the K9 Body Control Module. The K9 Body Control Module interprets this specific voltage pull-down as a request for wiper activation. In addition to this pull-down signal, a second switch in the S82 Windshield Wiper/Washer Switch is also pulled down to low reference. This signal is a discrete input to the K219 Lighting Control Module. The K219 Lighting Control Module requests wiping operation. To initiate high speed operation, the K219 Lighting Control Module energizes the KR12B Windshield Wiper Relay and grounds the KR12C Windshield Wiper Speed Control Relay. This allows battery voltage from the wiper fuse to be applied through the switched contacts of the KR12B Windshield Wiper Relay, through the switched contacts of the KR12C Windshield Wiper Speed Control Relay, to the windshield wiper motor high speed control circuit of the M75 Windshield Wiper Motor.

Mist (Single Wipe) Operation
The mist (single wipe) position is a momentary switch position that will return the S82 Windshield Wiper/Washer Switch to the off position as soon as the switch is released. With the S82 Windshield Wiper/Washer Switch in the mist (single wipe) position, the discrete signal circuit to the K9 Body Control Module is pulled down through two resistors in a resistor ladder to a low reference provided by the K9 Body Control Module. The K9 Body Control Module interprets this specific voltage pull-down as a request for wiper activation. The K9 Body Control Module communicates with the K219 Lighting Control Module via CAN, requesting consistent low speed wiping operation as long as the S82 Windshield Wiper/Washer Switch is held in the mist (single wipe) position. If the mist (single wipe) position

is only briefly selected, the K9 Body Control Module will request only a single wipe.

Wiper Park Operation
With the S82 Windshield Wiper/Washer Switch in the off position, the discrete signal circuit to the K9 Body Control Module is pulled down through one resistor in a resistor ladder to a low reference provided by the K9 Body Control Module. The K9 Body Control Module interprets this specific voltage pull-down as a request to stop wiper activation. The K9 Body Control Module communicates with the K219 Lighting Control Module via CAN, requesting wiper operation stop. At this time, the K219 Lighting Control Module will deactivate the KR12B Windshield Wiper Relay and KR12C Windshield Wiper Speed Control Relay. The relay contacts will switch back to their normally closed position and will apply ground to the wiper motor power inputs through the normally closed contacts of the wiper relays. This deactivates and dynamically brakes the wiper motor in the park position. When the wiper switch is turned to the OFF position while the wiper motor is somewhere in mid-cycle, the K219 Lighting Control Module will continue to operate the motor until the wipers reach the park position. If the ignition is turned OFF while the wipers are in mid-cycle, the wipers will stop immediately, regardless of position. The K219 Lighting Control Module will park the wipers next time the ignition is turned ON.

The windshield wiper system consists of the following electrical components:

- S82 Windshield Wiper/Washer Switch
- K9 Body Control Module
- K219 Lighting Control Module
- KR12B Windshield Wiper Relay
- KR12C Windshield Wiper Speed Control Relay
- B117A Windshield Outside Moisture/Ambient Light and Humidity Sensor
- M75 Windshield Wiper Motor

Windshield Wiper Components

S82 Windshield Wiper/Washer Switch
The S82 Windshield Wiper/Washer Switch is the primary input to the K9 Body Control Module for the driver to control windshield wiper operation. The S82 Windshield Wiper/Washer Switch also provides discrete input to the K219 Lighting Control Module during high speed wiper operation.

The S82 Windshield Wiper/Washer Switch contains three individual internal switch. One switch changes between mist (single wipe), off, intermittent, low speed, and high speed selection. The second switch changes with differing intermittent sensitivity selection. The third switch is only active when high speed wiper operation is selected. A resistor ladder is also used to determine switch selection and intermittent sensitivity selection. The high speed switch does not utilize the resistor ladder.

The K9 Body Control Module provides the S82 Windshield Wiper/Washer Switch with ground through a single low reference circuit and monitors the switch position through a single signal circuit. Voltage is applied by the K9 Body Control Module to this signal circuit and voltage drop is monitored to determine switch selection. This voltage drop will vary depending on the number of resistors in the resistor ladder, which changes depending on switch position. In the off position, current flows through a single resistor. In the mist (single wipe), low speed, and high speed position, current flows through two resistors. In the intermittent position, current flows through three or more resistors, depending on the intermittent sensitivity selected.

The S82 Windshield Wiper/Washer Switch provides a discrete switch input to the K219 Lighting Control Module during high speed wiper operation. Voltage is applied by the K219 Lighting Control Module to this signal circuit and voltage drop is monitored to determine switch selection. When high speed operation is selected, the signal circuit is pulled to ground (low reference).

K9 Body Control Module
The K9 Body Control Module will send a CAN message to the K219 Lighting Control Module to request wiper operation. The K9 Body Control Module responds to input requests from the S82 Windshield Wiper/Washer Switch. The K9 Body Control Module provides a constant ground for the S82 Windshield Wiper/Washer Switch and monitors a signal circuit to determine the requested windshield wiper position.

The K9 Body Control Module communicates with the B117A Windshield Outside Moisture/Ambient Light and Humidity Sensor via LIN. Messages are received from the B117A Windshield Outside Moisture/Ambient Light and Humidity Sensor to indicate the amount of water on the windshield.

K219 Lighting Control Module
The K219 Lighting Control Module controls the wiper motor via two PCB relays (KR12B Windshield Wiper Relay and KR12C Windshield Wiper Speed Control Relay). The K219 Lighting Control Module receives a message from K9 Body Control Module over CAN to determine what type of wiper operation is requested.

KR12B Windshield Wiper Relay
The KR12B Windshield Wiper Relay supplies B+ to the M75 Windshield Wiper Motor and is controlled by the K219 Lighting Control Module. The coil side of the relay receives a constant chassis ground and the switch side receives a constant B+. When wiper operation is requested, the K219 Lighting Control Module will

provide voltage to the coil side of the relay. This will energize the relay, closing the high current contact, and supply B+ to the M75 Windshield Wiper Motor through the KR12C Windshield Wiper Speed Control Relay, enabling wiper operation.

KR12C Windshield Wiper Speed Control Relay
The KR12C Windshield Wiper Speed Control Relay controls B+ to the M75 Windshield Wiper Motor and is controlled by the K219 Lighting Control Module. The coil side of the relay receives a ground controlled by the K219 Lighting Control Module. The switch side of the relay receives B+ through the KR12B Windshield Wiper Relay. When high speed wiper operation is requested, the K219 Lighting Control Module will provide ground to the coil side of the relay. This will energize the relay, closing the high current contact, and supply the B+ to the M75 Windshield Wiper Motor high speed control, enabling high speed wiper operation.

B117A Windshield Outside Moisture/Ambient Light and Humidity Sensor
Note: Due to the sensitivity of the sensor, the wipers may swipe once upon start up or rapid lighting changes.

The B117A Windshield Outside Moisture/Ambient Light and Humidity Sensor utilizes an internal infrared LED and an optic sensor to determine the amount of water on the windshield. The infrared LED bounces infrared light against the inside of the windshield. The optic sensor measures the amount of light returned after bouncing off the windshield. With a dry windshield, all light bounced off the windshield is returned to the optic sensor. As water accumulates on the windshield, the light input to the optic sensor is diffused and reduced. The amount of light reduction corresponds directly to the amount of water on the windshield. The B117A Windshield Outside Moisture/Ambient Light and Humidity Sensor interprets the amount of light returned and communicates this info to the K9 Body Control Module, which will control intermittent wiper operation based on the sensitivity selection of the S82 Windshield Wiper/Washer Switch and the amount of water on the windshield.

M75 Windshield Wiper Motor
The M75 Windshield Wiper Motor receives a constant chassis ground. B+ is controlled by the KR12B Windshield Wiper Relay and KR12C Windshield Wiper Speed Control Relay being operated by the K219 Lighting Control Module.

The M75 Windshield Wiper Motor includes a DC motor and an internal position switch to indicate the wiper park position. When wiper operation is requested, the DC motor spins. The spinning motor is directed to a wiping motion through the windshield wiper transmission. When wiper operation is no longer required, the M75 Windshield Wiper Motor will continue spinning until the internal position switch indicates it is in the park position.

Windshield Washer Operation

The windshield washer system allows the driver to clean the vehicle's windshield using a discrete switch. The washer system uses the S82 Windshield Wiper/Washer Switch as the primary means of driver control. The S82 Windshield Wiper/Washer Switch is a discrete input to the K9 Body Control Module. The K9 Body Control Module communicates with the K219 Lighting Control Module over CAN to control G24 Windshield Washer Pump activation. The K9 Body Control Module also communicates with the K219 Lighting Control Module to control B+ to the M75 Windshield Wiper Motor during operation.

The windshield wiper system consists of the following electrical components:

- S82 Windshield Wiper/Washer Switch
- K9 Body Control Module
- K219 Lighting Control Module
- KR12B Windshield Wiper Relay
- KR11 Windshield Washer Pump Relay
- G24 Windshield Washer Pump
- M75 Windshield Wiper Motor
- B118B Windshield Washer Fluid Level Switch

Windshield Washer Components

S82 Windshield Wiper/Washer Switch
The S82 Windshield Wiper/Washer Switch is the primary input to the K9 Body Control Module for the driver to control windshield washer operation.

The K9 Body Control Module provides the S82 Windshield Wiper/Washer Switch with ground through a single low reference circuit and monitors the switch position through a single signal circuit. Voltage is applied by the K9 Body Control Module to this signal circuit and voltage drop is monitored to determine switch selection. The S82 Windshield Wiper/Washer Switch contains an internal switch dedicated to windshield washer operation. When the switch is closed, the signal circuit is pulled to ground, indicating washer operation is requested.

K9 Body Control Module
The K9 Body Control Module responds to input requests from the S82 Windshield Wiper/Washer Switch. The K9 Body Control Module provides a constant ground for the S82 Windshield Wiper/Washer Switch and monitors a signal circuit to determine the requested windshield wiper position.

When washer operation is requested, the K9 Body Control Module will send a CAN message to the K219

Lighting Control Module to enable the G24 Windshield Washer Pump, as well as supply B+ to the M75 Windshield Wiper Motor for low speed wiper operation.

K219 Lighting Control Module
The K219 Lighting Control Module controls B+ to the G24 Windshield Washer Pump. When washer operation is requested from a CAN message from the K9 Body Control Module, the K219 Lighting Control Module will apply voltage via a high side driver to the KR11 Windshield Washer Pump Relay. The K219 Lighting Control Module also controls B+ to the M75 Windshield Wiper Motor. When washer operation is requested, the K219 Lighting Control Module will apply voltage via a high side driver to the KR12B Windshield Wiper Relay.

The K219 Lighting Control Module also monitors the B118B Windshield Washer Fluid Level Switch through a discrete signal circuit.

KR12B Windshield Wiper Relay
The KR12B Windshield Wiper Relay supplies B+ to the M75 Windshield Wiper Motor and is controlled by the K219 Lighting Control Module. The coil side of the relay receives a constant chassis ground and the switch side receives a constant B+. When wiper operation is requested, the K219 Lighting Control Module will provide voltage to the coil side of the relay. This will energize the relay, closing the high current contact, and supply B+ to the M75 Windshield Wiper Motor through the KR12C Windshield Wiper Speed Control Relay, enabling wiper operation.

KR11 Windshield Washer Pump Relay
The KR11 Windshield Washer Pump Relay supplies B+ to the G24 Windshield Washer Pump and is controlled by the K219 Lighting Control Module. The coil side of the relay receives a constant chassis ground and the switch side receives a constant B+. When wiper operation is requested, the K219 Lighting Control Module will provide voltage to the coil side of the relay. This will energize the relay, closing the high current contact, and supply B+ to the G24 Windshield Washer Pump, enabling washer pump operation.

G24 Windshield Washer Pump
The G24 Windshield Washer Pump receives a constant chassis ground. B+ is controlled by the KR11 Windshield Washer Pump Relay. With voltage applied, a DC motor spins, connecting and pressurizing washer fluid from the washer fluid reservoir. The pressurized washer fluid is deposited on the windshield through a series of lines and nozzles.

M75 Windshield Wiper Motor
The M75 Windshield Wiper Motor receives a constant chassis ground. B+ is controlled by the KR12B Windshield Wiper Relay and KR12C Windshield Wiper Speed Control Relay being operated by the K219 Lighting Control Module. The M75 Windshield Wiper Motor will wiper at low speed when washer operation is requested.

The M75 Windshield Wiper Motor includes a DC motor and an internal position switch to indicate the wiper park position. When wiper operation is requested, the DC motor spins. The spinning motor is directed to a wiping motion through the windshield wiper transmission. When wiper operation is no longer required, the M75 Windshield Wiper Motor will continue spinning until the internal position switch indicates it is in the park position.

B118B Windshield Washer Fluid Level Switch
The B118B Windshield Washer Fluid Level Switch receives a constant chassis ground. A signal circuit is monitored by the K219 Lighting Control Module. The K219 Lighting Control Module applies voltage to the signal circuit. When the B118B Windshield Washer Fluid Level Switch is closed, voltage on the signal circuit is pulled to ground, indicating fluid in the washer fluid reservoir.

Section 1

Brakes

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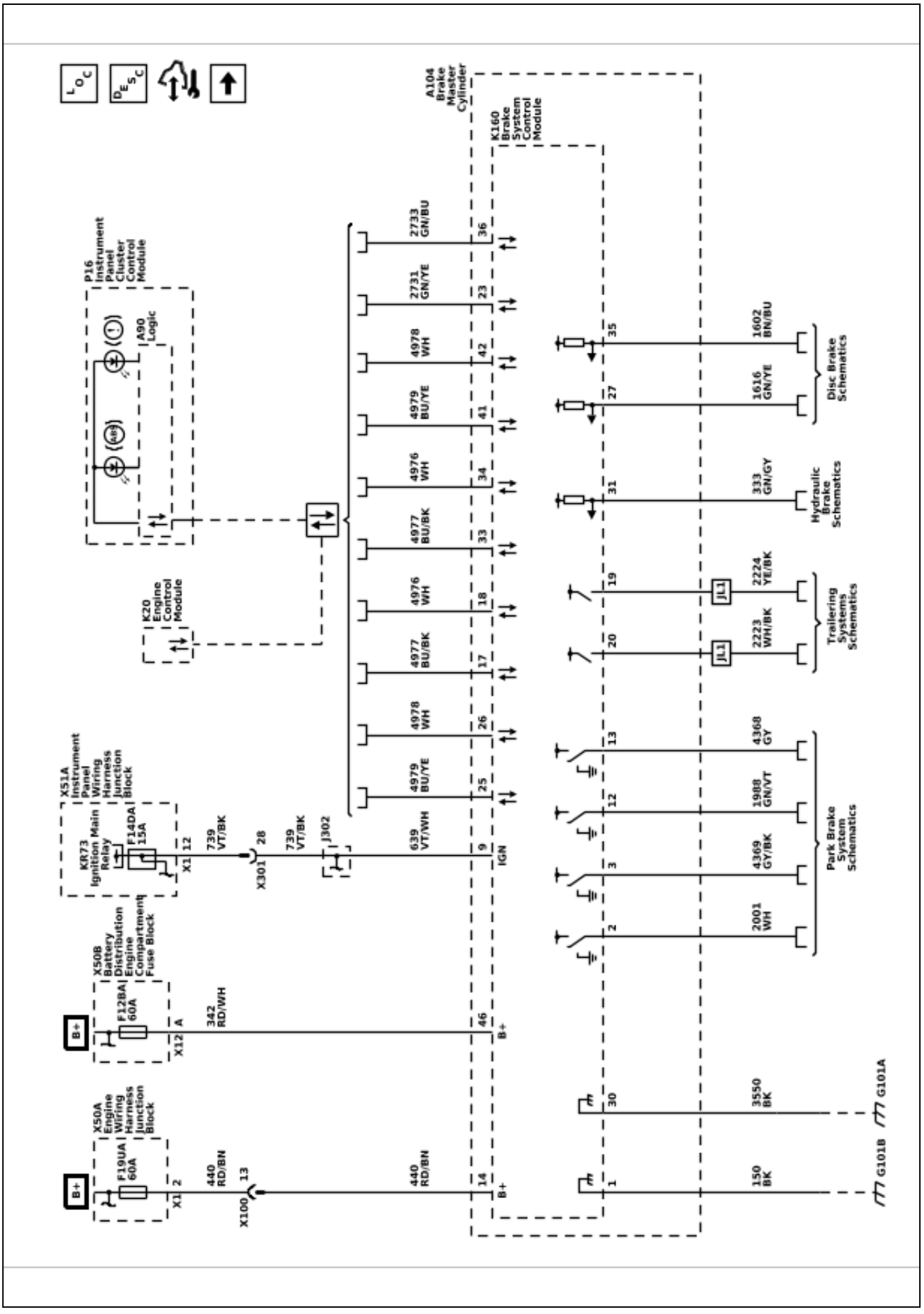
Brakes

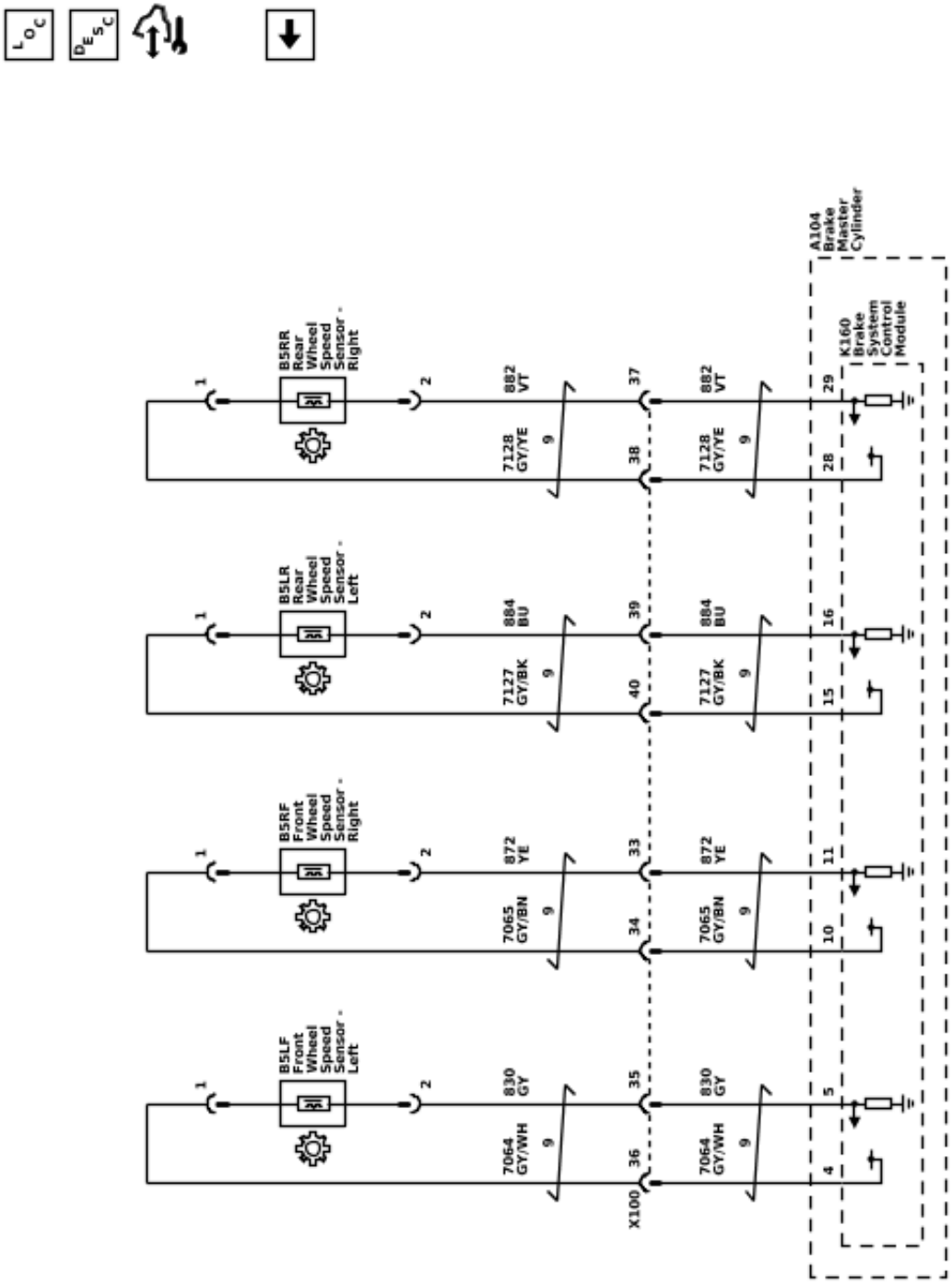
Antilock Brake System

Schematic and Routing Diagrams

Antilock Brake System Schematics (Module Power, Ground, Serial Data, Indicators, and Subsystem References)



Antilock Brake System Schematics (Wheel Speed Signals)



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Description and Operation

ABS Description and Operation

Description and Operation

This vehicle is equipped with a Integrated Brake Control (IBC), also known as Brake System Control Module.

The Integrated Brake Control is an electromechanical device that interprets and converts driver input and provides a corresponding hydraulic pressure output to activate a standard brake system according to the drivers demand. The electro-hydraulic boost system replaces the conventional vacuum-based power assist brake system, which provides an advantage in efficiency. The electro-hydraulic brake system supplies "on-demand" power when the driver presses the brake pedal. In an event of no electrical energy or failure condition the drivers input is mechanically converted to a hydraulic pressure output.

Depending on options, the following vehicle performance enhancement systems are provided.

- ABS
- Traction Control
- Stability Control
- Brake Pad Life Monitoring
- Dynamic Rear Proportioning
- Panic Brake Assist
- Teen Mode Support
- Trailer Sway Control
- Engine Drag Control
- Brake Drying/Cleaning
- Extended Hill Hold Start Assist
- Hill Descent Control
- Collision Imminent Braking
- Full Speed Range Adaptive Cruise Control Braking
- Trailer Brake Control
- Park Brake Control Motor on Caliper/Drum (with Push/Push)
- Unidirectional WSS
- CAN messages:
  - Chassis System Total Brake Axle Torque
  - DIC message during ABS (no pedal feedback)
  - Switch based ESC disable
  - Switch based Traction disable
  - ESC enable
  - OBDII - Rough Road Wheel Speed Usage

- The Body control module (BCM) monitors the brake pedal position sensor signal when the brake pedal is applied and sends a high speed serial data message to the Brake System Control Module indicating the brake pedal position.
- Instrument cluster - The instrument cluster displays the vehicle speed based on the information from the engine control module. The engine control module sends the vehicle speed information via a high speed serial data to the body control module. The body control module then sends the vehicle speed information via serial data to the instrument cluster in order to display the vehicle speed, either in kilometers or miles, based on the vehicle requirements.
- Multi-axis acceleration sensor - The yaw rate, lateral acceleration and longitudinal acceleration sensors are combined into one multi-axis acceleration sensor, internal to the inflatable restraint sensing and diagnostic module. The Brake System Control Module receives serial data message inputs from the yaw rate, lateral acceleration and longitudinal acceleration sensor and activates stability control and hill hold start assist function depending on multi-axis acceleration sensor input.
- Multifunction switch - The traction control switch is a multifunction momentary switch. The body control module monitors the signal circuit from the traction control switch and sends a high speed serial data message to the Brake System Control Module indicating the switch position. The traction control and stability control are manually disabled or enabled by pressing the traction control switch.
- Steering wheel angle sensor - The Brake System Control Module receives serial data message inputs from the steering angle sensor. The steering wheel angle sensor signal is used to calculate the intended driving direction. The steering wheel angle sensor is installed as an internal part of the power steering gear.
- Transmission control module - The Brake System Control Module receives high speed serial data message inputs from the transmission control module indicating the gear position of the transmission for hill start assist or hill hold functions.
- Wheel speed sensors – This vehicle is equipped with unique directional wheel speed sensors that can detect wheel direction as well as zero wheel speed. The wheel speed sensors are Active sensors that receive a 12 V power supply voltage from the Brake System Control Module and provide an output signal to the module. As the wheel spins, the wheel speed sensor sends the Brake System Control Module a DC square wave signal. The Brake System Control Module uses the

frequency of the square wave signal to calculate the wheel speed.

Power-Up-Self Test

The Brake System Control Module is able to detect many malfunctions whenever the ignition is ON. However, certain failures cannot be detected unless active diagnostic tests are performed on the components. Shorted solenoid coil or motor windings, for example, cannot be detected until the components are commanded ON by the Brake System Control Module. Therefore, a power-up self-test is performed to verify correct operation of system components. The Brake System Control Module performs the first phase of the power-up self-test when the ignition is first turned ON. This phase consists of internal self-testing of the Brake System Control Module along with electrical checks of system sensors and circuits.

Antilock Brake System (ABS) Features

The active control/modulation of brake fluid hydraulic modulates pressure to the front and/or rear brake corner subsystems (brake torque control) to preclude wheel lock-up and enhance tire-to-road longitudinal braking traction. Wheel lock-up (sliding wheel, not rolling wheel) occurs when the wheel brake torque exceeds the available tire-to-road traction. Avoidance of wheel lock-up provides the driver with the ability to maintain vehicle stability and steer-ability. Improved tire-to-road longitudinal braking traction minimizes vehicle stopping distance.

Brake Assist Features

The Brake Assist provides additional brake pressure over the pressure provided by the conventional brake apply system.

Panic Brake Assist

This feature will apply brakes more quickly when a panic brake situation is determined. Panic Brake Assist detects that the driver intent is to stop the vehicle as quickly as possible, but does not apply sufficient brake pressure to do so. The feature will detect the driver intent then actively apply brake pressure to maximum pressure, thus activating the ABS system and stopping the vehicle as quickly as possible.

Hydraulic Fade Compensation

Based on a brake disc/pad temperature estimate, driver applied master cylinder pressure and vehicle deceleration rate, Hydraulic Fade Compensation will increase brake system pressure above driver applied brake pressure when the brake system determines a gross fade condition.

The goal of providing additional brake system pressure is to reduce stopping distance during high deceleration requests from the driver. The driver will experience fading brakes while using low or medium brake pedal force application. The Hydraulic Fade Compensation will only activate during high brake pedal force application.

Rear Brake Boost

The Rear Brake Boost function provides rear hydraulic brake assist to ensure that all four corners are achieving maximum braking during ABS. When vehicle loading is heavily rear axle biased the rear brakes may not utilize all of the available road adhesion. The hydraulic Rear Brake Boost feature is designed to provide additional pressure to the rear brakes when the front brakes ABS are activated and the rear wheels have low slip.

Electronic Brake Pre-Fill

This feature is used to reduce the brake response time when the driver quickly releases the accelerator pedal. This will also be used to support the use of low drag calipers.

Motor on Caliper Torque Overlay

This feature is used to reduce the driver's braking effort when in backup (no power) mode. Torque is applied with the Electric Park Brake motors on the front or rear calipers, preferably isolating that hydraulic circuit, to provide assist. When in this mode, the Electric Park Brake motors are controlled to apply torque in accordance with the driver's commanded deceleration, instead of clamping to a certain force.

Electronic Stability Control (ESC) Features

Roll Over Mitigation / Preemptive ESC

Using the standard ESC sensor set, Roll Over Mitigation will detect driving situations that could cause a vehicle rollover. After detection, ESC brake control will be modified to reduce the chance of vehicle rollover.

Trailer Sway Control

Trailer Sway Control uses the ESC system to detect trailer instability and apply differential braking to dampen out trailer oscillation and instability. Trailer Sway Control will detect the vehicle dynamic characteristics associated with trailer sway and actuate the vehicle’s brakes and reduce engine torque, if required, to dampen or eliminate trailer oscillations. Trailer Sway Control shall recognize repeated trailer instability and communicate to the display device to warn a driver of unsafe trailer setup.

Torque Vectoring by Brakes

Torque Vectoring by Brakes enhances vehicle agility by using active brake applies and engine torque requests

to maximize traction on drive wheels. While cornering, brakes are applied to the inside drive wheels, thus allowing more torque to the outside wheels without slipping the inside wheels. Increasing the engine torque, above driver request, gives more torque to outer wheels. Torque Vectoring by Brakes is designed for all around performance, while this feature is solely designed for high cornering maneuvers.

Flat Tire ESC Enable
If flat tire is detected, ESC system shall not be allowed to be disabled by the driver (ESC shall be re-enabled if driver has already disabled). The traction control system will be allowed to be disabled by the driver.

ESC Control With Vehicle Weight Estimation
Brake System Control Module shall have the capability to estimate vehicle weight while the vehicle is being driven. This feature shall modify ESC control based on estimated vehicle weight when a compact spare tire is detected on the rear axle.

Traction Control System (TCS) Features

Vehicle Stuck Control
The traction control system shall recognize a vehicle “stuck” condition by monitoring excessive wheel slip for greater than 5 seconds with a vehicle reference velocity of less than 3 kph. Once detected, TCS will allow additional wheel slip of 5% to “dig” the vehicle out. This feature does not guarantee the vehicle to get unstuck, only to assist the driver.

Power Hop Control
Power hop is defined as an oscillation of the driven wheels due to acceleration on high coefficient surfaces. This wheel oscillation causes the vehicle to bounce resulting in driver discomfort, failure of driveline components and potentially other damage to the vehicle. This feature will be detected using Wheel speed sensor signal when TCS is “ ON”. In case TCS is “ OFF”, Brake System Control Module and ECM will be required to mitigate power hop. If the vehicle is exhibiting this signature, the traction control system will attenuate power hop by reducing engine torque and applying brake pressure.

Engine Drag Control
This feature is designed to mitigate drop-throttle-oversteer/understeer.

On a rear-wheel-drive vehicle during maximum cornering while applying throttle, the vehicle could exhibit oversteer when the driver quickly releases the throttle. This feature will slowly reduce the engine torque in order to maintain vehicle stability.

The Enabling Conditions include: Engine is required to be running, Clutch is released for Manual Trans , Vehicle speed is above 18kph (12mph) and the Powertrain is engaged through fault message from ECM/TCM/PCM

Enhanced Off Road Control (Rock Crawling)
This feature is intended to maximize rock crawling capability while in Offroad mode or 4 Low transfer case mode**.** This feature shall be enabled when in Offroad mode (if available) or when transfer case is in 4 Low. The traction control calibration shall be biased towards low speed, active capability through the use of more brake control with less wheel slip.

Brake System Control Module Features

Brake Drying/Cleaning

Brake Drying/Cleaning autonomously applies a small amount of brake pressure during long driving on wet roads in order to remove water from the rotor surface. The brake application is unperceivable to the driver, but should result in improved brake feel and performance. Conditions to enable Brake Drying/Cleaning.

- Wipers need to be ON
- If Cruise is Active, Brake Drying/Cleaning will not function as minimum pedal position is required
- If driver brakes, the distance counter will be reset
- Brake pressure needs to build up to 3 bar at all 4 wheels

Hill Start Assist

Hill Start Assist is a feature that will temporarily hold the vehicle while on a grade. This feature will hold the vehicle 2-5 seconds after the driver has removed their foot from brake pedal and the vehicle is on a grade exceeding 7%. The design is to prevent the vehicle from rolling down the hill before the driver has an opportunity to apply accelerator pedal. The brakes will automatically release when the accelerator pedal is applied. It will not activate if the vehicle is in a drive gear and facing downhill, or if the vehicle is facing uphill and in Reverse.

Driveline Damping

Driveline Damping is required on vehicles with ESC, Stop/Start functionality and an automatic transmission. This feature holds brake pressure to dampen driveline acceleration disturbance as engine is restarted and holds brake pressure to retard or prevent the vehicle from rolling. It is used for driver comfort and has also been used to extend vehicle hold on a steep grade.

Extended Hold Hill Start Assist
Extended Hold Hill Start Assist will function the same as Hill Start Assist except there will be an indefinite vehicle hold instead of a temporary vehicle hold. The vehicle will be held by the Brake System Control Module for up to five minutes, and then will transfer the hold to Electronic Park Brake when necessary. This

feature is required for all Stop/Start variants to prevent vehicle rollback when the engine shuts off. All of the driver exit strategies of Hill Start Assist with Electronic Park Brake will also apply to this feature.

Hill Descent Control
Hill Descent Control provides autonomous braking when the vehicle is descending a very steep incline in either forward or reverse transmission gear. The grade activation minimum threshold is 10%. Typical vehicle speeds while using this feature are 5-30kph (6–19mph). This feature can provide convenience and comfort for steep offroad driving.

Hill Descent Control is enabled by the driver activating the Hill Descent Control switch at a vehicle speed below the maximum enabling vehicle speed.

Hill Descent Control is disabled if vehicle speed exceeds 60 km/h for 30 seconds or immediately if vehicle speed exceeds 80km/h. Cruise control will not be allowed to activate when Hill Descent Control is enabled by the driver.

Automatic Vehicle Hold
Automatic Vehicle Hold is a driver enabled feature that holds the vehicle at a standstill for an indefinite amount of time. This feature is similar to the Extended Hold Hill Start Assist except it will function on all road grades. It must be enabled by the driver and will revert to a disabled state upon key-up. The brake System Control Module will hold vehicle, then transfer hold to Electric Park Brake (EPB) when necessary.

The Automatic Vehicle function requires the vehicle to have an electronic parking brake which will allow the brake pressure hold time to increase up to 5 minutes before engaging the electronic park brake. Automatic Vehicle is available on vehicles with automatic transmissions and only available on vehicles with manual transmissions if equipped with a neutral gear position indicator (start/stop engines have neutral gear position indicator).

Vehicle Moding
The Brake System Control Module shall use ‘Driver Selected Mode Status signals to determine what mode the vehicle is in. The Brake System Control Module shall use the supported Driving modes to indicate to the customer what mode they are in. Mode 0 that is correspond to “ Tour or Normal” mode shall always be supported and will be considered the default. Other supported modes are: Sport, Offroad, Track, Snow/Ice and Tow Haul.

Electric Park Brake Features

Park Rollaway EPB Apply

This feature applies the EPB autonomously when vehicle motion is detected while in Park. The most likely scenario for activation of this feature is a vehicle on a split-mu grade and an open differential. The low mu wheel can spin in the opposite direction from the vehicle motion, and so the high mu wheel may allow the vehicle to roll. Applying the EPB to both rear wheels prevents vehicle motion by preventing the high mu wheels from rotating.

Steep Grade Apply:

This feature autonomously applies the EPB when the vehicle is on a steep grade. The Steep Grade apply can be enabled if Park Rollaway Detection apply is enabled. It can also be enabled on its own.

Interface with Other Features

The features set below are systems that will be controlled (to various degrees) by the Brake System Control Module by sending out performance requests to each system which should be arbitrated in the sub-system for execution. The idea is that the Brake System Control Module request should override normal sub-system control and these requests should not override diagnostic, failure, or other special or overriding control.

Steering Torque Overlay (for both ABS and TCS)

This feature provides haptic feedback by increasing or decreasing steering assist to encourage appropriate course correction. This feature functions in combination with ESC or ABS

4WD Interface

Brake Controls send front and rear torque requests to the transfer case system while ABS/TCS/ESC is activating.

4WD w/4Low Interface

Brake Controls send front and rear torque requests to the transfer case system while ABS/TCS/ESC is activating

Trailer Braking Control Interface

The Brake System Control Module shall be able to independently use the trailer brake activation request to stabilize and decelerate the vehicle**.** The Brake System Control Module can use Trailer Braking Force Output and Trailer Braking Gain Setting as feedback to know how much braking the Integrated Trailer Brake Control is currently doing

Dynamic Braking with EPB

Dynamic Braking with EPB provides autonomous braking when the EPB switch is pressed when the vehicle is in motion. With the use of this feature, if the EPB switch is pressed while the vehicle is moving, the Brake System Control Module will apply braking at all 4 corners until the vehicle is stopped, then the EPB will apply and Brake System Control Module will release pressure.

Electronic Transmission Range Select (ETRS) Autonomous Apply

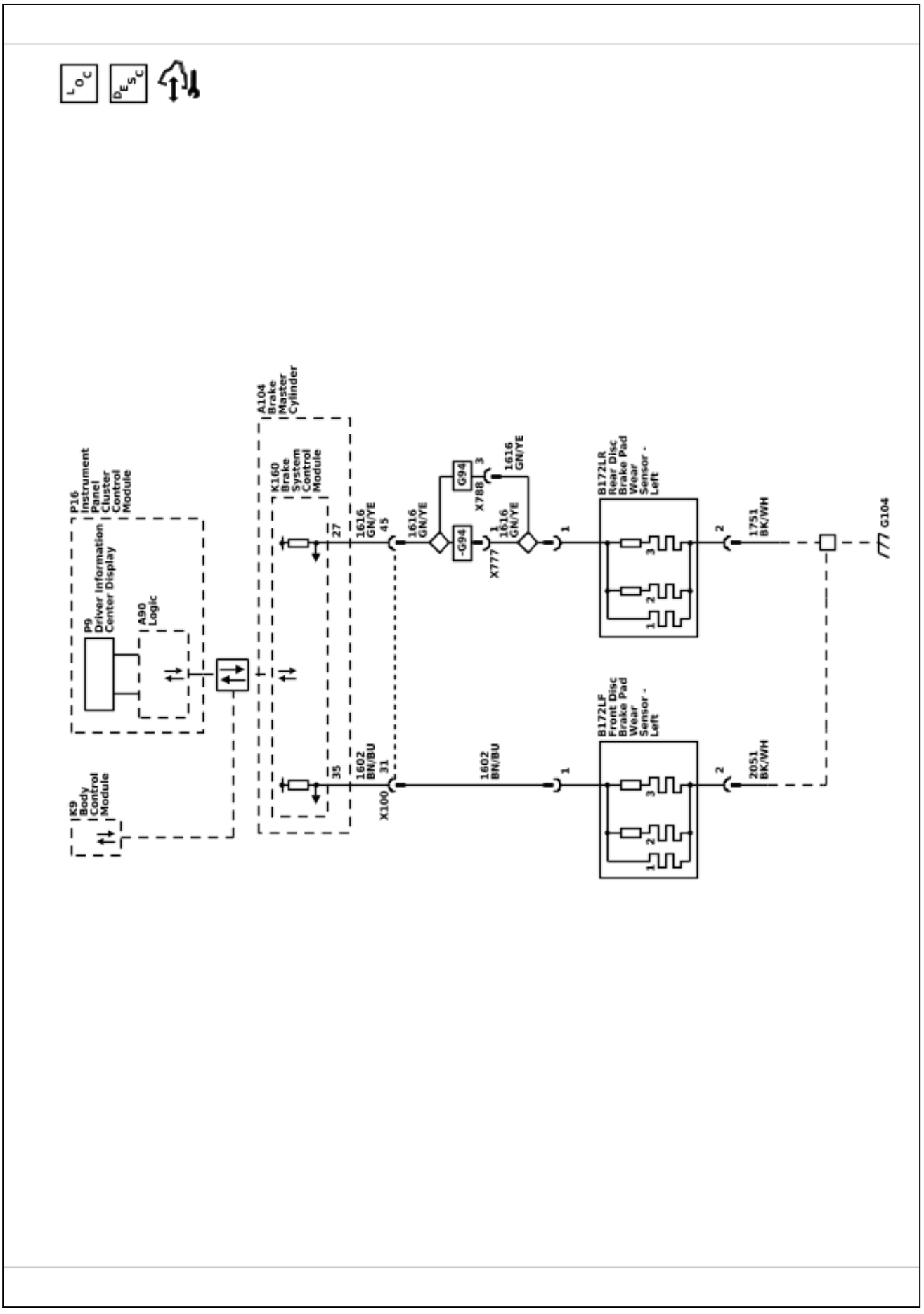
This feature applies brake pressure on a request from ETRS. This is done temporarily until the EPB can apply, using the ETRS EPB Apply feature.

The Brake Control System shall provide a short service brake hold to prevent the vehicle from rolling between when the ETRS commands a hold and the electronic park brake is applied. The primary purpose of the ETRS/Brakes interface is to apply the park brake when ETRS has a failure that prevents the transmission from achieving park; or if the driver shifts to park on a grade, EPB will reduce the load on the park pawl by applying (ETRS calculates and calibrates this grade).

Disc Brakes

Schematic and Routing Diagrams

Disc Brake Schematics (Brake Pad Wear Sensors)



Description and Operation

Disc Brake System Description and Operation

System Component Description

The disc brake system consists of the following components:

Disc Brake Pads: Applies mechanical output force from the hydraulic brake calipers to friction surfaces of brake rotors.

Disc Brake Rotors: Uses mechanical output force applied to friction surfaces from the disc brake pads to slow speed of tire and wheel assembly rotation.

Disc Brake Pad Hardware: Secures disc brake pads firmly in proper relationship to the hydraulic brake calipers. Enables a sliding motion of brake pads when mechanical output force is applied.

Disc Brake Caliper Hardware (Floating Caliper): Provides mounting for hydraulic brake caliper and secures the caliper firmly in proper relationship to caliper bracket. Enables a sliding motion of the brake caliper to the brake pads when mechanical output force is applied.

System Operation (Floating Caliper)

Mechanical output force is applied from the hydraulic brake caliper pistons to the inner brake pads. As the pistons press the inner brake pads outward, the caliper housings draw the outer brake pads inward. This allows the output force to be equally distributed. The brake pads apply the output force to the friction surfaces on both sides of the brake rotors, which slows the rotation of the tire and wheel assemblies. The correct function of both the brake pad and brake caliper hardware is essential for even distribution of braking force.

System Operation (Fixed Caliper)

Mechanical output force is applied from the hydraulic brake caliper inboard and outboard pistons to the inner and outer brake pads. The brake calipers are a fixed, opposed-piston design, allowing the output force to be equally distributed through the distribution of the pressurized brake fluid within the caliper. The brake pads apply the output force to the friction surfaces on both sides of the brake rotors, which slows the rotation of the tire and wheel assemblies. The correct function of the brake pad hardware and of the brake caliper inboard and outboard pistons is essential for even distribution of braking force.

System Characteristics

Brake Noise

Brake noise can occur and to a degree, some brake noise is normal. Variations in driving conditions such as the weather, environment, driving patterns, differences in vehicle loading, and type or style of driving, can affect brake wear. Any one of these variations can cause brake noise to become apparent. Inspect and verify that all metal-to-metal contact areas of the brake pads, brake pad guides or springs, brake caliper housing, caliper bracket and/or suspension knuckle, as applicable, are clean and free of corrosion and scale.

Brake noise is a “slip-stick” vibration of disc brake components and, if it occurs intermittently, can be considered normal. Most brake noise may be eliminated or temporarily reduced by performing 3 or 4 aggressive brake applications. If the brake noise persists or consistently recurs, application of a damping compound to the brake pad mounting plate where it contacts the caliper can lessen the vibration as the components move relative to each other. Refer to Adhesives, Fluids, Lubricants, and Sealers in this section for recommended compounds.

The following brake noises are characteristic of all brake systems. These noises cannot be avoided, and may not indicate improper operation of the brake system.

Squeak/Squeal Noise

A squeak or squeal noise can occur on vehicles with front semi-mettalic brake pads during light to medium brake pedal application at low to moderate vehicle speeds. Occasionally this noise may appear from the front or rear brakes after a period of non-use such as overnight, or cold brakes and/or in high humidity conditions.

Grinding Noise

Common occurrence for rear brakes and some front disc brakes during initial brake applications after the vehicle has been parked overnight. Caused by light corrosion forming on the metal brake component friction surfaces during vehicle non-use. Typically disappears after the first few brake applications.

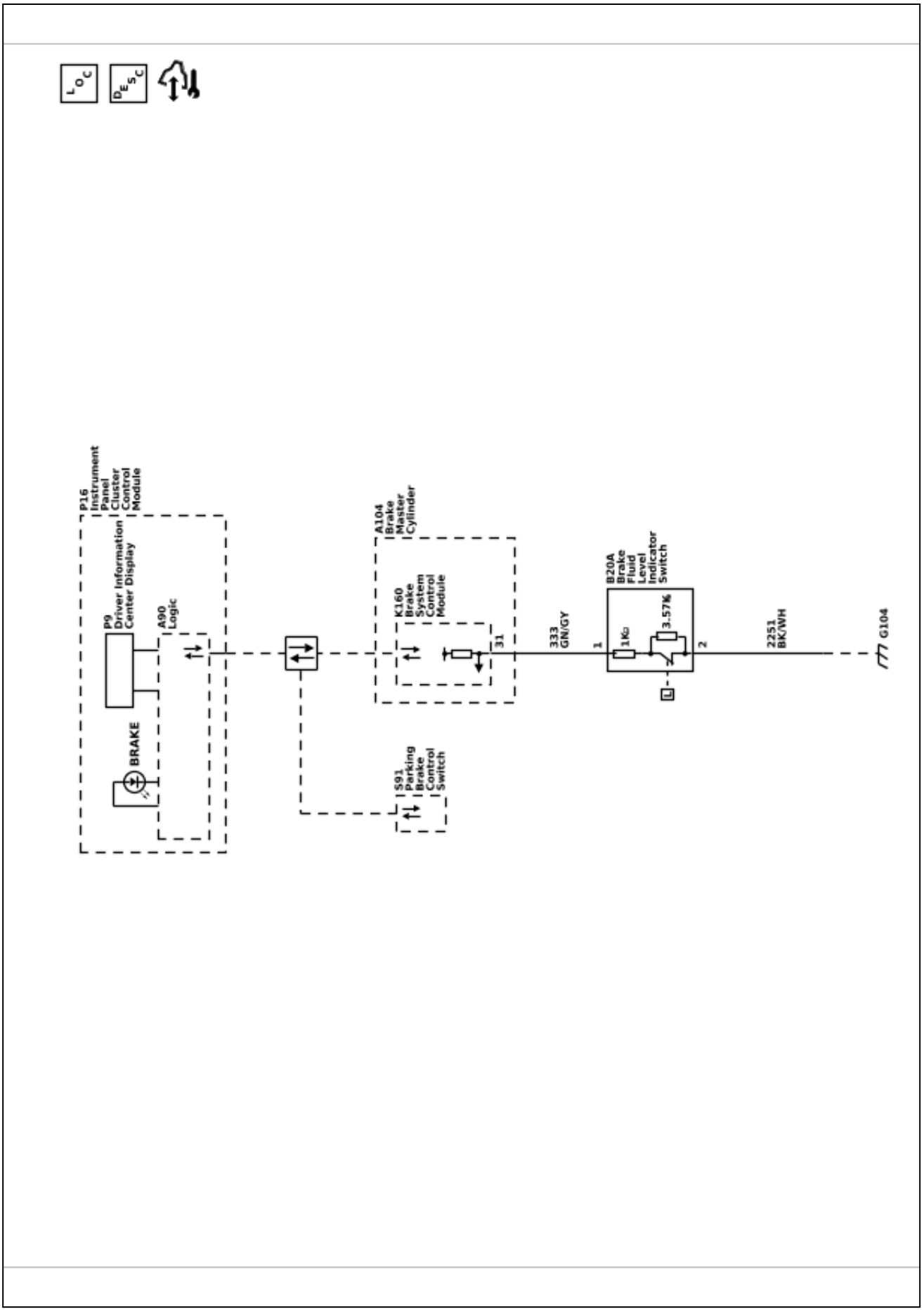
Groan Noise

A groan type noise may be heard during a quick stop, or when slowly moving forward from a complete stop. On vehicles equipped with antilock brake systems (ABS), a groan or moan noise may occur during heavy brake application or on road surfaces with compromised traction such as loose gravel, or on wet or icy roads. This is a normal function of ABS activation.

Hydraulic Brakes

Schematic and Routing Diagrams

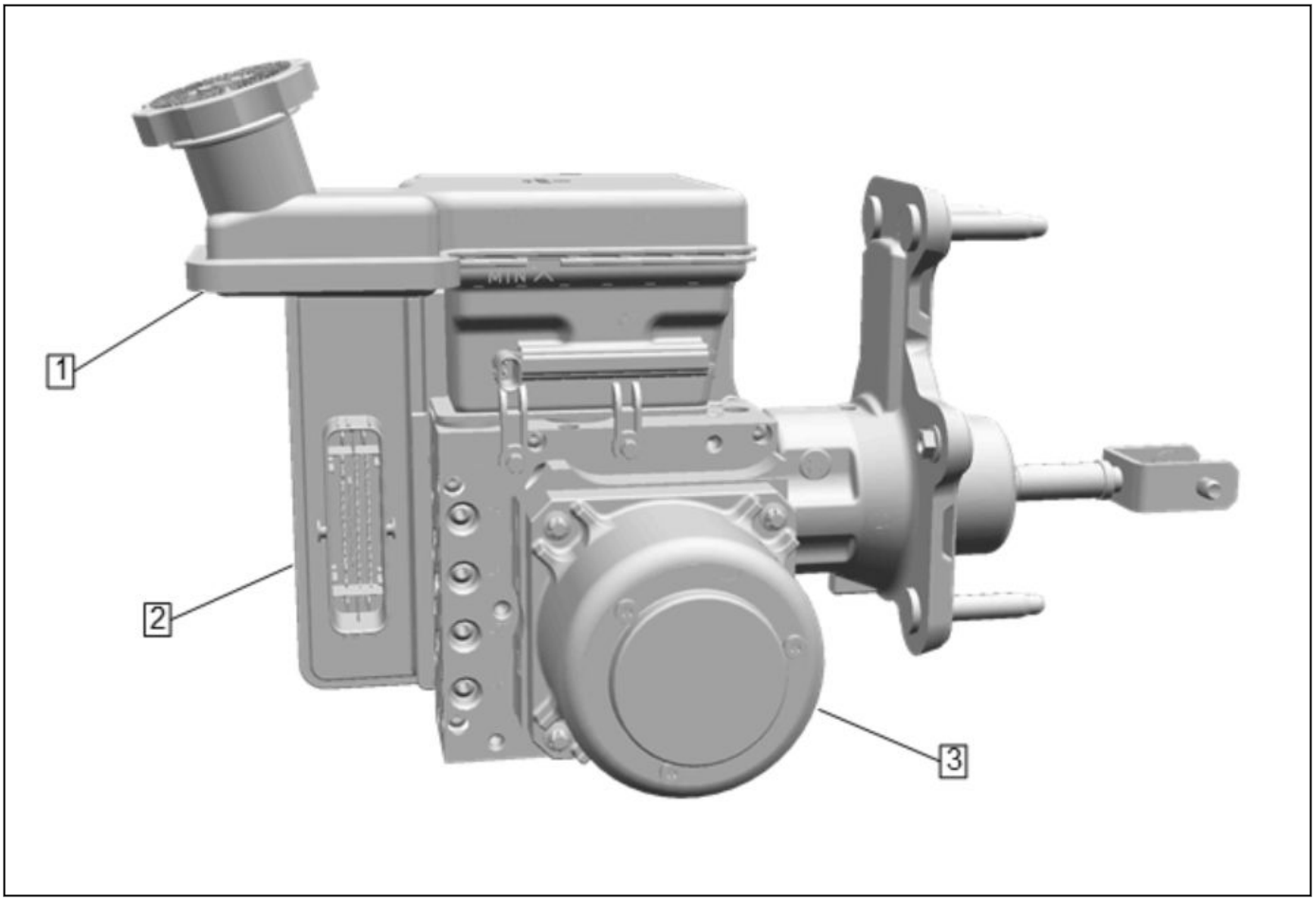
Hydraulic Brake Schematics (Hydraulic Brakes)



Description and Operation

Brake Assist System Description and Operation

System Component Description



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Note: The above graphic may not be an exact representation for every vehicle configuration.

The brake assist system is an electro - hydraulic brake booster that replaces a vacuum booster including its vacuum supply. The brake booster unit takes the driver applied brake demand and transforms this into an amplified brake pressure and does not rely on vacuum to function. The brake booster unit is designed to operate together with an electronic stability control module which is normally responsible for ABS, traction control and stability control.

The master cylinder and power brake booster unit consists of a brake master cylinder reservoir (1), an electronic brake booster control module (2), pedal coupling unit/pushrod, and the brake master cylinder (3) with integrated brake pressure modulator valve.

System Operation

Brake system input force is multiplied by the brake pedal and transferred by the pedal pushrod to the hydraulic brake master cylinder. Effort required to apply the brake system is reduced by the electronic brake booster.

Shutdown Test

The brake master cylinder performs a self-test 2 minutes after ignition off. The self-test consists of an internal hydraulic test of the brake master cylinder and an external hydraulic compliance test and hydraulic leak test of the brake lines and calipers. The brake master cylinder will take the appropriate actions based on the test results at the next startup. The self-test will not run again until the vehicle has been driven 0.804 Km (0.5 mile), 40.23 kph (25 mph) minimum.

Brake Assist System Description and Operation

Brake Assist Operating Mode	Description	Vehicle Braking Behavior	Vehicle Speed limited to XXX kph/mph	Red Brake Telltale	DIC	Other Displays
Full Brake Assist	• - Normal hydraulic brake assist. • - Brake pedal travel and force (pressure) measured. • - Pedal feel indicates the relation of the pedal travel to the pedal force. • - Brake system applies bra	• - Pedal feel: Normal (force to travel of brake pedal). • - Brake pedal effort to decel: Normal. • - Pedal Travel restricted to 80 mm due to pedal simulator.	No	No	None	None
Reduced Brake Assist	• - Normal hydraulic brake assist available • - Driver warned with DIC message but due to nature of failure, engineering determined more warning needed. • - Brake assist gain reduced in a noticeable fashion at low	• - Pedal feel: Normal • - Brake Pedal effort to decel: More effort required for low decel values (noticeable). Full braking capability for increased effort. • - Pedal Travel restricted to 80 mm due to pedal simulator.	No	No	Service Brake Assist	None

Brake Assist Operating Mode	Description	Vehicle Braking Behavior	Vehicle Speed limited to XXX kph/mph	Red Brake Telltale	DIC	Other Displays
Reduced Brake Assist	• - Normal hydraulic brake assist on 2 wheels. • - Performed when brake system detects and isolates a leak in one of the two brake circuits.	• - Pedal feel: Normal. • - Brake pedal effort to deceleration: Same deceleration requires double the effort. Can only achieve 50% deceleration. • - Vehicle will pull slightly to the side with the Front Brake active. • - Pedal Travel restricted to 80 mm due to pedal simulator.	Yes	Yes	Brake System Failure XXX kph/mph Top Speed Low Brake Fluid (Potentially)	ABS, ESC, and Engine Telltales Service Traction and ESC DIC Vehicle Speed Limited display from ECM
Two Wheel Brake Assist	• - Normal hydraulic brake assist on 2 wheels. • - Performed when brake system detects and isolates a leak in one of the two brake circuits.	• - Pedal feel: Normal. • - Brake pedal effort to deceleration: Same deceleration requires double the effort. Can only achieve 50% deceleration. • - Vehicle will pull slightly to the side with the Front Brake active. • - Pedal Travel restricted to 80 mm due to pedal simulator.	Yes	Yes	Brake System Failure XXX kph/mph Top Speed Low Brake Fluid (Potentially)	ABS, ESC, and Engine Telltales Service Traction and ESC DIC Vehicle Speed Limited display from ECM

Brake Assist Operating Mode	Description	Vehicle Braking Behavior	Vehicle Speed limited to XXX kph/mph	Red Brake Telltale	DIC	Other Displays
No Brake Assist with Electric Park Brake Assist	• - Hydraulic brake assist not available. • - Brake System uses Electric Park Brake to assist driver braking.	• - Pedal feel: Slightly stiffer than normal. • - Brake pedal effort to deceleration: Onset of braking is similar but more force required to achieve same deceleration compared with Full Brake Assist. • - Minimal non linearities in deceleration due to use of Electric Park Brake. • -	Yes	Yes	Brake System Failure XXX kph/mph Top Speed	ABS, ESC, and Engine Telltales Service Traction and ESC DIC Vehicle Speed Limited display from ECM

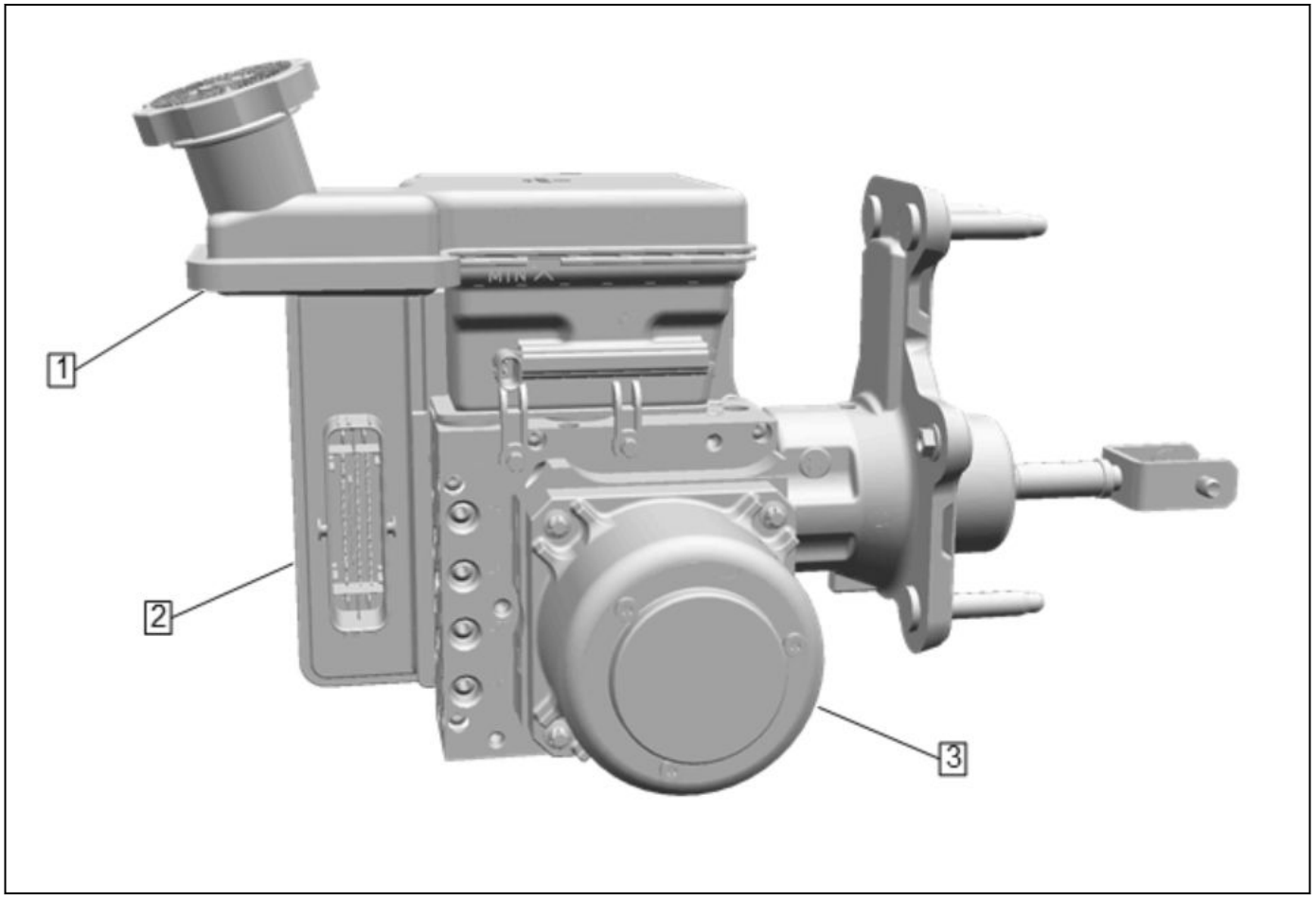
Brake Assist Operating Mode	Description	Vehicle Braking Behavior	Vehicle Speed limited to XXX kph/mph	Red Brake Telltale	DIC	Other Displays
No Brake Assist (Push Thru)	• - No hydraulic or Electric Park brake assist available. • - Driver pedal force distributes equal pressure to all 4 wheels	• - Pedal feel: Slightly softer than normal. • - Brake pedal effort to deceleration: Onset of braking requires more travel AND more force required to achieve same deceleration compared with No Brake Assist with Electric Park Brake Assist. • - Pedal Travel's almost to the floor with high	Yes	Yes	Brake System Failure XXX kph/mph Top Speed (Not displayed for full power loss or critical micro failures)	ABS, ESC, and Engine Telltales Service Traction and ESC DIC Vehicle Speed Limited display from ECM

Brake Assist Operating Mode	Description	Vehicle Braking Behavior	Vehicle Speed limited to XXX kph/mph	Red Brake Telltale	DIC	Other Displays
Two Wheel No Brake Assist (2 Wheel Push Thru)	• - Hydraulic brake assist not available. • - Brake system applies and releases Electric Park Brake proportional to driver pedal force to assist driver braking.	• - Pedal feel: Significantly softer than normal. • - Brake Pedal effort to deceleration: Onset of braking requires more travel AND more force required to achieve same deceleration compared with No Brake Assist. • - Vehicle will pull slightly to the side with the Front Brake active.	Yes	Yes	Brake System Failure XXX kph/mph Top Speed	ABS, ESC, and Engine Telltales Service Traction and ESC DIC Vehicle Speed Limited display from ECM
Brake Fade Detected Level 1	• - Normal hydraulic brake assist available. • - Brakes system estimates brake temps of 500 - 600 deg C. • - Driver warned with DIC display. • - Brake assist gain reduced in a noticeable fashion at low pedal travel	• - Pedal feel: Normal • - Brake Pedal effort to deceleration: Not significantly changed • - Pedal Travel restricted to 80 mm due to pedal simulator.	No	No	Reduce Braking to Avoid Overheating	None

Hydraulic Brake System Description and Operation

System Component Description

The hydraulic brake system consists of the following:



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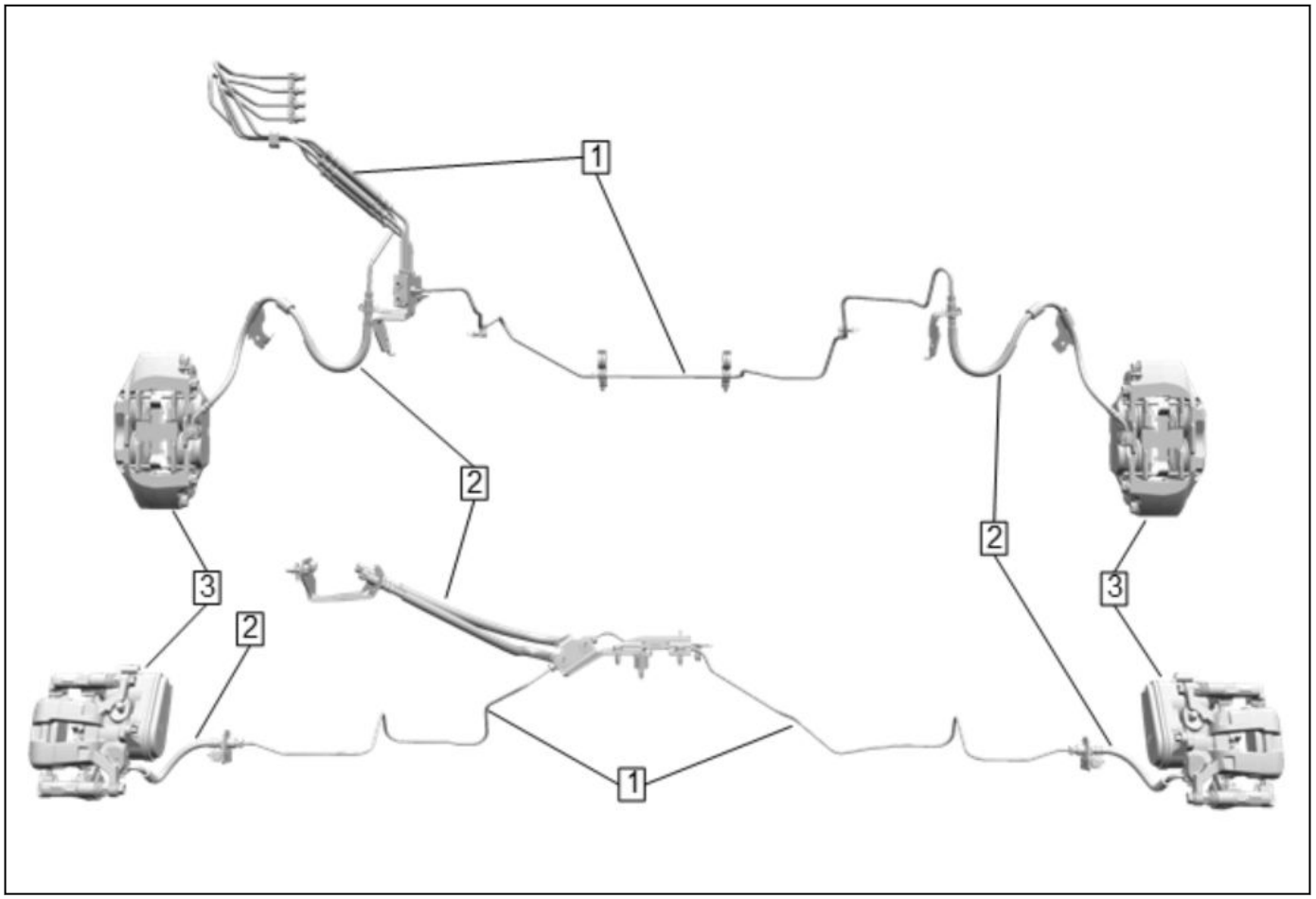
Note: The above graphic may not be an exact representation for every vehicle configuration.

Brake Master Cylinder Fluid Reservoir (1): Contains supply of brake fluid for the hydraulic brake system.

Electronic Brake Booster Control Module (2) and Brake Master Cylinder (3): The brake master cylinder and the electronic brake booster control module take the driver applied brake demand and transforms this into an amplified brake pressure. The integrated brake pressure modulator valve controls hydraulic pressure to each wheel independently and can be responsible for ABS, traction control, and stability control.



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Note: The above graphic may not be an exact representation for every vehicle configuration.

Hydraulic Brake Pipes (1) and Flexible Brake Hoses (2): Carries brake fluid to and from hydraulic brake system components.

Brake Calipers (3): Converts hydraulic input pressure into mechanical output force.

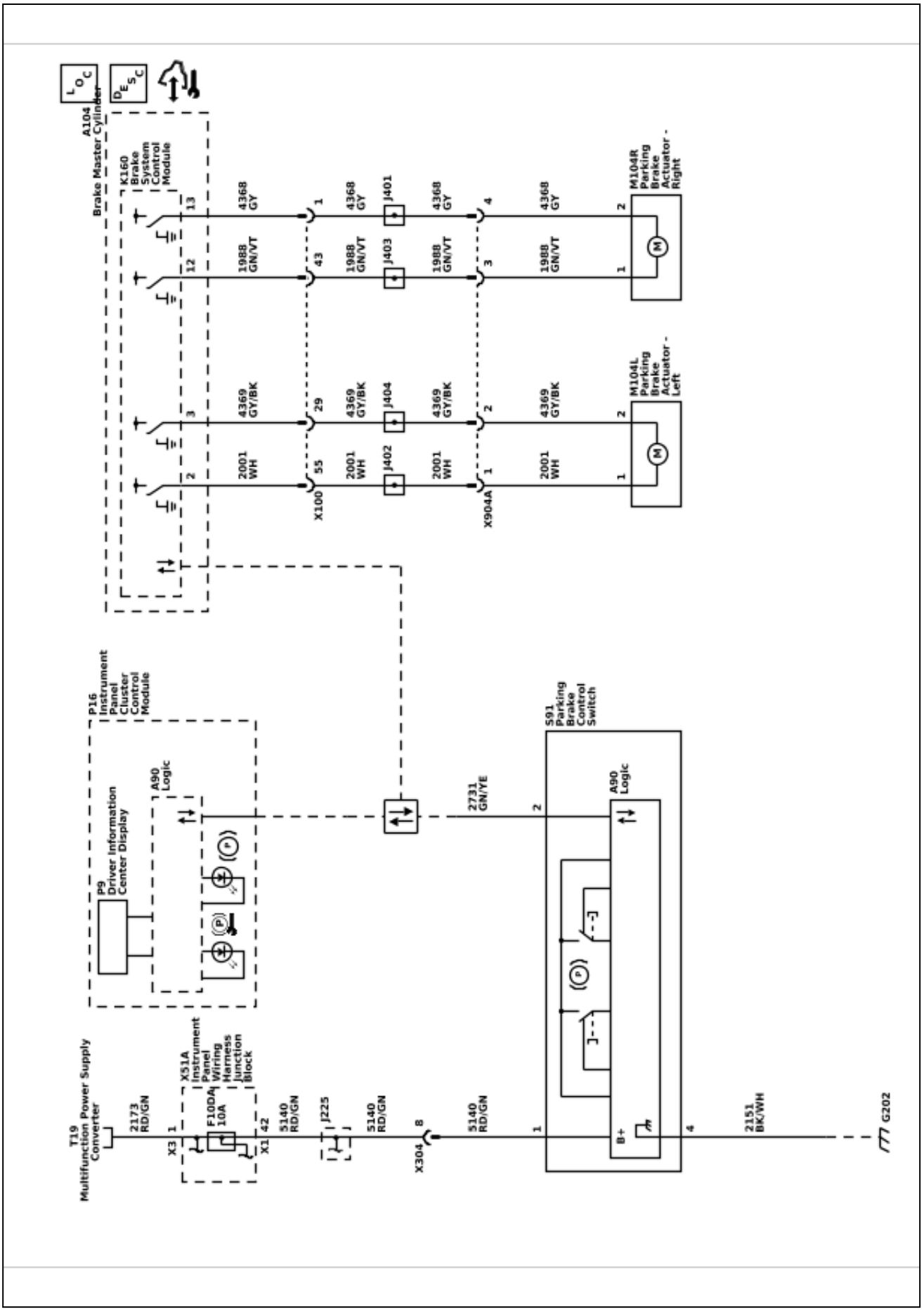
System Operation

Mechanical force is converted into hydraulic pressure by the master cylinder, regulated to meet braking system demands by the pressure balance control system, and delivered to the hydraulic brake wheel circuits by the pipes and flexible hoses. The wheel apply components then convert the hydraulic pressure back into mechanical force which presses linings against rotating brake system components.

Park Brake

Schematic and Routing Diagrams

Park Brake System Schematics (Park Brake System Schematics)



Description and Operation

Electronic Parking Brake Description

Vehicles with the electric parking brake have a switch in the center console or on the dash, which takes the place of the manual parking brake system, the foot pedal and release handle. In case of insufficient electrical power, the electric parking brake cannot be applied or released.

Electronic Brake Control Module/Brake System Control Module

The parking brake function is integrated into the Electronic Brake Control Module/Brake System Control Module. The module contains the logic for applying and releasing the parking brake when commanded by the Park Brake Switch.

When the Park Brake Switch is pulled, a signal is sent to the Electronic Brake Control Module/Brake System Control Module which will supply 12 V to the apply control circuits and ground to the release control circuits which will cause the left and right park brake actuators to activate causing the park brakes to engage. When the Park Brake Switch is pressed, a signal is sent to the Electronic Brake Control Module/ Brake System Control Module which will supply 12 V to the released control circuits and ground to the apply control circuits which will cause the left and right park brake actuators to activate causing the park brakes to release. In some vehicles, the Park Brake Switch is a push-button style switch. When the switch is pressed, the park brakes are commanded to either apply or release based off of their current position.

The Electronic Brake Control Module/Brake System Control Module will diagnose the park brake motor circuits to verify that they are functioning properly. The park brake motor circuits are used to command actuator motor operation, which will apply and release the parking brake. These circuits are used to activate the actuator, which applies or releases pressure on the caliper pistons, ultimately applying and releasing the park brake.

The Park Brake Motor Position Sensor is an internal sensor to the park brake actuator. This sensor is used to monitor the park brake motor position.

Electric Parking Brake Apply

The electric parking brake can be applied any time the vehicle is stopped or in motion. The electric parking brake is applied by momentarily operating the park brake control switch. The red park brake light will momentarily flash while the parking brake is being applied. Once fully applied, the red park brake light will turn on. If the electric parking brake is applied while the vehicle is in motion, the vehicle will decelerate as long as the switch is being operated. If the switch is operated until the vehicle comes to a stop, the park brake will remain applied.

If the red park brake light is flashing, the electric parking brake is only partially applied or released, or there is a problem with the electric parking brake. A DIC message will display.

The vehicle may automatically apply the electric parking brake in some situations when the vehicle is not moving. This is normal, and is done to periodically check the correct operation of the electric parking brake system.

Electric Parking Brake Release

To release the electric parking brake, turn the ignition switch to the ON or RUN position, apply, and hold the brake pedal, and push down momentarily on the park brake control switch. When the electric parking brake is released the red park brake light turns off.

Automatic Electric Parking Brake Release

The parking brake will automatically release if the vehicle is running, placed into gear, and an attempt is made to drive away. Avoid rapid acceleration when the parking brake is applied to preserve parking brake lining life.

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A11	*A11 Radio: Scan Tool Information 2-43*	*Radio/Navigation System Schematics 4-3*	[Link target (target-id 46758-) not found]	*A11 Radio: Programming and Setup 2-5*
A26	*A26 Heater and Air Conditioning User Interface Control - Front: Scan Tool Information 2-46*	*HVAC Schematics 6-3*	[Link target (target-id 265846-) not found]	*A26 Heater and Air Conditioning User Interface Control - Front: Programming and Setup 2-8*
B174W	*B174W Front View Camera - Windshield: Scan Tool Information (without UGN) 2-47* *B174W Front View Camera - Windshield: Scan Tool Information (with UGN) 2-47*	*Driver Assistance Systems Schematics 9-3*	[Link target (target-id 283748-) not found]	*B174W Front View Camera - Windshield: Programming and Setup 2-9*
B218L/R	*B218L Side Obstacle Detection Control Module - Left: Scan Tool Information 2-48* *B218R Side Obstacle Detection Control Module - Right: Scan Tool Information 2-48*	*Driver Assistance Systems Schematics 9-3*	[Link target (target-id 283745-) not found]	*B218L Side Obstacle Detection Control Module - Left: Programming and Setup 2-10* *B218R Side Obstacle Detection Control Module - Right: Programming and Setup 2-11*
K9	*K9 Body Control Module: Scan Tool Information 2-49*	*Body Control System Schematics 7-19*	*Body Control Module Replacement 7-22*	*K9 Body Control Module: Programming and Setup 2-11*
K20	*K20 Engine Control Module: Scan Tool Information 2-89*	*Engine Controls Schematics 5-11*	[Link target (target-id 305929-) not found]	*K20 Engine Control Module: Programming and Setup 2-14*
K29FV	*K29FV Front Seat Heater Vent Control Module: Scan Tool Information 2-147*	*Heated/Cooled Seat Schematics 10-9*	[Link target (target-id 271038-) not found]	*K29FV Front Seat Heater Vent Control Module: Programming and Setup 2-17*
K36	*K36 Restraints Control Module: Scan Tool Information 2-148*	*SIR Schematics 9-42*	[Link target (target-id 57768-) not found]	*K36 Restraints Control Module: Programming and Setup 2-17*
K38	*K38 Chassis Control Module: Scan Tool Information 2-152*	[Link target (target-id 150336-) not found]	[Link target (target-id 345039-) not found]	*K38 Chassis Control Module: Programming and Setup 2-19*
K40	*K40D Driver Seat Adjuster Memory Module: Scan Tool Information 2-159*	*Driver Seat Schematics 10-3*	[Link target (target-id 265094-) not found]	*K40D Driver Seat Adjuster Memory Module: Programming and Setup 2-20*

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K43	*K43 Power Steering Control Module: Scan Tool Information 2-162*	*Power Steering Schematics 11-3*	[Link target (target-id 119400-) not found]	*K43 Power Steering Control Module: Programming and Setup 2-20*
K56	Serial Data Gateway Module	*Data Communication Schematics 7-3*	*Serial Data Gateway Module Replacement 7-44*	*K56 Serial Data Gateway Module: Programming and Setup 2-21*
K61	Sunroof Control Module	*Sunroof Schematics 8-3*	[Link target (target-id 69635-) not found]	*K61 Sunroof Control Module: Programming and Setup 2-23*
K67	Trailer Brake Control Module	*Trailering Systems Schematics 0-46*	[Link target (target-id 327489-) not found]	*K67 Trailer Brake Control Module: Programming and Setup 2-24*
K68	*K68 Trailer Lighting Control Module: Scan Tool Information 2-164*	*Trailering Systems Schematics 0-46*	[Link target (target-id 327487-) not found]	*K68 Trailer Lighting Control Module: Programming and Setup 2-24*
K69	*K69 Transfer Case Control Module: Scan Tool Information 2-165*	• *Transfer Case Control Schematics 12-12* – MP 3010/3015 (NP0) transfer case • *Transfer Case Control Schematics 12-26* – MP 3023/3024 (NQH) transfer case	[Link target (target-id 192307-) not found] – MP 3010/3015 (NP0) transfer case [Link target (target-id 162319-) not found] – MP 3023/3024 (NQH) transfer case	*K69 Transfer Case Control Module: Programming and Setup 2-24*
K71	*K71 Transmission Control Module: Scan Tool Information (8L45 (M5N)) 2-170* *K71 Transmission Control Module: Scan Tool Information 2-178*	*Automatic Transmission Controls Schematics 12-3*	[Link target (target-id 260335-) not found]	*K71 Transmission Control Module: Programming and Setup (8L45 (M5N)) 2-25*
K73	*K73 Telematic Control Module: Scan Tool Information 2-184*	*OnStar/Telematics Schematics 4-10*	[Link target (target-id 328020-) not found]	*K73 Telematic Control Module: Programming and Setup (UDA) 2-27* *K73 Telematic Control Module: Programming and Setup (UE1) 2-27*
K85P	*K85P Restraints Occupant Classification System Module - Passenger: Scan Tool Information 2-186*	*SIR Schematics 9-42*	[Link target (target-id 188211-) not found]	*K85P Restraints Occupant Classification System Module - Passenger: Programming and Setup 2-29*
K111	*K111 Fuel Pump Power Control Module Scan Tool Information 2-198*	*Engine Controls Schematics 5-11*	[Link target (target-id 305911-) not found]	*K111 Fuel Pump Power Control Module: Programming and Setup 2-36*
K157	Video Processing Module	*Image Display Camera Schematics 4-35*	[Link target (target-id 283882-) not found]	*K157 Video Processing Module: Programming and Setup 2-31*
K160	*K160 Brake System Control Module: Scan Tool Information 2-186*	*Antilock Brake System Schematics 1-3*	[Link target (target-id 324093-) not found]	*K160 Brake System Control Module: Programming and Setup 2-32*
K182	*K182 Parking Assist Control Module: Scan Tool Information 2-193*	*Parking Assistance Systems Schematics 9-24*	[Link target (target-id 283577-) not found]	*K182 Parking Assist Control Module: Programming and Setup (UD5 without 00Z or UD7 without 00Y) 2-34* *K182 Parking Assist Control Module: Programming and Setup (UD5 with 00Z or UD7 with 00Y) 2-35*

Code	Control Module/Scan Tool Information	Schematic	Repair Instruction	Programming and Setup
K219	K219 Lighting Control Module: Scan Tool Information 2-145	Exterior Lights Schematics 0-19	[Link target (target-id 321424-) not found]	K219 Lighting Control Module: Programming and Setup 2-16
T1	DC/AC Converter Control Module	Cigar Lighter/Power Outlet Schematics 7-484	[Link target (target-id 342939-) not found]	T1 Accessory AC and DC Power Control Module: Programming and Setup 2-35
T3	T3 Audio Amplifier: Scan Tool Information 2-197	Radio/Navigation System Schematics 4-3	[Link target (target-id 343162-) not found]	T3 Audio Amplifier: Programming and Setup 2-35
T22	T22 Wireless Accessory Charging Module: Scan Tool Information 2-197	Cigar Lighter/Power Outlet Schematics 7-484	[Link target (target-id 343743-) not found]	T22 Wireless Accessory Charging Module: Programming and Setup 2-36

Repair Instructions

A11 Radio: Programming and Setup

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. Check the 12 volt battery with a digital multimeter and insure the voltage is above 12.5 volts. Install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programing. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- Programming must begin with the Ignition/Vehicle OFF. Programming will direct the appropriate control module(s) to change power mode as needed during the procedure, independent of the vehicle's power mode.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.

Diagnostic Aids

- Check for Preliminary information or Technical Service bulletins before programming.
- During programming you may be required to select multiple calibrations dependent upon vehicle equipment. Have the vehicle build/RPO information available during the following procedure to ensure the correct calibrations are selected.
- If the control module calibration is only being updated, USB programming may not be required, depending on the current software level, or the release of updates. If USB programming may not be required when replacing/reprogramming the control module. If USB files for the application are not available via SPS, or have not been received from General Motors in another manner, the USB process will not need to be performed unless instructed otherwise in a service document or publication.
- Begin with the vehicle in the vehicle OFF power mode. The Service Programming System will power mode the vehicle.
- The vehicle can be moved to an alternate location when performing the USB portion of the programming steps which could allow the possibility of working on another vehicle while the USB programming event is taking place.
- When transferring a large file (>1GB) from the Techline Connect server to the PC then to a USB stick, below are some useful tips:
  - A wired connection to the network is the quickest, most stable way to download the file.
  - Wireless connections can be used, however slower connection speeds may increase the likelihood of errors to occur during file download.
  - Once the file is downloaded to the PC, it will reside in cache unless the cache is cleared. Any

additional USB sticks made from that PC will be copied from cache and take a much shorter time compared to downloading from the server.

- Never take a USB stick directly to a vehicle for updating without starting a Techline Connect session for that particular VIN. If software is already on the stick, Techline Connect will take only seconds to confirm software on the stick is the latest and correct for that vehicle. Failure to perform this step will result in no warranty claim code indicating a USB programming event was completed.

- The display may go black several times during the programming event.

Reference Information

Special Tools

- Use a USB C type flash drive for the vehicle, it is not recommended to use an adapter as this may cause the programming event to fail.
- USB 3.0 & above with NTFS format.
- Minimum size 32GB.
- EL-52100 Multiple Diagnostic Interface 2 (MDI 2)

For equivalent regional tools, refer to *Special Tools 2-42*.

Reprogram Control Module

To program an existing control module, perform the following procedure:

Note: The vehicle must remain in PARK and the driver's door closed during the programming procedure.

1. Before proceeding with Prepare for USB File Transfer in SPS check for any Info Sys OTA updates under Settings>Updates on the vehicles infotainment screen. If an update is available, it is more efficient to install the OTA update if it will install successfully. If the OTA will not install and USB programming is necessary then before attempting USB programming you should first decline the update by selecting Details and then the Decline Update option, followed by confirming the Decline Update. If an Info Sys OTA update is not available, proceed with USB programming.

Note: For instructions on passive power moding, refer to *Power Mode Description and Operation 7-597*

2. Ignition/vehicle OFF
3. On the SPS Supported Controllers screen, select A11 Radio – Prepare for USB File Transfer and follow the on–screen instructions.
4. Connect a USB drive to the computer.
5. Perform a Quick Format on the USB drive to NTFS.

Note: If USB File Transfer is blocked, the software is the latest version. Programming is complete. Proceed to step 16

6. On the SPS Supported Controllers screen, select A11 Radio – USB File Transfer and follow the on–screen instructions.
7. Upon completion of the file transfer, properly eject the USB drive from the computer.
8. Ignition ON, infotainment system ON

Note: This step is not required and only needed when the radio screen is blank and monitoring USB update status is desired.

9. On the SPS Supported Controllers screen, select A11 Radio – USB File Download Status. This shows the status of the USB update on the SPS screen as the radio screen may go black during the update process.
10. Connect the USB drive to the USB port in the vehicle.
11. The infotainment system will recognize that update files are available. Follow the infotainment display on-screen instructions and select Update when prompted. If no instructions immediately appear on the infotainment display, select the following menu options:
    - Home
    - Settings
    - System
    - Updates

Note:

- If you receive an Update Failed screen, remove the USB, turn the vehicle OFF, and return to step 8. The update should continue where it stopped.
- The radio may display "Recovery Mode. Please Calibrate Device."

12. Upon completion of programming, remove the USB drive.

Note: Programming Part 1 will reboot the radio and automatically turn the vehicle OFF.

13. On the SPS Supported Controllers screen, select A11 Radio – Programming Part 1 and then follow the on-screen instructions.

Note: Programming Part 2 will automatically turn the vehicle OFF.

14. On the SPS Supported Controllers screen, select A11 Radio – Programming Part 2 and then follow the on-screen instructions.
15. Return to step 2 to continue updating the radio until step 6 on-screen instruction blocks USB File Transfer
16. Clear DTCs.

17. Ignition OFF, Retained Accessory Power (RAP) OFF, remove the key fob from range of the vehicle, and let the vehicle sit for five minutes. Retest system operation to verify the repair.

Replace and Program Control Module

To program a replacement control module, perform the following procedure:

Note: The vehicle must remain in PARK and the driver's door closed during the programming procedure.

Note: For instructions on passive power moding, refer to *Power Mode Description and Operation 7-597*

1. Ignition/vehicle OFF
2. On the SPS Supported Controllers screen, select A11 Radio – Prepare for USB File Transfer and follow the on–screen instructions.
3. Perform the Serial Data Authentication Configuration.
4. Connect a USB drive to the computer.
5. Perform a Quick Format on the USB drive to NTFS.

Note: If USB File Transfer is blocked, the software is the latest version. Programming is complete. Proceed to step 15

6. On the SPS Supported Controllers screen, select A11 Radio – USB File Transfer and follow the on–screen instructions.
7. Upon completion of the file transfer, properly eject the USB drive from the computer.
8. Ignition ON, infotainment system ON

Note: This step is not required and only needed when the radio screen is blank and monitoring USB update status is desired.

9. On the SPS Supported Controllers screen, select A11 Radio – USB File Download Status. This shows the status of the USB update on the SPS screen as the radio screen may go black during the update process.
10. Connect the USB drive to the USB port in the vehicle.
11. The infotainment system will recognize that update files are available. Follow the infotainment display on-screen instructions and select Update when prompted. If no instructions immediately appear on the infotainment display, select the following menu options:
    - Home
    - Settings
    - System
    - Updates

Note:
- If you receive an Update Failed screen, remove the USB, turn the vehicle OFF, and return to step 8. The update should continue where it stopped.
- The radio may display "Recovery Mode. Please Calibrate Device."

12. Upon completion of programming, remove the USB drive.

Note: Programming Part 1 will reboot the radio and automatically turn the vehicle OFF.

13. On the SPS Supported Controllers screen, select A11 Radio – Programming Part 1 and then follow the on-screen instructions.

Note: Programming Part 2 will automatically turn the vehicle OFF.

14. On the SPS Supported Controllers screen, select A11 Radio – Programming Part 2 and then follow the on-screen instructions.
15. Return to step 1 to continue updating the radio until step 5 on-screen instruction blocks USB File Transfer

Note: If Setup fails, check for DTC U1962. If this DTC is set, perform the Serial Data Authentication Configuration. Then clear the DTC and repeat step 12.

16. On the SPS Supported Controllers screen, select A11 Radio – Setup and then follow the on-screen instructions.
17. Clear DTCs.
18. Ignition OFF, Retained Accessory Power (RAP) OFF, remove the key fob from range of the vehicle, and let the vehicle sit for five minutes. Retest system operation to verify the repair.

XM Activation (If Equipped)

Important: On the radio being replaced, record the XM ID from the radio parts label or before removal tune to XM channel 0. This will be used during the call to XM radio to deactivate the receiver that has been removed from the vehicle.

1. Turn the replacement radio ON, tune to the XM channel 0, and record the radio ID. The radio ID will be needed for activation of the receiver.
2. Contact SiriusXM Dealer Support at (800) 852–9696 to activate the new receiver.
3. Park the vehicle outside in an area with an unobstructed view of the southern sky.
4. Leave the vehicle outside with the ignition switch in the ACC position and the radio on for 30 minutes to activate XM service.
5. Once activated, the radio will receive the remaining XM channels.

Unsuccessful Programming Recovery

Note:

- Ensure the *EL-52100* (MDI 2) is used when programming the vehicle. Using the EL-47955 (MDI) will result in a programming failure.
- It may be necessary to use another *EL-52100* (MDI 2) and/or cables to verify proper operation to eliminate the possibility of faulty equipment.
- If Ethernet programming fails, ensure there is no fault in the Ethernet circuits between the X84 Data Link Connector and K56 Serial Data Gateway Module. Refer to [Link target (target-id 300812-) not found] to diagnose these Ethernet circuits.

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. Exit Service Programming System (SPS) and disconnect all programming equipment from the vehicle.
2. Disconnect all battery voltage or ignition voltage sources from the control module.

Note: All voltage sources must be removed for a minimum of 10 min. This can be done several ways and should be completed by using the least intrusive way. This can vary depending on vehicle and control module location and can be done by one of the options listed below:

- Removing all fuses supplying battery voltage and ignition voltage to the control module.
- Disconnecting all harness connectors from the control module.
- Performing a 12 V battery disconnect by disconnecting the battery negative cable. Refer to [Link target (target-id 37733-) not found] .

3. Reconnect all battery voltage and ignition voltage sources to the control module.
4. Close down the current session of Techline Connect and reopen a new session.
5. Verify the control module, data link connector, and programming tool connections are secure and the tool software is up to date.
6. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
7. Access the Service Programming System (SPS) and follow the on-screen instructions for the control module.
8. Verify the control module can be programmed.

⇒ **If the control module can not be programmed**

8.1. Ignition ON/Vehicle in Service Mode for 1 min.

8.2. Ignition/Vehicle OFF.

8.3. Access SPS and follow the on-screen instructions for Replace and Program Control Module above.

Note: If programming is still not successful after the second programming attempt, check the following:

- For facilities using an internet firewall, ensure firewall settings are not blocking file downloads and/or require elevated rights.
- For United States and Canada GM dealers, the appropriate firewall settings can be found in the GM DEALER INFRASTRUCTURE & SECURITY GUIDELINES (DISG) section 2.d.vii.

8.4. Verify the control module can be programmed.

⇒ If the control module can not be programmed, replace the control module.

⇓ If the control module can be programmed

8.5. Clear DTCs.

⇓ **If the control module can be programmed**

9. Clear DTCs.

Repair Instructions

Perform the *Diagnostic Repair Verification 2-260* after completing the repair.

Control Module References 2-3 for control module replacement, programming, and setup.

A26 Heater and Air Conditioning User Interface Control - Front: Programming and Setup

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: *Diagnostic System Check - Vehicle 2-207*
- Review the description of Strategy Based Diagnosis: *Strategy Based Diagnosis 2-198*

Note:

- Do NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Verify the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery

maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programming. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.

- Turn Off or disable systems that may put a load on the vehicle's battery. For example, interior lights, daytime running lights, HVAC, and radio.
- During the programming procedure, follow the Service Programming System (SPS) prompts for the correct ignition switch position.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to No.

Programming an Existing or New Control Module

This control module does not require SPS programming or any setup procedures.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: *Diagnostic Repair Verification 2-260*

For control module replacement, programming, and setup refer to: *Control Module References 2-3*

B174W Front View Camera - Windshield: Programming and Setup

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required install the *EL-49642* SPS Programming Support Tool to maintain system voltage. If not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply. DO NOT connect a battery charger.
- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- During the programming procedure, follow the SPS prompts for the correct ignition switch position.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.
- Anytime the B174W Frontview Camera - Windshield is removed from its mount, it must follow the Frontview Camera Module Learn procedure.

Following Replacement of Windshield

The B174W Frontview Camera - Windshield must be calibrated, refer to [Link target (target-id 297673-) not found] .

Replace and Program Frontview Camera Module or Reprogram Frontview Camera Module (without UGN)

Note: Due to continuous improvements, the on screen selections may vary from instructions below.

To program a replacement or an existing B174W Frontview Camera - Windshield , perform the following procedure:

1. Ignition/Vehicle OFF
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. On the SPS Supported Controllers screen, select B174W Frontview Camera - Windshield – Programming and follow the on-screen instructions.
4. On the SPS Supported Controllers screen, select B174W Frontview Camera - Windshield – Setup **(if this option is available)** and follow the on-screen instructions.
5. Clear DTCs.
6. Following B174W Frontview Camera - Windshield replacement and reprogramming, the module must be calibrated. Refer to [Link target (target-id 297673-) not found] .

Replace and Program Frontview Camera Module or Reprogram Frontview Camera Module (with UGN)

To program a replacement or an existing B174W Frontview Camera - Windshield , perform the following procedure:

1. Access the Service Programming System (SPS) and follow the on-screen instructions.
2. On the SPS Supported Controllers screen, select B174W Frontview Camera - Windshield –

Programming and follow the on-screen instructions.

3. On the SPS Supported Controllers screen, select B174W Frontview Camera - Windshield – Setup **(if this option is available)** and follow the on-screen instructions.

Note: After programming is performed, it is normal to have DTC B101E 4B set until calibration is complete.

If reprogramming an existing module that was previously calibrated, calibration is not required. The module retains its calibration settings during reprogramming. If a new module was programmed the module alignment must be calibrated. Using a scantool, initiate the learn procedure for B174W Frontview Camera - Windshield . The scan tool must remain connected and on the calibration screen during the entire process.

Refer to [Link target (target-id 297673-) not found] .

Unsuccessful Programming Recovery

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. DO NOT turn the ignition OFF. Ensure that all B174W Frontview Camera - Windshield , DLC and programming tool connections are secure and the TIS terminal operating software is up to date.
2. Attempt to reprogram the B174W Frontview Camera - Windshield .
3. If the B174W Frontview Camera - Windshield can still not be programmed, turn the ignition OFF for at least one minute.
4. Turn the ignition ON and attempt to reprogram the B174W Frontview Camera - Windshield . The B174W Frontview Camera - Windshield should program.
   ⇒ If the B174W Frontview Camera - Windshield still cannot be programmed, replace the B174W Frontview Camera - Windshield .

B218L Side Obstacle Detection Control Module - Left: Programming and Setup

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the ECU is not properly configured with the correct calibration software, the ECU will not control all of the vehicle features properly.
- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or ECU damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. Install the *EL-49642* SPS Programming Support Tool to maintain system voltage. If not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- During the programming procedure, follow the SPS prompts for the correct ignition switch position.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.

Reference Information

Special Tools
EL-49642 SPS Programming Support Tool

For equivalent regional tools, refer to *Special Tools 2-42*.

Replace and Program ECU or Reprogram ECU

To program a replacement or an existing ECU, perform the following procedure:

Note:

- Due to continuous improvements, the on screen selections may vary from instructions below.
- Some systems only have one programmable Side Object Sensor Module.

1. Ignition/Vehicle OFF
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. On the SPS Supported Controllers screen, select B218 Side Object Sensor Module then select B218R Right Side Object Sensor Module or B218L Left Side Object Detection.
4. On the SPS Select Function / Sequence screen, select Sequential Programming or Programming
5. Clear DTCs.

Unsuccessful Programming Recovery

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. DO NOT turn the ignition OFF. Ensure that all ECU, DLC and programming tool connections are secure and the TIS terminal operating software is up to date.
2. Attempt to reprogram the ECU.
3. If the ECU can still not be programmed, turn the ignition OFF for at least one minute.
4. Turn the ignition ON and attempt to reprogram the ECU. The ECU should program.
   ⇒ If the ECU still cannot be programmed, replace the ECU.

Repair Instructions

Perform the *Diagnostic Repair Verification 2-260* after completing the repair.

Control Module References 2-3 for Control Module replacement, programming and setup

B218R Side Obstacle Detection Control Module - Right: Programming and Setup

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the ECU is not properly configured with the correct calibration software, the ECU will not control all of the vehicle features properly.
- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or ECU damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. Install the *EL-49642* SPS Programming Support Tool to maintain system voltage. If not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- During the programming procedure, follow the SPS prompts for the correct ignition switch position.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.

Reference Information

Special Tools
EL-49642 SPS Programming Support Tool

For equivalent regional tools, refer to *Special Tools 2-42*.

Replace and Program ECU or Reprogram ECU

To program a replacement or an existing ECU, perform the following procedure:

Note:

- Due to continuous improvements, the on screen selections may vary from instructions below.
- Some systems only have one programmable Side Object Sensor Module.

1. Ignition/Vehicle OFF
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. On the SPS Supported Controllers screen, select B218 Side Object Sensor Module then select B218R Right Side Object Sensor Module or B218L Left Side Object Detection.
4. On the SPS Select Function / Sequence screen, select Sequential Programming or Programming
5. Clear DTCs.

Unsuccessful Programming Recovery

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. DO NOT turn the ignition OFF. Ensure that all ECU, DLC and programming tool connections are secure and the TIS terminal operating software is up to date.
2. Attempt to reprogram the ECU.
3. If the ECU can still not be programmed, turn the ignition OFF for at least one minute.
4. Turn the ignition ON and attempt to reprogram the ECU. The ECU should program.
   ⇒ If the ECU still cannot be programmed, replace the ECU.

Repair Instructions

Perform the *Diagnostic Repair Verification 2-260* after completing the repair.

Control Module References 2-3 for Control Module replacement, programming and setup

K9 Body Control Module: Programming and Setup

Note:

- Do NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Verify the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programming. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicle's battery such as interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- Programming must begin with the Ignition/Vehicle OFF. Programming will direct the appropriate control module(s) to change power mode as needed during the procedure, independent of the vehicle's power mode.
- To prevent programming failure due to unintended wireless drops, it is recommended that a wired MDI 2 connection be used when programming the control module.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to No.

Reference Information

Special Tools

- *EL-52545*
  Tire Pressure Monitor Sensor and RF Diagnostic Tool
  or *EL-50448*
  Tire Pressure Monitor Sensor Activation Tool
- *EL-52100* Multiple Diagnostic Interface 2 (MDI 2)

For equivalent regional tools, refer to *Special Tools 2-42*.

Programming a New Control Module

To program a replacement K9 Body Control Module (BCM), perform the following procedure:

Note:

- Ensure the *EL-52100* (MDI 2) is used when programming the vehicle and verify it is working properly. Using the EL-47955 (MDI) will result in a programming failure.
- Verify all control modules are connected and communicating before attempting to program the control module.
- Verify the key fob is inside the vehicle. If the key fob is not inside the vehicle, the serial data authentication configuration procedure which runs automatically at the end of the programming step will fail even though the programming appears to run successfully. If the serial data authentication configuration procedure fails, DTC U1962 will set and/or the setup step will fail or be incomplete.
- Begin with the vehicle in vehicle OFF power mode. The Service Programming System will power mode the vehicle.

1. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
2. Access the Service Programming System (SPS) and follow the on-screen instructions.

Note: If unable to power mode vehicle for Brake Pedal Position Learn procedure during programming process, the driver door must be opened/closed continuously until the vehicle enters power mode.

3. On the SPS Supported Controllers screen, select K9 Body Control Module - Programming and follow the on-screen instructions.
4. Place the keyless entry transmitter in the programming pocket prior to proceeding with the next step. All additional transmitters must be at least 3 m (9.8 ft) away from the vehicle. Refer to the Remote Keyless Entry (RKE) System Operation document in the owner manual for the exact pocket location. This document is located in the Keys, Doors, and Windows > Keys and Locks category.

Note:

- To prevent errors or immobilizer learn failure, the vehicle must be in Park (for automatic transmission) or Neutral with park brake applied (for manual transmission).
- If DTC B1987 set immediately after programming a replacement K9 Body Control Module, the Immobilizer Learn procedure was not properly completed. The Immobilizer Learn procedure needs to be performed again.

- The Immobilizer Learn process may take between 10-12 min and progress will appear to have stopped during this process. This is a normal security timer response and a restart should not be performed.

5. On the SPS Supported Controllers screen, select Z1 Immobilizer Learn. On the next screen, select Body Control Module IMMO Learn with Existing Transponder or Remote Key and follow the on-screen instructions. When Immobilizer Learn is complete, press the Unlock button on the keyless entry transmitter to allow the keyless entry transmitter to exit the Immobilizer Learn mode.

Note: When performing the Tire Pressure Monitor Sensor Learn during K9 Body Control Module setup, the *EL-52545*
Tire Pressure Monitor Sensor and RF Diagnostic Tool must be used to activate each tire pressure sensor.

6. On the SPS Supported Controllers screen, select K9 Body Control Module - Setup and follow the on-screen instructions.
7. Check the driver information center display for additional messages regarding further calibration instructions. If there are no additional driver information center instructions present, programming is complete.
8. Clear DTCs.

Programming an Existing Control Module

To program an existing K9 Body Control Module, perform the following procedure:

Note:
- Ensure the *EL-52100* (MDI 2) is used when programming the vehicle and verify it is working properly. Using the EL-47955 (MDI) will result in a programming failure.
- Verify all control modules are connected and communicating before attempting to program the control module.
- Verify the key fob is inside the vehicle. If the key fob is not inside the vehicle, the serial data authentication configuration procedure which runs automatically at the end of the programming step will fail even though the programming appears to run successfully. If the serial data authentication configuration procedure fails, DTC U1962 will set and/or the setup step will fail or be incomplete.
- Begin with the vehicle in vehicle OFF power mode. The Service Programming System will power mode the vehicle.

1. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. On the SPS Supported Controllers screen, select K9 Body Control Module - Programming and follow the on-screen instructions.
4. Check the driver information center display for additional messages regarding further calibration instructions. If there are no additional driver information center instructions present, programming is complete.
5. Clear DTCs.

Unsuccessful Programming Recovery

Note:
- Ensure the *EL-52100* (MDI 2) is used when programming the vehicle. Using the EL-47955 (MDI) will result in a programming failure.
- It may be necessary to use another *EL-52100* (MDI 2) and/or cables to verify proper operation to eliminate the possibility of faulty equipment.
- If Ethernet programming fails, ensure there is no fault in the Ethernet circuits between the X84 Data Link Connector and K56 Serial Data Gateway Module. Refer to [Link target (target-id 300812-) not found] to diagnose these Ethernet circuits.

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. Exit Service Programming System (SPS) and disconnect all programming equipment from the vehicle.
2. Disconnect all battery voltage or ignition voltage sources from the K9 Body Control Module.
   All voltage sources must be removed for a minimum of 10 min. This can be done several ways and should be completed by using the least intrusive way. This can vary depending on vehicle and control module location and can be done by one of the options listed below:
   - Removing all fuses supplying battery voltage and ignition voltage to the control module.
   - Disconnecting all harness connectors from the control module.
   - Performing a 12 V battery disconnect by disconnecting the battery negative cable. Refer to [Link target (target-id 37733-) not found] .
3. Reconnect all battery voltage and ignition voltage sources to the K9 Body Control Module.
4. Close down the current session of Techline Connect and reopen a new session.
5. Verify the K9 Body Control Module, X84 Data Link Connector, and programming tool connections are secure and the tool software is up to date.

6. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
7. Access the Service Programming System (SPS) and follow the on-screen instructions for the K9 Body Control Module.
8. Verify the K9 Body Control Module can be programmed.

⇒ **If the K9 Body Control Module can not be programmed**

8.1. Ignition ON/Vehicle in Service Mode for 1 min.

8.2. Ignition/Vehicle OFF.

8.3. Access SPS and follow the on-screen instructions for the K9 Body Control Module.

Note: If programming is still not successful after the second programming attempt, check the following:

- For facilities using an internet firewall, ensure firewall settings are not blocking file downloads and/or require elevated rights.
- For United States and Canada GM dealers, the appropriate firewall settings can be found in the GM DEALER INFRASTRUCTURE & SECURITY GUIDELINES (DISG) section 2.d.vii.

8.4. Verify the K9 Body Control Module can be programmed.

⇒ If the K9 Body Control Module can not be programmed, replace the K9 Body Control Module.

⇓ If the K9 Body Control Module can be programmed

8.5. Clear DTCs.

⇓ **If the K9 Body Control Module can be programmed**

9. Clear DTCs.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: *Diagnostic Repair Verification 2-260*.

For control module replacement, programming, and setup, refer to: *Control Module References 2-3*.

K20 Engine Control Module: Programming and Setup

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector (DLC). If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programing. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- During the programming procedure, follow the SPS prompts for the correct ignition switch position.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to Incomplete.
- Note the engine oil life remaining percentage.
- If over 14k GVW, program the engine serial number with the scan tool.
- If unable to complete programming or have questions contact Techlline 1–800–828–6860

Replace and Program Control Module

Note:

- The Prepare Control Module for Removal function can only be performed when communication with the old control module is still possible.
- Instances may occur where data is not transferred during the Prepare Control Module for Removal Function

1. Ignition » On / Vehicle » In Service Mode
2. Perform the scan tool function: Create Report
   - Air Cleaner Life Remaining— If equipped
   - Engine Oil Life Remaining
   - Fuel Filter Life Remaining— If equipped
   - Fuel injector flow identifiers— If equipped
3. Access the Service Programming System and follow the on-screen instructions for the control module: K20 Engine Control Module
4. Select— Prepare Control Module for Removal— If applicable
5. Ignition/Vehicle & All vehicle systems » Off

6. Replace the component: K20 Engine Control Module
7. Ignition » On / Vehicle » In Service Mode

Note: If both controller options below are listed, select K20 Engine and K71 Transmission Control Modules.

8. Perform the SPS function:
   - K20 Engine Control Module— Follow the on-screen instructions.
   - K71 Transmission Control Module— Follow the on-screen instructions.
9. Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to No.
10. Perform the SPS function: Immobilizer Learn— If equipped .

    Refer to: [Link target (target-id 158692-) not found]

Note: If both controller options below are listed, select K20 Engine Control Module.

11. Perform the SPS function: K20 Engine Control ModuleSetup— Configuration

    Perform any adjustment, programming or setup procedures that are required when a component or module is removed or replaced. Follow the on-screen instructions.
12. Perform the scan tool learn/reset function:
    - Air Cleaner Monitor Setup— If equipped
    - Barometric Pressure Sensor Reset— If equipped
    - Engine Oil Life Remaining
    - Fuel Filter Life Remaining— If equipped
    - Fuel Pressure Regulator Learn— If equipped
    - Fuel Rail Pressure Relief Valve Learned Values Reset— If equipped
    - Fuel injector flow identifiers— If equipped
    - Intake System Learned Values Reset— If equipped
    - Throttle Body Idle Air Flow Compensation Reset
    - Turbocharger Wastegate Learn— If equipped
    - Turbocharger/Supercharger Boost Control Initial Position Learn— If equipped
13. Perform the scan tool function: Clear DTCs
14. Ignition/Vehicle & All vehicle systems » Off
15. Operate the vehicle within the conditions of the customer's concern.

Reprogram Control Module

To reprogram an existing K20 Engine Control Module, perform the following procedure:

1. Access the Service Programming System and follow the on-screen instructions for the control module: K20 Engine Control Module
2. Ignition » On / Vehicle » In Service Mode

Note: If both controller options below are listed, select K20 Engine and K71 Transmission Control Modules.

3. Perform the SPS function:
   - K20 Engine Control Module— Follow the on-screen instructions.
   - K71 Transmission Control Module— Follow the on-screen instructions.
4. Perform the scan tool function: Clear DTCs
5. Perform the scan tool learn/reset function:
   - Barometric Pressure Sensor Reset— If equipped
   - Fuel Pressure Regulator Learn— If equipped
   - Fuel Rail Pressure Relief Valve Learned Values Reset— If equipped
   - Intake System Learned Values Reset— If equipped
   - Throttle Body Idle Air Flow Compensation Reset
   - Turbocharger Wastegate Learn— If equipped
   - Turbocharger/Supercharger Boost Control Initial Position Learn— If equipped
6. Ignition/Vehicle & All vehicle systems » Off
7. Operate the vehicle within the conditions of the customer's concern.

Unsuccessful Programming Recovery

If programming a control module is not successful, perform the following procedure:

1. Verify the control module, data link connector and programming tool connections are secure and the tool software is up to date.
2. Ignition » On / Vehicle » In Service Mode
3. Access the Service Programming System and follow the on-screen instructions for the control module: K20 Engine Control Module

Note: If both controller options below are listed, select K20 Engine and K71 Transmission Control Modules.

4. Perform the SPS function:
   - K20 Engine Control Module— Follow the on-screen instructions.
   - K71 Transmission Control Module— Follow the on-screen instructions.
5. Perform the scan tool function: Clear DTCs

6. Ignition/Vehicle » Off — For greater than 1 min
7. Ignition » On / Vehicle » In Service Mode
8. Verify the control module programming is successful.

⇒ **If the programming is not successful**

8.1. Ignition/Vehicle » Off — For greater than 1 min

8.2. Ignition » On / Vehicle » In Service Mode

Note: If both controller options below are listed, select K20 Engine and K71 Transmission Control Modules.

8.3. Perform the SPS function:

- K20 Engine Control Module— Follow the on-screen instructions.
- K71 Transmission Control Module— Follow the on-screen instructions.

⇒ If the programming is not successful Replace the appropriate component: K20 Engine Control Module orK71 Transmission Control Module

⇓ If the programming is successful

8.4. All OK.

⇓ **If the programming is successful**

9. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification 2-260* after completing the repair.

Control Module References 2-3 for control module replacement, programming and setup.

K219 Lighting Control Module: Programming and Setup

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required install the *EL-49642* SPS Programming Support Tool to maintain system voltage. If not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply. DO NOT connect a battery charger.
- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- During the programming procedure, follow the SPS prompts for the correct ignition switch position.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.

Replace and Program Control Module

To program a replacement control module, perform the following procedure:

1. Access the Service Programming System (SPS) and follow the on-screen instructions.
2. On the SPS Supported Controllers screen, under Select Controller, select K219 Lighting Control Module.
3. On the SPS Supported Controllers screen, under Select Function / Sequence, select Programming and follow on screen instructions.
4. On the SPS Supported Controllers screen, under Select Function / Sequence, select Setup and follow the on-screen instructions.
5. Clear All DTCs.

Reprogram Control Module

Do not reprogram the lighting control module, unless directed by a service procedure, or a service bulletin.

To reprogram an existing control module, perform the following procedure:

1. Access the Service Programming System (SPS) and follow the on-screen instructions.
2. On the SPS Supported Controllers screen, under Select Controller, select K219 Lighting Control Module.
3. On the SPS Supported Controllers screen, under Select Function / Sequence, select Programming and follow on screen instructions.
4. Clear All DTCs.

Unsuccessful Programming Recovery

Note:

- Ensure the *EL-52100* (MDI 2) is used when programming the vehicle. Using the EL-47955 (MDI) will result in a programming failure.
- It may be necessary to use another *EL-52100* (MDI 2) and/or cables to verify proper operation to eliminate the possibility of faulty equipment.
- If Ethernet programming fails, ensure there is no fault in the Ethernet circuits between the X84 Data

Link Connector and K56 Serial Data Gateway Module. Refer to [Link target (target-id 300812-) not found] to diagnose these Ethernet circuits.

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. Exit Service Programming Systems and disconnect all programming equipment from the vehicle.
2. Disconnect all battery voltage or ignition voltage sources from the control module. All voltage sources must be removed for a minimum of 10 min. This can be done several ways and should be completed by using the least intrusive way. This can vary depending on vehicle and control module location and can be done by one of the options listed below:
   - Removing all fuses supplying battery voltage and ignition voltage to the control module.
   - Disconnecting all harness connectors from the control module.

Warning: Always ensure the Battery Maintenance Mode is inactive before disconnecting the low voltage 12 volt battery (or batteries). This mode can be active with the ignition off, regardless of whether the vehicle charging cord is plugged in or not. When this mode is active, the on-board high voltage battery charger(s) will energize the 12 volt battery cables and charge the 12 volt battery (or batteries). Disconnecting any battery cables while this mode is active may result in an electrical shock or a burn from hot battery cable leads.

   - Check the 12 V battery voltage with a digital multimeter before disconnecting any battery cables leads. If the voltage is 13.5 V or above, the Battery Maintenance Mode is active. The technician must wait for the T18 Battery Charger to deactivate before disconnecting the battery negative cable. For more information, refer to *Charging System Description and Operation 5-74* . With Battery Maintenance Mode inactive, perform a 12 V battery disconnect by disconnecting the battery negative cable. Refer to [Link target (target-id 37733-) not found] .
3. Reconnect all Battery voltage and Ignition voltage sources to the Control Module.
4. Close down the current session of Techline Connect and reopen a new session.
5. Verify the control module, data link connector, and programming tool connections are secure and the tool software is up to date.
6. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
7. Access the Service Programming System (SPS) and follow the on-screen instructions for the K219 Lighting Control Module.
8. Verify the control module can be programmed.

⇒ **If the control module can not be programmed**

   8.1. Ignition ON/Vehicle in Service Mode for 1 min.

   8.2. Ignition/Vehicle OFF.

   8.3. Access SPS and follow the on-screen instructions for the K219 Lighting Control Module.

Note: If programming is still not successful after the second programming attempt, check the following:

- For facilities using an internet firewall, ensure firewall settings are not blocking file downloads and/or require elevated rights.
- For United States and Canada GM dealers, the appropriate firewall settings can be found in the GM DEALER INFRASTRUCTURE & SECURITY GUIDELINES (DISG) section 2.d.vii.

   8.4. Verify the control module can be programmed.

⇒ If the control module can not be programmed, replace the K219 Lighting Control Module.

⇓ If the control module can be programmed

   8.5. Clear DTCs.

⇓ **If the control module can be programmed**

9. Clear DTCs.

Repair Instructions

Perform the *Diagnostic Repair Verification 2-260* after completing the repair.

Control Module References 2-3 for control module replacement, programming and setup

K29FV Front Seat Heater Vent Control Module: Programming and Setup

This device does not require programming or setup.

K36 Restraints Control Module: Programming and Setup

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle 2-207* prior to using this diagnostic procedure.
- Review the description of *Strategy Based Diagnosis 2-198*

Note:

- Do NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with

the correct calibration software, the control module will not control all of the vehicle features properly.

- Verify the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programming. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicle's battery such as interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- Programming must begin with the Ignition/Vehicle OFF. Programming will direct the appropriate control module(s) to change power mode as needed during the procedure, independent of the vehicle's power mode.
- To prevent programming failure due to unintended wireless drops, it is recommended that a wired MDI 2 connection be used when programming the control module.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to No.

Reference Information

Special Tools
EL-52100 Multiple Diagnostic Interface 2 (MDI 2)

Programming an Existing or New Control Module

To program an existing or new control module, perform the following procedure:

Note:
- Ensure the *EL-52100* (MDI 2) is used when programming the vehicle and verify it is working properly. Using the EL-47955 (MDI) will result in a programming failure.
- Verify all control modules are connected and communicating before attempting to program the K36 Restraints Control Module.
- Verify the key fob is inside the vehicle. If the key fob is not inside the vehicle, the serial data authentication configuration procedure which runs automatically at the end of the programming step will fail even though the programming appears to run successfully. If the serial data authentication configuration procedure fails, DTC U1962 will set and/or the setup step will fail or be incomplete.

1. Place the vehicle on level ground (the vehicle must be level or the IMU setup may fail)
2. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
3. Access the Service Programming System (SPS) and follow the on-screen instructions for the K36 Restraints Control Module.
4. Perform the SPS function: **Programming** and follow the on-screen instructions.
5. Perform the SPS function: **Setup** and follow the on-screen instructions.
6. Clear DTCs.

Unsuccessful Programming Recovery

Note:
- Ensure the *EL-52100* (MDI 2) is used when programming the vehicle. Using the EL-47955 (MDI) will result in a programming failure.
- It may be necessary to use another *EL-52100* (MDI 2) and/or cables to verify proper operation to eliminate the possibility of faulty equipment.
- If Ethernet programming fails, ensure there is no fault in the Ethernet circuits between the X84 Data Link Connector and K56 Serial Data Gateway Module. Refer to [Link target (target-id 300812-) not found] to diagnose these Ethernet circuits.

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. Exit Service Programming System (SPS) and disconnect all programming equipment from the vehicle.
2. Disconnect all battery voltage or ignition voltage sources from the control module.

Note: All voltage sources must be removed for a minimum of 10 min. This can be done several ways and should be completed by using the least intrusive way. This can vary depending on vehicle and control module location and can be done by one of the options listed below:
- Removing all fuses supplying battery voltage and ignition voltage to the control module.

- Disconnecting all harness connectors from the control module.
- Performing a 12 V battery disconnect by disconnecting the battery negative cable. Refer to [Link target (target-id 37733-) not found] .

3. Reconnect all battery voltage and ignition voltage sources to the control module.
4. Close down the current session of Techline Connect and reopen a new session.
5. Verify the control module, data link connector, and programming tool connections are secure and the tool software is up to date.
6. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
7. Access the Service Programming System (SPS) and follow the on-screen instructions for the control module.
8. Verify the control module can be programmed.

⇒ **If the control module can not be programmed**

8.1. Ignition ON/Vehicle in Service Mode for 1 min.

8.2. Ignition/Vehicle OFF.

8.3. Access SPS and follow the on-screen instructions for the control module.

Note: If programming is still not successful after the second programming attempt, check the following:

- For facilities using an internet firewall, ensure firewall settings are not blocking file downloads and/or require elevated rights.
- For United States and Canada GM dealers, the appropriate firewall settings can be found in the GM DEALER INFRASTRUCTURE & SECURITY GUIDELINES (DISG) section 2.d.vii.

8.4. Verify the control module can be programmed.

⇒ If the control module can not be programmed, replace the control module.

⇓ If the control module can be programmed

8.5. Clear DTCs.

⇓ **If the control module can be programmed**

9. Clear DTCs.

Repair Instructions

Perform the *Diagnostic Repair Verification 2-260* after completing the repair.

Control Module References 2-3 for control module replacement, programming, and setup.

K38 Chassis Control Module: Programming and Setup

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programming. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected form the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- During the programming procedure, follow the SPS prompts for the correct ignition switch position.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.

Replace and Program Control Module or Reprogram Control Module

To program a replacement or an existing control module, perform the following procedure:

1. Access the Service Programming System (SPS) and follow the on-screen instructions.
2. On the SPS Supported Controllers screen, select K38 Chassis Control Module - Programming and follow the on-screen instructions.
3. Clear DTCs.
4. With a scan tool, perform the Suspension Sensor Trim Height Calibration, if applicable.

Unsuccessful Programming Recovery

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. Ignition ON. Ensure the control module, DLC and programming tool connections are secure and the SPS software is up to date.

2. Verify the control module can be reprogrammed.

⇒ **If the control module cannot be reprogrammed**

2.1. Ignition OFF for one minute, ignition ON.

2.2. Verify the control module can be reprogrammed.

⇒ If the control module cannot be reprogrammed, replace the control module.

⇓ If the control module can be reprogrammed.

2.3. All OK.

⇓ **If the control module can be reprogrammed**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification 2-260* after completing the repair.

Control Module References 2-3 for Control Module replacement, programming and setup.

K40D Driver Seat Adjuster Memory Module: Programming and Setup

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programing. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- During the programming procedure, follow the SPS prompts for the correct ignition switch position.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.

Replace and Program Control Module or Reprogram Control Module

To program a replacement or an existing control module, perform the following procedure:

1. Access the Service Programming System (SPS) and follow the on-screen instructions.
2. On the SPS Supported Controllers screen, select K40D Driver Seat Adjuster Memory Module - Programming and follow the on-screen instructions.
3. Clear DTCs.
4. Move the seat to a central, middle range position, then perform the memory store operation for memory “1”, “2”, and “Exit” or “3” if equipped. Refer to the Owner Manual for storing memory seat positions.

Unsuccessful Programming Recovery

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. Ensure the control module, DLC and programming tool connections are secure and the SPS software is up to date.
2. Verify the control module can be reprogrammed.

⇒ **If the control module cannot be reprogrammed**

2.1. Disconnect the battery.

2.2. Wait 1 minute, reconnect the battery.

2.3. Verify the control module can be reprogrammed.

⇒ If the control module cannot be reprogrammed, replace the control module.

⇓ If the control module can be reprogrammed.

2.4. All OK.

⇓ **If the control module can be reprogrammed**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification 2-260* after completing the repair.

Control Module References 2-3 for Control Module replacement, programming and setup

K43 Power Steering Control Module: Programming and Setup

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.

- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programing. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- During the programming procedure, follow the SPS prompts for the correct ignition switch position.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.

Diagnostic Aids

The Electric Power Steering Control Module is part of the power steering assist motor assembly and is electronically paired with the steering gear's sensors.

Replace and Program or Reprogramming Control Module

To program a replacement control module, perform the following procedure:

1. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. On the SPS Supported Controllers screen, select K43 Power Steering Control Module - Programming and follow the on-screen instructions.
4. On the SPS Supported Controllers screen, select K43 Power Steering Control Module - Setup and follow the on-screen instructions.
5. If the Setup fails, check for DTC U1962. If this DTC is set, perform the Serial Data Authentication Configuration procedure. Then repeat the Setup step.
6. Clear DTCs.

Unsuccessful Programming Recovery

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. Ignition/Vehicle ON. Ensure the control module, DLC and programming tool connections are secure and the SPS software is up to date.
2. Verify the control module can be reprogrammed.

⇒ **If the control module cannot be reprogrammed**

2.1. Ignition/Vehicle OFF for one minute, Ignition/ Vehicle ON.

2.2. Verify the control module can be reprogrammed.

⇒ If the control module cannot be reprogrammed, replace the control module.

⇓ If the control module can be reprogrammed.

2.3. All OK.

⇓ **If the control module can be reprogrammed**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification 2-260* after completing the repair.

Control Module References 2-3 for control module replacement, programming and setup

K56 Serial Data Gateway Module: Programming and Setup

Note:

- Do NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Verify the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programming. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.

- Turn OFF or disable systems that may put a load on the vehicle's battery such as interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- Programming must begin with the Ignition/Vehicle OFF. Programming will direct the appropriate control module(s) to change power mode as needed during the procedure, independent of the vehicle's power mode.
- To prevent programming failure due to unintended wireless drops, it is recommended that a wired MDI 2 connection be used when programming the control module.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to No.

Reference Information

Special Tools
EL-52100 Multiple Diagnostic Interface 2 (MDI 2)

Programming a New Control Module

To program a replacement K56 Serial Data Gateway Module, perform the following procedure:

Note:
- Ensure the *EL-52100* (MDI 2) is used when programming the vehicle and verify it is working properly. Using the EL-47955 (MDI) will result in a programming failure.
- Verify all control modules are connected and communicating before attempting to program the K56 Serial Data Gateway Module.
- Verify the key fob is inside the vehicle. If the key fob is not inside the vehicle, the serial data authentication configuration procedure which runs automatically at the end of the programming step will fail even though the programming appears to run successfully. If the serial data authentication configuration procedure fails, DTC U1962 will set and/or the setup step will fail or be incomplete.
- Begin with the vehicle in vehicle OFF power mode. The Service Programming System will power mode the vehicle.

1. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. On the SPS Supported Controllers screen, select K56 Serial Data Gateway Module - Programming and follow the on-screen instructions.
4. On the SPS Supported Controllers screen, select K56 Serial Data Gateway Module - Setup and follow the on-screen instructions.

Note: If an error message indicates that a module is missing after the learn procedure is complete, diagnose that module to make sure that it's connected and communicating and then perform the Programming and Learn procedures again.

5. Clear DTCs.

Programming an Existing Control Module

To program an existing K56 Serial Data Gateway Module, perform the following procedure:

Note:
- Ensure the *EL-52100* (MDI 2) is used when programming the vehicle and verify it is working properly. Using the EL-47955 (MDI) will result in a programming failure.
- Verify all control modules are connected and communicating before attempting to program the K56 Serial Data Gateway Module.
- Verify the key fob is inside the vehicle. If the key fob is not inside the vehicle, the serial data authentication configuration procedure which runs automatically at the end of the programming step will fail even though the programming appears to run successfully. If the serial data authentication configuration procedure fails, DTC U1962 will set and/or the setup step will fail or be incomplete.
- Begin with the vehicle in vehicle OFF power mode. The Service Programming System will power mode the vehicle.

1. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. On the SPS Supported Controllers screen, select K56 Serial Data Gateway Module - Programming and follow the on-screen instructions.
4. Clear DTCs.

Unsuccessful Programming Recovery

Note:
- Ensure the *EL-52100* (MDI 2) is used when programming the vehicle. Using the EL-47955 (MDI) will result in a programming failure.
- It may be necessary to use another *EL-52100* (MDI 2) and/or cables to verify proper operation to eliminate the possibility of faulty equipment.

- If Ethernet programming fails, ensure there is no fault in the Ethernet circuits between the X84 Data Link Connector and K56 Serial Data Gateway Module. Refer to [Link target (target-id 300812-) not found] to diagnose these Ethernet circuits.

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. Exit Service Programming System (SPS) and disconnect all programming equipment from the vehicle.
2. Disconnect all battery voltage or ignition voltage sources from the K56 Serial Data Gateway Module. All voltage sources must be removed for a minimum of 10 min. This can be done several ways and should be completed by using the least intrusive way. This can vary depending on vehicle and control module location and can be done by one of the options listed below:
   - Removing all fuses supplying battery voltage and ignition voltage to the control module.
   - Disconnecting all harness connectors from the control module.
   - Performing a 12 V battery disconnect by disconnecting the battery negative cable. Refer to [Link target (target-id 37733-) not found] .
3. Reconnect all battery voltage and ignition voltage sources to the K56 Serial Data Gateway Module.
4. Close down the current session of Techline Connect and reopen a new session.
5. Verify the K56 Serial Data Gateway Module, X84 Data Link Connector, and programming tool connections are secure and the tool software is up to date.
6. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
7. Access the Service Programming System (SPS) and follow the on-screen instructions for the K56 Serial Data Gateway Module.
8. Verify the K56 Serial Data Gateway Module can be programmed.

⇒ **If the K56 Serial Data Gateway Module can not be programmed**

8.1. Ignition ON/Vehicle in Service Mode for 1 min.

8.2. Ignition/Vehicle OFF.

8.3. Access SPS and follow the on-screen instructions for the K56 Serial Data Gateway Module.

Note: If programming is still not successful after the second programming attempt, check the following:

- For facilities using an internet firewall, ensure firewall settings are not blocking file downloads and/or require elevated rights.
- For United States and Canada GM dealers, the appropriate firewall settings can be found in the GM DEALER INFRASTRUCTURE & SECURITY GUIDELINES (DISG) section 2.d.vii.

8.4. Verify the K56 Serial Data Gateway Module can be programmed.

⇒ If the K56 Serial Data Gateway Module can not be programmed, replace the K56 Serial Data Gateway Module.

⇓ If the K56 Serial Data Gateway Module can be programmed

8.5. Clear DTCs.

⇓ **If the K56 Serial Data Gateway Module can be programmed**

9. Clear DTCs.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: *Diagnostic Repair Verification 2-260*.

For control module replacement, programming, and setup, refer to: *Control Module References 2-3*.

K61 Sunroof Control Module: Programming and Setup

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle 2-207* prior to using this diagnostic procedure.
- Review the description of *Strategy Based Diagnosis 2-198*

Note:

- Do NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Verify the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger,

as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programming. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.

- Turn OFF or disable systems that may put a load on the vehicle's battery such as interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- Programming must begin with the Ignition/Vehicle OFF. Programming will direct the appropriate control module(s) to change power mode as needed during the procedure, independent of the vehicle's power mode.
- To prevent programming failure due to unintended wireless drops, it is recommended that a wired MDI 2 connection be used when programming the control module.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to No.

Reference Information

Special Tools
EL-52100 Multiple Diagnostic Interface 2 (MDI 2)

Programming an Existing or New Control Module

This control module does not require SPS programming or any setup procedures.

Please refer to: [Link target (target-id 130156-) not found] for programming and setup.

Repair Instructions

Perform the *Diagnostic Repair Verification 2-260* after completing the repair.

Control Module References 2-3 for control module replacement, programming, and setup.

K67 Trailer Brake Control Module: Programming and Setup

Replace and Program ECU or Reprogram ECU

This ECU does not require SPS programming or any setup procedures.

K68 Trailer Lighting Control Module: Programming and Setup

The K68 Trailer Lamp Control Module does not require programming, but does require serial data authentication. Refer to: *Serial Data Authentication Configuration 2-37*.

K69 Transfer Case Control Module: Programming and Setup

Note:

- Do NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Verify the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programming. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn Off or disable systems that may put a load on the vehicle's battery. For example, interior lights, daytime running lights, HVAC, and radio.
- During the programming procedure, follow the Service Programming System (SPS) prompts for the correct ignition switch position.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to No.

Programming an Existing or New Control Module

To program an existing or new control module, perform the following procedure:

1. Access SPS and follow the on-screen instructions for the control module: K69 Transfer Case Control Module
2. Perform the SPS function: K69 Transfer Case Control Module — Prepare Control Module for Removal
3. Perform the SPS function: K69 Transfer Case Control Module — Programming
4. Select Serial Data Authentication Configuration button (located to the left of the SPS supported controllers list or to the bottom right of the Techline Connect) and follow the on-screen instructions.
5. Perform the SPS function: K69 Transfer Case Control Module — Setup

6. Clear DTCs.
7. Perform the scan tool function: Range Actuator Learn

   Refer to: [Link target (target-id 304015-) not found]

Unsuccessful Programming Recovery

If programming a control module is not successful, perform the following procedure:

1. Verify the control module, data link connector and programming tool connections are secure and the tool software is up to date.
2. Perform the SPS function: K69 Transfer Case Control Module — Programming

   Verify the control module programming is successful.

⇒ **If the programming is not successful**

   2.1. Disconnect the battery.

   2.2. Wait 60 s before proceeding to the next step.

   2.3. Connect the battery.

   2.4. Perform the SPS function: K69 Transfer Case Control Module — Programming

⇒ If the programming is not successful » Replace the component: K69 Transfer Case Control Module

⇓ If the programming is successful

   2.5. Select Serial Data Authentication Configuration button (located to the left of the SPS supported controllers list or to the bottom right of the Techline Connect) and follow the on-screen instructions.

   2.6. Perform the SPS function: K69 Transfer Case Control Module — Setup

⇒ If the programming is not successful » Replace the component: A16 Transfer Case Four Wheel Drive Actuator

   Perform the SPS function: K69 Transfer Case Control Module — Setup

⇓ If the procedure was successful

   2.7. Perform the scan tool function: Range Actuator Learn

   Refer to: [Link target (target-id 304015-) not found]

   2.8. All OK.

⇓ **If the programming is successful**

3. Select Serial Data Authentication Configuration button (located to the left of the SPS supported controllers list or to the bottom right of the Techline Connect) and follow the on-screen instructions.
4. Perform the SPS function: K69 Transfer Case Control Module — Setup
5. Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to No.
6. Perform the scan tool function: Range Actuator Learn

   Refer to: [Link target (target-id 304015-) not found]
7. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: *Diagnostic Repair Verification 2-260*

For control module replacement, programming, and setup refer to: *Control Module References 2-3*

K71 Transmission Control Module: Programming and Setup (8L45 (M5N))

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. DO NOT use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programing. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- During the programming procedure, follow the SPS prompts for the correct ignition switch position. When instructed to turn OFF the ignition, it may be necessary to Open and Close the Drivers Door to ensure that the Retained Accessory Power (RAP) function fully powers down.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.

Replace and Program Control Module

To program a replacement K71 Transmission Control Module , perform the following procedure:

Note: Instances may occur where data is not transferred during the Prepare Control Module for Removal Function

1. Access the Service Programming System (SPS) and follow the on-screen instructions.
2. Before removing the old control module, perform the SPS function Prepare Control Module for Removal, if available.

Note: The Prepare Control Module for Removal function can only be performed when communication with the old control module is still possible.

3. Ignition/Vehicle » Off
4. Replace the component: K71 Transmission Control Module

Note: Begin with the vehicle in vehicle OFF power mode. The Service Programming System will power mode the vehicle.

5. Access the Service Programming System (SPS) and follow the on-screen instructions.
6. On the SPS Supported Controllers screen select K71 Transmission Control Module — Replace and Program ECU, and follow the on screen instructions.
7. Clear the DTCs after completing the Programming procedure.
8. Perform the Refresh Characterization Data at the MCVM Characterization procedure. Refer to: *Q77 Transmission Control Solenoid Valve Characterization Programming 2-39*
9. Perform the scan tool configuration/reset function: Transmission Service Fast Learn— If available
10. Ignition OFF for 2 minutes.
11. All OK.

Reprogram Control Module

To program an existing K71 Transmission Control Module, perform the following procedure.

1. Install *EL-49642* SPS programming support tool.
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. On the SPS Supported Controllers screen select K71 Transmission Control Module — Programming, and follow the on screen instructions.
4. Clear the DTCs after completing the Programming procedure.
5. Perform the Refresh Characterization Data at the MCVM Characterization procedure. Refer to: *Q77 Transmission Control Solenoid Valve Characterization Programming 2-39*
6. Perform the scan tool configuration/reset function: Transmission Service Fast Learn— If available
7. Ignition OFF for 2 minutes.
8. All OK.

Reprogram a Control Module after Transmission Repair/Replacement

To program an existing K71 Transmission Control Module, after a transmission repair/replacement, perform the following procedure:

1. Ignition/Vehicle » Off

Note: Begin with the vehicle in vehicle OFF power mode. The Service Programming System will power mode the vehicle.

2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. On the SPS Supported Controllers screen select K71 Transmission Control Module — Programming, and follow the on screen instructions.
4. Clear the DTCs after completing the Programming procedure.
5. Perform the Refresh Characterization Data at the MCVM Characterization procedure. Refer to: *Q77 Transmission Control Solenoid Valve Characterization Programming 2-39*
6. Perform the scan tool configuration/reset function: Transmission Service Fast Learn— If available
7. Ignition/Vehicle » Off — For 2 min
8. All OK.

Unsuccessful Programming Recovery

In the event of an interrupted or unsuccessful programming event, perform the following:

1. Ignition/Vehicle » Off
2. Ensure the control module, DLC, and programming tool connections are secure and the SPS software is up to date.
3. Verify the SPS software is up to date.
4. Verify the control module can be reprogrammed.

⇒ **If the control module cannot be programmed**

Replace the component: K71 Transmission Control Module

⇓ **If the control module can be reprogrammed**

5. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: *Diagnostic Repair Verification 2-260*.

For control module replacement, programming, and setup, refer to: *Control Module References 2-3*.

K73 Telematic Control Module: Programming and Setup (UDA)

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programing. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- Programming must begin with the Ignition/Vehicle OFF. Programming will direct the appropriate control module(s) to change power mode as needed during the procedure, independent of the vehicle's power mode.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.

Reference Information

Special Tools

- EL-52100 Multiple Diagnostic Interface 2 (MDI 2)

For equivalent regional tools, refer to *Special Tools 2-42*.

Replace and Program Control Module or Reprogram Control Module

To program a replacement or an existing control module, perform the following procedure:

Note: Begin with the vehicle in the vehicle OFF power mode. The Service Programming System will power mode the vehicle.

1. Ignition/Vehicle OFF
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. In the SPS Supported Controllers screen, select K73 Telematic Control Module and Service Activation and follow the on-screen instructions.
4. Clear DTCs.

Unsuccessful Programming Recovery

In the event of an interrupted or unsuccessful programming event, perform the following steps:

Note: Begin with the vehicle in the vehicle OFF power mode. The Service Programming System will power mode the vehicle.

1. Ignition/Vehicle OFF
2. Ensure the control module, DLC and programming tool connections are secure and the SPS software is up to date.
3. Verify the control module can be reprogrammed.

⇒ **If the control module cannot be reprogrammed**

3.1. Ignition OFF for one minute.

3.2. Verify the control module can be reprogrammed.

⇒ If the control module cannot be reprogrammed, replace the control module.

⇓ If the control module can be reprogrammed.

3.3. All OK.

⇓ **If the control module can be reprogrammed**

4. All OK.

K73 Telematic Control Module: Programming and Setup (UE1)

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.

- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programing. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- Programming must begin with the Ignition/Vehicle OFF. Programming will direct the appropriate control module(s) to change power mode as needed during the procedure, independent of the vehicle's power mode.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.

Diagnostic Aids

Note: Check for Preliminary Information or Technical Service Bulletins before programming.

- It is critical to use the service replacement K73 Telematic Control Module only in the vehicle for which it was ordered.
- Failure to perform the following procedures will result in a red LED, DTC(s) being set, and limited or incomplete OnStar® services.
- An OnStar® button press to the OnStar® call center is required to complete the module replacement procedure.
- To fully activate an OnStar® module, both the setup and activation request procedures must be completed on all vehicles with and without an active OnStar® subscription to insure the unit has been setup properly for the vehicle it has been installed into and also to update the OnStar® with the correct unit information.
- To initialize the Turn-by-Turn feature (if equipped), the vehicle must first be driven In open sky condition at speeds greater than 10 mph (16 kph) or more for a minimum of 5 miles (8 km) , and perform at least 2 left and 2 right 90 degree turns coming to complete stops prior to each turn.
- On vehicles up fitted with TTY capabilities, it is necessary to perform a power cycle of the OnStar® Interface Module (OTIM), and toggle the TTY mode after completing the Communication Interface Module installation and setup procedures.

Reference Information

Special Tools

- EL-52100 Multiple Diagnostic Interface 2 (MDI 2)

For equivalent regional tools, refer to *Special Tools 2-42*.

Replace and Program Control Module

To program a replacement control module, perform the following procedure:

Note: Begin with the vehicle in the vehicle OFF power mode. The Service Programming System will power mode the vehicle.

1. Ignition/Vehicle OFF.
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. Check and follow Preliminary Information or Technical Service Bulletins before programming. If control module software updates are available, in the SPS Supported Controllers screen, select K73 – Software Update and follow the on-screen instructions.

Note: Refer to and follow the Preliminary Information or Service Bulletin to successfully program this control module.

4. To properly calibrate, activate and configure the control module, in the SPS Supported Controllers screen, select K73 Telematic Control Module – Programming and Service Activation and follow the on-screen instructions.
5. Clear DTCs.
6. Ignition/Vehicle ON.
7. Press the OnStar® Blue Button to call OnStar®, inform the advisor a new module has been installed and to verify the module is fully configured, registered, and activated.

Note: An OnStar® button press to the OnStar® call center is required to complete the module replacement procedure.

Programming Control Module for an Update

To program an existing control module for an update, perform the following procedure:

Note: Begin with the vehicle in the vehicle OFF power mode. The Service Programming System will power mode the vehicle.

1. Ignition/Vehicle OFF.
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. Check and follow Preliminary Information or Technical Service Bulletins before programming. If control module software updates are available, in the SPS Supported Controllers screen, select K73 – Software Update and follow the on-screen instructions.

Note: For programming an existing module, you only need to perform “Software Update”.

4. Clear DTCs.

Unsuccessful Programming Recovery

In the event of an interrupted or unsuccessful programming event, perform the following steps:

Note: Begin with the vehicle in the vehicle OFF power mode. The Service Programming System will power mode the vehicle.

1. Ignition/Vehicle OFF
2. Ensure the control module, DLC and programming tool connections are secure and the SPS software is up to date.
3. Verify the control module can be reprogrammed.

⇒ **If the control module cannot be reprogrammed**

4. Ignition OFF for one minute.
   4.1. Verify the control module can be reprogrammed.

⇒ **If the control module cannot be reprogrammed**

⇒ Replace the control module.

⇓ **If the control module can be reprogrammed**

4.2. Clear DTCs.

4.3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification 2-260* after completing the repair procedure.

Refer to *Control Module References 2-3* for control module replacement, programming and setup.

K85P Restraints Occupant Classification System Module - Passenger: Programming and Setup

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle 2-207* prior to using this diagnostic procedure.
- Review the description of *Strategy Based Diagnosis 2-198*

Note:

- Do NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Verify the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programming. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicle's battery such as interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- Programming must begin with the Ignition/Vehicle OFF. Programming will direct the appropriate control module(s) to change power mode as needed during the procedure, independent of the vehicle’s power mode.
- To prevent programming failure due to unintended wireless drops, it is recommended that a wired MDI 2 connection be used when programming the control module.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to No.

Reference Information

Special Tools
EL-52100 Multiple Diagnostic Interface 2 (MDI 2)

Programming an Existing or New Control Module

To program an existing or new control module, perform the following procedure:

Note:

- Ensure the *EL-52100* (MDI 2) is used when programming the vehicle and verify it is working properly. Using the EL-47955 (MDI) will result in a programming failure.
- Verify all control modules are connected and communicating before attempting to program the K85P Restraints Occupant Classification System Module.
- Verify the key fob is inside the vehicle. If the key fob is not inside the vehicle, the serial data authentication configuration procedure which runs automatically at the end of the programming step will fail even though the programming appears to run successfully. If the serial data authentication configuration procedure fails, DTC U1962 will set and/or the setup step will fail or be incomplete.
- Before ROCSM Programing and Setup can be conducted, the front passenger seat must be completely empty of all items. The presence of any liquid or items on the front passenger seat will affect the calibration and operation of the ROCSM.
- DTC U3000.99 will set if the re-zero system test is performed with:
  - An aftermarket seat heater located too close to the sensor mat
  - A scan tool, laptop or other electronic device is in the seat.
  - The seat is damp or wet
  - An object or person is in the seat

1. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
2. Verify that the temperature is between 32°F (0°C) to 100°F (38 °C).
3. Verify the seat is completely dry.
4. Empty the front outboard passenger seat.
5. Verify that all SIR and ROCSM components, connectors, and connector position assurances are properly connected and mounted.
6. Access the Service Programming System (SPS) and follow the on-screen instructions for the K85P Restraints Occupant Classification System Module.
7. Perform the SPS function: **Programming** and follow the on-screen instructions.
8. Perform the SPS function: **Setup** and follow the on-screen instructions.
9. Clear DTCs.

Unsuccessful Programming Recovery

Note:

- Ensure the *EL-52100* (MDI 2) is used when programming the vehicle. Using the EL-47955 (MDI) will result in a programming failure.
- It may be necessary to use another *EL-52100* (MDI 2) and/or cables to verify proper operation to eliminate the possibility of faulty equipment.
- If Ethernet programming fails, ensure there is no fault in the Ethernet circuits between the X84 Data Link Connector and K56 Serial Data Gateway Module. Refer to [Link target (target-id 300812-) not found] to diagnose these Ethernet circuits.

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. Exit Service Programming System (SPS) and disconnect all programming equipment from the vehicle.
2. Disconnect all battery voltage or ignition voltage sources from the control module.

Note: All voltage sources must be removed for a minimum of 10 min. This can be done several ways and should be completed by using the least intrusive way. This can vary depending on vehicle and control module location and can be done by one of the options listed below:

- Removing all fuses supplying battery voltage and ignition voltage to the control module.
- Disconnecting all harness connectors from the control module.
- Performing a 12 V battery disconnect by disconnecting the battery negative cable. Refer to [Link target (target-id 37733-) not found] .

3. Reconnect all battery voltage and ignition voltage sources to the control module.
4. Close down the current session of Techline Connect and reopen a new session.
5. Verify the control module, data link connector, and programming tool connections are secure and the tool software is up to date.
6. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
7. Access the Service Programming System (SPS) and follow the on-screen instructions for the control module.
8. Verify the control module can be programmed.

⇒ **If the control module can not be programmed**

8.1. Ignition ON/Vehicle in Service Mode for 1 min.

8.2. Ignition/Vehicle OFF.

8.3. Access SPS and follow the on-screen instructions for the control module.

Note: If programming is still not successful after the second programming attempt, check the following:

- For facilities using an internet firewall, ensure firewall settings are not blocking file downloads and/or require elevated rights.
- For United States and Canada GM dealers, the appropriate firewall settings can be found in the GM DEALER INFRASTRUCTURE & SECURITY GUIDELINES (DISG) section 2.d.vii.

8.4. Verify the control module can be programmed.

⇒ If the control module can not be programmed, replace the control module.

⇓ If the control module can be programmed

8.5. Clear DTCs.

⇓ **If the control module can be programmed**

9. Clear DTCs.

Repair Instructions

For module replacement, refer to: [Link target (target-id 188211-) not found]

K157 Video Processing Module: Programming and Setup

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Verify the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. DO NOT use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programing. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- Programming must begin with the Ignition/Vehicle OFF. Programming will direct the appropriate control module(s) to change power mode as needed during the procedure, independent of the vehicle's power mode.
- During programming, it may be necessary to remove specific fuse(s). To prevent programming failure, ensure SPS on-screen instructions are followed for proper fuse removal when necessary.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.
- To prevent programming failure due to unintended wireless drops, it is recommended that a wired MDI connection be used when programming the control module.

Reference Information

Special Tools
EL-52100 Multiple Diagnostic Interface 2 (MDI 2)

Replace and Program Control Module

To program a replacement or an existing control module, perform the following procedure:

1. Ignition/Vehicle OFF.
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. On the SPS Supported Controllers screen, select K157 Video Processing Control Module - Programming and follow the on-screen instructions.
4. Clear DTCs.
5. Calibrate Vehicle Processing Control Module. Refer to: [Link target (target-id 283883-) not found]

Reprogram Control Module

To program a replacement or an existing control module, perform the following procedure:

1. Ignition/Vehicle OFF.
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. On the SPS Supported Controllers screen, select K157 Video Processing Control Module - Programming and follow the on-screen instructions.
4. Clear DTCs.
5. Calibrate Vehicle Processing Control Module. Refer to: [Link target (target-id 283883-) not found]

Unsuccessful Programming Recovery

Note:

- Ensure the *EL-52100* (MDI 2) is used when programming the vehicle. Using the EL-47955 (MDI) will result in a programming failure.
- It may be necessary to use another *EL-52100* (MDI 2) and/or cables to verify proper operation to eliminate the possibility of faulty equipment.
- If Ethernet programming fails, ensure there is no fault in the Ethernet circuits between the X84 Data Link Connector and K56 Serial Data Gateway Module. Refer to [Link target (target-id 300812-) not found] to diagnose these Ethernet circuits.

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. Exit Service Programming System (SPS) and disconnect all programming equipment from the vehicle.
2. Disconnect all battery voltage or ignition voltage sources from the control module. All voltage sources must be removed for a minimum of 10 min. This can be done several ways and should be completed by using the least intrusive way. This can vary depending on vehicle and control module location and can be done by one of the options listed below:
   - Removing all fuses supplying battery voltage and ignition voltage to the control module.
   - Disconnecting all harness connectors from the control module.

Warning: Always ensure the Battery Maintenance Mode is inactive before disconnecting the low voltage 12 volt battery (or batteries). This mode can be active with the ignition off, regardless of whether the vehicle charging cord is plugged in or not. When this mode is active, the on-board high voltage battery charger(s) will energize the 12 volt battery cables and charge the 12 volt battery (or batteries). Disconnecting any battery cables while this mode is active may result in an electrical shock or a burn from hot battery cable leads.

   - Check the 12 volt battery voltage with a digital multimeter before disconnecting any battery cables leads. If the voltage is 13.5 volts or above, the Battery Maintenance Mode is active. The technician must wait for the T18 battery charger to deactivate before disconnecting the battery negative cable. For more information refer to *Charging System Description and Operation 5-74* . With Battery Maintenance Mode inactive, perform a 12 V battery disconnect by disconnecting the battery negative cable. Refer to [Link target (target-id 37733-) not found] .
3. Reconnect all battery voltage and ignition voltage sources to the control module.
4. Close down the current session of Techline Connect and reopen a new session.
5. Verify the control module, data link connector, and programming tool connections are secure and the tool software is up to date.
6. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
7. Access the Service Programming System (SPS) and follow the on-screen instructions for the control module.
8. Verify the control module can be programmed.

⇒ **If the control module can not be programmed**

   8.1. Ignition ON/Vehicle in Service Mode for 1 min.

   8.2. Ignition/Vehicle OFF.

   8.3. Access SPS and follow the on-screen instructions for the control module.

Note: If programming is still not successful after the second programming attempt, check the following:

- For facilities using an internet firewall, ensure firewall settings are not blocking file downloads and/or require elevated rights.
- For United States and Canada GM dealers, the appropriate firewall settings can be found in the GM DEALER INFRASTRUCTURE & SECURITY GUIDELINES (DISG) section 2.d.vii.

   8.4. Verify the control module can be programmed.

⇒ If the control module can not be programmed, replace the control module.

⇓ If the control module can be programmed

   8.5. Clear DTCs.

⇓ **If the control module can be programmed**

9. Clear DTCs.

Repair Instructions

Perform the *Diagnostic Repair Verification 2-260* after completing the repair.

Control Module References 2-3 for control module replacement, programming, and setup.

K160 Brake System Control Module: Programming and Setup

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.

- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programing. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- During the programming procedure, follow the SPS prompts for the correct ignition switch position.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.

Replace and Program Control Module

To program a replacement or an existing control module, perform the following procedure:

1. Access the Service Programming System (SPS) and follow the on-screen instructions.
2. If equipped with Brake Pad Life Monitor (JBP), on the SPS Supported Controllers screen, select K160 Brake System Control Module - Prepare Module for Removal and follow the on-screen instructions.
3. On the SPS Supported Controllers screen, select K160 Brake System Control Module - Programming and follow the on-screen instructions.
4. On the SPS Supported Controllers screen, select K160 Brake System Control Module - Setup and follow the on-screen instructions.
5. If the A104 Brake Master Cylinder was also replaced proceed to step 7.
6. If only the K160 Brake System Control Module was replaced proceed to step 10.
7. Perform the scan tool Control Functions, Brake Pressure Sensor Calibration.
8. Perform the scan tool Control Functions, Brake System Plunger Pressure Rise Starting Point Learn.
9. Perform the scan tool Control Functions, Brake System Plunger Motor Position Sensor Learn.
10. Perform the scan tool Control Functions, Brake Hydraulics Test procedure.
11. If the Brake Hydraulics Test fails perform the scan tool Control Functions, Automated Brake Bleed procedure
12. If the programming procedure did not complete and a Device Control Limits Exceeded message is displayed refer to [Link target (target-id 316903-) not found]
13. Clear DTCs.
14. If ABS, Traction Control and/or Stabilitrak indicators or Brake Related Messages are ON after performing programming and setup, do the following:
    14.1. Disconnect the scan tool from the X84 Data Link Connector.
    14.2. Ignition/Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from the vehicle. It may take up to 10 min to power down.
    14.3. Ignition ON/Vehicle In Service Mode, verify ABS, Traction Control and/or Stabilitrak indicators or Brake Messsages are Off. If not, repeat the above step to make sure the vehicle is in sleep mode.
    14.4. Clear DTCs.

Reprogram Control Module

To reprogram an existing control module, perform the following procedure:

1. Access the Service Programming System (SPS) and follow the on-screen instructions.
2. On the SPS Supported Controllers screen, select K160 Brake System Control Module - Programming and follow the on-screen instructions.
3. If the programming procedure did not complete and a Device Control Limits Exceeded message is displayed refer to [Link target (target-id 316903-) not found]
4. Clear DTCs.
5. If ABS, Traction Control and/or Stabilitrak indicators or Brake Related Messages are ON after performing programming, do the following:
    5.1. Disconnect the scan tool from the X84 Data Link Connector.
    5.2. Ignition/Vehicle OFF, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from the vehicle. It may take up to 10 min to power down.

5.3. Ignition ON/Vehicle In Service Mode, verify ABS, Traction Control and/or Stabilitrak indicators or Brake Messsages are Off. If not, repeat the above step to make sure the vehicle is in sleep mode.

5.4. Clear DTCs.

Unsuccessful Programming Recovery

Note:

- Ensure the *EL-52100* (MDI 2) is used when programming the vehicle. Using the EL-47955 (MDI) will result in a programming failure.
- It may be necessary to use another *EL-52100* (MDI 2) and/or cables to verify proper operation to eliminate the possibility of faulty equipment.
- If Ethernet programming fails, ensure there is no fault in the Ethernet circuits between the X84 Data Link Connector and K56 Serial Data Gateway Module. Refer to [Link target (target-id 300812-) not found] to diagnose these Ethernet circuits.

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. Exit Service Programming System (SPS) and disconnect all programming equipment from the vehicle.
2. Disconnect all battery voltage or ignition voltage sources from the control module.

Note: All voltage sources must be removed for a minimum of 10 min. This can be done several ways and should be completed by using the least intrusive way. This can vary depending on vehicle and control module location and can be done by one of the options listed below:

- Removing all fuses supplying battery voltage and ignition voltage to the control module.
- Disconnecting all harness connectors from the control module.
- Performing a 12 V battery disconnect by disconnecting the battery negative cable. Refer to [Link target (target-id 37733-) not found] .

3. Reconnect all battery voltage and ignition voltage sources to the control module.
4. Close down the current session of Techline Connect and reopen a new session.
5. Verify the control module, data link connector, and programming tool connections are secure and the tool software is up to date.
6. Ignition/Vehicle OFF, ensure that the key fob is inside the vehicle and not moved for the duration of the programming to prevent an inadvertent power mode change during programming.
7. Access the Service Programming System (SPS) and follow the on-screen instructions for the control module.
8. Verify the control module can be programmed.

⇒ **If the control module can not be programmed**

8.1. Ignition ON/Vehicle in Service Mode for 1 min.

8.2. Ignition/Vehicle OFF.

8.3. Access SPS and follow the on-screen instructions for the control module.

Note: If programming is still not successful after the second programming attempt, check the following:

- For facilities using an internet firewall, ensure firewall settings are not blocking file downloads and/or require elevated rights.
- For United States and Canada GM dealers, the appropriate firewall settings can be found in the GM DEALER INFRASTRUCTURE & SECURITY GUIDELINES (DISG) section 2.d.vii.

8.4. Verify the control module can be programmed.

⇒ If the control module can not be programmed, replace the control module.

⇓ If the control module can be programmed

8.5. Clear DTCs.

⇓ **If the control module can be programmed**

9. Clear DTCs.

Repair Instructions

Perform the *Diagnostic Repair Verification 2-260* after completing the repair.

Control Module References 2-3 for Control Module replacement, programming and setup

K182 Parking Assist Control Module: Programming and Setup (UD5 without 00Z or UD7 without 00Y)

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the control module is not properly configured with the correct calibration software, the control module will not control all of the vehicle features properly.
- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt

programming. When required install the *EL-49642* SPS Programming Support Tool to maintain system voltage. If not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply. DO NOT connect a battery charger.

- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, radio, etc.
- During the programming procedure, follow the SPS prompts for the correct ignition switch position.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.

Replace and Program Control Module

To program a replacement control module, perform the following procedure:

1. Ignition/Vehicle OFF
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. On the SPS Supported Controllers screen, under Select Controller, select K182 Parking Assist Control Module.
4. On the SPS Supported Controllers screen, under Select Function / Sequence, select Programming and follow on screen instructions.
5. Clear DTCs.

Reprogram Control Module

Do not reprogram the parking assist control module, unless directed by a service procedure, or a service bulletin.

To reprogram an existing control module, perform the following procedure:

1. Access the Service Programming System (SPS) and follow the on-screen instructions.
2. On the SPS Supported Controllers screen, under Select Controller, select K182 Parking Assist Control Module.
3. On the SPS Supported Controllers screen, under Select Function / Sequence, select Programming and follow on screen instructions.
4. Clear DTCs.

Unsuccessful Programming Recovery

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. Ignition ON. Ensure the K182 Parking Assist Control Module, DLC and programming tool connections are secure and the SPS software is up to date.
2. Verify the parking assist control module can be reprogrammed.

⇒ **If the K182 Parking Assist Control Module cannot be reprogrammed**

2.1. Ignition OFF for one minute, ignition ON.

2.2. Verify the parking assist control module can be reprogrammed.

⇒ If the K182 Parking Assist Control Module cannot be reprogrammed, replace the parking assist control module.

⇓ If the K182 Parking Assist Control Module can be reprogrammed.

2.3. All OK.

⇓ **If the K182 Parking Assist Control Module can be reprogrammed**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification 2-260* after completing the repair.

Control Module References 2-3 for control module replacement, programming and setup

K182 Parking Assist Control Module: Programming and Setup (UD5 with 00Z or UD7 with 00Y)

Note: When performing #N222375790-09: Customer Satisfaction Program - Park Assist Retrofit - (Nov 1, 2023) refer to K182 Parking Assist Control Module: Programming and Setup (UD7 without 00Y) in SI.

This device does not require programming or setup.

T1 Accessory AC and DC Power Control Module: Programming and Setup

This device does not require programming or setup.

T3 Audio Amplifier: Programming and Setup

Note:

- DO NOT program a control module unless directed to by a service procedure or a service bulletin. If the ECU is not properly configured with the correct calibration software, the ECU will not control all of the vehicle features properly.
- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or ECU damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking,

over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programing. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.

- Turn OFF or disable systems that may put a load on the vehicles battery such as; interior lights, exterior lights (including daytime running lights), HVAC, , etc.
- During the programming procedure, follow the SPS prompts for the correct ignition switch position.
- Clear DTCs after programming is complete. Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.

Diagnostic Aids

During programming you may be required to select multiple calibrations dependent upon vehicle equipment. Have the vehicle build/RPO information available during the following procedure to ensure the correct calibrations are selected.

Replace and Program Control Module or Reprogram Control Module

To program a replacement or an existing control module, perform the following procedure:

1. Ignition OFF, Vehicle OFF
2. Access the Service Programming System (SPS) and follow the on-screen instructions.
3. On the SPS Supported Controllers screen, select T3 Audio Amplifier – Programming and follow the on-screen instructions.
4. Clear DTCs.

Unsuccessful Programming Recovery

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. Ignition ON. Ensure the control module, DLC and programming tool connections are secure and the SPS software is up to date.
2. Verify the control module can be reprogrammed.

⇒ **If the control module cannot be reprogrammed**

2.1. Ignition OFF for one minute, ignition ON.

2.2. Verify the control module can be reprogrammed.

⇒ If the control module cannot be reprogrammed, replace the control module.

⇓ If the control module can be reprogrammed.

2.3. All OK.

⇓ **If the control module can be reprogrammed**

3. All OK.

T22 Wireless Accessory Charging Module: Programming and Setup

This device does not require programming or setup.

K111 Fuel Pump Power Control Module: Programming and Setup

This control module does not require SPS programming but does require the following setup procedures after a new control module is installed:

Setup for Component Replacement — Fuel Pump Driver Control Module Configuration/ Fuel Pump Power Control Module Configuration

1. Ignition » On / Vehicle » In Service Mode — For 2 min
2. Ignition/Vehicle » Off — For 2 min
3. Ignition » On / Vehicle » In Service Mode
4. Perform the following action: Clear the DTCs.
5. Start Engine
6. Verify DTC P1005 is not set

⇒ **If the DTC sets**

6.1. Perform the following action: Clear the DTCs.

6.2. Ignition/Vehicle » Off — For 2 min

6.3. Start Engine

6.4. Verify the DTC does not set.

⇒ If the DTC sets» Repeat the procedure starting at step 1

⇒ If the DTC is not set » Configuration— Complete

⇓ **If the DTC is not set**

7. Configuration— Complete

Serial Data Authentication Configuration

General Information

Serial Data Authentication Configuration (or Key Provisioning) enables secure communication between control modules over different communication channels. This is critical for maintaining communication security. It ensures sensitive data exchanged between control modules is encrypted, preventing tampering and unauthorized access.

- During the process, control module data is retrieved from the vehicle to generate unique cryptographic keys.
- These keys are then written to each control module, allowing secure communication between control modules.
- In the case of control module replacement, re-running the configuration is required to introduce the new control module to the network; otherwise, communication will fail due to unrecognized messages.

Reference Information

Special Tools
EL-52100 Multiple Diagnostic Interface 2 (MDI 2)

Serial Data Authentication Configuration

Note: Before attempting to perform the Serial Data Authentication Configuration procedure,

- Make sure all CAN control modules are connected and communicating.
- Diagnose the following communication DTCs first: DTC U0073-U007E, U0100-U02FF, U1100-U12FF, U1600-U17FF, U1977, U1978, U2200-U23FF, and U2400-U25FF.
- Diagnose the following programming DTCs: U3000 51, U3000 52, U3000 53, U3000 56, and U3000 57.
- If DTC U1962 is stored only as a history DTC and not retrieved as a current DTC, do not perform the Serial Data Authentication Configuration procedure.
- DO NOT perform the Serial Data Authentication Configuration procedure unless directed to by a service procedure or a service bulletin.
- Ensure the programming tool is equipped with the latest software and is securely connected to the data link connector. If there is an interruption during programming, programming failure or control module damage may occur.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. Check the 12 V battery with a digital multimeter and ensure the voltage is above 12.5 V. When required, install a battery maintainer or power supply that provides a steady and stable voltage. DO NOT use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programing. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.

1. Ignition/Vehicle OFF, keep the key inside the vehicle.
2. Access the Service Programming System (SPS) and follow the on-screen instructions.

Note: The Serial Data Authentication Configuration button is located in the lower right corner of the SPS Supported Controllers screen in the Techline Connect system.

3. On the SPS Supported Controllers screen, select Serial Data Authentication Configuration button and follow the on-screen instructions.
4. Ignition/Vehicle OFF, disconnect the scan tool from the vehicle, all access doors closed, all vehicle systems OFF, and all keys at least 3 m (9.8 ft) away from vehicle. Allow the vehicle to go into sleep mode.
5. Ignition ON/Vehicle In Service Mode.
6. Using a scan tool, clear DTCs.

Troubleshooting

Serial Data Authentication Configuration can fail for several reasons. After confirming all control modules are fully programmed and that no underlying issues exist, follow these steps to attempt a successful configuration:

1. Verify X84 Data Link Connector (DLC) Connection: Ensure the X84 Data Link Connector is securely attached to the vehicle.
2. Use a Direct MDI 2 Connection: Connect the scan tool directly to the computer via a wired connection instead of using wireless connection (Techline Connect may need to be reset to change the connection type).
3. Disconnect the 12 V Battery: Reset the vehicle systems by disconnecting the 12 V battery negative cable for 1 min. For electric vehicles, check the 12 V battery voltage with a digital multimeter before disconnecting any battery cables leads. If the voltage is 13.5 V or above, the Battery Maintenance Mode is active. The technician must wait for the T18 Battery Charger to deactivate before disconnecting the battery negative cable. Follow the appropriate steps in the Battery Negative Cable Disconnection and Connection

procedure located under the Starting, Charging, and Low Voltage Energy Storage category.

4. Perform the Serial Data Authentication Configuration procedure. If the procedure still fails, inspect the X84 Data Link Connector for contamination, corrosion, and terminal tension and inspect the wiring between the X84 Data Link Connector and K56 Serial Data Gateway Module for any faults.

In the case of a Serial Data Authentication Configuration failure, the SPS error window should point to which control module is failing:

- Function: “Key Provisioning” refers to Serial Data Authentication Configuration.
- Sub Function: refers to which step in the process failed.
- ECU: refers to the failing control module if that is the case.

If the Sub Function column in SPS error window points to a “Configure Link” error, run through the trouble shooting steps 1-4 above.

If no SPS error window is displayed, but the SPS screen indicates that Serial Data Authentication Configuration has Failed, run through the trouble shooting steps 1-4 above.

Service Programming System (SPS)

For step-by-step control module programming instructions, please refer to the techline information system (TIS) terminal.

Review the information below to ensure proper programming protocol.

Note:

- DO NOT program a control module unless you are directed by a service procedure or you are directed by a General Motors service bulletin. Programming a control module at any other time will not permanently correct a customers concern.
- It is essential that the TIS terminal, MDI/MDI2, and/or Scan Tool, is equipped with the latest software before performing service programming.
- Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. When required, install a battery maintainer or power supply that provides a steady and stable voltage. Do not use a battery charger, as charging voltage will often fluctuate when connected to the vehicle. This may interrupt programing. If a battery maintainer is not available, connect a fully charged 12 V jumper or booster pack disconnected from the AC voltage supply.
- Some modules will require additional programming/setup events to be performed before or after programming.
- Some vehicles may require the use of a CANDi or MDI/MDI2 module for programming.
- Review the appropriate service information for these procedures.
- DTCs may set during programming. Clear DTCs after programming is complete.
- Clearing powertrain DTCs will set the Inspection/ Maintenance (I/M) system status indicators to NO.

Ensure the following conditions are met before programming a control module:

1. Vehicle system voltage:
   - There is not a charging system concern. All charging system concerns must be repaired before programming a control module.
   - Battery voltage is greater than 12 volts but less than 16 volts. The battery must be fully charged before programming the control module.
   - Turn OFF or disable any system that may put a load on the vehicles battery, such as the following components:
     - Interior lights
     - Exterior lights including daytime running lights (DRL)—Applying the parking brake, on most vehicles, disables the DRL system
     - Heating, ventilation, and air conditioning (HVAC) systems
     - Engine cooling fans
     - Radio, etc.
2. The ignition switch must be in the proper position. SPS prompts you to turn ON the ignition, with the engine OFF. DO NOT change the position of the ignition switch during the programming procedure, unless instructed to do so.
3. Make certain all tool connections are secure, including the following components and circuits:
   - Scan Tool
     - The RS-232 communication cable port
     - The connection at the data link connector (DLC)
     - The voltage supply circuits
   - MDI/MDI2
     - The USB, Ethernet or Wireless communication port
     - The connection at the data link connector (DLC)

4. DO NOT disturb the tool harnesses while programming. If an interruption occurs during the programming procedure, programming failure or control module damage may occur.

In the event of an interrupted or unsuccessful programming event, perform the following steps:

1. DO NOT turn the ignition OFF. Ensure that all control module and DLC connections are secure and the TIS terminal operating software is up to date.
2. Attempt to reprogram the control module.
3. If the control module can still not be programmed, turn the ignition OFF for at least one minute.
4. Turn the ignition ON and attempt to reprogram the control module. The control module should program.
   ⇒ If the control module still cannot be programmed, replace the control module.

After successfully programming the control module, ensure that all post programming procedures are performed; refer to *Control Module References 2-3* for the appropriate control module Programming and Setup document for any required procedures.

Q77 Transmission Control Solenoid Valve Characterization Programming

The solenoids in this transmission require unique performance characteristic data in order to function at maximum efficiency. This data is programmed and stored in the vehicle's transmission control module (TCM). When a transmission assembly, TCM, or solenoids are replaced during service, the performance characteristic data for the solenoids must be retrieved from a web server "cloud" repository and reprogrammed into the TCM.

Reprogramming also ensures that the characteristic data relationship is properly matched between the solenoids, valve body, and transmission.

Solenoid characterization reprogramming is performed using the TIS2Web Service Programming System (SPS).

Solenoid Reprogramming Procedure

Perform solenoid characterization reprogramming after one of the following service procedures:

Note: Select "Replace Transmission" at the MCVM Characterization selection screen.

- Replace transmission assembly

Note: Select "Replace Control Valve Solenoid Body" at the MCVM Characterization selection screen.

- Replace control valve solenoid body

Note: Select "Replace Solenoid" at the MCVM Characterization selection screen.

- Replace solenoid (currently not an available Service Procedure)

Note: Select "Refresh Characterization Data" at the MCVM Characterization selection screen.

- Replace TCM

To perform solenoid characterization after a transmission component replacement:

1. Document the new Transmission Unique Number (TUN) or Part Unique Number (PUN) as required.
   - The TUN location may be found here: [Link target (target-id 260620-) not found] . Since the TUN can be difficult to access when the transmission is installed in the vehicle, ensure you document the 16-digit TUN prior to installing the transmission in the vehicle.
   - The PUN location may be found here: [Link target (target-id 280523-) not found] . Before installing the control valve solenoid body onto the transmission, document the 16-digit PUN. If the control valve solenoid body PUN has not been saved for reference, it may be necessary to disassemble the control valve solenoid body from the transmission to clearly read the control valve solenoid body PUN.
2. Log into TIS2Web/SPS.
3. Type the vehicle identification number (VIN).
4. Perform the SPS Transmission Control Module programming event.
   - Select "Transmission Control Module - Programming" to update TCM calibrations and Solenoid Characterization data.

     OR
   - Select "Transmission Control Module - MCVM Operations" to update Solenoid Characterization data only.
5. From the "MCVM (Mechanical Characterization and Virtual Matching) Operation Selection" screen, select the applicable service procedure to be performed. You will be prompted to provide the necessary Transmission Unique Number (TUN) or Part Unique Number (PUN) when replacing a transmission part.
6. After Solenoid Characterization Reprogramming has completed, turn the ignition OFF for at least 30 seconds and then turn back ON in order to reset the controller.

At this point, the system will read the VIN from the engine control module (ECM) using the multiple diagnostic interface (MDI) and then retrieve the applicable genealogy data tree from the cloud. This data tree accesses the original characterization data so that it may be updated with the new component information. The system acquires characterization data for the given TUN/PUN via the cloud and updates the genealogy tree. The TCM is updated with the correct solenoid characterization data, and the cloud is updated with the new genealogy relationship.

Description and Operation

Over The Air Description and Operation

Each item in the list below represents topics covered in detail below.

- Over The Air (OTA) Description
- OTA Software Download
- Installing an Update
- Deferring or Declining an Update
- Unable to Complete
- Proper Battery Charging

Over The Air (OTA) Description

The Over The Air (OTA) feature was designed to install vehicle software updates remotely. Remote software update is an in-vehicle feature that enables the installation of a software package to update certain modules without requiring service test equipment to be physically connected to the vehicle. Remote software updates will utilize a long range or short range connection from the host module to a remote IT system. There must be an active 4G LTE or WiFi connection to download and install vehicle software updates. The customer does not need an active OnStar subscription but they do need to accept the vehicle Terms and Conditions to be eligible to receive OTA vehicle software updates.

Note: Fleet vehicles must be activated as a Fleet account (not a business account) and require a separate Terms and Conditions agreement to be completed. Please see your fleet administrator for assistance with completing this agreement.

OTA software updates that are pushed to vehicles remotely continue to expand in frequency and use on GM models. Vehicles using the Global A electrical architecture can support three modules for OTA updates, such as the radio, OnStar, and Serial Data Gateway modules.

The new Vehicle Intelligence Platform (VIP) electrical architecture, introduced on some 2020 vehicles and beyond, powers a new electronic system that is capable of managing up to 4.5 terabytes of data processing power per hour, which is a fivefold increase in capability over the previous Global A electrical architecture. On vehicles using the VIP architecture, virtually all modules can support OTA updates, which means that the OTA software is not only for the infotainment system.

When an OTA update has been downloaded to a vehicle and is available to be installed, a message is displayed on the infotainment screen notifying the driver of the impending update. The message to accept and install an OTA update will not appear until the minimum values for the battery State of Charge (SOC) and Outside Ambient Temperature (OAT) are met.

OTA Software Download

An OTA update can be pushed to a vehicle while the vehicle is parked or being driven. There is an option for notification to the driver that the software update is being downloaded to the vehicle, the default setting is set to off. Battery SOC and OAT values are not checked before a download. These checks are only performed once the software update is downloaded and ready to be installed.

The OTA software download can occur in increments. Download will not be paused while the vehicle is being driven, it continues in the background. If the vehicle is turned off the download will continue for a maximum of 10 minutes. If the download did not complete it will continue on the next ignition cycle from where it stopped.

Installing an Update

Once the OTA software is downloaded, a message on the infotainment screen will display a prompt to accept the installation. The customer does not need to remain in the vehicle during the installation of the software. However, the vehicle cannot be driven during the installation and certain vehicle features may not be available. It’s not required for the ignition to be ON for the installation to begin.

Installation time will vary based on the size of the update. The average installation will take approximately 15 minutes. Depending on the module, it may take longer to complete. The “Accept” message on the infotainment screen will provide an estimation of the approximate installation time. The customer may also comment that the radio appears to stay on after exiting the vehicle.

Deferring or Declining an Update

When an OTA update is downloaded, customers have the option to defer or decline the installation. The standard policy for OTA software updates is to set the customer notifications to 30 ignitions cycles. If the customer does not act upon the prompts within this counter, the update package is removed from the vehicle.

If a customer ignores the notification, the ignition cycle counter decreases by one immediately.

If the customer defers the installation by selecting the “Remind Me Later” option, the ignition cycle counter decreases by one, but it will not decrease again until after the customer-selected “Remind Me Later” period, regardless of the number of ignition cycles that occur during that period. For example, if 24 hours is selected for the next remind me time frame and I did 20 ignition cycles, those 20 ignition cycles do not decrease the ignition cycle counter.

Note: For customer use case, standard operating procedure for campaign is to set the notifications to 30 ignitions cycles. If the Customer does not act upon the prompts within this counter, the package / invite is removed from the vehicle. In this scenario, we will wait 2 weeks and re-enroll back into the campaign. FYI: this counter can be selected from 1 to 999 ignition cycles when setting up the campaign.

If the OTA update installation is deferred by the customer, it can be installed at a later date through the Vehicle Software menu under Settings > System on the infotainment screen.

If the customer selects the “Decline Update” option, the update package is immediately removed from the vehicle. In this case, the vehicle will not be re-enrolled to receive the OTA update at a later date, unless the update is a Field Action. OTA updates will not be installed in a vehicle without a customer’s consent. One exception with Constraint Consent use case there is a “May day” counter set in the vehicle, typically 10 ignition cycles. The Customer has that many ignition cycles to complete the update. Upon using all notifications, the installation will take place once this counter has expired. This use case is only for Cyber Critical recall Field Actions and requires Global Safety Field Investigations approval to utilize this use case. To date, this use case has not been used for any field actions.

Unable to Complete

There are a number of criteria that must be met in order to successfully complete the software update installation on a vehicle. The most common cause of being unable to complete an installation is the State of Charge (SOC) of the 12V battery. If the 12V battery does not meet the minimum SOC requirement of 70 percent or greater along with an Outside Ambient Temperature (OAT) greater than 14°F (-10°C), the OTA update installation will not occur. The colder the ambient air temperature is, the higher the target SOC becomes. To determine the battery SOC for VIP vehicles, go to BCM/12V Battery/Battery Sensor Module – State of Charge in GDS 2.

There may be other conditions that will affect an OTA update installation. If any of these conditions are present, a “Vehicle Conditions Not Ideal” message may display on the infotainment screen stating that conditions are not ideal to proceed with the update installation. These conditions do not indicate a failure; only that the vehicle does not meet all the criteria necessary to complete the OTA update installation.

Some customers may comment that the radio appears to stay on or is backlit after exiting the vehicle. If this occurs, it’s a telltale sign that an OTA update is in progress.

If an OTA fails to update ensure there is no 3rd party dongle connected to the ALDL of the vehicle. This could block an OTA from completing.

Proper Battery Charging

If a low battery SOC is preventing the OTA update installation, the 12V battery should be charged to meet the target SOC of 70 percent.

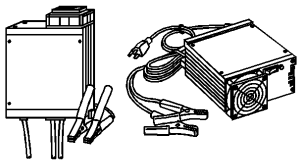
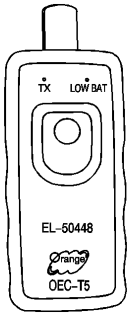
On some GM models, connecting the battery charger directly to the 12V battery posts will bypass the Battery Sensor Module, resulting in a default SOC value of 65 percent and a “Conditions Not Met” message.

Note: The Battery Sensor Module is attached directly to the battery negative terminal. It determines the battery condition by calculating the battery SOC, functions, and state of health, which is used to help determine if the 12V Stop/Start system will allow an Auto Stop when the vehicle has come to a stop. To properly charge the battery, the negative lead of the charger must be connected to chassis ground, and not directly to the negative battery post. Connecting to chassis ground allows current to flow through the Battery Sensor Module during charging as well as be monitored. The current cannot be monitored by the Battery Sensor Module if the negative lead of the charger is directly connected to the negative battery post.If a battery is improperly charged, the Battery Sensor Learn will be required to calibrate the Battery

Sensor Module. With the ignition off, let the vehicle rest for a minimum of four hours without any interruptions (opening a door, using the key fob, etc.). Verify if the battery SOC is 70 percent or greater using GDS 2 before attempting to continue with an OTA update.

Special Tools and Equipment

Special Tools

Illustration	Tool Number/ Description
 2223727	EL 49642 SPS Programming Support Tool
 2563769	EL 50448 Tire Pressure Monitor Sensor Activation Tool
5443144	EL 52100 Multi Diagnostic Interface 2 (MDI 2)
5331982	EL 52545 Tire Pressure Monitor Sensor and RF Diagnostic Tool
5608151	EL 52800 Battery Charger/Tester

Vehicle Diagnostic Information

Specifications

A11 Radio: Scan Tool Information

A11 Radio: Scan Tool Information

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON			
Data Display			
• Infotainment System Status	—	Run	Indicates the status of the infotainment system.
• Rearview Camera Supply Current	—	Varies	Indicates the rearview camera supply current
• Rearview Camera Supply Voltage	—	10V	Indicates the rearview camera supply voltage..
• Control Module Temperature Sensor 1	—	Varies	This displays the temperature reading of the control module temperature sensor 1.
• Control Module Temperature Sensor 2	—	Varies	This displays the temperature reading of the control module temperature sensor 2.
• Control Module Operation Mode	—	Run	This displays the current operational mode of the control module.
• Battery Saver Mode	—	On/Off	Indicates if battery saver mode is active.
Ethernet Bus Data			
• Ethernet Bus Master Clock	—	Yes/No	Ethernet Bus Master Clock
• Rear Seat Infotainment Module to Radio Ethernet Data Received	—	Yes/No	Indicates if the radio has received data from the rear seat infotainment module.
• Telematics Control Module to Radio Ethernet Data Ready To Transmit	—	Yes/No	Indicates if the telematics control module ethernet data is ready to transmit to the radio.
• Ethernet Port 0 Receive Failure Count	—	Varies	Displays failures in counts (Rear Seat Infotainment)
• Ethernet Port 0 Transmit Failure Count	—	Varies	Displays failures in counts (Rear Seat Infotainment)
• Ethernet Port 1 Receive Failure Count	—	Varies	Displays failures in counts (Audio Amplifier)
• Ethernet Port 1 Transmit Failure Count	—	Varies	Displays failures in counts (Audio Amplifier)
• Ethernet Port 2 Receive Failure Count	—	Varies	Displays failures in counts (Central Gateway Module)
• Ethernet Port 2 Transmit Failure Count	—	Varies	Displays failures in counts (Central Gateway Module)
• Ethernet Port 3 Receive Failure Count	—	Varies	Displays failures in counts (Telematics Control Module)
• Ethernet Port 3 Transmit Failure Count	—	Varies	Displays failures in counts (Telematics Control Module)

Parameter	System State	Expected Value	Description
• Ethernet Port 4 Receive Failure Count	—	Varies	Displays failures in counts
• Ethernet Port 4 Transmit Failure Count	—	Varies	Displays failures in counts
• Ethernet Port 5 Receive Failure Count	—	Varies	Displays failures in counts
• Ethernet Port 5 Transmit Failure Count	—	Varies	Displays failures in counts
• Ethernet Port 6 Receive Failure Count	—	Varies	Displays failures in counts
• Ethernet Port 6 Transmit Failure Count	—	Varies	Displays failures in counts
• Ethernet Port 0 IP Address	—	Varies	Displays ethernet IP address
• Ethernet Port 1 IP Address	—	Varies	Displays ethernet IP address
• Ethernet Port 2 IP Address	—	Varies	Displays ethernet IP address
• Ethernet Port 3 IP Address	—	Varies	Displays ethernet IP address
• Ethernet Port 4 IP Address	—	Varies	Displays ethernet IP address
• Ethernet Port 5 IP Address	—	Varies	Displays ethernet IP address
• Ethernet Port 6 IP Address	—	Varies	Displays ethernet IP address
Configuration Data			
• Manufacturer Enable Counter	—	Varies	Displays in counts
Bluetooth Data			
• Number of Bluetooth Devices Connected	—	Varies 1–10	Indicates the number of Bluetooth paired to the vehicle.
• Bluetooth Device 1: Connection Status	—	Varies	Indicates the device status. (0) Unconnected, (1) Connected / Idle, (2) Call active, (3) 3-way calling active
• Bluetooth Device 1: Friendly Name	—	Varies	The scan tool displays a decimal value between 0 and 255.
• Bluetooth Device 2: Connection Status	—	Varies	Indicates the device status. (0) Unconnected, (1) Connected / Idle, (2) Call active, (3) 3-way calling active
• Bluetooth Device 2: Friendly Name	—	Varies	Displays the bluetooth phone to telematics communication interface control module status.
• Bluetooth Device 3: Connection Status	—	Varies	Indicates the device status. (0) Unconnected, (1) Connected / Idle, (2) Call active, (3) 3-way calling active
• Bluetooth Device 3: Friendly Name	—	Varies	Indicates the name given to the paired device
• Bluetooth Device 4: Connection Status	—	Varies	Indicates the device status. (0) Unconnected, (1) Connected / Idle, (2) Call active, (3) 3-way calling active

Parameter	System State	Expected Value	Description
• Bluetooth Device 4: Friendly Name	—	Varies	Indicates the name given to the paired device
• Bluetooth Device 5: Connection Status	—	Varies	Indicates the device status. (0) Unconnected, (1) Connected / Idle, (2) Call active, (3) 3-way calling active
• Bluetooth Device 5: Friendly Name	—	Varies	Indicates the name given to the paired device
• Bluetooth Device 6: Connection Status	—	Varies	Indicates the device status. (0) Unconnected, (1) Connected / Idle, (2) Call active, (3) 3-way calling active
• Bluetooth Device 6: Friendly Name	—	Varies	Indicates the name given to the paired device
• Bluetooth Device 7: Connection Status	—	Varies	Indicates the device status. (0) Unconnected, (1) Connected / Idle, (2) Call active, (3) 3-way calling active
• Bluetooth Device 7: Friendly Name	—	Varies	Indicates the name given to the paired device
• Bluetooth Device 8: Connection Status	—	Varies	Indicates the device status. (0) Unconnected, (1) Connected / Idle, (2) Call active, (3) 3-way calling active
• Bluetooth Device 8: Friendly Name	—	Varies	Indicates the name given to the paired device
• Bluetooth Device 9: Connection Status	—	Varies	Indicates the device status. (0) Unconnected, (1) Connected / Idle, (2) Call active, (3) 3-way calling active
• Bluetooth Device 9: Friendly Name	—	Varies	Indicates the name given to the paired device
• Bluetooth Device 10: Connection Status	—	Varies	Indicates the device status. (0) Unconnected, (1) Connected / Idle, (2) Call active, (3) 3-way calling active
• Bluetooth Device 10: Friendly Name	—	Varies	Indicates the name given to the paired device
GPS Data			
Longitude at Last GPS Fix	—	Varies	Indicates the longitude coordinates at the last GPS signal reveived
Latitude at Last GPS Fix	—	Varies	Indicates the latitude coordinates at the last GPS signal reveived
Audio Data			
Left Rear Audio Output	—	Active/Not Active	Indicates the status of the audio output
Right Front Audio Output	—	Active/Not Active	Indicates the status of the audio output
Left Front Audio Output	—	Active/Not Active	Indicates the status of the audio output
Right Rear Audio Output	—	Active/Not Active	Indicates the status of the audio output
Current AM Frequency	—	Varies	Indicates the current frequency the radio is set to
Current FM Frequency	—	Varies	Indicates the current frequency the radio is set to
Auxiliary Input Data			
Infotainment Control Switch, Switch 1	—	Yes/No	Indicates if the switch is pressed
Infotainment Control Switch, Switch 2	—	Yes/No	Indicates if the switch is pressed
Infotainment Control Switch, Switch 3	—	Yes/No	Indicates if the switch is pressed
Infotainment Control Switch, Switch 4	—	Yes/No	Indicates if the switch is pressed

Parameter	System State	Expected Value	Description
Infotainment Control Switch, Switch 5	—	Yes/No	Indicates if the switch is pressed
Infotainment Control Switch, Switch 6	—	Yes/No	Indicates if the switch is pressed
Infotainment Control Switch, Switch 7	—	Yes/No	Indicates if the switch is pressed
Infotainment Control Switch, Switch 8	—	Yes/No	Indicates if the switch is pressed
Infotainment Control Switch, Knob 1 Push Switch	—	Yes/No	Indicates if the switch is pressed
Infotainment Control Switch, Knob 1 Rotary Position	—	Varies	Displays the counts when the knob is turned
Infotainment Control Switch, Knob 2 Push Switch	—	Yes/No	Indicates if the switch is pressed
Infotainment Control Switch, Knob 2 Rotary Position	—	Varies	Displays the counts when the knob is turned

A11 Radio: Scan Tool Output Controls

Output Control	Description
Display Check	
Info Display Dimming	Allows control of the info display dimming
Backlight Dimming	Allows control of the backlight dimming
Rearview Camera Display	Allows the rearview camera to be turned on and off
Radio Controls	
Radio Tuner AM Frequency	Allows control of the AM tuner frequency
Radio Tuner FM Frequency	Allows control of the FM tuner frequency

A26 Heater and Air Conditioning User Interface Control - Front: Scan Tool Information

A26 Heater and Air Conditioning User Interface Control– Front Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/ Vehicle in Service Mode			
Base Model Part Number	—	Varies	The 8– Digit Base Model Part Number is the part number for the hardware without software and calibrations.
Base Model Part Number – Alpha Code	—	Varies	The scan tool displays the Base Model Alpha Code
Boot Software Number	—	Varies	The scan tool displays the 8– Digit Boot Software Part Number
Communication Channel Status – CAN	—	Varies	The scan tool displays the status of the CAN Bus
Diagnostic Data Identifier	—	Varies	The scan tool displays the 4 character alphanumeric device ID.
End Model Part Number	—	Varies	The 8– Digit End Model Part Number is the part number for the hardware of the control module with software and calibrations.
End Model Part Number – Alpha Code	—	Varies	The scan tool displays the End Model Alpha Code

Parameter	System State	Expected Value	Description
Power Mode	—	Run	The scan tool displays the current vehicle power mode.
Vehicle Identification Number (VIN)	—	Varies	The scan tool displays the learned VIN

B174W Front View Camera - Windshield: Scan Tool Information (with UGN)

Identification Information

Parameter	System State	Expected Value	Definition
Operating Conditions: Ignition ON			
Module Diagnostic Address	–	Varies	The scan tool displays the Software Module 1 Identifier
Base Model Part Number	–	Varies	The scan tool displays the Base Model Part Number
End Model Part Number	–	Varies	The scan tool displays the End Model Part Number
Date Programmed	–	Varies	The scan tool displays the Date Programmed
Adaptive Cruise Control Disengage Hisotry Data	–	–	Refer to: Driver Assistance Systems Disable History Conditions
Adaptive Cruise Control Disengage Hisotry Data	–	–	Refer to: Driver Assistance Systems Disable History Conditions
Front Impact Mitigation Disable History Data	–	–	Refer to: Driver Assistance Systems Disable History Conditions
Lane Keep Assist Disable History	–	–	Refer to: Driver Assistance Systems Disable History Conditions
Parking Assist Disable History Data	–	–	Refer to: Parking Assist Systems Disable History Conditions
Rear Impact Mitigation Disable History Data	–	–	Refer to: Driver Assistance Systems Disable History Conditions
Trailer System Induced Disable History Data	–	–	Refer to: Driver Assistance Systems Disable History Conditions
Vehicle Dynamic System Disable History Data	–	–	Refer to: Driver Assistance Systems Disable History Conditions

B174W Front View Camera - Windshield: Scan Tool Information (without UGN)

Identification Information

Parameter	System State	Expected Value	Definition
Operating Conditions: Ignition ON			
Module Diagnostic Address	–	Varies	The scan tool displays the Software Module 1 Identifier
Base Model Part Number	–	Varies	The scan tool displays the Base Model Part Number
End Model Part Number	–	Varies	The scan tool displays the End Model Part Number
Date Programmed	–	Varies	The scan tool displays the Date Programmed

Data Display

Parameter	System State	Expected Value	Definition
Operating Conditions: Ignition ON			
Frontview Camera Module Learn Mode Status	–	Learn Successful	The scan tool displays the current learn status of the B174W Frontview Camera - Windshield

Parameter	System State	Expected Value	Definition
Frontview Camera Module Learn Mode Progress	–	100%	The scan tool displays the current learn progress of the B174W Frontview Camera - Windshield as a percentage
Yaw Rate	–	Varies	The scan tool displays the yaw offset of the B174W Frontview Camera - Windshield
Traffic Sign Memory	–	Varies	The scan tool displays if traffic sign memory is Active or Off

B218L Side Obstacle Detection Control Module - Left: Scan Tool Information

Identification Information

Parameter	System State	Expected Value	Definition
Operating Conditions: Ignition ON			
Vehicle Identification Number (VIN)	–	Varies	The scan tool displays the vehicle VIN number
Last Dealer Code or Scan Tool Serial Number	–	Varies	The scan tool displays the Last Dealer Code or Scan Tool Serial Number
Date Programmed	–	Varies	The scan tool displays the Date Programmed
Diagnostic Data Identifier	–	Varies	The scan tool displays the Diagnostic Data Identifier
Manufacturer Enable Counter	–	Varies	The scan tool displays the Manufacturer Enable Counter
Module Diagnostic Address	–	Varies	The scan tool displays the Software Module 1 Identifier
Manufacturer’s Traceability Number	–	Varies	The scan tool displays the Manufacturer’s Traceability Number
Application Software Part Number 1	–	Varies	The scan tool displays the Application Software Part Number 1
Calibration Part Number 1	–	Varies	The scan tool displays the Calibration Part Number 1
End Model Part Number	–	Varies	The scan tool displays the End Model Part Number
Base Model Part Number	–	Varies	The scan tool displays the Base Model Part Number
Application Software Part Number 1 Alpha Code	–	Varies	The scan tool displays the Application Software Part Number 1 Alpha Code
Calibration Part Number 1 Alpha Code	–	Varies	The scan tool displays the Calibration Part Number 1 Alpha Code
End Model Part Number Alpha Code	–	Varies	The scan tool displays the End Model Part Number Alpha Code
Base Model Part Number Alpha Code	–	Varies	The scan tool displays the Base Model Part Number Alpha Code

B218R Side Obstacle Detection Control Module - Right: Scan Tool Information

Identification Information

Parameter	System State	Expected Value	Definition
Operating Conditions: Ignition ON			
Vehicle Identification Number (VIN)	–	Varies	The scan tool displays the vehicle VIN number
Last Dealer Code or Scan Tool Serial Number	–	Varies	The scan tool displays the Last Dealer Code or Scan Tool Serial Number
Date Programmed	–	Varies	The scan tool displays the Date Programmed

Parameter	System State	Expected Value	Definition
Diagnostic Data Identifier	–	Varies	The scan tool displays the Diagnostic Data Identifier
Manufacturer Enable Counter	–	Varies	The scan tool displays the Manufacturer Enable Counter
Module Diagnostic Address	–	Varies	The scan tool displays the Software Module 1 Identifier
Manufacturer's Traceability Number	–	Varies	The scan tool displays the Manufacturer's Traceability Number
Application Software Part Number 1	–	Varies	The scan tool displays the Application Software Part Number 1
Calibration Part Number 1	–	Varies	The scan tool displays the Calibration Part Number 1
End Model Part Number	–	Varies	The scan tool displays the End Model Part Number
Base Model Part Number	–	Varies	The scan tool displays the Base Model Part Number
Application Software Part Number 1 Alpha Code	–	Varies	The scan tool displays the Application Software Part Number 1 Alpha Code
Calibration Part Number 1 Alpha Code	–	Varies	The scan tool displays the Calibration Part Number 1 Alpha Code
End Model Part Number Alpha Code	–	Varies	The scan tool displays the End Model Part Number Alpha Code
Base Model Part Number Alpha Code	–	Varies	The scan tool displays the Base Model Part Number Alpha Code

K9 Body Control Module: Scan Tool Information

Body Control Module — 12V Battery Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Battery Capacity	—	Varies	The scan tool displays Ah (Amp hr). Ah/20 is the amount of current a battery can supply for 20hrs until the voltage drops to 10.5V.
Battery Current	—	Varies	The scan tool displays Amps. This is the current flowing through the Battery Sensor Module.
Battery Current During Autostop	—	Varies	The scan tool displays Amps. This is the amperage flowing out of battery to maintain vehicle systems during an autostop.
Battery Sensor Internal Temperature Sensor	—	Varies	The scan tool displays temperature in Celsius.
Battery Sensor Module - Battery Nominal Resistance	—	Varies	The scan tool displays mOhm. This is the internal impedance of the 12V battery as measured by the Battery Sensor Module.
Battery Sensor Module - Battery Voltage	—	Varies	The scan tool displays Volts. This is the actual 12V battery voltage as measured by the Battery Sensor Module.

Parameter	System State	Expected Value	Description
Battery Sensor Module - Data Received	—	Yes	The scan tool displays Yes or No. This value indicates that information has been received by the Body Control Module from the Battery Sensor Module.
Battery Sensor Module - Ignition Off Minimum Battery State of Charge	—	Varies	The scan tool displays percentage (%).
Battery Sensor Module - Ignition Off Minimum Battery Voltage	—	Varies	The scan tool displays battery voltage in volts (V). This is the lowest 12V battery voltage recorded during key off.
Battery Sensor Module - Maximum Cranking Current	—	Varies	The scan tool displays maximum cranking current in amperes (A). This is the actual peak value of amps measured by the Battery Sensor Module on the previous engine crank event.
Battery Sensor Module - Minimum Cranking Voltage	—	Varies	The scan tool displays minimum cranking voltage in volts (V). This is the actual lowest voltage measured by the Battery Sensor Module on the previous engine crank event.
Battery Sensor Module - Open Circuit Voltage	—	Varies	The scan tool displays Volts.
Battery Sensor Module - Predicted Minimum Crank Voltage	—	Varies	The scan tool displays Volts. This is a value calculated by the Battery Sensor Module that predicts the minimum voltage during the next engine crank event.
Battery Sensor Module - State of Charge	—	Varies	The scan tool displays percentage (%). This is a measurement of the charge level compared to a fully charged 12V battery as measured by the Battery Sensor Module.
Battery Sensor Module State of Charge Error	—	Varies	The scan tool displays percentage (%).
Battery Sensor Module - State of Charge Status OK	—	—	—
Battery Sensor Module - State of Charge Variance	—	Varies	The scan tool displays percentage (%).
Battery Sulfation Protection Mode	—	—	—
Battery Type	—	Default	The scan tool displays Default, Flooded Battery, AGM Battery, Enhanced Flooded Battery, or Lithium Battery.
Battery Voltage Too Low	—	No	The scan tool displays Yes or No.
Charge Recovery Mode Active - Battery Saver Mode	—	0	The scan tool displays a numeric value. This indicates the level that battery saver mode is operating at. This provides an indication of what actions are being taken.

Parameter	System State	Expected Value	Description
Charge Recovery Mode Active - Battery Disconnected	—	—	—
Charge Recovery Mode Active - Charge Efficiency Off	—	—	—
Charge Recovery Mode Active - Service Tool Request	—	—	—
Charge Recovery Mode Active - State of Charge Loss	—	—	—
Charge Recovery Mode Active - Vehicle Inactive Too Long	—	—	—
Low-Voltage Battery Previous State of Charge	—	Varies	The scan tool displays percentage (%).
Low-Voltage Battery State of Charge	—	Varies	The scan tool displays percentage (%).
Low-Voltage Battery Temperature	—	Varies	The scan tool displays temperature in Celsius (°C).
Net Battery Amp Hours	—	Varies	The scan tool displays Ah. This is the sum of Amp per hour as measured through the Battery Sensor Module.
Net Battery Amp Hours Charged	—	Varies	The scan tool displays Ah.
Net Battery Amp Hours Discharged	—	Varies	The scan tool displays Ah.
Parasitic Current Greater than 0mA Counter	—	Varies	The scan tool displays min. This is a counter that tracks if the current during ignition off is within a particular range.
Parasitic Current -5.0A to -10.0A Counter	—	Varies	The scan tool displays min. This is a counter that tracks if the current during ignition off is within a particular range.
Parasitic Current 0mA to -10mA Counter	—	Varies	The scan tool displays min. This is a counter that tracks if the current during ignition off is within a particular range.
Parasitic Current -1.25A to -2.5A Counter	—	Varies	The scan tool displays min. This is a counter that tracks if the current during ignition off is within a particular range.
Parasitic Current -10mA to -20mA Counter	—	Varies	The scan tool displays min. This is a counter that tracks if the current during ignition off is within a particular range.
Parasitic Current -40mA to -80mA Counter	—	Varies	The scan tool displays min. This is a counter that tracks if the current during ignition off is within a particular range.
Parasitic Current -20mA to -40mA Counter	—	Varies	The scan tool displays min. This is a counter that tracks if the current during ignition off is within a particular range.
Parasitic Current -80mA to -160mA Counter	—	Varies	The scan tool displays min. This is a counter that tracks if the current during ignition off is within a particular range.

Parameter	System State	Expected Value	Description
Parasitic Current -10.0A or less Counter	—	Varies	The scan tool displays min. This is a counter that tracks if the current during ignition off is within a particular range.
Parasitic Current -2.5A to -5.0A Counter	—	Varies	The scan tool displays min. This is a counter that tracks if the current during ignition off is within a particular range.
Parasitic Current -640mA to -1.25A Counter	—	Varies	The scan tool displays min. This is a counter that tracks if the current during ignition off is within a particular range.
Parasitic Current -160mA to -320mA Counter	—	Varies	The scan tool displays min. This is a counter that tracks if the current during ignition off is within a particular range.
Parasitic Current -320mA to -640mA Counter	—	Varies	The scan tool displays min. This is a counter that tracks if the current during ignition off is within a particular range.
Stop/Start Mode	—	—	—
Voltage Drop During Autostop	—	Varies	The scan tool displays Volts. This is a measurement of the amount that the battery voltage has dropped during an autostop.

Body Control Module — Brake Pedal Position Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Brake Pedal Position Sensor Fully Released Learn Status	—	Yes	The scan tool displays Yes or No.
Brake Pedal Initial Travel Position Achieved	—	No	The scan tool displays Yes or No.
Brake Pedal Position Switch Circuit Signal	—	—	—
Extended Travel Brake Pedal Position Signal	—	—	—
Extended Travel Brake Pedal Position Switch	—	Inactive	The scan tool displays Active or Inactive.
Torque Converter Clutch/ Cruise Control Brake Pedal Position Switch	—	Inactive	The scan tool displays Active or Inactive.

Body Control Module — Chassis Control Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Drive Mode Select Switch 1	—	Inactive	The scan tool displays Inactive, Switch 1, Switch 2, Switch 3, Switch 4, Switch 5, Switch 6, Switch 7, Switch 8, Open/Short to Battery, Short to Ground, or Invalid. This is the primary bank of switches which the vehicle operator interfaces with for different selectable vehicle operating modes such as Sport Mode, Fuel Economy Mode...
Drive Mode Select Digital Switch 1	—	Inactive	The scan tool displays Active or Inactive. This is a discrete switch the vehicle operator interfaces with to select vehicle operating modes such as Sport Mode, Fuel Economy Mode...
Driver Shift Control Mode Switch	—	Inactive	The scan tool displays Upshift, Downshift, Inactive, or Invalid.
Hill Descent Control Switch	—	Inactive	The scan tool displays Active or Inactive.
Traction Control Switch	—	Inactive	The scan tool displays Active or Inactive. This indicates the state of the input that enables or disables the traction control system, which is a system designed to prevent loss of traction (and therefore the control of the vehicle) when excessive throttle or steering is applied by the driver.

Body Control Module — Content Theft Deterrent Alarm Trigger — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Content Theft Deterrent Alarm Status	—	Has Not Alarmed - No Alarm	The scan tool displays Has Not Alarmed - No Alarm, Alarming - Alarm, or Has Alarmed - Alarm Active. This indicates if the vehicle content theft deterrent system is in alarm mode or not.
Content Theft Deterrent Indicator	—	Off	The scan tool displays Off, On, Flashing Slow, or Flashing Fast. This is the illuminating lamp on the instrument cluster that indicates if the vehicle security system is active or not.
Current Content Theft Deterrent Trigger	—	No Information/None	This indicates what factor led to the activation of the content theft deterrent system.
Content Theft Deterrent Trigger History 1	—	No Information/None	This indicates the factor that led to the first history reason for activation of the content theft deterrent system.

Parameter	System State	Expected Value	Description
Content Theft Deterrent Trigger History 2	—	No Information/None	This indicates the factor that led to the second history reason for activation of the content theft deterrent system.
Content Theft Deterrent Trigger History 3	—	No Information/None	This indicates the factor that led to the third history reason for activation of the content theft deterrent system.
Glass Breakage	—	Not Detected	The scan tool displays Not Detected or Detected. This parameter indicates the damage to glass as a result to breaking. Glass divides into pieces as a result of a sudden or violent action.
Horn Relay Command	—	Inactive	The scan tool displays Active or Inactive. This refers to a request to initiate the sound for a vehicle's loud warning signal. This is used to display whether the Body Control Module is commanding the horn relay to be on or off.
Liftglass	—	Inactive	The scan tool displays Active or Inactive. The liftglass ajar warning light will be illuminated when the liftglass is not properly closed. This parameter indicates if the liftglass active or inactive.
Power Sounder Content Theft Deterrent Alarm Module Command	—	No Alarm	The scan tool displays No Alarm or Alarm Active. The power sounder is part of the vehicle's theft deterrent system. This parameter shows if the power sounder is commanded active (monitoring for vehicle theft attempt) or not.
Power Sounder Content Theft Deterrent Alarm Module Internal Battery State of Charge	—	OK	The scan tool displays OK or Not OK. This parameter describes the internal battery state of charge in the Power Sounder Content Theft Deterrent Alarm Module.
Rear Closure Unlock Command	—	Inactive	The scan tool displays Active or Inactive. This parameter for the rear closure unlock relay or unlock actuator will display On/Off upon the door being commanded to unlock. Commanded ON is when the Body Control Module energizes the rear closure unlock relay/actuator to unlock the door.
Security Indicator Command	—	Inactive	The scan tool displays Active or Inactive. Security Indicator Command refers to the command that is sent out by the module to turn the lamp (symbolic icon) on which acts as an indicator for the active state of the security system.

Parameter	System State	Expected Value	Description
Security Siren Command	—	Not Requested	The scan tool displays Not Requested or Disarmed. This is the serial data command to activate the output circuit for the alarm siren. Alarm siren is like a horn, but will activate during a theft event to warn away intruders.
Ultrasonic Intrusion Sensor	—	Disarmed	The scan tool displays Armed or Disarmed. The rear integration module supplies a low side drive output interface to the Intrusion and Inclination Sensor.
Ultrasonic Intrusion Sensor Disable Switch Signal	—	Inactive	The scan tool displays Active or Inactive. This is the switch which enables/disables the Ultrasonic Intrusion Sensor of the vehicle.
Ultrasonic Intrusion Sensor Malfunction	—	No	The scan tool displays Yes or No. This sensor detects an unauthorized opening of the vehicle's cabin by sending and receiving ultrasonic waves. This indicates the state of the sensor to fail to operate normally.

Body Control Module — Electric Power Management Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Battery Current	—	Varies	The scan tool displays Amps. This is the current flowing through the Battery Sensor Module.
Battery Saver Mode	—	Off	The scan tool displays Off, Assembly Plant Mode, Transport Mode, or Storage Mode.
Battery Saver Mode Ignition Off - Battery Voltage less than 11.6V	—	False	The scan tool displays True or False. This will set with key off if battery voltage drops below 11.6V
Battery Saver Mode Ignition Off - Battery Voltage less than 12.0V	—	False	The scan tool displays True or False. This will set with key off if battery voltage drops below 12.0V.
Battery Saver Mode Ignition Off - Parasitic Current 100mA or greater	—	False	The scan tool displays True or False. This will set with key off if parasitic current is greater than 100mA.
Battery Saver Mode Ignition Off - Parasitic Current 1A or greater	—	False	The scan tool displays True or False. This will set with key off if parasitic current is greater than 1A.
Fuel Economy Mode	—	Active	The scan tool displays Active or Inactive.
Generator Regulator Setpoint	—	—	The scan tool displays Volts.

Parameter	System State	Expected Value	Description
Load Shed Reason	—	Varies	The scan tool displays Amp Hour Demand Too High, Regulated Voltage Control, Hybrid/EV Battery State of Charge Low, Low Voltage, Service Tool Request, Battery Save Mode, or None. This provides indication of what is causing vehicle loads to be turned off in an attempt to prolong 12V battery life.
Load Shed Requested	—	—	—
Low-Voltage Battery Previous State of Charge	—	Varies	The scan tool displays percentage (%).
Low-Voltage Battery State of Charge	—	Varies	The scan tool displays percentage (%).
Low-Voltage Battery Temperature	—	Varies	The scan tool displays temperature in Celsius (°C).
Requested Idle Boost Level	—	Varies	The scan tool displays Assembly Plant Mode, Low Temperature, Ah, HVAC Request, Low Voltage, Remote Start, Service Tool Request, or None.
Regulated Voltage Control Mode	—	Varies	The scan tool displays Remote Start, Fuel Economy Mode, Normal, Charge Recovery Mode, Assembly Plant Mode, or Ignition and Start Switch Start.
Stop/Start Mode	—	—	—

Body Control Module — Front Exterior Lighting Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Headlamp Leveling Function	—	Inactive	The scan tool displays Active or Inactive.
Headlamp Leveling Sensor Learn	—	Learn Not Enabled	The scan tool displays Learn Not Enabled, Learning, Learn Successful, or Learn Failed. This parameter indicates the headlamp learns suspension trim position.
Left Headlamp Vertical Motor Command	—	Inactive	This scan tool displays Active or Inactive.
Right Headlamp Vertical Motor Command	—	Inactive	This scan tool displays Active or Inactive.
Left Auxiliary Daytime Running Lamps	—	Off	The scan tool displays On or Off.
Right Auxiliary Daytime Running Lamps	—	Off	The scan tool displays On or Off.
Left Daytime Running Lamps	—	Off	The scan tool displays On or Off.
Right Daytime Running Lamps	—	Off	The scan tool displays On or Off.
Left Front Auxiliary Park Lamp Command	—	Off	The scan tool displays On or Off.

Parameter	System State	Expected Value	Description
Right Front Auxiliary Park Lamp Command	—	Off	The scan tool displays On or Off.
Left Low Beam Command	—	Inactive	The scan tool displays Active or Inactive.
Right Low Beam Command	—	Inactive	The scan tool displays Active or Inactive.
Left Front Turn Signal Lamp Command	—	Off	The scan tool displays On or Off.
Right Front Turn Signal Lamp Command	—	Off	The scan tool displays On or Off.
Left Front Fog Lamp Command	—	Off	The scan tool displays On or Off.
Right Front Fog Lamp Command	—	Off	The scan tool displays On or Off.
Left Park Lamps Command	—	Off	The scan tool displays On or Off.
Right Park Lamps Command	—	Off	The scan tool displays On or Off.
Left Turn Signal Repeater Lamp Command	—	Off	The scan tool displays On or Off.
Right Turn Signal Repeater Lamp Command	—	Off	The scan tool displays On or Off.
Surround View Exterior Courtesy Lamps Command	—	Off	The scan tool displays On or Off.

Body Control Module — Heated Steering Wheel Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Heated Steering Wheel Indicator	—	Off	The scan tool displays Off, Low, Medium, or High.
Heated Steering Wheel Request Source	—	Switch	The scan tool displays Switch or Remote Vehicle Start.
Heated Steering Wheel Command	—	Off	The scan tool displays Off, Low, Medium, or High.
Heated Steering Wheel Relay	—	Inactive	The scan tool displays Active or Inactive.
Heated Steering Wheel Switch	—	Inactive	The scan tool displays Active or Inactive.
Service Heated Steering Wheel Indicator	—	Inactive	The scan tool displays Active or Inactive.
Heated Steering Wheel Load Reduction	—	Inactive	The scan tool displays Active or Inactive.
Heated Steering Wheel Mode	—	Off	The scan tool displays Off, Remote Vehicle Start, Automatic, or Switch.
Heated Steering Wheel Diagnostic Fault Active - Stuck Switch	—	Inactive	The scan tool displays Active or Inactive.
Heated Steering Wheel	—	Inactive	The scan tool displays Active or Inactive.
Heated Steering Wheel Internal Temperature	—	Off	The scan tool displays Off, Low, Medium, or High.

Body Control Module — HVAC Sensor Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
A/C Evaporator Temperature	—	Varies	The scan tool displays temperature in Celsius (°C) or Fahrenheit (°F). This parameter refers to the sensor used to determine the temperature of the air conditioning system's evaporator. The temperature is displayed with a low level of detail.
A/C Evaporator Temperature	—	Varies	The scan tool displays temperature in Celsius (°C) or Fahrenheit (°F). This parameter indicates the temperature (degrees of heat) of the air conditioning system's evaporator.
Ambient Air Temperature	—	Varies	The scan tool displays temperature in Celsius (°C) or Fahrenheit (°F). This parameter indicates the temperature of the air surrounding the vehicle.
Humidity Level at the Windshield	—	Varies	The scan tool displays percentage (%). This is the measurement of the amount of moisture near the windshield that is used by the heating, ventilation, air conditioning (HVAC) system to prevent fogging.
Left Front HVAC Mode Status	—	Not Determined	The scan tool displays Not Determined, Off, Auto, Floor, Floor and Vent, Vent, Vent and Windshield, Windshield, Floor and Windshield, or Floor and Vent and Windshield, or Max Defrost. This parameter describes what state the heating, ventilation, air conditioning system is in for the front left area of the vehicle cabin.
Left Front Passenger Compartment Air Temperature	—	Varies	The scan tool displays the amount of heat in the air in the left front area of the interior cabin of the vehicle in Celsius (°C) or Fahrenheit (°F).
Left Rear HVAC Mode Status	—	Not Determined	The scan tool displays Not Determined, Off, Auto, Floor, Floor and Vent, Vent, Vent and Roof, Roof, Roof and Floor, or Floor and Vent and Roof. This parameter describes what state the heating, ventilation, air conditioning system is in for the rear left area of the vehicle cabin.
Passenger Compartment Air Temperature Sensor Voltage	—	Varies	The scan tool displays the voltage of the passenger compartment air temperature sensor in mV.

Parameter	System State	Expected Value	Description
Passenger Compartment Humidity	—	Varies	The scan tool displays percentage (%). The parameter indicates the amount of water in the air in the passenger compartment.
Rear Lower Duct Air Temperature Sensor Voltage	—	Varies	The scan tool displays Volts. This is a temperature sensor used to monitor the air temperature from the rear floor ducts.
Right Front HVAC Mode Status	—	Not Determined	The scan tool displays Not Determined, Off, Auto, Floor, Floor and Vent, Vent, Vent and Windshield, Windshield, Floor and Windshield, or Floor and Vent and Windshield, or Max Defrost. This parameter describes what state the heating, ventilation, air conditioning system is in for the front right area of the vehicle cabin.
Right Front Passenger Compartment Air Temperature	—	Varies	The scan tool displays the amount of heat in the air in the right front area of the interior cabin of the vehicle in Celsius (°C) or Fahrenheit (°F).
Right Rear HVAC Mode Status	—	Not Determined	The scan tool displays Not Determined, Off, Auto, Floor, Floor and Vent, Vent, Vent and Roof, Roof, Roof and Floor, or Floor and Vent and Roof. This parameter describes what state the heating, ventilation, air conditioning system is in for the rear right area of the vehicle cabin.
Sunload Sensor Voltage	—	Varies	The scan tool displays Volts. This is a sensor that detects how warm the sun is shining.
Windshield Temperature	—	Varies	The scan tool displays temperature in Celsius (°C) or Fahrenheit (°F). This parameter detects the temperature of the front window (windshield).

Body Control Module — HVAC System Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
A/C Compressor Refrigerant Solenoid Valve Command	—	Varies	The scan tool displays percentage (%).

Parameter	System State	Expected Value	Description
A/C Compressor Displacement	—	Ready	The scan tool displays Ready, Ramp up, Running, or Ramp down. A variable displacement air conditioning compressor has the ability to change the amount of refrigerant that is pumped into the system (output) while it is running by way of a pulse width modulated (PWM) solenoid. A PWM solenoid will vary the compressor output by using a DC supply voltage that is switched on and off at a given frequency for a modulated period of time (duty cycle). The duty cycle is the “on” time of the voltage and is expressed as a percentage of the time period. This parameter describes the condition in which a variable displacement air conditioning compressor is increasing displacement, holding steady, or decreasing displacement.
A/C Switch	—	Compressor Off	The scan tool displays Compressor Off, Compressor On, or Compressor In Econ. This parameter is used to indicate the status of the signal being sent to the Engine Control Module to turn the A/C on.
Air Quality Sensor	—	Varies	The scan tool displays percentage (%). This is a sensor that measures the amount of contamination, pollution, dirt, odor in the ambient air.
Air Quality Recirculation Control	—	Inactive	The scan tool displays Active or Inactive. The recirculation door in an air conditioning system has the ability to either allow fresh air into the vehicle or to pass the existing cabin air back through the air conditioning system. The recirculation door will be closed if the Air Quality Sensor detects oxidizing, reducing, or ammonia gasses and reopens the door when these gasses are no longer detected.
Auxiliary Blower Motor Speed Command	—	Varies	This parameter shows the value (counts) being sent to command the rear blower from the Auxiliary Blower switch on the front panel. This describes the rear blower motor for the HVAC system. This is supplemental to the primary blower fan.

Parameter	System State	Expected Value	Description
Auxiliary Coolant Pump	—	Inactive	The scan tool displays Active or Inactive. The Auxiliary Coolant Pump refers to a second engine cooling pump that may be devoted to a different function other than for purposes of engine cooling.
Auxiliary Coolant Pump Dry	—	Inactive	The scan tool displays Active or Inactive. This parameter contains the fault information that is communicated by the Electric Auxiliary Coolant Pump over Local Interconnect Network (LIN) to the engine controller. An electric coolant pump circulates engine coolant. This indicates whether the pump was operated without coolant.
Auxiliary Coolant Pump Internal Status	—	Inactive	The scan tool displays Active or Inactive. This parameter contains the fault information that is communicated by the Electric Auxiliary Coolant Pump over Local Interconnect Network (LIN) to the engine controller. An electric coolant pump circulates engine coolant. This indicates whether the pump indicates an internal error.
Auxiliary Coolant Pump Motor Stalled	—	Inactive	The scan tool displays Active or Inactive. This parameter contains the fault information that is communicated by the Electric Auxiliary Coolant Pump over Local Interconnect Network (LIN) to the engine controller. An electric coolant pump circulates engine coolant. This indicates whether the pump has stopped running.
Auxiliary Heater Enable Signal	—	Inactive	The scan tool displays Active or Inactive.
Blower Motor Feedback Signal	—	Varies	The scan tool displays percentage (%). The Blower Motor passes air through the heater core and circulates air throughout the passenger compartment. The Blower Motor is controlled by a module. This parameter indicates the Blower Motor operation Feedback Signal received by the module.
Blower Motor Speed	—	Varies	This parameter indicates the commanded HVAC Blower Motor Speed, displayed in percent, that the blower is turning. The blower motor is a motor with a cage attached to force the air through ducts such as heater, ventilation and defrost ducts.

Parameter	System State	Expected Value	Description
Blower Motor Speed Command	—	Varies	This parameter indicates the commanded HVAC Blower Motor Speed, displayed in percent, that the blower is turning. The blower motor is a motor with a cage attached to force the air through ducts such as heater, ventilation and defrost ducts.
Blower Motor Speed Feedback Signal	—	Normal Function	The scan tool displays Out of Range Low, Stall, Partial Stall, Voltage Out of Range, Normal Function, Motor Over Temperature, Not Used, Mechanical Malfunction, or Out of Range High. The Blower Motor passes air through the heater core and circulates air throughout the passenger compartment. The Blower Motor is controlled by a module. This parameter indicates the Blower Motor operation Feedback Signal received by the module.
Blower Motor Speed Request	—	—	This parameter shows the current state of the switch that turns on the front blower (device that produces a current of air).
Calculated A/C Evaporator Air Temperature	—	Varies	The scan tool displays temperature in Celsius (°C). This parameter indicates the calculated temperature (degrees of heat) of the air that is flowing through the evaporator. The temperature is calculated by the HVAC controller using parameters such as outside air temperature, evaporator temperature and compressor status. An evaporator is a device in a process used to turn the liquid form of a chemical substance into its gaseous-form/vapor.
Coolant Heater Control Module Inlet Coolant Temperature	—	Varies	The scan tool displays this parameter Identifier as a value between -40°C and 150°C approximately to reflect Inlet Coolant Temperature into Coolant Heater Control Module, reported by Coolant Heater Control Module.
Coolant Heater Control Module LIN Bus	—	True	The scan tool displays this parameter identifier as False or True. This parameter identifier is indicative of a Signal State of Coolant Heater Operation Enable from Electronic Climate Control to Coolant Heater Control Module on Local Interconnect Network Bus that allows Coolant Heater to Start Diagnostics whether or not Heating is commanded.

Parameter	System State	Expected Value	Description
Coolant Heater Control Module Status	—	Normal Function	The scan tool displays Normal Function, Temporarily Limited, Recoverable Malfunction, or Non-Recoverable Malfunction. This parameter is used to determine whether the Coolant Heater Control Module is operating normally (Normal Operation) or if there is a problem with a) the Coolant Heater Control Module (scan tool displays only Limited Operation) or b) there is a blockage or restriction in coolant flow (scan tool switches between Normal Running and Limited Operation).
Coolant Heater Control Module Temperature	—	Varies	The scan tool displays temperature in Celsius (°C). This is the temperature inside the coolant heater control module.
Coolant Heater Current	—	Varies	The scan tool displays the present electric current flow value of the coolant heater in amps.
Desired Engine Coolant Bypass Valve Position	—	Not Requested	The scan tool displays Not Requested, Bypass, or Connected. This parameter displays the requested target position of the Coolant Bypass Valve.
Engine Coolant Heater Command	—	Varies	The scan tool displays in kW. This is the serial data command to control the device to heat up the coolant in case the engine does not produce enough heat.
Front Blower Motor State	—	Varies	The scan tool displays Not Determined, Off, Auto, Manual, or Manual Max. This parameter indicates the current mode or condition of the front blower motor.
Heater Pump Speed	—	Varies	The scan tool displays the heater pump speed in RPM. This is a coolant pump which circulates heat through the heater core to maintain cabin temperature. While the vehicle is in Autostop, the pump can interrupt the Autosop timing, if the cabin temperature is too low.

Parameter	System State	Expected Value	Description
HVAC Afterblow	—	Inactive	The scan tool displays Active or Inactive. This parameter displays whether the afterblow function is in a functioning state or not. The afterblow function temporarily turns on the fan after the vehicle is off to dry the evaporator core which will reduce microbial growth and odors. An evaporator is a device in a process used to turn the liquid form of a chemical substance into its gaseous-form/vapor.
HVAC Afterblow - Blower Motor Speed	—	Varies	This parameter displays how fast the fan is running while in an afterblow condition. The fan speed is displayed as steps from 0 to 12 with 0 being off and 12 being the fastest speed. The afterblow function temporarily turns on the fan after the vehicle is off to dry the evaporator core which will reduce microbial growth and odors. An evaporator is a device in a process used to turn the liquid form of a chemical substance into its gaseous-form/vapor.
HVAC Afterblow Configuration	—	—	—
HVAC System Heater Core Coolant Flow Rate Feedback	—	Varies	The scan tool displays the coolant flowing rate in L/min. The HVAC System Heater Core contains coolant that flows though the core to heat the vehicle passenger compartment. The system is controlled by a module. This parameter indicates the coolant flow rate through the heater core requested by the module.
HVAC System Heater Core Coolant Flow Rate Request	—	Varies	The scan tool displays the coolant flowing rate in L/s. The HVAC System Heater Core contains coolant that flows though the core to heat the vehicle passenger compartment. The system is controlled by a module. This parameter indicates the coolant flow rate through the heater core requested by the module.
Rear Defogger Activated by Automatic	—	Yes	The Auto Rear Defogger (heating wires in the glass) can automatically activate if the ambient temperature is below 5°C. This parameter has the states Yes/No.
Rear Defogger Command	—	—	—
Rear Defogger Deactivation Reason	—	—	—
Rear Defogger Indicator	—	—	—
Rear Defogger Mode	—	—	—

Parameter	System State	Expected Value	Description
Rear Defogger On Time Remaining	—	—	—
Rear Defogger Relay Command	—	—	—
Rear Defogger Status	—	—	—
Rear Defogger Switch	—	—	—
Sun Azimuth	—	—	—
Sun Elevation	—	—	—

Body Control Module — HVAC Door Position Data 1 — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Air Recirculation Door Actuator Command	—	Varies	This is the serial data command to move the flap of the Recirculation Door, in counts or pulses, for a HVAC system door. Recirculation is using inside air for the HVAC system, instead of outside fresh air.
Left Temperature Door Position Command	—	Varies	The scan tool displays percentage (%). This is the serial data command to control the actual position (angle) of the flap that controls the air flow (and therefore the air temperature) through the left heater core.
Low Speed Pollution Taking Recirc Action	—	—	—

Body Control Module — HVAC Door Position Data 2 — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Right Temperature Door Position Command	—	Varies	The scan tool displays percentage (%). This is the serial data command to move the position (angle) of the flap that controls the air flow (and therefore the air temperature) through the right heater core.

Body Control Module — HVAC Faceplate Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Air Recirculation Door Position	—	Varies	The scan tool displays the command status of the HVAC control module recirculation switch: Not Determined, Auto, Fresh Air, or Recirc. The mode of recirculation means the air inside the vehicle is recirculated rather than drawn from outside.

Parameter	System State	Expected Value	Description
Air Quality Sensor Switch	—	Off	The scan tool displays Off, Low Sensitivity, or Hi Sensitivity. This parameter describes the switch state of the Air Quality Sensor on the HVAC Faceplate.
Auxiliary Blower Motor Switch	—	Off	The scan tool displays Not Determined, Off, Auto, Manual, or Manual Max. This parameter reflects the current state of the switch in the rear of the vehicle that controls the rear blower. This describes the rear blower motor for the HVAC system. This is supplemental to the primary blower fan.
Desired Left Temperature	—	Varies	The scan tool displays Temp Set Off, Temp Set Normal, Temp Set Low, or Temp Set Hi. This parameter displays the setting of left temperature.
Desired Right Temperature	—	Varies	The scan tool displays Temp Set Off, Temp Set Normal, Temp Set Low, or Temp Set Hi. This parameter displays the setting of right temperature.

Body Control Module — Hybrid/EV Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Coolant Heater Control Module Temperature	—	Varies	The scan tool displays temperature in Celsius (°C). This is the temperature inside the coolant heater control module.

Body Control Module — Indicator Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Child Security Lock Indicator command	—	Off	The scan tool displays On or Off.
Lane Departure Warning Indicator Status	—	Off	The scan tool displays On or Off.
Security Indicator Command	—	Off	The scan tool displays On or Off.

Body Control Module — Interior Lighting Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Cargo Lamp Command	—	Inactive	The scan tool displays Active or Inactive.
Cargo Lamp Indicator	—	Inactive	The scan tool displays Active or Inactive.

Parameter	System State	Expected Value	Description
Cargo Mirror Lamp	—	Inactive	The scan tool displays Active or Inactive.
Dome Lamp Command	—	Off	The scan tool displays On or Off.
Door Ambient Lighting Command	—	Off	The scan tool displays On or Off.
Front Courtesy Lamps	—	Inactive	The scan tool displays Active or Inactive.
Front Footwell Ambient Lighting Command	—	Off	The scan tool displays On or Off.
Instrument Panel Ambient Lighting Command	—	Off	The scan tool displays On or Off.
Interior Courtesy Lamps Command	—	Inactive	The scan tool displays Active or Inactive.
Left Turn Signal Switch	—	Inactive	The scan tool displays Active or Inactive.
Right Turn Signal Switch	—	Inactive	The scan tool displays Active or Inactive.
Overhead Ambient Lighting Command	—	Off	The scan tool displays On or Off.
Park Lamps Indicator	—	Inactive	The scan tool displays Active or Inactive.
Rear Footwell Ambient Lighting Command	—	Off	The scan tool displays On or Off.
Welcome Lighting	—	Off	The scan tool displays On or Off.

Body Control Module — Keyless Entry Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Current Number of Key Fobs Programmed	—	Varies	This parameter indicates how many transmitters have been learned to the Body Control Module currently.
Key Fob Identifier	—	Varies	This parameter refers to the part number of key fob or transmitter being placed in the backup pocket location that uses the radio transmitter inside a vehicle key used to control the central door locking via button presses.
Key Fob 1 Malfunction	—	No	The scan tool displays Yes or No. This parameter indicates a fault in transmitter # 1.
Key Fob 2 Malfunction	—	No	The scan tool displays Yes or No. This parameter indicates a fault in transmitter # 2.
Key Fob 3 Malfunction	—	No	The scan tool displays Yes or No. This parameter indicates a fault in transmitter # 3.
Key Fob 4 Malfunction	—	No	The scan tool displays Yes or No. This parameter indicates a fault in transmitter # 4.

Parameter	System State	Expected Value	Description
Key Fob 5 Malfunction	—	No	The scan tool displays Yes or No. This parameter indicates a fault in transmitter # 5.
Key Fob 6 Malfunction	—	No	The scan tool displays Yes or No. This parameter indicates a fault in transmitter # 6.
Key Fob 7 Malfunction	—	No	The scan tool displays Yes or No. This parameter indicates a fault in transmitter # 7.
Key Fob 8 Malfunction	—	No	The scan tool displays Yes or No. This parameter indicates a fault in transmitter # 8.
Number of Key Fobs Learned	—	Varies	This parameter indicates how many transmitters have been programmed to the Keyless Entry Control Module.
Total Key Fobs Erased	—	Off	This parameter indicates the number of transmitters erased from the Body Control Module memory.
Passive Entry Disabled Due to Lack of Motion Counter	—	Varies	This parameter indicates the count value of the passive entry inhibited due to no key fob or transmitter movement.
Passive Start Disabled Due to Excessive Motion Counter	—	Varies	This parameter indicates the count value of the passive start inhibited due to large key fob or transmitter movement.
Passive Start Diabled Due to Lack of Motion Counter	—	Varies	This parameter indicates the count value of the passive start inhibited due to no key fob or transmitter movement.

Body Control Module — Outside Rear View Mirror Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Mirror Folding	—	Inactive	The scan tool displays Inactive, Fold, or Unfold.
Mirror Select Switch	—	Not Active	The scan tool displays Active or Inactive.

Body Control Module — Power Mode Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Accessory/Retained Accessory Power Relay Command	—	Inactive	The scan tool displays Active or Inactive.
Backup Run/Crank Relay Command	—	Inactive	The scan tool displays Active or Inactive.
Backup System Power Mode	—	Off	The scan tool displays Off, Accessory, Run, Start, or Propulsion Active. This parameter indicates Power Mode determined by Serial Data Gateway Module.

Parameter	System State	Expected Value	Description
Battery Saver Mode	—	Off	The scan tool displays Off, Assembly Plant Mode, Transport Mode, or Storage Mode.
Ignition Switch Status	—	Varies	The scan tool displays Short to Ground, Active, Inactive, or Open/Short to Battery.
Power Mode	—	Varies	The scan tool displays Off, Accessory, Run, Start, or Propulsion Active. This parameter indicates the current power mode of the module.
Power Mode Timeout	—	Disable	The scan tool displays Enable or Disable. This parameter disables or enables the power mode timeout function (not whether timer is active or inactive) and indicates whether or not the power mode timeout function has been disabled allowing to stay in power mode indefinitely (not whether timer is active or inactive).
Run/Crank Relay Command	—	Inactive	The scan tool displays Active or Inactive.
Run Relay Command	—	Inactive	The scan tool displays Active or Inactive.

Body Control Module — Rear Exterior Lighting Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Backup Lamps	—	Off	The scan tool displays On or Off.
Center High Mounted Stop Lamp	—	Off	The scan tool displays On or Off.
Hands-Free Liftgate Sensor Lamp	—	Off	The scan tool displays On or Off.
Left Stop Lamp Command	—	Off	The scan tool displays On or Off.
Right Stop Lamp Command	—	Off	The scan tool displays On or Off.
Left Tail Lamp	—	Off	The scan tool displays On or Off.
Right Tail Lamp	—	Off	The scan tool displays On or Off.
Left Auxiliary Tail Lamp	—	Off	The scan tool displays On or Off.
Right Auxiliary Tail Lamp	—	Off	The scan tool displays On or Off.
Left Rear Turn Signal Lamp Command	—	Off	The scan tool displays On or Off.
Right Rear Turn Signal Lamp Command	—	Off	The scan tool displays On or Off.
Left Trailer Turn Signal/Stop Lamp Command	—	Off	The scan tool displays On or Off.

Parameter	System State	Expected Value	Description
Right Trailer Turn Signal/Stop Lamp Command	—	Off	The scan tool displays On or Off.
License Plate Lamps Command	—	Off	The scan tool displays On or Off.
Rear Fog Lamp Command	—	Off	The scan tool displays On or Off.
Tail Lamps	—	Off	The scan tool displays On or Off.
Trailer Backup Lamps Command	—	Off	The scan tool displays On or Off.

Body Control Module — Rear HVAC Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Lower Rear Duct Temperature	—	Varies	The scan tool displays temperature in Celsius (°C). This is the temperature reading in the HVAC air routing system.
Upper Rear Duct Temperature	—	Varies	The scan tool displays temperature in Celsius (°C). This is the temperature reading in the HVAC air routing system.

Body Control Module — Remote Vehicle Start Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Engine Stalled During Remote Vehicle Start Mode	—	Varies	This parameter indicates the number of times the engine was stalled or unexpectedly stops running. This is part of the Remote Vehicle Start subsystem that disables remote start.
Park Lamps Request	—	No	The scan tool displays Yes or No. This parameter refers to the state (on or off) of the electronic request to illuminate the lamps located on the exterior four corners of the vehicle.
Remote Vehicle Start Disabled By Driver	—	Varies	This parameter determines if remote vehicle start was turned off by the driver. Remote start is activated by pressing a button on the key fob which allows the engine to start when the key fob is several yards from the vehicle.
Remote Vehicle Start Request	—	No	The scan tool displays Yes or No. This parameter displays the On / Off position or status for the remote start functionality.

Parameter	System State	Expected Value	Description
Remote Vehicle Start Source	—	None	The scan tool displays None, Key Fob 1, Key Fob 2, Key Fob 3, Enhanced Services, or Virtual Key. This parameter indicates which key fob was used for Remote Vehicle Start such as husband, wife, child, Onstar, bluetooth, etc...
Remote Vehicle Start Status	—	Inactive	The scan tool displays Yes or No. This parameter indicates the state of remote start which is activated by pressing a button on the key fob which allows the engine to start when the key fob is several yards from the vehicle. States are active or inactive.
Remote Vehicle Start Timer	—	Varies	This parameter indicates the amount of time the engine will run after a remote start request. One additional request is allowed which will reset the timer once. The scan tool displays time remaining in seconds.
Run/Crank Relay Command	—	None	The scan tool displays None, Active, or Deactive. This parameter indicates the state (off or on) of command for an ignition relay control circuit. "Run" means engine is started and keeps going, and "crank" engages the starter when the key in the ignition switch turns making engine turn over.
Turn Signal Lamps Request	—	No	The scan tool displays Yes or No. This parameter indicates the request for the turn signal lamps to flash during a remote start request and remain on for visual confirmation the remote start is functioning.

Body Control Module — Remote Vehicle Start Disable History Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Remote Vehicle Start Disable History 1	—	Varies	The scan tool displays Valet Mode, Run Abort, Ignition Switch Status, Hood Open Switch Signal Invalid, Hood Open Switch, Hazard Lamps Switch, Key Fob in Vehicle, Crank Abort, Brake Transmission Shift Interlock Solenoid Actuator, Content Theft Deterrent Mode, Power Mode Incorrect, Battery Voltage, Remote Vehicle Start Crank Time, or Folding Top Position. This parameter indicates one of the last eight reasons the powertrain has disabled the remote vehicle start.

Parameter	System State	Expected Value	Description
Remote Vehicle Start Disable History 2	—	Varies	The scan tool displays Valet Mode, Run Abort, Ignition Switch Status, Hood Open Switch Signal Invalid, Hood Open Switch, Hazard Lamps Switch, Key Fob in Vehicle, Crank Abort, Brake Transmission Shift Interlock Solenoid Actuator, Content Theft Deterrent Mode, Power Mode Incorrect, Battery Voltage, Remote Vehicle Start Crank Time, or Folding Top Position. This parameter indicates one of the last eight reasons the powertrain has disabled the remote vehicle start.
Remote Vehicle Start Disable History 3	—	Varies	The scan tool displays Valet Mode, Run Abort, Ignition Switch Status, Hood Open Switch Signal Invalid, Hood Open Switch, Hazard Lamps Switch, Key Fob in Vehicle, Crank Abort, Brake Transmission Shift Interlock Solenoid Actuator, Content Theft Deterrent Mode, Power Mode Incorrect, Battery Voltage, Remote Vehicle Start Crank Time, or Folding Top Position. This parameter indicates one of the last eight reasons the powertrain has disabled the remote vehicle start.

Body Control Module — Seat Heating/Venting/Cooling Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Seat Heating/Venting/Cooling Load Shed	—	Inactive	The scan tool displays Active or Inactive. When this parameter is active, it indicates the Heating/Venting/Cooling system is shutdown to reduce strain on the vehicle electrical system which is experiencing too high of a current draw.
Left Front Seat Heating/Venting/Cooling Operating Conditions	—	Varies	The scan tool displays Remote Vehicle Start, Automatic, Manual, or Autostop Request. The functional behavior of heated seats is dependent on its determined operational state. This parameter indicates the defined state which it is operating in.

Parameter	System State	Expected Value	Description
Left Front Seat Heating/ Venting/Cooling Requested Mode	—	Varies	The scan tool displays Off, Seat Back Heating, Seat Back and Cushion Heating, or Seat Venting/Cooling. This parameter indicates the type of Heated/Vented Seat function being requested, as determined by the Body Control Module tracking various inputs.
Left Front Seat Heating/ Venting/Cooling Requested Level	—	Varies	The scan tool displays Off, High, Medium, or Low. This parameter indicates the type of Heated/Vented Seat level of intensity being requested as determined by the Body Control Module tracking various inputs.
Left Front Seat Heating/ Venting/Cooling Mode	—	Varies	The scan tool displays Off, Seat Back Heating, Seat Back and Cushion Heating, or Seat Venting/Cooling. This parameter indicates the type of Heated/Vented Seat function being applied as commanded by the Body Control Module software based on a number of factors.
Left Front Seat Heating/ Venting/Cooling Level	—	Varies	The scan tool displays Off, High, Medium, or Low. This parameter indicates the type of Heated/Vented Seat level of intensity being applied as commanded by the Body Control Module software based on a number of factors.
Left Front Seat Blower Command	—	Inactive	The scan tool displays Active or Inactive. This parameter can be used for setting various blower speeds but service tool will only turn on high to verify module outputs and fan operation.
Right Front Seat Heating/ Venting/Cooling Operating Conditions	—	Varies	The scan tool displays Remote Vehicle Start, Automatic, Manual, or Autostop Request. The functional behavior of heated seats is dependent on its determined operational state. This parameter indicates the defined state which it is operating in.
Right Front Seat Heating/ Venting/Cooling Requested Mode	—	Varies	The scan tool displays Off, Seat Back Heating, Seat Back and Cushion Heating, or Seat Venting/Cooling. This parameter indicates the type of Heated/Vented Seat function being requested, as determined by the Body Control Module tracking various inputs.

Parameter	System State	Expected Value	Description
Right Front Seat Heating/ Venting/Cooling Requested Level	—	Varies	The scan tool displays Off, High, Medium, or Low. This parameter indicates the type of Heated/Vented Seat level of intensity being requested as determined by the Body Control Module tracking various inputs.
Right Front Seat Heating/ Venting/Cooling Mode	—	Varies	The scan tool displays Off, Seat Back Heating, Seat Back and Cushion Heating, or Seat Venting/Cooling. This parameter indicates the type of Heated/Vented Seat function being applied as commanded by the Body Control Module software based on a number of factors.
Right Front Seat Heating/ Venting/Cooling Level	—	Varies	The scan tool displays Off, High, Medium, or Low. This parameter indicates the type of Heated/Vented Seat level of intensity being applied as commanded by the Body Control Module software based on a number of factors.
Right Front Seat Blower Command	—	Inactive	The scan tool displays Active or Inactive. This parameter can be used for setting various blower speeds but service tool will only turn on high to verify module outputs and fan operation.

Body Control Module — Sunroof Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Sunroof Closed	—	Yes	The scan tool displays Yes or No. This parameter indicates that sunroof is not open. The sunroof is a fixed or operable opening in an automobile roof which allows light and/or fresh air to enter the passenger compartment.
Sunroof Open	—	Yes	The scan tool displays Yes or No. This parameter indicates the sunroof state that it is not closed. The sunroof is a fixed or operable opening in an automobile roof which allows light and/or fresh air to enter the passenger compartment.
Sunroof Switch	—	Varies	The scan tool displays Inactive, Open, Close, or Stop. This is the switch to move the sunroof.
Sunroof Switch Fault	—	Varies	The scan tool displays Short to Ground, Short to Battery, Stuck, or None.

Parameter	System State	Expected Value	Description
Sunroof Not Learned	—	No	The scan tool displays Yes or No. This parameter indicates that the control module has not learned the sunroof (the glass) home position.
Sunroof Motor Overtemperature	—	No	The scan tool displays Yes or No. This parameter indicates that the motor that operates the sunroof motor is too hot to operate properly.
Sunroof Obstruction	—	No	The scan tool displays Yes or No. This parameter indicates that an obstruction is detected which prevents the movement of the sunroof.
Sunroof System Voltage Low	—	No	The scan tool displays Yes or No. This parameter indicates the sunroof performance is degraded due to voltage being below a certain threshold.
Sunroof Vent	—	No	The scan tool displays Yes or No. This parameter indicates the sunroof is partially open.
Sunshade Closed	—	Yes	The scan tool displays Yes or No.
Sunshade Open	—	Yes	The scan tool displays Yes or No.
Sunshade Switch	—	Varies	The scan tool displays Inactive, Open, Close, or Stop. This is the switch to move the sunshade (the non-transparent cover below the sunroof).
Sunshade Switch Fault	—	Varies	The scan tool displays Short to Ground, Short to Battery, Stuck, or None.
Sunshade Not Learned	—	No	The scan tool displays Yes or No. This parameter indicates that the sunshade position is not learned.
Sunshade Motor Overtemperature	—	Inactive	The scan tool displays Active or Inactive. This parameter indicates that the motor that operates the sunshade is too hot to operate properly.
Sunshade Obstruction	—	No	The scan tool displays Yes or No. This parameter indicates that an obstruction is detected which prevents the movement of the sunshade.
Sunshade System Voltage Low	—	No	The scan tool displays Yes or No. This parameter indicates that the sunshade performance is degraded due to voltage being below a certain threshold.

Body Control Module — Tire Pressure Monitoring Sensor Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Left Front Tire Pressure Sensor Identification	—	Varies	This parameter refers to the part number of the electronic device that measures the force of air on the interior surface of the left, front tire.
Left Front Tire Pressure Sensor Battery Status	—	Normal	The scan tool displays Normal or Low Pressure. This parameter displays the state of the power supply (battery) for the left front tire pressure sensor which is an electronic device that measures the force of air on the interior surface of the tire.
Left Front Tire Pressure Sensor Status	—	Varies	This parameter will display different types of sensor faults. The tire pressure sensors are mounted inside a tire assembly on valve stems or wheel rims.
Left Front Tire Pressure Sensor Signal Strength	—	Varies	The tire pressure monitoring system detects a pressure loss at the tires. Each wheel is equipped with a pressure sensor to measure the pressure and temperature. This parameter displays the signal strength of the sensor.
Left Front Tire Pressure Signal Frame Count	—	Varies	This is the number of data frames the tire pressure sensor is transmitting while driving.
Left Front Tire Pressure Signal Packet Count	—	Varies	This is the number of packet counts the tire pressure sensor is transmitting while driving.
Left Rear Tire Pressure Sensor Identification	—	Varies	This parameter refers to the part number of the electronic device that measures the force of air on the interior surface of the left, rear tire.
Left Rear Tire Pressure Sensor Battery Status	—	Normal	The scan tool displays Normal or Low Pressure. This parameter displays the state of the power supply (battery) for the left rear tire pressure sensor which is an electronic device that measures the force of air on the interior surface of the tire.
Left Rear Tire Pressure Sensor Status	—	Varies	This parameter will display different types of sensor faults. The tire pressure sensors are mounted inside a tire assembly on valve stems or wheel rims.

Parameter	System State	Expected Value	Description
Left Rear Tire Pressure Sensor Signal Strength	—	Varies	The tire pressure monitoring system detects a pressure loss at the tires. Each wheel is equipped with a pressure sensor to measure the pressure and temperature. This parameter displays the signal strength of the sensor.
Left Rear Tire Pressure Signal Frame Count	—	Varies	This is the number of data frames the tire pressure sensor is transmitting while driving.
Left Rear Tire Pressure Signal Packet Count	—	Varies	This is the number of packet counts the tire pressure sensor is transmitting while driving.
Right Front Tire Pressure Sensor Identification	—	Varies	This parameter will display the six digit identification number of the sensor indicated which is an electronic device that measures the force of air on the interior surface of the tire.
Right Front Tire Pressure Sensor Battery Status	—	Normal	The scan tool displays Normal or Low Pressure. This parameter displays the state of the power supply (battery) for the right front tire pressure sensor which is an electronic device that measures the force of air on the interior surface of the tire.
Right Front Tire Pressure Sensor Status	—	Varies	This parameter will display different types of sensor faults. The tire pressure sensors are mounted inside a tire assembly on valve stems or wheel rims.
Right Front Tire Pressure Sensor Signal Strength	—	Varies	The tire pressure monitoring system detects a pressure loss at the tires. Each wheel is equipped with a pressure sensor to measure the pressure and temperature. This parameter displays the signal strength of the sensor.
Right Front Tire Pressure Signal Frame Count	—	Varies	This is the number of data frames the tire pressure sensor is transmitting while driving.
Right Front Tire Pressure Signal Packet Count	—	Varies	This is the number of packet counts the tire pressure sensor is transmitting while driving.
Right Rear Tire Pressure Sensor Identification	—	Varies	This parameter will display the six digit identification number of the sensor indicated which is an electronic device that measures the force of air on the interior surface of the tire.

Parameter	System State	Expected Value	Description
Right Rear Tire Pressure Sensor Battery Status	—	Normal	The scan tool displays Normal or Low Pressure. This parameter displays the state of the power supply (battery) for the right rear tire pressure sensor which is an electronic device that measures the force of air on the interior surface of the tire.
Right Rear Tire Pressure Sensor Status	—	Varies	This parameter will display different types of sensor faults. The tire pressure sensors are mounted inside a tire assembly on valve stems or wheel rims.
Right Rear Tire Pressure Sensor Signal Strength	—	Varies	The tire pressure monitoring system detects a pressure loss at the tires. Each wheel is equipped with a pressure sensor to measure the pressure and temperature. This parameter displays the signal strength of the sensor.
Right Rear Tire Pressure Signal Frame Count	—	Varies	This is the number of data frames the tire pressure sensor is transmitting while driving.
Right Rear Tire Pressure Signal Packet Count	—	Varies	This is the number of packet counts the tire pressure sensor is transmitting while driving.

Body Control Module — Tire Pressure Monitoring System Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Left Front Tire Pressure	—	Varies	Tire pressure is a measure of the amount of air in a vehicle's tires, in pounds per square inch (PSI). This parameter is the amount of pressure present in the front of the vehicle on the left side.
Left Front Tire Pressure Sensor Mode	—	Varies	The scan tool displays Learn Mode - Remotely Triggered, Undefined, Re-Measure, Drive Mode, Power Down, Wake-Up, or Learn Mode - Pressure Triggered. This parameter refers to the operational level of the electronic device that measures the force of air on the interior surface of the left front tire.
Left Front Tire Pressure Status	—	Varies	The scan tool displays Unknown, Nominal, Very Low Pressure, Low, Weak Signal, or High. This parameter indicates the state of the tire based on tire pressure.

Parameter	System State	Expected Value	Description
Left Front Tire Temperature	—	Varies	The tire pressure monitoring system detects a pressure loss at the tires. Each wheel is equipped with a pressure sensor to measure the pressure and temperature. This parameter displays the temperature of the tire.
Left Rear Tire Pressure	—	Varies	Tire pressure is a measure of the amount of air in a vehicle's tires, in pounds per square inch (PSI). This parameter is the amount of pressure present in the rear of the vehicle on the left side.
Left Rear Tire Pressure Sensor Mode	—	Varies	The scan tool displays Learn Mode - Remotely Triggered, Undefined, Re-Measure, Drive Mode, Power Down, Wake-Up, or Learn Mode - Pressure Triggered. This parameter refers to the operational level of the electronic device that measures the force of air on the interior surface of the left rear tire.
Left Rear Tire Pressure Status	—	Varies	The scan tool displays Unknown, Nominal, Very Low Pressure, Low, Weak Signal, or High. This parameter identifies status of left rear tire pressure.
Left Rear Tire Temperature	—	Varies	The tire pressure monitoring system detects a pressure loss at the tires. Each wheel is equipped with a pressure sensor to measure the pressure and temperature. This parameter displays the temperature of the tire.
Right Front Tire Pressure	—	Varies	Tire pressure is a measure of the amount of air in a vehicle's tires, in pounds per square inch (PSI). This parameter is the amount of pressure present in the front of the vehicle on the right side.
Right Front Tire Pressure Sensor Mode	—	Varies	The scan tool displays Learn Mode - Remotely Triggered, Undefined, Re-Measure, Drive Mode, Power Down, Wake-Up, or Learn Mode - Pressure Triggered. This parameter refers to the operational level of the electronic device that measures the force of air on the interior surface of the right front tire.
Right Front Tire Pressure Status	—	Varies	The scan tool displays Unknown, Nominal, Very Low Pressure, Low, Weak Signal, or High. This parameter indicates the state of the tire based on tire pressure.

Parameter	System State	Expected Value	Description
Right Front Tire Temperature	—	Varies	The tire pressure monitoring system detects a pressure loss at the tires. Each wheel is equipped with a pressure sensor to measure the pressure and temperature. This parameter displays the temperature of the tire.
Right Rear Tire Pressure	—	Varies	Tire pressure is a measure of the amount of air in a vehicle's tires, in pounds per square inch (PSI). This parameter is the amount of pressure present in the rear of the vehicle on the right side.
Right Rear Tire Pressure Sensor Mode	—	Varies	The scan tool displays Learn Mode - Remotely Triggered, Undefined, Re-Measure, Drive Mode, Power Down, Wake-Up, or Learn Mode - Pressure Triggered. This parameter refers to the operational level of the electronic device that measures the force of air on the interior surface of the right rear tire.
Right Rear Tire Pressure Status	—	Varies	The scan tool displays Unknown, Nominal, Very Low Pressure, Low, Weak Signal, or High. This parameter indicates the state of the tire based on tire pressure.
Right Rear Tire Temperature	—	Varies	The tire pressure monitoring system detects a pressure loss at the tires. Each wheel is equipped with a pressure sensor to measure the pressure and temperature. This parameter displays the temperature of the tire.
Last Tire Fill Alert Notification	—	Varies	The scan tool displays Left Rear Inner, Left Rear Outer, Right Rear Outer, Left Front, Right Rear Inner, Spare, Unknown, or Right Front. Tire Fill Alert is a software feature that indicates when a predetermined pressure level is reached performed on the last tire.
Tire Fill Alert System State - Current	—	Varies	The scan tool displays Non Monitor, Monitoring, Active, or Achieved. Tire Fill Alert is software feature in the Tire Pressure Module system. Basically, the Tire Pressure Module system enables the High Pressure Warnings when the air pressure level goes higher than target pressure level. This parameter indicates the immediate status of the system in the present power cycle.

Parameter	System State	Expected Value	Description
Tire Fill Alert System State - Previous	—	Varies	The scan tool displays Non Monitor, Monitoring, Active, or Achieved. Tire Fill Alert is software feature in the Tire Pressure Module System. Basically, the Tire Pressure Module system enables the High Pressure Warnings when the air pressure level goes higher than target pressure level. This parameter indicates the status in the former power cycle.
Self Auto Learn Status - Left Front Sensor	—	Inactive	The scan tool displays Active or Inactive. For vehicles with Self Auto Learn capable sensors, this parameter is used to define transmission during rolling Self Auto Learn state. A value of 1 means Self Auto Learn rolling state is Active and a value of 0 sets for all other non Self Auto Learn transmissions.
Self Auto Learn Status - Left Rear Sensor	—	Inactive	The scan tool displays Active or Inactive. For vehicles with Self Auto Learn capable sensors, this parameter is used to define transmission during rolling Self Auto Learn state. A value of 1 means Self Auto Learn rolling state is Active and a value of 0 sets for all other non Self Auto Learn transmissions.
Self Auto Learn Status - Right Front Sensor	—	Inactive	The scan tool displays Active or Inactive. For vehicles with Self Auto Learn capable sensors, this parameter is used to define transmission during rolling Self Auto Learn state. A value of 1 means Self Auto Learn rolling state is Active and a value of 0 sets for all other non Self Auto Learn transmissions.
Self Auto Learn Status - Right Rear Sensor	—	Inactive	The scan tool displays Active or Inactive. For vehicles with Self Auto Learn capable sensors, this parameter is used to define transmission during rolling Self Auto Learn state. A value of 1 means Self Auto Learn rolling state is Active and a value of 0 sets for all other non Self Auto Learn transmissions.

Body Control Module — Windows Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
All Windows Up/Down	—	Close	The scan tool displays Open or Close.
Driver Window Learned	—	Yes	The scan tool displays Yes or No.

Parameter	System State	Expected Value	Description
Driver Window Motor Relay Fault Status	—	OK	This scan tool displays OK or Malfunction.
Left Front Window Express Down	—	Inactive	The scan tool displays Active or Inactive.
Left Front Window Express Up	—	Inactive	The scan tool displays Active or Inactive.
Left Front Window Learned Indicator	—	Not Active	The scan tool displays Active or Not Active.
Left Front Window Lockout Status	—	Inactive	The scan tool displays Active or Inactive.
Left Front Window Motor Current	—	Varies	The scan tool displays left front window motor current in amperes (A).
Left Front Window Switch	—	Inactive	The scan tool displays Inactive, Up, Express Up, Down, Express Down, or Stop.
Left Rear Window Express Up	—	Inactive	The scan tool displays Active or Inactive.
Left Rear Window Express Down	—	Inactive	The scan tool displays Active or Inactive.
Left Rear Window Learned	—	Yes	The scan tool displays Yes or No.
Left Rear Window Learned Indicator	—	Not Active	The scan tool displays Active or Not Active.
Left Rear Window Lockout Status	—	Inactive	The scan tool displays Active or Not Active.
Left Rear Window Motor Current	—	Varies	The scan tool displays left rear window motor current in amperes (A).
Left Rear Window Motor Relay Fault Status	—	OK	This scan tool displays OK or Malfunction.
Left Rear Window Switch	—	Inactive	The scan tool displays Inactive, Up, Express Up, Down, Express Down, or Stop.
Passenger Window Learned	—	Yes	The scan tool displays Yes or No.
Passenger Window Motor Relay Fault Status	—	OK	This scan tool displays OK or Malfunction.
Right Front Window Express Up	—	Inactive	The scan tool displays Active or Inactive.
Right Front Window Express Down	—	Inactive	The scan tool displays Active or Inactive.
Right Front Window Learned Indicator	—	Not Active	The scan tool displays Active or Not Active.
Right Front Window Lockout Status	—	Inactive	The scan tool displays Active or Inactive.
Right Front Window Motor Current	—	Varies	The scan tool displays right front window motor current in amperes (A).
Right Front Window Switch	—	Inactive	The scan tool displays Inactive, Up, Express Up, Down, Express Down, or Stop.
Right Rear Window Express Up	—	Inactive	The scan tool displays Active or Inactive.

Parameter	System State	Expected Value	Description
Right Rear Window Express Down	—	Inactive	The scan tool displays Active or Inactive.
Right Rear Window Learned	—	Yes	The scan tool displays Yes or No.
Right Rear Window Learned Indicator	—	Not Active	The scan tool displays Active or Not Active.
Right Rear Window Lockout Status	—	Inactive	The scan tool displays Active or Inactive.
Right Rear Window Motor Current	—	Varies	The scan tool displays right rear window motor current in amperes (A).
Right Rear Window Motor Relay Fault Status	—	OK	This scan tool displays OK or Malfunction.
Right Rear Window Switch	—	Inactive	The scan tool displays Inactive, Up, Express Up, Down, Express Down, or Stop.
Window Lockout Indicator	—	Inactive	The scan tool displays Active or Inactive.

Body Control Module — Wiper/Washer Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Windshield Washer Switch	—	Off	This parameter is used to display the state of the windshield washer switch. The states are On or Off. This is the electrical connection that controls the input to the motor that causes washer fluid to be dispensed on the front windshield.
Windshield Wiper Switch	—	Off	The scan tool displays Off, Sensitivity 1, Sensitivity 2, Sensitivity 3, Sensitivity 4, Sensitivity 5, Low, or High. This is the electrical connection that controls the input to the motor that causes movement of the wiper arm to clear the front windshield.
Windshield Wiper Mode	—	Varies	The scan tool displays Low, High, Delay 1, Delay 2, Delay 3, Delay 4, Delay 5, Suspended Due to Engine Crank, Parked, Service Park, Depressed Park, or Winter Park. This parameter displays the windshield wiper mode status.
Windshield Wiper Auto Mode Switch	—	—	—
Windshield Wiper Motor Protection Mode	—	—	—

Body Control Module — Tire Pressure Monitoring System Data – Front — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Selected Front Tire Type	—	Standard Load	The scan tool displays No Tire Type, Standard Load, Extra Load, Load Range C, Load Range D, or Load Range E. This parameter displays the front tire type.
Front Tire Pressure on Placard	—	Varies	This parameter reads the tire pressures selected for the front of the vehicle during programming / vehicle setup. Placard is the label printed on the driver side door. The recommended tire inflation pressures are listed on that label. The purpose of this parameter is to monitor for vehicles which have for some reason cleared the placard values to zero.
Front Tire Pressure on Placard (Eco)	—	Varies	This parameter shows the tire pressure printed on the label (placard) in the driver side door. There are 3 pressures given on the label for Comfort, Eco, Fully Loaded.
Front Tire Pressure on Placard (Comfort)	—	Varies	This parameter shows the tire pressure printed on the label (placard) in the driver side door. There are 3 pressures given on the label for Comfort, Eco, Fully Loaded.
Front Tire Pressure on Placard (Fully Loaded)	—	Varies	This parameter shows the tire pressure printed on the label (placard) in the driver side door. There are 3 pressures given on the label for Comfort, Eco, Fully Loaded.
Tire Pressure Monitoring System Regulation Type	—	Varies	The scan tool displays FMVSS, China, ECER64, or None. The Tire Pressure Monitoring System can be built to follow different legal standards. This parameter shows the name of the regulation (law giving entity), like Federal Motor Vehicle Safety Standards or Economic Comission for Europe.

Body Control Module — Tire Pressure Monitoring System Data – Rear — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Selected Rear Tire Type	—	Standard Load	The scan tool displays No Tire Type, Standard Load, Extra Load, Load Range C, Load Range D, or Load Range E. This parameter is used to display the type of tire selected (Load Range) for rear of the vehicle. The load range of the tire is generally how much weight or load the tire is capable performing.
Rear Tire Pressure on Placard	—	Varies	This parameter reads the tire pressures selected for the rear of the vehicle during programming / vehicle setup. Placard is the label printed on the driver side door. The recommended tire inflation pressures are listed on that label. The purpose of this parameter is to monitor for vehicles which have for some reason cleared the placard values to zero.
Rear Tire Pressure on Placard (Eco)	—	Varies	This parameter shows the tire pressure printed on the label (placard) in the driver side door. There are 3 pressures given on the label for Comfort, Eco, Fully Loaded.
Rear Tire Pressure on Placard (Comfort)	—	Varies	This parameter shows the tire pressure printed on the label (placard) in the driver side door. There are 3 pressures given on the label for Comfort, Eco, Fully Loaded.
Rear Tire Pressure on Placard (Fully Loaded)	—	Varies	This parameter shows the tire pressure printed on the label (placard) in the driver side door. There are 3 pressures given on the label for Comfort, Eco, Fully Loaded.
Tire Pressure Monitoring System Regulation Type	—	Varies	The scan tool displays FMVSS, China, ECER64, or None. The Tire Pressure Monitoring System can be built to follow different legal standards. This parameter shows the name of the regulation (law giving entity), like Federal Motor Vehicle Safety Standards or Economic Comission for Europe.

Body Control Module — Vehicle Access Data — Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Child Security Lock - Lock Command	—	Inactive	The scan tool displays Inactive or Lock.

Parameter	System State	Expected Value	Description
Child Security Lock - Unlock Command	—	Inactive	The scan tool displays Inactive or Unlock.
Driver Door Open Switch	—	Inactive	This scan tool displays Active or Inactive.
Fuel Fill Door Lock	—	Inactive	The scan tool displays Inactive or Lock.
Fuel Fill Door Unlock	—	Inactive	The scan tool displays Inactive or Unlock.
Glove Box Unlatch Switch	—	Locked	The scan tool displays Locked or Unlocked.
Left Front Door Ajar Switch	—	Inactive	The scan tool displays Active or Inactive.
Left Front Door Lock Command	—	Inactive	The scan tool displays Inactive or Lock.
Left Front Door Lock Indicator Command	—	Off	The scan tool displays On or Off.
Left Front Door Lock Switch	—	Inactive	The scan tool displays Active or Inactive.
Left Front Door Unlock Command	—	Inactive	The scan tool displays Inactive or Unlock.
Left Rear Door Ajar Switch	—	Inactive	The scan tool displays Active or Inactive.
Left Rear Door Lock Command	—	Inactive	The scan tool displays Inactive or Lock.
Left Rear Door Lock Indicator Command	—	Off	The scan tool displays On or Off.
Left Rear Door Unlock Command	—	Inactive	The scan tool displays Inactive or Unlock.
Passenger Door Open Switch	—	Inactive	The scan tool displays Active or Inactive.
Right Front Door Ajar Switch	—	Inactive	The scan tool displays Active or Inactive.
Right Front Door Lock Command	—	Inactive	The scan tool displays Inactive or Lock.
Right Front Door Lock Indicator Command	—	Off	The scan tool displays On or Off.
Right Front Door Unlock Command	—	Inactive	The scan tool displays Inactive or Unlock.
Right Rear Door Ajar Switch	—	Inactive	The scan tool displays Active or Inactive.
Right Rear Door Lock Command	—	Inactive	The scan tool displays Inactive or Lock.
Right Rear Door Lock Indicator Command	—	Off	The scan tool displays On or Off.
Rear Door Unlock Indicator Command	—	Off	The scan tool displays On or Off.
Right Rear Door Unlock Command	—	Inactive	The scan tool displays Inactive or Unlock.
Rear Closure Release	—	Inactive	The scan tool displays Inactive or Unlock.
Rear Closure Lock Command	—	Inactive	The scan tool displays Inactive or Lock.
Rear Closure Unlock Command	—	Inactive	The scan tool displays Inactive or Unlock.

Parameter	System State	Expected Value	Description
Theft Deterrent Lock Command	—	Inactive	The scan tool displays Inactive or Lock.
Theft Deterrent Unlock Command	—	Inactive	The scan tool displays Inactive or Unlock.

Body Control Module — Content Theft Deterrent Alarm Trigger — Scan Tool Output Controls

Output Control	Description
Horn Relay Command	This output control refers to a request to initiate the sound for a vehicle's loud warning signal. This output control is used to command the horn relay on and off.

Body Control Module — Exterior Lighting — Scan Tool Output Controls

Output Control	Description
Center High Mounted Stop Lamp	This output control is used to activate the center high mounted stop lamp when selecting On. The center high mounted stop lamp should illuminate until commanded Off.
Left Stop Lamp	This output control is used to activate the left stop lamp when selecting On. The left stop lamp should illuminate until commanded Off.
Right Stop Lamp	This output control is used to activate the right stop lamp when selecting On. The right stop lamp should illuminate until commanded Off.
License Plate Lamps	This output control is used to activate the license plate lamps when selecting On. The license plate lamps should illuminate until commanded Off.
Backup Lamps	This output control is used to activate the backup lamps when selecting On. The backup lamps should illuminate until commanded Off.
Left Park Lamps	This output control is used to activate the left park lamps when selecting On. The left park lamps should illuminate until commanded Off.
Right Park Lamps	This output control is used to activate the right park lamps when selecting On. The right park lamps should illuminate until commanded Off.
Left Daytime Running Lamps	This output control is used to activate the left daytime running lamps when selecting On. The left daytime running lamps should illuminate until commanded Off.
Right Daytime Running Lamps	This output control is used to activate the right daytime running lamps when selecting On. The right daytime running lamps should illuminate until commanded Off.
Left Auxiliary Daytime Running Lamps	This output control is used to activate the left auxiliary daytime running lamps when selecting On. The left auxiliary daytime running lamps should illuminate until commanded Off.
Right Auxiliary Daytime Running Lamps	This output control is used to activate the right auxiliary daytime running lamps when selecting On. The right auxiliary daytime running lamps should illuminate until commanded Off.
Left Front Auxiliary Park Lamp Command	This output control is used to activate the left front auxiliary park lamp when selecting On. The left front auxiliary park lamp should illuminate until commanded Off.
Right Front Auxiliary Park Lamp Command	This output control is used to activate the right front auxiliary park lamp when selecting On. The right front auxiliary park lamp should illuminate until commanded Off.
Left Front Turn Signal Lamp Command	This output control is used to activate the left front turn signal lamp when selecting On. The left front turn signal lamp should illuminate until commanded Off.
Right Front Turn Signal Lamp Command	This output control is used to activate the right front turn signal lamp when selecting On. The right front turn signal lamp should illuminate until commanded Off.
Left Turn Signal Repeater Lamp Command	This output control is used to activate the left turn signal repeater lamp when selecting On. The left turn signal repeater lamp should illuminate until commanded Off.
Right Turn Signal Repeater Lamp Command	This output control is used to activate the right turn signal repeater lamp when selecting On. The right turn signal repeater lamp should illuminate until commanded Off.
Rear Fog Lamp(s)	This output control is used to activate the rear fog lamp(s) when selecting On. The rear fog lamp(s) should illuminate until commanded Off.

Body Control Module — HVAC Controls — Scan Tool Output Controls

Output Control	Description
Blower Motor	This output control commands the HVAC blower motor speed, displayed in percent. The blower should be turning. The blower motor is a motor with a cage attached to force the air through ducts such as heater, ventilation and defrost ducts.

Body Control Module — Interior Lighting — Scan Tool Output Controls

Output Control	Description
Child Security Lock Indicator	This output control is used to activate the child security lock indicator when selecting On. The child security lock indicator should illuminate until commanded Off.
Dome/Reading Lamps Front Overhead Console	This output control is used to activate the dome/reading lamps when selecting On. The dome/reading lamps should illuminate until commanded Off.
Lane Departure Warning Indicator	This output control is used to activate the lane departure warning indicator when selecting On. The lane departure warning indicator should illuminate until commanded Off.
Security Indicator	This output control is used to activate the security indicator when selecting On. The security indicator should illuminate until commanded Off.

Body Control Module — Power Mode — Scan Tool Output Controls

Output Control	Description
Run/Crank Relay Command	This output control is used to command run/crank relay active or inactive.
Accessory/Retained Accessory Power Relay Command	This output control is used to command accessory/retained accessory power relay active or inactive.
Run Relay Command	This output control is used to command run relay active or inactive.
Power Mode Timeout	This output control is used to disable or enable the power mode timeout function (not whether timer is active or inactive).
Battery Saver Mode	This output control is used to enable or disable the transport mode state.

Body Control Module — Seat Heating/Venting/Cooling — Scan Tool Output Controls

Output Control	Description
Left Front Seat Heating	This output control is used to turn on/off all outputs for heating elements for the left front seat.
Right Front Seat Heating	This output control is used to turn on/off all outputs for heating elements for the right front seat.
Driver Seat Blower	This output control can be used for setting various blower speeds, but service tool will only turn on high to verify module outputs and fan operation.
Passenger Seat Blower	This output control can be used for setting various blower speeds, but service tool will only turn on high to verify module outputs and fan operation.

Body Control Module — Configuration/Reset Functions — Scan Tool Output Controls

Output Control	Description
Brake Pedal Position Sensor Learn	
Brake Pedal Position Sensor Learn	This output control is used to activate the brake pedal position sensor learn when selecting Learn. The brake pedal position sensor learn procedure should start.
HVAC Actuators Learn	
HVAC Actuators Learn	This output control is used to activate the HVAC actuators learn when selecting Learn. The HVAC actuators learn procedure should start.

K20 Engine Control Module: Scan Tool Information

Engine Control Module Scan Tool Data

Parameter	System State	Expected Value	Description
This is a comprehensive list. Not all parameters listed are available for all applications. **Base Operating Conditions:** Engine Idling/Radiator Hose Hot/Park or Neutral/Closed Loop			
5 V Reference 1, 2, 3, 4 or 5	Engine Idling	5 Volts	This parameter displays the voltage sensed on the 5 V reference circuits at the control module. The scan tool will display a higher value at higher voltage. The scan tool will display a lower value at lower voltage.
5 V Reference 1, 2, 3, 4 or 5 Circuit Status	Engine Idling	OK	This parameter will display OK if the circuit is good or Malfunction if a short to ground, short to B+ is present.
A/C Compressor Clutch Inhibit Reason History 1 or 2	Ignition ON	None	This parameter displays one of the following if an A/C Compressor Clutch Inhibit reasons is detected. High Side Fluid Pressure, Engine Speed, Battery Voltage, Engine Stall, Engine Speed Stabilization, Wide Open Throttle, Vehicle Launch Performance, High Coolant Temperature, AC Relay Fault, Hybrid Request, AutoStop Request, High Power Electronics Coolant Temperature, High Transmission Fluid Temperature, Full Pedal Power Limit Applied, Airbag deployed, Battery Power Limit Exceeded, Powertrain Diagnostics, AC Compressor Fault, Serial Communication Fault, or Low Brake Vacuum.
A/C Compressor Clutch Relay Command	Engine Idling	Off	This parameter displays when the A/C Compressor Clutch relay is commanded ON or OFF.
A/C Compressor Clutch Relay Control Circuit High Voltage Test Status	Engine Idling	OK	This parameter displays the status of the relay control circuit. It can display OK, Malfunction or Not Run.
A/C Compressor Clutch Relay Control Circuit Low Voltage Test Status	Engine Idling	OK	This parameter displays the status of the relay control circuit. It can display OK, Malfunction or Not Run.
A/C Compressor Clutch Relay Control Circuit Open Test Status	Engine Idling	OK	This parameter displays the status of the relay control circuit. It can display OK, Malfunction or Not Run.
A/C Disabled – A/C Pressure Out of Range	A/C ON	No	This parameter displays whether the A/C pressure is out of range for normal operation as determined by the control module.
A/C Disengage 1–8 History	A/C ON	Reason for A/C Disengagement	The parameter displays reason for the last 8 air conditioning (A/C) compressor disengagements in order from 1 to 8 with 8 being the most recent. There are 8 possible causes for the A/C compressor to disengage.
A/C High Side Pressure Sensor	A/C OFF	0.75–1.5 Volts*	This parameter displays the voltage signal from the A/C high side pressure sensor input to the control module. * Varies with temperature, humidity, and altitude.
	A/C ON	1.3–2.5 Volts*	
A/C High Side Pressure Sensor	A/C OFF	450–827 kPa (65–120 psi)*	This parameter displays the pressure from the A/C high side pressure sensor signal circuit to the control module. * Varies with temperature, humidity, and altitude.
	A/C ON	827–2,350 kPa (120–341 psi)*	
A/C OFF for WOT	A/C ON	No	This parameter displays whether the control module is commanding the A/C compressor clutch relay OFF for wide open throttle (WOT).

Parameter	System State	Expected Value	Description
A/C Request Signal	A/C ON	No	This parameter displays the state of the A/C request input to the control module from the heating, ventilation, and air conditioning (HVAC) controls.
Accelerator Pedal Position	Engine Idling	0–100 %	This parameter displays the angle of the accelerator pedal position (APP) as calculated by the control module using the signals from the APP sensors.
Accelerator Pedal Position When Engine Overspeed Detected	Engine Idling	0–100 %	This parameter displays the accelerator pedal position (APP) observed upon initial detection of an overspeed condition. This value will be updated upon each overspeed condition.
Active Grille Air Shutter Ambient Air Temperature	Ignition ON	ºC (ºF)	This parameter displays the temperature detected and used by the Active Air Shutter system.
Active Grille Air Shutter Control	Ignition ON	Active / Inactive	This parameter indicates if the Active Grille Air Shutter Control is Active or Inactive.
Active Grille Air Shutter Control Status	Ignition ON	ON/OFF	This parameter displays the control status of the active air shutter.
Active Grille Air Shutter Desired Position Achieved	Ignition ON	Yes / No	This parameter indicates if the Active Grille Air Shutter Desired Position is Achieved.
Active Grille Air Shutter Diagnostic Control	Ignition ON	Active / Inactive	This parameter indicates if the control system is attempting to move the Active Grille Air Shutter for diagnostic purposes. Displays Active or Inactive.
Active Grille Air Shutter Ice Protection Mode	Ignition ON	Active / Inactive	This parameter indicates whether or not the Shutter control algorithm is in Ice Mode, which attempts to park the shutter and prohibit further operation. Displays Active or Inactive.
Active Grille Air Shutter Initialization Status	Ignition ON	Complete / Incomplete	This parameter displays the initialization status of the Active Grille Air Shutter.
Active Grille Air Shutter Position	Ignition ON	0–100 %	This parameter displays the position of the active grill air shutter. 0% = fully closed, 100% = fully open.
Active Grille Air Shutter Status	Ignition ON	Moving / Stationary	This parameter indicates if the Active Grille Air Shutter is Moving or Stationary.
Active Grille Air Shutter Supply Voltage	Ignition ON	Volts	This parameter indicates the Active Grille Air Shutter Supply Voltage.
Active Grille Air Shutter Torque Command	Ignition ON	Counts	This parameter displays the commanded torque level for the active air shutter. 0 = Nominal Torque.
Air/Fuel Equivalence Ratio Command	Engine Idling	Varies:1	This parameter should display 1.0 when in Closed Loop fuel control.
Alternative Fuel Injector 1, 2, 3, 4, 5, 6, 7 or 8 Command	Ignition ON	On / Off	This parameter contains the commanded state of the alternative fuel injector 1 output (the output is considered to be commanded on if the injector is enabled while the engine is running or cranking).
Alternative Fuel Injector 1 Control Circuit High Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Alternative Fuel Injector 1 control circuit. The parameter displays Malfunction if the Alternative Fuel Injector 1 control circuit is shorted to voltage.
Alternative Fuel Injector 1 Control Circuit Low Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Alternative Fuel Injector 1 control circuit. The parameter displays Malfunction if the Alternative Fuel Injector 1 control circuit is shorted to ground.

Parameter	System State	Expected Value	Description
Alternative Fuel Injector Pulse Width Bank 1	Ignition ON	ms	This parameter displays the alternative fuel injector pulse width (on time) commanded to each cylinder on bank 1.
Alternative Fuel Injector Pulse Width Bank 2	Ignition ON	ms	This parameter displays the alternative fuel injector pulse width (on time) commanded to each cylinder on bank 2.
Alternative Fuel Rail Pressure	Ignition ON	kPa / PSI	This parameter displays the fuel rail pressure calculated as the difference between alternative fuel rail absolute pressure and ambient air pressure (barometric pressure). This measurement is a "gauge pressure." (Gauge = Absolute − Ambient) Range 0 to 2048 kPa.
Alternative Fuel Rail Pressure	Ignition ON	Volts	This parameter displays the alternative fuel rail pressure sensor analog input as a percentage of its reference voltage.
Alternative Fuel Rail Pressure Sensor	Ignition ON	kPa	This parameter displays an ‘undefaulted’ fuel rail pressure relative to manifold vacuum. This is intended for gaseous fuel injection alternative fuel applications (CNG/LPG Mono-Fuel and Bi-Fuel).
Alternative Fuel Rail Temperature	Ignition ON	°C (°F)	This parameter displays the undefaulted alternative fuel rail temperature measured by a sensor. Range is −40 to 215°C.
Alternative Fuel Shutoff Valve 1 or 2 Control Circuit Command	Ignition ON	On / Off	This parameter displays the commanded state of the alternative fuel shutoff valve 1 output (the output is considered to be commanded on if the shutoff valve is enabled while the engine is running or cranking).
Alternative Fuel Shutoff Valve 1 or 2 Control Circuit High Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Alternative Fuel Shutoff Valve 1 or 2 control circuit. The parameter displays Malfunction if the Alternative Fuel Shutoff Valve is shorted to voltage.
Alternative Fuel Tank Pressure	Ignition ON	Volts	This parameter displays the alternative fuel tank pressure sensor analog input as a percentage of its reference voltage.
Ambient Air Temperature	Engine Idling	Varies	This parameter displays temperature from the input of the Intake Air Temperature Sensor.
Ambient Air Temperature	Ignition ON	°C (°F) Varies	This parameter displays the outside air temperature as calculated by the control module.
Ambient Air Temperature When Recommended Maximum Fuel Alcohol Content Exceeded	—	°C (°F)	This parameter displays the ambient air temperature when the recommended maximum fuel alcohol content was exceeded.
Ambient Humidity	Ignition ON	0–100 %	This parameter displays the current ambient humidity level.
APP Sensor 1	Accelerator pedal not actuated	0.98 Volts	This parameter displays the actual voltage on the accelerator pedal position (APP) sensor 1 signal circuit as measured by the control module.
	Accelerator pedal fully actuated	4.25 Volts	
APP Sensor 1 and 2	Ignition ON	Agree	This parameter displays Disagree if the control module detects the signal voltage from APP sensor 1 is not in correct relationship to APP sensor 2. The scan tool displays Agree under the normal operating conditions.

Parameter	System State	Expected Value	Description
APP Sensor 1 Circuit Status	Engine Idling	OK	APP Sensor 1 Out of Range indicates that the sensed accelerator pedal position 1 sensor value is currently out of range or that a Malfunction has been detected based upon the sensed accelerator pedal position 1 sensor value being out of range
APP Sensor 1 Learned Applied Position	Ignition ON	78 %	This parameter contains the learned maximum (fully applied) accelerator pedal position relating to absolute accelerator pedal position (no correction or normalization based upon learned minimum or maximum positions) from accelerator pedal position sensor 1.
APP Sensor 1 Learned Released Position	Ignition ON	0.98 Volts	This parameter indicates the accelerator pedal sensor 1 signal at its minimum learned position (pedal released) as a percentage of its reference voltage. (The minimum learned position is automatically updated periodically as determined by the calibration.
APP Sensor 1 Position	Pedal Released	0 %	This parameter contains the displacement determined from accelerator pedal position sensor 1 (corrected and normalized based upon its learned minimum and maximum positions).
	Pedal Fully Applied	99 %	
APP Sensor 2	Ignition ON	Volts	This parameter contains the accelerator pedal position sensor 2 analog input as a percentage of its reference voltage
APP Sensor 2	Accelerator pedal not actuated	0.49 Volts	This parameter displays the actual voltage on the accelerator pedal position (APP) sensor 2 signal circuit as measured by the control module.
	Accelerator pedal fully actuated	2.14 Volts	
APP Sensor 2 Circuit Status	Ignition ON	OK	APP Sensor 2 Out of Range indicates that the sensed accelerator pedal position 2 sensor value is currently out of range or that a malfunction has been detected (and latched) based upon the sensed accelerator pedal position 2 sensor value being out of range
APP Sensor 2 Learned Applied Position	Ignition ON	78 %	This parameter contains the learned maximum (fully applied) accelerator pedal position relating to absolute accelerator pedal position (no correction or normalization based upon learned minimum or maximum positions) from accelerator pedal position sensor 2.
APP Sensor 2 Learned Released Position	Ignition ON	0.49 Volts	This parameter indicates the accelerator pedal sensor 2 signal at its minimum learned position (pedal released) as a percentage of its reference voltage. (The minimum learned position is automatically updated periodically as determined by the engine control module.
APP Sensor 2 Position	Pedal Released	0 %	This parameter contains the displacement determined from accelerator pedal position sensor 2 (corrected and normalized based upon its learned minimum and maximum positions).
	Pedal Fully Applied	100 %	
APP Sensors	Pedal Released	0 %	This parameter contains the accelerator pedal position resulting directly from the settling of differences of the accelerator pedal position sensors (prior to any compensation to determine driver intent).
	Pedal Fully Applied	99 %	
Autostop/Autostart Disable Mode	—	Active	This parameter displays “Active” when all conditions for allowing the autostop/autostart mode are present (no inhibit conditions exist), this parameter displays "Inactive" when all conditions for allowing the autostop/autostart mode are not present.

Parameter	System State	Expected Value	Description
Autostart Inhibit Reason Autostop/Autostart Malfunction	Engine Idling	No	This parameter displays that a immediate stop was commanded due to a Autostop/Autostart malfunction.
Autostart Inhibit Reason	Engine Idling	No	The scan tool displays Yes if one of the following Autostart Inhibit Reason is detected. Control Function Active, Crank Abort, Driver Exited Vehicle, ECM Malfunction, ECM Request, Engine Coolant Temperature Out of Range, Hood Ajar, Hybrid/EV Power Conditions, Hybrid/EV Battery Pack Contactor Open, Hybrid/EV Battery Pack Power Low, Hybrid/EV Battery Pack State of Charge Low, Hybrid/EV Battery Pack Voltage Low, Hybrid/EV Propulsion System Inactive, Not Commanded, Run/Crank Not Active, System Malfunction, Transmission Range.
Autostart Reason	Engine Idling	No	This parameter displays Yes if one of the following Autostart Reason is detected. A/C Request, Acceleration Request, Accelerator Pedal Pressed, Auxiliary Transmission Fluid Pump Not Available, Brake Booster Weak Vacuum, Brake Pedal Released, Clutch Pedal Applied, Control Function Active, Drive Motor Inverter Temperature High, Drive Motor Temperature High, Driver Exited Vehicle, ECM Request, Engine Coolant Temperature Out of Range, Hood Ajar, Hybrid/EV Battery Module Voltage Low, Hybrid/EV Battery Pack Power Low, Hybrid/EV Battery Pack State of Charge Low, Hybrid/EV Battery Pack Temperature, Hybrid/EV Battery Pack Voltage Low, Hybrid/EV Propulsion System Inactive, Ignition Switch Start, Inclination, Invalid Data Received, Low Voltage Battery Discharge Current High, Low Voltage Battery State of Function Low, Low Voltage Battery State of Health Low, Low Voltage Battery Voltage Low, Maximum Autostop Time Exceeded, Minimum Engine Run Time Not met, Reduced Engine Power Active, Remote Vehicle Start Request, Stop/Start Select Switch, System Malfunction, System Optimization, System Voltage Low, TCM Demand, Tow/Haul Mode Switch ON, Transmission Fluid Temperature Out of Range, Transmission In Reverse, Transmission Range, Vehicle Speed Too High.

Parameter	System State	Expected Value	Description
Autostop Disable Reason	Engine Idling	No	The scan tool displays Yes if one of the following Autostop Disable Reason is detected. 12 V Start Counter Exceeded, A/C Request, Acceleration Request, Accelerator Pedal Pressed, Auxiliary Transmission Fluid Pump Not Available, Brake Booster Weak Vacuum, Brake Pedal Released, Clutch Pedal Applied, Control Function Active, Drive Motor Inverter Temperature High, Drive Motor Temperature High, ECM Request, Engine Coolant Temperature Out of range, Engine Speed High, Generator Load High, Hood Ajar Hybrid/EV Battery Module Voltage Low, Hybrid/EV Battery Pack Power Low, Hybrid/EV Battery Pack State of Charge Low, Hybrid/EV Battery Pack Temperature, Hybrid/EV Battery Pack Voltage Low, Hybrid/EV Propulsion System Inactive, Idle Boost Mode Active, Ignition Switch Start, Intake Manifold Weak Vacuum, Invalid Data Received, Low Voltage Battery Discharge Current High, Low Voltage Battery State of Charge Low, Low Voltage Battery State of Function Low, Low Voltage Battery State of Health Low, Low Voltage Battery Temperature Out of Range, Low Voltage Battery Voltage Low, Maximum Vehicle Stop Time Exceeded, Minimum Engine Run Time Not Met, Reduced Engine Power Active, Remote Vehicle Start Request, Run/Crank Not Active, Stop/Start Select Switch, System Optimization, System Voltage Low, TCM Request, Tow/Haul Mode Switch ON, Transmission Fluid Temperature Out of Range, Transmission in Reverse, Transmission Range, Vehicle Inclination, Vehicle Speed Threshold Not Reached, Vehicle Speed Too High, Wheel Slip Detected.
Auxiliary Coolant Pump Relay Command	Ignition ON	On / Off	This parameter displays the command status of the Auxiliary Coolant Pump Relay.
Auxiliary Coolant Pump Relay Control Circuit High Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the status of the Auxiliary Coolant Pump Relay Control Circuit High Voltage Test. Can display OK, Malfunction, or Not Run.
Auxiliary Coolant Pump Relay Control Circuit Low Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the status of the Auxiliary Coolant Pump Relay Control Circuit Low Voltage Test. Can display OK, Malfunction, or Not Run.
Auxiliary Coolant Pump Relay Control Circuit Open Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the status of the Auxiliary Coolant Pump Relay Control Circuit Open Circuit Test. Can display OK, Malfunction, or Not Run.
Average Fuel Age	Ignition ON	Days	This parameter displays the average fuel age in days.
Axle Torque	Engine Idling	N•m	This parameter displays the Axle Torque value sent from the hybrid control processor (HCP) to the ECM and anti-lock brake system (ABS) module.
Axle Torque Command	Ignition ON	N•m (lb ft)	This parameter displays the commanded Axle Torque value.
BARO	Engine Idling	65–104 kPa (8–16 psi)	This parameter displays the barometric pressure. The control module uses the barometric pressure sensor input for fuel control to compensate for altitude differences.
BARO Sensor	Engine Idling	2.5–4.0 Volts	This parameter displays the barometric pressure sensor voltage.

Parameter	System State	Expected Value	Description
Barometric Pressure Sensor Bank 1	Ignition ON	kPa (PSI)	This parameter displays the ambient air pressure.
Barometric Pressure Sensor Bank 2	Ignition ON	Volts	This parameter displays the signal voltage of the barometric pressure sensor
Base Model Part Number	Ignition ON	#	This parameter displays information which is used during programming to identify unique combinations of hardware and software.
Battery Capacity	Ignition ON	Ah	This parameter displays the capacity of the battery in Amp-hours.
Battery Sensor Module Battery State Information	Ignition ON	Available / Not Available	This parameter indicates if Battery State Information is Available or Not Available. Battery State Information is Not Available when there is a battery drain such as a parasitic draw.
Battery Sensor Module Reset Occurred - Using Estimated State of Charge	Ignition ON	Yes / No	This parameter indicates if the current battery State of Charge is estimated. This occurs when the BSM has been reset.
Battery State of Charge	Ignition ON	0–100 %	This parameter displays the Battery State of Charge (SOC). SOC is a calculated value provided by an intelligent battery sensor (IBS).
Battery State of Health	Ignition ON	0–100 %	This parameter displays the Battery State of Health (SOH). SOH is a calculated value provided by an intelligent battery sensor (IBS).
Battery Type	Ignition ON	N/A	This parameter displays the battery type.
Battery Voltage	Ignition ON	Volts	This parameter displays the battery voltage.
Battery Voltage High Resolution	Ignition ON	Volts	This parameter displays the high resolution battery voltage value.
Boost Pressure	Engine Idling	kPa	This parameter shows the Turbocharger boost pressure in kPa.
Boost Pressure Sensor	Engine Idling	kPa	This parameter shows the Turbocharger boost pressure in kPa.
Boost Pressure Sensor	—	Volts	This parameter displays the turbocharger boost pressure sensor in voltage.
Brake Booster Pressure Sensor	Engine Idling	Volts	This parameter displays the brake booster vacuum pressure analog input as a percentage of its reference voltage.
Brake Booster Pressure Sensor	Engine Idling	kPa	This parameter displays the undefaulted, unfiltered brake booster vacuum pressure measured by a sensor.
Brake Pedal Position Circuit Signal	Ignition ON	Closed	This parameter displays the serial data message of the brake signal from the electronic brake and traction control module (EBTCM).
Brake Pedal Position Circuit Signal	—	Released	This parameter displays the displacement of the brake pedal.
Brake Pedal Position Sensor	Ignition ON	0–100 %	This parameter displays the displacement of the brake pedal, where 0% corresponds to the brake pedal being released and 100% corresponds to the brake pedal being fully applied.
Brake Pedal Position Sensor	Ignition ON	Volts	This parameter displays the brake pedal position as indicated by the analog sensor as a percentage of its reference voltage.
Brake Pedal Position Sensor Fully Released Learn Status	Ignition ON	Complete	This parameter displays the brake pedal fully released learn position status.

Parameter	System State	Expected Value	Description
Brake Pedal Position Sensor Learned Released Position	Ignition ON	Volts	This parameter displays the position learned for the brake pedal position sensor when the brake pedal is fully released.
Brake Pedal Position Sensor Signal	Ignition ON	Released	This parameter displays the serial data message of the brake position sensor signal from the electronic brake and traction control module (EBTCM).
Calculated Air Flow	Engine Idling	G/S	This parameter contains the mass airflow determined from the speed density (MAP based) calculation of air mass per cylinder.
Calculated BARO	Engine Idling	kPa/psi 97.2 kPa/14.1 psi at idle	This parameter contains an estimate of barometric pressure, used to correlate with sensed ambient air pressure in the Barometric Pressure Correlation Diagnostic.
Calculated Catalyst Temperature or Calculated Catalyst Temperature Bank 1 or Bank 2	Engine Idling	Approximately 552°C (1,026°F)	This parameter contains the estimated catalyst temperature (as a function of engine speed, engine airflow, and fuel ethanol percentage) for use in the oxygen sensor and catalyst monitor diagnostic algorithms.
Calculated Engine Oil Pressure	Engine Idling	kPa (PSI)	This parameter displays the filtered value for the engine oil pressure.
Calculated Engine Oil Temperature	Engine Idling	105°C (221°F)	This parameter displays the estimated engine oil temperature (as a function of engine coolant temperature and other parameters).
Calibration History Buffer	Ignition ON	Unlocked	This parameter displays locked when the buffer has been locked against further updates due to detection of a non-production calibration.
Calibration Verification Number History 1–10	Ignition ON	#	This parameter displays the history entries for the primary calibration part in the controller.
Camshaft Position Active Counter	Ignition ON	Counts	This parameter displays a rolling count of the number of primary cam position sensor pulses.
Camshaft Position Sensor	Engine Idling	0 RPM	This parameter displays the speed of the engine as calculated by the signal from a camshaft position (CMP) sensor. This parameter will always display 0 unless a condition with the CKP sensor or CKP reluctor exists. If a CKP condition exists the control module will use a valid CMP sensor signal to determine engine speed and crank/camshaft position.
Camshaft Position Signal Output Circuit High Voltage Test Status	Engine Idling	OK	This parameter displays the state of the Camshaft Position Signal Output Circuit. The parameter displays Malfunction if the Camshaft Position Signal Output Circuit is shorted to voltage.
Camshaft Position Signal Output Circuit Low Voltage Test Status	Engine Idling	OK	This parameter displays the state of the Camshaft Position Signal Output Circuit. The parameter displays Malfunction if the Camshaft Position Signal Output Circuit is shorted to ground.
Camshaft Position Signal Output Circuit Open Test Status	Engine Idling	OK	This parameter displays the state of the Camshaft Position Signal Output Circuit. The parameter displays Malfunction if the Camshaft Position Signal Output Circuit is open.
Catalyst Monitor Complete	Engine Idling	Yes/No	This parameter indicates the status of the Catalyst. The scan tool displays YES when the diagnostic is complete. And NO if the diagnostic has not run, or a malfunction is detected in the catalyst.

Parameter	System State	Expected Value	Description
Catalyst Monitor Complete This Ignition Cycle	Engine Idling	Yes/No	This parameter indicates the status of the catalyst monitor diagnostic. Catalyst Monitor Test Running indicates yes or no when the catalyst monitor diagnostic is actively running a test.
Catalyst Monitor Enabled	Engine Idling	Yes/No	The scan tool displays YES when the Catalyst Monitor is Enabled. If the scan tool displays NO this could indicate a malfunction in the Catalyst Monitor circuit.
Catalyst Monitor Enabled this Ignition Cycle	Engine Idling	Yes/No	This parameter displays the monitor enable status during the current driving/monitoring cycle.
Catalyst Monitor Not At Idle Test Conditions Met	Engine Idling	Yes/No	This parameter indicates the status of the catalyst monitor diagnostic. Catalyst Monitor Test Running indicates yes or no when the catalyst monitor diagnostic is actively running a test.
Catalyst Monitor Test Counter or Catalyst Monitor Test Counter Bank 1 or 2	Engine Idling	Counts	This parameter contains the number of repeated results of the catalyst monitor diagnostic test that have been performed since a code clear (used to determine if a sufficient number of tests have run to report a passing condition).
Catalyst Monitor Test Result or Catalyst Monitor Test Result Bank 1 or 2	Engine Idling	No Decision/Failed/ Passed	This parameter indicates the status of the catalyst monitor diagnostic. Multiple tests may run before the diagnostic reports a “Pass” or “Fail” and will be tracked by Catalyst Monitor Diagnostic Test Counter. When this Parameter reports a “Pass” or “Fail”, the diagnostic is complete for the current trip and will not attempt any further tests.
Catalyst Monitor Test State	Engine Idling	Active/Inactive	This parameter indicates the status of the catalyst monitor diagnostic by displaying active or inactive. This test will only run with the engine at idle.
Change Engine Oil Indicator Command	Ignition ON	Off	This parameter sends a signal through the serial communication to inform the driver to change the engine oil. It is based on a calibrated amount of time.
Charge Air Cooler Coolant Pump Relay Command	Ignition ON	Off	This parameter displays the commanded state of the intercooler pump relay command.
Charge Air Cooler Coolant Pump Relay Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the charge air cooler coolant pump control circuit. The parameter displays Malfunction if the charge air cooler coolant pump control circuit is shorted to voltage.
Charge Air Cooler Coolant Pump Relay Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the charge air cooler coolant pump control circuit. The parameter displays Malfunction if the charge air cooler coolant pump control circuit is shorted to ground.
Charge Air Cooler Coolant Pump Relay Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the charge air cooler coolant pump control circuit. The parameter displays Malfunction if the charge air cooler coolant pump control circuit is open.
Clutch Pedal Starter Inhibit Switch (If Equipped)	Engine Idling	On	This parameter displays ON when the clutch pedal is released.
Clutch Pedal Switch (If Equipped)	Engine Idling	Released	This parameter displays the state of the clutch pedal as determined by the control module from the clutch pedal switch.

Parameter	System State	Expected Value	Description
Cold Startup	Ignition ON	No	This parameter displays whether the engine meets the conditions for a cold startup during the present ignition cycle. The scan tool displays Yes when the conditions for a cold startup are met during the ignition cycle. The scan tool displays No when the conditions for a cold startup are not met during the present ignition cycle. Conditions for a cold startup require the coolant temperature and the intake air temperature to be below a predetermined temperature and within a certain range of each other. These conditions must occur after the engine was warmed up to a specific temperature during the previous ignition cycle.
Component Monitor Complete	Ignition ON	Yes/No	This parameter displays Yes when the Component Monitor is Complete. The engine control module looks at many input and output components to make this determination. If a malfunction is detected the scan tool will display No.
Component Monitor Enabled	Ignition ON	Yes/No	This parameter displays Yes when Component Monitor is Enabled. And No when it is not Enabled.
Component Monitor - This Ignition Cycle	Ignition ON	Disabled, Enabled, Complete	This parameter displays the status of the Component Monitor during this ignition cycle. Can display Disabled, Enabled, or Complete.
Cooling Fan Command	—	0–100 %	This parameter displays the amount of fan power commanded as a percentage of the total fan power available.
Cooling Fan Motor Command	—	0–100 %	This parameter displays the commanded duty cycle for the cooling fan.
Cooling Fan Control Circuit High Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the status of the Cooling Fan Control Circuit High Voltage Test. Can display OK, Malfunction, or Not Run.
Cooling Fan Control Circuit Low Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the status of the Cooling Fan Control Circuit Low Voltage Test. Can display OK, Malfunction, or Not Run.
Cooling Fan Control Circuit Open Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the status of the Cooling Fan Control Circuit Open Circuit Test. Can display OK, Malfunction, or Not Run.
Cooling Fan Relay 1 Command	Ignition ON	On	This parameter displays the commanded state of the fan relay 1 control circuit. The cooling fan relay 1 should be ON when the scan tool indicates the FC Relay 1 Command is ON. The cooling fan relay 1 should be OFF when the scan tool indicates the FC Relay 1` Command is OFF.
Cooling Fan Relays 2 and 3 Command	Ignition ON	On	This parameter displays the commanded state of the fan relay 2 output.
Cooling Fan Relay 1 Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the cooling fan relay control circuit. The parameter displays Malfunction if the cooling fan relay control circuit is open.
Cooling Fan Relay 1, or 2 and 3 Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the cooling fan relay control circuit. The parameter displays Malfunction if the cooling fan relay control circuit is shorted to voltage.
Cooling Fan Relay 1, or 2 and 3 Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the cooling fan relay control circuit. The parameter displays Malfunction if the cooling fan relay control circuit is shorted to ground.

Parameter	System State	Expected Value	Description
Cooling Fan Solenoid Valve Command	Ignition ON	0–100 %	This parameter displays the commanded duty cycle for the PWM fan system.
Cooling Fan Speed	Ignition ON	Varies	This parameter displays the current state of the cooling fan speed. (For example OFF, Low, Medium, or High) rather than rotational speed.
CPP Learn Status	Ignition ON	Learned	This parameter displays the status of the procedure used to learn the clutch pedal fully applied position.
CPP Learned Apply Position	Ignition ON	Volts	This parameter displays the position learned for the clutch pedal position sensor when the clutch pedal is fully applied during the associated learn procedure.
CPP Learned Release Position	Ignition ON	Volts	This parameter displays the position learned for the clutch pedal position sensor when the clutch pedal is released.
CPP Sensor	Ignition ON	Volts	This parameter displays the clutch pedal position sensor analog input as a voltage.
CPP Sensor	Ignition ON	0–100 %	This parameter displays the displacement of the clutch pedal (corrected and normalized based upon its learned released and fully applied positions), where 0% corresponds to the clutch pedal being released and 100% corresponds to the clutch pedal being fully applied.
Crank Request Signal	Ignition switch not in the crank position	No	This parameter displays whether the ignition switch has been cycled to the crank position requesting the control module to activate the starter relay.
	Ignition switch in the crank position	Yes	
Crankshaft Position Active Counter	Engine Idling	0–255 Counts	This parameter displays an incrementing counter when the control module receives a signal from the crankshaft position sensor (CKP).
Crankshaft Position Learned Apply Position	Ignition ON	Volts	This parameter displays the position learned for the clutch pedal position (CPP) sensor when the clutch pedal is fully applied during the associated learn procedure.
Crankshaft Position Learned Release Position	Ignition ON	Volts	This parameter displays the position learned for the clutch pedal position sensor when the clutch pedal is released.
Crankshaft Position Resync Counter	Engine Idling	0 Counts	This parameter displays the number of times the control module has to resynchronize with the CKP sensor. The parameter will begin to increment if the control module does not detect a CKP reference pulse. The parameter will reset to 0 after the ignition is switched OFF.
Crankshaft Position Sensor	Engine Idling	RPM	This parameter displays engine speed.
Crankshaft Position Signal Output Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the crankshaft position signal output circuit. The parameter displays Malfunction if the crankshaft position signal output circuit is shorted to voltage.
Crankshaft Position Signal Output Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the crankshaft position signal output circuit. The parameter displays Malfunction if the crankshaft position signal output circuit is shorted to ground.

Parameter	System State	Expected Value	Description
Crankshaft Position Signal Output Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the crankshaft position signal output circuit. The parameter displays Malfunction if the crankshaft position signal output circuit is open.
Crankshaft Position Variation Learn	Ignition ON	Not Learned	This parameter displays if the crank angle learned this key cycle.
Crankshaft Position Variation Learn Attempts	Ignition ON	Counts	This parameter displays the number of attempts to learn the crank angle sensing error (CASE) during current key cycle.
Crankshaft Position Variation Learn Crank Pulse to Cylinder Count	Ignition ON	Counts	This parameter displays the number of attempts to learn the crank angle sensing error (CASE) during the current key cycle.
Crankshaft Position Variation Learn Crank Pulse to Cylinder Count	Ignition ON	Agree	This parameters displays the number of crank pulses observed over an engine cycle did not equal the number of cylinders for the engine at some point during the CASE learn cycle.
Crankshaft Position Variation Learn Cylinder Compensation Factors	Engine Running	In Range / Out Of Range	This parameter indicates if one or more compensation factors calculated for individual cylinders is out of range.
Crankshaft Position Variation Learn Data Collected	Ignition ON	Sufficient / Insufficient	This parameter indicates if the CASE learn algorighm has collected sufficient data.
Crankshaft Position Variation Learn Opposing Cylinder Compensation Factors	Ignition ON	In Range / Out Of Range	This parameter indicates if the difference in the compensation factors calculated for one or more pairs of opposing cylinders is out of range.
Crankshaft Position Variation Learn Reluctor Ring Tooth Spacing Factors	Ignition ON	In Range / Out Of Range	This parameter indicates if one or more of the compensation factors calculated for the individual tooth spacing is out of range.
Crankshaft Position Variation Learn Required Engine Speed	Ignition ON	In Range	This parameter displays that the engine speed required to complete the CASE learn process has not been achieved.
Crankshaft Position Variation Learn Status	Ignition ON	Complete	This parameter displays the status of the crank angle sensing error (CASE) learn algorithm.
Crankshaft Position Variation Learn Sum of Cylinder Compensation Factors	Ignition ON	In Range / Out Of Range	This parameter indicates if the sum of the compensation factors calculated for the individual cylinders is too large.
Cruise Control	Cruise ON	Active	This parameter displays the status of the cruise control system as determined by the control module.
Cruise Control Acceleration Switch	Ignition ON	Active, Inactive, Invalid	This parameter Indicates the state of the cruise control speed ACCEL switch. This signal is based upon the state of the cruise control speed ACCEL switch received over serial communication from the platform electronics.
Cruise Control Cancel Switch	Cruise ON	Inactive	This parameter displays the status of the cruise control cancel switch.
Cruise Control Switch 2	Cruise ON	N/A	This parameter indicates the state of the secondary Cruise Control Switch.
Cruise Control Disengage 1-8 History	Cruise ON	Reason for Cruise Disengagement	The parameter displays the last 8 cruise control disengages in order from 1 to 8, with 8 being the most recent. There are approximately 30 possible causes for the cruise control to disengage.

Parameter	System State	Expected Value	Description
Cruise Control Inhibit Reason	Cruise OFF	Off	The parameter displays the reason the cruise control system cannot engage.
	Cruise ON	Park/Neutral	
Cruise Control ON/OFF Switch	Cruise ON	On	The engine control module (ECM) monitors the signal circuit of the cruise control switch. A closed switch is displayed as ON.
Cruise Control Resume/ Accelerator Switch	Cruise ON	On	The scan tool displays ON, when the cruise ON/OFF switch is ON and the resume/accel (+) button is pressed, the ECM detects a pre-determined voltage value for the resume/accel. switch.
Cruise Control Set/Coast Switch	Cruise ON	On	The scan tool displays ON, when the cruise ON/OFF switch is ON and the ECM detects a predetermined voltage value for the set/coast (−) switch.
Cruise Control Switch	Cruise ON	Inactive	The engine control module (ECM) monitors the signal circuit of the cruise control switch. A closed switch is displayed as Active.
Current Fuel Type	Ignition ON	Varies	This parameter displays the current fuel type such as Not available, Gasoline/petrol, Methanol, Ethanol, Diesel, Liquefied Petroleum Gas, Compressed Natural Gas, Propane, Battery/electric, Bi-fuel, or Hybrid.
Current Gear	Transmission in Park/ Neutral	P/N	This parameter displays the transmission gear commanded by the transmission control module.
	Transmission not in Park/ Neutral	Reverse/1st-5th	
Current Gear When Engine Overspeed Detected	Engine Idling	Varies	This parameter displays the transmission actual gear observed upon initial detection of an overspeed condition.
Cycles of Misfire Data	Engine Running	0–3,000 counts	This parameter displays the number of cylinder firing events recorded by the control module.
Cylinder Deactivation Disable History 1-8	Engine Running	—	This parameter displays one of the last eight reasons for the reactivation of all engine cylinders.

Parameter	System State	Expected Value	Description
Cylinder Deactivation Inhibit	Engine Running	Yes / No	A/C Compressor Clutch On, Acceleration Request, APP High, APP Rate High, Axle Torque Limiting, Brake Booster Pressure Sensor DTC, Brake Booster Weak Vacuum, Calculated Torque, Camshaft Position Actuator DTC, Camshaft Position Sensor DTC, Catalyst Overtemperature Protection, Catalyst Temperature Low, Crankshaft Position Sensor DTC, Cylinder Deactivation Solenoid Valve DTC, Cylinder Deactivation System DTC, Deceleration Fuel Cut-Off, ECT, ECT Sensor DTC, Engine Controls Ignition Relay DTC, Engine Oil Pressure, Engine Oil Pressure Control Solenoid Valve Stuck Off, Engine Oil Pressure Control Test Active, Engine Oil Pressure Sensor DTC, Engine Oil Temperature, Engine Overtemperature Protection, Engine Speed, Engine Stall Prevention, Exiting Deceleration Fuel Cut-Off, Fuel Trim Cylinder Balance DTC, Heater Performance, HO2S 2 Test, Hot Coolant Mode, IAT Sensor DTC, Ignition Voltage, Injector Stable Time, Insufficient Torque Capacity, Intake Manifold Weak Vacuum, MAP Sensor DTC, Maximum Deactivation Time Exceeded, Maximum Throttle Exceeded, Minimum Time After TAC DTC, Minimum Time On All Cylinders, Misfire DTC, Oil Aeration, Panic Brake Assist Active, Piston Protection, RPM Limit, Scan Tool Override, TAC System DTC, Torque Reduction, Transmission Gear, Transmission Range, Transmission Shifting, Vehicle Speed Too Low, VSS DTC
Cylinder Deactivation Performance Test	Engine Running	OK / Malfunction	This parameter indicates if one or more cylinders failed to deactivate when commanded.
Cylinder Deactivation System Command	Engine Running	All Cylinder / Cylinder Deactivation	This parameter indicates the status of the Cylinder Deactivation System Command.
Cylinder 1,2,3,4,5,6,7,8 Current Misfire Counter	Engine Idling	Counts	The scan tool displays a range of 0–255 counts. This parameter displays the number of misfires that have been detected during the last 255 cylinder firing events. The counters may normally display some activity, but the activity should be nearly equal for all of the cylinders, and in low numbers.
Cylinder 1–4 Exhaust Camshaft Profile Sleeve Position	Engine Running	Fixed Lift / Low Lift / High Lift / Cylinder Deactivation / Undetermined	The scan tool displays the position of the Exhaust Camshaft Profile Sleeve as commanded by the control module.
Cylinder 1,2,3,4,5,6,7, or 8 History Misfire Counter	Engine Running	Counts	The scan tool displays a range of 0–65,535 counts. The misfire history counters display the total level of misfire that has been detected on each cylinder. The misfire history counters will not update or show any activity until a misfire DTC P0300 has become active. The misfire history counters will update every 255 cylinder firing events.
Cylinder 1, 2, 3, 4, 5, 6, 7 or 8 Injector Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the injector control circuit. The parameter displays Malfunction if the injector control circuit is shorted to voltage.
Cylinder 1, 2, 3, 4, 5, 6, 7 or 8 Injector Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the injector control circuit. The parameter displays Malfunction if the injector control circuit is shorted to ground.

Parameter	System State	Expected Value	Description
Cylinder 1, 2, 3, 4, 5, 6, 7 or 8 Injector Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the injector control circuit. The parameter displays Malfunction if the injector control circuit is open.
Cylinder 1, 2, 3, 4, 5, 6, 7 or 8 Injector Flow Identifier	Ignition ON	OK	This parameter displays the End of Line Injector Adjustment (EIA) for the fuel injector. This value shall be used by the ECM for adjustment to actual fuel injected quantity compared to nominal for the injector.
Cylinder 1-6 Injector Control Circuit Status	Engine Idling	OK	This parameter displays the state of the fuel injector control circuit.
Cylinder 1-6 Injector Disabled Misfire Detected	Engine Idling	No	This parameter displays the injector that has been disabled by the misfire catalyst converter protection calibration.
Cylinder 1–4 Intake Camshaft Profile Sleeve Position	Engine Running	Fixed Lift / Low Lift / High Lift / Cylinder Deactivation / Undetermined	The scan tool displays the position of the IntakeCamshaft Profile Sleeve as commanded by the control module.
Cylinder 1–6 Knock Detected	Engine Idling	No	This parameter displays yes if a knock has been detected in an individual cylinder.
DC/DC Converter Ignition 1 Signal	Engine Running	On / Off	This parameter indicates if the DC/DC Converter Ignition 1 Signal is On or Off.
DC/DC Converter Output Voltage 1 Variance - Engine Cranking	Engine Cranking	Volts	This parameter indicates the DC/DC Converter Output Voltage 1 Variance with the engine cranking.
DC/DC Converter Output Voltage 1 Variance - Engine Running / Off	Engine Running/Off	Volts	This parameter indicates the DC/DC Converter Output Voltage 1 Variance with the engine running or Off.
DC/DC Converter Output Voltage 2 Variance - Engine Cranking	Engine Cranking	Volts	This parameter indicates the DC/DC Converter Output Voltage 2 Variance with the engine cranking.
DC/DC Converter Output Voltage 2 Variance - Engine Running / Off	Engine Running/Off	Volts	This parameter indicates the DC/DC Converter Output Voltage 2 Variance with the engine running or Off.
DC/DC Converter Output Voltage Sensor Circuit 1	Engine Running	Volts	This parameter measures voltage at the DC/DC Converter Output Voltage Sensor Circuit 1.
DC/DC Converter Output Voltage Sensor Circuit 2	Engine Running	Volts	This parameter measures voltage at the DC/DC Converter Output Voltage Sensor Circuit 2.
Deceleration Fuel Cut-Off	Engine Running	Inactive	This parameter displays the status of the operating mode of the control module used to turn OFF the fuel injectors and the EVAP canister purge valve during certain deceleration conditions.
Desired Active Grille Air Shutter Position	Ignition ON	0–100 %	This parameter displays the commanded position for the active grille air shutter. 0%=fully closed, 100%=fully open.
Desired Boost Pressure	Engine Running	kPa	This parameter displays the desired turbocharger boost pressure.
Desired Cooling Fan Speed	Ignition ON	RPM	This parameter displays the desired fan speed.
Desired ECT	Ignition ON	°C (°F)	This parameter displays the desired engine coolant temperature in degrees.

Parameter	System State	Expected Value	Description
Desired Exhaust Camshaft Position or Desired Exhaust Camshaft Position Bank 1 or 2	Engine Idling	0 Degrees	This parameter displays the desired exhaust camshaft angle as commanded by the control module.
	Engine speed at 2000 RPM	10 Degrees	
Desired Fuel Pressure	Ignition ON	kPa (PSI)	This parameter displays the desired fuel supply pressure.
Desired Fuel Rail Pressure	Engine Idling	Varies 3.4 mPa to 5.5 mPa (500 to 800 psi)	This parameter displays the desired Fuel Rail Pressure commanded by the control module.
Desired Idle Speed	Engine Idling	Approximately 650 RPM	This parameter displays the desired engine idle speed as commanded by the control module. The desired idle speed varies depending on engine load.
Desired Intake Camshaft Position or Desired Intake Camshaft Position Bank 1 or 2	Engine Idling	0 Degrees	This parameter displays the desired intake camshaft angle as commanded by the control module.
	Engine speed at 2000 RPM	10 Degrees	
Desired Throttle Position	Engine Idling	0–100 %	Commanded Throttle Actuator Control.
Distance Since DTC Cleared	Engine Idling	0 Km/mi	This parameter displays in kilometers or miles the distance traveled since a DTC was cleared.
Distance Since First Malfunction	Engine Idling	0 Km/mi	This parameter displays in kilometers or miles the distance traveled since a Malfunction occurred.
Distance Since Last Malfunction	Engine Idling	0 Km/mi	This parameter displays the distance accumulated since last malfunction was captured. This parameter is only meaningful within the context of a failure record or freeze frame.
Distance Since Last Oil Level Warning	Engine Idling	0 Km/mi	This parameter displays in kilometers or miles the distance traveled since the last oil level warning Malfunction occurred.
Distance Since Last Oil Pressure Warning	Engine Idling	0 Km/mi	This parameter displays in kilometers or miles the distance traveled since the last oil pressure warning Malfunction occurred.
Distance Since Recommended Maximum Fuel Alcohol Content Exceeded	Engine Idling	0 Km/mi	This parameter displays in kilometers or miles the distance Since Recommended Maximum Fuel Alcohol Content Exceeded.
Distance This Driving Cycle	Ignition ON	km / miles	This parameter displays the distance a vehicle has traveled in the current driving cycle.
Distance with MIL On	Ignition ON	km / miles	This parameter displays the accumulated distance driven with the malfunction indicator lamp (MIL) on.
Drag Control Status	Vehicle Moving	Active/Inactive	EDC Active (Drag Active) control mode is indicated when the requested torque signal is above the driver requested value while the traction control system signal input is active.
Driver Requested Axle Torque	Engine Idling	N•m	This parameter displays a (desired) output value after comparing engine load as an input to the hybrid control processor and engine control module.
Drop-Throttle Detected while Traction Control Active	Engine Idling	No	This parameter displays if the Drop Throttle Control Mode is active while the Traction Control System Data Control Signal input is active.

Parameter	System State	Expected Value	Description
Drop-Throttle Status	Engine Idling	Inactive	This parameter displays the Drop Throttle Control Mode is active when the Requested Torque Signal indicates greater than 90 percent duty cycle while the Traction Control System Data Control Signal input is active.
ECM Authentication Status	Ignition ON	Valid	ECM Authentication Status indicates the result of the comparison between the last received immobilizer response and the expected response calculated into the ECM.
ECM Challenge Status	Ignition ON	Valid	This parameter displays the immobilizer system status of the ECM challenge. This indicates whether the currently calculated ECM challenge is valid.
ECM in Immobilizer Fail Enable Mode	Ignition ON	Yes / No	This parameter displays that a serial communication failure has been detected after the receipt of the correct VTD password.
ECM Odometer	Ignition ON	km (miles)	This parameter displays the odometer reading of the vehicle.
ECM Response Source	Ignition ON	Ignition Switch Start	ECM Response Source indicates the source used to calculate the ECM response.
Economy Mode Indicator Command	Ignition ON	Off	This parameter indicates the status of the serial data signal used to illuminate the economy mode indicator lamp.
ECT Sensor	Ignition ON	88 to 105°C (190 to 221°F)	This parameter displays the temperature of the engine coolant based on input to the control module from the engine coolant temperature (ECT) sensor.
ECT vs. IAT Sensor Temperature at Last ECT vs. RCT Malfunction Detection	Ignition ON	Agree	This parameter displays that the temperature values of the ECT and IAT sensors did not agree at the time of the most recent failure of the ECT/RCT rationality diagnostic.
EGR/Camshaft Position Monitor Complete	Ignition ON	Yes/No	This parameter displays the status of the EGR/Camshaft Position Monitor. The parameter will display Yes when the EGR/Camshaft Position Monitor is complete.
EGR/Camshaft Position Monitor Complete This Ignition Cycle	Engine Idling	Yes/No	This parameter displays Yes or No of the completion status during the current driving/monitoring cycle of emission related monitors.
EGR/Camshaft Position Monitor Enabled	Ignition ON	Yes/No	This parameter displays the status of the EGR/Camshaft Position Monitor. The parameter will display Yes when the EGR/Camshaft Position Monitor is Enabled.
EGR/Camshaft Position Monitor Enabled This Ignition Cycle	Engine Idling	Yes/No	This parameter displays Yes or No of the completion status during the current driving/monitoring cycle of emission related monitors.
Electric Power Management Inhibit Reason	Engine Idling	None	This parameter displays the reason for the source of the Regulated Voltage Control (RVC) override command. RVC lowers system operating voltage to reduce system electrical load and improve fuel economy performance. The following is a list of possible reasons: • None • Control Function • Active/Fuel System • On-board Diagnostic System • Air Flow Measurement System • Cylinder Deactivation System • System Transmission Control Module

Parameter	System State	Expected Value	Description
End Model Part Number	—	#	This parameter identifies the part number that represents the combination of hardware, software, and calibrations present in the ECU.
Engine Autostopped	—	No	This parameter displays the status of the internal combustion engine (ICE) in vehicles incorporating ICE autostart/stop functionality.
Engine Calibration Part Number History 1-10	Ignition ON	#	This parameter displays the engine calibration part number history.
Engine Calibration Part Number History 1-10 Counter	Ignition ON	#	This parameter displays the number of times the engine controller had been calibrated.
Engine Controls Ignition Relay Command	Ignition ON	Off	This parameter displays the state of the control circuit for control module power relay as commanded by the control module.
Engine Controls Ignition Relay Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the Engine Controls Ignition Relay control circuit. The parameter displays Malfunction if the Engine Controls Ignition Relay control circuit is shorted to voltage.
Engine Controls Ignition Relay Controls Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the Engine Controls Ignition Relay control circuit. The parameter displays Malfunction if the Engine Controls Ignition Relay control circuit is shorted to ground.
Engine Controls Ignition Relay Controls Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the Engine Controls Ignition Relay control circuit. The parameter displays Malfunction if the Engine Controls Ignition Relay control circuit is open.
Engine Controls Ignition Relay Feedback 2 Signal	Ignition ON	Volts	This parameter indicates the signal voltage from the second input to the controller from the powertrain relay.
Engine Controls Ignition Relay Feedback 3 Signal	Ignition ON	Volts	This parameter indicates the signal voltage from the third input to the controller from the powertrain relay.
Engine Controls Ignition Relay Feedback Signal	Ignition ON	12.0–14.9 Volts	This parameter displays the voltage available at the engine controls ignition relay terminal of the engine control module.
Engine Coolant Pump Clutch Relay Command	Ignition ON	Flow / No Flow	This parameter displays the commanded state of the engine coolant pump clutch.
Engine Coolant Thermostat Heater Command	Ignition ON	0–100 %	This parameter displays the commanded duty cycle for the engine coolant thermostat.
Engine Coolant Thermostat Heater Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the engine coolant thermostat heater control circuit. The parameter displays Malfunction if the engine coolant thermostat heater control circuit is shorted to voltage.
Engine Coolant Thermostat Heater Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the engine coolant thermostat heater control circuit. The parameter displays Malfunction if the engine coolant thermostat heater control circuit is shorted to ground.
Engine Coolant Thermostat Heater Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the engine coolant thermostat heater control circuit. The parameter displays Malfunction if the engine coolant thermostat heater control circuit is open.
Engine Crank Command	Ignition ON	Yes / No	This parameter indicates if the engine is being commanded to crank or not.

Parameter	System State	Expected Value	Description
Engine Crank Time	Ignition ON	0:00:00 Seconds – Varies	This parameter indicates the time between the start of engine cranking to when the engine reaches an operating RPM.
Engine Load	Engine Idling	25–45 %	This parameter displays the calculated engine load in percent based on inputs to the control module from various engine sensors.
	Engine speed at 2,500 RPM	40–60 %	
Engine Load During Misfire History 1-10	Ignition ON	0–100 %	This parameter displays the engine load during the last misfire event.
Engine Off	—	No	This parameter displays the status of the internal combustion engine (ICE) in vehicles incorporating ICE autostop/autostart functionality.
Engine OFF Time	Engine Idling	0:00:00 Seconds – Varies	This parameter displays the amount of time that has elapsed since the engine was last cycled OFF.
Engine Oil Absolute Pressure Sensor	Engine Idling	kPa/PSI	This parameter displays the undefaulted, unfiltered measured engine oil pressure read by an oil absolute pressure sensor.
Engine Oil Level Switch	Engine Idling	OK	This parameter displays the status of the engine oil level switch as determined by the control module. The control module uses this information to turn on the low engine oil lamp if the engine oil level remains approximately 1 quart low for a sufficient amount of time. The scan tool will display Low when the engine oil level is low. The scan tool will display OK when the engine oil level is correct.
Engine Oil Life Remaining	Engine Idling	0–100 %	This parameter displays the percent of engine oil life remaining. The controller calculates the engine oil life by monitoring engine load, coolant temperature, and engine speed.
Engine Oil Pressure	Engine Idling	kPa/PSI	This parameter displays the actual engine oil pressure measured by a sensor.
Engine Oil Pressure Control Disable History 1 or 2	Ignition ON	—	This parameter indicates one of the last two reasons that powertrain has disengaged oil control.
Engine Oil Pressure Control Solenoid Valve Command	Ignition ON	High Pressure/Low Pressure	This parameter displays the commanded state of the variable displacement oil pump output.
Engine Oil Pressure Control Solenoid Valve Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the engine oil pressure control solenoid valve control circuit. The parameter displays Malfunction if the engine oil pressure control solenoid valve control circuit is shorted to voltage.
Engine Oil Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the engine oil pressure control solenoid valve control circuit. The parameter displays Malfunction if the c engine oil pressure control solenoid valve control circuit is shorted to ground.
Engine Oil Pressure Control Solenoid Valve Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the engine oil pressure control solenoid valve control circuit. The parameter displays Malfunction if the engine oil pressure control solenoid valve control circuit is open.
Engine Oil Pressure Control Test Counter	Ignition ON	Counts	This parameter displays the number of times that the Engine Oil Pressure Control test has been activated during the current key cycle.
Engine Oil Pressure Control Test Inhibit History 1 or 2	Ignition ON	—	This parameter indicates one of the last two reasons that powertrain has inhibited oil pressure intrusive diagnostic test.

Parameter	System State	Expected Value	Description
Engine Oil Pressure Sensor	Engine Idling	OK	This parameter displays the engine oil pressure as determined by engine oil pressure sensor.
Engine Oil Pressure Switch	Engine Idling	OK / Low	This parameter displays the status of the engine oil pressure sensor.
Engine Oil Temperature Sensor	Ignition ON	C° (°F)	This parameter displays engine oil temperature as measured by a sensor connected to the ECM.
Engine Oil Temperature When Engine Overspeed Detected	Engine Idling	Temperature	This parameter displays the temperature of the engine oil as determined by the control module.
Engine Oil Type	Ignition ON	Conventional / Synthetic	This parameter indicates whether the engine oil type is conventional or synthetic oil.
Engine Overspeed	Engine Idling	Not Present	This parameter displays if an Engine Overspeed is Present or Not Present.
Engine Overspeed Counter	Ignition ON	Counts	This parameter displays the accumulated number of engine overspeed detection events.
Engine Run Time	Engine Idling	0:00:00 Increments when the engine is operating	This parameter displays the time elapsed since the engine was started.
Engine Running	—	No	This parameter displays the status of the internal combustion engine (ICE) in vehicles incorporating ICE autostop/autostart functionality.
Engine Serial Number	Ignition ON	#	This parameter displays the engine serial number.
Engine Shutdown Counter – Excessive Idle Time	Ignition ON	Counts	This parameter displays the count of engine shutdowns due to excessive idle time.
Engine Shutdown Counter – High Coolant Temperature	Ignition ON	Counts	This parameter displays the count of engine shutdowns due to high coolant temperature.
Engine Shutdown Counter – Low Coolant Level	Ignition ON	Counts	This parameter displays the count of engine shutdowns due to low coolant level.
Engine Shutdown Counter – Low Oil Level	Ignition ON	Counts	This parameter displays the count of engine shutdowns due to low oil level.
Engine Speed	Engine Cranking	Greater than 60 RPM	This parameter displays the speed of the engine crankshaft rotation from information received from the crankshaft position (CKP) sensor. If there is a CKP sensor DTC, the ECM calculates the engine speed from one of the camshaft position (CMP) sensors.
	Engine Idling	550–700 RPM	
Engine Speed During Misfire History 1–5	Ignition ON	RPM	This parameter displays the last 5 engine speeds during misfire events.
Engine Speed When Engine Overspeed Detected	Engine Idling	RPM	This parameter displays the engine speed observed upon initial detection of an overspeed condition. This value will be updated after each overspeed condition.
Engine Stalled	Ignition ON	No	This parameter displays that the internal combustion engine has stopped running unintentionally.
Engine Starting	Ignition ON	No	This parameter displays that the internal combustion engine is being started (in transition from engine OFF to engine running).

Parameter	System State	Expected Value	Description
Engine Stopping	Ignition ON	No	Engine Stopping indicates that the internal combustion engine is stopping (in transition from engine running to engine off, OR in transition from engine running to engine failed).
Engine Torque	Engine Running	0–100 %	This parameter indicates the current indicated torque as a percent of engine reference torque.
Engine Torque Command	Engine Idling	N•m	This parameter displays the commanded predicted engine torque value, which is the torque request for the slow response air path (control of the throttle).
EVAP Malfunction History	Engine Running	None	This parameter displays the result of the evaporative emission (EVAP) system as determined by the control module. The scan tool will display the following: None Excess Vacuum Purge Valve Leak Small Leak Weak Vacuum No Test Result
EVAP Monitor Complete	Engine Running	Yes/No	This parameter displays if the most recent evaporative emissions diagnostic test is complete.
EVAP Monitor Complete This Ignition Cycle	Engine Running	Yes/No	This parameter displays the diagnostic monitor completion status during the current driving/ monitoring cycle.
EVAP Monitor Enabled	Engine Running	Yes/No	This parameter displays if the evaporative emissions diagnostic test is enabled.
EVAP Monitor Enabled This Ignition Cycle	Engine Running	Yes/No	This parameter displays the diagnostic monitor enable status during the current driving/ monitoring cycle.
EVAP Purge Solenoid Valve Command	Engine Idling	0–100 %	This parameter displays the commanded duty cycle for the canister purge output.
EVAP Purge Solenoid Valve Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the evaporative emission (EVAP) purge solenoid control circuit. The parameter displays Malfunction if the EVAP purge solenoid control circuit is shorted to voltage.
EVAP Purge Solenoid Valve Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the evaporative emission (EVAP) purge solenoid control circuit. The parameter displays Malfunction if the EVAP purge solenoid control circuit is shorted to ground.
EVAP Purge Solenoid Valve Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the evaporative emission (EVAP) purge solenoid control circuit. The parameter displays Malfunction if the EVAP purge solenoid control circuit is open.
EVAP System Fuel Tank Pressure Sensor to Fuel Tank Restriction Detected	Ignition ON	Yes / No	This parameter indicates if the Fuel Tank Pressure Sensor detects a blockage in the fuel system.
EVAP Vent Solenoid Command	Engine Idling	Not Venting	This parameter displays the state of the control circuit for evaporative emission (EVAP) vent solenoid as commanded by the control module.

Parameter	System State	Expected Value	Description
EVAP Vent Solenoid Valve Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the EVAP vent solenoid control circuit. The parameter displays Malfunction if the EVAP vent solenoid control circuit is shorted to voltage. This parameter may not change if the scan tool is used to command the EVAP vent solenoid ON.
EVAP Vent Solenoid Valve Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the EVAP vent solenoid control circuit. The parameter displays Malfunction if the EVAP vent solenoid control circuit is shorted to ground. This parameter may not change if the scan tool is used to command the EVAP vent solenoid ON.
EVAP Vent Solenoid Valve Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the EVAP vent solenoid control circuit. The parameter displays Malfunction if the EVAP vent solenoid control circuit is open. This parameter may not change if the scan tool is used to command the EVAP vent solenoid ON.
Exhaust Camshaft Position	Engine Idling	°	This parameter displays the position of the exhaust camshaft in terms of degrees of camshaft rotation (retard) from the park position (a value of zero represents the park position).
Exhaust Camshaft Position Active Counter or Exhaust Camshaft Position Active Counter Bank 1 or 2	Engine Idling	0–255	This parameter displays an incrementing counter when the control module receives a signal from the exhaust camshaft position (CMP) sensor.
Exhaust Camshaft Position Actuator Solenoid Valve Control Circuit High Voltage Test Status or Exhaust Camshaft Position Actuator Solenoid Valve Control Circuit High Voltage Test Status Bank 1 or 2	Engine Idling	OK	This parameter displays the state of the exhaust camshaft actuator solenoid control circuit. The parameter displays Malfunction if the camshaft actuator solenoid control circuit is shorted to voltage.
Exhaust Camshaft Position Actuator Solenoid Valve Control Circuit Low Voltage Test Status or Exhaust Camshaft Position Actuator Solenoid Valve Control Circuit Low Voltage Test Status Bank 1 or 2	Engine Idling	OK	This parameter displays the state of the exhaust camshaft actuator solenoid control circuit. The parameter displays Malfunction if the camshaft actuator solenoid control circuit is shorted to ground.
Exhaust Camshaft Position Actuator Solenoid Valve Control Circuit Open Test Status or Exhaust Camshaft Position Actuator Solenoid Valve Control Circuit Open Test Status Bank 1 or 2	Engine Idling	OK	This parameter displays the state of the exhaust camshaft actuator solenoid control circuit. The parameter displays Malfunction if the camshaft actuator solenoid control circuit is open.

Parameter	System State	Expected Value	Description
Exhaust Camshaft Position or Exhaust Camshaft Position Bank 1 or 2	Engine Idling	0 Degrees	This parameter displays the actual exhaust camshaft position in degrees.
	Engine speed at 2000 RPM	10 Degrees	
Exhaust Camshaft Position Command or Exhaust Camshaft Position Command Bank 1 or 2	Engine Idling	20 %	This parameter displays the on-time or duty cycle of the exhaust camshaft position (CMP) actuator solenoid valve as commanded by the control module.
	Engine speed at 2000 RPM	50 %	
Exhaust Camshaft Position Variance or Exhaust Camshaft Position Variance Bank 1 or 2	Engine Idling	0 Degrees	This parameter displays in degrees, the difference between the desired exhaust camshaft position and the actual exhaust camshaft position.
	Engine speed at 2000 RPM	0 Degrees	
Exhaust Camshaft Profile Actuator 1–4 Command	Ignition ON	On / Off	This parameter displays the commanded state of the Exhaust Camshaft Profile Actuator output.
Exhaust Camshaft Profile Actuator 1–4 Control Circuit High Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Exhaust Camshaft Profile Actuator control circuit per cylinder. The parameter displays Malfunction if the Exhaust Camshaft Profile Actuator control circuit is shorted to voltage.
Exhaust Camshaft Profile Actuator 1–4 Control Circuit Low Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Exhaust Camshaft Profile Actuator control circuit per cylinder. The parameter displays Malfunction if the Exhaust Camshaft Profile Actuator control circuit is shorted to ground.
Exhaust Camshaft Profile Actuator 1–4 Control Circuit Open Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Exhaust Camshaft Profile Actuator control circuit per cylinder. The parameter displays Malfunction if the Exhaust Camshaft Profile Actuator control circuit is open.
Exhaust Camshaft Profile Actuator Position Sensor 1–4	Ignition ON	0–100 %	This parameter displays the commanded duty cycle for the Exhaust Camshaft Profile Actuator.
Exhaust Camshaft Profile Actuator Position Sensor 1–4	Ignition ON	mm	This parameter displays the commanded duty cycle for the Exhaust Camshaft Profile Actuator.
Exhaust Camshaft Profile Sleeve Position Sensor 1, 2	Engine Idling	Counts	This parameter displays the number of times that the Exhaust Camshaft Profile Sleeve test has been activated during the current key cycle.
Extended Travel Brake Pedal Position Signal	Engine Idling	Released	This parameter displays the status of the Extended Travel Brake Pedal Position sensor.
Extended Travel Brake Pedal Switch	Ignition ON	Released	This parameter displays the undebounced / undefaulted state of the extended travel brake switch input to the ECM
Filtered System Voltage	Ignition ON	Volts	This parameter indicates the filtered voltage of the system.
Filtered System Voltage Prior to Engine Crank	Ignition ON	Volts	This parameter displays the filtered system voltage just before an engine cranking event.
Freeze Frame DTC	Ignition ON	#	This parameter displays the diagnostic trouble code (DTC) that caused the freeze frame to be stored.

Parameter	System State	Expected Value	Description
Fuel Alcohol Content	Engine Idling	0–100 %	This parameter displays the percentage of alcohol in the fuel. The value is calculated by the ECM using the fuel composition sensor input.
Fuel Alcohol Content When Recommended Maximum Fuel Alcohol Content Exceeded	Engine Idling	0–100 %	This parameter displays a percentage of Fuel Alcohol Content When Recommended Maximum Fuel Alcohol Content Exceeded.
Fuel Composition Learn	Engine Idling	Inactive	This parameter displays Active or Inactive. Active will be displayed if the ECM is learning the alcohol content of the fuel.
Fuel Composition Sensor	Engine Idling	Hz	This parameter displays the frequency of the fuel composition sensor input. This value can be used to determine fuel composition or sensor malfunction.
Fuel Consumed Since Recommended Maximum Fuel Alcohol Content Exceeded	Engine Idling	Liters	This parameter displays in Liters the Fuel Consumed Since Recommended Maximum Fuel Alcohol Content Exceeded.
Fuel Control Loop Status	Engine Idling	Closed	Fuel Closed Loop Active indicates that oxygen sensor 1 of each bank is being used as feedback to adjust the amount of fuel delivered to the engine.
Fuel Economy	Engine Idling	Liters per Hour	This parameter displays the instant fuel consumption rate of the engine in liters per hour.
Fuel Economy Mode	Ignition ON	Inactive	This parameter indicates if the economy mode algorithm has activated economy mode.
Fuel Economy Mode Request	Ignition ON	Off	This parameter indicates if the driver of the vehicle has requested economy mode by pressing the economy mode switch.
Fuel Economy Mode Switch	Ignition ON	OK	This parameter displays the state of the fuel economy mode switch circuit. The parameter displays Malfunction if the fuel economy mode switch circuit is shorted to voltage.
Fuel Economy Mode Switch	Ignition ON	OK	This parameter displays the state of the fuel economy mode switch circuit. The parameter displays Malfunction if the fuel economy mode switch circuit is shorted to ground.
Fuel Economy Mode Switch	Ignition ON	OK	This parameter displays the state of the fuel economy mode switch circuit. The parameter displays Malfunction if the fuel economy mode switch circuit is open.
Fuel Economy Mode Switch	Ignition ON	Volts	This parameter displays the economy mode switch reference voltage.
Fuel Enrichment-Hot Catalyst	Engine Running	Inactive	Fuel Enrichment Catalyst Protection Active indicates fuel is being added to cool the catalytic converter.
Fuel Enrichment-Hot Coolant	Engine Running	Inactive	Hot Coolant Enrichment Active indicates that the conditions to enable hot coolant enrichment are active and that a richer than stoichiometric air/fuel ratio is being commanded in order to help cool the engine when a system malfunction is causing the engine to run at extreme temperatures.
Fuel Injector Driver Supply Voltage	Ignition ON	Volts	This parameter displays the injector driver circuit boost supply voltage.
Fuel Level Sensor	Ignition ON	Volts	This parameter displays the unfiltered fuel level sensor analog input for the primary fuel tank as a percentage of its reference voltage.

Parameter	System State	Expected Value	Description
Fuel Level Sensor Left Tank (If Equipped)	Ignition ON	0–5 Volts	This parameter displays the voltage signal received by the control module from the secondary fuel level sensor in the left side of the fuel tank.
Fuel Level Sensor Reference Command	Engine Idling	0–100 %	This parameter displays the percentage of time that the power supply for the fuel level sensor is on. This percentage is minimized when the fuel has high ethanol content and is maximized when the fuel has low ethanol content.
Fuel Level Sensor Right Tank (If Equipped)	Ignition ON	0–5 Volts	This parameter displays the voltage signal received by the control module from the primary fuel level sensor in the right side of the fuel tank.
Fuel Maintenance Mode	Ignition ON	Active / Inactive	This parameter displays if the Fuel Maintenance Mode is currently active.
Fuel Maintenance Mode Counter	Ignition ON	Counts	This parameter displays the cumulative number of fuel maintenance mode events over the life of the controller.
Fuel Mode Active	Ignition ON	Gaseous, Gasoline	This parameter displays if the fuel mode algorithm has activated the alternative fuel mode.
Fuel Mode Driver Request	Ignition ON	Gaseous, Gasoline	This parameter displays if the driver of the vehicle has selected one of the two specific fuel modes (alternative fuel, or petrol fuel)
Fuel Mode Indication On	Ignition ON	Gaseous, Gasoline	This parameter displays the status of the signal used to illuminate the fuel mode indicator lamp.
Fuel Mode Indicator Lamp Command	Ignition ON	On / Off	This parameter displays the commanded state of the fuel mode indicator lamp.
Fuel Mode Indicator Lamp Control Circuit High Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Fuel Mode Indicator Lamp control circuit. The parameter displays Malfunction if the Fuel Mode Indicator Lamp control circuit is shorted to voltage.
Fuel Mode Indicator Lamp Control Circuit Low Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Fuel Mode Indicator Lamp control circuit. The parameter displays Malfunction if the Fuel Mode Indicator Lamp control circuit is shorted to ground.
Fuel Mode Indicator Lamp Control Circuit Open Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Alternative Fuel Injector 1 control circuit. The parameter displays Malfunction if the Alternative Fuel Injector 1 control circuit is open.
Fuel Mode Switch	Ignition ON	mV	This parameter displays the Fuel Mode Switch circuit in voltage.
Fuel Mode Switch Both States Latched	Ignition ON	True, False	This parameter displays true once both the on and off switch states are observed and will remain latched for the current ignition cycle.
Fuel Mode Switch State	Ignition ON	Fault Low, On, Indeterminate, Off, Fault High	This parameter displays the raw fuel mode switch state information.
Fuel Pressure Drop - Cylinder 1-8 Injector	Engine Running	—	This parameter contains the result of the Fuel Injector Flow Device Control (Direct and Gaseous Fuel Injected Engines). The fuel or alternative fuel rail pressure sensor value after the injection event is subtracted from the fuel rail or alternative fuel pressure sensor value before the injection event and reported as the pressure drop for the appropriate injector.

Parameter	System State	Expected Value	Description
Fuel Pressure Regulator Control Circuit Command	Engine Cranking or Running	On	This parameter displays the commanded state of the fuel pressure regulator 1 low side output (the output is considered to be commanded ON if the regulator is enabled while the engine is running or cranking).
Fuel Pressure Regulator Control Circuit Command	Engine Cranking or Running	0–100 %	This parameter displays the commanded state of the fuel pressure regulator 1 low side output (the output is considered to be commanded ON if the regulator is enabled while the engine is running or cranking).
Fuel Pressure Regulator Control Circuit High Voltage Test	Ignition ON	OK	This parameter displays the status of the output driver for the fuel pressure regulator control circuit. The scan tool will display OK if the circuit is operating correctly or Not Run if a diagnosis has not been made. The scan tool will display Malfunction if there is an short to voltage in the circuit.
Fuel Pressure Regulator Control Circuit Low Voltage Test	Ignition ON	OK	This parameter displays the status of the output driver for the fuel pressure regulator control circuit. The scan tool will display OK if the circuit is operating correctly or Not Run if a diagnosis has not been made. The scan tool will display Malfunction if there is an short to ground in the circuit.
Fuel Pressure Regulator Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the status of the output driver for the fuel pressure regulator control circuit. The scan tool will display OK if the circuit is operating correctly or Not Run if a diagnosis has not been made. The scan tool will display Malfunction if there is an open in the circuit.
Fuel Pressure Regulator High Control Circuit Command	Engine Idling	On / Off	This parameter displays the commanded duty cycle for the fuel pressure regulator 1 solenoid output.
Fuel Pressure Regulator High Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the status of the output driver for the fuel pressure regulator high control circuit. The scan tool will display OK if the circuit is operating correctly or Not Run if a diagnosis has not been made. The scan tool will display Malfunction if there is an short to voltage in the circuit.
Fuel Pressure Regulator High Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the status of the output driver for the fuel pressure regulator high control circuit. The scan tool will display OK if the circuit is operating correctly or Not Run if a diagnosis has not been made. The scan tool will display Malfunction if there is an short to ground in the circuit.
Fuel Pressure Regulator High Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the status of the output driver for the fuel pressure regulator high control circuit. The scan tool will display OK if the circuit is operating correctly or Not Run if a diagnosis has not been made. The scan tool will display Malfunction if there is an open in the circuit.
Fuel Pressure Sensor	Engine Idling	kPa/PSI	For Port Fuel Injected (PFI) systems, this Parameter displays fuel rail pressure at the engine. For high pressure fuel systems, this Parameter indicates the low side fuel pressure before the high pressure pump.
Fuel Pressure Sensor	Ignition ON	Volts	This parameter displays the fuel supply pressure sensor analog input as a percentage of its reference voltage.

Parameter	System State	Expected Value	Description
Fuel Pump Enable Command	Ignition ON	On	This parameter displays the commanded state of the fuel pump output (the output is considered to be commanded ON if its duty cycle is not zero).
Fuel Pump Enable Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the status of the output driver for the fuel pump control circuit. The scan tool will display OK if the circuit is operating correctly or Not Run if a diagnosis has not been made. The scan tool will display Malfunction if there is an short to voltage in the circuit.
Fuel Pump Enable Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the status of the output driver for the fuel pump control circuit. The scan tool will display OK if the circuit is operating correctly or Not Run if a diagnosis has not been made. The scan tool will display Malfunction if there is an short to ground in the circuit.
Fuel Pump Enable Circuit Open Test Status	Ignition ON	OK	This parameter displays the status of the output driver for the fuel pump control circuit. The scan tool will display OK if the circuit is operating correctly or Not Run if a diagnosis has not been made. The scan tool will display Malfunction if there is an open in the circuit.
Fuel Pump Relay Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the fuel pump relay control circuit. The parameter displays Malfunction if the fuel pump relay control circuit is shorted to voltage.
Fuel Pump Relay Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the fuel pump relay control circuit. The parameter displays Malfunction if the fuel pump relay control circuit is shorted to ground.
Fuel Pump Relay Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the fuel pump relay control circuit. The parameter displays Malfunction if the fuel pump relay control circuit is open.
Fuel Pump Speed Output Circuit High Voltage Test Status	Engine Running	OK, Malfunction, Not Run	This parameter displays the Fuel Pump Speed Output Circuit High Voltage Test Status. Can display OK, Malfunction, or Not Run.
Fuel Pump Speed Output Circuit Low Voltage Test Status	Engine Running	OK, Malfunction, Not Run	This parameter displays the Fuel Pump Speed Output Circuit Low Voltage Test Status. Can display OK, Malfunction, or Not Run.
Fuel Pump Speed Output Circuit Open Test Status	Engine Running	OK, Malfunction, Not Run	This parameter displays the Fuel Pump Speed Output Circuit Open Circuit Test Status. Can display OK, Malfunction, or Not Run.
Fuel Pump Trim	Engine Running	0–4 %	This parameter displays the adjustments for the fuel pump duty cycle control. This is calculated by comparing the estimated fuel rail pressure to the desired fuel rail pressure. If the short term fuel pump trim consistently deviates from 0, the long term fuel pump trim is adjusted accordingly.
Fuel Rail Pressure Regulator Command (If Equipped)	Engine idling	36 Degrees	The scan tool displays in degrees, the Fuel Rail Pressure Regulator ON time as commanded by the control module.
Fuel Rail Pressure Sensor	Engine Idling	1.9–5.0 MPa/279–725 PSI	This parameter displays the high side fuel pressure after the high pressure pump.
Fuel Rail Pressure Sensor	Engine Idling	0 to 5 Volts	This parameter displays the voltage signal received by the control module from the fuel rail pressure (FRP) sensor.

Parameter	System State	Expected Value	Description
Fuel Rail Pressure Sensor Initial Learn	—	Complete	This parameter displays the if the Fuel Rail Pressure Sensor First Time Adaptation is Complete
Fuel Rail Pressure Sensor Learn	—	Active	This parameter displays the current state of the fuel rail pressure sensor learn condition.
Fuel Rail Pressure Sensor Learn Inhibit	—	No	This parameter displays the reason for the fuel rail pressure sensor learn to be inhibited. These include: Assembly Plant Mode Counter Not Programmed, Assembly Plant Suspension, Barometric Pressure Sensor DTC, Barometric Pressure Too Low, Clutch Pedal Applied, Clutch Pedal Position Sensor DTC, Desired Fuel Rail Pressure Too Low, DTC Present, Engine in Catalyst Warm-Up Mode, Engine Not Synchronized, Engine Stopped, Fuel Pressure Spike, Fuel Level Too Low, Fuel Pressure Regulator Control Circuit DTC, Fuel Pump Control Function Active, Fuel Pump is Off, Fuel Rail Pressure Control Function Active, Fuel Rail Pressure Sensor DTC, Fuel System in Open Loop Operation, Fuel Temperature Out of Range, Idle Test Failed, Injector Flow Test in Progress, Intake Air Temperature Too Low, Low Pressure Fuel System Malfunction, Low Pressure Fuel System Pressure Too Low, Minimum Engine Run Time Not Met, Minimum Normal Fuel Pressure Control Time Not Met, Minimum Run Time, Time After New Engine Mode Not Met, Minimum Time After Drive Not Met, Minimum Time for Released Accelerator Pedal Not Met, New Engine Mode, Not in Control of Idle Speed, Other Diagnostics Active, Sensor Reading Too High Test Failed, Some Cylinders Are Turned Off, Stuck Sensor Test Failed, Vehicle Speed Too High
Fuel Rail Pressure Sensor Learn Status	—	Complete	This parameter displays several signals associated with the status of the power mode and starter systems.
Fuel Rail Pressure Sensor Learned Value	—	kPa	This parameter displays the fuel rail pressure learned value at the fuel rail pressure sensor.
Fuel Rail Temperature Sensor 1	Ignition ON	ºC (ºF)	This parameter indicates the fuel rail temperature measured by the first sensor on the rail.
Fuel Rail Temperature Sensor 2	Ignition ON	ºC (ºF)	This parameter indicates the fuel rail temperature measured by the second sensor on the rail.
Fuel System Monitor Complete	Engine Idling	Yes/No	This parameter displays the enable and completion status during the current driving/ monitoring cycle of each continuous legislated emission related monitor and noncontinuous legislated emission related monitor.
Fuel System Monitor Complete This Ignition Cycle	Ignition ON	No	This parameter displays the completion status of the fuel system monitor during the current driving / monitoring cycle.
Fuel System Monitor Enabled	Engine Idling	Yes/No	This parameter displays the enable and completion status during the current driving/ monitoring cycle of each continuous legislated emission related monitor and noncontinuous legislated emission related monitor.
Fuel System Monitor Enabled This Ignition Cycle	Ignition ON	No	This parameter displays the enable status of the fuel system monitor during the current driving / monitoring cycle.

Parameter	System State	Expected Value	Description
Fuel Tank Pressure Sensor	Ignition ON, engine OFF	kPa/psi	This parameter displays the pressure/vacuum inside the fuel tank. A negative value indicates a vacuum, while a positive value indicates a pressure.
Fuel Tank Pressure Sensor	—	mmHg / in H2O	This parameter displays the fuel tank pressure in mmHg/in H2O at the fuel tank pressure sensor.
Fuel Tank Pressure Sensor	Ignition ON, engine OFF	0–5 Volts	This parameter displays the voltage signal received by the control module from the fuel tank pressure (FTP) sensor.
Fuel Tank Rated Capacity	Ignition ON	Varies	This parameter displays the capacity of the fuel tank in liters or gallons. The rated capacity displayed by the scan tool will varies with vehicle type.
Fuel Trim Cylinder Balance Test or Fuel Trim Cylinder Balance Test Bank 1–2	Ignition ON	Inactive	This parameter indicates the current state of the fuel trim cylinder balance test.
Fuel Trim Cylinder Balance Test Counter or Fuel Trim Cylinder Balance Test Counter Bank 1-2	Ignition ON	Counts	This parameter displays the number of Air Fuel Imbalance Monitor tests that have been performed since a code clear or non volatile memory (NVM) reset.
Fuel Trim Cylinder Balance Test Status Bank 1-2	Ignition ON	No Result	This parameter indicates the current state of the fuel trim cylinder balance test.
Fuel Trim Learn	Engine Idling	Enabled	This parameter displays Enabled when conditions are appropriate for enabling long term fuel trim corrections. This indicates that the long term fuel trim is adapting continuing amounts of short term fuel trim. If the scan tool displays Disabled, then long term fuel trim will not respond to changes in short term fuel trim.
Fuel Trim Learn	—	Enabled	This parameter displays if the fuel trim learn is enabled.
Fuel Trim Memory Cell	Engine Idling	Counts 0–250	This parameter displays long term fuel corrections that is active based upon the current operating conditions (MAP, engine speed, purge duty cycle, A/C compressor state, and transmission range).
Fuel Trim Memory Cell	—	#	This parameter displays the intake air temperature (measured by a sensor located near the throttle body) recorded at power-up (Run/Crank transition from low to high).
Fuel Trim System Test State	Engine Idling	Complete	This parameter displays the current state of the fuel adjustment system diagnostic.
Fuel Trim System Test State	—	Complete	This parameter displays the state of the fuel trim system test.
Fuel Volatility	Engine Idling	Varies	This parameter indicates the rate the fuel can be vaporized in the cylinder as calculated by the control module. The scan tool will display HIGH when the fuel volatility is high. The scan tool will display LOW when the fuel volatility is low.
Generator F Terminal Signal	Engine Idling	0–100 %	This parameter displays the amount of generator ON-time as commanded by the control module. The higher the percentage the greater the generator output.

Parameter	System State	Expected Value	Description
Generator Indicator Command	Engine Idling	On	This parameter displays On or Off associated with the status of the generator.
Generator L Terminal Circuit High Voltage Test Status	Engine Idling	OK	This parameter displays the state of the generator L circuit terminal. The parameter displays Malfunction if the generator L circuit is shorted to voltage.
Generator L Terminal Circuit Low Voltage Test Status	Engine Idling	OK	This parameter displays the state of the generator L circuit terminal. The parameter displays Malfunction if the generator L circuit is shorted to ground.
Generator L Terminal Circuit Open Test Status	Engine Idling	OK	This parameter displays the state of the generator L circuit terminal. The parameter displays Malfunction if the generator L circuit is open.
Generator L-Terminal Command	Engine Idling	0–100 %	This parameter displays the control modules commanded state of the voltage regulator on the generator.
Generator L-Terminal Signal Command	Ignition ON	On / Off	This parameter displays the commanded state of the generator L-terminal output.
Heated Catalyst Monitor Complete	Engine Idling	Yes	This parameter indicates the status of the heated catalyst. The scan tool displays Yes when the diagnostic is complete. And No if the diagnostic has not ran or a malfunction is detected in the heated catalyst.
Heated Catalyst Monitor Enabled	Engine Idling	Yes	This parameter indicates the status of the heated catalyst monitor diagnostic. Catalyst Monitor Test Running indicates Yes or No when the heated catalyst monitor diagnostic is actively running a test.
Heater Coolant Pump Relay Command	Ignition ON	On / Off	This parameter indicates if the heater core pump relay is commanded On or Off.
Heater Coolant Pump Relay Control Circuit High Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the Heater Coolant Pump Relay Control Circuit High Voltage Test Status. Can display OK, Malfunction, or Not Run.
Heater Coolant Pump Relay Control Circuit Low Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the Heater Coolant Pump Relay Control Circuit Low Voltage Test Status. Can display OK, Malfunction, or Not Run.
Heater Coolant Pump Relay Control Circuit Open Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the Heater Coolant Pump Relay Control Circuit Open Circuit Test Status. Can display OK, Malfunction, or Not Run.
High Side Driver 1 Circuit High Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the High Side Driver 1 Circuit High Voltage Test Status. Can display OK, Malfunction, or Not Run.
High Side Driver 1 Circuit Low Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the High Side Driver 1 Circuit Low Voltage Test Status. Can display OK, Malfunction, or Not Run.
High Side Driver 1 Circuit Open Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the High Side Driver 1 Circuit Open Circuit Test Status. Can display OK, Malfunction, or Not Run.
High Side Driver 1 Command	Ignition ON	On / Off	This parameter indicates if the High Side Driver 1 is being commanded On or Off.
High Side Driver 2 Circuit High Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the High Side Driver 2 Circuit High Voltage Test Status. Can display OK, Malfunction, or Not Run.
High Side Driver 2 Circuit Low Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the High Side Driver 2 Circuit Low Voltage Test Status. Can display OK, Malfunction, or Not Run.

Parameter	System State	Expected Value	Description
High Side Driver 2 Circuit Open Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the High Side Driver 2 Circuit Open Circuit Test Status. Can display OK, Malfunction, or Not Run.
High Side Driver 2 Command	Ignition ON	On / Off	This parameter indicates if the High Side Driver 2 is being commanded On or Off.
Hood Position	Ignition ON	Closed, Ajar, Open, Invalid	This parameter indicates the Position of the Hood.
Hood Position Switch	Ignition ON	Closed	This parameter displays the current position of the hood.
HO2S Sensor 1 or HO2S Bank 1 Sensor 1 or Bank 2 Sensor 1	Engine Idling	0.00–1.00 Volts	This parameter displays the voltage output from the HO2S to the control module. A lower voltage indicates a lean exhaust, while a higher voltage indicates a rich exhaust.
HO2S Sensor 1 or HO2S Bank 1 Sensor 1 or Bank 2 Sensor 1	Engine Idling	Lambda 0.8–1.1	This parameter displays the voltage output as a lambda value. When the fuel system is lean, the oxygen level will be high and the lambda signal will be high or more than 1. When the fuel system is rich, the oxygen level will be low, and the lambda signal will be low or less than 1. The ECM uses this information to maintain the correct air/fuel ratio
HO2S Sensor 2 or HO2S Bank 1 Sensor 2 or Bank 2 Sensor 2	Engine Idling	0.00–1.00 Volts	This parameter displays the voltage output from the HO2S to the control module. A lower voltage indicates a lean exhaust, while a higher voltage indicates a rich exhaust.
HO2S Heater Sensor 1 or HO2S Heater Bank 1 Sensor 1 or Bank 2 Sensor 1	Engine Idling	Amps	This parameter display the current feedback for the oxygen sensor heater output for sensor 1.
HO2S Heater Sensor 2 or HO2S Heater Bank 1 Sensor 2 or Bank 2 Sensor 2	Engine Idling	Amps	This parameter display the current feedback for the oxygen sensor heater output for sensor 2.
HO2S Heater Command or HO2S Heater Command Bank 1 or 2 Sensor 1 or 2	Engine Idling	Off	This parameter display the state of the HO2S heater control circuit as commanded by the control module.
HO2S Heater Command Bank 1 or 2 Sensor 1 or 2 Heater Command	Engine Idling	0–100 %	This parameter displays the HO2S heater ON time in percentage, as commanded by the control module.
HO2S Heater Control Circuit High Voltage Test Status or HO2S Heater Control Circuit High Voltage Test Status Bank 1 Sensor 1 or Bank 2 Sensor 1	Engine Idling	OK	This parameter displays the state of the oxygen sensor heater control circuit. The parameter displays Malfunction if the oxygen sensor heater control circuit is shorted to voltage.
HO2S Heater Control Circuit High Voltage Test Status or HO2S Heater Control Circuit High Voltage Test Status Bank 1 Sensor 2 or Bank 2 Sensor 2	Engine Idling	OK	This parameter displays the state of the oxygen sensor heater control circuit. The parameter displays Malfunction if the oxygen sensor heater control circuit is shorted to voltage.

Parameter	System State	Expected Value	Description
HO2S Heater Control Circuit Low Voltage Test Status or HO2S Heater Control Circuit Low Voltage Test Status Bank 1 Sensor 1 or Bank 2 Sensor 1	Engine Idling	OK	This parameter displays the state of the oxygen sensor heater control circuit. The parameter displays Malfunction if the oxygen sensor heater control circuit is shorted to ground.
HO2S Heater Control Circuit Low Voltage Test Status or HO2S Heater Control Circuit Low Voltage Test Status Bank 1 Sensor 2 or Bank 2 Sensor 2	Engine Idling	OK	This parameter displays the state of the oxygen sensor heater control circuit. The parameter displays Malfunction if the oxygen sensor heater control circuit is shorted to ground.
HO2S Heater Control Circuit Open Test Status or HO2S Heater Control Circuit Open Test Status Bank 1 Sensor 1 or Bank 2 Sensor 1	Engine Idling	OK	This parameter displays the state of the oxygen sensor heater control circuit. The parameter displays Malfunction if the oxygen sensor heater control circuit is open.
HO2S Heater Control Circuit Open Test Status or HO2S Heater Control Circuit Open Test Status Bank 1 Sensor 2 or Bank 2 Sensor 2	Engine Idling	OK	This parameter displays the state of the oxygen sensor heater control circuit. The parameter displays Malfunction if the oxygen sensor heater control circuit is open.
HO2S/Heater Monitor Complete This Ignition Cycle	Engine Idling	Yes/No	This parameter displays the diagnostic monitor completion status during the current driving/ monitoring cycle.
HO2S Heater Monitor Enabled	Ignition ON	No	This parameter displays the current state of the H02S heater monitor.
HO2S/Heater Monitor Enabled This Ignition Cycle	Engine Idling	Yes/No	This parameter displays the diagnostic monitor enable status during the current driving/ monitoring cycle.
Humidity Sensor Intake Air Temperature Signal	Ignition ON	Hz	This parameter displays the frequency of the humidity sensor’s intake air temperature (IAT) sensor input.
IAT Sensor 1	Ignition ON	−39° to 140°C (−38° to 284°F)	This parameter displays the temperature of the air entering the air induction system based on input to the control module from the intake air temperature (IAT) sensor.
IAT Sensor 2	Engine Idling	Hz	This parameter displays the frequency of the humidity sensor’s intake air temperature (IAT) sensor input to the engine control module.
IAT Sensor 2	—	°C (°F)	This parameter displays the temperature of the air entering the engine as calculated by the control module based on the input from the intake air temperature (IAT) sensor 2. The scan tool will display a low value when the air temperature is low, and a high value when the air temperature is high.

Parameter	System State	Expected Value	Description
IAT Sensor 3	—	°C (°F)	This parameter displays the temperature of the air entering the engine as calculated by the control module based on the input from the intake air temperature (IAT) sensor 3. The scan tool will display a low value when the air temperature is low, and a high value when the air temperature is high.
Idle Speed Correction	Ignition ON	RPM	This parameter displays the engine idle speed correction within a restricted range to address complaints of vehicle vibration.
Ignition 1 Signal	Ignition ON	B+	This parameter displays B+ when the control module detects a voltage at the ignition 1 input terminal.
Ignition Accessory Signal	Ignition ON	On	This parameter displays On when the control module detects a voltage at the ignition accessory input terminal.
Ignition Coil 1,2,3,4,5,6,7, or 8 Control Circuit High Voltage Test Status	Engine Running	OK	This parameter displays the state of the Ignition control circuit. The parameter displays Malfunction if the Ignition control circuit is shorted to voltage.
Ignition Coil 1,2,3,4,5,6,7, or 8 Control Circuit Low Voltage Test Status	Engine Idling	OK	This parameter displays the state of the Ignition control circuit. The parameter display Malfunctions if the Ignition control circuit is shorted to ground.
Ignition Coil 1,2,3,4,5,6,7, or 8 Control Circuit Open Test Status	Engine Idling	OK	This parameter displays the state of the Ignition control circuit. The parameter displays if Malfunction the Ignition control circuit is open.
Ignition Coil Supply Voltage or Ignition Coil Supply Voltage Bank 1 or 2	Engine Idling	On	This parameter displays ON when voltage is supplied to the Ignition coil.
Ignition Cycles Since Recommended Maximum Fuel Alcohol Content Exceeded	Engine Idling	Counts	This parameter displays the number of Ignition Cycles since Recommended Maximum Fuel Alcohol Content Exceeded.
Ignition Cycles with Malfunction Since 1st Malfunction	Ignition ON	Counts	This parameter contains the number of ignition cycles with a failure reported since the first ignition cycle with a failure reported.
Ignition Cycles Without Completed Test Since 1st Malfunction	Engine Idling	Counts	This parameter displays the number of ignition cycles without a pass or a failure reported since the first ignition cycle with a failure reported.
Ignition Cycles Without Malfunction Since Last Malfunction	Engine Idling	Counts	This parameter displays the number of ignition cycles with a pass reported and no malfunctions reported since the first ignition cycle with a malfunction reported.
Ignition Cycles without Malfunction Since Last Malfunction	Ignition ON	Counts	This parameter contains the number of ignition cycles with a pass reported and no failures reported since the first ignition cycle with a failure reported.
Ignition Off Time	Ignition ON	hh:mm:ss	This parameter displays the time that the ignition has been OFF.
Ignition Timing	Engine Idling	Degrees	This parameter displays the final spark advance in terms of a crankshaft angle.
Immobilizer Auto Learn Counter	Ignition ON	Counts	This parameter displays the number of auto-learn cycles that have been successfully completed within the immobilizer system.

Parameter	System State	Expected Value	Description
Immobilizer Automatic Learn Timer	Ignition ON	h/m/s	This parameter displays the time elapsed within the current auto-learn cycle within the immobilizer system.
Immobilizer ECM Identifier	Ignition ON	OK	This parameter displays that the immobilizer control module (ICM) has received the correct powertrain identifier.
Immobilizer Environment Device 1-4	Ignition ON	OK	This parameter displays that the associated device is OK or unknown or its identification is pending to the immobilizer control module (ICM).
Immobilizer Fuel Disable	Ignition ON	Inactive	This parameter displays if the vehicle is immobilized by the ECM.
Immobilizer Module Environment Identification	Ignition ON	Inactive	This parameter displays that the ICM has not received the powertrain identifier or has received the wrong powertrain identifier.
Immobilizer Module Fuel Disable	Ignition ON	Inactive	This parameter displays if the vehicle is immobilized by the ICM.
Immobilizer Module Identification	Ignition ON	Complete	This parameter indicates that the ICM has not received the powertrain identifier or has received the wrong powertrain identifier.
Immobilizer Module Security Code Programmed	Ignition ON	Yes	This parameter indicates that the ICM security code has been programmed (i.e., the immobilizer device is locked).
Immobilizer Password Learn	Ignition ON	Active/Inactive	Learning Enabled indicates that learning of immobilizer code information is enabled.
Immobilizer Password Learn Scan Tool Delay	Engine Idling	Active/Inactive	Scan tool Learn Delay Active indicates that the security code has been accepted but the scan tool learn delay is active and will not allow learning enabled, programming security code, or resetting security code.
Immobilizer Password Programmed	Ignition ON	Yes	This parameter indicates that the ICM password has been programmed.
Immobilizer Post-Release Passive State	Ignition ON	Active / Inactive	This parameter displays that the immobilizer algorithm is in the post release passive state.
Immobilizer Post-Release State	Ignition ON	Active / Inactive	This parameter displays that the immobilizer algorithm is in the post release passive state.
Immobilizer Pre-Release State	Ignition ON	Active / Inactive	This parameter displays that the immobilizer algorithm is in the pre release active state.
Immobilizer Release State	Ignition ON	Active / Inactive	This parameter displays that the immobilizer algorithm is in the release active state.
Immobilizer Security Code Accepted	Engine Idling	Yes/No	Security Code Accepted displaying Yes indicates' that the received security code is correct.
Immobilizer Security Code Function	Engine Idling	Present/Not Present	This parameter indicates if the ECU supports the immobilizer security code strategy.
Immobilizer Security Code Lockout	Engine Idling	Yes/No	Security Code Lockout Active indicates that the security code has not passed and lockout is active.
Immobilizer Security Code Lockout Active Timer	Engine Idling	ms	This parameter displays the time elapsed since the immobilizer security code lockout has been activated either due to a battery disconnect or an incorrect immobilizer security code being entered.
Immobilizer Security Code Programmed	Ignition ON	Yes/No	Security Code Programmed indicates that the security code has been programmed.

Parameter	System State	Expected Value	Description
Immobilizer Security Code Programming Counter	Ignition ON	Counts	This parameter displays the number of times a new immobilizer security code has been programmed through secure access. This counter can only be incremented.
Immobilizer Security Code Reset Counter	Ignition ON	Counts	This parameter displays the number of times the immobilizer security code has been reset to the default value through secure access. This counter can only be incremented.
Immobilizer Security Information Programmed	Ignition ON	Yes/No	This parameter displays the status of the immobilizer system.
Immobilizer Security Level	Ignition ON	#	This parameter displays the current immobilizer security level. If the correct security code is entered, the security level will remain at or be reset to a level of 10. If an incorrect security code is entered, the security level will be set to a level of 9.
Immobilizer Transponder Identification	Ignition ON	Active / Inactive	This parameter displays that the transponder identification process is active within the ICM.
Immobilizer Transponder Key	Ignition ON	OK	This parameter displays that the transponder key is correct for the ICM.
Immobilizer Transponder Key Identification	Ignition ON	OK	This parameter displays that the transponder key identification process is active within the ICM.
Immobilizer System Status	Ignition ON	Varies	This parameter displays the status of the immobilizer system, the following maybe displayed. Standby, Immobilized at Startup, Immobilized, No Response, Immobilized Negative Response, Immobilized, Incorrect Response, Post-Release State, Pre-Release State, Release State.
Immobilizer Valid Response Received Time	Ignition ON	ms	This parameter displays the actual time observed for a valid immobilizer response.
Initialized Fuel Alcohol Content	Ignition ON	0–100 %	This parameter displays the initialized fuel composition to be used as a starting point for the fuel composition algorithm.
Injector Duty Cycle or Injector Duty Cycle Bank 1 or 2	Engine idling	0.82−1.50 ms	This parameter displays the amount of fuel injector ON time or pulse width as commanded by the control module.
Inspection/Maintenance Drive Cycle Complete	Engine Idling	Yes/No	Inspection/Maintenance Drive Cycle Complete means that all required components of the standard drive cycle have completed.
Inspection/Maintenance Drive Cycle Idle Time Complete	Engine Idling	Yes/No	Inspection/Maintenance Drive Cycle Idle Time Complete indicates that the engine idle time requirement is complete.
Inspection/Maintenance Drive Cycle Idle Timer	Engine Idling	hh:mm:ss	This parameter displays the Inspection/ Maintenance Drive Cycle Idle Timer.
Inspection/Maintenance Drive Cycle Propulsion System Active Time Complete	Engine Idling	Yes/No	This parameter displays the Inspection/ Maintenance Drive Cycle Propulsion System Active Time Complete. The parameter displays Yes when the Inspection/Maintenance Drive Cycle Propulsion System Active Time is Complete.
Inspection/Maintenance Drive Cycle Propulsion System Active Timer	Engine Idling	hh:mm:ss	This parameter displays the total accumulated time in which the propulsion system has been active after the 1st time the engine is started.

Parameter	System State	Expected Value	Description
Inspection/Maintenance Drive Cycle Vehicle Speed Time Complete	Engine Idling	Yes/No	This parameter displays Yes when the Vehicle Speed Time Complete indicates that the vehicle has been above 25 mph for five minutes.
Inspection/Maintenance Drive Cycle Vehicle Speed Timer	Engine Idling	hh:mm:ss	This parameter displays the total accumulated time in which the vehicle speed has been greater than 25 mph after the 1st time the engine is started.
Intake Air Humidity Sensor	Engine Idling	0–100 %	This parameter displays the raw duty cycle signal from the relative humidity sensor electronics, which represents the relative humidity of the intake air.
Intake Camshaft Position	Engine Idling	°	This parameter displays the position of the intake camshaft for bank 1 in terms of degrees of camshaft rotation (advance) from the park position (a value of zero represents the park position).
Intake Camshaft Position Active Counter or Intake Camshaft Position Active Counter Bank 1 or 2	Engine Idling	0–255	This parameter displays an incrementing counter when the control module receives a signal from the intake camshaft position (CMP) sensor.
Intake Camshaft Position Actuator Oil Pressure	Engine Idling	kPa	This parameter displays the oil pressure at the intake camshaft position actuator.
Intake Camshaft Position Actuator Oil Pressure Sensor	Engine Idling	Volts	This parameter displays the intake camshaft position actuator pressure sensor in voltage.
Intake Camshaft Position Actuator Park Lock Solenoid Valve Command Bank 1	Ignition ON	Locked / Unlocked	This parameter indicates if the Intake Camshaft Position Actuator Park Lock Solenoid Valve for Bank 1 is Locked or Unlocked.
Intake Camshaft Position Actuator Park Lock Solenoid Valve Command Bank 2	Ignition ON	Locked / Unlocked	This parameter indicates if the Intake Camshaft Position Actuator Park Lock Solenoid Valve for Bank 2 is Locked or Unlocked.
Intake Camshaft Position Actuator Park Lock Solenoid Valve Control Circuit High Voltage Test Status Bank 1	Ignition ON	OK, Malfunction, Not Run	This parameter displays the Intake Camshaft Position Actuator Park Lock Solenoid Valve Control Circuit High Voltage Test Status Bank 1. Can display OK, Malfunction, or Not Run.
Intake Camshaft Position Actuator Park Lock Solenoid Valve Control Circuit High Voltage Test Status Bank 2	Ignition ON	OK, Malfunction, Not Run	This parameter displays the Intake Camshaft Position Actuator Park Lock Solenoid Valve Control Circuit High Voltage Test Status Bank 2. Can display OK, Malfunction, or Not Run.
Intake Camshaft Position Actuator Park Lock Solenoid Valve Control Circuit Low Voltage Test Status Bank 1	Ignition ON	OK, Malfunction, Not Run	This parameter displays the Intake Camshaft Position Actuator Park Lock Solenoid Valve Control Circuit Low Voltage Test Status Bank 1. Can display OK, Malfunction, or Not Run.
Intake Camshaft Position Actuator Park Lock Solenoid Valve Control Circuit Low Voltage Test Status Bank 2	Ignition ON	OK, Malfunction, Not Run	This parameter displays the Intake Camshaft Position Actuator Park Lock Solenoid Valve Control Circuit Low Voltage Test Status Bank 2. Can display OK, Malfunction, or Not Run.
Intake Camshaft Position Actuator Park Lock Solenoid Valve Control Circuit Open Test Status Bank 1	Ignition ON	OK, Malfunction, Not Run	This parameter displays the Intake Camshaft Position Actuator Park Lock Solenoid Valve Control Circuit Open Circuit Test Status Bank 1. Can display OK, Malfunction, or Not Run.

Parameter	System State	Expected Value	Description
Intake Camshaft Position Actuator Park Lock Solenoid Valve Control Circuit Open Test Status Bank 2	Ignition ON	OK, Malfunction, Not Run	This parameter displays the Intake Camshaft Position Actuator Park Lock Solenoid Valve Control Circuit Open Circuit Test Status Bank 2. Can display OK, Malfunction, or Not Run.
Intake Camshaft Position Actuator Park Lock Test Abort Reason Bank 1	Ignition ON	N/A	This parameter indicates the reason why the Intake Camshaft Actuator Park Lock Pin Test for Bank 1 was aborted.
Intake Camshaft Position Actuator Park Lock Test Abort Reason Bank 2	Ignition ON	N/A	This parameter indicates the reason why the Intake Camshaft Actuator Park Lock Pin Test for Bank 2 was aborted.
Intake Camshaft Position Actuator Park Lock Test Status Bank 1	Ignition ON	N/A	This parameter indicates the status of the intake camshaft actuator park lock pin test for bank 1.
Intake Camshaft Position Actuator Park Lock Test Status Bank 2	Ignition ON	N/A	This parameter indicates the status of the intake camshaft actuator park lock pin test for Bank 2.
Intake Camshaft Position Actuator Solenoid Valve Control Circuit High Voltage Test Status or Intake Camshaft Position Actuator Solenoid Valve Control Circuit High Voltage Test Status Bank 1 or 2	Engine Idling	OK	This parameter displays the state of the intake camshaft actuator solenoid control circuit. The parameter displays Malfunction if the camshaft actuator solenoid control circuit is shorted to voltage.
Intake Camshaft Position Actuator Solenoid Valve Control Circuit Low Voltage Test Status or Intake Camshaft Position Actuator Solenoid Valve Control Circuit Low Voltage Test Status Bank 1 or 2	Engine Idling	OK	This parameter displays the state of the intake camshaft actuator solenoid control circuit. The parameter displays Malfunction if the camshaft actuator solenoid control circuit is shorted to ground.
Intake Camshaft Position Actuator Solenoid Valve Control Circuit Open Test Status or Intake Camshaft Position Actuator Solenoid Valve Control Circuit Open Test Status Bank 1 or 2	Engine Idling	OK	This parameter displays the state of the intake camshaft actuator solenoid control circuit. The parameter displays Malfunction if the camshaft actuator solenoid control circuit is open.
Intake Camshaft Position or Intake Camshaft Position Bank 1 or 2	Engine Idling	0 Degrees	This parameter displays the actual intake camshaft position in degrees.
	Engine speed at 2000 RPM	10 Degrees	
Intake Camshaft Position Commanded or Intake Camshaft Position Commanded Bank 1 or 2	Engine Idling	20 %	This parameter displays the ON-time or duty cycle of the intake camshaft position (CMP) actuator solenoid valve as commanded by the control module.
	Engine speed at 2000 RPM	50 %	
Intake Camshaft Position Variance or Intake Camshaft Position Variance Bank 1 or 2	Engine Idling	0 Degrees	This parameter displays in degrees, the difference between the desired intake camshaft position and the actual intake camshaft position.
	Engine speed at 2000 RPM	0 Degrees	

Parameter	System State	Expected Value	Description
Intake Camshaft Profile Actuator 1–8 Command	Ignition ON	On / Off	This parameter displays the commanded state of the Intake Camshaft Profile Actuator output.
Intake Camshaft Profile Actuator 1–8 Control Circuit High Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Intake Camshaft Profile Actuator control circuit per cylinder. The parameter displays Malfunction if the Intake Camshaft Profile Actuator control circuit is shorted to voltage.
Intake Camshaft Profile Actuator 1–8 Control Circuit Low Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Intake Camshaft Profile Actuator control circuit per cylinder. The parameter displays Malfunction if the Intake Camshaft Profile Actuator control circuit is shorted to ground.
Intake Camshaft Profile Actuator 1–8 Control Circuit Open Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Intake Camshaft Profile Actuator control circuit per cylinder. The parameter displays Malfunction if the Intake Camshaft Profile Actuator control circuit is open.
Intake Camshaft Profile Actuator Position Sensor 1–4	Ignition ON	0–100 %	This parameter displays the commanded duty cycle for the Intake Camshaft Profile Actuator.
Intake Camshaft Profile Actuator Position Sensor 1–4	Ignition ON	mm	This parameter displays the commanded duty cycle for the Intake Camshaft Profile Actuator.
Intake Camshaft Profile Sleeve Position Sensor 1, 2	Engine Idling	Counts	This parameter displays the number of times that the Intake Camshaft Profile Sleeve test has been activated during the current key cycle.
Intake Manifold Pressure	Engine Idling	kPa/psi	This parameter displays the engine intake manifold vacuum pressure calculated as the difference between ambient air pressure (barometric pressure) and intake manifold absolute pressure (MAP).
Intake Manifold Tuning Control Valve Control Circuit Command	Ignition ON	On	This parameter displays the commanded state of the intake manifold tuning valve output.
Intake Manifold Tuning Control Valve Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the intake manifold tuning control valve control circuit. The parameter displays Malfunction if the intake manifold tuning control valve control circuit is shorted to voltage.
Intake Manifold Tuning Control Valve Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the skip shift solenoid actuator control circuit. The parameter displays Malfunction if the skip shift solenoid actuator control circuit is shorted to ground.
Intake Manifold Tuning Control Valve Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the skip shift solenoid actuator control circuit. The parameter displays Malfunction if the skip shift solenoid actuator control circuit is open.
Intake Manifold Tuning Control Valve Feedback Signal	Ignition ON	0–100 %	This parameter displays the duty cycle of the PWM feedback from the intake manifold tuning electronics, which represents the position of the intake manifold tuning valve.
Intake Manifold Tuning Control Valve Learn	Ignition ON	Inactive	This parameter displays that the intake manifold tuning electronics are currently learning the hard stop position for the intake manifold tuning valve.
Intake Manifold Tuning Control Valve Position	Ignition ON	Closed	This parameter displays whether the intake manifold tuning valve is in an open, closed, or intermediate position based upon the PWM feedback from the intake manifold tuning electronics.

Parameter	System State	Expected Value	Description
Intake Rocker Arm Solenoid Valve 1–2 Command	Engine Idling	Off	This parameter displays the intake rocker arm solenoid valve command ON/OFF status.
Intake Rocker Arm Solenoid Valve 1–2 Command	Engine Idling	High Lift/Low Lift	This parameter displays the intake rocker arm solenoid valve command status.
Intake Rocker Arm Solenoid Valve 1–2 Control Circuit High Voltage Test Status	Engine Idling	OK	This parameter displays the state of the intake rocker arm solenoid valve control circuit. The parameter displays Malfunction if the intake rocker arm solenoid valve circuit is shorted to voltage.
Intake Rocker Arm Solenoid Valve 1–2 Control Circuit Low Voltage Test Status	Engine Idling	OK	This parameter displays the state of the intake rocker arm solenoid valve control circuit. The parameter displays Malfunction if the intake rocker arm solenoid valve control circuit is shorted to ground.
Intake Rocker Arm Solenoid Valve 1–2 Control Circuit Open Test Status	Engine Idling	OK	This parameter displays the state of the intake rocker arm solenoid valve control circuit. The parameter displays Malfunction if the intake rocker arm solenoid valve control circuit is open.
ISS/OSS Supply Voltage	Engine Idling	OK	This parameter displays the state of the ISS/OSS Supply Voltage circuit.
Knock Retard	Engine Idling	0 Degrees	This parameter indicates the amount of spark advance the control module removes from the ignition control (IC) spark advance in response to the signal from the knock sensors.
Long Term Fuel Pump Trim	—	#	This parameter displays a numeric value. This is the long term (LT) fuel pump trim.
Long Term Fuel Trim or Long Term Fuel Trim Bank 1 or 2	Engine Idling	0 %	This parameter displays the commanded Long Term Fuel Trim correction by the control module for cruise and acceleration conditions.
Long Term Fuel Trim Test Average or Long Term Fuel Trim Test Average Bank 1 or 2	Engine Idling	0 %	This parameter displays the filtered long term closed loop fuel correction. This value is compared to thresholds to determine if the fuel adjustment system diagnostic is passing or failing or if an excess purge vapor test should be executed.
Long Term Fuel Trim Test Average without Purge or Long Term Fuel Trim Test Average without Purge Bank 1 or 2	Engine Idling	0 %	This parameter displays the filtered non purge long term closed loop fuel correction. This value is compared to thresholds to determine if the fuel adjustment system diagnostic is passing, failing, or indeterminate during normal purge-OFF operation as well as during the intrusive excess purge vapor test.
Long Term Secondary O2 Sensor Fuel Trim Bank 1 or 2	Ignition ON	0–100 %	This parameter displays the Long Term Secondary O2 Sensor Fuel Trim for Bank 1 or 2.
Lost Communication with Active Grille Air Shutter Actuator Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter indicates the status of the Active Grille Air Shutter actuator diagnostic test.
Low Engine Oil Level Indicator Command	Engine Idling	Off	The scan tool displays On or Off. This is the state of the low engine oil level indicator as monitored by the ECM.
Low Engine Oil Pressure Indicator Command	Engine Idling	Off	This parameter displays the commanded state of the low EOP lamp control circuit by the control module.
Low-Voltage Battery Current	Ignition ON	Amps	This parameter displays the battery current.

Parameter	System State	Expected Value	Description
Low-Voltage Battery State of Charge	Ignition ON	Volts	This parameter indicates the percentage of the battery charge remaining.
Low-Voltage Battery State of Function	Ignition ON	Volts	This parameter displays the predicted minimum voltage of the next crank event.
Low-Voltage Battery State of Health	Ignition ON	Volts	This parameter indicates the available capacity of the battery if it were fully charged, relative to the capacity when the battery was new.
Low-Voltage Battery Temperature	Ignition ON	ºC (ºF)	This parameter indicates the temperature of the battery.
MAF Performance Test	Engine Idling	OK	This parameter displays the status of the MAF performance test by the engine control module. The scan tool will display OK if no malfunction is found. The scan tool will display malfunction if the engine control module detects a malfunction during the test.
MAF Sensor	Engine Idling	3.0–8.3 g/s	This parameter displays in grams per second, the measured quantity of air flowing into the engine during all operating conditions.
	Engine speed at 2,500 RPM	11.88 g/s	
MAF Sensor	Engine Idling	2,000–2,500 Hz	The scan tool displays a range of 0-65,555 hertz. This parameter displays the frequency signal input to the control module, and represents measured quantity of air flowing into the engine during all operating conditions.
MAF Sensor Supply Voltage Command	Ignition ON	On / Off	This parameter indicates if the mass air flow sensor supply voltage is commanded On or Off.
MAF Sensor Supply Voltage Control Circuit High Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the mass air flow sensor supply voltage Control Circuit High Voltage Test Status. Can display OK, Malfunction, or Not Run.
MAF Sensor Supply Voltage Control Circuit Low Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the mass air flow sensor supply voltage Control Circuit Low Voltage Test Status. Can display OK, Malfunction, or Not Run.
MAF Sensor Supply Voltage Control Circuit Open Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the mass air flow sensor supply voltage Control Circuit Open Circuit Test Status. Can display OK, Malfunction, or Not Run.
MAF When Engine Overspeed Detected	Engine Idling	g/s	This parameter indicates the quantity calculated by the control module based on a signal from the MAF sensor at the time an overspeed was detected.
MAP Performance Test 1	Engine Idling	OK	MAP Test 1 Residual Out of Tolerance indicates that the filtered MAP Test 1 residual (the difference between the measured intake manifold pressure and the intake manifold pressure predicted from the intake manifold model using the mass airflow predicted from the throttle model) exceeds a failure threshold.
MAP Performance Test 2	Engine Idling	OK	MAP Test 2 Residual Out of Tolerance indicates that the filtered MAP Test 2 residual (the difference between the measured intake manifold pressure and the intake manifold pressure predicted from the intake manifold model using the measured mass airflow) exceeds a failure threshold.
MAP Sensor	Engine Idling	kPa/psi	This parameter displays the actual engine intake manifold absolute pressure (MAP).

Parameter	System State	Expected Value	Description
MAP Sensor	Engine Idling	0.4–2.0 Volts	The parameter displays The MAP sensor voltage as it measures the change in the intake manifold pressure which results from engine load and speed changes. As the intake manifold pressure increases, the air density in the intake also increases and additional fuel is required.
Maximum Engine Speed When Engine Overspeed Detected	Engine Idling	RPM	This parameter displays the Maximum Engine Speed When Engine Overspeed Detected.
MIL Command	Engine Idling	Off	This parameter displays the commanded state of the malfunction indicator lamp (MIL) control circuit by the control module.
MIL Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the MIL control circuit. The parameter displays Malfunction if the MIL control circuit is shorted to voltage.
MIL Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the MIL control circuit. The parameter displays Malfunction if the MIL control circuit is shorted to ground.
MIL Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the MIL control circuit. The parameter displays Malfunction if the MIL control circuit is open.
MIL Requested	Engine Idling	No	This parameter displays the reason the engine control module illuminated the MIL. The scan tool will display Yes when the MIL is requested as a result of an A or B type DTC. The scan tool will display No if the MIL is illuminated for another reason, such as transmission DTCs.
MIL Requested by DTC	Engine Idling	No	This parameter indicates the reason the control module illuminated the MIL. The scan tool will display YES when the MIL is requested as a result of an A or B type DTC. The scan tool will display NO if the MIL is illuminated for another reason, such as transmission DTCs.
Minimum DC/DC Converter Output Voltage on Circuit 1 - Last Engine Crank	Ignition ON	Volts	This parameter indicates the minimum DC/DC Converter Output Voltage on Circuit 1 on the last engine crank.
Minimum DC/DC Converter Output Voltage on Circuit 2 - Last Engine Crank	Ignition ON	Volts	This parameter indicates the minimum DC/DC Converter Output Voltage on Circuit 2 on the last engine crank.
Misfire Diagnostic Engine Load	Engine Idling	0–100 %	This parameter displays the engine load used within the misfire diagnostic (calculated as the ratio of the mass of air predicted to be in the cylinder two firing events into the future to the maximum possible mass of air in the cylinder based on the current ambient air pressure and charge temperature).
Misfire Diagnostic Engine Speed	Engine Idling	RPM	This parameter displays the engine speed used within the misfire diagnostic. This engine speed is the maximum engine speed observed over the previous engine cycle.
Misfire Engine Load History 1–5	Engine Idling	0–100 %	This parameter displays the specific engine load when the engine was operating for one of the last five misfire events .
Misfire Engine Speed History 1–5	Engine Idling	RPM	This parameter displays the specific engine speed when the engine was operating for one of the last five misfire events .

Parameter	System State	Expected Value	Description
Misfire Monitor Complete	Engine Idling	Yes/No	This parameter displays the status of the Misfire Monitor. The parameter will display Yes when the Misfire Monitor is Complete.
Misfire Monitor Complete This Ignition Cycle	Ignition ON	No	This parameter displays the completion status of the misfire monitor during the current driving / monitoring cycle.
Misfire Monitor Enabled	Engine Idling	Yes/No	This parameter displays the status of the Misfire Monitor. The parameter will display Yes when the Misfire Monitor is Enabled.
Misfire Monitor Enabled This Ignition Cycle	Ignition ON	No	This parameter displays the enable status of the misfire monitor during the current driving / monitoring cycle.
Neutral Position Sensor	—	°	This parameter displays the current state of the neutral position sensor in degrees.
Number of Calibration History Events Stored	Ignition ON	Counts	This parameter displays the history entries for the primary calibration in the controller.
Number of DTC(s)	Engine Idling	0	This parameter indicates the number of diagnostic trouble codes (DTCs).
O2S/HO2S Monitor Complete	Engine Idling	Yes/No	This parameter displays the enable and completion status during the current driving/ monitoring cycle of each continuous legislated emission related monitor and non continuous legislated emission related monitor.
O2S/HO2S Monitor Complete This Ignition Cycle	Engine Idling	Yes/No	This parameter displays the enable and completion status during the current driving/ monitoring cycle of each continuous legislated emission related monitor and non continuous legislated emission related monitor.
O2S/HO2S Monitor Enabled	Engine Idling	Yes/No	This parameter displays the enable and completion status during the current driving/ monitoring cycle of each continuous legislated emission related monitor and non continuous legislated emission related monitor.
O2S/HO2S Monitor Enabled This Ignition Cycle	Engine Idling	Yes/No	This parameter displays the enable and completion status during the current driving/ monitoring cycle of each continuous legislated emission related monitor and non continuous legislated emission related monitor.
Odometer at Engine Shutdown – Excessive Idle Time	Ignition ON	km / miles	This parameter displays the odometer reading at an engine shutdown due to excessive idle time.
Odometer at Engine Shutdown – High Coolant Temperature	Ignition ON	km / miles	This parameter displays the odometer reading at an engine shutdown due to high coolant temperature.
Odometer at Engine Shutdown – Low Coolant Level	Ignition ON	km / miles	This parameter displays the odometer reading at an engine shutdown due to low coolant level.
Odometer at Engine Shutdown – Low Oil Level	Ignition ON	km / miles	This parameter displays the odometer reading at an engine shutdown due to low oil level.
Odometer When Engine Overspeed Detected	Engine Idling	km/miles	This parameter displays the kilometers or miles of the Odometer When Engine Overspeed Detected.
Oil Level Warning Counter City	Ignition ON	Counts	This parameter displays a rolling count of oil level debounce events for the city calibration.
Oil Level Warning Counter Country Road	Ignition ON	Counts	This parameter displays a rolling count of oil level debounce events for the country road calibration

Parameter	System State	Expected Value	Description
Oil Level Warning Counter Highway	Ignition ON	Counts	This parameter displays a rolling count of oil level debounce events for the highway calibration.
Output Shaft Speed Sensor	Engine Idling	RPM	This parameter displays the transmission output speed.
Park/Neutral Position Switch (If Equipped)	Engine Idling	Park/Neutral	This parameter indicates the range selection of the automatic transmission as calculated by the control module based on input from the PNP switch. The scan tool will display, In Gear, Park, or Neutral depending on the PNP switch position.
Park/Neutral Position Switch (RPO=MO5)	Engine Idling	Active/Inactive	This parameter indicates the status of the Park/Neutral Position (PNP) Switch. When in Park, the PNP Switch is closed and the scan tool will display active. When in Reverse, Neutral, or Drive, the PNP Switch is open and the scan tool will display inactive.
Power Enrichment	Engine Idling	Inactive	This parameter indicates if the control module has detected conditions appropriate to operate in Power Enrichment mode. The scan tool will display Active if the mode is in operation, and Inactive if the mode is not in operation. The control module enters Open Loop operation and increases injector pulse width when in power enrichment mode.
Power Mode	Engine Idling	Run	This parameter displays the state of the System Power Mode. This signal is based upon the state of the system power mode received over serial communication from the vehicle electronics. If the serial data signal not received, the Parameter will display Off.
Radiator Coolant Temperature Sensor	—	Varies C° (F°)	This parameter displays the undefaulted radiator coolant temperature measured by a sensor located in the coolant outlet of the radiator.
RCT vs. IAT Sensor Temperature at Last ECT vs. RCT Malfunction Detection	Engine Idling	Agree	This parameter displays that the temperature values of the RCT and IAT sensors did not agree at the time of the most recent failure of the ECT/RCT rationality diagnostic.
Recommended Maximum Fuel Alcohol Content	Engine Idling	0–100 %	This parameter displays the percentage of the Recommended Maximum Fuel Alcohol Content.
Recommended Maximum Fuel Alcohol Content Exceeded	Engine Idling	No	This parameter displays Yes or No if the Recommended Maximum Fuel Alcohol Content Exceeded.
Recommended Maximum Fuel Alcohol Content When Recommended Maximum Fuel Alcohol Content Exceeded	Engine Idling	%	This parameter displays the percentage of the Recommended Maximum Fuel Alcohol Content When Recommended Maximum Fuel Alcohol Content Exceeded.
Reduced Engine Power	Engine Idling	Inactive	This parameter displays Active if the control module is commanding reduced engine power due to a throttle actuator control (TAC) system condition.

Parameter	System State	Expected Value	Description
Reduced Engine Power History	Engine Idling	Throttle Malfunction, Cooling Fan Malfunction, Engine Over-temperature Protection Active, Engine Oil Temperature Too High, Remote Vehicle Speed Limiting, Engine Calibration Malfunction, Engine Oil Life, High Pressure Fuel System Malfunction	This parameter displays the last reason that Powertrain has illuminated the Reduced Engine Power (REP) indication.
Redundant Odometer Memory	Engine Idling	Present	ECU Odometer Programmed indicates if the ECU odometer value has been programmed.
Refueling Events Since Recommended Maximum Fuel Alcohol Content Exceeded	Engine Idling	Counts	This parameter displays the number Refueling Events Since Recommended Maximum Fuel Alcohol Content Exceeded.
Remaining Fuel in Tank	Engine Idling	0–100 %	This parameter displays the total fuel level as a percentage of the rated capacity of the fuel tank.
Remaining Fuel in Tank	Engine Idling	Liters/Gallons	This parameter displays the actual total fuel volume contained in the fuel tank.
Remote Vehicle Start Disable History 1–8	Engine Cranking	Reason for RVS Disable	These parameters displays the last eight reasons the control module disabled remote vehicle start (RVS).
Remote Vehicle Start Request Signal	Ignition ON	Off	Remote Vehicle Start Request indicates the state of the request received over serial communication from the remote vehicle start (RVS) system to start the vehicle in remote mode.
Replicated Transmission OSS Signal	Ignition ON	RPM	This parameter displays the Replicated Transmission Output Speed (Replicated TOS) received from the Transmission Control Module.
Reverse Inhibit Solenoid Actuator Command	Ignition ON	Allowed	This parameter displays that the driver is inhibited from shifting into reverse.
Reverse Inhibit Solenoid Actuator Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the reverse inhibit solenoid actuator control circuit. The parameter displays Malfunction if the reverse inhibit solenoid actuator control circuit is shorted to voltage.
Reverse Inhibit Solenoid Actuator Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the reverse inhibit solenoid actuator control circuit. The parameter displays Malfunction if the reverse inhibit solenoid actuator control circuit is shorted to ground.
Reverse Inhibit Solenoid Actuator Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the reverse inhibit solenoid actuator control circuit. The parameter displays Malfunction if the reverse inhibit solenoid actuator control circuit is open.
Reverse Position Switch	Engine Idling	Off	This parameter displays if the manual transmission shifter is in reverse.
Secondary Air Injection Monitor Enabled	Engine Idling	Yes	This parameter displays the status of the secondary air injection monitor.
Secondary Air Injection Pressure	Engine Idling	kPa	This parameter displays the normalized secondary air injection system pressure.
Secondary Air Injection Pressure Sensor	Engine Idling	kPa	This parameter displays the unfiltered secondary air injection system pressure.

Parameter	System State	Expected Value	Description
Secondary Air Injection Pressure Sensor	Engine Idling	Volts	This parameter displays the secondary air injection system pressure analog input as a percentage of its reference voltage.
Secondary Air Injection Pressure Sensor Variance	Engine Idling	kPa	This parameter displays the weighted average pressure error (difference between the predicted and actual secondary air injection system pressure) during the secondary air injection on test (phase 1).
Secondary Air Injection Pump Relay Command	Engine Idling	Off	This parameter displays the commanded state of the secondary air injection pump output.
Secondary Air Injection Pump Relay Control Circuit High Voltage Test Status	Engine Idling	OK	This parameter displays the state of the secondary air injection pump relay control circuit. The parameter displays Malfunction if the secondary air injection pump relay control circuit is shorted to voltage.
Secondary Air Injection Pump Relay Control Circuit Low Voltage Test Status	Engine Idling	OK	This parameter displays the state of the secondary air injection pump relay control circuit. The parameter displays Malfunction if the secondary air injection pump relay control circuit is shorted to ground.
Secondary Air Injection Pump Relay Control Circuit Open Test Status	Engine Idling	OK	This parameter displays the state of the secondary air injection pump relay control circuit. The parameter displays Malfunction if the secondary air injection pump relay control circuit is open.
Secondary Air Injection Solenoid Valve Command	Engine Idling	Off	This parameter displays the commanded state of the secondary air injection valve output.
Secondary Air Injection Solenoid Valve Control Circuit High Voltage Test Status	Engine Idling	OK	This parameter displays the state of the secondary air injection solenoid valve control circuit. The parameter displays Malfunction if the secondary air injection solenoid valve control circuit is shorted to voltage.
Secondary Air Injection Solenoid Valve Control Circuit Low Voltage Test Status	Engine Idling	OK	This parameter displays the state of the secondary air injection solenoid valve control circuit. The parameter displays Malfunction if the secondary air injection solenoid valve control circuit is shorted to ground.
Secondary Air Injection Solenoid Valve Control Circuit Open Test Status	Engine Idling	OK	This parameter displays the state of the secondary air injection solenoid valve control circuit. The parameter displays Malfunction if the secondary air injection solenoid valve control circuit is open.
Short Term Fuel Pump Trim	—	#	This parameter displays a numeric value. This is the short term (ST) fuel pump trim.
Short Term Fuel Trim or Short Term Fuel Trim Bank 1 or Bank 2	Engine Idling	−5 % to +5 %	This parameter displays the short-term correction to the fuel delivery by the control module in response to oxygen sensor 1 or 2. If the oxygen sensor indicates a lean air/fuel mixture, the control module will add fuel increasing the short term fuel trim above 0. If the oxygen sensor indicates a rich air/fuel mixture, the control module will reduce fuel decreasing the short term fuel trim below 0.
Short Term Fuel Trim Test Average or Short Term Fuel Trim Test Average Bank 1 or Bank 2	Engine Idling	0–100 %	This parameter display's the filtered short term closed loop fuel correction. This value is compared to thresholds to determine if the fuel adjustment system diagnostic is passing or failing or if an excess purge vapor test should be executed.

Parameter	System State	Expected Value	Description
Short Term Secondary O2 Sensor Fuel Trim Bank 1 or 2	Ignition ON	0–100 %	This parameter displays the Short Term Secondary O2 Sensor Fuel Trim for Bank 1 or 2.
Skip Shift Solenoid Actuator Command	Ignition ON	No Skip	This parameter indicates that the skip shift solenoid is commanded on, inhibiting the driver from shifting up to one of the next highest gears.
Skip Shift Solenoid Actuator Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the skip shift solenoid actuator control circuit. The parameter displays Malfunction if the skip shift solenoid actuator control circuit is shorted to voltage.
Skip Shift Solenoid Actuator Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the skip shift solenoid actuator control circuit. The parameter displays Malfunction if the skip shift solenoid actuator control circuit is shorted to ground.
Skip Shift Solenoid Actuator Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the skip shift solenoid actuator control circuit. The parameter displays Malfunction if the skip shift solenoid actuator control circuit is open.
Specific Humidity	Ignition ON	0–100 %	This parameter shows the current specific humidity level.
Starter Pinion Solenoid Actuator Relay Command	Engine Cranking	On / Off	This parameter indicates the commanded state of the Starter Pinion Solenoid Actuator relay.
Starter Pinion Solenoid Actuator Relay Control Circuit High Voltage Test Status	Engine Cranking	OK, Malfunction, Not Run	This parameter displays the Starter Pinior Solenoid Actuator Relay Control Circuit High Voltage Test Status. Can display OK, Malfunction, or Not Run.
Starter Pinion Solenoid Actuator Relay Control Circuit Low Voltage Test Status	Engine Cranking	OK, Malfunction, Not Run	This parameter displays the Starter Pinior Solenoid Actuator Relay Control Circuit Low Voltage Test Status. Can display OK, Malfunction, or Not Run.
Starter Pinion Solenoid Actuator Relay Control Circuit Open Test Status	Engine Cranking	OK, Malfunction, Not Run	This parameter displays the Starter Pinior Solenoid Actuator Relay Control Circuit Open Circuit Test Status. Can display OK, Malfunction, or Not Run.
Starter Relay Command	Ignition switch not in the crank position	Off	This parameter indicates whether the control module is commanding the starter relay to go On or Off.
	Ignition switch in the crank position	On	
Starter Relay Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the starter relay control circuit. The parameter displays Malfunction if the starter relay control circuit is shorted to voltage. This parameter may not change if the scan tool is used to command the relay control circuit On.
Starter Relay Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the starter relay control circuit. The parameter displays Malfunction if the starter relay control circuit is shorted to ground. This parameter may not change if the scan tool is used to command the relay control circuit On.

Parameter	System State	Expected Value	Description
Starter Relay Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the starter relay control circuit. The parameter displays Malfunction if the starter relay control circuit is open. This parameter may not change if the scan tool is used to command the relay control circuit On.
Start-Up ECT	Ignition ON	−39° to 140°C (−38° to 284°F)	This parameter displays the temperature of the engine coolant on start-up based on input to the control module from the ECT sensor.
Start-Up Fuel Rail Temperature	Engine Idling	ºC (ºF)	This parameter indicates the fuel rail temperature when the engine was started from the first sensor located on the fuel rail.
Start-Up Fuel Rail Temperature 1	Engine Idling	ºC (ºF)	This parameter indicates the fuel rail temperature when the engine was started from the first sensor located on the fuel rail.
Start-Up Fuel Rail Temperature 2	Engine Idling	ºC (ºF)	This parameter indicates the fuel rail temperature when the engine was started from the second sensor located on the fuel rail.
Start-Up IAT Sensor or Start-Up IAT Sensor 1 or 2	Ignition ON	−39° to 140°C (−38° to 284°F)	This parameter displays the temperature of the intake air at start in the air induction system based on input to the control module from the IAT sensor.
Start-Up IAT Sensor 3	Engine Idling	ºC (ºF)	This parameter indicates the intake air temperature when the engine was started.
Stop/Start Disable Mode	Ignition ON	Active / Inactive / Not Available	This parameter indicates the status of the Stop/Start Disable Mode.
Supercharger Bypass Solenoid Valve Command	Ignition ON	0–100 %	This parameter displays the commanded duty cycle for the supercharger boost solenoid output.
Supercharger Bypass Solenoid Valve Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the supercharger bypass solenoid valve control circuit. The parameter displays Malfunction if the supercharger bypass solenoid valve control circuit is shorted to voltage.
Supercharger Bypass Solenoid Valve Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the supercharger bypass solenoid valve control circuit. The parameter displays Malfunction if the supercharger bypass solenoid valve control circuit is shorted to ground.
Supercharger Bypass Solenoid Valve Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the supercharger bypass solenoid valve control circuit. The parameter displays Malfunction if the supercharger bypass solenoid valve control circuit is open.
Supercharger Inlet Pressure	Engine Idling	kPa	This parameter displays the supercharger inlet vacuum pressure calculated as the difference between ambient air pressure (barometric pressure) and supercharger inlet absolute pressure (SCIAP).
Supercharger Inlet Pressure Sensor	Engine Idling	kPa	This parameter displays the unfiltered supercharger inlet absolute pressure (SCIAP).
Supercharger Inlet Pressure Sensor	Engine Idling	Volts	This parameter displays the supercharger inlet absolute pressure (SCIAP) analog input as a percentage of its reference voltage.
SVS Indicator Command	Ignition ON	Off	This parameter displays that the Service Vehicle Soon lamp is being commanded on due to the failure of a non emission related diagnostic test.

Parameter	System State	Expected Value	Description
System Off	Ignition ON	No	This parameter displays that the vehicle is waiting for a key crank to happen (key crank not done yet).
TAC Forced Engine Shutdown	Ignition ON	No	This parameter indicates the status of the TAC motor by the control module. The scan tool will display Yes if the engine has been shut down due to a throttle control fault.
TAC Motor	Ignition ON	Enabled	This parameter indicates the status of the throttle actuator control (TAC) motor driver in the control module. The scan tool will display Enabled if TAC motor operation is allowed. The scan tool will display Disabled if the control module detects a condition that affects TAC motor operation.
TAC Motor Command	Ignition ON	0–100 %	This parameter displays the commanded duty cycle for the throttle actuator output.
TCC/Cruise Control Brake Pedal Switch	Ignition ON	Applied / Released	This parameter indicates the state of the TCC/ Cruise Control Brake Pedal Switch.
Throttle Body Idle Air Flow Compensation	Engine Idling	0–100 %	This parameter displays the percent compensation of the Learned Airflow Variation Calibration. This value indicates the current amount of airflow compensation in response to engine intake airflow restrictions. It can also be used as feedback for the Learned Airflow Adapts Reset Trigger Device Control.
Throttle Position	Ignition ON	0–100 %	This parameter displays the desired throttle position angle commanded by the control module.
Throttle Position Performance Test	Engine Idling	OK	Throttle Position Residual Out of Tolerance indicates that the filtered throttle position residual (the product of the MAF residual and the MAP Test 1 residual) exceeds a failure threshold.
Throttle Position Sensor 1	Ignition ON	3.7–4.3 Volts	This parameter displays the actual voltage on the TP sensor 1 signal circuit as measured by the control module.
Throttle Position Sensor 1 Learned Minimum	Ignition ON	0.51 Volts	This parameter displays the learned minimum value of throttle position (TP) sensor 1 as recorded by the control module during the last learn procedure.
Throttle Position Sensor 1 or 2 Position	Ignition ON	0–100 %	This parameter displays the actual voltage on the TP sensor 2 signal circuit as measured by the control module.
Throttle Position Sensor 2	Ignition ON	0.5–0.8 Volts	This parameter displays the voltage signal sent to the control module from TP sensor 2 of the throttle assembly. The TP sensor 2 is a range of values indicating a low voltage when the throttle is closed to a high voltage when the throttle plate is fully open.
Throttle Position Sensor 2 Learned Minimum	Ignition ON	0.51 Volts	This parameter displays the learned minimum value of TP sensor 2 as recorded by the control module during the last learn procedure.
Throttle Position Sensors 1 and 2	Ignition ON	Agree	This parameter displays Disagree when the control module detects that TP sensor 1 voltage signal is not within the correct relationship to TP sensor 2. The scan tool displays Agree under the normal operating conditions.
Tire Size	Ignition ON	Rev/km	This parameter displays the vehicle tire circumference in centimeters.

Parameter	System State	Expected Value	Description
Torque Delivered Signal	Vehicle Moving	N•m /Lb/Ft	This parameter displays the engine torque based upon the airflow through the engine and the torque losses due to spark retard and fuel shutoff. Since this is a steady state engine torque, it does not include the inertial component of engine torque.
Torque Management Ignition Timing Retard	Engine Idling	Degrees	This parameter displays the total spark retard (in terms of a crankshaft angle).
Torque Request Inhibit – Fuel	Engine Idling	No	This parameter displays the existing condition in the ECM causing the transmission torque request to be limited.
Torque Request Inhibit – Ignition Timing	Engine Idling	No	This parameter displays the existing condition in the ECM causing the transmission torque request to be limited.
Torque Request Inhibit – Ignition Timing Advance	Engine Idling	No	This parameter displays the existing condition in the ECM causing the transmission torque request to be limited.
Torque Request Inhibit – Minimum Idle	Engine Idling	No	This parameter displays the existing condition in the ECM causing the transmission torque request to be limited.
Torque Request Inhibit – Minimum Torque	Engine Idling	No	This parameter displays the existing condition in the ECM causing the transmission torque request to be limited.
Torque Request Inhibit – TAC	Engine Idling	No	This parameter displays the existing condition in the ECM causing the transmission torque request to be limited.
Torque Request Inhibit – TAC Limit	Engine Idling	No	This parameter displays the existing condition in the ECM causing the transmission torque request to be limited.
Total Alternative Fuel Level Percentage	Ignition ON	0–100 %	This parameter displays the undefaulted, total alternative fuel level as a percentage of the rated (advertised) capacity of the alternative fuel tank(s).
Total Engine Mass Air Flow	Engine Idling	g/s	This parameter indicates the engine mass airflow.
Total Engine Overspeed Time	Engine Idling	ms	This parameter displays the Total Engine Overspeed Time.
Total Knock Retard	Engine Idling	0°	This parameter displays how much ignition spark timing is being retarded due to all control systems monitored by the control module.
Total Misfire	Engine Idling	0	This parameter displays the total number of cylinder firing events that the control module detected as misfires for the last 200 crankshaft revolution sample period.
Traction Control Axle Torque Request Signal	Vehicle Moving	N•m (lb ft)	This parameter indicates the axle torque requested by the traction control module.
Traction Control Status	Vehicle Moving	Inactive	This parameter displays Active if the electronic brake and traction control module (EBTCM) is commanding traction control.
Transmission Fluid Pressure Accumulator Solenoid Valve Command	Ignition ON	On/Off	This parameter displays the position of the Transmission Fluid Pressure Accumulator Solenoid Valve Control.
Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit High Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit. The parameter displays Malfunction if the Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit is shorted to voltage.

Parameter	System State	Expected Value	Description
Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit Low Voltage Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit. The parameter displays Malfunction if the Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit is shorted to ground.
Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit Open Test Status	Ignition ON	OK, Malfunction, Not Run	This parameter displays the state of the Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit. The parameter displays Malfunction if the Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit is open.
Transmission Fluid Temperature Sensor	Ignition ON	°C (°F)	This parameter displays the undefaulted, unfiltered transmission oil / fluid temperature measured by a sensor.
Turbocharger 1 Turbine Inlet Valve Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the turbocharger 1 turbine inlet valve control circuit. The parameter displays Malfunction if the turbocharger 1 turbine inlet valve control circuit is shorted to voltage.
Turbocharger 1 Turbine Inlet Valve Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the turbocharger 1 turbine inlet valve control circuit. The parameter displays Malfunction if the turbocharger 1 turbine inlet valve control circuit is open.
Turbocharger 1 Turbine Inlet Valve Duty Cycle	Ignition ON	0–100 %	This parameter displays the commanded duty cycle for the turbocharger 1 turbine inlet valve in a percentage.
Turbocharger Bypass Solenoid Valve Command	Ignition ON	0–100 %	This parameter displays the commanded duty cycle for the turbocharger bypass solenoid valve in a percentage.
Turbocharger Bypass Solenoid Valve Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the turbocharger bypass solenoid valve control circuit. The parameter displays Malfunction if the turbocharger bypass solenoid valve control circuit is shorted to voltage.
Turbocharger Bypass Solenoid Valve Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the turbocharger bypass solenoid valve control circuit. The parameter displays Malfunction if the turbocharger bypass solenoid valve control circuit is shorted to ground.
Turbocharger Bypass Solenoid Valve Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the turbocharger bypass solenoid valve control circuit. The parameter displays Malfunction if the turbocharger bypass solenoid valve control circuit is open.
Turbocharger Wastegate Solenoid Valve Command	Ignition ON	0–100 %	This parameter displays the commanded duty cycle for the turbocharger wastegate solenoid valve in a percentage.
Turbocharger Wastegate Solenoid Valve Control Circuit High Voltage Test Status	Ignition ON	OK	This parameter displays the state of the turbocharger wastegate solenoid valve control circuit. The parameter displays Malfunction if the turbocharger wastegate solenoid valve control circuit is shorted to voltage.
Turbocharger Wastegate Solenoid Valve Control Circuit Low Voltage Test Status	Ignition ON	OK	This parameter displays the state of the turbocharger wastegate solenoid valve control circuit. The parameter displays Malfunction if the turbocharger wastegate solenoid valve control circuit is shorted to ground.

Parameter	System State	Expected Value	Description
Turbocharger Wastegate Solenoid Valve Control Circuit Open Test Status	Ignition ON	OK	This parameter displays the state of the turbocharger wastegate solenoid valve control circuit. The parameter displays Malfunction if the turbocharger wastegate solenoid valve control circuit is open.
Upshift Indicator Command	Vehicle Moving	Off	This parameter displays On when commanded by the engine control module.
Variable Valve Lift Low Lift Disable History 1–8	Engine Idling	Varies	This parameter displays the reason for the last 8 variable valve lift disable history reasons.
Variable Valve Lift Low Lift Inhibit – Reason	Engine Idling	Varies	This parameter lists the reason the variable valve lift low lift may be inhibited. These include; 4WD Low State Invalid, A/C Compressor Clutch On, Acceleration Request, Brake Booster Pressure Sensor DTC, Brake Booster Weak Vacuum, Calculated Torque, Camshaft Position Sensor DTC, Control Function Active, Crankshaft Position Sensor DTC, ECT, ECT Sensor DTC, Engine Controls Ignition Relay DTC, Engine Not Synchronized, Engine Off, Engine Oil Pressure, Engine Oil Pressure Control Solenoid Valve Stuck Off, Engine Oil Pressure Control Test Active, Engine Oil Pressure Sensor DTC, Engine Oil Temperature, Engine Overtemperature Protection, Engine Power Not Requested, Engine Speed, Engine Torque Capacity, Fuel Alcohol Content Learn In Progress, Fuel Alcohol Content Too High, Fuel System Disabled, Green Engine Mode, HO2S 2 Test, Hot Coolant Mode, Hybrid/EV Powertrain Control Module Request, IAT Sensor DTC, Ignition Voltage, MAP Sensor DTC, Maximum Throttle Exceeded, Minimum Time After TAC DTC, Misfire DTC, Oil Aeration. On-Board Diagnostic System, Rocker Arm Solenoid Valve DTC, RPM Limit, TAC System DTC, Transmission Gear, Transmission Range, Transmission Shifting, Vehicle Speed Too Low, VSS DTC.
Variable Valve Lift System Command	—	Low Lift	This parameter displays the current state of the variable valve lift system command.
Vehicle Speed Sensor	Vehicle Moving	Km/h mph	This parameter displays the speed of the vehicle as calculated by the transmission control module (TCM) from information received from the vehicle speed sensor (VSS).
Vehicle Speed When Engine Overspeed Detected	Engine Idling	Km/h mph	This parameter displays the Vehicle Speed When Engine Overspeed Detected.
VIN Programming Counter	Ignition ON	Counts	This parameter displays the number of times the VIN has been programmed. This counter can only be incremented.
Warm Ups Since DTC Cleared	Engine Idling	Counts	This parameter indicates the number of warm up cycles that have occurred Since DTCs were cleared. The scan tool will display a higher counts as more warm up cycles have occurred since the DTCs were cleared.
Warm Ups without Emission Malfunctions	Engine Idling	Counts	This parameter displays the number of OBD defined warm up cycles since the last emissions related (fault type A or B) fail report or MIL request. Emissions related DTCs are cleared from memory when this counter reaches 40.

Parameter	System State	Expected Value	Description
Warm Ups without Non Emission Malfunctions	Engine Idling	Counts	This parameter displays the number of OBD defined warm up cycles since the last non emissions related (fault type C) fail report. Non emissions related DTCs are cleared from memory when this counter reaches 40.
Weight Percent Water in Air	Engine Idling	0–100 %	This parameter displays the calculated value of weight per cent water (specific humidity) in the intake air.
Wide Open Throttle	Engine Idling	No	This parameter displays the throttle status commanded by the control module. The scan tool will display Yes if the vehicle throttle is commanded to 100 percent.
Wide Open Throttle	Ignition ON	No	This parameter displays the desired throttle position exceeds a WOT threshold (selected specifically for service).

Engine Control Module (ECM) Scan Tool Output Controls

Output Control	Description
This is a comprehensive list. Not all output controls listed are available for all applications.	
A/C Compressor Clutch Relay	This device control is used to override the state of the air conditioning compressor output.
Active Grill Air Shutter 1 or 2 Commanded Position	This device control is used to command the position of the active grill air shutter 1 or 2 output. 0% equals fully closed, 100% equals fully open.
Alternative Fuel High Pressure Shutoff Valve Control	This device control is used to override the state of the alternative fuel shutoff valve 1 output.
Alternative Fuel Injector Disable Control	This device control is used with the engine running to override the state of the alternative fuel injector outputs. This device control is used to disable alternative fuel injectors in order to cut off alternative fuel to the associated cylinders.
Alternative Fuel Injector Flow Control	This device control is used to trigger a single Alternative fuel injector to be commanded on for a calibrated number of pulses (e.g. 25) in order to test the flow of the Alternative fuel injector.
Alternative Fuel Low Pressure Shutoff Valve Control	This device control is used to verify functionality of the Alternative Fuel Low Pressure Fuel Shutoff Valve system by allowing the Alternative Fuel Low Pressure Fuel Shutoff Valve output to be commanded to a specific Alternative Fuel Rail Pressure.
Alternative Fuel System Leak Test – Service Bay Test	This device control will signal the ECM to begin the Alternative Fuel System Leak Test.
Autostop/Autostart	This device control is used to override the internal combustion engine (ICE) running state.
BiFuel System – Fuel Mode Selection	When this CPID is active, the fuel mode is commanded to the selection made in “Fuel Mode Selection.”
Brake Pedal Position Learn	This device control is used to reset the brake pedal fully released learned position to its initialized value after a brake system repair.
Camshaft Profile Actuator Stuck On Reset	This device control is used to reset a latched default action when the camshaft profile actuator control is stuck on. The device control will work in conjunction with the vehicle diagnostics to ensure a proper system check before allowing normal vehicle operation.
Camshaft Profile Actuator System	This device control is used to override the state
Compression Test	This device control is used to set up the internal combustion engine for a compression test. The fuel pump, fuel injectors, and spark are all disabled. The throttle is opened to a Wide Open Throttle (WOT) position. For conventional engine vehicles, the extended crank feature is not active, and for strong hybrid vehicles, the Hybrid Powertrain Control Module is configured to crank at the speed specified in the device control command. Engine cranking is completely controlled by the technician either through the ignition key or through a remote starter switch as applicable. The device control limits and rejects will apply normally upon entry to the device control. Once the device control is active, the limits will be monitored (to prevent unwanted starter operation, for example), but in the case of a limit exceeded or a tester disconnect, device control of the fuel and spark will not be released until the Power Mode switches to Accessory or OFF. This will prevent unexpected fuel and spark operation in the case of a device control abort.

Output Control	Description
Coolant Fill	This device control is used to start an automatic coolant fill service routine that will ensure proper fill and de-aeration of the cooling system.
Cooling Fan Relay 1	This function activates the cooling fan relay 1. The normal commanded state of the fan relay is NONE. The relay command status can also be monitored on the scan tool data parameter Cooling Fan Relay 1 Command. The control module allows cooling fan relay control when the following conditions are met: • The Ignition is ON or the engine is running. • A/C compressor operation is not requested. • The engine coolant temperature is less than 106°C (224°F).
Cooling Fan Relay 1,2 and 3	This function activates the cooling fan relay 1, 2 and 3. The normal commanded state of the fan relays is NONE. The relay command status can also be monitored on the scan tool data parameters Cooling Fan Relay 1 Command and Cooling Fan Relays 2 and 3 Command. The control module allows cooling fan relay control when the following conditions are met: • The Ignition is ON or the engine is running. • A/C compressor operation is not requested. • The engine coolant temperature is less than 106°C (224°F).
Cooling Fan 2 and 3	This function activates the cooling fan relay 2 and relay 3. The normal commanded state of the fan relays is NONE. The relay command status can also be monitored on the scan tool data parameter 2 and 3 Command. The control module allows cooling fan relay control when the following conditions are met: • The Ignition is ON or the engine is running. • A/C compressor operation is not requested. • The engine coolant temperature is less than 106°C (224°F).
Crankshaft Position Variation Learn	This device control is used to activate the crankshaft position variation learn algorithm which calculates the reference pulse correction factors for the misfire diagnostic.
Cylinder Power Balance	**Note:** The Misfire Current and Misfire History parameters may not increment when using this function. This function disables the selected fuel injector. The normal commanded state is None. The scan tool initiates the test when the following conditions are met: • The engine is operating and the engine idle is stable. • The vehicle speed is 0 km/h (0 mph). • There are no DTCs set for the vehicle speed sensor. If the fuel injector was disabled for 30 seconds, fuel injector control is not allowed again on the same fuel injector for 60 seconds.
Cylinder 1–4 Exhaust Camshaft Profile Sleeve	This device control is used to override the state. In order to command Deactivate on the B camshaft, the A camshaft profile for the same cylinder must be commanded to Deactivate.
Cylinder 1–4 Intake Camshaft Profile Sleeve	This device control is used to override the state. Upon return to normal control, the system shall actuate the camshaft profile control sleeve as necessary to the system desired position.
Depressurize Fuel System	When the low pressure fuel pump is used in conjunction with a separate high pressure fuel pump for Direct Injection (DI) engines, this device control can be used to reduce the high fuel pressure to a low working level. The high fuel pressure control shall monitor the low pressure “Fuel Pump Device Control with Engine Running” such that when the low pressure pump is commanded OFF the high pressure pump will be controlled to a low pressure value. This combination shall be held until either the FPMR device control is released, or the engine stalls.
Engine Controls Ignition Relay	This device control is used to override the state of the Powertrain Relay.
Engine Coolant Thermostat Heater	This device control is used to override the state of the Engine Coolant Thermostat Heater.
Engine Oil Life Reset	This DID contains the engine oil remaining life determined from an algorithm based upon the effective engine revolutions and the distance driven since the last oil change. This DID may be used to reset the engine oil remaining life to 100 % after an oil change or to any other value when replacing a control module.
Engine Oil Pressure Control Solenoid Valve	This device control is used to override the state of the variable displacement oil pump. When the variable displacement oil pump is turned on, the oil pump will be commanded to a low pressure state.

Output Control	Description
Engine Speed	This function controls the idle speed override in 25 RPM, 100 RPM, and 500 RPM increments, from the base idle speed to 1,400 RPM. The scan tool initiates the test when the following conditions are met: • The transmission is in park or neutral. • The engine speed is less than 1,000 RPM. The engine speed will remain in the commanded state until cancelled by the scan tool.
EVAP Purge/Seal	**Note:** The EVAP Purge and Vent Solenoid Command parameters may not change states when using this output control. This function activates both the EVAP purge solenoid valve and EVAP vent solenoid to seal the EVAP system. When activated, the purge valve is commanded to 0 percent and the vent valve is commanded ON, Not-venting. The normal commanded state for both solenoids is None. Both of the solenoids remain in the commanded state until cancelled by the scan tool or the FTP sensor exceeds −24 mm Hg (−12 inch H20).
EVAP Purge Solenoid Valve	**Note:** The EVAP Purge Solenoid Command parameter may not change states when using this output control. This function controls the evaporative emission (EVAP) purge solenoid valve. The normal commanded state is NONE. The system will increase or decrease the amount of purge by changing the duty cycle of the purge valve in 10 percent increments within a range of 0–100 percent. The system remains in the commanded state until cancelled by the scan tool or the fuel tank pressure (FTP) sensor exceeds −24 mm Hg (−12 inch H20).
EVAP Test	This device control is used to activate the evaporative emissions service bay test.
EVAP Vent Solenoid Valve	**Note:** The EVAP Vent Solenoid Command parameter may not change states when using this output control. This function controls the EVAP vent solenoid. The normal commanded state is NONE. When commanded ON, the vent valve switches to Not-venting. The system remains in the commanded state unless one of the following conditions occur: • Cancelled by the scan tool • The EVAP canister purge solenoid is more than 0 percent, and the FTP sensor exceeds −24 mm Hg (−12 inch H20).
Excessive Clutch Slip Data Reset	This device control is used to reset all clutch slip detection values.
Exhaust Camshaft Position Actuator or Exhaust Camshaft Position Actuator Bank 1	This device control is used to override the state of the exhaust cam phase output. The commanded camshaft position is expressed in terms of degrees of camshaft rotation (retard for exhaust camshaft) from the park position (a camshaft position of zero represents the park position).
Exhaust Camshaft Position Actuator or Exhaust Camshaft Position Actuator Bank 2	This device control is used to override the state of the exhaust cam phase output. The commanded camshaft position is expressed in terms of degrees of camshaft rotation (retard for exhaust camshaft) from the park position (a camshaft position of zero represents the park position).
Exhaust Camshaft Position Actuator Solenoid Valve or Exhaust Camshaft Position Actuator Solenoid Valve Bank 1	This device control is used to override the state of the exhaust cam phase solenoid output.
Exhaust Camshaft Position Actuator Solenoid Valve or Exhaust Camshaft Position Actuator Solenoid Valve Bank 2	This device control is used to override the state of the exhaust cam phase solenoid output.
Exhaust Camshaft Profile Actuator	This device control is used to override the state of the B camshaft profile actuator control outputs. The device control is intended as an electrical test and is only allowed with the actuator connector disconnected. This is confirmed by having the open circuit fault active for the camshaft profile actuator position sensor and at least one of the two camshaft profile actuator control outputs on the actuator assembly the device control is being requested for.
Fuel Composition Reset	**Note:** Do not use this output control unless the actual alcohol content of the fuel in the tank is 10 percent or less. This will reset the learned alcohol composition to 0 percent in the engine control module (ECM).

Output Control	Description
Fuel Control Loop Status	This function controls the heated oxygen sensor (HO2S) loop status. The commanded states include NONE, OPEN, and CLOSED. The normal commanded state is NONE. The loop status changes as commanded, OPEN or CLOSED. The system remains in the commanded state until cancelled by the scan tool.
Fuel Injector Balance Test (If Available)	This function enables the fuel injector in order to verify the correct fuel injector flow. The ECM will pulse the selected fuel injector when the following conditions are met: • All instruction on the scan tool is complete. • A fuel injector is selected. • The ignition is ON with the engine OFF. The selected fuel injector can only be flowed/pulsed once per ignition cycle.
Fuel Mode Indicator Lamp System	This device control is used to verify the functionality of the Fuel Mode Indicator Lamp.
Fuel Pressure	This function allows control of the fuel rail pressure (FRP) regulator which is integral to the high pressure fuel pump. The system will Increase or Decrease the fuel rail pressure in increments, as commanded within an approximate range of 1862–17,237 kPa (270–2500 psi). The scan tool initiates the test when the following conditions are met: • The engine is operating • The ignition voltage is 10–18 V • The vehicle speed is 0 mph • DTC P0700 is not set The system remains in the commanded state for about 30 seconds or until cancelled by the scan tool or the ECM detects a vehicle speed.
Fuel Pressure Regulator	**Note:** As this is an electrical circuit test, a regulator solenoid commanded to ON does not necessarily equate to the regulator state at maximum fuel pressure. This device control is intended for use on a Direct Injection (DI) high pressure fuel supply system to activate the fuel pressure regulator at ignition ON, engine OFF. Both the low side and high side of the regulator are controlled together. Commanding the regulator to ON will modulate the high side driver to a calibratible Maximum Duty Cycle.
Fuel Pump Enable	This function controls the fuel pump. The normal commanded state is NONE. The scan tool initiates the test when the following conditions are met: • There are no vehicle speed sensor DTCs set. • The vehicle speed is 0 km/h (0 mph). When commanded ON/OFF, the engine control module (ECM) turns the fuel pump ON/OFF. If the engine is running and the fuel pump is commanded OFF, the engine will stall. The system remains in the commanded state for about 2 seconds or until cancelled by the scan tool or the ECM detects a vehicle speed.
Fuel Pump Speed	This device control is used to override the normal control of the fuel pump output. The device control is a service diagnostic aid that is used to determine if the fuel pump system is functioning properly. Different limit checks are used when the engine is and is not running for the operation of the fuel pump.
Fuel Rail Pressure	This device control is intended for use on a Direct Injection (DI) high pressure fuel supply system to override the commanded fuel high pressure output from the powertrain controller.
Fuel Trim Enable	This function disables the control modules ability to learn new fuel trim parameters. The commanded states are NONE, ENABLED, DISABLED. The normal commanded state is NONE. The system remains in the commanded state until cancelled by the scan tool.
Fuel Trim Reset	This function is used to reset the learned fuel trim values to their initial values.
Generator L-Terminal	Commands the generator L terminal ON and OFF.
Heater Coolant Pump	This device control is used to override the state of the heater core pump relay output.
HO2S Heater Sensor 1 or HO2S Heater Bank 1 Sensor 1	This device control is used to override the duty cycle of the oxygen sensor heaters. With the engine OFF, this device control is intended to be used as a discrete control for circuit diagnosis. With the engine OFF, none of the oxygen sensor heaters can be commanded ON for more than 3.0 seconds, after which the selected oxygen sensor heater must be disabled for a limited duration (typically 60 seconds) before it may be enabled again. With the engine running, this device control is used to operate the oxygen sensor heaters at the various duty cycles available to the engine controller.

Output Control	Description
HO2S Heater Sensor 2 or HO2S Heater Bank 1 Sensor 2	This device control is used to override the duty cycle of the oxygen sensor heaters. With the engine OFF, this device control is intended to be used as a discrete control for circuit diagnosis. With the engine OFF, none of the oxygen sensor heaters can be commanded ON for more than 3.0 seconds, after which the selected oxygen sensor heater must be disabled for a limited duration (typically 60 seconds) before it may be enabled again. With the engine running, this device control is used to operate the oxygen sensor heaters at the various duty cycles available to the engine controller.
HO2S Heater Bank 2 Sensor 1	This device control is used to override the duty cycle of the oxygen sensor heaters. With the engine OFF, this device control is intended to be used as a discrete control for circuit diagnosis. With the engine OFF, none of the oxygen sensor heaters can be commanded ON for more than 3.0 seconds, after which the selected oxygen sensor heater must be disabled for a limited duration (typically 60 seconds) before it may be enabled again. With the engine running, this device control is used to operate the oxygen sensor heaters at the various duty cycles available to the engine controller.
HO2S Heater Bank 2 Sensor 2	This device control is used to override the duty cycle of the oxygen sensor heaters. With the engine OFF, this device control is intended to be used as a discrete control for circuit diagnosis. With the engine OFF, none of the oxygen sensor heaters can be commanded ON for more than 3.0 seconds, after which the selected oxygen sensor heater must be disabled for a limited duration (typically 60 seconds) before it may be enabled again. With the engine running, this device control is used to operate the oxygen sensor heaters at the various duty cycles available to the engine controller.
HO2S Heater Learn	This device control is used to trigger the reset of the learned resistances for the oxygen sensor heaters following a replacement in service. The learned resistances are reset to a calibration used to prevent overheating of the sensors until more accurate resistances may be learned following an extended engine OFF time (typically 12 or more hours).
Idle Ignition Timing	Disables and enables idle spark advance with the engine running.
Idle Learn	This function allows the throttle position and the idle speed to be relearned by the ECM, once the following conditions have been met. • The ignition is ON with the engine OFF. • The ECT is between 5–85°C (41–185°F). • No throttle actuator control (TAC) system DTCs are set.
Ignition Timing Retard	This device control is used to retard the spark angle from the software calculated spark angle. For example, if the software calculated spark angle was 15 degrees advanced and this device control requested a 3 degree retard, the commanded spark angle that would be delivered would be 12 degrees advanced.
Intake Air Heater	This device control is used to override the state of the intake air heater.
Intake Camshaft Position Actuator or Intake Camshaft Position Actuator Bank 1	This device control is used to override the state of the intake cam phase output. The commanded camshaft position is expressed in terms of degrees of camshaft rotation (advance for intake camshafts) from the park position (a camshaft position of zero represents the park position).
Intake Camshaft Position Actuator or Intake Camshaft Position Actuator Bank 2	This device control is used to override the state of the intake cam phase output. The commanded camshaft position is expressed in terms of degrees of camshaft rotation (advance for intake camshafts) from the park position (a camshaft position of zero represents the park position).
Intake Camshaft Position Actuator Solenoid Valve or Intake Camshaft Position Actuator Solenoid Valve Bank 1	This device control is used to override the state of the intake cam phase solenoid output.
Intake Camshaft Position Actuator Solenoid Valve or Intake Camshaft Position Actuator Solenoid Valve Bank 2	This device control is used to override the state of the intake cam phase solenoid output.
Intake Camshaft Profile Actuator	This device control is used to override the state of the A camshaft profile actuator control outputs. The device control is intended as an electrical test and is only allowed with the actuator connector disconnected. This is confirmed by having the open circuit fault active for the camshaft profile actuator position sensor and at least one of the two camshaft profile actuator control outputs on the actuator assembly the device control is being requested for.

Output Control	Description
Intake Rocker Arm Solenoid Valve 1–2 or 1 and 2	When the engine is running, this device control may be used to command intake valve opening to low or high (high being default when the solenoid is not energized) valve lift mode either in cylinder pairs or as a system.
Malfunction Indicator Lamp (MIL)	This function controls the malfunction indicator lamp (MIL). The normal commanded state is NONE. When commanded ON/OFF, the ECM turns the MIL ON/OFF. The system remains in the commanded state until cancelled by the scan tool.
Mass Air Flow Sensor Supply Voltage	This device control is used to override the state of the mass air flow sensor supply voltage output.
Misfire Graphic	This function clears the misfire graphics from the scan tool.
Oil Life Reset	This output control is used to reset the engine oil life monitor from 0 to 100 %.
Remote Vehicle Start Disable History Reset	This function clears the remote vehicle start (RVS) disable history. When RESET is selected the reason the control module did not allow RVS in the last 8 attempts is cleared.
Secondary Air Injection Pump Relay	This device control is used to turn the AIR Pump ON or OFF.
Secondary Air Injection Solenoid Valve	This device control is used to turn the AIR Valve ON or OFF.
Secondary Air Injection Test	This device control is used to trigger the secondary air injection (SAI) diagnostic service bay test, which causes the on board SAI diagnostic to execute until it is completed or aborted.
Starter Relay (If Available)	Commands the starter relay ON and OFF.
Throttle Position	This device control is used to override the commanded throttle position.
Throttle Sweep	This function moves the Throttle plate slowly from a closed position to wide open position, aiding diagnosis of TAC motor.
Transmission Fluid Pressure Accumulator Solenoid Valve	This device control is used to override the state of the Transmission Fluid Pressure Accumulator Solenoid Valve.
Turbocharger Bypass Solenoid Valve	This device control is used to control the duty cycle for the turbocharger A compressor bypass.
Turbocharger Wastegate Solenoid Valve	This device control is used to control the duty cycle for the turbocharger A wastegate.

K219 Lighting Control Module: Scan Tool Information

Lighting Control Module — Data Display — Front Exterior Lighting Data

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Left Daytime Running Lamps	—	Off	The scan tool displays On or Off.
Right Daytime Running Lamps	—	Off	The scan tool displays On or Off.
Left Low Beam Command	—	Inactive	The scan tool displays Active or Inactive.
Right Low Beam Command	—	Inactive	The scan tool displays Active or Inactive.
Left Front Turn Signal Lamp Command	—	Off	The scan tool displays On or Off.
Right Front Turn Signal Lamp Command	—	Off	The scan tool displays On or Off.
Left Park Lamps Command	—	Off	The scan tool displays On or Off.
Right Park Lamps Command	—	Off	The scan tool displays On or Off.

Lighting Control Module — Data Display — Rear Exterior Lighting Data

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Left Turn Signal Lamps	—	Off	The scan tool displays On or Off.
Right Turn Signal Lamps	—	Off	The scan tool displays On or Off.
Left Tail Lamp Driver	—	Off	The scan tool displays On or Off.
Right Tail Lamp Driver	—	Off	The scan tool displays On or Off.
Center High Mounted Stop Lamp Driver	—	Off	The scan tool displays On or Off.
License Plate Lamp Circuit Driver	—	Off	The scan tool displays On or Off.

Lighting Control Module — Data Display — Side Exterior Lighting Data

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Left Side Marker Lamp Command	—	Off	The scan tool displays On or Off.
Right Side Marker Lamp Command	—	Off	The scan tool displays On or Off.
Left Turn Signal Repeater Lamp Command	—	Off	The scan tool displays On or Off.
Right Turn Signal Repeater Lamp Command	—	Off	The scan tool displays On or Off.

Lighting Control Module — Data Display — Indicator Data

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Vehicle in Service Mode, Vehicle in Park, All Doors Closed			
Daytime Running Lamps Indicator	—	Off	The scan tool displays On or Off.
Front Park Lamps Indicator	—	Off	The scan tool displays On or Off.
Headlamp High Beam Indicator	—	Inactive	The scan tool displays Active or Inactive.
Left Turn Signal Indicator	—	Off	The scan tool displays On or Off.
Right Turn Signal Indicator	—	Off	The scan tool displays On or Off.
Left Front Turn Signal Lamp Malfunction Indicator	—	Off	The scan tool displays On or Off.
Left Rear Turn Signal Lamp Malfunction Indicator	—	Off	The scan tool displays On or Off.
Right Front Turn Signal Lamp Malfunction Indicator	—	Off	The scan tool displays On or Off.
Right Rear Turn Signal Lamp Malfunction Indicator	—	Off	The scan tool displays On or Off.

Lighting Control Module — Exterior Lighting — Scan Tool Output Controls

Output Control	Description
Center High Mounted Stop Lamp	This output control is used to activate the center high mounted stop lamp when selecting On. The center high mounted stop lamp should illuminate until commanded Off.
Left Stop Lamp	This output control is used to activate the left stop lamp when selecting On. The left stop lamp should illuminate until commanded Off.
Right Stop Lamp	This output control is used to activate the right stop lamp when selecting On. The right stop lamp should illuminate until commanded Off.
License Plate Lamps	This output control is used to activate the license plate lamps when selecting On. The license plate lamps should illuminate until commanded Off.
Backup Lamps	This output control is used to activate the backup lamps when selecting On. The backup lamps should illuminate until commanded Off.
Left Front Park Lamp Status	This output control is used to activate the left park lamps when selecting On. The left park lamps should illuminate until commanded Off.
Right Front Park Lamp Status	This output control is used to activate the right park lamps when selecting On. The right park lamps should illuminate until commanded Off.
Left Daytime Running Lamps	This output control is used to activate the left daytime running lamps when selecting On. The left daytime running lamps should illuminate until commanded Off.
Right Daytime Running Lamps	This output control is used to activate the right daytime running lamps when selecting On. The right daytime running lamps should illuminate until commanded Off.
Left Auxiliary Daytime Running Lamps	This output control is used to activate the left auxiliary daytime running lamps when selecting On. The left auxiliary daytime running lamps should illuminate until commanded Off.
Right Auxiliary Daytime Running Lamps	This output control is used to activate the right auxiliary daytime running lamps when selecting On. The right auxiliary daytime running lamps should illuminate until commanded Off.
Left Front Auxiliary Park Lamp Command	This output control is used to activate the left front auxiliary park lamp when selecting On. The left front auxiliary park lamp should illuminate until commanded Off.
Right Front Auxiliary Park Lamp Command	This output control is used to activate the right front auxiliary park lamp when selecting On. The right front auxiliary park lamp should illuminate until commanded Off.
Left Front Turn Signal Lamp Command	This output control is used to activate the left front turn signal lamp when selecting On. The left front turn signal lamp should illuminate until commanded Off.
Right Front Turn Signal Lamp Command	This output control is used to activate the right front turn signal lamp when selecting On. The right front turn signal lamp should illuminate until commanded Off.
Left Turn Signal Repeater Lamp Command	This output control is used to activate the left turn signal repeater lamp when selecting On. The left turn signal repeater lamp should illuminate until commanded Off.
Right Turn Signal Repeater Lamp Command	This output control is used to activate the right turn signal repeater lamp when selecting On. The right turn signal repeater lamp should illuminate until commanded Off.
Left Rear Turn Signal Lamp	This output control is used to activate the left rear turn signal lamp when selecting On. The left rear turn signal lamp should illuminate until commanded Off.
Right Rear Turn Signal Lamp	This output control is used to activate the right rear turn signal lamp when selecting On. The right rear turn signal lamp should illuminate until commanded Off.

K29FV Front Seat Heater Vent Control Module: Scan Tool Information

Front Seat Heating Control Module Scan Tool Data Parameters

Parameter	Expected Values	Description
Operating Conditions: Engine Running		
Seat Heating/Venting/Cooling Load Shed	Inactive / Active	When this parameter is active it indicates the Heating/Venting/ System is shutdown to reduce strain on the vehicle electrical system which is experiencing too high of a current draw
Left Front Seat Heating/Venting/ Cooling Operating Conditions	Remote Vehicle Start / Automatic / Manual / Autostop Request	The functional behavior of heated seats is dependent on its determined operational state. This parameter indicates the defined state which it is operating in.

Parameter	Expected Values	Description
Left Front Seat Heating/Venting/ Cooling Switch	Inactive / Active	The Heated/Vented switch assembly contains a number of switches affecting the operation of the Heated Vented Seats. This parameter indicates when any one of the switches is active and is persistent as long as the switch is pressed.
Left Front Seat Heating/Venting/ Cooling Requested Mode	Off / Seat Back Heating / Seat Back and Cushion Heating / Seat Venting/ Cooling	This parameter indicates the type of Heated/Vented Seat function being requested , as determined by the BCM tracking various inputs
Left Front Seat Heating/Venting/ Cooling Requested Level	Off / High / Medium / Low	This parameter indicates the type of Heated/Vented Seat level of intensity being requested as determined by the BCM tracking various inputs
Left Front Seat Heating/Venting/ Cooling Mode	Off / Seat Back Heating / Seat Back and Cushion Heating / Seat Venting/ Cooling	This parameter indicates the type of Heated/Vented Seat function being applied as commanded by the BCM software based on a number of factors
Left Front Seat Heating/Venting/ Cooling Level	Off / High / Medium / Low	This parameter indicates the type of Heated/Vented Seat level of intensity being applied as commanded by the BCM software based on a number of factors.
Right Front Seat Heating/Venting/ Cooling Operating Conditions	Remote Vehicle Start / Automatic / Manual / Autostop Request	The functional behavior of heated seats is dependent on its determined operational state. This parameter indicates the defined state which it is operating in.
Right Front Seat Heating/Venting/ Cooling Switch	Inactive / Active	The Heated/Vented switch assembly contains a number of switches affecting the operation of the Heated Vented Seats. This parameter indicates when any one of the switches is active and is persistent as long as the switch is pressed.
Right Front Seat Heating/Venting/ Cooling Requested Mode	Off / Seat Back Heating / Seat Back and Cushion Heating / Seat Venting/ Cooling	This parameter indicates the type of Heated/Vented Seat function being requested, as determined by the BCM tracking various inputs
Right Front Seat Heating/Venting/ Cooling Requested Level	Off / High / Medium / Low	This parameter indicates the type of Heated/Vented Seat level of intensity being requested as determined by the BCM tracking various inputs
Right Front Seat Heating/Venting/ Cooling Mode	Off / Seat Back Heating / Seat Back and Cushion Heating / Seat Venting/ Cooling	This parameter indicates the type of Heated/Vented Seat function being applied as commanded by the BCM software based on a number of factors
Right Front Seat Heating/Venting/ Cooling Level	Off / High / Medium / Low	This parameter indicates the type of Heated/Vented Seat level of intensity being applied as commanded by the BCM software based on a number of factors.

Front Seat Heating Control Module Scan Tool Output Controls

Control Functions	Description
Operating Conditions: Engine Running	
Left Front Seat Heating	This output control is used to command the left front seat heater elements On.
Right Front Seat Heating	This output control is used to command the right front seat heater elements On.
Left Front Seat Blower Command	This output control is used to command the left front seat blower On.
Right Front Seat Blower Command	This output control is used to command the right front seat blower On.

K36 Restraints Control Module: Scan Tool Information

Note: Some parameters and values in the table below may not apply to every vehicle.

Restraints Control Module Scan Tool Data Parameters

Parameter	Expected Value	Definition
Operating Conditions: Ignition ON		
2nd Row Left Seat Belt Reminder Sensor Pad Enable Status	Disabled/Enabled	The scan tool displays if the left rear seat belt reminder sensor pad is enabled to the RCM.
2nd Row Left Seat Belt Reminder Sensor Pad Learn Status	Learned/Not Learned	The scan tool displays Learned or Not Learned. Learned is displayed if the left rear seat belt reminder sensor pad has been learned by the RCM.
2nd Row Left Seat Belt Status	Buckled/Unbuckled	The scan tool displays Buckled or Unbuckled. This is the state of the left rear seat belt switch when the seat belt is buckled or unbuckled.
2nd Row Middle Seat Belt Reminder Sensor Pad Enable Status	Disabled/Enabled	The scan tool displays if the rear middle seat belt reminder sensor pad is enabled to the RCM.
2nd Row Middle Seat Belt Reminder Sensor Pad Learn Status	Learned/Not Learned	The scan tool displays Learned or Not Learned. Learned is displayed if the rear middle seat belt reminder sensor pad has been learned by the RCM.
2nd Row Middle Seat Belt Status	Buckled/Unbuckled	The scan tool displays Buckled or Unbuckled. This is the state of the middle rear seat belt switch when the seat belt is buckled or unbuckled.
2nd Row Middle Seat Belt Reminder Sensor Pad Enable Status	Disabled/Enabled	The scan tool displays if the rear right seat belt reminder sensor pad is enabled to the RCM.
2nd Row Middle Seat Belt Reminder Sensor Pad Learn Status	Learned/Not Learned	The scan tool displays Learned or Not Learned. Learned is displayed if the rear right seat belt reminder sensor pad has been learned by the RCM.
2nd Row Right Seat Belt Status	Buckled/Unbuckled	The scan tool displays Buckled or Unbuckled. This is the state of the right rear seat belt switch when the seat belt is buckled or unbuckled.
Air Bag Malfunction Indicator	On/Off/Flashes	The scan tool will display On or Flashes if there is a problem with the SIR system. Any problems within the SIR system will illuminate the air bag indicator. The indicator will either flash or stay on.
Base Model Part Number	Varies, 8 Digit Number	The scan tool displays the part number of the RCM which is stored in non volatile memory.
Calibration Part Number	Varies, 8 Digit Number	The scan tool displays the part number of the calibration file in the RCM.
Deployment Loop 1-18 Enable Status	Enabled/Disabled	The scan tool displays Enabled or Disabled. This is the status of the air bag or pretensioner.
Deployment Loop 1-18 Learn Status	Learned/Not Learned	The scan tool displays Learned or Not learned. Learned is displayed if the RCM has defined the number loop programmed from an air bag or pretensioner.
Deployment Loop 1-18 Resistance	1.44–4.25 Ohms	The scan tool displays the resistance of the learned loop of the air bag or pretensioner when connected to the RCM.
Deployment Loop 1-18 Type	Varies	The scan tool displays the name of the air bag or pretensioner associated with the loop type 1–18.
Driver Seat Belt Reminder Indicator	On/Off	The scan tool displays On if this indicator is on. If the indicator is on it means the seat belt has not been buckled.
Driver Seat Belt Sensor Enable Status	Enabled/Disabled	The scan tool displays if the seat belt sensor in the seat belt buckle is enabled to the RCM.
Driver Seat Belt Sensor Learn Status	Learned/Not learned	The scan tool displays Learned or Not Learned. Learned is displayed if the driver seat belt sensor has been learned by the RCM.
Driver Seat Belt Status	Buckled/Unbuckled	The scan tool displays Buckled or Unbuckled. This is the state of the driver seat belt switch when the seat belt is buckled or unbuckled.

Parameter	Expected Value	Definition
Driver Seat Position Sensor	Rearward/Forward	The scan tool will display if the driver seat is forward or rearward of the sensor set position.
Driver Seat Position Sensor Enable Status	Enabled/Disabled	The scan tool displays if the seat position sensor is enabled to the RCM.
Driver Seat Position Sensor Learn Status	Learned/Not Learned	The scan tool displays Learned or Not Learned. Learned is displayed if the driver seat position sensor has been learned by the RCM.
End Model Part Number	Varies, 8 Digit Number	The scan tool displays the part number of the RCM in production.
Impact Sensor 1-8 Enable Status	Enabled/Disabled	The scan tool displays Enabled or Disabled This is the status of the impact sensor.
Impact Sensor 1-8 Learn Status	Learned/Not Learned	The scan tool displays Learned or Not learned. Learned is displayed if the RCM has learned and has assigned a number to that impact sensor.
Impact Sensor 1-8 Type	Equipped/Not Equipped	The scan tool displays the name of the impact sensor associated with the type 1–8.
Restraint Control Module Module Primary Key	Hex Value	The scan tool indicates the primary key Hex value.
Manufacturer's Traceability Number	Varies, 16 Digit Number	The scan tool displays the 16 digit traceability number in the RCM.
Module Setup	Incomplete/Complete	The scan tool indicates if the RCM is set up.
Passenger Air Bag Disabled Switch	On/Off	The scan tool displays Off when the customer manually turns the passenger airbag off with this switch.
Passenger Air Bag Off Indicator	On/Off	The scan tool displays Off when the passenger indicator is not illuminated. This indicator is off when the disable switch is in the off position or no one is sitting in the passenger seat.
Passenger Air Bag On Indicator	On/Off	The scan tool displays On when the passenger indicator is illuminated. This indicator is on when the disable switch is in the on position and someone is sitting in the passenger seat.
Passenger Air Bag Status	Enabled/Disabled	The scan tool displays if the passenger air bag is enabled to the RCM.
Passenger Air Bag Disable Indicator Enable Status	Enabled/Disabled	The scan tool displays if the passenger air bag disable indicator is enabled to the RCM.
Passenger Air Bag Disable Indicator Learn Status	Learned/Not Learned	The scan tool displays Learned or Not Learned. Learned is displayed if the RCM has learned the status of the passenger air bag disable indicator.
Passenger Air Bag Disable Switch Enable Status	Enabled/Disabled	The scan tool displays if the passenger air bag disable switch is enabled to the RCM.
Passenger Air Bag Disable Switch Learn Status	Learned/Not Learned	The scan tool displays Learned or Not Learned. Learned is displayed if the RCM has learned the status of the passenger air bag disable switch.
Passenger Air Bag Enable Indicator Enable Status	Enabled/Disabled	The scan tool displays if the passenger air bag enable indicator is enabled to the RCM.
Passenger Air Bag Enable Indicator Learn Status	Learned/Not Learned	The scan tool displays Learned or Not Learned. Learned is displayed if the RCM has learned the status of the passenger air bag enable indicator.
Passenger Classification	00–07	The scan tool will display what type of individual is sitting in the passenger seat.
Passenger Presence Detection System Enable Status	Enabled/Disabled	The scan tool displays if the restraint occupation classification system is enabled to the RCM.
Passenger Presence Detection System Learn Status	Learned/Not Learned	The scan tool displays Learned or Not Learned. Learned is displayed if the RCM has learned the passenger presence system.
Passenger Presence Detection System Reporting DTC(s)	Yes/No	The RCM will report if there are DTCs set in the passenger presence module.

Parameter	Expected Value	Definition
Passenger Seat Belt Reminder Indicator	On/Off	The scan tool displays On if this indicator is on. If the indicator is on it means the seat belt has not been buckled.
Passenger Seat Belt Reminder Indicator Enable Status	Disabled/Enabled	The scan tool displays if the passenger seat belt reminder indicator is enabled to the RCM.
Passenger Seat Belt Reminder Indicator Learn Status	Learned/Not Learned	The scan tool displays Learned or Not Learned. Learned is displayed if the passenger seat belt reminder indicator has been learned by the RCM.
Passenger Seat Belt Reminder Sensor Pad Enable Status	Disabled/Enabled	The scan tool displays if the passenger seat belt reminder sensor pad is enabled to the RCM.
Passenger Seat Belt Reminder Sensor Pad Learn Status	Learned/Not Learned	The scan tool displays Learned or Not Learned. Learned is displayed if the passenger seat belt reminder sensor pad has been learned by the RCM.
Passenger Seat Belt Sensor Enable Status	Enabled/Disabled	The scan tool displays if the seat position sensor is enabled to the RCM.
Passenger Seat Belt Sensor Learn Status	Learned/Not learned	The scan tool displays Learned or Not Learned. Learned is displayed if the passenger seat belt sensor has been learned by the RCM.
Passenger Seat Belt Status	Buckled/Unbuckled	The scan tool displays Buckled or Unbuckled. This is the state of the passenger seat belt switch when the seat belt is buckled or unbuckled.
Passenger Seat Occupancy Status	Empty Seat/Occupied	The scan tool displays Occupied if someone is sitting in the passenger seat.
Passenger Seat Position Sensor	Rearward/Forward	The scan tool will display if the passenger seat is forward or rearward of the sensor set position.
Passenger Seat Position Sensor Enable Status	Disabled/Enabled	The scan tool displays if the passenger seat position sensor pad is enabled to the RCM.
Passenger Seat Position Sensor Learn Status	Learned/Not Learned	The scan tool displays Learned or Not Learned. Learned is displayed if the passenger seat position sensor has been learned by the RCM.
Power Mode	Off/Accessory/Run/Crank Request	The scan tool will display the power mode of the vehicle.
Primary Key Status	Valid/Invalid	The scan tool displays Valid if the primary key matches what is stored to memory in the RCM.
Primary Key Status Last Ignition Cycle	Invalid/Valid	The RCM checks to see if the primary key data received is valid.
Received Primary Key	Hex Value	The scan tool displays a Hex value indicating the RCM received primary key data.
Rollover Sensor Enable Status	Disabled/Enabled	The scan tool displays if the rollover sensor is enabled to the RCM.
Rollover Sensor Learn Status	Learn/Unlearn	The scan tool displays Learned or Not Learned. Learned is displayed if the rollover sensor has been learned by the RCM.
Security Code Accepted	Yes/No	The RCM either accepts the security code or it does not. The scan tool displays Yes if the security code has been accepted by the RCM.
Security Code Lockout	Yes/No	The scan tool displays Yes if the RCM has been locked out because of the security code not being accepted.
Security Code Lockout Active Timer	Random Value	The RCM uses a timer before the security code is locked in the RCM.
Security Code Programmed	Yes/No	The scan tool displays Yes if the RCM has been programmed with the security code.
Security Code Programming Counter	Random Value	The RCM uses a counter for the value of the security code programming.
Security Code Reset Counter	Random Value	The RCM uses a counter to reset the value of the security code.
Software Part Number	Varies, 8 Digit Number	The scan tool displays the software part number in the RCM.

Parameter	Expected Value	Definition
Vehicle Identification Number	Varies, 17 Digit Number	The VIN number of the vehicle programmed into the RCM.
VIN Programmed	Yes/No	The scan tool displays Yes if the VIN has been programmed into the RCM.
VIN Programming Counter	Random Value	The RCM uses this counter while programming the VIN.

K38 Chassis Control Module: Scan Tool Information

Chassis Control Module (CCM) Scan Tool Data Parameters for Fuel System

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Engine Idling at Normal Operating Temperature/Vehicle is in Park or Neutral			
Desired Fuel Pressure	—	306.8 kPa (44.5 psi)	This displays kPa (psi). This is the desired fuel pressure.
Fuel Pump Command	—	On	The scan tool displays On or Off. This is the current state of the fuel pump command.
Fuel Pump Signal Command	—	Varies	This displays %. This is the commanded fuel pump signal measured in percentage.
Fuel Pressure Sensor	—	296.4–310.3 kPa (43–45 psi)	This displays kPa (psi). This is the current pressure at the fuel pressure sensor.
Fuel Pressure Sensor	—	2.00–3.00 Volts	This voltage can vary depending on the engine application, engine load, operating conditions and other factors. This display is in Volts. This is the fuel pressure sensor voltage.
Ignition 1 Signal	—	Varies	This displays Volts. This is the current ignition 1 signal.
LT Fuel Pump Trim	—	Varies	This displays a numeric value. This is the long term (LT) fuel pump trim.
ST Fuel Pump Trim	—	Varies	This displays a numeric value. This is the short term (ST) fuel pump trim.

Chassis Control Module (CCM) Scan Tool Output Controls for Fuel System

Output Control	Description
Fuel Pressure Control	This output control is used to control the fuel pressure.
Fuel Pump	This output control is used to command the fuel pump ON and OFF.
Fuel Pump Trim Reset	This output control is used to reset the fuel pump trim.

CCM Scan Tool Parameters for Active Grille Air Shutters (If Equipped)

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Engine Idling at Normal Operating Temperature / Vehicle is in Park or Neutral			
Active Grille Air Shutter Position Command (Single Shutter System)	—	Varies	This displays %. This is the commanded active grille air shutter position.
Active Grille Air Shutter Position (Single Shutter System)	—	Varies	This displays %. This is the actual active grille air shutter position.

Parameter	System State	Expected Value	Description
Active Grille Air Shutter 1 Position Command (Dual Shutter System)	—	Varies	This displays %. This is the commanded active grille air shutter position.
Active Grille Air Shutter 1 Position (Dual Shutter System)	—	Varies	This displays %. This is the actual active grille air shutter position.
Active Grille Air Shutter 2 Position Command (Dual Shutter System)	—	Varies	This displays %. This is the commanded active grille air shutter position.
Active Grille Air Shutter 2 Position (Dual Shutter System)	—	Varies	This displays %. This is the actual active grille air shutter position.

CCM Scan Tool Output Controls for Active Grille Air Shutters (If Equipped)

Output Control	Description
Active Grille Air Shutter System (Single Shutter System)	This output control is used to perform the Active Grille Air Shutter Actuator test. It is used to cycle the active grille air shutter open and closed. The test result will display pass or fail based on the ability of the louvers to cycle open and closed.
Active Grille Air Shutter 1 (Dual Shutter System)	This output control is used to perform the Active Grille Air Shutter Actuator test. It is used to cycle the active grille air shutter open and closed. The test result will display pass or fail based on the ability of the louvers to cycle open and closed.
Active Grille Air Shutter 2 (Dual Shutter System)	This output control is used to perform the Active Grille Air Shutter Actuator test. It is used to cycle the active grille air shutter open and closed. The test result will display pass or fail based on the ability of the louvers to cycle open and closed.

CCM Scan Tool Parameters for Active Engine Mounts (If Equipped)

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Engine Idling at Normal Operating Temperature / Vehicle is in Park or Neutral			
Engine Mount Actuator Output 1	—	On/Off	The scan tool will display On/Off. This is the engine mount actuator commanded state.
Engine Mount Actuator Output 2	—	On/Off	The scan tool will display On/Off. This is the engine mount actuator commanded state.
Engine Mount Actuator Control Circuit 1 Status (2014 model year only)	—	Passed	The scan tool displays Passed/Short to Battery/Short to Ground/Open This is the engine mount actuator control circuit 1 condition.
Engine Mount Actuator Control Circuit 2 Status (2014 model year only)	—	Passed	The scan tool displays Passed/Short to Battery/Short to Ground/Open This is the engine mount actuator control circuit 2 condition.

CCM Scan Tool Output Controls for Active Engine Mounts (If Equipped)

Output Control	Description
Engine Mount Actuator Output 1	This output control is used to turn the engine mount actuator 1 On and Off.
Engine Mount Actuator Output 2	This output control is used to turn the engine mount actuator 2 On and Off.

CCM Scan Tool Parameters for Exhaust Flow Control Valves (If Equipped)

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Engine Idling at Normal Operating Temperature / Vehicle is in Park or Neutral			
Exhaust Flow Control Valve Command	—	Open/Closed	Exhaust Flow Valve Commanded State
Exhaust Flow Control Valve Command	—	%	Exhaust Flow Valve Commanded Duty Cycle (0%-100%)
Exhaust Flow Control Valve Performance Mode	—	Active/Inactive	Exhaust Flow Valve Control Status
Exhaust Flow Control Valve Rumble Mode	—	Active/Inactive	Exhaust Flow Valve Control Status
Exhaust Flow Control Valve	—	Active/Inactive	Exhaust Flow Valve Control Status
Cylinder Deactivation Exhaust Flow Valve Command	—	Open/Closed/Disabled	Exhaust Flow Valve Commanded State
Cylinder Deactivation Exhaust Flow Control Valve	—	Active/Inactive	Exhaust Flow Valve Control Status
Cylinder Deactivation Exhaust Flow Control Valve 1 Position	—	Open range is 4 - 28 degrees Closed range is 64 - 93 degrees	Cylinder Deactivation Exhaust Flow Control Valve 1 actual position in degrees
Cylinder Deactivation Exhaust Flow Control Valve 2 Position	—	Open range is 4 - 28 degrees Closed range is 64 - 93 degrees	Cylinder Deactivation Exhaust Flow Control Valve 2 actual position in degrees

CCM Scan Tool Output Controls for Exhaust Flow Control Actuators (If Equipped)

Output Control	Description
Exhaust Flow Control Valve Command	This output control is used to cycle the exhaust flow control valve open and closed.
Cylinder Deactivation Exhaust Flow Valve Command	This output control is used to cycle the cylinder deactivation exhaust flow control valve open and closed.

CCM Scan Tool Parameters for Trailer Brake Control System (If Equipped)

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Engine Idling at Normal Operating Temperature / Vehicle is in Park or Neutral			
ABS Active Signal	—	OK	The scan tool displays Ok/Not Ok. The scan tool displays Ok when no problems are found with the ABS Active Signal serial data message from the electronic brake control module to the chassis control module.
Antilock Braking System	—	Inactive	The scan tool displays Active/Inactive. The scan tool displays Inactive when the ABS system is not functioning.
Automatic Brake Control Gain Request From EBCM	—	0–100%	The scan tool displays a number between 0–100%.
Automatic Brake Request From EBCM	—	No	The scan tool displays Yes/No. This is a request from the EBCM to apply the trailer brakes.

Parameter	System State	Expected Value	Description
Automatic-Brake Torque	—	Nm	The scan tool displays a numerical value.
Automatic-Brake Torque Signal	—	Ok	The scan tool displays Ok/Not Ok. The scan tool displays Ok when no problems are found with the Automatic Brake Torque Signal serial data message to the chassis control module.
Automatic Braking Active Signal	—	Ok	The scan tool displays Ok/Not OK. The scan tool displays OK when no problems are found with the Automatic Braking Active Signal serial data message to the chassis control module.
Automatic Braking Event	—	Not Detected	The scan tool displays Detected/Not Detected. This parameter represents a command to apply the trailer brakes from the adaptive cruise control system.
Brake Master Cylinder Pressure Sensor	—	Varies	The scan tool will display brake fluid pressure in the master cylinder. The scan tool will display a kPa or psi signal received from the chassis control module.
Brake Pressure Signal	—	OK	The scan tool will display Ok/Not Ok. The scan tool will display a serial data message received from the chassis control module.
Brake Request from EBCM	—	Ok	The scan tool displays Ok/Not Ok. The scan tool displays Ok when no problems are found with the Brake Request signal serial data message from the electronic brake control module to the chassis control module.
Desired Trailer Brake Control Duty Cycle	—	0–100%	The scan tool displays a number between 0–100%. This number represents a duty cycle request signal from the chassis control module to the trailer brake power module.
Deviation Between Manual Trailer Brake Apply Request Signal 1 and 2	—	Varies	The scan tools displays a percentage difference between the Apply Request Signal 2 and Redundant Request Signal 1.
Driver Initiated Brake Event	—	Not Detected	The scan tool displays Detected/Not Detected. The scan tool detects when the driver has applied the trailer brakes.
Induced Voltage by Trailer Brake Coil	—	0–20 V	The scan tool displays a voltage. This number represents the actual voltage supplied by the trailer brake power module to the trailer brakes.

Parameter	System State	Expected Value	Description
Manual Trailer Brake Apply Request Signal 1	—	Varies	The scan tool displays a percentage. This represents a brake apply signal between the chassis control module and the trailer brake power module.
Manual Trailer Brake Apply Request Signal 2	—	Varies	The scan tool displays a percentage. This represents a brake apply signal between the chassis control module and the trailer brake power module.
Stop Lamp Signal	—	Not Requested	The scan tool displays Requested/Not Requested. This is the brake pedal position sensor signal from the BCM to the chassis control module.
Trailer Brake Automatic Control State	—	Normal	The scan tool displays Normal/Active/Temporarily Inhibited/Temporarily Limited/ Permanently Failed/ Communication Failed/ Disabled by Calibration. This represents the operational state of the chassis control module.
Trailer Brake Control Duty Cycle	—	0–100%	The scan tool displays a percentage. This is the pulse width modulated output signal from the trailer brake power module to the trailer brakes.
Trailer Brake Control Output Circuit	—	Okay	The scan tool displays Unknown/Short to Battery/ Short to Ground/Okay. This represents the state of health of the output circuit from the trailer brake power module to the trailer brakes.
Trailer Brake Control Output Circuit	—	0–20 V	The scan tool displays a voltage. This represents the voltage supplied by the trailer brake power module to the trailer brakes.
Trailer Brake Power Control Module	—	De-Energized	The scan tool displays Energized/De-Energized. This represents the state of the trailer brake power module.
Trailer Brake Power Control Module Battery Voltage	—	Varies	The scan tool displays a voltage. This represents the battery voltage supplied to the trailer brake power module.
Trailer Brake Type	—	Undefined	The scan tool displays Undefined when a trailer is not connected to the vehicle. The scan tool displays Electromagnetic Brakes or Electrohydraulic Brakes when a trailer is connected to the vehicle. The type displayed is based on what is detected by the chassis control module.

Parameter	System State	Expected Value	Description
Trailer Brake User Gain	—	Varies	The scan tool displays percent of full gain setting. The scan tool displays 0–100%. Each full gain setting represents an increment of approximately 10 percent of full gain setting. Approximately 40% will be indicated with a gain setting of 4.0, 65% will be indicated with a gain setting of 6.5, etc.
Trailer Brake User Gain Switch	—	Varies	The scan tool displays percent of full gain setting. The scan tool displays 0–100%. Each full gain setting represents an increment of approximately 10 percent of full gain setting. Approximately 40% will be indicated with a gain setting of 4.0, 65% will be indicated with a gain setting of 6.5, etc.
Vehicle Speed	—	Varies	The scan tool displays 0–327 km/h (0–204 mph). The scan tool displays 0 km/h (0 mph) when the vehicle is not moving. This is the vehicle speed serial data message from the ECM.
Vehicle Stability Enhancement System Signal	—	Ok	The scan tool displays Ok/Not Ok. The scan tool displays Ok when no problems are found with the Vehicle Stability Enhancement System signal to the chassis control module.
Wheel Speed Signal	—	Ok	The scan tool displays Ok/Not Ok. The scan tool displays Ok when no problems are found with the Wheel Speed signal from the EBCM to the chassis control module.

Chassis Control Module (CCM) Scan Tool Output Controls for Trailer Brake Control System (If Equipped)

Output Control	Description
Trailer Brake Control Signal	This output control is used to turn the trailer brake power control module on and off.
Trailer Brake Duty Cycle	This output control is used to control the trailer brake apply signal from trailer brake power control module.

CCM Scan Tool Parameters for Vehicle Level Control (If Equipped)

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON			
Left Rear Vehicle Level Position Sensor	—	.25–4.75 Volts	This displays Volts. This is the level position sensor voltage.
Right Rear Vehicle Level Position Sensor	—	.25–4.75 Volts	This displays Volts. This is the level position sensor voltage.
Vehicle Level Control Compressor Over Temperature	—	No	This displays Yes or No. This will display Yes if the compressor is overheated.

Parameter	System State	Expected Value	Description
Excessive Compressor Activity	—	No	This displays Yes or No. This will display Yes if the compressor activity is excessive.
Vehicle Level Control Status	—	Normal	This displays Normal/Uneven Surface or Hoisted/ Overloaded/Failed.
Vehicle Level Control Compressor	—	Varies	This displays On or Off. This will display if the compressor is on or off.
Vehicle Level Control Exhaust Valve	—	Varies	This displays Open or Closed. This will display if the exhaust valve is open or closed.
Vehicle Level Control Pressure Sensor	—	.4–4.8 Volts	This displays Volts. This is the level control pressure sensor voltage.
Vehicle Leveling Sensors Supply Voltage	—	4.9–5.1 Volts	This displays Volts. This is the leveling sensors supply voltage.
Vehicle Level Control Pressure Sensor Supply Voltage	—	4.9–5.1 Volts	This displays Volts. This is the level control pressure sensor supply voltage.
Vehicle Level Trim Height Status	—	Learned/Not Learned	This displays if the level trim height status

CCM Scan Tool Output Controls for Vehicle Level Control (If Equipped)

Output Control	Description
Suspension Position Sensor Trim Height	This output control is used to learn the trim height.
Vehicle Level Control Compressor Relay	This output control is used to command the compressor ON and OFF.
Vehicle Level Control Exhaust Valve	This output control is used to command the exhaust valve ON and OFF.

CCM Scan Tool Parameters for Transmission Cooling Fan (If Equipped)

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Engine Idling at Normal Operating Temperature / Vehicle is in Park or Neutral			
Transmission Cooling Fan Circuit High Voltage Test Status	—	OK	Malfunction/Not Run/OK
Transmission Cooling Fan Circuit Open Test Status	—	OK	Malfunction/Not Run/OK
Transmission Cooling Fan Circuit Low Voltage Status	—	OK	Malfunction/Not Run/OK
Transmission Cooling Fan Command	—	Yes/No	The scan tool displays Yes/No. This shows if the transmission cooling fan is being commanded ON.
Transmission Cooling Fan Duty Cycle	—	0 – 100%	The scan tool displays a percentage. This is the transmission cooling fan ON duty cycle.

CCM Scan Tool Output Controls for Transmission Cooling Fan (If Equipped)

Output Control	Description
Transmission Cooling Fan Duty Cycle	This output control is used to control the transmission cooling fan.

K40D Driver Seat Adjuster Memory Module: Scan Tool Information

Seat Position Scan Tool Data Parameters

Parameter	Expected Value	Definition
Operating Conditions: Ignition ON		
Driver Seat Back Switch	Inactive	The scan tool displays Inactive, Forward, or Rearward. When the seat recline switch is pressed, the scan tool displays the direction for which the switch is pressed.
Driver Seat Back Direction Command	Inactive	The scan tool displays Inactive, Forward, or Rearward. When the seat recline switch is pressed or when a memory recall occurs, the scan tool displays the direction the memory control module is commanding the seat recline motor.
Driver Seat Back Position	Varies	The scan tool displays 0–65,535 counts. The module counts the number of pulse signals with each rotation of the motor that the scan tool displays as counts. High count values indicate that the seat back is in the forward position, while low count values indicate that the seat back is in the rearward position.
Driver Seat Cushion Front Vertical Direction Command	Inactive	The scan tool displays Inactive, Up or Down. When the seat front vertical switch is pressed or when a memory recall occurs, the scan tool displays the direction the memory control module is commanding the seat front vertical motor.
Driver Seat Cushion Front Vertical Position	Varies	The scan tool displays 0–65,535 counts. The module counts the number of pulse signals with each rotation of the motor that the scan tool displays as counts. High count values indicate that the seat front vertical is in the up position, while low count values indicate that the seat front vertical is in the down position.
Driver Seat Cushion Front Vertical Switch	Inactive	The scan tool displays Inactive, Up or Down. When the seat front vertical switch is pressed, the scan tool should display the direction for which the switch is pressed.
Driver Seat Cushion Rear Vertical Direction Command	Inactive	The scan tool displays Inactive, Up or Down. When the seat rear vertical switch is pressed or when a memory recall occurs, the scan tool displays the direction the memory control module is commanding the seat rear vertical motor.
Driver Seat Cushion Rear Vertical Position	Varies	The scan tool displays 0–65,535 counts. The module counts the number of pulse signals with each rotation of the motor that the scan tool displays as counts. High count values indicate that the seat rear vertical is in the up position, while low count values indicate that the seat rear vertical is in the down position.
Driver Seat Cushion Rear Vertical Switch	Inactive	The scan tool displays Inactive, Up or Down. When the seat rear vertical switch is pressed, the scan tool should display the direction for which the switch is pressed.
Driver Seat Horizontal Direction Command	Inactive	The scan tool displays Inactive, Forward, or Rearward. When the seat horizontal switch is pressed or when a memory recall occurs, the scan tool displays the direction the memory control module is commanding the seat horizontal motor.
Driver Seat Horizontal Position	Varies	The scan tool displays 0–65,535 counts. The module counts the number of pulse signals with each rotation of the motor that the scan tool displays as counts. High count values indicate that the seat horizontal position is forward, while low count values indicate that the seat horizontal position is rearward.
Driver Seat Horizontal Switch	Inactive	The scan tool displays Inactive, Forward, or Rearward. When the seat horizontal switch is pressed, the scan tool should display the direction for which the switch is pressed.

Parameter	Expected Value	Definition
Driver Seat Lumbar Support Horizontal Switch	Inactive	The scan tool displays Inactive, Forward, or Rearward. When the seat lumbar horizontal switch is pressed, the scan tool should display the direction for which the switch is pressed.
Driver Seat Lumbar Support Horizontal Direction Command	Inactive	The scan tool displays Inactive, Forward, or Rearward. When the seat lumbar horizontal switch is pressed, the scan tool displays the direction the memory control module is commanding the seat lumbar horizontal motor.
Lumbar Support Horizontal Position	Varies	The module stores the pressure information for lumbar position.
Driver Seat Lumbar Support Vertical Switch	Inactive	The scan tool displays Inactive, Up, or Down. When the seat lumbar vertical switch is pressed, the scan tool should display the direction for which the switch is pressed.
Driver Seat Lumbar Support Vertical Direction Command	Inactive	The scan tool displays Inactive, Up, or Down. When the seat lumbar vertical switch is pressed, the scan tool displays the direction the memory control module is commanding the seat lumbar vertical motor.
Driver Seat Memory Recall Switches	Inactive	The scan tool displays Inactive, Memory 1, Memory 2, or Exit. When a memory function switch is pressed, the scan tool should momentarily display the function selected.
Driver Seat Memory Set Switch	Inactive	The scan tool displays Inactive/Active. When the memory SET switch is pressed, the scan tool should display Active.
Driver Seat Back Side Bolster Direction Command	Inactive	The scan tool displays Inactive, Inflate, or Deflate. When the seat back side bolster switch is pressed, the scan tool displays the function the memory control module is commanding the seat lumbar/bolster pump.
Driver Seat Back Side Bolster Switch	Inactive	The scan tool displays Inactive, Inflate, or Deflate. When the seat back side bolster switch is pressed, the scan tool should display the function for which the switch is pressed.
Driver Seat Cushion Side Bolster Direction Command	Inactive	The scan tool displays Inactive, Inflate, or Deflate. When the seat back side bolster switch is pressed, the scan tool displays the function the memory control module is commanding the seat lumbar/bolster pump.
Driver Seat Cushion Side Bolster Switch	Inactive	The scan tool displays Inactive, Inflate, or Deflate. When the seat back side bolster switch is pressed, the scan tool should display the function for which the switch is pressed.
Seat Massage Switch	Inactive	The scan tool displays Inactive/Active. When the seat massage switch s pressed, the scan tool should display Active.

Mirror Memory Scan Tool Data Parameters

Parameter	Expected Value	Definition
Operating Conditions: Ignition ON		
Mirror Select Switch	None	The scan tool displays None, Driver Door, or Passenger Door. The scan tool displays the current state of the mirror select switch.
Mirror Direction Switch	Inactive	The scan tool displays Inactive/Up/Down/Left/Right/Folding/ Extending. The scan tool displays the current state of the power mirror switch as pressed.
Driver Mirror Direction Command	Inactive	The scan tool displays Inactive/Up/Down/Left/Right. When the power mirror switch is being used or when a memory recall occurs, the scan tool displays the direction the memory control module is commanding the driver mirror motors.
Driver Mirror Vertical Position	Varies	The scan tool displays 0–5 V. The voltage displayed represents the position of the driver vertical motor. High voltage values indicate the mirror position is up, while low count values indicate the mirror position is down.

Parameter	Expected Value	Definition
Driver Mirror Horizontal Position	Varies	The scan tool displays 0–5 V. The voltage displayed represents the position of the driver horizontal motor. High voltage values indicate the mirror position is to the right or in, while low count values indicate the mirror position is to the left or out.
Passenger Mirror Direction Command	Inactive	The scan tool displays Inactive/Up/Down/Left/Right. When the power mirror switch is being used or when a memory recall occurs, the scan tool displays the direction the memory control module is commanding the passenger mirror motors.
Passenger Mirror Vertical Position	Varies	The scan tool displays 0–5 V. The voltage displayed represents the position of the passenger vertical motor. High voltage values indicate the mirror position is up, while low count values indicate the mirror position is down.
Passenger Mirror Horizontal Position	Varies	The scan tool displays 0–5 V. The voltage displayed represents the position of the passenger horizontal motor. High voltage values indicate the mirror position is to the right or in, while low count values indicate the mirror position is to the left or out.

Steering Column Scan Tool Data Parameters

Parameter	Expected Value	Definition
Operating Conditions: Ignition ON		
Steering Column Direction Switch	Varies	The scan tool displays Inactive, Forward, Rearward, Up, or Down. When the steering column switch is pressed, the scan tool should display the direction for which the switch is pressed.
Steering Column Direction Command	Varies	The scan tool displays Inactive, Forward, Rearward, Up, or Down. When the module is commanding movement of the column, the scan tool should display the direction the module is commanding the column to move in.
Steering Column Vertical Position	Varies	The scan tool displays 0–5 V. The voltage displayed is an input to the seat memory control module from the steering column vertical position sensor. Higher voltage readings indicates the steering wheel position is up while lower voltage readings indicate the steering wheel position is down.
Steering Column Horizontal Position	Off	The scan tool displays 0–5 V. The voltage displayed is an input to the seat memory control module from the steering column vertical position sensor. Higher voltage readings indicates the steering wheel position is forward toward the front of the vehicle or away from the driver while lower voltage readings indicate the steering wheel position is rearward toward the driver.

Seat Memory Scan Tool Control Functions

Control Functions	Description
Driver Seat Back Horizontal Movement	This output control is used to command the driver seat back recline position Forward and Rearward.
Driver Seat Cushion Front Vertical Movement	This output control is used to command the driver seat cushion front vertical position Up and Down.
Driver Seat Cushion Rear Vertical Movement	This output control is used to command the driver seat cushion rear vertical position Up and Down.
Driver Seat Horizontal Movement	This output control is used to command the driver seat horizontal position Forward and Rearward.
Driver Seat Back Side Bolster Movement	This output control is used to command the driver seat back side bolster support to Inflate or Deflate.

Control Functions	Description
Driver Seat Lumbar Support Horizontal Movement	This output control is used to command the driver seat lumbar horizontal position Forward and Rearward.
Driver Seat Lumbar Support Vertical Movement	This output control is used to command the lumbar vertical position Up and Down.

Mirror Memory Scan Tool Control Functions

Control Functions	Description
Driver Mirror Fold	This output control is used to command the driver mirror to fold and unfold.
Driver Mirror Movement	This output control is used to command the driver mirror up and down or left and right.
Passenger Mirror Fold	This output control is used to command the passenger mirror to fold and unfold.
Passenger Mirror Movement	This output control is used to command the passenger mirror up and down or left and right.

Adjustable Steering Column Scan Tool Control Functions

Control Functions	Description
Steering Column Tilt Up Command	This output control is used to command the steering column to the up position.
Steering Column Tilt Down Command	This output control is used to command the steering column to the down position.
Steering Column Telescope Forward Command	This output control is used to command the steering column to the forward position.
Steering Column Telescope Rearward Command	This output control is used to command the steering column to the rearward position.

Seat Cushion Haptic Motors Scan Tool Control Functions

Control Functions	Description
Driver Seat Cushion Left Rear Haptic Movement	This output control is used to Enable and Disable the driver seat cushion left rear haptic motor function.
Driver Seat Cushion Right Rear Haptic Movement	This output control is used to Enable and Disable the driver seat cushion right rear haptic motor function.

K43 Power Steering Control Module: Scan Tool Information

Power Steering Control Module Scan Tool Data Parameters

Parameter	Expected Value	Description
Operating Conditions: Ignition ON		
Steering Wheel Input Torque	Varies	This displays the current steering input torque in N•m
Power Steering System Status	No Assist No Assist – Auto Stop Active Full Assist Limp Home Mode Limp Aside Mode	This displays the current status of the power steering system. When no faults are present, the status should be Full Assist.

Parameter	Expected Value	Description
Power Steering System Assist Status	Normal Maximum Assist - Level 1 Maximum Assist - Level 2 Minimum Assist - Level 1 Minimum Assist - Level 2	This displays the current performance mode of the power steering assist.
Advanced Parking Assist Status	Temporarily Inhibited Available Active Malfunction	This displays the current status of the advance parking assist system.
Power Steering Softstops Learn Status	Not Learned Learned	This displays whether the power steering rack softstops have been learned.
Battery Voltage	Varies	This displays Volts. This is the current battery voltage.
Ignition On Time	Varies	This displays seconds. This is the amount of time the current ignition cycle has been active.
Vehicle Speed	0 Km/h (0 MPH)	This displays km/h (mph). This is the current vehicle speed.
Electric Power Steering Motor Current Commanded	Varies	This displays amps (A). This displays the amount of current requested by the power steering assist motor.
Electric Power Steering Motor Current Feedback	Varies	This displays amps (A). This displays the Electric Power Steering Motor Current Feedback.
Calculated Steering Gear Rack Travel	Varies	This displays mm. This is the amount of rack travel in either direction from center.
Power Steering Output Torque	Varies	This displays N•m . This displays the current value of the Output Torque of the Electric Power Steering.
Calculated System Temperature	Varies	This displays ° C. This is the current system temperature.
Power Steering Level 1 Malfunction Ignition Cycle Counter	Varies	This displays counts. This is the number of ignition cycles performed while the vehicle is in a state of Power Steering Level 1 Malfunction.
Power Steering Motor Overload Protection Counter	Varies	This displays counts. This displays the Electric Power Steering Motor Overload Protection Incidents counter.
Ignition Cycle Counter	Varies	This displays counts. This number of ignition cycles performed.
Steering Wheel Angle Sensor Calibration Status	Unknown Estimated Calibrated	This displays the current calibration status of the steering wheel angle sensor.
Power Steering Assist Request from other Vehicle Device	Unknown Temporarily Inhibited Inactive Active Temporarily Limited Malfunction	Displays the current state of requests to the power steering control module for assist from other vehicle devices.
Power Steering Assist Inhibited - Motor Over Temperature	Yes/No	Indicates if the power steering assist motor is experiencing an over temperature condition and is reducing assist.

Parameter	Expected Value	Description
Power Steering Motor Assist Status	Normal Reduced Unavailable	This displays the current status of the power steering assist motor.
Power Steering Assist Mode	None Normal Sport Mode Comfort Track Mode Tow/Haul City Mode Performance	This displays the currently selected assist mode.
System Power Mode	Off Accessory Run Start Propulsion Active	This displays the current ignition power mode of the vehicle.
System Logistic Setting	Off Assembly Plant Mode Transport Mode Storage Mode	This displays the currently selected logistic setting of the vehicle system.

Power Steering Control Module Scan Tool Output Controls

Output Control	Description
Steering Wheel Angle Sensor Learn	Command to relearn the center position of the power steering system.
Power Steering Active Pull/Drift Compensation Learn	Clear active pull compensation learned limits. Command to reset the active pull compensation learned values.

K68 Trailer Lighting Control Module: Scan Tool Information

Body Control Module Scan Tool Data Parameters

Parameter	System State	Expected Value	Definition
Operating Conditions: Ignition ON, Vehicle in Park.			
Battery Voltage	—	Varies	The scan tool displays the current battery voltage.
Brake Pedal Switch Status	—	Active/Inactive	The scan tool displays the status of the brake pedal
State of Charge	—	Varies	The scan tool displays percentage. This parameter displays state of charge status.
System Voltage	—	Varies	The scan tool displays the current system voltage.
Trailer Connection Status	—	Connected/Not Connected	The scan tool displays the trailer connected status.

Body Control Module Scan Tool Output Controls

Scan Tool Output Control	Description
Left Trailer Turn Signal/ Stop Lamp Command	The Trailer Lighting Control Module activates the left trailer turn signal/stop lamp control circuit when you select Active. B+ should be applied to terminal G at the X88 Trailer Connector.
Right Trailer Turn Signal/ Stop Lamp Command	The Trailer Lighting Control Module activates the right trailer turn signal/stop lamp control circuit when you select Active. B+ should be applied to terminal D at the X88 Trailer Connector.

Scan Tool Output Control	Description
Left Trailer Tail Lamp	The Trailer Lighting Control Module activates the trailer park lamp control circuit when you select Active. B+ should be applied to terminal F at the X88 Trailer Connector.
Right Trailer Tail Lamp	The Trailer Lighting Control Module activates the trailer park lamp control circuit when you select Active. B+ should be applied to terminal F at the X88 Trailer Connector.
Trailer Backup Lamps	The Trailer Lighting Control Module activates the trailer backup lamp control circuit when you select Active. B+ should be applied to terminal A at the X88 Trailer Connector.

K69 Transfer Case Control Module: Scan Tool Information

Scan Tool Data Parameters

Parameter	Expected Value	Expected Value	Description
Operating Conditions: Ignition ON, engine OFF, Park or Neutral, and transfer case in 2WD, unless otherwise noted.			
Engine Speed	RPM	Varies	This parameter displays engine RPM.
Warm-Ups Since Diagnostic Trouble Code Cleared	Counts	Varies	This parameter displays the number of warm-ups since DTC cleared.
Control Module Voltage Signal	0.0 to 25.5 V	Battery Voltage	This parameter displays the voltage measured by the transfer case control module at the battery positive voltage circuit.
Ignition Cycles without Completed Test Since First Malfunction	Counts	Varies	This parameter displays the number of ignition cycles without a pass or a failure reported.
Engine Torque in Steady State	Nm	Varies	This parameter displays the engine actual steady state torque as received via CAN.
Steering Wheel Angle	Steering wheel in straight position	−5 to +5°	The scan tool displays °. This is the current position of the steering angle sensor.
	Steering wheel turned left until stop	450–550°	
	Steering wheel turned right until stop	−550 to −450°	
4WD Automatic Range Indicator Command	ON or OFF	OFF	This parameter displays ON when the transfer case control module commands the Auto 4WD indicator ON.
Electric Park Brake Not Available	Not Available, Available, Failed	Available	This parameter displays the EPB status based on CAN message.
Odometer	M or Km	Varies	This parameter displays the vehicle mileage.
Propulsion System Status	Not Active, Active	Active	This parameter displays the propulsion system state as received via CAN.
Service 4WD Indicator Command	ON or OFF	OFF	This parameter displays ON anytime a DTC sets.
All Wheel Drive	Normal, Temporarily Inhibited, Temporarily Limited, Failed	Normal	This parameter displays the status of the transfer case system.
AWD Off Indicator Request	Requested, Not Requested	Not Requested	This parameter displays ON anytime the AWD OFF DIC message displays.
AWD Input-Output Circuit Status	OK, Failed	OK	This parameter displays the status of the AWD system.
Transfer Case Clutch Torque	Nm	0.0	This parameter displays the estimated torque being held by the transfer case clutch.

Parameter	Expected Value	Expected Value	Description
Transfer Case Thermal Capacity Used	%	Varies	This parameter displays the estimated clutch capacity used.
Transfer Case Drive Mode	Two Wheel Drive High Active, Four Wheel Drive High Lock Active, Four Wheel Drive Low Active, All Wheel Drive Connected Active, Four Wheel Drive High Auto Active, Four Wheel Drive Low Active, All Wheel Drive Connected Active, Two Wheel Drive Low Active, Position Unknown, Transfer Case Neutral Active	Varies	This parameter displays the current mode of the 4WD system based on the secondary axle.
Calculated Transfer Case Clutch Temperature	°C/°F	Varies	This parameter displays the estimated clutch temperature.
Transfer Case Fluid Temperature	°C/°F	Varies	This parameter displays the estimated transfer case fluid temperature.
Transfer Case Clutch Engagement	%	Varies	This parameter displays the transfer case clutch torque level in percentage of clutch capacity.
Requested Transfer Case Clutch Torque	Nm	Varies	This parameter displays the commanded torque to be held by the transfer case clutch.
Transfer Case Clutch Overtemperature Counter	Counts	Varies	This parameter displays the count of clutch over temperature events.
Clutch Overtemperature Counter Reset Request Allowed	No, Yes	Yes	This parameter displays status of over temperature counter reset.
Transfer Case Clutch Learn Status	Not Learned, Passed, Failed, Aborted, In Progress, Reserved	Passed	This parameter displays the status of the last transfer case clutch learn.
Vehicle Stability Control Request	%	Varies	Vehicle stability enhancement system coupling request value
AWD Front and Rear Wheel Speed Differential	RPM	Varies	This parameter displays the speed difference between the front and rear wheels.
Lateral Acceleration	G’s	Varies	This parameter displays the vehicles lateral acceleration..
Yaw Rate	degree/sec	Varies	This parameter displays the vehicles yaw.
Secondary Axle Locking Torque Coupling Request	Not Requested, Maximum Torque, Minimum Torque, Actual Torque	Varies	This parameter displays the secondary axle locking torque requested by CAN message.

Parameter	Expected Value	Expected Value	Description
Range Actuator Lock Command	Disengaged or Engaged	Disengaged	This parameter displays the commanded status of the range actuator lock. The lock will be engaged in Auto 4WD, 4WD High, or 4WD Low, and Disengaged in 2WD High and Neutral.
Range Actuator Motor Current - Shunt Circuit 1	Amps	Varies	This parameter displays the measured current of the Transfer Case Range Actuator on Shunt 1.
Range Actuator Motor Current - Shunt Circuit 2	Amps	Varies	This parameter displays the measured current of the Transfer Case Range Actuator on Shunt 2.
Message Authentication Key Configuration State	Not Needed, Needed	Varies	This parameter is an indication to service tool that key provisioning is necessary.
Power Mode	OFF, Accessory, Run or Crank Request	Run	This parameter displays the status of the ignition switch.
Left Front Wheel Speed	Varies	0 km/h (0 MPH)	The scan tool displays km/h (MPH) depending on the current speed of the left front wheel speed sensor.
Left Rear Wheel Speed	Varies	0 km/h (0 MPH)	The scan tool displays km/h (MPH) depending on the current speed of the left rear wheel speed sensor.
Right Front Wheel Speed	Varies	0 km/h (0 MPH)	The scan tool displays km/h (MPH) depending on the current speed of the right front wheel speed sensor.
Right Rear Wheel Speed	Varies	0 km/h (0 MPH)	The scan tool displays km/h (MPH) depending on the current speed of the right rear wheel speed sensor.
Transfer Case Range Position Sensor and Transfer Case Incremental Position Sensor Variance Allowed	°	Varies	This parameter displays the allowed variation between transfer case range position sensor and the range actuator position sensor.
Transfer Case Range Position Sensor and Transfer Case Incremental Position Sensor Variance	°	Varies	This parameter displays the actual variation between transfer case range position sensor and the range actuator position sensor.
Front Axle Engagement Actuator Command	Engaged or Disengaged	Disengaged	This parameter displays either Engaged or Disengaged. Engaged when the body control module is commanding Auto 4WD, 4WD, or 4WD Low ranges, and Disengaged when the body control module is commanding Neutral, or 2WD ranges.
Front Axle Engagement Actuator Control Circuit High Voltage Test Status	Not Run, OK or Malfunction	OK	This parameter monitors the status of the front axle engagement actuator control circuit. A short to battery on the front axle engagement actuator control circuit will cause this parameter to display Malfunction.
Front Axle Engagement Actuator Control Circuit Low Voltage Test Status	Not Run, OK or Malfunction	OK	This parameter monitors the status of the front axle engagement actuator control circuit. A short to ground on the front axle engagement actuator control circuit will cause this parameter to display Malfunction.
Front Axle Engagement Actuator Control Circuit Open Test Status	Not Run, OK or Malfunction	OK	This parameter monitors the status of the front axle engagement actuator control circuit. An open/high resistance condition on the front axle engagement actuator control circuit will cause this parameter to display Malfunction.
Front Axle Actuator Status	Engaged or Disengaged	Disengaged	This parameter displays the actual status of the front axle. The parameter will display Engaged when the system is in Auto 4WD, 4WD, or 4WD Low modes, and Disengaged when the system is in Neutral, or 2WD High or Neutral mode.

Parameter	Expected Value	Expected Value	Description
Range Actuator Control Circuit High Voltage Test Status	Not Run, OK or Malfunction	OK	This parameter monitors the status of the range actuator control circuit. The range actuator control circuit is made up of the range actuator control circuit A and the range actuator control circuit B. A short to battery on the range actuator control circuit A or the range actuator control circuit B will cause this parameter to display Malfunction.
Range Actuator Control Circuit Low Voltage Test Status	Not Run, OK or Malfunction	OK	This parameter monitors the status of the range actuator control circuit. The range actuator control circuit is made up of the range actuator control circuit A and the range actuator control circuit B. A short to ground on the range actuator control circuit A or the range actuator control circuit B will cause this parameter to display Malfunction.
Range Actuator Control Circuit Open Test Status	Not Run, OK or Malfunction	OK	This parameter monitors the status of the range actuator control circuit. The range actuator control circuit is made up of the range actuator control circuit A and the range actuator control circuit B. An open on the range actuator control circuit A or the range actuator control circuit B will cause this parameter to display Malfunction.
Range Actuator Control Circuit Shorted Test Status	Not Run, OK or Malfunction	OK	This parameter monitors the status of the range actuator control circuit. The range actuator control circuit is made up of the range actuator control circuit A and the range actuator control circuit B. A short to ground, short to battery or short together on the range actuator control circuit A and/or the range actuator control circuit B will cause this parameter to display Malfunction.
Range Actuator Current	−15.0 to +36.0 A	0.0 A	This parameter displays the current drawn by the range actuator from the transfer case control module on either the range actuator control circuit A or the range actuator control circuit B. Typical values display 0.0 to 12.0 A. This parameter will display 0.0 A after shifting ranges.
Range Actuator Direction Command	Invalid, Stationary, Clockwise or Counter-clockwise	Stationary	This parameter displays what direction the transfer case control module is commanding the range actuator to turn. This parameter will display Stationary after a range change.
Transfer Case Range - Range Position Sensor	2WD, 4WD High–2WD 4WD High/ Locked, 4WD High–Neutral, Neutral, Neutral–4WD Low, or 4WD Low	2WD	This parameter displays the actual position of the transfer case according to the range actuator position sensor.
Transfer Case Range - Incremental Position Sensor	2WD, 4WD High–2WD 4WD High/ Locked, 4WD High–Neutral, Neutral, Neutral–4WD Low, or 4WD Low	2WD	This parameter displays the actual position of the transfer case according to the incremental position sensor.
Transfer Case Position - Range Position Sensor	–125 to 120°	6°	This parameter displays the position of the range actuator position sensor in degrees. Typical scan tool displays: • 2WD High = 6° • 4WD Auto = 89° • 4WD High = 117° • 4WD Low = −123° • Neutral = −32°

Parameter	Expected Value	Expected Value	Description
Transfer Case Commanded Position	−65 to 0°	0°	This parameter displays the commanded position of the transfer case in degrees. Typical scan tool displays: • 2WD High = 0° • 4WD Auto = 0° • 4WD High = 0° • 4WD Low = −65° • Neutral = −20°
Transfer Case Commanded Position	2WD, 4WD High/Locked, 4WD Low, Neutral or None	2WD	This parameter displays the current range commanded by the driver.
Transfer Case Range Selection Switch State	Invalid, Neutral, 2WD, 4WD/AWD Automatic, 4WD High/ Locked, 4WD Low, 4WD Unlocked	2WD	This parameter displays the current mode the transfer case is in, as indicated by the transfer case range position switch.
Range Actuator Lock Command Status	Disengage, Engage, Failed	Engage	This parameter displays the range actuator brake status.
Range Actuator Brake Control Circuit Current	Amps	Varies	This parameter displays the current for the transfer case range actuator brake.
Range Actuator Brake Control Circuit Low Side Voltage	Volts	Varies	This parameter displays the diagnostic voltage for the transfer case range actuator brake.
Range Actuator Brake Control Circuit High Side Voltage	Volts	Varies	This parameter displays the diagnostic voltage for the transfer case range actuator brake.
Range Actuator Lock Command Status	Unlocked, Locked	Locked	This parameter displays the command status of the range actuator brake.
Range Actuator Lock Control Circuit Low Voltage Test Status	Failed, Indeterminate, Passed	Passed	This parameter displays the status of the range actuator brake test.
Range Actuator Lock Control Circuit Open Test Status	Failed, Indeterminate, Passed	Passed	This parameter displays the status of the range actuator brake test.
Range Actuator Lock Control Circuit High Voltage Test Status	Failed, Indeterminate, Passed	Passed	This parameter displays the status of the range actuator brake test.
Transfer Case Clutch Learn Counter	Counts	Varies	This parameter displays the number of times the transfer case clutch learn has been completed.

Scan Tool Output Controls

Output Control	Description
Note: Transmission must be in transmission neutral for any of these output controls to operate. Refer to the scan tool manual for complete scan tool operating instructions.	
Front Axle Engagement Actuator	**Note:** Transmission must be in transmission Neutral for this output control to operate. This function allows the technician to command the front axle to engage or disengage.

Output Control	Description
Range Actuator (if equipped)	This function is intended to activate the range actuator control circuits. The range actuator control circuits can be commanded OFF or ON, in either the clockwise or counter-clockwise direction, to ensure all portions of the control module driver are operational. This device control can be operated with the actuator connected to verify actuator operation, or disconnected for circuit testing. The activation of this control must ensure the range actuator lock is activated as well to ensure actuator movement when the range actuator is plugged in. If the device control is activated with the range actuator plugged in, the range actuator shall return to the nearest legal range position after return to normal control.
Range Actuator Lock	**Note:** You may need to perform an ignition OFF in order to recover. This function allows the technician to command the range actuator lock to engage or disengage.
Range Actuator Learn	This function allows the technician to command the transfer case control module to relearn the clutch status after the range actuator, control module, or transfer case has been replaced.
Transfer Case Clutch Engagement	This function is used to override the clutch capacity command of the all wheel drive clutch output.
Transfer Case Clutch Identifier	This device control is used to program the transfer case clutch identifier.
Transfer Case Range	This device control is used to override the transfer case range position.
Transfer Case Neutral Range Indicator	This function allows the technician to command the transfer case neutral range indicator, within the transfer case control switch, ON or OFF.
Transfer Case Clutch Learn Counter Reset Command	This function allows the technician to command a reset of the learn counter.

K71 Transmission Control Module: Scan Tool Information (8L45 (M5N))

K71 Transmission Control Module — Scan Tool Parameter

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition= On			
Sensor Supply Circuit Status	—	Okay	Indicates that the Signal Out of Range buffered 9V Reference 1 value (within the controller) is currently out of range.
Sensor Supply 2 Circuit Status	—	Okay	Indicates that the Signal Out of Range buffered 9V Reference 2 value (within the controller) is currently out of range.
Calculated Line Pressure	Ignition On - Engine Off	550 to 620 kPa (80 to 90 PSI)	The expected calculated transmission line pressure when accounting for pump loss factors.
	Ignition On - Engine Running	550 to 620 kPa (80 to 90 PSI)	
	48 km/h (30 MPH)	380 to 480 kPa (55 to 70 PSI)	
	80 km/h (50 MPH)	380 to 480 kPa (55 to 70 PSI)	
Calculated Throttle Position	0 km/h (0 MPH)	0%	The accelerator effective position, which represents the driver’s intended request for torque or acceleration. It is determined from the maximum of the driver requests to open the throttle (e.g., accelerator pedal, cruise control, PTO, etc.) and is normalized to 0 to 100 %, where 0 % represents an idle or coast request and 100% represents a request for wide open throttle (WOT). It is the primary indication of accelerator position / throttle position used by transmission control algorithms and, thus, is often referred to as transmission throttle position. In the event that the engine is operating in a forced idle mode due to an accelerator pedal position fault, the accelerator effective position will have a value of 0 %, corresponding to an idle request.
	48 km/h (30 MPH)	5%	
	80 km/h (50 MPH)	20%	

Parameter	System State	Expected Value	Description
Control Module Voltage Signal	Ignition On - Engine Off	12.60 V	The voltage of the power input to the control module. Since battery voltage is not directly measured by powertrain controllers, switched battery voltage, available from the Run/Crank input to the controller, shall be used to populate this PID.
	Ignition On - Engine Running	14.40 V	
Current Gear	P	Park	Indicates the current gear that the transmission has achieved. In order for the transmission to achieve a gear other than Park/Neutral, transmission hydraulic pressure must be available (Engine Speed = Greater than 349 RPM).
	R	Reverse	
	N	Neutral	
	D	1–8	
	L	1–8	
Driver Shift Control Mode	S3 Transmission Shift Lever = P, R, N, D	Inactive	The status of the Sport/Low/Manual Mode, this PID will read active when the transmission shift lever is in the Sport/Low/Manual Mode.
	S3 Transmission Shift Lever = L, M, S	Active	
Up and Down Shift Switch	No Button Pressed	Inactive	The status of the Up and Down shift switches.
	Upshift» Pressed	Upshift	
	Downshift» Pressed	Downshift	
Engine Coolant Temperature	Ignition On - Engine Off	21°C (70°F)	The undefaulted engine coolant temperature measured by a sensor. If the data used to compute engine coolant temperature is obtained from a serial data signal, then, if the signal is not received, the value shall be set to: −40°C (−40°F) .
	Ignition On - Engine Running	80 to 95°C (175 to 205°F)	
	48 km/h (30 MPH)	80 to 95°C (175 to 205°F)	
	80 km/h (50 MPH)	80 to 95°C (175 to 205°F)	
Engine Speed	Ignition On - Engine Off	0 RPM	The engine speed determined from the crank position sensor. The data used to compute engine speed is obtained from a serial data signal.
	Ignition On - Engine Running	753 RPM	
	48 km/h (30 MPH)	1371 RPM	
	80 km/h (50 MPH)	1566 RPM	
Engine Torque	Ignition On - Engine Off	−53 Nm (−39 lb ft)	The calculated engine torque based upon the airflow through the engine and the torque losses due to spark retard and fuel shutoff. Since this is a steady state engine torque, it does not include the inertial component of engine torque.
	Ignition On - Engine Running	−6 Nm (−4 lb ft)	
	48 km/h (30 MPH)	10 Nm (7 lb ft)	
	80 km/h (50 MPH)	45 Nm (33 lb ft)	
Gear Command	P	Park	The current gear that is being commanded within the transmission. Only Park/Neutral will be commanded if transmission hydraulic pressure is not available. Transmission hydraulic pressure is available when Engine Speed = Greater than 349 RPM.
	R	Reverse	
	N	Neutral	
	D	1–8	
	L	1–8	

Parameter	System State	Expected Value	Description
Gear Ratio	1	4.62:1	This Parameter Identifier (PID) contains the calculated gear ratio based on Transmission Input Shaft Speed and Transmission Output Shaft Speed.
	2	3.04:1	
	3	2.15:1	
	4	1.66:1	
	5	1.26:1	
	6	1.00:1	
	7	0.85:1	
	8	0.66:1	
	R	3.93:1	
High Side Driver Circuit High Test Status	—	Okay	The status of the short to voltage test.
High Side Driver Circuit Low Test Status	—	Okay	The status of the short to ground test.
High Side Driver Circuit Open Test Status	—	Not Run	The status of the open circuit test.
High Side Driver Command	Engine ≠Running	Off	The commanded state of the shared high side driver.
	Engine = Running	On	
High Side Driver 2 Circuit High Test Status	—	Okay	The status of the short to voltage test.
High Side Driver 2 Circuit Low Test Status	—	Okay	The status of the short to ground test.
High Side Driver 2 Circuit Open Test Status	—	Not Run	The status of the open circuit test.
High Side Driver 2 Command	Engine ≠Running	Off	The commanded state of the shared high side driver 2.
	Engine = Running	On	
Ignition and Start Switch Signal	—	On	Displays the signal associated with the status of hardwire vehicle power mode inputs.
Ignition and Start Switch Accessory Signal	—	On	Displays the status of the ignition voltage availability to the controller.
Ignition and Start Signal	Ignition On - Engine Off	12.60 V	The voltage of the Run/Crank input to the controller.
	Ignition On - Engine Running	14.40 V	
Power Mode	—	Run	Displays the state of the ignition.
Shift Limiting Active Reason	—	None	Displays current Reason for a default shift pattern.
Torque Converter Clutch Pressure Command	0 km/h (0 MPH)	0.00 kPa (0.00 PSI)	Displays the commanded pressure to the Torque Converter Clutch.
	48 km/h (30 MPH)	160 kPa (23 PSI)	
	80 km/h (50 MPH)	250 kPa (36 PSI)	

Parameter	System State	Expected Value	Description
Torque Converter Clutch Slip Speed	Ignition On - Engine Off	0 RPM	The Torque Converter Clutch slip speed determined as the difference between engine speed and transmission input shaft speed.
	Ignition On - Engine Running	30 RPM	
	48 km/h (30 MPH)	3 RPM	
	80 km/h (50 MPH)	9 RPM	
Tow/Haul Mode	Inactive	Inactive	Displays the current state of Tow/Haul Mode.
	Active	Active	
Transmission Control Solenoid Valve 1–9 Calibration Data	—	Valid	Stored history of any condition causing the Transmission Control Solenoid Valves to set a Transmission Control Solenoid Valve Calibration Incorrect DTC.
Transmission Control Solenoid Valve 1−9 Control Circuit High Test Status	—	Not RunorOkay	The status of the short to power test. The parameter status will indicate not run, if the command for the solenoid is not in the correct state to perform the circuit test.
Transmission Control Solenoid Valve 1−9 Control Circuit Low Test Status	—	Not RunorOkay	The status of the short to ground test. The parameter status will indicate not run, if the command for the solenoid is not in the correct state to perform the circuit test.
Transmission Control Solenoid Valve 1–9 Control Circuit Open Test Status	—	Not RunorOkay	The status of the open circuit test. The parameter status will indicate not run, if the command for the solenoid is not in the correct state to perform the circuit test.
Transmission Control Solenoid Valve 1 Current	Ignition On - Engine Off	0.0 A	The Average Diagnostic Current for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	0.4 A	
	48 km/h (30 MPH)	1.15 A	
	80 km/h (50 MPH)	1.15 A	
Transmission Control Solenoid Valve 1 Current Command	Ignition On - Engine Off	1.15 A	The Current Command for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	0.4 A	
	48 km/h (30 MPH)	1.15 A	
	80 km/h (50 MPH)	1.15 A	
Transmission Control Solenoid Valve 1 Pressure Command	Ignition On - Engine Off	0.00 kPa (0.00 PSI)	The commanded pressure for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	760 kPa (110 PSI)	
	48 km/h (30 MPH)	0 kPa (0 PSI)	
	80 km/h (50 MPH)	760 kPa (110 PSI)	

Parameter	System State	Expected Value	Description
Transmission Control Solenoid Valve 2 Current	Ignition On - Engine Off	0.0 A	The Average Diagnostic Current for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	1.15 A	
	48 km/h (30 MPH)	1.15 A	
	80 km/h (50 MPH)	0.0 A	
Transmission Control Solenoid Valve 2 Current Command	Ignition On - Engine Off	0.0 A	The Current Command for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	1.15 A	
	48 km/h (30 MPH)	1.15 A	
	80 km/h (50 MPH)	0.0 A	
Transmission Control Solenoid Valve 2 Pressure Command	Ignition On - Engine Off	0.00 kPa (0.00 PSI)	The commanded pressure for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	1638 kPa (238 PSI)	
	48 km/h (30 MPH)	1638 kPa (238 PSI)	
	80 km/h (50 MPH)	0.00 kPa (0.00 PSI)	
Transmission Control Solenoid Valve 3 Current	Ignition On - Engine Off	0.0 A	The Average Diagnostic Current for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	0.0 A	
	48 km/h (30 MPH)	1.15 A	
	80 km/h (50 MPH)	1.15 A	
Transmission Control Solenoid Valve 3 Current Command	Ignition On - Engine Off	0.0 A	The Current Command for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	0.0 A	
	48 km/h (30 MPH)	1.15 A	
	80 km/h (50 MPH)	1.15 A	
Transmission Control Solenoid Valve 3 Pressure Command	Ignition On - Engine Off	0 kPa (0 PSI)	The commanded pressure for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	0 kPa (0 PSI)	
	48 km/h (30 MPH)	800 kPa (116 PSI)	
	80 km/h (50 MPH)	1344 kPa (195 PSI)	

Parameter	System State	Expected Value	Description
Transmission Control Solenoid Valve 4 Current	Ignition On - Engine Off	0.0 A	The Average Diagnostic Current for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	1.15 A	
	48 km/h (30 MPH)	1.15 A	
	80 km/h (50 MPH)	1.15 A	
Transmission Control Solenoid Valve 4 Current Command	Ignition On - Engine Off	1.15 A	The Current Command for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	1.15 A	
	48 km/h (30 MPH)	1.15 A	
	80 km/h (50 MPH)	1.15 A	
Transmission Control Solenoid Valve 4 Pressure Command	Ignition On - Engine Off	0 kPa (0 PSI)	The commanded pressure for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	0 kPa (0 PSI)	
	48 km/h (30 MPH)	0 kPa (0 PSI)	
	80 km/h (50 MPH)	0 kPa (0 PSI)	
Transmission Control Solenoid Valve 5 Current	Ignition On - Engine Off	0.0 A	The Average Diagnostic Current for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	1.15 A	
	48 km/h (30 MPH)	0.4 A	
	80 km/h (50 MPH)	0.4 A	
Transmission Control Solenoid Valve 5 Current Command	Ignition On - Engine Off	1.15 A	The Current Command for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	1.15 A	
	48 km/h (30 MPH)	0.4 A	
	80 km/h (50 MPH)	0.4 A	
Transmission Control Solenoid Valve 5 Pressure Command	Ignition On - Engine Off	0 kPa (0 PSI)	The commanded pressure for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	0 kPa (0 PSI)	
	48 km/h (30 MPH)	760 kPa (110 PSI)	
	80 km/h (50 MPH)	760 kPa (110 PSI)	

Parameter	System State	Expected Value	Description
Transmission Control Solenoid Valve 6 Current	Ignition On - Engine Off	0.0 A	The Average Diagnostic Current for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	0.85 A	
	48 km/h (30 MPH)	0.85 A	
	80 km/h (50 MPH)	0.85 A	
Transmission Control Solenoid Valve 6 Current Command	Ignition On - Engine Off	0.85 A	The Current Command for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	0.85 A	
	48 km/h (30 MPH)	0.85 A	
	80 km/h (50 MPH)	0.85 A	
Transmission Control Solenoid Valve 6 Pressure Command	Ignition On - Engine Off	0 kPa (0 PSI)	The commanded pressure for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	0 kPa (0 PSI)	
	48 km/h (30 MPH)	760 kPa (110 PSI)	
	80 km/h (50 MPH)	0 kPa (0 PSI)	
Transmission Control Solenoid Valve 7 Current	Ignition On - Engine Off	0.0 A	The Average Diagnostic Current for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	0.0 A	
	48 km/h (30 MPH)	0.32 A	
	80 km/h (50 MPH)	0.29 A	
Transmission Control Solenoid Valve 7 Current Command	Ignition On - Engine Off	0.0 A	The commanded pressure for the Transmission Control Solenoid Valve
	Ignition On - Engine Running	0.0 A	
	48 km/h (30 MPH)	0.32 A	
	80 km/h (50 MPH)	0.29 A	
Q77H Transmission Control Solenoid Valve 8	—	OfforOn	The current command for the Transmission Control Solenoid Valve 8.
Transmission Control Solenoid Valve 9	—	OfforOn	The current command for the Transmission Control Solenoid Valve 9.
Transmission Fluid Temperature	Ignition On - Engine Off	33°C (91°F)	The undefaulted, unfiltered transmission oil / fluid temperature measured by a sensor. In automatic transmission applications, this PID is based upon the transmission oil temperature sensor input to the TCM.
	Ignition On - Engine Running	42°C (108°F)	
	48 km/h (30 MPH)	49°C (120°F)	
	80 km/h (50 MPH)	63°C (145°F)	

Parameter	System State	Expected Value	Description
Input Shaft Speed Sensor	Ignition On - Engine Off	0 RPM	The undefaulted, raw transmission input speed (the speed at the input of the gear box) determined from the speed measured by the Transmission Input Speed Sensor with the application of factors to account for the location of the sensor.
	Ignition On - Engine Running	551 RPM	
	48 km/h (30 MPH)	1166 RPM	
	80 km/h (50 MPH)	1184 RPM	
Input Speed Sensor Direction	Forward	Forward	The enumerated state of the raw Transmission Input Speed Sensor direction information. This parameter will display Undetermined State, until the TCM receives the speed sensor input.
	Reverse	Reverse	
Input Speed Sensor Direction Signal	Forward	0.05 ms	The enumerated state of the raw Transmission Input Speed Sensor direction information. This parameter will display Undetermined State, until the TCM receives the speed sensor input. contains the Transmission Input Speed Sensor Direction ON Period Time in milliseconds. This PID will display 0.00 ms until the TCM receives the speed sensor input
	Reverse	0.18 ms	
Intermediate Speed Sensor	0 km/h (0 MPH)	0 RPM	Displays the current speed of the Intermediate Speed Sensor 1.
	48 km/h (30 MPH)	975 RPM	
	80 km/h (50 MPH)	1930 RPM	
Output Shaft Speed Sensor	0 km/h (0 MPH)	0 RPM	Displays the current speed of the Output Shaft Speed Sensor.
	48 km/h (30 MPH)	1159 RPM	
	80 km/h (50 MPH)	1850 RPM	
Output Speed Sensor Direction	Forward	Forward	The enumerated state of the raw Transmission Output Speed Sensor direction information. This parameter will display Undetermined State, until the TCM receives the speed sensor input.
	Reverse	Reverse	
Output Speed Sensor Direction Signal	Forward	0.05 ms	The enumerated state of the raw Transmission Output Speed Sensor direction information. This parameter will display Undetermined State, until the TCM receives the speed sensor input. contains the Transmission Output Speed Sensor Direction ON Period Time in milliseconds. This PID will display 0.00 ms until the TCM receives the speed sensor input
	Reverse	0.18 ms	
Transmission Range Sensor 1	P	15%	The raw PWM duty cycle for Transmission Range Sensor 1/A that is wired to the TCM.
	R	39%	
	N	50%	
	D	62%	
	M	74%	
Transmission Range Sensor 2	P	85%	The raw PWM duty cycle for Transmission Range Sensor 2/B that is wired to the ECM.
	R	60%	
	N	49%	
	D	38%	
	M	26%	
Vehicle Speed	—	Varies	The undefaulted vehicle speed calculated from the Transmission Output Speed Sensor.

K71 Transmission Control Module — Scan Tool Control Function

Control Function	Description
High Side Driver	Overrides the state of the High Side Driver Output
High Side Driver 2	Overrides the state of the High Side Driver 2 Output
Shift Transmission Gear	Overrides the commanded gear output
Transmission Control Solenoid Valve 1–9	Overrides the state of the Transmission Control Solenoid Valve — On or Off
Transmission Control Solenoid Valve 1–7 Current	Overrides the current of the Transmission Control Solenoid Valve — 0–1.2 A
Torque Converter Clutch— Dynamic Test	Overrides the state of the Transmission Control Solenoid Valve that operates the Torque Converter Clutch, to be used during a road test.
Torque Converter Clutch— Static Test	Overrides the state of the Transmission Control Solenoid Valve that operates the Torque Converter Clutch, to be used when the engine is not running.

K71 Transmission Control Module: Scan Tool Information

K71 Transmission Control Module — Scan Tool Parameter

Parameter	System State	Expected Value
Operating Conditions: Ignition= On		
Calculated Line Pressure	Ignition On - Engine Off	550 kPa (80 PSI)
	Ignition On - Engine Running	550 kPa (80 PSI)
	48 km/h (30 MPH)	500 kPa (73 PSI)
	80 km/h (50 MPH)	524 kPa (76 PSI)
Calculated Throttle Position	0 km/h (0 MPH)	0%
	48 km/h (30 MPH)	10%
	80 km/h (50 MPH)	13%
Control Module Voltage Signal	Ignition On - Engine Off	12.60 V
	Ignition On - Engine Running	14.40 V
Current Gear	P	Park
	R	Reverse
	N	Neutral
	D	1–10
	L	1–10
Driver Shift Control Mode	S3 Transmission Shift Lever = P, R, N, D	Inactive
	S3 Transmission Shift Lever = L, M, S	Active
Driver Shift Request	No Button Pressed	Inactive
	Upshift» Pressed	Up
	Downshift» Pressed	Down
Engine Coolant Temperature	Ignition On - Engine Off	41°C (105°F)
	Ignition On - Engine Running	52°C (126°F)
	48 km/h (30 MPH)	87°C (189°F)
	80 km/h (50 MPH)	94°C (201°F)

Parameter	System State	Expected Value
Engine Speed	Ignition On - Engine Off	0 RPM
	Ignition On - Engine Running	582 RPM
	48 km/h (30 MPH)	1173 RPM
	80 km/h (50 MPH)	1277 RPM
Engine Torque	Ignition On - Engine Off	−41 Nm (−30 lb ft)
	Ignition On - Engine Running	15 Nm (11 lb ft)
	48 km/h (30 MPH)	58 Nm (43 lb ft)
	80 km/h (50 MPH)	136 Nm (100 lb ft)
Gear Command	P	Park
	R	Reverse
	N	Neutral
	D	1–10
	L	1–10
Gear Ratio	1	4.68:1
	2	2.98:1
	3	2.15:1
	4	1.77:1
	5	1.52:1
	6	1.27:1
	7	1.00:1
	8	0.85:1
	9	0.69:1
	10	0.64:1
	R	4.86:1
High Side Driver Circuit High Test Status	—	Okay
High Side Driver Circuit Low Test Status	—	Okay
High Side Driver Circuit Open Test Status	—	Not Run
High Side Driver Command	Engine ≠Running	Disabled
	Engine = Running	Enabled
High Side Driver 2 Circuit High Test Status	—	Okay
High Side Driver 2 Circuit Low Test Status	—	Okay
High Side Driver 2 Circuit Open Test Status	—	Not Run
High Side Driver 2 Command	Engine ≠Running	Disabled
	Engine = Running	Enabled
Ignition and Start Signal	Ignition On - Engine Off	12.60 V
	Ignition On - Engine Running	14.40 V
Ignition and Start Switch Signal	—	On
Ignition and Start Switch Accessory Signal	—	On
Input Shaft Speed Sensor	Ignition On - Engine Off	0 RPM
	Ignition On - Engine Running	551 RPM
	48 km/h (30 MPH)	1166 RPM
	80 km/h (50 MPH)	1184 RPM

Parameter	System State	Expected Value
Input Speed Sensor Direction	Forward	Forward
	Reverse	Reverse
Input Speed Sensor Direction Signal	Forward	0.05 ms
	Reverse	0.18 ms
Intermediate Speed Sensor	0 km/h (0 MPH)	0 RPM
	48 km/h (30 MPH)	1170 RPM
	80 km/h (50 MPH)	2754 RPM
Intermediate Speed Sensor Direction	Forward	Forward
	Reverse	Reverse
Intermediate Speed Sensor Direction Signal	Forward	0.05 ms
	Reverse	0.18 ms
Intermediate Speed Sensor 2	0 km/h (0 MPH)	0 RPM
	48 km/h (30 MPH)	1166 RPM
	80 km/h (50 MPH)	2754 RPM
Intermediate Speed Sensor 2 Direction	Forward	Forward
	Reverse	Reverse
Intermediate Speed Sensor 2 Direction Signal	Forward	0.05 ms
	Reverse	0.18 ms
Output Shaft Speed Sensor	0 km/h (0 MPH)	0 RPM
	48 km/h (30 MPH)	1159 RPM
	80 km/h (50 MPH)	1720 RPM
Output Shaft Speed Sensor Direction	Forward	Forward
	Reverse	Reverse
Output Shaft Speed Sensor Direction Signal	Forward	0.05 ms
	Reverse	0.18 ms
Park System Status	P	Park
	R, N, D, L, S	Out of Park
Power Mode	—	Run
Propulsion System Status	Engine Running	Active
	Engine Off	Inactive
Sensor Supply Circuit Status	—	Okay
Sensor Supply 2 Circuit Status	—	Okay
Shift Limiting Active Reason	—	None
TCC Pressure Control Solenoid Valve Command	0 km/h (0 MPH)	0.00 kPa (0.00 PSI)
	48 km/h (30 MPH)	334 kPa (48 PSI)
	80 km/h (50 MPH)	317 kPa (46 PSI)
Torque Converter Clutch Slip Speed	Ignition On - Engine Off	0 RPM
	Ignition On - Engine Running	30 RPM
	48 km/h (30 MPH)	1 RPM
	80 km/h (50 MPH)	47 RPM
Tow/Haul Mode	Inactive	Inactive
	Active	Active

Parameter	System State	Expected Value
Transmission Control Solenoid Valve 1–9 Calibration Data	—	Valid
Transmission Control Solenoid Valve 1-9 Control Circuit High Test Status	—	Not RunorOkay
Transmission Control Solenoid Valve 1-9 Control Circuit Low Test Status	—	Not RunorOkay
Transmission Control Solenoid Valve 1–9 Control Circuit Open Test Status	—	Not RunorOkay
Transmission Control Solenoid Valve 1 Current	Ignition On - Engine Off	0.75 A
	Ignition On - Engine Running	0.98 A
	48 km/h (30 MPH)	0.99 A
	80 km/h (50 MPH)	0.98 A
Transmission Control Solenoid Valve 1 Current Command	Ignition On - Engine Off	0.76 A
	Ignition On - Engine Running	0.98 A
	48 km/h (30 MPH)	1.02 A
	80 km/h (50 MPH)	0.97 A
Transmission Control Solenoid Valve 1 Pressure Command	Ignition On - Engine Off	0.00 kPa (0.00 PSI)
	Ignition On - Engine Running	136 kPa (20 PSI)
	48 km/h (30 MPH)	0 kPa (0 PSI)
	80 km/h (50 MPH)	0 kPa (0 PSI)
Transmission Control Solenoid Valve 2 Current	Ignition On - Engine Off	0.82 A
	Ignition On - Engine Running	0.98 A
	48 km/h (30 MPH)	0.99 A
	80 km/h (50 MPH)	0.92 A
Transmission Control Solenoid Valve 2 Current Command	Ignition On - Engine Off	0.83 A
	Ignition On - Engine Running	0.98 A
	48 km/h (30 MPH)	1.02 A
	80 km/h (50 MPH)	0.92 A
Transmission Control Solenoid Valve 2 Pressure Command	Ignition On - Engine Off	0.00 kPa (0.00 PSI)
	Ignition On - Engine Running	2,200 kPa (320 PSI)
	48 km/h (30 MPH)	0.00 kPa (0.00 PSI)
	80 km/h (50 MPH)	2,200 kPa (320 PSI)
Transmission Control Solenoid Valve 3 Current	Ignition On - Engine Off	0.75 A
	Ignition On - Engine Running	1.01 A
	48 km/h (30 MPH)	1.05 A
	80 km/h (50 MPH)	0.88 A
Transmission Control Solenoid Valve 3 Current Command	Ignition On - Engine Off	0.76 A
	Ignition On - Engine Running	1.02 A
	48 km/h (30 MPH)	1.06 A
	80 km/h (50 MPH)	0.89 A
Transmission Control Solenoid Valve 3 Pressure Command	Ignition On - Engine Off	0 kPa (0 PSI)
	Ignition On - Engine Running	0 kPa (0 PSI)
	48 km/h (30 MPH)	2,200 kPa (320 PSI)
	80 km/h (50 MPH)	2,200 kPa (320 PSI)

Parameter	System State	Expected Value
Transmission Control Solenoid Valve 4 Current	Ignition On - Engine Off	1.2 A
	Ignition On - Engine Running	0.89 A
	48 km/h (30 MPH)	0.69 A
	80 km/h (50 MPH)	0.88 A
Transmission Control Solenoid Valve 4 Current Command	Ignition On - Engine Off	1.2 A
	Ignition On - Engine Running	0.89 A
	48 km/h (30 MPH)	0.70 A
	80 km/h (50 MPH)	0.89 A
Transmission Control Solenoid Valve 4 Pressure Command	Ignition On - Engine Off	0 kPa (0 PSI)
	Ignition On - Engine Running	0 kPa (0 PSI)
	48 km/h (30 MPH)	2,200 kPa (320 PSI)
	80 km/h (50 MPH)	173 kPa (25 PSI)
Transmission Control Solenoid Valve 5 Current	Ignition On - Engine Off	0.04 A
	Ignition On - Engine Running	0.04 A
	48 km/h (30 MPH)	0.46 A
	80 km/h (50 MPH)	0.58 A
Transmission Control Solenoid Valve 5 Current Command	Ignition On - Engine Off	0.04 A
	Ignition On - Engine Running	0.04 A
	48 km/h (30 MPH)	0.47 A
	80 km/h (50 MPH)	0.59 A
Transmission Control Solenoid Valve 5 Pressure Command	Ignition On - Engine Off	0 kPa (0 PSI)
	Ignition On - Engine Running	0 kPa (0 PSI)
	48 km/h (30 MPH)	2200 kPa (320 PSI)
	80 km/h (50 MPH)	170 kPa (25 PSI)
Transmission Control Solenoid Valve 6 Current	Ignition On - Engine Off	0.57 A
	Ignition On - Engine Running	0.54 A
	48 km/h (30 MPH)	0.53 A
	80 km/h (50 MPH)	1.20 A
Transmission Control Solenoid Valve 6 Current Command	Ignition On - Engine Off	0.57 A
	Ignition On - Engine Running	0.54 A
	48 km/h (30 MPH)	0.54 A
	80 km/h (50 MPH)	1.20 A
Transmission Control Solenoid Valve 6 Pressure Command	Ignition On - Engine Off	0 kPa (0 PSI)
	Ignition On - Engine Running	2,200 kPa (320 PSI)
	48 km/h (30 MPH)	2,200 kPa (320 PSI)
	80 km/h (50 MPH)	2,200 kPa (320 PSI)
Transmission Control Solenoid Valve 7 Current	Ignition On - Engine Off	0.01 A
	Ignition On - Engine Running	0.78 A
	48 km/h (30 MPH)	0.54 A
	80 km/h (50 MPH)	1.20 A

Parameter	System State	Expected Value
Transmission Control Solenoid Valve 7 Current Command	Ignition On - Engine Off	0.01 A
	Ignition On - Engine Running	0.78 A
	48 km/h (30 MPH)	0.54 A
	80 km/h (50 MPH)	0.51 A
Transmission Control Solenoid Valve 8 Current	Ignition On - Engine Off	0.00 A
	Ignition On - Engine Running	0.00 A
	48 km/h (30 MPH)	0.52 A
	80 km/h (50 MPH)	0.50 A
Transmission Control Solenoid Valve 8 Current Command	Ignition On - Engine Off	0.00 A
	Ignition On - Engine Running	0.78 A
	48 km/h (30 MPH)	0.54 A
	80 km/h (50 MPH)	1.20 A
Transmission Control Solenoid Valve 9	—	OfforOn
Transmission Fluid Temperature	Ignition On - Engine Off	33°C (91°F)
	Ignition On - Engine Running	42°C (108°F)
	48 km/h (30 MPH)	49°C (120°F)
	80 km/h (50 MPH)	63°C (145°F)
Transmission Hot Mode	—	No
Transmission Park Valve Lock Solenoid Actuator	Park	Off
	Out of Park	On
Transmission Park Valve Position Sensor	Park	2.00 V
	Out of Park	0.80 V
Transmission Park Valve Position Sensor 1	Park	2.00 V
	Out of Park	0.80 V
Transmission Park Valve Position Sensor Status	Park	Park
	Out of Park	Out of Park
Transmission Park Valve Position Sensor 2	Park	0.80 V
	Out of Park	1.98 V
Transmission Park Valve Position Sensor 2 Status	Park	Park
	Out of Park	Out of Park
Transmission Range Control Valve Position Sensor Status	Park	0.80 V
	Out of Park	1.98 V
Transmission Range Control Valve 1 Position Switch Status	Park	Complete
	Out of Park	Failed
Transmission Range Sensor 1	P	13%
	R	47%
	N	61%
	D	75%
	L	86%
Transmission Range Sensor 2	P	87%
	R	53%
	N	39%

Parameter	System State	Expected Value
	D	25%
	L	14%
Vehicle Speed	—	Varies

K71 Transmission Control Module — Scan Tool Control Function

Control Function	Description
High Side Driver 1–2	Overrides the state of the High Side Driver Output
Shift Transmission Gear	Overrides the commanded gear output
Transmission Control Solenoid Valve 1–8	Overrides the state of the Transmission Control Solenoid Valve — On or Off
Transmission Control Solenoid Valve 1–8 Current	Overrides the current of the Transmission Control Solenoid Valve — 0-1 A
Torque Converter Clutch	Overrides the state of the Transmission Control Solenoid Valve that operates the Torque Converter Clutch.

K73 Telematic Control Module: Scan Tool Information

Telematic Control Module Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON			
GPS Data			
• Dead Reckoning Calibration Status	—	Calibrated or Not Calibrated	Indicates the dead reckoning calibration status.
• Position Calibration Method	—	Varies	Indicates the method used to determine current location. (0) GPS, (1) Wheel Speed Dead Reckoning only, (2) Combined Wheel Speed and GPS, (3) Gyro only, (4) Combined Gyro and GPS, (5) No Fix
• Month	—	MM	This displays the current month.
• Day	—	DD	This displays the current day of the month.
• Year	—	YY	This displays the current year.
• Hour	—	HH	This displays the GPS current hour (24 hour format – GMT).
• Minute	—	MM	This displays the GPS current minute.
• Second	—	SS	This displays the GPS current second.
• Number of Satellites Tracked	—	Varies	The scan tool displays the number of satellites being tracked by the Telematic Control Module.
Signal Strength Data			
• GSM Signal Strength	—	Varies	The scan tool displays 0–127. This is the Telematic Control Module signal strength.
• Current Public Land Mobile Network	—	Varies	Identifies the cellular communications network currently in use by the Telematic Control Module. Each network has a unique decimal number assigned to it for identification.
Bluetooth Data			
• Bluetooth	—	Enabled	Indicates if the Bluetooth system is enabled or disabled.
• Bluetooth Link Status	—	Varies	Indicates the current link status. (0) Unconnected, (1) Connected / Idle, (2) Call active, (3) 3-way calling active

Parameter	System State	Expected Value	Description
• Bluetooth Link Quality	—	Varies	The scan tool displays a decimal value between 0 and 255.
• Bluetooth Phone to Telematic Control Module Authentication Status	—	Active or Inactive	Displays the bluetooth phone to Telematic Control Module authentication status.
• Bluetooth Phone to Telematic Control Module Communication Status	—	Active or Inactive	Displays the bluetooth phone to Telematic Control Module status.
• Bluetooth Phone Voice Recognition Status	—	Active or Inactive	Displays the bluetooth phone to voice recognition status.
WLAN Device Data			
Off-Board Navigation	—	Enabled or Disabled	Indicates if Off-Board Navigation is enabled or disabled
Wireless LAN	—	Enabled or Disabled	Indicates the capability of the wireless communication of the Telematic Control Module
Number of WLAN Devices	—	Varies	Indicates the number of Wireless devices present
Active WLAN 2.4GHz Chennel	—	Varies	Indicates the active Wireless channel being used on the 2.4 GHz frequency
WLAN Link Status	—	Radio System – Never, Remembered but Not Associated or Associated	Indicates the link status of the Telematic Control Module and Infotainment system
GSM Signal Strength	—	Varies	State for Received Signal Strength Indicator
Mobile Communication Standard	—	2G, 3G, 4G or 4G LTE	State for Cellular Data Connection. Indicates the currently used data rate speed
WLAN Password	—	Varies	Indicates the Telematic Control Module Wireless Password
WLAN SSID (Service Set Identifier)	—	Varies	Indicates the Telematic Control Module Wireless Service Name
WLAN Encryption – WPA (Wi–Fi Protected Access)	—	Active or Inactive	Indicates if the WLAN Encryption – WPA (Wi–Fi Protected Access) is Active or Inactive
WLAN Encryption – WPA2 (Wi–Fi Protected Access II)	—	Active or Inactive	Indicates if the WLAN Encryption – WPA2 (Wi–Fi Protected Access II) is Active or Inactive
WLAN Encryption – AES (Advanced Encryption Standard)	—	Active or Inactive	Indicates if the WLAN Encryption – AES (Advanced Encryption Standard) is Active or Inactive
WLAN Encryption – TKIP (Temporal Key Intergrity Protocol)	—	Active or Inactive	Indicates if the WLAN Encryption – TKIP (Temporal Key Integrity Protocol) is Active or Inactive

Telematic Control Module Scan Tool Output Controls

Output Control	Description
B1000 Information	This shows the data recorded when DTC B1000 was set in the Telematic Control Module.
Green Indicator	The Telematic Control Module illuminates the green LED when ON is selected.
Phone Call Test	When ON is selected, Telematic Control Module commands OnStar to connect to the OnStar Center.
Red Indicator	The Telematic Control Module illuminates the red LED when ON is selected.
Preferred Roaming List Update	The Telematic Control Module performs a preferred roaming list (PRL) update when this is selected.
Remote Vehicle Speed Limiting Reset	This function resets the speed limiting feature.

K85P Restraints Occupant Classification System Module - Passenger: Scan Tool Information

Restraint Occupant Classification System Module Scan Tool Data Parameters

Parameter	Expected Value	Definition
Operating Conditions: Ignition ON		
Base Model Part Number	Varies, 8 Digit Number	The scan tool displays the part number of the ROCSM which is stored in non volatile memory.
Battery Voltage	Volts	The scan tool will display battery voltage.
Calibration Part Number	Varies, 8 Digit Number	The scan tool displays the part number of the calibration file in the ROCSM.
End Model Part Number	Varies, 8 Digit Number	The scan tool displays the part number of the ROCSM in production.
Manufacturer's Traceability Number	Varies, 16 Digit Number	The scan tool displays the 16 digit traceability number in the ROCSM.
Passenger Air Bag Enable/Disable Request by Restraint Occupant Classification System Module	Disable	The scan tool displays the Passenger Air Bag Enable/ Disable Request by Restraint Occupant Classification System Module.
Restraint Occupant Classification Module Primary Key	Hex Value	The scan tool indicates the primary key Hex value.
Restraint Occupant Classification System Reporting DTC(s)	Yes/No	The ROCSM will report if there are DTCs set in the Restraint Occupant Classification module.
Passenger Seat Occupancy Status	Empty Seat	The scan tool displays Undefined, Empty Seat, Occupied, or Invalid. This is the state of the passenger seat if it is occupied or empty and monitored by the Restraint Occupant Classification System.
Power Mode	Off / Accessory / Run / Crank Request	The scan tool will display the power mode of the vehicle.
Primary Key Status	Valid/Invalid	The scan tool displays Valid if the primary key matches what is stored to memory in the ROCSM.
Received Primary Key	Hex Value	The scan tool displays a Hex value indicating the ROCSM received primary key data.
Software Part Number	Varies, 8 Digit Number	The scan tool displays the software part number in the ROCSM.

K160 Brake System Control Module: Scan Tool Information

The Electronic Brake Control Module (EBCM) scan tool data parameters list contains all ABS related parameters that are available on the scan tool. The list is arranged in alphabetical order. A given parameter may appear in any one of the data lists.

Brake System Control Module Scan Tool Data Parameters

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON			
ABS Active SIgnal		OK/Malfunction	Determine the state of the ABS system
ABS Pump Motor Voltage		0 V	The scan tool displays the commanded pump motor voltage.
Actual Brake System Plunger Motor Torque		Varies	The scan tool displays the motor torque feedback.
Actual Brake System Plunger Position		Varies	The scan tool displays Plunger Position Feedback
Actual Brake System Plunger Speed		Varies	The scan tool displays Plunger Speed Feedback

Parameter	System State	Expected Value	Description
All Wheel Drive		Active/Inactive	The scan tool displays when in four wheel drive (if equipped).
Antilock Braking System		OK/Malfunction	The scan tool displays OK or Malfunction. Malfunction is displayed if there is an ABS malfunction.
Automatic Brake Control Gain Request from Brake System Control Module		Varies	The scan tool displays a percentage of Autonomous Control Gain Request from BSCM
Automatic Braking Event		Detected/Not Detected	The scan tool displays Automatic Trailer Braking Event
Automatic Brake Request from Brake System Control Module		Yes/No	The scan tool displays Trailer Brake Autonomous Control Status
Automatic Braking Active Signal		Okay/ Malfunction	ABS Active Malfunction indicates invalid protected ABS active data received from Automatic Brake System Control Module
Automatic Braking Torque Signal		Okay/ Malfunction	The scan tool displays Automatic Brake Torque Signal Failure
Autonomous Braking Request Signal		Okay/ Malfunction	Autonomous Signal malfunction indicates invalid autonomous braking data received from Automatic Brake System Control Module
Brake Fluid Level Sensor		Okay/Low	The scan tool displays OK when the brake fluid is at correct level and Low when the brake fluid is low.
Brake Fluid Reservoir Seperating Solenoid Valve		Active/Inactive	The scan tool displays Eboost System Internal Valves Feedback Status Reservoir Seperation Valve Commanded
Brake Master Cylinder Separating Solenoid Valve 1		Active/Inactive	The scan tool displays Eboost System Internal Valves Feedback Status Circuit Seperating Valve 1 Commanded.
Brake Master Cylinder Separating Solenoid Valve 2		Active/Inactive	The scan tool displays Eboost System Internal Valves Feedback Status Circuit Seperating Valve 2 Commanded
Brake Pad Wear Malfunction Signal		None Propulstion Active, Vehicle Speed, Malfunction, Reset	The scan tool displays the Brake Pad Life Monitoring Axle Reset Reject Reason
Brake Pad Wear Signal		Low/High	The scan tool displays Brake Pad Wear Input Status
Brake Pedal Position Sensor	Brake pedal released	Inactive	The scan tool displays Inactive or Active depending on the state of the brake pedal.
	Brake pedal applied	Active	
Brake Pedal Simulator Separating Solenoid Valve		Active/Inactive	System Internal Valves Feedback Status Simulator Separating Valve Commanded
Brake Pressure Signal		Okay/ Malfunction	The scan tool displays Brake Pressure Signal Failure
Brake System		Active/Inactive	The scan tool displays the boost status.
Brake System Plunger Motor Resistance		Varies	The scan tool displays the calculated Motor Resistance
Brake System Plunger Motor Temperature 1		Varies	The scan tool displays the Module Motor Driver Temperature CH1
Brake System Plunger Motor Temperature 2		Varies	The scan tool displays the Module Motor Driver Temperature CH2

Parameter	System State	Expected Value	Description
Brake System Plunger Separating Solenoid Valve 1		Active/Inactive	The scan tool displays System Internal Valves Feedback Status Plunger Separating Valve 1 Commanded.
Brake System Plunger Separating Solenoid Valve 2		Active/Inactive	System Internal Valves Feedback Status Plunger Separating Valve 2 Commanded
Brake Pressure		Varies	The scan tool displays brake apply pressure.
Brake Pressure Created by Applying Brake Pedal		Varies	The scan tool displays Brake Pedal Driver Applied Pressure
Brake Pressure Sensor	Brake pedal released	0–1 V	The scan tool displays 0–5 V depending on the applied hydraulic brake pressure.
	Brake pedal applied	1–5 V	
Brake Pressure Sensor	Brake pedal released	2000–3000 kPa	The scan tool displays the actual pressure applied to the brake pedal.
Brake Pressure Test		Incomplete, Active, Complete, Failed	The scan tool displays the Wheel Pressure Control Feedback Test Status
Brake System Plunger Motor Current Limitation		Active/Inactive	Eboost Motor Current Limitation
Brake System Plunger Motor Status		Active/Inactive	The scan tool displays if the Eboost Motor Status has limitations.
Brake System Plunger Motor Temperature Limitation		Active/Inactive	Eboost Motor Temperature Limitation
Brake System Plunger Motor Torque Limitation		Active/Inactive	Eboost Motor Torque Limitation
Brake System Plunger Travel		Varies	The scan tool displays the plunger travel.
Calculated Input rod Position		Varies	The scan tool displays the EBoost Input Rod Stroke - Calculated
Delivered Torque		Varies	The scan tool displays 0–100% depending on the how much torque the engine is delivering.
Desired Trailer Brake Control Duty Cycle		OK/Malfunction	The banded trailer brake duty cycle sent to the Trailer Brake Module. It represents the requested duty cycle as transformed to allow diagnostics on the transmission line
Desired Brake System Plunger Position		Varies	The scan tool displays the command Plunger Position
Desired Brake System Plunger Speed		Varies	The scan tool displays the commanded Plunger Speed.
Desired Brake System Plunger Motor Torque		Varies	The scan tool displays the commanded Motor Torque.
Deviation Between Manual Trailer Brake Apply Request Signal 1 and 2		Varies	The scan tool displays Trailer Brake Manual Apply Switch Position Error
Diagnostic Mode		Active/Inactive	Diagnostic Mode Status
Driver Initiated Brake Event		Not Detected/ Detected	The scan tool displays Brake Event Detected
Dynamic Rear Proportioning Status		Okay/ Malfunction	The scan tool displays Dynamic Rear Proportioning System Failure Status
Engine Drag Control Status		Okay/ Malfunction	The scan tool displays Engine Drag Control Status
Front Brake Pad Wear Sensors		Varies	The scan tool displays Front Axle Brake Pad Wear Sensor Voltage

Parameter	System State	Expected Value	Description
Induced Voltage by Trailer Brake Coil		Varies	The scan tool displays Inductance Measurement Voltage
Input Rod Position 1		Varies	The scan tool display the position of the Input Rod Stroke 1
Input Rod Position 2		Varies	The scan tool display the position of the Input Rod Stroke 2
Input Rod Position Sensors 1 and 2 Supply Voltage		Varies	The scan tool display the Brake Pedal Postion Sensor Reference Voltage
Lateral Acceleration		Varies	The scan tool displays 0–5 V depending on the vehicle's lateral acceleration.
Left Front Inlet Solenoid Valve Feedback		Inactive/Active	Active is displayed when the left front inlet solenoid valve is commanded ON.
Left Front Outlet Solenoid Valve Feedback		Inactive/Active	Active is displayed when the left front outlet solenoid valve is commanded ON.
Left Front Wheel Speed		0 km/h (0 MPH)	The scan tool displays km/h (MPH) depending on the current speed of the left front wheel speed sensor.
Left Front Brake Pressure		Varies	The scan tool displays the left front wheel pressure
Left Park Brake Actuator Force		Varies	The scan tool displays the Left Park Brake Actuator force
Left Park Brake Actuator Status		Released, Applied, Malfunction, Service Release, Releasing, Applying, Unknown	The scan tool displays the Left Park Brake Actuator Status
Left Park Brake Actuator Voltage		Varies	The scan tool displays the Left Park Brake Actuator voltage
Left Rear Brake Pressure		Varies	The scan tool displays the left rear wheel pressure
Left Rear Inlet Solenoid Valve Feedback		Inactive	The scan tool displays Inactive or Active. Active is displayed when the left rear inlet solenoid valve is commanded ON.
Left Rear Outlet Solenoid Valve Feedback		Inactive	The scan tool displays Inactive or Active. Active is displayed when the left rear outlet solenoid valve is commanded ON.
Left Rear Wheel Speed		0 km/h (0 MPH)	The scan tool displays km/h (MPH) depending on the current speed of the left rear wheel speed sensor.
Limited Brake Function - Only Limited Brake Pressure Available		Active/Inactive	The scan tool displays Partial Boost status
Limited Brake Function - Low Voltage Condition		Active/Inactive	The scan tool displays Low Voltage Boost Status
Limited Brake Function - Only One Brake Circuit Available		Active/Inactive	The scan tool displays half system boost status.
Longitudinal Acceleration		Varies	The scan tool displays the vehicle's longitudinal acceleration.
Manual Trailer Brake		Released/ Applied	Trailer Braking Signals Status Manual Trailer Brake Applied
Manual Trailer Brake Apply Request Signal 1		OK/Malfunction	Trailer Brake Primary Manual Apply Switch Position
Manual Trailer Brake Apply Request Signal 2		OK/Malfunction	Trailer Brake Redundant Manual Apply Switch Position
Module Temperature		Varies	The scan tool displays the Bake System Control Module Temperature.

Parameter	System State	Expected Value	Description
Normal Braking Mode		Active/Inactive	The scan tool displays if the vehicle is in normal braking mode.
Park Brake Actuator		Active/Inactive	The scan tool displays the Electric Park Brake Motor Status
Park Brake Actuator Direction		Released/ Applied	The scan tool displays the Electric Park Brake Motor Status
Panic Brake Assist Status		OK	The scan tool displays OK or Malfunction. Malfunction is displayed if the EBCM disables the panic brake assist due to a fault.
Park Brake Mode		Active/Inactive	The scan tool displays if in Shut Down Boost status
Park Brake Switch		Active/Inactive	The scan tool displays the status of the Electric Park Brake Switch
Pump Motor Relay Feedback		Inactive	The scan tool displays Inactive or Active. Active is displayed when the pump motor is commanded ON.
Primary Isolation Solenoid Valve Feedback		Inactive	The scan tool displays Inactive or Active. Active is displayed when the isolation solenoid valve is commanded ON.
Primary Prime Solenoid Valve Feedback		Inactive	The scan tool displays Inactive or Active. Active is displayed when the prime solenoid valve is commanded ON.
Rear Brake Pad Wear Sensors		Varies	The scan tool displays the remaining percentage of brake pad.
Redundant Trailer Brake Manual Apply Slider		Varies	The scan tool displays Manual Apply Switch Voltage.
Regenerative Braking Axle Torque Request		Varies	The scan tool displays Regenerative Braking Axle Torque Request
Regenerative Braking, Stability or Traction Control Disable History 1		Varies	The scan tool displays Regenerative Braking, Stability or Traction Control Disabling ECU History 1
Regenerative Braking, Stability or Traction Control Disable History 2		Varies	The scan tool displays Regenerative Braking, Stability or Traction Control Disabling ECU History 2
Regenerative Braking, Stability or Traction Control Disable History 3		Varies	The scan tool displays Regenerative Braking, Stability or Traction Control Disabling ECU History 3
Regenerative Braking, Stability or Traction Control Disable History 4		Varies	The scan tool displays Regenerative Braking, Stability or Traction Control Disabling ECU History 4
Regenerative Braking, Stability or Traction Control Disable History 5		Varies	The scan tool displays Regenerative Braking, Stability or Traction Control Disabling ECU History 5
Regenerative Braking, Stability or Traction Control Disable History 6		Varies	The scan tool displays Regenerative Braking, Stability or Traction Control Disabling ECU History 6
Regenerative Braking, Stability or Traction Control Disable History 7		Varies	The scan tool displays Regenerative Braking, Stability or Traction Control Disabling ECU History 7
Regenerative Braking, Stability or Traction Control Disable History 8		Varies	The scan tool displays Regenerative Braking, Stability or Traction Control Disabling ECU History 8
Regenerative Braking, Stability or Traction Control Disable History 9		Varies	The scan tool displays Regenerative Braking, Stability or Traction Control Disabling ECU History 9
Regenerative Braking, Stability or Traction Control Disable History 10		Varies	The scan tool displays Regenerative Braking, Stability or Traction Control Disabling ECU History 10
Requested Torque		Varies	The scan tool displays 0–100% depending on the how much torque is requested.
Right Front Brake Pressure		Varies	The scan tool displays the right front wheel pressure.
Right Front Inlet Solenoid Valve Feedback		Inactive	The scan tool displays Inactive or Active. Active is displayed when the right front inlet solenoid valve is commanded ON.

Parameter	System State	Expected Value	Description
Right Front Outlet Solenoid Valve Feedback		Inactive	The scan tool displays Inactive or Active. Active is displayed when the right front outlet solenoid valve is commanded ON.
Right Front Wheel Speed		0 km/h (0 MPH)	The scan tool displays km/h (MPH) depending on the current speed of the right front wheel speed sensor.
Right Park Brake Actuator Force		Varies	Scan tool displays the Right Park Brake Actuator force
Right Park Brake Actuator Status		Released, Applied, Malfunction, Service Release, Releasing, Applying, Unknown	Scan tool displays the Right Park Brake Actuator Status
Right Park Brake Actuator Voltage		Varies	Scan tool displays the Right Park Brake Actuator voltage
Right Rear Brake Pressure		Varies	The scan tool displays the right rear wheel pressure.
Right Rear Inlet Solenoid Valve Feedback		Inactive	The scan tool displays Inactive or Active. Active is displayed when the right rear inlet solenoid valve is commanded ON.
Right Rear Outlet Solenoid Valve Feedback		Inactive	The scan tool displays Inactive or Active. Active is displayed when the right rear outlet solenoid valve is commanded ON.
Right Rear Wheel Speed		0 km/h (0 MPH)	The scan tool displays km/h (MPH) depending on the current speed of the right rear wheel speed sensor.
Roller Test Stand Mode		Active/Inactive	The scan tool displays dyno mode status
Secondary Isolation Solenoid Valve Feedback		Active/Inactive	The scan tool displays Inactive or Active. Active is displayed when the isolation solenoid valve is commanded ON.
Secondary Prime Solenoid Valve Feedback		Active/Inactive	The scan tool displays Inactive or Active. Active is displayed when the prime solenoid valve is commanded ON.
Shutdown Mode		Active/Inactive	The scan tool displays if in shutdown mode
Stop Lamp Signal		Not Requested/ Requested	The scan tool displays Brake Lights Requested
Steering Wheel Angle	Steering wheel in straight position	−5 to +5°	The scan tool displays °. This is the current position of the steering angle sensor.
	Steering wheel turned left until stop	450–550°	
	Steering wheel turned right until stop	−550 to −450°	
System Voltage	—	11–14 V	The scan tool displays V. This is the current battery voltage.
Traction Control Switch	Traction control switch released	Inactive	The scan tool displays Inactive or Active depending on the traction control switch status.
	Traction control switch pressed	Active	
Traction Control System		OK	The scan tool displays OK or Malfunction. Malfunction is displayed if there is a traction control malfunction.

Parameter	System State	Expected Value	Description
Trailer Brake Automatic Control State		Normal, Active, Temporarily Limited, Permanently Failed, Communication Failed, Off, No Signal	Trailer Brake Autonomous Control Status Autonomous Control Feedback State
Trailer Brake Control		Disabled, Inactive, Normal Brake Mode, High Brake Mode, Manual Apply Brake Mode, Brake in Autonomous Mode, Undefined	The Scan tool displays Trailer Braking Arbitration State
Trailer Brake Control Output Circuit		Indeterminate, Voltage too High, Voltage too Low, Okay	The Scan tool displays Trailer Brake Control Output State
Trailer Brake Manual Apply Slider		Varies	The scan tool displays the trailer brake slider position as a percentage
Trailer Brake Power Control Module		De-Energized/ Energized	Trailer Brake Control Status Energized
Trailer Brake Power Control Module Battery Voltage		Varies	The scan tool displays Trailer Brake Power Control Module Battery Voltage.
Trailer Brake Sensitivity		Varies	The scan tool displays Trailer Brake User Gain
Trailer Brake Sensitivity Switch Up Button		Active/Inactive	The scan tool displays Trailer Brake Control Switch User Gain Button States
Trailer Brake Type		Unknown, Electrical, Electrohydraulic	The scan tool displays Trailer Connection Status
Vehicle Stability System		OK	The scan tool displays OK or Malfunction. Malfunction is displayed if there is a stability control malfunction.
Vehicle Stability Enhancement System Signal			
Vehicle Stability Enhancement System Switch	Traction control switch released	Inactive	The scan tool displays Inactive or Active depending on the traction control switch status.
	Traction control switch pressed	Active	
Wheel Speed Signal		Okay/ Malfunction	The scan tool displays Wheel Speed Signal Failure
Yaw Rate Signal		Varies	The scan tool displays 0–5 V depending on the vehicle's yaw rate.

Brake System Control Module Scan Tool Output Controls

Output Control	Description
Automated Brake Bleed	This is used in order to bleed ABS hydraulics.
Brake Hydraulics Test	This is used to check for leaks or air in the system.
Brake System Hydraulic Corner Test	Commands brake hydraulic pressure to each corner.
Deactivate Brake Boost System	This is used to deactivate brake boost system before performing certain functions.
Left Park Brake Actuator	Commands the left park brake actuator ON or OFF.
Right Park Brake Actuator	Commands the right park brake actuator ON or OFF.
Deactivate Rear Park Brake Service Position	Commands the caliper piston back into position after servicing the rear brakes,
Activate Rear Park Brake Service Position	Retracts the caliper piston to service the rear brakes.
Trailer Brake Control Signal	Commands the trailer brakes on and off
Trailer Brake Duty Cycle	Controls the battery output voltage to the trailer brakes.
Trailer Brake Switch Indicator	Conmands the Trailer Brake Switch Indicator on or off

K182 Parking Assist Control Module: Scan Tool Information

Note: Due to software and hardware variations, not all information may be applicable.

Parking Assist Control Module Scan Tool Data Parameters – Identification Information

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Engine OFF/Parking Assist ON			
Vehicle Identification Number (VIN)	—	Varies	The scan tool displays the Vehicle Identification Number
Diagnostic Data Identifier	—	Varies	The scan tool displays the Diagnostic Data Identifier
XML Configuration Compatibility Identifier	—	Varies	The scan tool displays the XML Configuration Compatibility Identifier
XML Data File Part Number	—	Varies	The scan tool displays the XML Data File Part Number
XML Data File Alpha Code	—	Varies	The scan tool displays the XML Data File Alpha Code
Module Diagnostic Address	—	Varies	The scan tool displays the Module Diagnostic Address
Manufacturer's Traceability Number	—	Varies	The scan tool displays the Manufacturer's Traceability Number
Software Part Number	—	Varies	The scan tool displays the Software Part Number
Calibration Part Number 2	—	Varies	The scan tool displays the Calibration Part Number 2
End Model Part Number	—	Varies	The scan tool displays the End Model Part Number
Base Model Part Number	—	Varies	The scan tool displays the Base Model Part Number
Software Module 1 Identifier Alpha Code	—	Varies	The scan tool displays the Software Module 1 Identifier Alpha Code
End Model Part Number Alpha Code	—	Varies	The scan tool displays the End Model Part Number Alpha Code
Base Model Part Number Alpha Code	—	Varies	The scan tool displays the Base Model Part Number Alpha Code
GMLAN Identification Data - Bus 1 Type	—	Varies	The scan tool displays the GMLAN Identification Data - Bus 1 Type

Parameter	System State	Expected Value	Description
GMLAN Identification Data - Data Dictionary 1 Version	—	Varies	The scan tool displays the GMLAN Identification Data - Data Dictionary 1 Version
GMLAN Identification Data - GMLAN Kernel 1 Version	—	Varies	The scan tool displays the GMLAN Identification Data - GMLAN Kernel 1 Version
Date Programmed	—	Varies	The scan tool displays the date the module was programmed

Parking Assist Control Module Scan Tool Data Parameters – Park Assist System Data

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Engine OFF/Parking Assist ON			
Power Mode	—	Run	The scan tool displays Off, Accessory, Run or Crank. This is the state of the ignition switch.
Battery Voltage	—	11–14 V	The scan tool displays V. This is the current battery voltage.
Parking Assist System Status	—	Enable	The scan tool displays Disable, Enable, Inhibited or Failed. This is the state of the parking assist system.
Parking Assist Chime	—	Varies	The scan tool displays On or Off. On is displayed if there is an object within the measuring range of the object sensors.
Parking Assist Sensors	—	ON	The scan tool displays On or Off.
Calculated Transmission Range	Transmission in reverse	Park	The scan tool displays Park, Reverse, Neutral, Drive or Unknown depending on the state of the commanded gear.
Parking Assist Switch	—	Active/Inactive	The scan tool displays Active or Inactive depending on the state of the parking assist switch.
Advanced Parking Assist Switch	—	Active/Inactive	The scan tool displays Active or Inactive depending on the state of the advanced parking assist switch.
Parking Assist Sensors Reference Voltage	—	7.3–12.1 V	The scan tool displays V. This is the amount of voltage being sent to the object sensors.
Parking Assist Switch LED	—	Varies	The scan tool displays On or Off depending on the state of the parking assist switch LED.
Right Side Object Detection Indicator	—	Varies	The scan tool displays a blank, On or Off depending on the state of the right side object detection indicator command status.
Left Side Object Detection Indicator	—	Varies	The scan tool displays a blank, On or Off depending on the state of the left side object detection indicator command status.
Advanced Parking Assist Status	—	Standby	The scan tool displays Standby, Active, or Inactive depending on the state of the advanced parking assist.

Parking Assist Control Module Scan Tool Data Parameters – Parking Assist Sensor Data

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Engine OFF/Parking Assist ON			
Parking Assist Sensors	—	ON	The scan tool displays On or Off.
Parking Assist Sensors Reference Voltage	—	7.3–12.1 V	The scan tool displays V. This is the voltage being sent to the object sensors.
Left Front Advanced Parking Assist Side Object Sensor	—	32767 mm	The scan tool displays mm. This is the distance between the parking assist sensor and the nearest object.

Parameter	System State	Expected Value	Description
Left Front Outer Object Sensor Distance to Object	—	32767 mm	The scan tool displays mm. This is the distance between the parking assist sensor and the nearest object.
Left Front Inner Object Sensor Distance to Object	—	32767 mm	The scan tool displays mm. This is the distance between the parking assist sensor and the nearest object.
Right Front Advanced Parking Assist Side Object Sensor	—	32767 mm	The scan tool displays mm. This is the distance between the parking assist sensor and the nearest object.
Right Front Outer Object Sensor Distance to Object	—	32767 mm	The scan tool displays mm. This is the distance between the parking assist sensor and the nearest object.
Right Front Inner Object Sensor Distance to Object	—	32767 mm	The scan tool displays mm. This is the distance between the parking assist sensor and the nearest object.
Left Rear Advanced Parking Assist Side Object Sensor	—	32767 mm	The scan tool displays mm. This is the distance between the parking assist sensor and the nearest object.
Left Rear Outer Object Sensor Distance to Object	—	32767 mm	The scan tool displays mm. This is the distance between the parking assist sensor and the nearest object.
Left Rear Inner Object Sensor Distance to Object	—	32767 mm	The scan tool displays mm. This is the distance between the parking assist sensor and the nearest object.
Right Rear Advanced Parking Assist Side Object Sensor	—	32767 mm	The scan tool displays mm. This is the distance between the parking assist sensor and the nearest object.
Right Rear Outer Object Sensor Distance to Object	—	32767 mm	The scan tool displays mm. This is the distance between the parking assist sensor and the nearest object.
Right Rear Inner Object Sensor Distance to Object	—	32767 mm	The scan tool displays mm. This is the distance between the parking assist sensor and the nearest object.

Parking Assist Control Module Scan Tool Data Parameters – Parking Assist Disable History 1–4 Data

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Engine OFF/Parking Assist ON			
Parking Assist Disable History 1	—	Varies	The scan tool displays None, Manual Disable, Park Brake Applied, Trailer or Other Attached Object, Excessive Speed in Reverse, No or Invalid Sensor Signals, Sensor Disturbance, Sensors Dirty, Sound Signal Return Time Not Plausible. This is the state of the park assist disable history.
Parking Assist Disable History 2	—	Varies	The scan tool displays None, Manual Disable, Park Brake Applied, Trailer or Other Attached Object, Excessive Speed in Reverse, No or Invalid Sensor Signals, Sensor Disturbance, Sensors Dirty, Sound Signal Return Time Not Plausible. This is the state of the park assist disable history.

Parameter	System State	Expected Value	Description
Parking Assist Disable History 3	—	Varies	The scan tool displays None, Manual Disable, Park Brake Applied, Trailer or Other Attached Object, Excessive Speed in Reverse, No or Invalid Sensor Signals, Sensor Disturbance, Sensors Dirty, Sound Signal Return Time Not Plausible. This is the state of the park assist disable history.
Parking Assist Disable History 4	—	Varies	The scan tool displays None, Manual Disable, Park Brake Applied, Trailer or Other Attached Object, Excessive Speed in Reverse, No or Invalid Sensor Signals, Sensor Disturbance, Sensors Dirty, Sound Signal Return Time Not Plausible. This is the state of the park assist disable history.

Parking Assist Control Module Scan Tool Data Parameters – Parking Assist Disable History 5–7 Data

Parameter	System State	Expected Value	Description
Operating Conditions: Ignition ON/Engine OFF/Parking Assist ON			
Parking Assist Disable History 5	—	Varies	The scan tool displays None, Manual Disable, Park Brake Applied, Trailer or Other Attached Object, Excessive Speed in Reverse, No or Invalid Sensor Signals, Sensor Disturbance, Sensors Dirty, Sound Signal Return Time Not Plausible. This is the state of the park assist disable history.
Parking Assist Disable History 6	—	Varies	The scan tool displays None, Manual Disable, Park Brake Applied, Trailer or Other Attached Object, Excessive Speed in Reverse, No or Invalid Sensor Signals, Sensor Disturbance, Sensors Dirty, Sound Signal Return Time Not Plausible. This is the state of the park assist disable history.
Parking Assist Disable History 7	—	Varies	The scan tool displays None, Manual Disable, Park Brake Applied, Trailer or Other Attached Object, Excessive Speed in Reverse, No or Invalid Sensor Signals, Sensor Disturbance, Sensors Dirty, Sound Signal Return Time Not Plausible. This is the state of the park assist disable history.

Parking Assist Control Module Scan Tool Output Controls

Output Control	Description
Park Assist Switch LED	The parking assist control module illuminates the advanced park assist LED of the when commanded from the scan tool.
Clear Disable History Data	The parking assist control module clears the Parking Assist Disable History data when commanded from the scan tool.
Clear Side Object Detection Disable History	The parking assist control module clears the Side Object Detection Disable History data when commanded from the scan tool.
CAN Bus Configuration Learn	The parking assist control module learns the CAN Bus configuration when commanded from the scan tool.
Parking Assist Sensor Learn	The parking assist control module learns the Parking Assist Sensor configuration when commanded from the scan tool.

T3 Audio Amplifier: Scan Tool Information

Amplifier Scan Tool Data Parameters

Parameter	Expected Value	Definition
Operating Conditions: Ignition ON		
Power Mode	Off ACC Crank Run	The scan tool displays Off, Accessory, Run or Crank Request. This is the vehicle power mode status as received via serial data.
Active Noise Cancellation	On Off	The scan tool displays On or Off. This indicates if the Active Noise Cancellation feature is available and capable of operating.
Engine Sound Enhancement	On Off	The scan tool displays On or Off. This is the status of the engine sound enhancement function.
Battery Voltage	Varies	The scan tool displays volts. This is the voltage at the input to the amplifier.
Vehicle Speed	0 km/h	The scan tool displays the vehicle speed received by the amplifier in km/h or mph.
Engine Speed	0 RPM	The scan tool displays the current engine speed received by the amplifier in RPM .
Calculated System Temperature	Varies	The scan tool displays the calculated temperature of the amplifier in °C or °F.
Microphone Status	Normal	The scan tool displays Normal, Clipped, or Malfunction.
Microphone 1 Input Level	Varies	The scan tool displays counts from 0 to 65,535. This is the sound level currently being received by the microphone 1, with higher numbers indicating louder sounds.
Microphone 2 Input Level	Varies	The scan tool displays counts from 0 to 65,535. This is the sound level currently being received by the microphone 2, with higher numbers indicating louder sounds.
Microphone 3 Input Level	Varies	The scan tool displays counts from 0 to 65,535. This is the sound level currently being received by the microphone 3, with higher numbers indicating louder sounds.
Door Status	Varies	The scan tool displays All Closed or One or More Open. This is the current status of the vehicle access door latches as received via serial data.

T22 Wireless Accessory Charging Module: Scan Tool Information

The T22 Wireless Accessory Charging Module scan tool data parameters list contains all automatic level control related parameters that are available on the scan tool. The list is arranged in alphabetical order. A given parameter may appear in any one of the data lists.

Wireless Accessory Charging Module Scan Tool Data Parameters

Parameter	System State	Expected Value	Description (Range)
Operating Conditions: Ignition ON			
Alignment Status	—	Varies	The scan tool displays the current condition of Radar Alignment.
Charging Current Level	—	Varies	The scan tool displays the state or energy level of charging device being energized by inductive charging coil located under the cup holder (None, Low, Medium, High).
Charging Current Value	—	Varies	The scan tool displays the current in mA being energized by inductive charging coil located under cup holder (0–1000mA).

Parameter	System State	Expected Value	Description (Range)
Wireless Charging Disable History - 1	—	Varies	Indicates why the wireless charging system was disabled.
Wireless Charging Disable History - 2	—	Varies	Indicates why the wireless charging system was disabled.
Wireless Charging Disable History - 3	—	Varies	Indicates why the wireless charging system was disabled.
Wireless Charging Disable History - 4	—	Varies	Indicates why the wireless charging system was disabled.
Wireless Charging Disable History - 5	—	Varies	Indicates why the wireless charging system was disabled.
Wireless Charging Disable History - 6	—	Varies	Indicates why the wireless charging system was disabled.
Wireless Charging Disable History - 7	—	Varies	Indicates why the wireless charging system was disabled.
Wireless Charging Disable History - 8	—	Varies	Indicates why the wireless charging system was disabled.

K111 Fuel Pump Power Control Module Scan Tool Information

Refer to: *K20 Engine Control Module: Scan Tool Information 2-89*.

Diagnostic Information and Procedures

Strategy Based Diagnosis

The goal of Strategy Based Diagnosis is to provide guidance when you create a plan of action for each specific diagnostic situation. Following a similar plan for each diagnostic situation, you will achieve maximum efficiency when you diagnose and repair vehicles. Although each of the Strategy Based Diagnosis steps are numbered, you are not required to complete every step in order to successfully diagnose a customer concern. The first step of your diagnostic process should always be Understand and Verify the Customer's Concern. The final step of your diagnostic process should be to Repair and verify the Fix. Refer to the steps listed below for the correct Strategy Based Diagnosis.

Note: For additional information on the following steps refer to the corresponding numbered paragraphs listed below.

1. Understand and verify the customers concern.
2. Verify the vehicle is not operating as designed:

⇒ **If the vehicle is operating as designed review the suggestions listed below:**

- Check Identical Vehicle
- Customer Misunderstanding of System – Explain operation to customer or refer to owners or service manual
- Customer dissatisfaction – Submit a Field Product Report

⇓ **If the vehicle is not operating as designed**

3. Perform preliminary checks – Visual inspections and operational

⇒ **If the customers concern is found, refer to step 5**

⇓ **If the customers concern is not found**

4. Perform the Diagnostic System Check – Vehicle, determine the diagnostic service category to perform.

⇒ **If the customers concern is found, refer to step 5**

⇓ **If the customers concern is not found**

5. Check for related Bulletins, Recalls and Preliminary Information.

⇒ **If the customers concern is found, refer to step 7**

⇓ **If the customers concern is not found**

6. Follow the diagnostic path listed below:
   - 6.1. Current DTC – Follow DTC Diagnostics
   - 6.2. Symptom no DTC – Follow Symptom Diagnostics
   - 6.3. No published diagnostic – Analyze and develop diagnostics or call Technical Assistance
   - 6.4. Intermittent/History DTC – See diagnostic detail below
7. Isolate the root cause then repair and verify the fix.
8. Re-examine the concern.

⇒ **If the vehicle is not repaired, refer to step 1**

⇓ **If the vehicle is repaired**

9. All OK.

Additional Information

1. Understand and Verify the Customer's Concern: The first part of this step is to obtain as much information as possible from the customer. Are there aftermarket accessories on the vehicle? When does the condition occur? Where does the condition occur? How long does the condition last? How often does the condition occur? In order to verify the concern, the technician should be familiar with the normal operation of the system and refer to the owner or service manual for any information needed.
2. Vehicle Operating as Designed: This condition exists when the vehicle is found to operate normally. The condition described by the customer may be normal. Compare with another like vehicle that is operating normally under the same conditions described by the customer. Explain your findings and the operation of the system to the customer. If the customer is dissatisfied submit a Field Product Report.
3. Preliminary Checks: Conduct a thorough visual inspection. Review the service history. Detect unusual sounds or odors. Gather diagnostic trouble code (DTC) information in order to achieve an effective repair.
4. Perform Published Diagnostic System Check-Vehicle: The *Diagnostic System Check - Vehicle 2-207* verifies the proper operation of the system. This will lead the technician in an organized approach to diagnostics and identify what category of diagnostic to perform.
5. Check for related Bulletins, Recalls and Preliminary Information (PI).
6. Diagnostic categories:
   - 6.1. Current DTC: Follow the designated DTC diagnostic in order to make an effective repair. Refer to *Diagnostic Trouble Code (DTC) List - Vehicle 2-212*.
   - 6.2. Symptom - No DTC: Select the appropriate symptom diagnostic. Follow the diagnostic steps or suggestions in order to complete the repair. Refer to *Symptoms - Vehicle 2-259*.
   - 6.3. No Published Diagnostics: Analyze the Concern. Develop a plan for the diagnostics. The service manual schematics will help you to see system power, ground, input, and output circuits. You can also identify splices and other areas where multiple circuits are tied together. Look at component locations to see if components, connectors or harnesses may be exposed to extreme temperature, moisture, or corrosives (road salt, battery acid, oil or other fluids). Utilize the wiring diagrams, system description and operation, and system circuit description.
   - 6.4. Intermittent/History DTC: An intermittent condition is one that does not occur continuously, may be difficult to duplicate, and will only occur when certain conditions are met. Generally, an intermittent is caused by faulty electrical connections and wiring, malfunctioning components, electromagnetic/radio frequency interference, driving conditions, or aftermarket equipment. The following approaches/tools may prove to be beneficial in locating and repairing an intermittent condition or history DTC.
     - Combining technicians knowledge with the available service information.
     - Evaluate the symptoms and conditions described by the customer.

       North America – The GM Customer Concern Verification Sheets have been designed to improve communications between the service customer and the technician. The more clearly the technician understands the concern and its symptoms, the more likely the concern will be fixed right the first time. The blank CCVS can be found in GM Global Connect under Service, Service Forms.
     - Follow the suggestions on [Link target (target-id 62112-) not found] .
     - Use a tool with data capturing capabilities like scan tool, digital multi-meter, or (if available) a vehicle data recorder.
7. Isolate the Root Cause then Repair and Verify Fix: After isolating the root cause, make the repairs and validate for the correct operation by performing the *Diagnostic Repair Verification 2-260*. Verifying that the DTC or symptom has been corrected may involve road testing the vehicle.
8. Re-examine the Concern: If a technician cannot successfully find or isolate the concern, a re-evaluation is necessary. Re-verify the concern. The concern could be an intermittent or normal condition.

Diagnostic Procedure Instructions

The following is an instructional overview of all categories which may be included in a diagnostic procedure.

Diagnostic Instructions

- A link to the *Diagnostic System Check - Vehicle 2-207* is provided here. This procedure should be performed prior to performing other diagnostic procedures, as this prevents misdiagnosis where there are integrated system dependencies.
- A link to the *Strategy Based Diagnosis 2-198* is provided here. This provides an overview on how a technician should diagnose a vehicle.
- A link to the *Diagnostic Procedure Instructions 2-199* is provided here. This information is an instructional overview of all categories which may be included in a diagnostic procedure.

DTC Descriptor

Lists all DTCs and descriptors that are diagnosed within the procedure.

If the DTC supports symptom bytes they will either be listed with the DTC or there will be a link to the symptom byte list.

Diagnostic Fault Information

The Diagnostic Fault Information table identifies each circuit that makes up an electrical subsystem and the associated circuit faults. DTCs and symptoms are listed in the table for all circuit fault modes. This information can be used to diagnose an electrical fault, or as a quick visual aid showing how the different DTCs and symptoms apply for the subsystem being diagnosed.

All DTCs and symptoms shown in this table are not necessarily diagnosed during this procedure.

An example table from an engine coolant temperature (ECT) procedure:

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	P0117	P0118, P0119	P0118*, P0119	P0128, P111E
Low Reference	—	P0118, P0119	—	P0128
* Internal control module or component damage may occur if the circuit shorts to B+.				

Typical Scan Tool Data

The Typical Scan Tool Data table identifies a scan tool data parameter and its value in reference to potential circuit faults.

An example table from an ECT procedure:

ECT Sensor

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Idling— At normal operating temperature. **Parameter Normal Range:** 88 to 105°C (190 to 221°F)			
Signal	140°C (248°F)	−40°C (−40°F)	−40°C (−40°F)
Low Reference	—	−40°C (−40°F)	—

Circuit/System Description

Circuit/System Description identifies circuits, components, and describes how the circuit/system normally functions.

Conditions for Running the DTC

Conditions for Running the DTC, identifies what conditions must be present to allow the diagnostic to run.

Conditions for Setting the DTC

Conditions for Setting the DTC, identifies the conditions that must be present in order to fail the diagnostic and when to set the DTC.

Actions Taken When the DTC Sets

Actions Taken When the DTC sets, identifies the default actions taken when a control module sets a DTC.

Conditions for Clearing the DTC

Conditions for Clearing the DTC, identifies the conditions that must be met in order to clear the DTC.

Diagnostic Aids

Diagnostic Aids are suggestions which explain other methods to diagnose the condition. It also provides unique information about the system to assist the technician in finding and repairing a vehicle condition.

Reference Information

Reference Information includes links providing additional information to be used with the diagnostic procedure.

For example:

- Schematic Reference
- Connector End View Reference
- Component View Reference
- Description and Operation
- Electrical Information Reference
- DTC Type Reference
- Scan Tool Reference
- Special Tools

Circuit/System Verification

The Circuit/System Verification, when supported, needs to be performed prior to the Circuit/System Testing. It will determine the following conditions:

- If a higher priority concern needs to be addressed first (E.g. other DTCs)
- If other conditions are present (E.g. low fluid level)
- If the condition is current
- If the condition is intermittent
- If the system is all Ok

Note: Any diagnostic step that asks if a DTC is “set” refers to a Set, Current, Present, Active DTC status. This does not include any other DTC status. For example History, Not Run, Passed and Failed.

Circuit/System Verification is a non-intrusive procedure outlining how to verify that a system or a portion of a system is functioning correctly. During the verification process, the vehicle is kept intact and tested as a complete system. The verification is used to assist the technician in determining whether a condition is current, intermittent, or not present (All Ok). When a condition is determined to be intermittent a technician can use the [Link target (target-id 62112-) not found] link in Electrical Information Reference for additional testing information.

The technician should be able to identify if the fault is occurring on the input (signal) circuit or on the output (control) circuit when applicable.

Component Codes
The component codes are a language independent method of identifying a common component between different areas in the service information. The component codes work regardless on how the actual component name was translated.

The component codes used on the schematics will have the base code with an extension to identify location or quantity. For example the ABS wheel speed sensors are identified on the schematic with a base code (B5) and a location extension (LF, RF, LR, and RR) as seen below:

- B5LF Wheel Speed Sensor - Left Front
- B5RF Wheel Speed Sensor - Right Front
- B5LR Wheel Speed Sensor - Left Rear
- B5LR Wheel Speed Sensor - Left Rear

The diagnostic procedures will use the base code (B5) for a wheel speed sensor but may or may not use the extension identifying location (LF, RF, LR, and RR).

Example:
Disconnect the harness connector at the appropriate B5 Wheel Speed Sensor.

Or

Disconnect the appropriate electrical connector: B5 Wheel Speed Sensor

This is done so the diagnostic procedure can be common for all four wheel speed sensors and not have to take into account part location or quantity.

When the diagnostic states “the appropriate” it is up to the technician to identify which component is being diagnosed either by the symptom (Driver’s door lock is inoperative) or the DTC descriptor (DTC C0585 04: Left Rear Door Latch Circuit Open).

Circuit/System Testing

Note: Performing the Circuit/System Verification category first will aid in determining if a vehicle condition currently exists.

Circuit/System Testing is a step by step, positive-flow, testing sequence which allows the technician to perform each test step, in sequence, until a fault is detected. If the result of a numbered test step is NOT achieved, the Right Repair Arrow below the failed test will identify what actions need to take place. If the result of a numbered test step is achieved, the normal flow is to proceed to the next numbered test step, as indicated by the Down Pass Arrow.

Intrusive diagnostics are performed to locate the system fault. System harness connections are disconnected from the component or control module to test individual circuit functions. The component or control module will be used to assist in verifying the circuit function. When a test does not pass, the repair steps (Right Repair Arrow) will indicate what circuit faults to test. For example a short to voltage, short to ground, or open/high resistance.

When testing for individual circuit faults, the technician is expected to perform terminal inspections such as connection surfaces and terminal tension at both the harness and the component or control module. When a condition is determined to be intermittent a technician can use the [Link target (target-id 62112-) not found] or [Link target (target-id 62194-) not found] link in Electrical Information Reference for additional information.

The component and control module will also be diagnosed during the test steps. A retest of a component or control module should always be performed before replacement. For example, reconnect all components and control modules and retest the system to verify the condition still exists before replacing components or control modules.

Component Testing

Component Testing may offer a static and/or dynamic component tests. These tests can be used to verify if a component is operating correctly to avoid unnecessary replacement.

Testing control modules in this category will not be offered. In most cases, the control module is used to verify the harness circuits in the Circuit/System Testing category and a retest of the control module should always be performed before replacement.

Repair Instructions

Repair Instructions provides a link to *Diagnostic Repair Verification 2-260*. This link describes how to verify the vehicle is repaired.

All links to repair, replacement, or programming procedures are located here.

Repair Verification

Repair Verification describes how to verify the vehicle is repaired when additional instructions are needed beyond what is in the Diagnostic Repair Verification.

Diagnostic System Check Instructions

The following is an overview of instructions for the general information and 14 step System Verification included in the Diagnostic System Check - Vehicle procedure.

Diagnostic Instructions

A link to *Strategy Based Diagnosis 2-198* is provided as an overview on how a technician should diagnose a vehicle.

A link to the Diagnostic System Check Instructions is provided. This provides an overview of instructions and examples for the general information and 14 step System Verification included in the Diagnostic System Check - Vehicle procedure. The examples in this document are intended to give the technician a general idea of what the test step is referring to. They are not intended to list every possible condition or situation.

Diagnostic Systems Check steps are listed by priority to guide the technician to the appropriate diagnostic procedure to correct the customer concern. There are many ways to determine the priority of diagnosing a vehicle concern. Some faults can cause customer perceived symptoms in areas unrelated to the fault. Using an example from the System Check, after reading DTCs, the technician is asked to verify there are no Electronic Control Unit Internal Performance Faults present. It is important that any internal performance issues are addressed prior to continuing through the System Check. There is no benefit addressing other DTCs that could be set due to an internal fault to a control module. If the fault is present, performing the diagnostic procedure for that fault will likely correct the customer perceived concern and possibly eliminate other DTCs that may be set.

Not all steps of the Diagnostic System Check have to be performed. The Diagnostic System Check tries to prioritize the test steps with the highest priority faults first. The technician is then lead to another document to do the actual diagnosis or repair. The strategy is to repair higher level faults that may be the cause of other system or component level symptoms. Additionally, the Diagnostic System Check can only be used for a single fault at a time. If additional faults are present, the technician must perform the diagnostic system check for each concern until all customer concerns are corrected.

Once a repair has been completed, General Motors diagnostic strategy is to always have the technician verify that the customer concern has been corrected. This is to prevent comebacks and to ensure customer satisfaction with their dealership experience. Therefore a link has been provided to *Diagnostic Repair Verification 2-260* procedure for the technician to verify the customer concern has been corrected.

There are some assumptions made when General Motors prepares service information. They include the following areas which are presumed to function as designed:

- The 12-volt battery is fully charged. General Motors assumes the majority of vehicles brought in for repair will be able to start and be driven into the service stall. If the vehicle has a dead battery, it is slow cranking or for any other reason the

technician feels the customer concern may be battery related, a link is provided to [Link target (target-id 37781-) not found] . This procedure will guide the technician through inspecting and verifying the battery functions properly.

- Fuses should not be open. General Motors does not call out in diagnostic procedures to verify a fuse. The technician is expected to find an open fuse when the diagnostic test step states to check for an open circuit condition. Therefore a link has been provided to *Power Distribution Schematics 7-540* and *Electrical Center Identification Views 7-53* for technicians to reference power sources and fuse locations if they feel there may be loss of power due to an open fuse condition.
- Ground circuits are clean, tight, and in the correct location. General Motors assumes that the original ground circuits have not been compromised. The technician is expected to find a poor ground connection when the diagnostic test step states to test the ground circuit for an open/high resistance. Therefore a link has been provided to *Ground Distribution Schematics 7-577* and *Harness Routing Views 7-452* for technicians to reference ground locations and which ground circuits may be related to the customer concern.
- All connectors/terminals fully seated in the area of concern. General Motors assumes that all connections are properly installed. The technician is expected to find an open or poor connection when the diagnostic test step asks to test the circuit for an open/high resistance. Therefore a link has been provided to [Link target (target-id 62031-) not found] for technicians to reference which connections may be related to the customer concern.
- There are no aftermarket devices that affect the operation of the system. General Motors can only author diagnostic and repair information for vehicle systems and components that are original equipment or genuine GM Accessories. Aftermarket equipment can negatively affect original equipment operation and lead a technician's diagnosis of a concern in the wrong direction. Therefore a link has been provided to [Link target (target-id 310488-) not found] that guides a technician through the possible causes of vehicle problems related to aftermarket accessories.
- The scan tool powers up. General Motors assumes that power is available at the Data Link Connector and the scan tool will power on. Therefore a link has been provided to [Link target (target-id 148078-) not found] if the technician finds that the scan tool does not power on.

Diagnostic System Check

1. VERIFY CUSTOMER CONCERN — This step is to obtain as much information as possible from the customer. Are there aftermarket accessories on the vehicle? When does the condition occur? Where does the condition occur? How long does the condition last? How often does the condition occur? Review the service history of the vehicle for previous repairs that could help diagnose the current concern.

   Now that the technician understands the customer concern, they should validate the concern on the vehicle. In order to verify the concern, the technician should be familiar with the normal operation of the system and refer to the owner or service manual for any information needed. Inspect the visible system components for obvious damage or conditions that could cause the concern. Conduct a thorough visual inspection. Detect unusual sounds or odors.

   The condition described by the customer may be normal. If the technician finds the vehicle to operate normally, compare with another like vehicle that is operating normally, under the same conditions described by the customer. If this is the case, explain your findings and the operation of the system to the customer. If the customer is dissatisfied, submit a Field Product Report.
2. BULLETIN SEARCH — By searching for related bulletins, recall/field actions and preliminary information documents, a procedure for a known field issue may resolve the customer concern with little or no diagnosis necessary saving the technician diagnostic time.
3. MECHANICAL CONCERNS — This step is designed to take the technician directly to a list of symptom diagnostic procedures. The technician is asked to verify the symptoms exhibited by the system are mechanical in nature and not related to an electrical system, see some examples below. If the technician feels the concern could be related to an electrical system, they should continue through the Diagnostic System Check to verify the electrical functionality of vehicle. If the technician feels the concern is exclusively related to a mechanical system, a link to *Symptoms - Vehicle 2-259* is provided to select the appropriate symptom diagnostic procedure for the customer concern.

   Examples:

   - Brake noise or diagnosing irregular pad wear
   - Water leak diagnosis
   - Engine or transmission fluid leak diagnosis
   - Manual window or door lock diagnosis

- Vehicle vibration diagnosis
- Exhaust noise or leak diagnosis

4. VEHICLE POWER UP VERIFICATION — The technician is asked in this step to verify the vehicle powers up. The technician should look for clues that multiple vehicle systems are receiving vehicle power mode messages, such as the cluster waking up, the radio powers on, the HVAC blower is operational, windshield wipers turn on, etc, with the ignition On. This would be a rare condition as both the power mode master and back-up power mode master would have to be inoperable, however, if the vehicle does not power up, a link to [Link target (target-id 148321-) not found] is provided.
5. CONTROL MODULE COMMUNICATION and DTC CHECK — The technician is asked in this step to record the following three pieces of data on the Repair Order; any control module that the scan tool determined is not communicating, any DTC and symptom byte set current or history, and the control module that has set the DTC.

   This is considered a setup step for the rest of the Diagnostic System Check. The technician is not expected to do anything other than record the three pieces of data provided by the scan tool on the Repair Order. This provides the information needed to complete the rest of the diagnostic system check.

   To complete this step, the technician is asked to utilize the scan tool Vehicle DTC Information function. This function will query every possible control module on the vehicle requesting all DTCs. During the DTC query, the scan tool will try to establish communication with each control module. If the scan tool can communicate with the control module during the DTC request, it will display PRESENT and provide the number of DTCs set in the control module. If the scan tool cannot communicate with a control module, it will only display NOT COMMUNICATING. Since the scan tool cannot determine if a given control module should be present or not, the technician is asked in a future step to verify that the vehicle was not built with control modules listed as NOT COMMUNICATING.

   If the scan tool cannot establish communications with ALL of the vehicles control modules, a link to [Link target (target-id 148085-) not found] is provided. A faulty control module or fault with the serial data circuit can cause no communication with all of the control modules on the vehicle. If any control module communicates on the serial data circuit, continue through the Diagnostic System check, as a future step will address any specific non communicating or group of non communicating control modules.

   Once the scan tool has completed the routine, the technician should review each control module that has set a DTC and document them on the Repair Order. When reviewing the DTCs, the technician should take notice if any DTCs are powertrain related, and if so, navigate in the scan tool to the Powertrain area and utilize the Capture Info function. This will upload any Freeze Frame/Failure Records stored in the control module to the scan tool in case the data is lost from the control module. As an example, if the technician commands a Clear DTCs function on a powertrain controller, all diagnostic information stored in the controller is erased. This includes Freeze Frame/ Failure Records and Inspection/Maintenance System Status indicators, if required for your region.
6. CONTROL MODULE INTERNAL PERFORMANCE FAULTS — The technician is asked to review the DTCs recorded in step 5 and verify there are no control module internal performance faults set current. This type of fault may be the cause of other symptoms or DTCs displayed by the vehicle. By addressing this fault first, the technician may find the other concerns are resolved. The technician should always follow the diagnostic procedure for these types of faults prior to replacing any control module. If the technician finds a control module has an internal performance fault, a link is provided to *Diagnostic Trouble Code (DTC) List - Vehicle 2-212* to select the appropriate DTC diagnostic procedure.

   Examples:

Note: DTC U3000 is used for both high level control module faults and lower level faults. The fault level is determined by the symptom byte set with the DTC. Examples of some DTC U3000 internal performance fault symptoms are shown below.

- U3000 04 Control Module System Internal Malfunction
- U3000 41 Control Module General Checksum Malfunction
- U3000 49 Control Module Internal Malfunction
- P0606 Control Module Internal Performance
- P0607 Control Module Performance

7. CONTROL MODULE COMMUNICATION VERIFICATION — This step is used to ensure the control modules that are NOT COMMUNICATING were not built on the vehicle. If the technician determines that a control module that is NOT COMMUNICATING should be present, the technician is asked to follow the appropriate diagnostic procedure listed in the [Link target (target-id 148085-) not found] document.

8. COMMUNICATION and POWER MODE FAULTS — This step is asking the technician to look for communication DTCs or DTCs related to control modules powering up based on power mode, communication enable or wake-up circuits. See in the below table some examples of the DTCs the technician should diagnose prior to continuing through the Diagnostic System Check. The technician should review the list of DTCs recorded in step 4 and verify that none of these type of DTCs are present. If so, the technician is referred to the *Diagnostic Trouble Code (DTC) List - Vehicle 2-212* to select the appropriate DTC diagnostic procedure.

   Examples:

Note: DTC U3000 is used for both high level control module faults and lower level faults. The fault level is determined by the symptom byte set with the DTC. Examples of some DTC U3000 communication and power mode faults are shown below.

- U3000 04 Control Module Bus Signal/Message Malfunction
- U0140 Lost Communication with Body Control Module
- U0164 Lost Communication with Heater and Air Conditioning User Interface Control - Front
- U0184 Lost Communication with Radio
- U0402 Invalid Data Received from Transmission Control Module
- U0452 Invalid Data Received from Restraints Control Module
- U001B Gear Shift Control Module Powertrain Sensor Bus Enable
- U300D Ignition Input On/Start
- B1AA3 Run/Crank Relay Coil Control

9. POWER MODE VERIFICATION — This step verifies the Power Mode Master is receiving the proper output state of the ignition switch/push button switch. The technician should use the main power mode input, this being either the ignition key or, on vehicles equipped with Passive Entry Passive Start, the push button switch. The test should not be performed using a key fob, if the MIL is illuminated the powertrain controller may disable this input. The technician is asked to perform the test with the driver door open. This ensures the retained accessory power mode is inactive during this test which could result in different scan tool readings. The technician is only asked to verify the current Power Mode parameter in the power mode data display list. If the parameter does not match the actual ignition switch position, a link is provided to perform the [Link target (target-id 148321-) not found] diagnostic procedure.
10. SERIAL DATA AUTHENTICATION FAULTS — This step verifies that control modules are able to authenticate and verify the legitimacy of certain critical messages on in-vehicle networks. The technician should review the list of DTCs recorded in step 4 and verify that none of these DTCs are present. If so, the technician is referred to the *Diagnostic Trouble Code (DTC) List - Vehicle 2-212* to select the appropriate DTC diagnostic procedure.

    Examples:

    - U1960 Message Authentication Keys Missing or Incomplete
    - U1961 Control Module Security Hardware Internal Malfunction
    - U1962 Unable to Authenticate Serial Data Message
    - U3034 Message Authentication Keys Missing or Incomplete
    - U3035 Unable to Authenticate Serial Data Message
11. PROACTIVE ALERT IDENTIFIERS— The technician is asked in this step to verify there are no Proactive Alert Identifiers set. These identifiers are displayed on the scan tool and will only appear when the OnStar subscription is active and the customer has opted into the Proactive Alert service.
12. ENGINE CRANK and RUN VERIFICATION — Here the technician is asked to verify that the engine cranks and runs. The technician should use the main power mode input, this being either the ignition key or, on vehicles equipped with Passive Entry Passive Start, the push button switch, to complete this step. The test should not be performed using a key fob, if the MIL is illuminated the powertrain controller may disable this input. The technician should know at this point whether the engine cranks and runs without having to actually performing this test step. One of the follow has probably already occurred and this step can be skipped: The technician drove the vehicle into the stall or verified when checking the Crank and Run parameter in step 8. If the technician has not already somehow verified the engine cranks in previous steps, the technician should perform this test step. Regardless of how this step was performed, if the engine does not crank, a link is provided to *Engine Does Not Crank 2-260* or if the engine cranks but does not run, a link is provided to *Engine Cranks But Does Not Run 2-260* for the technician to choose the correct diagnostic procedure for the actual engine application being used.

13. REMAINING DTC REVIEW — Here the technician is asked to review any remaining DTCs that were not addressed in previous steps. The technician is asked first to verify there are no control module supply voltage, system voltage or 5 V circuit DTCs present. Control modules, systems or components with insufficient or zero voltage can cause one or multiple symptoms to exist on the vehicle. Control module voltage issues could also be the cause of failures during a programming event. The technician should correct voltage issues prior to addressing any programming or configuration DTCs. The technician should then check for any ECU programming, setup or configuration DTCs. By programming software or configuring a control module, the technician could correct the customer concern unobtrusively. The remaining DTCs, which are usually specific system or component faults, are diagnosed last. They can include ECU input and output circuit DTCs or individual circuit faults that usually cause single symptoms or failure modes on the vehicle and can be fixed following the proper DTC diagnostic procedure. In general, the technician should think about what DTCs or faults could be caused by another DTC or fault. A failed sensor may set a component DTC and then the system may set a DTC indicating the system cannot operate properly. By correcting the sensor fault, the system may now operate properly and the system level DTC will transition to history. Refer to the examples within each category below to understand the differences between these DTCs. If DTCs of these type are current, the technician is referred to *Diagnostic Trouble Code (DTC) List - Vehicle 2-212* to choose the correct DTC diagnostic procedure.

    13.1. Voltage DTCs

Note: DTC U3000 is used for both high level control module faults and lower level faults. The fault level is determined by the symptom byte set with the DTC. Examples of some DTC U3000 voltage faults are shown below.

- U3000 16 Control Module Circuit Low Voltage
- U3000 17 Control Module Circuit High Voltage
- B19F4 Vehicle 12V Charging System
- P0560 System Voltage
- P0651 Sensor Reference 2 Circuit
- U3006 Control Module Power 1 Circuit

    13.2. Programming, Setup, Configuration or Software Performance DTCs

Note: DTC U3000 is used for both high level control module faults and lower level faults. The fault level is determined by the symptom byte set with the DTC. Examples of some DTC U3000 programming, setup, configuration, or software faults are shown below.

- U3000 51 Control Module Not Programmed
- U3000 54 Control Module Missing Calibration
- U3000 55 Control Module Not Configured
- C05D4 Brake Master Cylinder Piston Position Sensor Calibration Not Learned
- P0602 Control Module Not Programmed
- P0630 VIN Not Programmed or Mismatched - Powertrain Control Module (PCM)

    13.3. Component related DTCs

Note: DTC U3000 is used for both high level control module faults and lower level faults. The fault level is determined by the symptom byte set with the DTC. Examples of some DTC U3000 component faults are shown below.

- U3000 4A Control Module Incorrect Component Installed
- B0013 Co-Driver Knee Module High Control
- B15A7 Instrument Panel Accent Lighting Control
- C0502 Left Front Wheel Speed Sensor Circuit Low Input
- P0535 Air Conditioning Evaporator Temperature Sensor Circuit
- P0131 Heated Oxygen Sensor Circuit Low
- P0712 Transmission Fluid Temperature Sensor Circuit Low

    13.4. System related DTCs

Note: DTC U3000 is used for both high level control module faults and lower level faults. The fault level is determined by the symptom byte set with the DTC. Examples of some DTC U3000 system related faults are shown below.

- U3000 9A Control Module Incorrect Component or System Operating Conditions Exceeded
- B1A04 Front View Camera - Windshield
- C003F Wheel Speed Sensors Direction Correlation
- C2A21 Park Brake Actuator Position Unknown
- P0101 Mass Airflow Sensor Performance
- P175E Transmission Control System - Shift Limiting Active

13.5. Any other remaining DTCs — The technician should diagnose and correct any other DTCs that are left that were not from the categories above.

14. EMISSION RELATED INSPECTION/MAINTENANCE TESTING CONCERNS — Several regions require that a vehicle pass on-board diagnostic system tests and the inspection/maintenance emission tests in order to renew license plates or vehicle registration. This is accomplished by viewing the Inspection/Maintenance System Status display on a scan tool. Using a scan tool, the technician can observe the Inspection/Maintenance System Status in order to verify that the vehicle meets the criteria that comply with the local area requirements. If inspection and maintenance checks are required in your region, and the customer concern is related to not passing an Inspection/Maintenance test, a link is provided to *Inspection/Maintenance System Check 2-260* where the technician can choose the appropriate Inspection/Maintenance System Check for the actual engine application being used.
15. SYMPTOM DIAGNOSIS — At this step, the diagnostics are assuming that the only information the technician has available to diagnose the customer concern are symptoms of a problem. There are no DTCs set current or history. There may be a Driver Information Center display message or a system indicator to aid in identifying the root cause. The technician should evaluate the symptoms and conditions described by the customer and perform the symptoms diagnostics for the area of customer concern. A link is provided to *Symptoms - Vehicle 2-259* which contains a list of all symptoms related to this service manual publication.

Diagnostic Starting Point - Vehicle

Begin the system diagnosis with *Diagnostic System Check - Vehicle 2-207*. The Diagnostic System Check - Vehicle will provide a complete strategy to locate and repair a mechanical or electrical vehicle fault. Not following this strategy may cause additional diagnostic time and/or misdiagnosis.

The Diagnostic System Check - Vehicle will provide the following strategy:

- When to verify the customer concern and identify related bulletins, recalls and preliminary information
- When to identify a control module that is not communicating, a control module that has set a DTC, and the DTC diagnostic priority
- When to address power mode concerns
- When to verify the engine cranks and runs
- When to diagnose symptom related concerns

Diagnostic System Check - Vehicle

Diagnostic Instructions

- Review *Strategy Based Diagnosis 2-198* for an overview of the diagnostic approach.
- *Diagnostic System Check Instructions 2-202* provides an overview of each diagnostic step.
- Continue through the Diagnostic System Check until you are directed to follow a particular diagnostic or repair procedure. Once a repair has been completed, perform the *Diagnostic Repair Verification 2-260* and verify the customer concern has been corrected.

The diagnostic procedures within this manual are developed on the assumption that the following areas function as designed:

- The 12 V battery is fully charged and cables are clean and tight. Refer to: [Link target (target-id 37781-) not found] .
- Fuses are not open. Refer to: *Power Distribution Schematics 7-540* and *Electrical Center Identification Views 7-53*.
- Ground circuits for the area of customer concern are clean, tight, and in the correct location. Refer to: *Ground Distribution Schematics 7-577* and *Harness Routing Views 7-452*.
- All connectors/terminals fully seated in the area of concern. Refer to: [Link target (target-id 62031-) not found] .
- There are no aftermarket devices that affect the operation of the system. Refer to: [Link target (target-id 310488-) not found] .
- The scan tool powers up. Refer to: [Link target (target-id 148078-) not found] .

Diagnostic System Check

1. VERIFY CUSTOMER CONCERN — Understand and validate the customer concern. Inspect the visible system components for obvious damage or conditions that may cause the concern.
2. BULLETIN SEARCH — Check for related bulletins, recall/field actions and preliminary information.
3. MECHANICAL CONCERNS — Verify the symptom is not exclusively a mechanical concern.

⇒ **If the symptom is exclusively a mechanical concern**

Refer to: *Symptoms - Vehicle 2-259*.

⇓ **If the symptom is not a mechanical concern**

Note:

- Do not clear any DTCs unless instructed to do so by a diagnostic procedure. If any DTC is Powertrain related, select Capture Info to store DTC and Freeze Frame/Failure Records to the scan tool.
- Changes in vehicle power mode can be determined by the indicators on the S38 On/Off Vehicle Switch. The indicator should match the selected power mode and change as the power mode is changed.

4. VEHICLE POWER UP VERIFICATION — Vehicle in Service Mode, verify the vehicle powers up.

⇒ **If the vehicle does not power up**

Refer to: [Link target (target-id 148321-) not found] .

⇓ **If the vehicle powers up**

Note: When checking for DTCs and determining what diagnostic actions should be taken, it is important to understand if the DTC is a current DTC or a history DTC. It is not uncommon for vehicles to arrive for service with a DTC that is history and the underlying fault condition no longer present. Refer to *DTC Status Information 2-210* to help determine which DTCs are current and should be diagnosed as such, and which DTCs are not current and should not be considered for diagnosis.

5. CONTROL MODULE COMMUNICATION and DTC CHECK — Using a scan tool, perform the Vehicle DTC Information function and verify at least one control module communicates with the scan tool. Record on the Repair Order the following information:
   - Any control module that is not communicating.
   - Any DTC, including symptom byte, and the control module that has set the DTC.

⇒ **If the scan tool does not communicate with any control module on the vehicle**

Refer to: [Link target (target-id 148085-) not found] .

⇓ **If the scan tool communicates with any control module**

6. CONTROL MODULE INTERNAL PERFORMANCE FAULTS — Verify there are no current control module Internal Hardware Performance DTCs set.

⇒ **If any DTC of this type is set**

Refer to: *Diagnostic Trouble Code (DTC) List - Vehicle 2-212*.

⇓ **If no DTC of this type is set**

7. CONTROL MODULE COMMUNICATION VERIFICATION — Verify the vehicle is equipped with any control module identified as not communicating on the scan tool. For a list of all control modules the vehicle may be equipped with, refer to: [Link target (target-id 148085-) not found] . With all non-communicating control module(s) identified, select the appropriate Data Communication schematic to determine the RPO(s) associated with the control module and verify the RPO is or is not present on the vehicle being diagnosed. All control modules should be communicating, as equipped.

⇒ **If the vehicle is equipped with a control module that is not communicating**

Refer to: [Link target (target-id 148085-) not found] . Select the appropriate Scan Tool Does Not Communicate with Device on CAN link in the Diagnostic Procedure column.

⇓ **If all control modules the vehicle is built with are communicating**

8. COMMUNICATION and POWER MODE FAULTS — Verify there are no current control module Power Mode or Communication DTCs set.

⇒ **If any DTC of this type is set**

Refer to: *Diagnostic Trouble Code (DTC) List - Vehicle 2-212*.

⇓ **If no DTC of this type is set**

Note: The engine may start during this test. Ensure the vehicle is out of gear and the parking brake is applied. Turn the engine OFF as soon as the crank power mode parameter has been observed.

9. POWER MODE VERIFICATION — Driver door open, observe each scan tool Power Mode data parameter while cycling through all power modes. Verify all Power Mode data parameters match the actual ignition switch/push button switch selection.

⇒ **If any Power Mode data parameter does not match**

Refer to: [Link target (target-id 148321-) not found] .

⇓ **If all Power Mode data parameters match**

10. SERIAL DATA AUTHENTICATION FAULTS - Verify DTC U1960, U1961, U1962, U3034, or U3035 is not set.

⇒ **If any of the DTCs are set**

Refer to: *Diagnostic Trouble Code (DTC) List - Vehicle 2-212*.

⇓ **If none of the DTCs are set**

11. PROACTIVE ALERT IDENTIFIERS — The technician is asked in this step to verify there are no Proactive Alert Identifiers set. These identifiers are displayed on the scan tool and will only appear when the OnStar subscription is active and the customer has opted into the Proactive Alert service.

⇒ **If any Proactive Alert Identifier is set**

Refer to: *Proactive Alerts List 2-260*

⇓ **If no Proactive Alert Identifier is set**

12. ENGINE CRANK and RUN VERIFICATION — Verify that the engine cranks and runs.

⇒ **If the engine does not crank**

Refer to: *Engine Does Not Crank 2-260*.

⇒ **If the engine does not run**

Refer to: *Engine Cranks But Does Not Run 2-260*.

⇓ **If the engine cranks and runs**

13. REMAINING DTC REVIEW — Verify there are no other DTCs set.

⇒ **If other DTCs are set**

Diagnose them in the order listed below. Refer to *Diagnostic Trouble Code (DTC) List - Vehicle 2-212*.

13.1. Voltage DTCs

13.2. Programming, Setup or Configuration or Software Performance DTCs

13.3. Component related DTCs

13.4. System related DTCs

13.5. Any remaining DTCs

⇓ **If no other DTCs are set**

14. EMISSION RELATED INSPECTION/MAINTENANCE TESTING CONCERNS — If inspection and maintenance checks are required in your region, verify the customer concern is not related to inspection/maintenance testing.

⇒ **If the customer concern is related to inspection/maintenance testing**

Refer to: *Inspection/Maintenance System Check 2-260*.

⇓ **If the customer concern is not related to inspection/maintenance testing**

15. SYMPTOM DIAGNOSIS — Diagnose any remaining customer concern. Refer to: *Symptoms - Vehicle 2-259*.

DTC Status Information

Diagnostic Trouble Codes (DTCs) are status indicators of the vehicle's self-diagnostic and reporting capability. Each DTC represents the status of a particular internal test within a control module. Given appropriate conditions, the control module will begin actively monitoring conditions specified by the diagnostic. These are identified and referred to as Conditions for Running the DTC in service information. Each DTC has an associated status, identifying the state of the control module diagnostic. These statuses are identified when viewing DTC information on the scan tool and are described below.

DTC Status

Decoded Value	Description
Not Failed	Test has completed at least once this operating cycle and has passed successfully each time
Current	Test has completed since the last DTC clear, has met the threshold to be stored in long term memory, and has failed the most recent completed test. Test may not have run yet this operation cycle.
History	Test has completed since the last DTC clear, has met the threshold to be stored in long term memory, and has passed the most recent completed test. Test may not have run yet this operation cycle.
Pending	Test has completed and failed at least once in the current or previous operation cycle.
Test Not Complete this Operating Cycle	Test has completed at least once since DTC clear but has not completed yet this operation cycle. Test may have failed since clear but has not met the threshold to be stored in long term memory.
Test Not Complete Since DTC Cleared	Test has not completed successfully since the DTC was last cleared.
Failed Since DTC Cleared	Test has completed since the last DTC clear and failed at least once but has not met the threshold to be stored in long term memory and has not failed during the current or previous operation cycle.

This Operating Cycle

Decoded Value	Description
Failed	Test has completed at least once this operation cycle and has failed at least once.
Not Failed	Test has completed at least once this operation cycle and has passed each time.
Passed and Failed	Test has completed and failed at least once this operation cycle, but the most recent test passed.
Test Not Complete for this DTC	Test has not completed yet this operation cycle.

Last Test

Decoded Value	Description
Passed	Most recent test completed and passed.
Failed	Most recent test completed and failed.
Not Complete Since DTC Cleared	Test has not completed since DTC clear.

Since DTC Clear

Decoded Value	Description
Failed	Test has completed at least once since DTC was cleared and has failed at least once, including the most recent test.
Passed and Failed	Test has completed at least once since DTC was cleared and the most recent test passed, but not all tests have passed.
Not Failed	Test has completed at least once since DTC was cleared and every test has passed.
Test Not Complete for this DTC	Test has not completed yet since DTC was cleared.

Warning Indicator

Decoded Value	Description
Requested	A malfunction indicator has been commanded to be illuminated as a result of this DTC.
Not Requested	A malfunction indicator has not been requested as a result of this DTC.

Diagnosing History DTCs

It is very important to understand DTC status and its relationship to diagnosing a vehicle. If a DTC status is History, this means that the fault is not currently present on the vehicle. In any instance of a history DTC, diagnosis using a DTC diagnostic procedure in service information should not be attempted if not directly related to the customer complaint. Every diagnostic is written only for an active fault with a current DTC. Following a diagnostic procedure when only a history DTC is present will likely result in a misdiagnosis. This is foundational to *Strategy Based Diagnosis 2-198* and outlined as part of *Diagnostic System Check - Vehicle 2-207*.

If a DTC is only presented as a history DTC and is related to the customer complaint, it may be used as a guide or indicator for replicating the condition that caused the DTC to set. Observing the Conditions for Running the DTC in a DTC diagnostic procedure may help in recreating the conditions necessary for the DTC to run. Information within the DTC diagnostic procedure, such as the Fault Information table or Conditions for Setting the DTC, may also be helpful in recreating an intermittent DTC. Refer to Additional Information in *Strategy Based Diagnosis 2-198* for more detail in diagnosing intermittent concerns.

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Emissions Related DTCs

Action Taken When the DTC Sets – Type A

- The control module illuminates the malfunction indicator lamp (MIL) when the diagnostic runs and fails.
- The control module records the operating conditions at the time the diagnostic fails. The control module stores this information in the Freeze Frame/Failure Records.

Action Taken When the DTC Sets – Type B

- The control module illuminates the MIL on the second consecutive ignition cycle that the diagnostic runs and fails.
- The control module records the operating conditions at the time the diagnostic fails. The first time the diagnostic fails, the control module stores this information in the Failure Records. If the diagnostic reports a failure on the second consecutive ignition cycle, the control module records the operating conditions at the time of the failure. The control module writes the operating conditions to the Freeze Frame and updates the Failure Records.
- The following applies to misfire DTCs:
  - If the control module detects a low level or an emission level misfire condition during 2 consecutive trips, the control module illuminates the MIL.
  - If the control module detects a high level or catalyst damaging misfire, the control module flashes the MIL at a rate of once per second.
  - If the control module detects a misfire during 2 non-consecutive trips, the stored conditions are compared with the current conditions. The control module illuminates the MIL when the following conditions occur:
    - The engine load is within 20 percent of the previous test that failed.
    - The engine speed is within 375 RPM of the previous test that failed.
    - The engine coolant temperature is in the same range of the previous test that failed.
- The following applies to fuel trim DTCs:
  - If the control module detects a fuel trim condition during 2 consecutive trips, the control module illuminates the MIL.
  - If the control module detects a fuel trim condition during 2 non-consecutive trips, the stored conditions are compared with the current conditions. The control module illuminates the MIL when the following conditions occur:
    - The engine load is within 20 percent of the previous test that failed.
    - The engine speed is within 375 RPM of the previous test that failed.
    - The engine coolant temperature is in the same range of the previous test that failed.

Conditions for Clearing the MIL/DTC – Type A or Type B

- The control module turns OFF the MIL after 4 consecutive ignition cycles that the diagnostic runs and does not fail.

- A current DTC, Last Test Failed, clears when the diagnostic runs and passes.
- A history DTC clears after 40 consecutive warm-up cycles, if no failures are reported by this or any other emission related diagnostic.
- Clear the MIL and the DTC with a scan tool.

Non-Emissions Related DTCs

Action Taken When the DTC Sets – Type C

- The control module stores the DTC information into memory when the diagnostic runs and fails.
- The MIL will not illuminate.
- The control module records the operating conditions at the time the diagnostic fails. The control module stores this information in the Failure Records.
- The driver information center, if equipped, may display a message.

Conditions for Clearing the DTC – Type C

- A current DTC Last Test Failed clears when the diagnostic runs and passes.
- A history DTC clears after 40 consecutive warm-up cycles, if no failures are reported by this or any other non-emission related diagnostic.
- Clear the DTC with a scan tool.

Diagnostic Trouble Code (DTC) List - Vehicle

This master list includes all applicable diagnostic trouble codes in alphanumeric order.

Diagnostic Trouble Code (DTC) List - Vehicle

DTC	Diagnostic Procedure
B0001	Supplemental Restraints - [Link target (target-id 200229-) not found]
B0010	Supplemental Restraints - [Link target (target-id 289884-) not found]
B0011	Supplemental Restraints - [Link target (target-id 289884-) not found]
B0021	Supplemental Restraints - [Link target (target-id 317288-) not found]
B0029	Supplemental Restraints - [Link target (target-id 317288-) not found]
B0070	Supplemental Restraints - [Link target (target-id 317289-) not found]
B0072	Supplemental Restraints - [Link target (target-id 317289-) not found]
B007E	Supplemental Restraints - [Link target (target-id 313882-) not found]
B007F	Supplemental Restraints - [Link target (target-id 313882-) not found]
B0090	Supplemental Restraints - [Link target (target-id 317522-) not found]
B0091	Supplemental Restraints - [Link target (target-id 317522-) not found]
B0092	Supplemental Restraints - [Link target (target-id 317522-) not found]
B0093	Supplemental Restraints - [Link target (target-id 317522-) not found]
B0094	Supplemental Restraints - [Link target (target-id 317522-) not found]
B0095	Supplemental Restraints - [Link target (target-id 317522-) not found]
B0096	Supplemental Restraints - [Link target (target-id 317522-) not found]
B0097	Supplemental Restraints - [Link target (target-id 317522-) not found]
B0098	Supplemental Restraints - [Link target (target-id 317522-) not found]
B012C	Power Outlets - [Link target (target-id 338801-) not found]

DTC	Diagnostic Procedure
B1008	Horns and Pedestrian Alerts - [Link target (target-id 315457-) not found]
B100D	Lighting - [Link target (target-id 317464-) not found]
B1023	Wipers and Washers - [Link target (target-id 317708-) not found]
B102E	Lighting - [Link target (target-id 313549-) not found]
B1038	Vehicle Access - [Link target (target-id 316927-) not found]
B1048	Lighting - [Link target (target-id 317465-) not found]
B1066	Fixed and Moveable Windows - [Link target (target-id 315458-) not found]
B107E	Vehicle Access - [Link target (target-id 317528-) not found]
B107F	Vehicle Access - [Link target (target-id 317528-) not found]
B108E	Lighting - [Link target (target-id 313551-) not found]
B1090	Power Seats - [Link target (target-id 324035-) not found]
B1091	Power Seats - [Link target (target-id 324035-) not found]
B1092	Power Seats - [Link target (target-id 324035-) not found]
B1093	Power Seats - [Link target (target-id 324035-) not found]
B1094	Power Seats - [Link target (target-id 324035-) not found]
B1095	Power Seats - [Link target (target-id 324035-) not found]
B10AB	Lighting - [Link target (target-id 328885-) not found]
B10B4	Supplemental Restraints - [Link target (target-id 317523-) not found]
B10FA	HVAC - Automatic - [Link target (target-id 318791-) not found]
B10FA	HVAC - Manual - [Link target (target-id 337960-) not found]
B1105	Power Seats - [Link target (target-id 317270-) not found]
B1114	Cellular, Entertainment, and Navigation - [Link target (target-id 313041-) not found]
B113C	Theft Deterrent - [Link target (target-id 320486-) not found]
B1141	HVAC - Automatic - [Link target (target-id 318791-) not found]
B1141	HVAC - Manual - [Link target (target-id 337960-) not found]
B115E	Vehicle Access - [Link target (target-id 317532-) not found]
B115F	Vehicle Access - [Link target (target-id 317532-) not found]
B11A2	Vehicle Access - [Link target (target-id 348875-) not found]
B11A4	Vehicle Access - [Link target (target-id 348876-) not found]
B11A4	Vehicle Access - [Link target (target-id 348877-) not found]
B11D1	Lighting - [Link target (target-id 317876-) not found]
B11D2	Lighting - [Link target (target-id 317876-) not found]
B120C	Supplemental Restraints - [Link target (target-id 317523-) not found]
B1236	Lighting - [Link target (target-id 313554-) not found]
B1236	Image Display Cameras - [Link target (target-id 319392-) not found]
B125D	Vehicle Access - [Link target (target-id 348876-) not found]
B125D	Vehicle Access - [Link target (target-id 348877-) not found]
B1267	Wipers and Washers - [Link target (target-id 317709-) not found]
B1270	Driver Assistance Systems - [Link target (target-id 332121-) not found]
B1271	Driver Assistance Systems - [Link target (target-id 332121-) not found]
B12CC	Seat Heating and Cooling - [Link target (target-id 317279-) not found]
B12D4	Supplemental Restraints - [Link target (target-id 317524-) not found]

DTC	Diagnostic Procedure
B12D5	Supplemental Restraints - [Link target (target-id 317524-) not found]
B130C	Supplemental Restraints - [Link target (target-id 313887-) not found]
B130D	Supplemental Restraints - [Link target (target-id 313887-) not found]
B132B	Parking Assistance Systems - [Link target (target-id 297192-) not found]
B132C	Parking Assistance Systems - [Link target (target-id 297192-) not found]
B132D	Parking Assistance Systems - [Link target (target-id 297192-) not found]
B132E	Parking Assistance Systems - [Link target (target-id 297192-) not found]
B1338	Seat Heating and Cooling - [Link target (target-id 317279-) not found]
B1339	Seat Heating and Cooling - [Link target (target-id 317279-) not found]
B133A	Seat Heating and Cooling - [Link target (target-id 317279-) not found]
B1346	Cellular, Entertainment, and Navigation - [Link target (target-id 313801-) not found]
B1388	Driver Assistance Systems - [Link target (target-id 331168-) not found]
B1389	Driver Assistance Systems - [Link target (target-id 331168-) not found]
B13A9	Supplemental Restraints - [Link target (target-id 329393-) not found]
B13AA	Cellular, Entertainment, and Navigation - [Link target (target-id 313043-) not found]
B13AB	Cellular, Entertainment, and Navigation - [Link target (target-id 317598-) not found]
B13AC	Driver Assistance Systems - [Link target (target-id 297199-) not found]
B13AD	Driver Assistance Systems - [Link target (target-id 297200-) not found]
B13AE	Parking Assistance Systems - [Link target (target-id 297196-) not found]
B13AF	Parking Assistance Systems - [Link target (target-id 297196-) not found]
B13B0	Parking Assistance Systems - [Link target (target-id 297193-) not found]
B13B1	Parking Assistance Systems - [Link target (target-id 297193-) not found]
B13E7	Horns and Pedestrian Alerts - [Link target (target-id 313548-) not found]
B1442	Remote Functions - [Link target (target-id 319783-) not found]
B1444	Remote Functions - [Link target (target-id 319784-) not found]
B147F	Driver Assistance Systems - [Link target (target-id 345921-) not found]
B1491	Supplemental Restraints - [Link target (target-id 317525-) not found]
B14BB	Vehicle Access - [Link target (target-id 332255-) not found]
B1511	Remote Functions - [Link target (target-id 319787-) not found]
B1513	Remote Functions - [Link target (target-id 319788-) not found]
B1594	Image Display Cameras - [Link target (target-id 309439-) not found]
B1595	Image Display Cameras - [Link target (target-id 309440-) not found]
B1596	Image Display Cameras - [Link target (target-id 341717-) not found]
B1597	Image Display Cameras - [Link target (target-id 309441-) not found]
B1598	Image Display Cameras - [Link target (target-id 309442-) not found]
B15AB	Driver Assistance Systems - [Link target (target-id 345918-) not found]
B15DF	Supplemental Restraints - [Link target (target-id 317291-) not found]
B15E3	Supplemental Restraints - [Link target (target-id 317291-) not found]
B15EE	Immobilizer - [Link target (target-id 320484-) not found]
B15FD	Sunroof - [Link target (target-id 319558-) not found]
B1618	Cellular, Entertainment, and Navigation - [Link target (target-id 313047-) not found]
B170C	Seat Heating and Cooling - [Link target (target-id 317280-) not found]

DTC	Diagnostic Procedure
B170E	Seat Heating and Cooling - [Link target (target-id 317280-) not found]
B171C	Vehicle Access - [Link target (target-id 348875-) not found]
B1737	Cellular, Entertainment, and Navigation - [Link target (target-id 304104-) not found]
B174E	Cellular, Entertainment, and Navigation - [Link target (target-id 324214-) not found]
B178C	Cellular, Entertainment, and Navigation - [Link target (target-id 313049-) not found]
B17F0	Supplemental Restraints - [Link target (target-id 328903-) not found]
B17F2	Supplemental Restraints - [Link target (target-id 328903-) not found]
B1803	Vehicle Access - [Link target (target-id 348875-) not found]
B1805	Vehicle Access - [Link target (target-id 348876-) not found]
B1805	Vehicle Access - [Link target (target-id 348877-) not found]
B1835	Lighting - [Link target (target-id 317470-) not found]
B1836	Lighting - [Link target (target-id 317471-) not found]
B1837	Lighting - [Link target (target-id 313557-) not found]
B192B	Theft Deterrent - [Link target (target-id 320488-) not found]
B1952	Fixed and Moveable Windows - [Link target (target-id 317545-) not found]
B1953	Fixed and Moveable Windows - [Link target (target-id 323948-) not found]
B1954	Fixed and Moveable Windows - [Link target (target-id 323949-) not found]
B1955	Fixed and Moveable Windows - [Link target (target-id 323950-) not found]
B1956	Fixed and Moveable Windows - [Link target (target-id 348872-) not found]
B1960	Cellular, Entertainment, and Navigation - [Link target (target-id 304095-) not found]
B1961	Cellular, Entertainment, and Navigation - [Link target (target-id 304095-) not found]
B1962	Cellular, Entertainment, and Navigation - [Link target (target-id 304095-) not found]
B1963	Cellular, Entertainment, and Navigation - [Link target (target-id 304095-) not found]
B196B	Wipers and Washers - [Link target (target-id 320727-) not found]
B196F	Power Seats - [Link target (target-id 317273-) not found]
B1977	Immobilizer - [Link target (target-id 313612-) not found]
B197D	Immobilizer - [Link target (target-id 313618-) not found]
B197F	Immobilizer - [Link target (target-id 313620-) not found]
B1980	Immobilizer - [Link target (target-id 313621-) not found]
B1981	Immobilizer - [Link target (target-id 313622-) not found]
B1987	Immobilizer - [Link target (target-id 313623-) not found]
B198B	Wipers and Washers - [Link target (target-id 316885-) not found]
B1998	Lighting - [Link target (target-id 317881-) not found]
B1999	Lighting - [Link target (target-id 317881-) not found]
B199A	Lighting - [Link target (target-id 317882-) not found]
B199B	Lighting - [Link target (target-id 317882-) not found]
B19A0	Lighting - [Link target (target-id 313663-) not found]
B19A1	Lighting - [Link target (target-id 317885-) not found]
B19A2	Lighting - [Link target (target-id 317885-) not found]
B19A3	Lighting - [Link target (target-id 313559-) not found]
B19A4	Lighting - [Link target (target-id 313559-) not found]
B19B6	Power Seats - [Link target (target-id 317276-) not found]

DTC	Diagnostic Procedure
B19BA	Lighting - [Link target (target-id 317476-) not found]
B19BB	Parking Assistance Systems - [Link target (target-id 297191-) not found]
B19BC	Parking Assistance Systems - [Link target (target-id 297191-) not found]
B19BD	Parking Assistance Systems - [Link target (target-id 297191-) not found]
B19BE	Parking Assistance Systems - [Link target (target-id 297191-) not found]
B19C2	Seat Heating and Cooling - [Link target (target-id 317281-) not found]
B19C3	Seat Heating and Cooling - [Link target (target-id 317281-) not found]
B19C7	Vehicle Access - [Link target (target-id 317543-) not found]
B19CA	Seat Heating and Cooling - [Link target (target-id 317282-) not found]
B19CB	Seat Heating and Cooling - [Link target (target-id 317282-) not found]
B19CC	Seat Heating and Cooling - [Link target (target-id 317282-) not found]
B19CD	Seat Heating and Cooling - [Link target (target-id 317282-) not found]
B19D6	Seat Heating and Cooling - [Link target (target-id 317283-) not found]
B19D9	Sunroof - [Link target (target-id 313609-) not found]
B19DA	Cellular, Entertainment, and Navigation - [Link target (target-id 313051-) not found]
B19F2	Steering Wheel and Column - [Link target (target-id 317603-) not found]
B19F4	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 314836-) not found]
B1A04	Driver Assistance Systems - [Link target (target-id 310121-) not found]
B1A05	Driver Assistance Systems - [Link target (target-id 310122-) not found]
B1A1B	Data Communications - [Link target (target-id 297097-) not found]
B1A1F	Data Communications - [Link target (target-id 317030-) not found]
B1A30	Parking Assistance Systems - [Link target (target-id 317616-) not found]
B1A32	Seat Belts - [Link target (target-id 313880-) not found]
B1A33	Supplemental Restraints - [Link target (target-id 313892-) not found]
B1A34	Supplemental Restraints - [Link target (target-id 317293-) not found]
B1A35	Supplemental Restraints - [Link target (target-id 317294-) not found]
B1A36	Cellular, Entertainment, and Navigation - [Link target (target-id 313052-) not found]
B1A37	Secondary and Configurable Customer Controls - [Link target (target-id 323237-) not found]
B1A4B	Power Outlets - [Link target (target-id 338328-) not found]
B1A4C	Steering Wheel and Column - [Link target (target-id 317604-) not found]
B1A50	Displays and Gauges - [Link target (target-id 309456-) not found]
B1A62	Image Display Cameras - [Link target (target-id 309443-) not found]
B1A65	Power Seats - [Link target (target-id 317277-) not found]
B1A66	Power Seats - [Link target (target-id 317277-) not found]
B1A67	Power Seats - [Link target (target-id 317277-) not found]
B1A68	Image Display Cameras - [Link target (target-id 309444-) not found]
B1A69	Image Display Cameras - [Link target (target-id 309445-) not found]
B1A6A	Image Display Cameras - [Link target (target-id 309446-) not found]
B1A72	Trailering Systems - [Link target (target-id 325950-) not found]
B1A75	Trailering Systems - [Link target (target-id 325953-) not found]
B1A76	Wiring Systems and Power Management - [Link target (target-id 317723-) not found]
B1A78	Power Outlets - [Link target (target-id 331014-) not found]

DTC	Diagnostic Procedure
B1A7A	Supplemental Restraints - [Link target (target-id 317295-) not found]
B1A84	Power Seats - [Link target (target-id 324035-) not found]
B1A85	Power Seats - [Link target (target-id 324035-) not found]
B1A91	Cellular, Entertainment, and Navigation - [Link target (target-id 323932-) not found]
B1A95	Cellular, Entertainment, and Navigation - [Link target (target-id 323936-) not found]
B1A96	Cellular, Entertainment, and Navigation - [Link target (target-id 323936-) not found]
B1A9B	Image Display Cameras - [Link target (target-id 309448-) not found]
B1A9C	Image Display Cameras - [Link target (target-id 309449-) not found]
B1A9D	Image Display Cameras - [Link target (target-id 309450-) not found]
B1A9E	Image Display Cameras - [Link target (target-id 309451-) not found]
B1AA3	Wiring Systems and Power Management - [Link target (target-id 313605-) not found]
B1AC4	Wiring Systems and Power Management - [Link target (target-id 313603-) not found]
B1AD0	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 327526-) not found]
B1ADF	Remote Functions - [Link target (target-id 319790-) not found]
B1AE1	Cellular, Entertainment, and Navigation - [Link target (target-id 318801-) not found]
B1AE2	Cellular, Entertainment, and Navigation - [Link target (target-id 318801-) not found]
B1AE3	Cellular, Entertainment, and Navigation - [Link target (target-id 318801-) not found]
B1AEE	Remote Functions - [Link target (target-id 319791-) not found]
B1B12	Wiring Systems and Power Management - [Link target (target-id 317724-) not found]
B1B15	Wiring Systems and Power Management - [Link target (target-id 317726-) not found]
B1B19	Cellular, Entertainment, and Navigation - [Link target (target-id 319001-) not found]
B1B31	Cellular, Entertainment, and Navigation - [Link target (target-id 327983-) not found]
B1B38	Driver Assistance Systems - [Link target (target-id 320653-) not found]
B1B42	Wiring Systems and Power Management - [Link target (target-id 322002-) not found]
B1B55	Trailering Systems - [Link target (target-id 325956-) not found]
B1B56	Trailering Systems - [Link target (target-id 325958-) not found]
B1B57	Trailering Systems - [Link target (target-id 325958-) not found]
B1B58	Trailering Systems - [Link target (target-id 325960-) not found]
B1B77	Data Communications - [Link target (target-id 324200-) not found]
B1B83	Trailering Systems - [Link target (target-id 325961-) not found]
B1BA6	Cellular, Entertainment, and Navigation - [Link target (target-id 349175-) not found]
B1C09	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 200414-) not found]
B1C4A	Displays and Gauges - [Link target (target-id 341722-) not found]
B1C4D	Displays and Gauges - [Link target (target-id 341725-) not found]
B1C5E	Vehicle Access - [Link target (target-id 348877-) not found]
B1C9F	Displays and Gauges - [Link target (target-id 341728-) not found]
B1CA2	Cellular, Entertainment, and Navigation - [Link target (target-id 345316-) not found]
B1D4E	Image Display Cameras - [Link target (target-id 333112-) not found]
B1D4F	Image Display Cameras - [Link target (target-id 333113-) not found]
B1D50	Image Display Cameras - [Link target (target-id 333114-) not found]
B1D51	Image Display Cameras - [Link target (target-id 333115-) not found]
B1D71	Displays and Gauges - [Link target (target-id 341729-) not found]

DTC	Diagnostic Procedure
B1D73	Displays and Gauges - [Link target (target-id 341730-) not found]
B1D74	Displays and Gauges - [Link target (target-id 341731-) not found]
B272D	Rear Drive Axle - [Link target (target-id 282299-) not found]
B2A01	HVAC - Automatic - [Link target (target-id 320816-) not found]
B2A01	HVAC - Manual - [Link target (target-id 337961-) not found]
B2A02	HVAC - Automatic - [Link target (target-id 320816-) not found]
B2A02	HVAC - Manual - [Link target (target-id 337961-) not found]
B2A03	HVAC - Automatic - [Link target (target-id 320816-) not found]
B2A03	HVAC - Manual - [Link target (target-id 337961-) not found]
B2A04	HVAC - Automatic - [Link target (target-id 320816-) not found]
B2A04	HVAC - Manual - [Link target (target-id 337961-) not found]
B2A05	HVAC - Automatic - [Link target (target-id 320816-) not found]
B2A05	HVAC - Manual - [Link target (target-id 337961-) not found]
B2A16	HVAC - Automatic - [Link target (target-id 320821-) not found]
B2A16	HVAC - Manual - [Link target (target-id 337962-) not found]
B2A17	HVAC - Automatic - [Link target (target-id 320821-) not found]
B2A17	HVAC - Manual - [Link target (target-id 337962-) not found]
B2A18	HVAC - Automatic - [Link target (target-id 320821-) not found]
B2A18	HVAC - Manual - [Link target (target-id 337962-) not found]
B2A19	HVAC - Automatic - [Link target (target-id 320821-) not found]
B2A19	HVAC - Manual - [Link target (target-id 337962-) not found]
B2A1A	HVAC - Automatic - [Link target (target-id 320822-) not found]
B2A1A	HVAC - Manual - [Link target (target-id 337963-) not found]
B2A1B	HVAC - Automatic - [Link target (target-id 320822-) not found]
B2A1B	HVAC - Manual - [Link target (target-id 337963-) not found]
B2A1C	HVAC - Automatic - [Link target (target-id 320822-) not found]
B2A1C	HVAC - Manual - [Link target (target-id 337963-) not found]
B2A1D	HVAC - Automatic - [Link target (target-id 320822-) not found]
B2A1D	HVAC - Manual - [Link target (target-id 337963-) not found]
B2A1E	HVAC - Automatic - [Link target (target-id 320823-) not found]
B2A1E	HVAC - Manual - [Link target (target-id 337964-) not found]
B2A1F	HVAC - Automatic - [Link target (target-id 320823-) not found]
B2A1F	HVAC - Manual - [Link target (target-id 337964-) not found]
B2A20	HVAC - Automatic - [Link target (target-id 320823-) not found]
B2A20	HVAC - Manual - [Link target (target-id 337964-) not found]
B2A21	HVAC - Automatic - [Link target (target-id 320823-) not found]
B2A21	HVAC - Manual - [Link target (target-id 337964-) not found]
B2A36	HVAC - Automatic - [Link target (target-id 320829-) not found]
B2A37	HVAC - Automatic - [Link target (target-id 320829-) not found]
B2A38	HVAC - Automatic - [Link target (target-id 320829-) not found]
B2A39	HVAC - Automatic - [Link target (target-id 320829-) not found]
B2A3E	HVAC - Automatic - [Link target (target-id 320831-) not found]

DTC	Diagnostic Procedure
B2A3F	HVAC - Automatic - [Link target (target-id 320831-) not found]
B2A40	HVAC - Automatic - [Link target (target-id 320831-) not found]
B2A41	HVAC - Automatic - [Link target (target-id 320831-) not found]
B2A42	HVAC - Automatic - [Link target (target-id 320832-) not found]
B2A43	HVAC - Automatic - [Link target (target-id 320832-) not found]
B2A44	HVAC - Automatic - [Link target (target-id 320832-) not found]
B2A45	HVAC - Automatic - [Link target (target-id 320832-) not found]
B2A4E	HVAC - Manual - [Link target (target-id 347483-) not found]
B2A4F	HVAC - Manual - [Link target (target-id 347483-) not found]
B2A50	HVAC - Manual - [Link target (target-id 347483-) not found]
B2A51	HVAC - Manual - [Link target (target-id 347483-) not found]
B2A67	HVAC - Automatic - [Link target (target-id 320842-) not found]
B2A67	HVAC - Manual - [Link target (target-id 337967-) not found]
B2A68	HVAC - Automatic - [Link target (target-id 320842-) not found]
B2A68	HVAC - Manual - [Link target (target-id 337967-) not found]
B2A69	HVAC - Automatic - [Link target (target-id 320842-) not found]
B2A69	HVAC - Manual - [Link target (target-id 337967-) not found]
B2A6A	HVAC - Automatic - [Link target (target-id 320842-) not found]
B2A6A	HVAC - Manual - [Link target (target-id 337967-) not found]
B2A6B	HVAC - Automatic - [Link target (target-id 320843-) not found]
B2A6B	HVAC - Manual - [Link target (target-id 337968-) not found]
B2A6C	HVAC - Automatic - [Link target (target-id 320843-) not found]
B2A6C	HVAC - Manual - [Link target (target-id 337968-) not found]
B2A6D	HVAC - Automatic - [Link target (target-id 320843-) not found]
B2A6D	HVAC - Manual - [Link target (target-id 337968-) not found]
B2A6E	HVAC - Automatic - [Link target (target-id 320843-) not found]
B2A6E	HVAC - Manual - [Link target (target-id 337968-) not found]
B2A73	HVAC - Automatic - [Link target (target-id 320845-) not found]
B2A73	HVAC - Manual - [Link target (target-id 343518-) not found]
B2A74	HVAC - Automatic - [Link target (target-id 320845-) not found]
B2A74	HVAC - Manual - [Link target (target-id 343518-) not found]
B2A75	HVAC - Automatic - [Link target (target-id 320845-) not found]
B2A75	HVAC - Manual - [Link target (target-id 343518-) not found]
B2A76	HVAC - Automatic - [Link target (target-id 320845-) not found]
B2A76	HVAC - Manual - [Link target (target-id 343518-) not found]
B2A7B	HVAC - Automatic - [Link target (target-id 320847-) not found]
B2A7B	HVAC - Manual - [Link target (target-id 343519-) not found]
B2A7C	HVAC - Automatic - [Link target (target-id 320847-) not found]
B2A7C	HVAC - Manual - [Link target (target-id 343519-) not found]
B2A7D	HVAC - Automatic - [Link target (target-id 320847-) not found]
B2A7D	HVAC - Manual - [Link target (target-id 343519-) not found]
B2A7E	HVAC - Automatic - [Link target (target-id 320847-) not found]

DTC	Diagnostic Procedure
B2A7E	HVAC - Manual - [Link target (target-id 343519-) not found]
B2A83	HVAC - Automatic - [Link target (target-id 320849-) not found]
B2A84	HVAC - Automatic - [Link target (target-id 320849-) not found]
B2A85	HVAC - Automatic - [Link target (target-id 320849-) not found]
B2A86	HVAC - Automatic - [Link target (target-id 320849-) not found]
B2A87	HVAC - Automatic - [Link target (target-id 320850-) not found]
B2A88	HVAC - Automatic - [Link target (target-id 320850-) not found]
B2A89	HVAC - Automatic - [Link target (target-id 320850-) not found]
B2A8A	HVAC - Automatic - [Link target (target-id 320850-) not found]
B2A8B	HVAC - Automatic - [Link target (target-id 320851-) not found]
B2A8C	HVAC - Automatic - [Link target (target-id 320851-) not found]
B2A8D	HVAC - Automatic - [Link target (target-id 320851-) not found]
B2A8E	HVAC - Automatic - [Link target (target-id 320851-) not found]
B2A93	HVAC - Automatic - [Link target (target-id 320853-) not found]
B2A94	HVAC - Automatic - [Link target (target-id 320853-) not found]
B2A95	HVAC - Automatic - [Link target (target-id 320853-) not found]
B2A96	HVAC - Automatic - [Link target (target-id 320853-) not found]
B2A97	HVAC - Automatic - [Link target (target-id 320854-) not found]
B2A98	HVAC - Automatic - [Link target (target-id 320854-) not found]
B2A99	HVAC - Automatic - [Link target (target-id 320854-) not found]
B2A9A	HVAC - Automatic - [Link target (target-id 320854-) not found]
B2AA7	HVAC - Manual - [Link target (target-id 347494-) not found]
B2AA8	HVAC - Manual - [Link target (target-id 347494-) not found]
B2AA9	HVAC - Manual - [Link target (target-id 347494-) not found]
B2AAA	HVAC - Manual - [Link target (target-id 347494-) not found]
B2AEF	HVAC - Automatic - [Link target (target-id 317704-) not found]
B2AEF	HVAC - Manual - [Link target (target-id 337971-) not found]
B2AF0	HVAC - Automatic - [Link target (target-id 317704-) not found]
B2AF0	HVAC - Manual - [Link target (target-id 337971-) not found]
B2AF1	HVAC - Automatic - [Link target (target-id 317704-) not found]
B2AF1	HVAC - Manual - [Link target (target-id 337971-) not found]
B2AF2	HVAC - Automatic - [Link target (target-id 317704-) not found]
B2AF2	HVAC - Manual - [Link target (target-id 337971-) not found]
B2AF3	HVAC - Automatic - [Link target (target-id 317704-) not found]
B2AF3	HVAC - Manual - [Link target (target-id 337971-) not found]
B2AF4	HVAC - Automatic - [Link target (target-id 317704-) not found]
B2AF4	HVAC - Manual - [Link target (target-id 337971-) not found]
B2AF5	HVAC - Automatic - [Link target (target-id 317705-) not found]
B2AF6	HVAC - Automatic - [Link target (target-id 317705-) not found]
B2AF7	HVAC - Automatic - [Link target (target-id 317705-) not found]
B2AF8	HVAC - Automatic - [Link target (target-id 317705-) not found]
B2AF9	HVAC - Automatic - [Link target (target-id 317705-) not found]

DTC	Diagnostic Procedure
B2AFA	HVAC - Automatic - [Link target (target-id 317705-) not found]
B2AFB	HVAC - Automatic - [Link target (target-id 317706-) not found]
B2AFC	HVAC - Automatic - [Link target (target-id 317706-) not found]
B2AFD	HVAC - Automatic - [Link target (target-id 317706-) not found]
B2AFE	HVAC - Automatic - [Link target (target-id 317706-) not found]
B2AFF	HVAC - Automatic - [Link target (target-id 321874-) not found]
B2AFF	HVAC - Manual - [Link target (target-id 337974-) not found]
B2B00	HVAC - Automatic - [Link target (target-id 321874-) not found]
B2B00	HVAC - Manual - [Link target (target-id 337974-) not found]
B2B01	HVAC - Automatic - [Link target (target-id 321874-) not found]
B2B01	HVAC - Manual - [Link target (target-id 337974-) not found]
B2B02	HVAC - Automatic - [Link target (target-id 317701-) not found]
B2B02	HVAC - Manual - [Link target (target-id 337975-) not found]
B2B03	HVAC - Automatic - [Link target (target-id 317701-) not found]
B2B03	HVAC - Manual - [Link target (target-id 337975-) not found]
B2B05	HVAC - Automatic - [Link target (target-id 321289-) not found]
B2B05	HVAC - Manual - [Link target (target-id 337976-) not found]
B2B06	HVAC - Automatic - [Link target (target-id 321290-) not found]
B2B07	HVAC - Automatic - [Link target (target-id 321291-) not found]
B2B07	HVAC - Manual - [Link target (target-id 337978-) not found]
B2B09	HVAC - Automatic - [Link target (target-id 321293-) not found]
B2B09	HVAC - Manual - [Link target (target-id 337979-) not found]
B2B0B	HVAC - Automatic - [Link target (target-id 317701-) not found]
B2B0B	HVAC - Manual - [Link target (target-id 337975-) not found]
B2B0C	HVAC - Automatic - [Link target (target-id 317701-) not found]
B2B0C	HVAC - Manual - [Link target (target-id 337975-) not found]
B2B22	HVAC - Automatic - [Link target (target-id 321291-) not found]
B2B22	HVAC - Manual - [Link target (target-id 337978-) not found]
B2B23	HVAC - Automatic - [Link target (target-id 321291-) not found]
B2B23	HVAC - Manual - [Link target (target-id 337978-) not found]
B2B24	HVAC - Automatic - [Link target (target-id 321291-) not found]
B2B24	HVAC - Manual - [Link target (target-id 337978-) not found]
B2B28	HVAC - Automatic - [Link target (target-id 321289-) not found]
B2B28	HVAC - Manual - [Link target (target-id 337976-) not found]
B2B29	HVAC - Automatic - [Link target (target-id 321289-) not found]
B2B29	HVAC - Manual - [Link target (target-id 337976-) not found]
B2B2A	HVAC - Automatic - [Link target (target-id 321289-) not found]
B2B2A	HVAC - Manual - [Link target (target-id 337976-) not found]
B2B2B	HVAC - Automatic - [Link target (target-id 321290-) not found]
B2B2C	HVAC - Automatic - [Link target (target-id 321290-) not found]
B2B2D	HVAC - Automatic - [Link target (target-id 321290-) not found]
B2B2E	HVAC - Automatic - [Link target (target-id 321293-) not found]

DTC	Diagnostic Procedure
B2B2E	HVAC - Manual - [Link target (target-id 337979-) not found]
B2B2F	HVAC - Automatic - [Link target (target-id 321293-) not found]
B2B2F	HVAC - Manual - [Link target (target-id 337979-) not found]
B2B30	HVAC - Automatic - [Link target (target-id 321293-) not found]
B2B30	HVAC - Manual - [Link target (target-id 337979-) not found]
B2BA2	Wiring Systems and Power Management - [Link target (target-id 321482-) not found]
B2BA3	Wiring Systems and Power Management - [Link target (target-id 321482-) not found]
B2BC2	HVAC - Automatic - [Link target (target-id 345901-) not found]
B2BC3	HVAC - Automatic - [Link target (target-id 345901-) not found]
B2BC4	HVAC - Automatic - [Link target (target-id 345901-) not found]
B2BCC	Cellular, Entertainment, and Navigation - [Link target (target-id 345999-) not found]
B2BCD	Cellular, Entertainment, and Navigation - [Link target (target-id 348881-) not found]
B3623	Cruise Control - [Link target (target-id 226319-) not found]
B3794	Cruise Control - [Link target (target-id 226319-) not found]
C0001	Antilock Brake System - [Link target (target-id 261542-) not found]
C0002	Antilock Brake System - [Link target (target-id 261542-) not found]
C0003	Antilock Brake System - [Link target (target-id 261542-) not found]
C0004	Antilock Brake System - [Link target (target-id 261542-) not found]
C0010	Antilock Brake System - [Link target (target-id 261542-) not found]
C0011	Antilock Brake System - [Link target (target-id 261542-) not found]
C0014	Antilock Brake System - [Link target (target-id 261542-) not found]
C0015	Antilock Brake System - [Link target (target-id 261542-) not found]
C0018	Antilock Brake System - [Link target (target-id 261542-) not found]
C0019	Antilock Brake System - [Link target (target-id 261542-) not found]
C001C	Antilock Brake System - [Link target (target-id 261542-) not found]
C001D	Antilock Brake System - [Link target (target-id 261542-) not found]
C0021	Hydraulic Brakes - [Link target (target-id 301649-) not found]
C0024	Antilock Brake System - [Link target (target-id 127367-) not found]
C003F	Antilock Brake System - [Link target (target-id 310825-) not found]
C0049	Hydraulic Brakes - [Link target (target-id 301650-) not found]
C004A	Disc Brakes - [Link target (target-id 313905-) not found]
C004B	Hydraulic Brakes - [Link target (target-id 325748-) not found]
C0051	Antilock Brake System - [Link target (target-id 1508-) not found]
C0051	Power Steering - [Link target (target-id 297198-) not found]
C0056	Antilock Brake System - [Link target (target-id 340056-) not found]
C0057	Antilock Brake System - [Link target (target-id 340056-) not found]
C0058	Antilock Brake System - [Link target (target-id 340056-) not found]
C0059	Antilock Brake System - [Link target (target-id 340056-) not found]
C0061	Antilock Brake System - [Link target (target-id 309335-) not found]
C0062	Antilock Brake System - [Link target (target-id 309335-) not found]
C0063	Antilock Brake System - [Link target (target-id 309335-) not found]
C006A	Supplemental Restraints - [Link target (target-id 329408-) not found]

DTC	Diagnostic Procedure
C0072	Antilock Brake System - [Link target (target-id 301656-) not found]
C0500	Antilock Brake System - [Link target (target-id 272224-) not found]
C0501	Antilock Brake System - [Link target (target-id 272224-) not found]
C0502	Antilock Brake System - [Link target (target-id 272224-) not found]
C0503	Antilock Brake System - [Link target (target-id 272224-) not found]
C0504	Antilock Brake System - [Link target (target-id 272224-) not found]
C0505	Antilock Brake System - [Link target (target-id 302672-) not found]
C0506	Antilock Brake System - [Link target (target-id 272224-) not found]
C0507	Antilock Brake System - [Link target (target-id 272224-) not found]
C0508	Antilock Brake System - [Link target (target-id 272224-) not found]
C0509	Antilock Brake System - [Link target (target-id 272224-) not found]
C050A	Antilock Brake System - [Link target (target-id 272224-) not found]
C050B	Antilock Brake System - [Link target (target-id 302672-) not found]
C050C	Antilock Brake System - [Link target (target-id 272224-) not found]
C050D	Antilock Brake System - [Link target (target-id 272224-) not found]
C050E	Antilock Brake System - [Link target (target-id 272224-) not found]
C050F	Antilock Brake System - [Link target (target-id 272224-) not found]
C0510	Antilock Brake System - [Link target (target-id 272224-) not found]
C0511	Antilock Brake System - [Link target (target-id 302672-) not found]
C0512	Antilock Brake System - [Link target (target-id 272224-) not found]
C0513	Antilock Brake System - [Link target (target-id 272224-) not found]
C0514	Antilock Brake System - [Link target (target-id 272224-) not found]
C0515	Antilock Brake System - [Link target (target-id 272224-) not found]
C0516	Antilock Brake System - [Link target (target-id 272224-) not found]
C0517	Antilock Brake System - [Link target (target-id 302672-) not found]
C052A	Power Steering - [Link target (target-id 333347-) not found]
C053B	Antilock Brake System - [Link target (target-id 307000-) not found]
C053D	Antilock Brake System - [Link target (target-id 302608-) not found]
C053E	Antilock Brake System - [Link target (target-id 302608-) not found]
C053F	Antilock Brake System - [Link target (target-id 302608-) not found]
C0546	Data Communications - [Link target (target-id 332895-) not found]
C0551	Antilock Brake System - [Link target (target-id 309335-) not found]
C0552	Antilock Brake System - [Link target (target-id 332586-) not found]
C0553	Antilock Brake System - [Link target (target-id 332586-) not found]
C0554	Antilock Brake System - [Link target (target-id 332586-) not found]
C0555	Antilock Brake System - [Link target (target-id 272226-) not found]
C0556	Antilock Brake System - [Link target (target-id 272226-) not found]
C0557	Antilock Brake System - [Link target (target-id 272226-) not found]
C0558	Antilock Brake System - [Link target (target-id 272226-) not found]
C055F	Antilock Brake System - [Link target (target-id 304966-) not found]
C0560	Antilock Brake System - [Link target (target-id 272227-) not found]
C0571	Antilock Brake System - [Link target (target-id 272228-) not found]

DTC	Diagnostic Procedure
C0572	Antilock Brake System - [Link target (target-id 272228-) not found]
C0574	Antilock Brake System - [Link target (target-id 272228-) not found]
C0579	Hydraulic Brakes - [Link target (target-id 351764-) not found]
C057A	Hydraulic Brakes - [Link target (target-id 351764-) not found]
C057D	Hydraulic Brakes - [Link target (target-id 351764-) not found]
C057F	Hydraulic Brakes - [Link target (target-id 327694-) not found]
C0580	Hydraulic Brakes - [Link target (target-id 327694-) not found]
C0582	Hydraulic Brakes - [Link target (target-id 327694-) not found]
C058A	Hydraulic Brakes - [Link target (target-id 301767-) not found]
C058E	Hydraulic Brakes - [Link target (target-id 301767-) not found]
C0590	Hydraulic Brakes - [Link target (target-id 327694-) not found]
C0591	Hydraulic Brakes - [Link target (target-id 327694-) not found]
C0594	Hydraulic Brakes - [Link target (target-id 301767-) not found]
C0595	Hydraulic Brakes - [Link target (target-id 301767-) not found]
C0596	Hydraulic Brakes - [Link target (target-id 301767-) not found]
C059B	Antilock Brake System - [Link target (target-id 272227-) not found]
C05A3	Antilock Brake System - [Link target (target-id 272230-) not found]
C05A4	Antilock Brake System - [Link target (target-id 272230-) not found]
C05B0	Hydraulic Brakes - [Link target (target-id 310748-) not found]
C05B3	Antilock Brake System - [Link target (target-id 351880-) not found]
C05B4	Antilock Brake System - [Link target (target-id 351880-) not found]
C05B6	Antilock Brake System - [Link target (target-id 351880-) not found]
C05B7	Antilock Brake System - [Link target (target-id 351880-) not found]
C05BB	Hydraulic Brakes - [Link target (target-id 312947-) not found]
C05C2	Hydraulic Brakes - [Link target (target-id 301670-) not found]
C05CA	Antilock Brake System - [Link target (target-id 343664-) not found]
C05CB	Antilock Brake System - [Link target (target-id 343664-) not found]
C05CC	Antilock Brake System - [Link target (target-id 343664-) not found]
C05CD	Antilock Brake System - [Link target (target-id 343664-) not found]
C05CE	Antilock Brake System - [Link target (target-id 343664-) not found]
C05CF	Antilock Brake System - [Link target (target-id 343664-) not found]
C05D0	Antilock Brake System - [Link target (target-id 302614-) not found]
C05D1	Antilock Brake System - [Link target (target-id 302615-) not found]
C05D2	Antilock Brake System - [Link target (target-id 302616-) not found]
C05D3	Antilock Brake System - [Link target (target-id 302617-) not found]
C05D4	Antilock Brake System - [Link target (target-id 302618-) not found]
C05D5	Antilock Brake System - [Link target (target-id 302619-) not found]
C05D6	Power Steering - [Link target (target-id 333345-) not found]
C05D7	Shift Lock Control - [Link target (target-id 313637-) not found]
C05DD	Transfer Case - MP 3010/3015 - [Link target (target-id 325241-) not found]
C05DD	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 325245-) not found]
C05FB	Transfer Case - MP 3010/3015 - [Link target (target-id 300826-) not found]

DTC	Diagnostic Procedure
C05FB	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 300827-) not found]
C05FF	Transfer Case - MP 3010/3015 - [Link target (target-id 306748-) not found]
C05FF	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 306749-) not found]
C0605	Power Steering - [Link target (target-id 350265-) not found]
C0609	Park Brake - [Link target (target-id 302982-) not found]
C060B	Park Brake - [Link target (target-id 306987-) not found]
C0610	Park Brake - [Link target (target-id 306988-) not found]
C0616	Park Brake - [Link target (target-id 301674-) not found]
C0632	Transfer Case - MP 3010/3015 - [Link target (target-id 347186-) not found]
C0632	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 347187-) not found]
C0676	Hydraulic Brakes - [Link target (target-id 340047-) not found]
C0677	Hydraulic Brakes - [Link target (target-id 340048-) not found]
C0678	Hydraulic Brakes - [Link target (target-id 340049-) not found]
C0697	Antilock Brake System - [Link target (target-id 332586-) not found]
C0698	Antilock Brake System - [Link target (target-id 332586-) not found]
C0699	Antilock Brake System - [Link target (target-id 332586-) not found]
C10BA	Transfer Case - MP 3010/3015 - [Link target (target-id 325242-) not found]
C10BA	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 325246-) not found]
C10DA	Lighting - [Link target (target-id 317493-) not found]
C10EE	Antilock Brake System - [Link target (target-id 304967-) not found]
C1114	Trailering Systems - [Link target (target-id 325998-) not found]
C1119	Power Steering - [Link target (target-id 313799-) not found]
C1146	Power Steering - [Link target (target-id 297201-) not found]
C114F	Steering Wheel and Column - [Link target (target-id 347270-) not found]
C1158	Trailering Systems - [Link target (target-id 326009-) not found]
C115E	Transfer Case - MP 3010/3015 - [Link target (target-id 325249-) not found]
C115E	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 325247-) not found]
C1162	Transfer Case - MP 3010/3015 - [Link target (target-id 309959-) not found]
C1162	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 309874-) not found]
C1168	Power Steering - [Link target (target-id 317736-) not found]
C116A	Power Steering - [Link target (target-id 317738-) not found]
C116B	Disc Brakes - [Link target (target-id 301556-) not found]
C116C	Disc Brakes - [Link target (target-id 301557-) not found]
C116D	Tire Pressure Monitoring - [Link target (target-id 313635-) not found]
C116E	Transfer Case - MP 3010/3015 - [Link target (target-id 325244-) not found]
C116E	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 325248-) not found]
C116F	Transfer Case - MP 3010/3015 - [Link target (target-id 325242-) not found]
C116F	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 325246-) not found]
C1170	Transfer Case - MP 3010/3015 - [Link target (target-id 325249-) not found]
C1170	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 325247-) not found]
C1171	Tire Pressure Monitoring - [Link target (target-id 314982-) not found]
C1172	Tire Pressure Monitoring - [Link target (target-id 314982-) not found]

DTC	Diagnostic Procedure
C1173	Tire Pressure Monitoring - [Link target (target-id 314982-) not found]
C1174	Tire Pressure Monitoring - [Link target (target-id 314982-) not found]
C118D	Transfer Case - MP 3010/3015 - [Link target (target-id 325242-) not found]
C118D	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 325246-) not found]
C119C	Transfer Case - MP 3010/3015 - [Link target (target-id 325242-) not found]
C119C	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 325246-) not found]
C11A1	Power Steering - [Link target (target-id 333349-) not found]
C11A2	Power Steering - [Link target (target-id 333349-) not found]
C11A4	Transfer Case - MP 3010/3015 - [Link target (target-id 300357-) not found]
C11A4	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 300372-) not found]
C11A5	Rear Drive Axle - [Link target (target-id 282300-) not found]
C11A6	Power Steering - [Link target (target-id 333350-) not found]
C11A8	Power Steering - [Link target (target-id 333351-) not found]
C11A9	Transfer Case - MP 3010/3015 - [Link target (target-id 347176-) not found]
C11A9	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 327124-) not found]
C11AD	Transfer Case - MP 3010/3015 - [Link target (target-id 300360-) not found]
C11AD	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 300375-) not found]
C11B0	Front Drive Axle - [Link target (target-id 282290-) not found]
C11B3	Transfer Case - MP 3010/3015 - [Link target (target-id 300363-) not found]
C11B3	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 300378-) not found]
C11B9	Transfer Case - MP 3010/3015 - [Link target (target-id 300826-) not found]
C11B9	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 300827-) not found]
C1211	Antilock Brake System - [Link target (target-id 1550-) not found]
C124F	Antilock Brake System - [Link target (target-id 228994-) not found]
C1250	Antilock Brake System - [Link target (target-id 228994-) not found]
C1251	Antilock Brake System - [Link target (target-id 228994-) not found]
C1252	Antilock Brake System - [Link target (target-id 267540-) not found]
C1253	Antilock Brake System - [Link target (target-id 267540-) not found]
C1254	Antilock Brake System - [Link target (target-id 267540-) not found]
C1304	Lighting - [Link target (target-id 317495-) not found]
C1308	Front Drive Axle - [Link target (target-id 282294-) not found]
C1309	Rear Drive Axle - [Link target (target-id 282303-) not found]
C1445	Antilock Brake System - [Link target (target-id 272247-) not found]
C1595	Trailering Systems - [Link target (target-id 326013-) not found]
C1596	Trailering Systems - [Link target (target-id 326014-) not found]
C159A	Rear Drive Axle - [Link target (target-id 282305-) not found]
C159B	Front Drive Axle - [Link target (target-id 282296-) not found]
C159C	Trailering Systems - [Link target (target-id 326015-) not found]
C15A3	Parking Assistance Systems - [Link target (target-id 310221-) not found]
C15A9	Transfer Case - MP 3010/3015 - [Link target (target-id 300363-) not found]
C15A9	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 300378-) not found]
C15AA	Transfer Case - MP 3010/3015 - [Link target (target-id 300360-) not found]

DTC	Diagnostic Procedure
C15AA	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 300375-) not found]
C15AB	Transfer Case - MP 3010/3015 - [Link target (target-id 300826-) not found]
C15AB	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 300827-) not found]
C15AC	Transfer Case - MP 3010/3015 - [Link target (target-id 306748-) not found]
C15AC	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 306749-) not found]
C15C1	Transfer Case - MP 3010/3015 - [Link target (target-id 300826-) not found]
C15C1	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 300827-) not found]
C15C6	Antilock Brake System - [Link target (target-id 307843-) not found]
C2A01	Antilock Brake System - [Link target (target-id 310825-) not found]
C2A02	Antilock Brake System - [Link target (target-id 310825-) not found]
C2A03	Antilock Brake System - [Link target (target-id 310825-) not found]
C2A04	Antilock Brake System - [Link target (target-id 310825-) not found]
C2A07	Antilock Brake System - [Link target (target-id 302623-) not found]
C2A08	Antilock Brake System - [Link target (target-id 309963-) not found]
C2A0A	Antilock Brake System - [Link target (target-id 324293-) not found]
C2A0B	Antilock Brake System - [Link target (target-id 304968-) not found]
C2A13	Antilock Brake System - [Link target (target-id 304969-) not found]
C2A14	Antilock Brake System - [Link target (target-id 304969-) not found]
C2A15	Antilock Brake System - [Link target (target-id 307845-) not found]
C2A16	Antilock Brake System - [Link target (target-id 307845-) not found]
C2A17	Hydraulic Brakes - [Link target (target-id 310751-) not found]
C2A1A	Antilock Brake System - [Link target (target-id 304970-) not found]
C2A1A	Hydraulic Brakes - [Link target (target-id 312948-) not found]
C2A1B	Hydraulic Brakes - [Link target (target-id 312949-) not found]
C2A1C	Hydraulic Brakes - [Link target (target-id 310752-) not found]
C2A1D	Park Brake - [Link target (target-id 303014-) not found]
C2A1E	Antilock Brake System - [Link target (target-id 304971-) not found]
C2A20	Hydraulic Brakes - [Link target (target-id 310753-) not found]
C2A21	Park Brake - [Link target (target-id 309644-) not found]
C2A22	Hydraulic Brakes - [Link target (target-id 310754-) not found]
C2A3B	Hydraulic Brakes - [Link target (target-id 354261-) not found]
C2A3D	Antilock Brake System - [Link target (target-id 324294-) not found]
P0010	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P0011	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P0012	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P0013	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P0014	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P0016	Engine Controls and Fuel - 2.7L - [Link target (target-id 306016-) not found]
P0017	Engine Controls and Fuel - 2.7L - [Link target (target-id 306016-) not found]
P001A	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P001B	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P001C	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]

DTC	Diagnostic Procedure
P002A	Engine Controls and Fuel - 2.7L - [Link target (target-id 328871-) not found]
P002B	Engine Controls and Fuel - 2.7L - [Link target (target-id 328871-) not found]
P002C	Engine Controls and Fuel - 2.7L - [Link target (target-id 328871-) not found]
P0030	Engine Controls and Fuel - 2.7L - [Link target (target-id 306177-) not found]
P0031	Engine Controls and Fuel - 2.7L - [Link target (target-id 306177-) not found]
P0032	Engine Controls and Fuel - 2.7L - [Link target (target-id 306177-) not found]
P0033	Engine Controls and Fuel - 2.7L - [Link target (target-id 305956-) not found]
P0034	Engine Controls and Fuel - 2.7L - [Link target (target-id 305956-) not found]
P0035	Engine Controls and Fuel - 2.7L - [Link target (target-id 305956-) not found]
P0036	Engine Controls and Fuel - 2.7L - [Link target (target-id 306177-) not found]
P0037	Engine Controls and Fuel - 2.7L - [Link target (target-id 306177-) not found]
P0038	Engine Controls and Fuel - 2.7L - [Link target (target-id 306177-) not found]
P003C	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P003D	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P0054	Engine Controls and Fuel - 2.7L - [Link target (target-id 306177-) not found]
P005A	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P0068	Engine Controls and Fuel - 2.7L - [Link target (target-id 333427-) not found]
P0071	Displays and Gauges - [Link target (target-id 268233-) not found]
P0072	Displays and Gauges - [Link target (target-id 268233-) not found]
P0073	Displays and Gauges - [Link target (target-id 268233-) not found]
P0074	Displays and Gauges - [Link target (target-id 268233-) not found]
P0089	Engine Controls and Fuel - 2.7L - [Link target (target-id 305888-) not found]
P0090	Engine Controls and Fuel - 2.7L - [Link target (target-id 329294-) not found]
P0091	Engine Controls and Fuel - 2.7L - [Link target (target-id 329294-) not found]
P0092	Engine Controls and Fuel - 2.7L - [Link target (target-id 329294-) not found]
P0096	Engine Controls and Fuel - 2.7L - [Link target (target-id 305896-) not found]
P0097	Engine Controls and Fuel - 2.7L - [Link target (target-id 310244-) not found]
P0098	Engine Controls and Fuel - 2.7L - [Link target (target-id 310244-) not found]
P0099	Engine Controls and Fuel - 2.7L - [Link target (target-id 310244-) not found]
P00B2	Engine Heating and Cooling - [Link target (target-id 341328-) not found]
P00B3	Engine Heating and Cooling - [Link target (target-id 304123-) not found]
P00B4	Engine Heating and Cooling - [Link target (target-id 304123-) not found]
P00B5	Engine Heating and Cooling - [Link target (target-id 304123-) not found]
P00C6	Engine Controls and Fuel - 2.7L - [Link target (target-id 305888-) not found]
P00C7	Engine Controls and Fuel - 2.7L - [Link target (target-id 305823-) not found]
P00C9	Engine Controls and Fuel - 2.7L - [Link target (target-id 329294-) not found]
P00CA	Engine Controls and Fuel - 2.7L - [Link target (target-id 329294-) not found]
P00E9	Engine Controls and Fuel - 2.7L - [Link target (target-id 305896-) not found]
P00EA	Engine Controls and Fuel - 2.7L - [Link target (target-id 305829-) not found]
P00EB	Engine Controls and Fuel - 2.7L - [Link target (target-id 305829-) not found]
P00EC	Engine Controls and Fuel - 2.7L - [Link target (target-id 305829-) not found]
P00F4	Engine Controls and Fuel - 2.7L - [Link target (target-id 310244-) not found]

DTC	Diagnostic Procedure
P00F5	Engine Controls and Fuel - 2.7L - [Link target (target-id 310244-) not found]
P00F6	Engine Controls and Fuel - 2.7L - [Link target (target-id 310244-) not found]
P00FF	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P0101	Engine Controls and Fuel - 2.7L - [Link target (target-id 333427-) not found]
P0102	Engine Controls and Fuel - 2.7L - [Link target (target-id 326137-) not found]
P0103	Engine Controls and Fuel - 2.7L - [Link target (target-id 326137-) not found]
P0106	Engine Controls and Fuel - 2.7L - [Link target (target-id 333427-) not found]
P0107	Engine Controls and Fuel - 2.7L - [Link target (target-id 306143-) not found]
P0108	Engine Controls and Fuel - 2.7L - [Link target (target-id 306143-) not found]
P0111	Engine Controls and Fuel - 2.7L - [Link target (target-id 305896-) not found]
P0112	Engine Controls and Fuel - 2.7L - [Link target (target-id 310244-) not found]
P0113	Engine Controls and Fuel - 2.7L - [Link target (target-id 310244-) not found]
P0114	Engine Controls and Fuel - 2.7L - [Link target (target-id 310244-) not found]
P0116	Engine Controls and Fuel - 2.7L - [Link target (target-id 341327-) not found]
P0117	Engine Controls and Fuel - 2.7L - [Link target (target-id 346506-) not found]
P0118	Engine Controls and Fuel - 2.7L - [Link target (target-id 346506-) not found]
P0119	Engine Controls and Fuel - 2.7L - [Link target (target-id 346506-) not found]
P0121	Engine Controls and Fuel - 2.7L - [Link target (target-id 333427-) not found]
P0122	Engine Controls and Fuel - 2.7L - [Link target (target-id 332874-) not found]
P0123	Engine Controls and Fuel - 2.7L - [Link target (target-id 332874-) not found]
P0128	Engine Controls and Fuel - 2.7L - [Link target (target-id 305758-) not found]
P0131	Engine Controls and Fuel - 2.7L - [Link target (target-id 305900-) not found]
P0132	Engine Controls and Fuel - 2.7L - [Link target (target-id 305900-) not found]
P0135	Engine Controls and Fuel - 2.7L - [Link target (target-id 306177-) not found]
P0137	Engine Controls and Fuel - 2.7L - [Link target (target-id 306081-) not found]
P0138	Engine Controls and Fuel - 2.7L - [Link target (target-id 306081-) not found]
P013A	Engine Controls and Fuel - 2.7L - [Link target (target-id 306081-) not found]
P013B	Engine Controls and Fuel - 2.7L - [Link target (target-id 306081-) not found]
P013E	Engine Controls and Fuel - 2.7L - [Link target (target-id 306081-) not found]
P013F	Engine Controls and Fuel - 2.7L - [Link target (target-id 306081-) not found]
P0141	Engine Controls and Fuel - 2.7L - [Link target (target-id 306177-) not found]
P015A	Engine Controls and Fuel - 2.7L - [Link target (target-id 305900-) not found]
P015B	Engine Controls and Fuel - 2.7L - [Link target (target-id 305900-) not found]
P0171	Engine Controls and Fuel - 2.7L - [Link target (target-id 306146-) not found]
P0172	Engine Controls and Fuel - 2.7L - [Link target (target-id 306146-) not found]
P0182	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
P0183	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
P0187	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
P0188	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
P018B	Engine Controls and Fuel - 2.7L - [Link target (target-id 306147-) not found]
P018C	Engine Controls and Fuel - 2.7L - [Link target (target-id 306147-) not found]
P018D	Engine Controls and Fuel - 2.7L - [Link target (target-id 306147-) not found]

DTC	Diagnostic Procedure
P0191	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
P0192	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
P0196	Displays and Gauges - [Link target (target-id 309839-) not found]
P0197	Displays and Gauges - [Link target (target-id 309839-) not found]
P0198	Displays and Gauges - [Link target (target-id 309839-) not found]
P0199	Displays and Gauges - [Link target (target-id 309839-) not found]
P01BB	Displays and Gauges - [Link target (target-id 301798-) not found]
P01BC	Displays and Gauges - [Link target (target-id 301798-) not found]
P01BD	Displays and Gauges - [Link target (target-id 301798-) not found]
P01F0	Engine Controls and Fuel - 2.7L - [Link target (target-id 305758-) not found]
P0201	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P0202	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P0203	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P0204	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P0222	Engine Controls and Fuel - 2.7L - [Link target (target-id 332874-) not found]
P0223	Engine Controls and Fuel - 2.7L - [Link target (target-id 332874-) not found]
P0236	Engine Controls and Fuel - 2.7L - [Link target (target-id 333427-) not found]
P0237	Engine Controls and Fuel - 2.7L - [Link target (target-id 306156-) not found]
P0238	Engine Controls and Fuel - 2.7L - [Link target (target-id 306156-) not found]
P0245	Engine Controls and Fuel - 2.7L - [Link target (target-id 310249-) not found]
P0246	Engine Controls and Fuel - 2.7L - [Link target (target-id 310249-) not found]
P0261	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P0262	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P0264	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P0265	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P0267	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P0268	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P026B	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P0270	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P0271	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P0299	Engine Controls and Fuel - 2.7L - [Link target (target-id 310250-) not found]
P02EE	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P02EF	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P02F0	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P02F1	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P0300	Engine Controls and Fuel - 2.7L - [Link target (target-id 305839-) not found]
P0301	Engine Controls and Fuel - 2.7L - [Link target (target-id 305839-) not found]
P0302	Engine Controls and Fuel - 2.7L - [Link target (target-id 305839-) not found]
P0303	Engine Controls and Fuel - 2.7L - [Link target (target-id 305839-) not found]
P0304	Engine Controls and Fuel - 2.7L - [Link target (target-id 305839-) not found]
P0315	Engine Controls and Fuel - 2.7L - [Link target (target-id 306044-) not found]
P0324	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]

DTC	Diagnostic Procedure
P0325	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P0326	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P0327	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P0328	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P0329	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P032A	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P032B	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P032C	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P032D	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P032E	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P032F	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P0330	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P0331	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P0332	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P0333	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P0335	Engine Controls and Fuel - 2.7L - [Link target (target-id 306037-) not found]
P0336	Engine Controls and Fuel - 2.7L - [Link target (target-id 306037-) not found]
P0340	Engine Controls and Fuel - 2.7L - [Link target (target-id 306068-) not found]
P0341	Engine Controls and Fuel - 2.7L - [Link target (target-id 306068-) not found]
P034A	Engine Controls and Fuel - 2.7L - [Link target (target-id 305998-) not found]
P034B	Engine Controls and Fuel - 2.7L - [Link target (target-id 305998-) not found]
P0351	Engine Controls and Fuel - 2.7L - [Link target (target-id 305820-) not found]
P0352	Engine Controls and Fuel - 2.7L - [Link target (target-id 305820-) not found]
P0353	Engine Controls and Fuel - 2.7L - [Link target (target-id 305820-) not found]
P0354	Engine Controls and Fuel - 2.7L - [Link target (target-id 305820-) not found]
P0365	Engine Controls and Fuel - 2.7L - [Link target (target-id 306068-) not found]
P0366	Engine Controls and Fuel - 2.7L - [Link target (target-id 306068-) not found]
P037C	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P03EC	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P03ED	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P03EE	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P03EF	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P03F0	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P03F1	Engine Controls and Fuel - 2.7L - [Link target (target-id 328871-) not found]
P03F2	Engine Controls and Fuel - 2.7L - [Link target (target-id 328871-) not found]
P03F3	Engine Controls and Fuel - 2.7L - [Link target (target-id 328871-) not found]
P03F4	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P0420	Engine Controls and Fuel - 2.7L - [Link target (target-id 306159-) not found]
P0442	Engine Controls and Fuel - 2.7L - [Link target (target-id 306061-) not found]
P0443	Engine Controls and Fuel - 2.7L - [Link target (target-id 305870-) not found]
P0446	Engine Controls and Fuel - 2.7L - [Link target (target-id 305877-) not found]
P0449	Engine Controls and Fuel - 2.7L - [Link target (target-id 305871-) not found]

DTC	Diagnostic Procedure
P0451	Engine Controls and Fuel - 2.7L - [Link target (target-id 305878-) not found]
P0452	Engine Controls and Fuel - 2.7L - [Link target (target-id 305878-) not found]
P0453	Engine Controls and Fuel - 2.7L - [Link target (target-id 305878-) not found]
P0454	Engine Controls and Fuel - 2.7L - [Link target (target-id 305878-) not found]
P0455	Engine Controls and Fuel - 2.7L - [Link target (target-id 306061-) not found]
P0458	Engine Controls and Fuel - 2.7L - [Link target (target-id 305870-) not found]
P0459	Engine Controls and Fuel - 2.7L - [Link target (target-id 305870-) not found]
P0461	Displays and Gauges - [Link target (target-id 200973-) not found]
P0462	Displays and Gauges - [Link target (target-id 200973-) not found]
P0463	Displays and Gauges - [Link target (target-id 200973-) not found]
P0464	Displays and Gauges - [Link target (target-id 200973-) not found]
P0494	Engine Heating and Cooling - [Link target (target-id 327034-) not found]
P0496	Engine Controls and Fuel - 2.7L - [Link target (target-id 320980-) not found]
P0498	Engine Controls and Fuel - 2.7L - [Link target (target-id 305871-) not found]
P0499	Engine Controls and Fuel - 2.7L - [Link target (target-id 305871-) not found]
P04DB	Engine Controls and Fuel - 2.7L - [Link target (target-id 348394-) not found]
P04E2	Engine Controls and Fuel - 2.7L - [Link target (target-id 348394-) not found]
P04E3	Engine Controls and Fuel - 2.7L - [Link target (target-id 348394-) not found]
P04FB	Engine Controls and Fuel - 2.7L - [Link target (target-id 348394-) not found]
P0506	Engine Controls and Fuel - 2.7L - [Link target (target-id 306148-) not found]
P0507	Engine Controls and Fuel - 2.7L - [Link target (target-id 306148-) not found]
P050D	Engine Controls and Fuel - 2.7L - [Link target (target-id 306021-) not found]
P0513	Immobilizer - [Link target (target-id 156476-) not found]
P0521	Displays and Gauges - [Link target (target-id 161095-) not found]
P0522	Displays and Gauges - [Link target (target-id 161095-) not found]
P0523	Displays and Gauges - [Link target (target-id 161095-) not found]
P0532	HVAC - Automatic - [Link target (target-id 69299-) not found]
P0532	HVAC - Manual - [Link target (target-id 75796-) not found]
P0533	HVAC - Automatic - [Link target (target-id 69299-) not found]
P0533	HVAC - Manual - [Link target (target-id 75796-) not found]
P0537	HVAC - Automatic - [Link target (target-id 359576-) not found]
P0537	HVAC - Manual - [Link target (target-id 359577-) not found]
P0538	HVAC - Automatic - [Link target (target-id 359576-) not found]
P0538	HVAC - Manual - [Link target (target-id 359577-) not found]
P0539	HVAC - Automatic - [Link target (target-id 359576-) not found]
P0539	HVAC - Manual - [Link target (target-id 359577-) not found]
P0560	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 303008-) not found]
P0561	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 303008-) not found]
P0562	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 303008-) not found]
P0563	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 303008-) not found]
P0564	Cruise Control - [Link target (target-id 226319-) not found]
P0565	Cruise Control - [Link target (target-id 226319-) not found]

DTC	Diagnostic Procedure
P0567	Cruise Control - [Link target (target-id 226319-) not found]
P0568	Cruise Control - [Link target (target-id 226319-) not found]
P056C	Cruise Control - [Link target (target-id 226319-) not found]
P0572	Cruise Control - [Link target (target-id 168713-) not found]
P0573	Cruise Control - [Link target (target-id 168713-) not found]
P057B	Engine Controls and Fuel - 2.7L - [Link target (target-id 306195-) not found]
P057C	Engine Controls and Fuel - 2.7L - [Link target (target-id 306195-) not found]
P057D	Engine Controls and Fuel - 2.7L - [Link target (target-id 306195-) not found]
P057E	Engine Controls and Fuel - 2.7L - [Link target (target-id 306195-) not found]
P0580	Cruise Control - [Link target (target-id 226319-) not found]
P0581	Cruise Control - [Link target (target-id 226319-) not found]
P0589	Cruise Control - [Link target (target-id 226319-) not found]
P058A	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 314847-) not found]
P058B	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 314847-) not found]
P058C	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 314847-) not found]
P058D	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 314847-) not found]
P058E	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 314847-) not found]
P058F	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 314847-) not found]
P0592	Cruise Control - [Link target (target-id 226319-) not found]
P0593	Cruise Control - [Link target (target-id 226319-) not found]
P059F	Bumpers and Fascias - [Link target (target-id 259626-) not found]
P05AE	Bumpers and Fascias - [Link target (target-id 259627-) not found]
P05CC	Engine Controls and Fuel - 2.7L - [Link target (target-id 305821-) not found]
P05CE	Engine Controls and Fuel - 2.7L - [Link target (target-id 305821-) not found]
P05D1	Secondary and Configurable Customer Controls - [Link target (target-id 323238-) not found]
P05D2	Secondary and Configurable Customer Controls - [Link target (target-id 323238-) not found]
P05D3	Secondary and Configurable Customer Controls - [Link target (target-id 323238-) not found]
P05EC	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P0601	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P0601	Data Communications - [Link target (target-id 272300-) not found]
P0601	Automatic Transmission - 8L45/8L80 - [Link target (target-id 347431-) not found]
P0602	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P0602	Data Communications - [Link target (target-id 272300-) not found]
P0602	Automatic Transmission - 8L45/8L80 - [Link target (target-id 347431-) not found]
P0603	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P0603	Data Communications - [Link target (target-id 272300-) not found]
P0603	Automatic Transmission - 8L45/8L80 - [Link target (target-id 347431-) not found]
P0604	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P0604	Data Communications - [Link target (target-id 272300-) not found]
P0604	Automatic Transmission - 8L45/8L80 - [Link target (target-id 347431-) not found]
P0605	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P0605	Data Communications - [Link target (target-id 272300-) not found]

DTC	Diagnostic Procedure
P0606	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P0606	Data Communications - [Link target (target-id 272300-) not found]
P0606	Automatic Transmission - 8L45/8L80 - [Link target (target-id 347431-) not found]
P0607	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P0607	Data Communications - [Link target (target-id 272300-) not found]
P0607	Automatic Transmission - 8L45/8L80 - [Link target (target-id 347431-) not found]
P060A	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P060A	Data Communications - [Link target (target-id 272300-) not found]
P060A	Automatic Transmission - 8L45/8L80 - [Link target (target-id 347431-) not found]
P060B	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P060B	Data Communications - [Link target (target-id 272300-) not found]
P060C	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P060C	Data Communications - [Link target (target-id 272300-) not found]
P060C	Automatic Transmission - 8L45/8L80 - [Link target (target-id 347431-) not found]
P060D	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P0610	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P0610	Data Communications - [Link target (target-id 272300-) not found]
P0615	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 147526-) not found]
P0616	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 147526-) not found]
P0617	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 147526-) not found]
P061C	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P0621	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 37806-) not found]
P0622	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 37807-) not found]
P0627	Engine Controls and Fuel - 2.7L - [Link target (target-id 305890-) not found]
P0628	Engine Controls and Fuel - 2.7L - [Link target (target-id 305890-) not found]
P0629	Engine Controls and Fuel - 2.7L - [Link target (target-id 305890-) not found]
P062B	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P062F	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P062F	Data Communications - [Link target (target-id 272300-) not found]
P062F	Automatic Transmission - 8L45/8L80 - [Link target (target-id 347431-) not found]
P0630	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P0630	Data Communications - [Link target (target-id 272300-) not found]
P0633	Immobilizer - [Link target (target-id 142528-) not found]
P0634	Data Communications - [Link target (target-id 272300-) not found]
P0641	Antilock Brake System - [Link target (target-id 359723-) not found]
P0641	Engine Controls and Fuel - 2.7L - [Link target (target-id 306149-) not found]
P0645	HVAC - Automatic - [Link target (target-id 69300-) not found]
P0645	HVAC - Manual - [Link target (target-id 119567-) not found]
P0646	HVAC - Automatic - [Link target (target-id 69300-) not found]
P0646	HVAC - Manual - [Link target (target-id 119567-) not found]
P0647	HVAC - Automatic - [Link target (target-id 69300-) not found]
P0647	HVAC - Manual - [Link target (target-id 119567-) not found]

DTC	Diagnostic Procedure
P064D	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P064E	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P064F	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P064F	Data Communications - [Link target (target-id 272300-) not found]
P0651	Antilock Brake System - [Link target (target-id 359723-) not found]
P0651	Engine Controls and Fuel - 2.7L - [Link target (target-id 306149-) not found]
P0658	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323922-) not found]
P0659	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323922-) not found]
P0685	Engine Controls and Fuel - 2.7L - [Link target (target-id 309648-) not found]
P0686	Engine Controls and Fuel - 2.7L - [Link target (target-id 309648-) not found]
P0687	Engine Controls and Fuel - 2.7L - [Link target (target-id 309648-) not found]
P0689	Engine Controls and Fuel - 2.7L - [Link target (target-id 309648-) not found]
P0690	Engine Controls and Fuel - 2.7L - [Link target (target-id 309648-) not found]
P0697	Antilock Brake System - [Link target (target-id 359723-) not found]
P0697	Engine Controls and Fuel - 2.7L - [Link target (target-id 306149-) not found]
P069E	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P06A3	Antilock Brake System - [Link target (target-id 359723-) not found]
P06A3	Engine Controls and Fuel - 2.7L - [Link target (target-id 306149-) not found]
P06B6	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P06B7	Engine Controls and Fuel - 2.7L - [Link target (target-id 306060-) not found]
P06B8	Data Communications - [Link target (target-id 272300-) not found]
P06D1	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P06DA	Engine Mechanical - 2.7L - [Link target (target-id 310673-) not found]
P06DB	Engine Mechanical - 2.7L - [Link target (target-id 310673-) not found]
P06DC	Engine Mechanical - 2.7L - [Link target (target-id 310673-) not found]
P06DD	Engine Mechanical - 2.7L - [Link target (target-id 310673-) not found]
P06EC	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P0700	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P0707	Automatic Transmission - 8L45/8L80 - [Link target (target-id 312997-) not found]
P0708	Automatic Transmission - 8L45/8L80 - [Link target (target-id 312997-) not found]
P0711	Automatic Transmission - 8L45/8L80 - [Link target (target-id 260447-) not found]
P0712	Automatic Transmission - 8L45/8L80 - [Link target (target-id 260447-) not found]
P0713	Automatic Transmission - 8L45/8L80 - [Link target (target-id 260447-) not found]
P0716	Automatic Transmission - 8L45/8L80 - [Link target (target-id 321295-) not found]
P0717	Automatic Transmission - 8L45/8L80 - [Link target (target-id 321295-) not found]
P0721	Automatic Transmission - 8L45/8L80 - [Link target (target-id 350525-) not found]
P0722	Automatic Transmission - 8L45/8L80 - [Link target (target-id 350525-) not found]
P0723	Automatic Transmission - 8L45/8L80 - [Link target (target-id 350525-) not found]
P0746	Automatic Transmission - 8L45/8L80 - [Link target (target-id 263724-) not found]
P0747	Automatic Transmission - 8L45/8L80 - [Link target (target-id 263724-) not found]
P0776	Automatic Transmission - 8L45/8L80 - [Link target (target-id 260429-) not found]
P0777	Automatic Transmission - 8L45/8L80 - [Link target (target-id 260429-) not found]

DTC	Diagnostic Procedure
P077C	Automatic Transmission - 8L45/8L80 - [Link target (target-id 350525-) not found]
P077D	Automatic Transmission - 8L45/8L80 - [Link target (target-id 350525-) not found]
P0796	Automatic Transmission - 8L45/8L80 - [Link target (target-id 260380-) not found]
P0797	Automatic Transmission - 8L45/8L80 - [Link target (target-id 260380-) not found]
P07BF	Automatic Transmission - 8L45/8L80 - [Link target (target-id 321295-) not found]
P07C0	Automatic Transmission - 8L45/8L80 - [Link target (target-id 321295-) not found]
P0800	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P0815	Automatic Transmission - 8L45/8L80 - [Link target (target-id 331393-) not found]
P0816	Automatic Transmission - 8L45/8L80 - [Link target (target-id 331393-) not found]
P0826	Automatic Transmission - 8L45/8L80 - [Link target (target-id 331393-) not found]
P0841	Automatic Transmission - 8L45/8L80 - [Link target (target-id 347419-) not found]
P0842	Automatic Transmission - 8L45/8L80 - [Link target (target-id 347419-) not found]
P0843	Automatic Transmission - 8L45/8L80 - [Link target (target-id 347419-) not found]
P0856	Antilock Brake System - [Link target (target-id 165434-) not found]
P08FF	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P0960	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P0962	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P0963	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P0964	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P0966	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P0967	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P0968	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P0970	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P0971	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P0A7B	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P0AC4	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P0CA1	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P0E32	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 334682-) not found]
P0E33	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 334682-) not found]
P0E34	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 334682-) not found]
P0E37	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 334684-) not found]
P0E38	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 334684-) not found]
P0E39	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 334684-) not found]
P1005	Engine Controls and Fuel - 2.7L - [Link target (target-id 310703-) not found]
P100C	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 280530-) not found]
P100D	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 280530-) not found]
P1029	Engine Controls and Fuel - 2.7L - [Link target (target-id 310647-) not found]
P102A	Engine Controls and Fuel - 2.7L - [Link target (target-id 310647-) not found]
P102B	Engine Controls and Fuel - 2.7L - [Link target (target-id 310647-) not found]
P1038	Engine Controls and Fuel - 2.7L - [Link target (target-id 310249-) not found]
P103A	Engine Controls and Fuel - 2.7L - [Link target (target-id 310249-) not found]
P103B	Engine Controls and Fuel - 2.7L - [Link target (target-id 306177-) not found]

DTC	Diagnostic Procedure
P103C	Engine Controls and Fuel - 2.7L - [Link target (target-id 306177-) not found]
P103D	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P1098	Engine Heating and Cooling - [Link target (target-id 341329-) not found]
P10A1	Engine Heating and Cooling - [Link target (target-id 341329-) not found]
P10A3	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P10A4	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P10A5	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P10A6	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P10A7	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P10A8	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P10A9	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P10AA	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P10BC	Engine Controls and Fuel - 2.7L - [Link target (target-id 310251-) not found]
P10C6	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P10E8	Engine Controls and Fuel - 2.7L - [Link target (target-id 329294-) not found]
P10F5	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P1101	Engine Controls and Fuel - 2.7L - [Link target (target-id 333427-) not found]
P111F	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
P1176	Engine Controls and Fuel - 2.7L - [Link target (target-id 305791-) not found]
P1177	Engine Controls and Fuel - 2.7L - [Link target (target-id 305791-) not found]
P117A	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P11FF	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P1248	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P1249	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P124A	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P124B	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P1255	Engine Controls and Fuel - 2.7L - [Link target (target-id 306086-) not found]
P126E	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
P126F	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
P127C	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
P128A	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
P128B	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
P128C	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P128D	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P128F	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P129B	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 182379-) not found]
P129C	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 182379-) not found]
P129F	Engine Controls and Fuel - 2.7L - [Link target (target-id 310226-) not found]
P12A6	Engine Controls and Fuel - 2.7L - [Link target (target-id 305890-) not found]
P134C	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P135A	Engine Controls and Fuel - 2.7L - [Link target (target-id 306057-) not found]
P135C	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]

DTC	Diagnostic Procedure
P1387	Engine Heating and Cooling - [Link target (target-id 341330-) not found]
P13B1	Engine Mechanical - 2.7L - [Link target (target-id 310673-) not found]
P1400	Engine Controls and Fuel - 2.7L - [Link target (target-id 306087-) not found]
P1434	Displays and Gauges - [Link target (target-id 280602-) not found]
P1467	Engine Controls and Fuel - 2.7L - [Link target (target-id 310705-) not found]
P1468	Engine Controls and Fuel - 2.7L - [Link target (target-id 310705-) not found]
P1469	Engine Controls and Fuel - 2.7L - [Link target (target-id 310705-) not found]
P146A	Engine Controls and Fuel - 2.7L - [Link target (target-id 310705-) not found]
P146B	Engine Controls and Fuel - 2.7L - [Link target (target-id 320982-) not found]
P146C	Engine Controls and Fuel - 2.7L - [Link target (target-id 320980-) not found]
P146D	Engine Controls and Fuel - 2.7L - [Link target (target-id 320983-) not found]
P146E	Engine Controls and Fuel - 2.7L - [Link target (target-id 320983-) not found]
P146F	Engine Controls and Fuel - 2.7L - [Link target (target-id 320983-) not found]
P148E	Engine Controls and Fuel - 2.7L - [Link target (target-id 310705-) not found]
P148F	Engine Controls and Fuel - 2.7L - [Link target (target-id 310705-) not found]
P1490	Engine Controls and Fuel - 2.7L - [Link target (target-id 310705-) not found]
P149A	Engine Controls and Fuel - 2.7L - [Link target (target-id 341327-) not found]
P149D	Engine Controls and Fuel - 2.7L - [Link target (target-id 341327-) not found]
P149E	Engine Controls and Fuel - 2.7L - [Link target (target-id 341327-) not found]
P14A0	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P14A4	Engine Controls and Fuel - 2.7L - [Link target (target-id 310705-) not found]
P14B6	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P14CD	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P14D4	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P14D5	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P14D6	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P150C	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P1516	Engine Controls and Fuel - 2.7L - [Link target (target-id 306006-) not found]
P151E	Bumpers and Fascias - [Link target (target-id 259626-) not found]
P151F	Bumpers and Fascias - [Link target (target-id 259627-) not found]
P153B	HVAC - Automatic - [Link target (target-id 359576-) not found]
P153B	HVAC - Manual - [Link target (target-id 359577-) not found]
P155A	Cruise Control - [Link target (target-id 226319-) not found]
P155B	Cruise Control - [Link target (target-id 226319-) not found]
P155C	Cruise Control - [Link target (target-id 226319-) not found]
P15F8	Antilock Brake System - [Link target (target-id 227356-) not found]
P15FD	Antilock Brake System - [Link target (target-id 272641-) not found]
P160A	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P160D	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P160E	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P161C	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P163A	Engine Controls and Fuel - 2.7L - [Link target (target-id 329294-) not found]

DTC	Diagnostic Procedure
P1682	Engine Controls and Fuel - 2.7L - [Link target (target-id 309648-) not found]
P16A7	Engine Controls and Fuel - 2.7L - [Link target (target-id 309648-) not found]
P16AF	Engine Controls and Fuel - 2.7L - [Link target (target-id 309648-) not found]
P16B3	Engine Controls and Fuel - 2.7L - [Link target (target-id 309648-) not found]
P16D4	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 314848-) not found]
P16D5	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 314848-) not found]
P16D6	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 314848-) not found]
P16D7	Engine Controls and Fuel - 2.7L - [Link target (target-id 305893-) not found]
P16D8	Engine Controls and Fuel - 2.7L - [Link target (target-id 305893-) not found]
P16D9	Engine Controls and Fuel - 2.7L - [Link target (target-id 305893-) not found]
P16DD	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 315564-) not found]
P16DE	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 315564-) not found]
P16DF	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 315564-) not found]
P16E1	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 314850-) not found]
P16E2	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 314850-) not found]
P16E3	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 314850-) not found]
P16E9	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P16E9	Data Communications - [Link target (target-id 272300-) not found]
P16EA	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P16EA	Data Communications - [Link target (target-id 272300-) not found]
P16EB	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P16EB	Data Communications - [Link target (target-id 272300-) not found]
P16EC	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P16EC	Data Communications - [Link target (target-id 272300-) not found]
P16ED	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P16ED	Data Communications - [Link target (target-id 272300-) not found]
P16EE	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P16EE	Data Communications - [Link target (target-id 272300-) not found]
P16EF	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P16EF	Data Communications - [Link target (target-id 272300-) not found]
P16F0	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P16F0	Data Communications - [Link target (target-id 272300-) not found]
P16F1	Data Communications - [Link target (target-id 272300-) not found]
P16F2	Data Communications - [Link target (target-id 272300-) not found]
P16F3	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P16F3	Data Communications - [Link target (target-id 272300-) not found]
P16F9	Data Communications - [Link target (target-id 272300-) not found]
P16FD	Data Communications - [Link target (target-id 272300-) not found]
P16FE	Data Communications - [Link target (target-id 272300-) not found]
P1700	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P172A	Automatic Transmission - 8L45/8L80 - [Link target (target-id 350525-) not found]
P175E	Automatic Transmission - 8L45/8L80 - [Link target (target-id 320798-) not found]

DTC	Diagnostic Procedure
P1762	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P176B	Automatic Transmission - 8L45/8L80 - [Link target (target-id 321298-) not found]
P176C	Automatic Transmission - 8L45/8L80 - [Link target (target-id 321298-) not found]
P176D	Automatic Transmission - 8L45/8L80 - [Link target (target-id 321298-) not found]
P1783	Automatic Transmission - 8L45/8L80 - [Link target (target-id 321295-) not found]
P178F	Automatic Transmission - 8L45/8L80 - [Link target (target-id 321298-) not found]
P17CE	Automatic Transmission - 8L45/8L80 - [Link target (target-id 321295-) not found]
P17D3	Automatic Transmission - 8L45/8L80 - [Link target (target-id 321298-) not found]
P17D4	Transfer Case - MP 3010/3015 - [Link target (target-id 302594-) not found]
P17D4	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 302595-) not found]
P185F	Transfer Case - MP 3010/3015 - [Link target (target-id 302594-) not found]
P185F	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 302595-) not found]
P193B	Secondary and Configurable Customer Controls - [Link target (target-id 346797-) not found]
P1E00	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P2088	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P2089	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P208A	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P208B	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P208C	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P208D	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P208E	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P208F	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P2090	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P2091	Engine Controls and Fuel - 2.7L - [Link target (target-id 305826-) not found]
P2096	Engine Controls and Fuel - 2.7L - [Link target (target-id 306129-) not found]
P2097	Engine Controls and Fuel - 2.7L - [Link target (target-id 306129-) not found]
P2101	Engine Controls and Fuel - 2.7L - [Link target (target-id 306006-) not found]
P2119	Engine Controls and Fuel - 2.7L - [Link target (target-id 306006-) not found]
P2122	Engine Controls and Fuel - 2.7L - [Link target (target-id 306139-) not found]
P2123	Engine Controls and Fuel - 2.7L - [Link target (target-id 306139-) not found]
P2127	Engine Controls and Fuel - 2.7L - [Link target (target-id 306139-) not found]
P2128	Engine Controls and Fuel - 2.7L - [Link target (target-id 306139-) not found]
P2135	Engine Controls and Fuel - 2.7L - [Link target (target-id 332874-) not found]
P2138	Engine Controls and Fuel - 2.7L - [Link target (target-id 306139-) not found]
P2147	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P2148	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P2150	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P2151	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P2153	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P2154	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P2156	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]
P2157	Engine Controls and Fuel - 2.7L - [Link target (target-id 306084-) not found]

DTC	Diagnostic Procedure
P215B	Transfer Case - MP 3010/3015 - [Link target (target-id 302594-) not found]
P215B	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 302595-) not found]
P2176	Engine Controls and Fuel - 2.7L - [Link target (target-id 306006-) not found]
P2184	Engine Controls and Fuel - 2.7L - [Link target (target-id 346506-) not found]
P2185	Engine Controls and Fuel - 2.7L - [Link target (target-id 346506-) not found]
P2186	Engine Controls and Fuel - 2.7L - [Link target (target-id 346506-) not found]
P219A	Engine Controls and Fuel - 2.7L - [Link target (target-id 305843-) not found]
P2228	Engine Controls and Fuel - 2.7L - [Link target (target-id 310255-) not found]
P2229	Engine Controls and Fuel - 2.7L - [Link target (target-id 310255-) not found]
P222A	Engine Controls and Fuel - 2.7L - [Link target (target-id 310255-) not found]
P222B	Engine Controls and Fuel - 2.7L - [Link target (target-id 310255-) not found]
P222C	Engine Controls and Fuel - 2.7L - [Link target (target-id 310255-) not found]
P222D	Engine Controls and Fuel - 2.7L - [Link target (target-id 310255-) not found]
P222E	Engine Controls and Fuel - 2.7L - [Link target (target-id 310255-) not found]
P222F	Engine Controls and Fuel - 2.7L - [Link target (target-id 310255-) not found]
P2230	Engine Controls and Fuel - 2.7L - [Link target (target-id 310255-) not found]
P2237	Engine Controls and Fuel - 2.7L - [Link target (target-id 305900-) not found]
P223C	Engine Controls and Fuel - 2.7L - [Link target (target-id 305900-) not found]
P223E	Engine Controls and Fuel - 2.7L - [Link target (target-id 305900-) not found]
P2243	Engine Controls and Fuel - 2.7L - [Link target (target-id 305900-) not found]
P2251	Engine Controls and Fuel - 2.7L - [Link target (target-id 305900-) not found]
P2261	Engine Controls and Fuel - 2.7L - [Link target (target-id 306166-) not found]
P2270	Engine Controls and Fuel - 2.7L - [Link target (target-id 306081-) not found]
P2271	Engine Controls and Fuel - 2.7L - [Link target (target-id 306081-) not found]
P227C	Engine Controls and Fuel - 2.7L - [Link target (target-id 310255-) not found]
P227D	Engine Controls and Fuel - 2.7L - [Link target (target-id 310255-) not found]
P227E	Engine Controls and Fuel - 2.7L - [Link target (target-id 310255-) not found]
P228C	Engine Controls and Fuel - 2.7L - [Link target (target-id 305888-) not found]
P228D	Engine Controls and Fuel - 2.7L - [Link target (target-id 305888-) not found]
P2300	Engine Controls and Fuel - 2.7L - [Link target (target-id 305820-) not found]
P2301	Engine Controls and Fuel - 2.7L - [Link target (target-id 305820-) not found]
P2303	Engine Controls and Fuel - 2.7L - [Link target (target-id 305820-) not found]
P2304	Engine Controls and Fuel - 2.7L - [Link target (target-id 305820-) not found]
P2306	Engine Controls and Fuel - 2.7L - [Link target (target-id 305820-) not found]
P2307	Engine Controls and Fuel - 2.7L - [Link target (target-id 305820-) not found]
P2309	Engine Controls and Fuel - 2.7L - [Link target (target-id 305820-) not found]
P2310	Engine Controls and Fuel - 2.7L - [Link target (target-id 305820-) not found]
P23C4	Engine Heating and Cooling - [Link target (target-id 341329-) not found]
P23C5	Engine Heating and Cooling - [Link target (target-id 341329-) not found]
P23C6	Engine Heating and Cooling - [Link target (target-id 341329-) not found]
P2534	Wiring Systems and Power Management - [Link target (target-id 221459-) not found]
P2535	Wiring Systems and Power Management - [Link target (target-id 221459-) not found]

DTC	Diagnostic Procedure
P2544	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P2561	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P257D	Vehicle Access - [Link target (target-id 208940-) not found]
P257E	Vehicle Access - [Link target (target-id 208940-) not found]
P257F	Vehicle Access - [Link target (target-id 208940-) not found]
P25A2	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P25AF	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P25C9	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P2610	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P2626	Engine Controls and Fuel - 2.7L - [Link target (target-id 305900-) not found]
P262B	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P262B	Data Communications - [Link target (target-id 272300-) not found]
P264F	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P2670	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P2671	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P26B7	Engine Heating and Cooling - [Link target (target-id 341329-) not found]
P26BB	Engine Heating and Cooling - [Link target (target-id 341329-) not found]
P26C0	Engine Heating and Cooling - [Link target (target-id 341330-) not found]
P26C2	Engine Heating and Cooling - [Link target (target-id 341330-) not found]
P26C8	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P26C9	Engine Controls and Fuel - 2.7L - [Link target (target-id 306092-) not found]
P26CE	Engine Heating and Cooling - [Link target (target-id 331827-) not found]
P26E4	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 257465-) not found]
P26E5	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 257465-) not found]
P26E6	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 257465-) not found]
P2714	Automatic Transmission - 8L45/8L80 - [Link target (target-id 260363-) not found]
P2715	Automatic Transmission - 8L45/8L80 - [Link target (target-id 260363-) not found]
P2718	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323922-) not found]
P2720	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323922-) not found]
P2721	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323922-) not found]
P2723	Automatic Transmission - 8L45/8L80 - [Link target (target-id 260677-) not found]
P2724	Automatic Transmission - 8L45/8L80 - [Link target (target-id 260677-) not found]
P2727	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323922-) not found]
P2729	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323922-) not found]
P2730	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323922-) not found]
P2736	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P2738	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P2739	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P2796	Automatic Transmission - 8L45/8L80 - [Link target (target-id 309966-) not found]
P2797	Automatic Transmission - 8L45/8L80 - [Link target (target-id 309966-) not found]
P2798	Automatic Transmission - 8L45/8L80 - [Link target (target-id 309966-) not found]
P2799	Automatic Transmission - 8L45/8L80 - [Link target (target-id 309966-) not found]

DTC	Diagnostic Procedure
P279A	Transfer Case - MP 3010/3015 - [Link target (target-id 302594-) not found]
P279A	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 302595-) not found]
P279B	Transfer Case - MP 3010/3015 - [Link target (target-id 302594-) not found]
P279B	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 302595-) not found]
P279C	Transfer Case - MP 3010/3015 - [Link target (target-id 302594-) not found]
P279C	Transfer Case - MP 3023/3024/3025 - [Link target (target-id 302595-) not found]
P27A7	Automatic Transmission - 8L45/8L80 - [Link target (target-id 264791-) not found]
P27A8	Automatic Transmission - 8L45/8L80 - [Link target (target-id 264791-) not found]
P27A9	Automatic Transmission - 8L45/8L80 - [Link target (target-id 264791-) not found]
P27AA	Automatic Transmission - 8L45/8L80 - [Link target (target-id 264791-) not found]
P27AB	Automatic Transmission - 8L45/8L80 - [Link target (target-id 264791-) not found]
P27AC	Automatic Transmission - 8L45/8L80 - [Link target (target-id 264791-) not found]
P27AD	Automatic Transmission - 8L45/8L80 - [Link target (target-id 264791-) not found]
P27B5	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P2802	Automatic Transmission - 8L45/8L80 - [Link target (target-id 312997-) not found]
P2803	Automatic Transmission - 8L45/8L80 - [Link target (target-id 312997-) not found]
P2805	Automatic Transmission - 8L45/8L80 - [Link target (target-id 312997-) not found]
P2808	Automatic Transmission - 8L45/8L80 - [Link target (target-id 263743-) not found]
P2809	Automatic Transmission - 8L45/8L80 - [Link target (target-id 263743-) not found]
P2812	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P2814	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P2815	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P2817	Automatic Transmission - 8L45/8L80 - [Link target (target-id 263745-) not found]
P2818	Automatic Transmission - 8L45/8L80 - [Link target (target-id 263745-) not found]
P281B	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323922-) not found]
P281D	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323922-) not found]
P281E	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323922-) not found]
P2821	Automatic Transmission - 8L45/8L80 - [Link target (target-id 347866-) not found]
P2824	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P2826	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P2827	Automatic Transmission - 8L45/8L80 - [Link target (target-id 323923-) not found]
P29FA	Engine Heating and Cooling - [Link target (target-id 341330-) not found]
P29FB	Engine Heating and Cooling - [Link target (target-id 341330-) not found]
P2AB8	Engine Controls and Fuel - 2.7L - [Link target (target-id 310257-) not found]
P2AB9	Engine Controls and Fuel - 2.7L - [Link target (target-id 310257-) not found]
P2B00	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P2B01	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P2B02	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P2B03	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P2B08	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P2B09	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P2B0A	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]

DTC	Diagnostic Procedure
P2B0B	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P2B2D	Engine Controls and Fuel - 2.7L - [Link target (target-id 346506-) not found]
P2B2E	Engine Controls and Fuel - 2.7L - [Link target (target-id 346506-) not found]
P2B33	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P2B34	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P2B35	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P2B39	Engine Controls and Fuel - 2.7L - [Link target (target-id 328871-) not found]
P2B3A	Engine Controls and Fuel - 2.7L - [Link target (target-id 328871-) not found]
P2B3B	Engine Controls and Fuel - 2.7L - [Link target (target-id 328871-) not found]
P2B4F	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P2B51	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P2B53	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P2B81	Engine Controls and Fuel - 2.7L - [Link target (target-id 310257-) not found]
P2B85	Engine Heating and Cooling - [Link target (target-id 331827-) not found]
P2B93	Engine Controls and Fuel - 2.7L - [Link target (target-id 310257-) not found]
P2B95	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P2B96	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P2BA2	Engine Heating and Cooling - [Link target (target-id 331827-) not found]
P2BB5	Engine Controls and Fuel - 2.7L - [Link target (target-id 346506-) not found]
P2BB8	Engine Controls and Fuel - 2.7L - [Link target (target-id 346506-) not found]
P2BB9	Engine Controls and Fuel - 2.7L - [Link target (target-id 346506-) not found]
P2BBA	Engine Controls and Fuel - 2.7L - [Link target (target-id 346506-) not found]
P2C05	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C06	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C07	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C08	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C09	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C0A	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C0B	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C0C	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C0D	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C0E	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C0F	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C10	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C12	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C13	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C14	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C15	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C16	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C17	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C18	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P2C19	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]

DTC	Diagnostic Procedure
P2C1E	Engine Controls and Fuel - 2.7L - [Link target (target-id 305888-) not found]
P2C1F	Engine Controls and Fuel - 2.7L - [Link target (target-id 305888-) not found]
P2C20	Engine Controls and Fuel - 2.7L - [Link target (target-id 305888-) not found]
P2C21	Displays and Gauges - [Link target (target-id 309840-) not found]
P2C9B	Engine Controls and Fuel - 2.7L - [Link target (target-id 310257-) not found]
P2CB9	Engine Heating and Cooling - [Link target (target-id 327034-) not found]
P2CBB	Engine Heating and Cooling - [Link target (target-id 327034-) not found]
P2DE7	Engine Heating and Cooling - [Link target (target-id 341329-) not found]
P2DE8	Engine Heating and Cooling - [Link target (target-id 341330-) not found]
P2DE9	Engine Heating and Cooling - [Link target (target-id 331827-) not found]
P2E81	Engine Heating and Cooling - [Link target (target-id 341330-) not found]
P2E82	Engine Heating and Cooling - [Link target (target-id 331827-) not found]
P305D	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 272220-) not found]
P305E	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 272220-) not found]
P3071	Engine Heating and Cooling - [Link target (target-id 331827-) not found]
P3072	Engine Heating and Cooling - [Link target (target-id 331827-) not found]
P3073	Engine Heating and Cooling - [Link target (target-id 331827-) not found]
P3074	Engine Heating and Cooling - [Link target (target-id 331827-) not found]
P3075	Engine Heating and Cooling - [Link target (target-id 331827-) not found]
P3076	Engine Heating and Cooling - [Link target (target-id 331827-) not found]
P3080	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P3081	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P3082	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P3083	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P3084	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P3085	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P3086	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P3087	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P3088	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P3089	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P308A	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P308B	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P308C	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P308D	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P308E	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P308F	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P3090	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P3091	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P3092	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P3093	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P3094	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P3095	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]

DTC	Diagnostic Procedure
P3096	Engine Controls and Fuel - 2.7L - [Link target (target-id 326034-) not found]
P3097	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P3098	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P3099	Engine Controls and Fuel - 2.7L - [Link target (target-id 328871-) not found]
P309A	Engine Controls and Fuel - 2.7L - [Link target (target-id 328871-) not found]
P309B	Engine Controls and Fuel - 2.7L - [Link target (target-id 328871-) not found]
P309C	Engine Controls and Fuel - 2.7L - [Link target (target-id 326035-) not found]
P30B0	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P30B1	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P30B2	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P30B3	Engine Controls and Fuel - 2.7L - [Link target (target-id 310669-) not found]
P30BE	Engine Controls and Fuel - 2.7L - [Link target (target-id 310670-) not found]
P30BF	Engine Controls and Fuel - 2.7L - [Link target (target-id 310670-) not found]
P30C2	Engine Controls and Fuel - 2.7L - [Link target (target-id 310670-) not found]
P30C3	Engine Controls and Fuel - 2.7L - [Link target (target-id 310670-) not found]
P30C6	Engine Controls and Fuel - 2.7L - [Link target (target-id 310670-) not found]
P30C7	Engine Controls and Fuel - 2.7L - [Link target (target-id 310670-) not found]
P30CA	Engine Controls and Fuel - 2.7L - [Link target (target-id 310670-) not found]
P30CB	Engine Controls and Fuel - 2.7L - [Link target (target-id 310670-) not found]
P30CE	Engine Controls and Fuel - 2.7L - [Link target (target-id 310671-) not found]
P30CF	Engine Controls and Fuel - 2.7L - [Link target (target-id 310671-) not found]
P30D0	Engine Controls and Fuel - 2.7L - [Link target (target-id 310671-) not found]
P30D1	Engine Controls and Fuel - 2.7L - [Link target (target-id 310671-) not found]
P30D4	Engine Controls and Fuel - 2.7L - [Link target (target-id 310223-) not found]
P30D6	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P30D6	Data Communications - [Link target (target-id 272300-) not found]
P30D7	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P30D7	Data Communications - [Link target (target-id 272300-) not found]
P30D8	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P30D8	Data Communications - [Link target (target-id 272300-) not found]
P30D9	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P30D9	Data Communications - [Link target (target-id 272300-) not found]
P30DA	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P30DA	Data Communications - [Link target (target-id 272300-) not found]
P30DB	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P30DB	Data Communications - [Link target (target-id 272300-) not found]
P30DC	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P30DC	Data Communications - [Link target (target-id 272300-) not found]
P30DD	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P30DD	Data Communications - [Link target (target-id 272300-) not found]
P30DE	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P30EC	Antilock Brake System - [Link target (target-id 310827-) not found]

DTC	Diagnostic Procedure
P30EE	Engine Heating and Cooling - [Link target (target-id 327034-) not found]
P30EF	Engine Heating and Cooling - [Link target (target-id 327034-) not found]
P30F0	Engine Heating and Cooling - [Link target (target-id 327034-) not found]
P30F1	Engine Heating and Cooling - [Link target (target-id 327034-) not found]
P30F2	Engine Heating and Cooling - [Link target (target-id 327034-) not found]
P30F3	Engine Heating and Cooling - [Link target (target-id 327034-) not found]
P314E	Engine Controls and Fuel - 2.7L - [Link target (target-id 324175-) not found]
P314F	Antilock Brake System - [Link target (target-id 309494-) not found]
P3186	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P3186	Data Communications - [Link target (target-id 272300-) not found]
P3187	Engine Controls and Fuel - 2.7L - [Link target (target-id 338053-) not found]
P3188	Engine Controls and Fuel - 2.7L - [Link target (target-id 338053-) not found]
P3191	Engine Controls and Fuel - 2.7L - [Link target (target-id 324285-) not found]
P31C3	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 346596-) not found]
U0073	Data Communications - [Link target (target-id 148027-) not found]
U0074	Data Communications - [Link target (target-id 168614-) not found]
U0075	Data Communications - [Link target (target-id 219671-) not found]
U0076	Data Communications - [Link target (target-id 225597-) not found]
U0078	Data Communications - [Link target (target-id 208739-) not found]
U0079	Data Communications - [Link target (target-id 313798-) not found]
U007B	Data Communications - [Link target (target-id 274046-) not found]
U007E	Data Communications - [Link target (target-id 277590-) not found]
U0100-U02FF	Data Communications - [Link target (target-id 148031-) not found]
U02BB	Engine Controls and Fuel - 2.7L - [Link target (target-id 310705-) not found]
U0400-U05FF	Data Communications - [Link target (target-id 179843-) not found]
U0600-U06FF	Data Communications - [Link target (target-id 276055-) not found]
U0606	Engine Controls and Fuel - 2.7L - [Link target (target-id 332874-) not found]
U0607	Engine Controls and Fuel - 2.7L - [Link target (target-id 332874-) not found]
U060F	Engine Controls and Fuel - 2.7L - [Link target (target-id 326137-) not found]
U0617	Engine Heating and Cooling - [Link target (target-id 341329-) not found]
U0618	Engine Heating and Cooling - [Link target (target-id 341330-) not found]
U0625	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
U0632	Engine Heating and Cooling - [Link target (target-id 327034-) not found]
U0633	Engine Heating and Cooling - [Link target (target-id 327034-) not found]
U0644	Engine Controls and Fuel - 2.7L - [Link target (target-id 310257-) not found]
U0670	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
U0671	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
U0672	Engine Heating and Cooling - [Link target (target-id 331827-) not found]
U067C	Engine Heating and Cooling - [Link target (target-id 327034-) not found]
U101A	Data Communications - [Link target (target-id 317051-) not found]
U101B	Engine Controls and Fuel - 2.7L - [Link target (target-id 323120-) not found]
U1104	Data Communications - [Link target (target-id 321236-) not found]

DTC	Diagnostic Procedure
U1109	Data Communications - [Link target (target-id 329043-) not found]
U110A	Data Communications - [Link target (target-id 329044-) not found]
U1120	Data Communications - [Link target (target-id 329053-) not found]
U1122	Data Communications - [Link target (target-id 329055-) not found]
U1126	Data Communications - [Link target (target-id 329058-) not found]
U1127	Data Communications - [Link target (target-id 301016-) not found]
U113B	Data Communications - [Link target (target-id 329070-) not found]
U1150	Data Communications - [Link target (target-id 329077-) not found]
U1151	Data Communications - [Link target (target-id 329078-) not found]
U1155	Data Communications - [Link target (target-id 332900-) not found]
U1300-U1344	Data Communications - [Link target (target-id 317053-) not found]
U1314-U1316	Engine Heating and Cooling - [Link target (target-id 327034-) not found]
U1319	Engine Controls and Fuel - 2.7L - [Link target (target-id 326137-) not found]
U131B	Engine Heating and Cooling - [Link target (target-id 331827-) not found]
U1345-U1349	Data Communications - [Link target (target-id 317756-) not found]
U134A-U14FF	Data Communications - [Link target (target-id 317053-) not found]
U1379	Engine Heating and Cooling - [Link target (target-id 341330-) not found]
U137A	Engine Controls and Fuel - 2.7L - [Link target (target-id 310705-) not found]
U1500-U15FF	Data Communications - [Link target (target-id 179844-) not found]
U1602	Data Communications - [Link target (target-id 328899-) not found]
U1603	Data Communications - [Link target (target-id 328900-) not found]
U1604	Data Communications - [Link target (target-id 317757-) not found]
U1605	Data Communications - [Link target (target-id 317758-) not found]
U1607	Data Communications - [Link target (target-id 328512-) not found]
U1608	Data Communications - [Link target (target-id 328513-) not found]
U1609	Data Communications - [Link target (target-id 328514-) not found]
U160A	Data Communications - [Link target (target-id 328515-) not found]
U160B	Data Communications - [Link target (target-id 328516-) not found]
U160C	Data Communications - [Link target (target-id 328517-) not found]
U160F	Data Communications - [Link target (target-id 328518-) not found]
U1610	Data Communications - [Link target (target-id 328519-) not found]
U1611	Data Communications - [Link target (target-id 319395-) not found]
U1627	Data Communications - [Link target (target-id 332914-) not found]
U1639	Data Communications - [Link target (target-id 332925-) not found]
U1643	Data Communications - [Link target (target-id 332932-) not found]
U1647	Data Communications - [Link target (target-id 332933-) not found]
U164A	Data Communications - [Link target (target-id 332934-) not found]
U164B	Data Communications - [Link target (target-id 335271-) not found]
U164E	Data Communications - [Link target (target-id 332935-) not found]
U164F	Data Communications - [Link target (target-id 332936-) not found]
U1651	Data Communications - [Link target (target-id 184702-) not found]
U1818	Data Communications - [Link target (target-id 168622-) not found]

DTC	Diagnostic Procedure
U18A2	Data Communications - [Link target (target-id 225598-) not found]
U18E2	Data Communications - [Link target (target-id 317760-) not found]
U1960-U1962	Data Communications - [Link target (target-id 315363-) not found]
U1967	Cellular, Entertainment, and Navigation - [Link target (target-id 319002-) not found]
U1973	Displays and Gauges - [Link target (target-id 309457-) not found]
U1977	Data Communications - [Link target (target-id 317061-) not found]
U1978	Data Communications - [Link target (target-id 317062-) not found]
U197E	Displays and Gauges - [Link target (target-id 317153-) not found]
U197F	Displays and Gauges - [Link target (target-id 317154-) not found]
U198B	Data Communications - [Link target (target-id 349296-) not found]
U2000-U20FF	Data Communications - [Link target (target-id 317070-) not found]
U2110-U2117	Data Communications - [Link target (target-id 317071-) not found]
U223B	Displays and Gauges - [Link target (target-id 348392-) not found]
U2A90	Displays and Gauges - [Link target (target-id 322010-) not found]
U2A91	Displays and Gauges - [Link target (target-id 322011-) not found]
U2C91	Data Communications - [Link target (target-id 349297-) not found]
U3000	Image Display Cameras - [Link target (target-id 327503-) not found]
U3000	Data Communications - [Link target (target-id 229188-) not found]
U3000	Driver Assistance Systems - [Link target (target-id 317614-) not found]
U3000	Parking Assistance Systems - [Link target (target-id 320659-) not found]
U3000	Supplemental Restraints - [Link target (target-id 321864-) not found]
U3000	Power Seats - [Link target (target-id 352062-) not found]
U3000	Power Steering - [Link target (target-id 317740-) not found]
U3002	Antilock Brake System - [Link target (target-id 309495-) not found]
U3002	Data Communications - [Link target (target-id 280674-) not found]
U3003	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 205272-) not found]
U3006-U3009	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 311937-) not found]
U300D	Wiring Systems and Power Management - [Link target (target-id 319488-) not found]
U3018	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 297157-) not found]
U3019	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 297157-) not found]
U3023	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 327359-) not found]
U3034	Data Communications - [Link target (target-id 315363-) not found]
U3035	Data Communications - [Link target (target-id 315363-) not found]
U3501-U3588	Starting, Charging, and Low Voltage Energy Storage - [Link target (target-id 297157-) not found]
U35B9	Data Communications - [Link target (target-id 332964-) not found]

Symptom Byte List

Symptom Byte List

Symptom Byte	Symptom Byte Description	Symptom Byte Definition
00	No Sub Type Information	This sub type is used for failures where the base DTC text string provides the complete description of the failure itself.
01	General Electrical Failure	This sub type is used for General Electrical Failures that cannot be assigned to a specific sub type.

Symptom Byte	Symptom Byte Description	Symptom Byte Definition
02	General Signal Failure	This sub type is used for General Signal Failures that cannot be assigned to a specific sub type.
03	FM (Frequency Modulated) / PWM (Pulse Width Modulated) Failure	This sub type is used for FM / PWM Failures that cannot be assigned to a specific sub type.
04	System Internal Failure	This sub type is used for control module Internal Failures that cannot be assigned to a specific sub type.
05	System Programming Failure	This sub type is used for System Programming Failures that cannot be assigned to a specific sub type.
06	Algorithm Based Failure	This sub type is used for Algorithm Based Failures that cannot be assigned to a specific sub type.
07	Mechanical Failure	This sub type is used for Mechanical Failures that cannot be assigned to a specific sub type.
08	Bus Signal / Message Failure	This sub type is used for Bus Signal / Message Failures that cannot be assigned to a specific sub type.
09	Component Failure	This sub type is used for Component Failures that cannot be assigned to a specific sub type.
0A	General Electric Failures — 2	This range specifies the standard wiring failure modes (i.e., shorts and opens), and direct current (DC) quantities related by Ohm's Law.
0B	Reserved	—
0C	Reserved	—
0D	Reserved	—
0E	Reserved	—
0F	Reserved	—
10	Reserved	—
11	Circuit Short To Ground	This sub type is used for failures where the control module measures ground (battery negative) potential for greater than a specified time period or when some other value less than the low voltage limit DTC Sub Type is measured.
12	Circuit Short To Battery	This sub type is used for failures, where the control module measures vehicle system (battery positive) potential for greater than a specified time period or when some other value higher than the high voltage limit DTC Sub Type is measured.
13	Circuit Open	This sub type is used for failures, where the control module determines an open circuit via lack of bias voltage, low current flow, no change in the state of an input in response to an output, etc.
14	Circuit Short To Ground or Open	This sub type is used for failures, where the condition detected by the control module is the same for either indicated failure mode.
15	Circuit Short To Battery or Open	This sub type is used for failures, where the condition detected by the control module is the same for either indicated failure mode.
16	Circuit Voltage Below Threshold	This sub type is used for failures, where the control module measures a voltage below a specified range.
17	Circuit Voltage Above Threshold	This sub type is used for failures, where the control module measures a voltage above a specified range.
18	Circuit Current Below Threshold	This sub type is used for failures, where the control module measures current flow below a specified range.
19	Circuit Current Above Threshold	This sub type is used for failures, where the control module measures current flow above a specified range.
1A	Circuit Resistance Below Threshold	This sub type is used for failures, where the control module infers a circuit resistance below a specified range.

Symptom Byte	Symptom Byte Description	Symptom Byte Definition
1B	Circuit Resistance Above Threshold	This sub type is used for failures, where the control module infers a circuit resistance above a specified range.
1C	Circuit Voltage Out of Range	This sub type is used for failures, where the control module measures a voltage outside the expected range but not identified as too high or too low.
1D	Circuit Current Out of Range	This sub type is used for failures, where the control module measures a current outside the expected range but not identified as too high or too low.
1E	Circuit Resistance Out of Range	This sub type is used for failures, where the control module measures a resistance outside the expected range but not identified as too high or too low.
1F	Circuit Intermittent	This sub type is used for failures, where the control module momentarily detects one of the conditions defined above, but not long enough to set a specific sub type.
20	Reserved	—
21	Signal Amplitude < Minimum	This sub type is used for failures where the control module measures a signal voltage amplitude below a specified range (e.g., low gain).
22	Signal Amplitude > Maximum	This sub type is used for failures where the control module measures a signal voltage amplitude above a specified range (e.g., gain too high).
23	Signal Stuck Low	This sub type is used for failures where the control module measures a signal that remains low when transitions are expected.
24	Signal Stuck High	This sub type is used for failures where the control module measures a signal that remains high when transitions are expected.
25	Signal Shape / Waveform Failure	This sub type is used for failures where the shape of the signal (plot of the amplitude with respect to time) is not correct, e.g., improper circuit impedance.
26	Signal Rate of Change Below Threshold	This sub type is used for failures where the signal transitions more slowly than the specified limit.
27	Signal Rate of Change Above Threshold	This sub type is used for failures where the signal transitions more quickly than the specified limit.
28	Signal Bias Level Out of Range / Zero Adjustment Failure	This sub type is used for failures where the control module applies a bias voltage or a zero signal level to a circuit upon which is superimposed a signal voltage (e.g., bias voltage to an Oxygen Sensor circuit, or a filtered digital m/sec2 signal while vehicle stands still for a lateral accelerator sensor module.)
29	Signal Invalid	This sub type is used for failures where the value of the signal is not plausible given the operating conditions.
2A	Signal Stuck In Range	This sub type is used for failures where the value of the signal is in the normal operating range, but not correct for current operating conditions.
2B	Signal Cross Coupled	This sub type is used when a signal is found to be incorrectly correlated to another signal that the control module is also monitoring, indicating that the signals are shorted together
2C	Reserved	—
2D	Reserved	—
2E	Reserved	—
2F	Signal Erratic	This sub type is used for failures where the signal is momentarily implausible (not long enough for "signal invalid") or discontinuous.
30	Reserved	—

Symptom Byte	Symptom Byte Description	Symptom Byte Definition
31	No Signal	This sub type is used for failures where the control module does not detect a signal which ought to be present (e.g., wheel speed signals present for three of the four wheels and brakes not applied.)
32	Signal Low Time < Minimum	This sub type is used for failures where the control module detects the low pulse is too narrow with respect to time.
33	Signal Low Time > Maximum	This sub type is used for failures where the control module detects the low pulse is too wide with respect to time.
34	Signal High Time < Minimum	This sub type is used for failures where the control module detects the high pulse is too narrow with respect to time.
35	Signal High Time > Maximum	This sub type is used for failures where the control module detects the high pulse is too wide with respect to time.
36	Signal Frequency Too Low	This sub type is used for failures where the control module detects excessive duration for one cycle of the output across a specified sample size.
37	Signal Frequency Too High	This sub type is used for failures where the control module detects insufficient duration for one cycle of the output across a specified sample size.
38	Signal Frequency Incorrect	This sub type is used for failures where the control module measures an incorrect number of cycles in a given time period.
39	Signal Has Too Few Pulses	This sub type is used for failures where the control module measures too few pulses (e.g., position is calibrated in counts from one extreme to the other).
3A	Signal Has Too Many Pulses	This sub type is used for failures where the control module measures too many pulses (e.g., position is calibrated in counts from one extreme to the other).
3B	Reserved	—
3C	Reserved	—
3D	Reserved	—
3E	Reserved	—
3F	Reserved	—
40	Reserved	—
41	General Checksum Failure	This sub type is used by the control module to indicate an incorrect checksum calculation where memory type is not specified.
42	General Memory Failure	This sub type is used by the control module to indicate a memory failure where memory type is not specified.
43	Special Memory Failure	This sub type is used by the control module to indicate a memory failure where the specific memory type is not defined in this category.
44	Data Memory Failure	This sub type is used by the control module to indicate a data (or working) memory failure for embedded systems using FLASH memory. This is equivalent to RAM in RAM/ROM/EEPROM embedded systems.
45	Program Memory Failure	This sub type is used by the control module to indicate a program memory failure for embedded systems using FLASH memory. This is equivalent to ROM in RAM/ROM/EEPROM embedded systems.
46	Calibration / Parameter Memory Failure	This sub type is used by the control module to indicate a calibration / parameter memory failure for embedded systems using FLASH memory. This is equivalent to EEPROM in RAM/ROM/EEPROM embedded systems.
47	Watchdog / Safety µC Failure	This sub type is used by the control module to indicate a watchdog / safety µC failure, or a failure in the execution of operational software.

Symptom Byte	Symptom Byte Description	Symptom Byte Definition
48	Supervision Software Failure	This sub type is used by the control module to indicate a supervision software failure.
49	Internal Electronic Failure	This sub type is used by the control module to indicate the detection of an internal circuit failure.
4A	Incorrect Component Installed	This sub type is used by the control module to indicate a mismatch between the hardware connected to the control module and the hardware expected by the control module.
4B	Over Temperature	This sub type is used by the control module to indicate the detection of an internal temperature above the expected range.
4C	Reserved	—
4D	Reserved	—
4E	Reserved	—
4F	Reserved	—
50	Reserved	—
51	Not Programmed	This sub type is used by the control module to indicate that programming is required.
52	Not Activated	This sub type is used by the control module to indicate that some portion of the program has not been enabled.
53	Deactivated	This sub type is used by the control module to indicate that that some portion of the program has been disabled.
54	Missing Setup/Learn	This sub type is used by the control module to indicate that an operational range, etc., for a sensor or actuator must be taught to the control module, e.g. by programming or learning.
55	Not Configured	This sub type is used by the control module to indicate the need to enter (program) the sub system option content or the vehicle option content.
56	Invalid / Incompatible Configuration	This sub type indicates a control module or system configuration that cannot be valid, e.g. to have mutually exclusive options set on at the same time, or a set up that is not supported by the currently installed hardware/software.
57	Invalid / Incompatible Software Component	This sub type is used by the control module to indicate that a software component (calibration or program) has been identified as invalid for the control module or incompatible with other hardware or software identified by the control module, e.g. a downloaded calibration software component is incompatible with a permanent or downloaded strategy software component.
58	Reserved	—
59	Reserved	—
5A	Reserved	—
5B	Reserved	—
5C	Reserved	—
5D	Reserved	—
5E	Reserved	—
5F	Reserved	—
60	Reserved	—
61	Signal Calculation Failure	This sub type is used for algorithm based calculation failures where the calculated value is outside the expected range.
62	Signal Compare Failure	This sub type is used for failures where the control module compares two or more input parameters for plausibility but cannot specifically identify the component that is faulted.
63	Circuit / Component Protection Time-Out	This sub type is used for failures where the control module detects a function is active for greater than a specified time period.

Symptom Byte	Symptom Byte Description	Symptom Byte Definition
64	Signal Plausibility Failure	This sub type is used for failures where the control module detects a single input parameter is operating outside the plausible range.
65	Signal Has Too Few Transitions / Events	This sub type is used for failures where the control module monitors a parameter over time within specified limits and detects fewer than the expected number of transitions.
66	Signal Has Too Many Transitions / Events	This sub type is used for failures where the control module monitors a parameter over time within specified limits and detects more than the expected number of transitions.
67	Signal Incorrect After Event	This sub type is used for failures where the control module does not see the correct change of a parameter or group of parameters in response to a particular event.
68	Event Information	This sub type is used by the control module to indicate the detection of a system event that was not caused by the control module itself but forces the control module to store a DTC (e.g. missing functionality from another system/control module).
69	Reserved	—
6A	Reserved	—
6B	Reserved	—
6C	Reserved	—
6D	Reserved	—
6E	Reserved	—
6F	Reserved	—
70	Reserved	—
71	Actuator Stuck	This sub type is used for failures where the control module does not detect any mechanical motion in response to energizing a motor, solenoid, relay, etc.
72	Actuator Stuck Open	This sub type is used for failures where the control module does not detect any mechanical motion upon commanding the operation of a motor, solenoid, relay, etc., to close some piece of equipment.
73	Actuator Stuck Closed	This sub type is used for failures where the control module does not detect any mechanical motion upon commanding the operation of a motor, solenoid, relay, etc., to open some piece of equipment.
74	Actuator Slipping	This sub type is used for failures where the control module detects excessive duration to command a motor, solenoid, relay, etc., to move a piece of equipment to a desired position.
75	Emergency Position Not Reachable	This sub type is used for failures where the control module is unable to command a motor, solenoid, relay, etc., to move a piece of equipment to the emergency position.
76	Wrong Mounting Position	This sub type is used for failures where the control module detects incorrectly mounted components, e.g., acceleration sensor showing a position error of 90°.
77	Commanded Position Not Reachable	This sub type is used for failures where the control module is unable to command a motor, solenoid, relay, etc., to move a piece of equipment to the commanded position either due to a failure in the actuator or its mechanical environment.
78	Alignment or Adjustment Incorrect	This sub type is used for failures where the control module detects incorrectly adjusted or aligned components.
79	Mechanical Linkage Failure	This sub type is used for failures where the control module detects that the actuator is operational but the driven device is not operating, e.g., drive cable for power sliding door broken.
7A	Fluid Leak or Seal Failure	This sub type is used for failures where the control module detects that a mechanical component has an unexpected gas or liquid flow in, out, or through the component.

Symptom Byte	Symptom Byte Description	Symptom Byte Definition
7B	Low Fluid Level	This sub type is used for failures where the control module detects that a fluid level is too low for proper operation of the system.
7C	Slow Response	This sub type is used where control module has detected a response that is longer than expected or a degraded rate of change in the monitored component or system.
7D	Reserved	—
7E	Actuator Stuck On	This sub type is used for failures where the control module detects the actuator mechanical function is fixed in the ON / applied state
7F	Actuator Stuck Off	This sub type is used for failures where the control module detects the actuator mechanical function is fixed in the OFF / Released state.
80	Reserved	—
81	Invalid Serial Data Received	This sub type is used by the control module to indicate a signal was received with the corresponding validity bit equal to "invalid" or post processing of the signal determines it is invalid.
82	Alive / Sequence Counter Incorrect / Not Updated	This sub type is used by the control module to indicate that a signal was received without the corresponding rolling count value being properly updated.
83	Value of Signal Protection Calculation Incorrect	This sub type is used by the control module to indicate, that a message was processed with an incorrect protection (checksum) calculation.
84	Signal Below Allowable Range	This sub type is used for failures where some circuit quantity, reported via serial data, is below a specified range.
85	Signal Above Allowable Range	This sub type is used for failures where some circuit quantity, reported via serial data, is above a specified range.
86	Signal Invalid	This sub type is used for failures where some circuit quantity, reported via serial data, is not plausible given the operating conditions.
87	Missing Message	This sub type is used for failures where one (or more) expected message(s) is not received, e.g., periodic transmission where the repetition time is too high, or message not received as a result of unforeseen reset events of the concerning component (e.g. engine control unit communicating with ABS).
88	Bus off	This sub type is used for failures where a data bus is not available.
89	Data Transfer Failure	This subtype is for failures where an ECU requests a data transfer from an external source (off-board, on-board, or another ECU) and the data transfer initiates but fails to complete.
8A	Reserved	—
8B	Reserved	—
8C	Reserved	—
8D	Reserved	—
8E	Reserved	—
8F	Erratic	This sub type is used for failures where the signal, reported via serial data, is momentarily implausible or discontinuous.
90	Reserved	—
91	Parametric	This sub type is used for failures where the control module has detected that a component parameter (e.g., capacitance or inductance) is outside its expected range.
92	Performance or Incorrect Operation	This sub type is used for failures where the control module has detected that the component performance is outside its expected range or operating in an incorrect way.

Symptom Byte	Symptom Byte Description	Symptom Byte Definition
93	No Operation	This sub type is used for failures where the control module has detected that the component is not operating.
94	Unexpected Operation	This sub type is used for failures where the control module has detected that the component is operating in a way or at a time that it has not been commanded to operate.
95	Incorrect Assembly	This sub type is used for failures where the control module has detected that the component has been incorrectly installed (e.g., hydraulic pipes crossed over, circuits cross wired) or polarity errors.
96	Component Internal Failure	This sub type is used for failures where the control module has received an indication about the component that indicates a failure (e.g., an intelligent actuator or sensor) is indicating an internal fault.
97	Component or System Operation Obstructed or Blocked	This sub type is used for failures where the control module has detected that the operation of a component is prevented by an obstruction, e.g., advanced cruise system radar beam obstructed.
98	Component or System Over Temperature	This sub type is used for failures where the control module has detected that the temperature is too high for the correct operation of the component or system.
99	Exceeded Learning Limit	This sub type is used for failures where the control module has detected that the component or system has exceeded the expected range allowed for learning component tolerances.
9A	Component or System Operating Conditions	This sub type is used for failures where the control module has detected that environmental or other operating conditions are either temporarily or permanently outside the design limits for correct operation such that all or part of a component function is inhibited or fails, e.g. a radio is disabled because its LCD display or its CD mechanism cannot operate at a low ambient temperature.
9B	High/Excessive Flow	This sub type is used for failures where the control module has detected that the component or system is operating above the expected flow range flow, e.g. too much EGR at idle.
9C	Low/Insufficient Flow	This sub type is used for failures where the control module has detected that the component or system is operating below the expected flow range flow, e.g. too little EGR at part throttle.
9D	Component or System Under Temperature	This sub type is used for failures where the control module has detected that the temperature is too low for the correct operation of the component or system.
9E	Stuck On	This sub type is used for failures where the control module detects the electrical circuit or switch is fixed in the ON / Applied state
9F	Stuck Off	This sub type is used for failures where the control module detects the electrical circuit or switch is fixed in the OFF / Released state.
A0	Reserved	—
A1	System Voltage	This sub type is used for failures, where the control module system voltage is outside the expected range but not identified as too high or too low.
A2	System Voltage Low	This sub type is used for failures where the control module system voltage is below a specified range.
A3	System Voltage High	This sub type is used for failures where the control module system voltage is above a specified range.
A4	Reserved	—
A5	Reserved	—
A6	Reserved	—
A7	Reserved	—

Symptom Byte	Symptom Byte Description	Symptom Byte Definition
A8	Reserved	—
A9	Reserved	—
AA	Reserved	—
AB	Reserved	—
AC	Reserved	—
AD	Reserved	—
AE	Reserved	—
AF	Reserved	—
B0	Reserved	—
B1	Reserved	—
B2	Reserved	—
B3	Reserved	—
B4	Reserved	—
B5	Reserved	—
B6	Reserved	—
B7	Reserved	—
B8	Reserved	—
B9	Reserved	—
BA	Reserved	—
BB	Reserved	—
BC	Reserved	—
BD	Reserved	—
BE	Reserved	—
BF	Reserved	—
C0	Reserved	—
C1	Reserved	—
C2	Reserved	—
C3	Reserved	—
C4	Reserved	—
C5	Reserved	—
C6	Reserved	—
C7	Reserved	—
C8	Reserved	—
C9	Reserved	—
CA	Reserved	—
CB	Reserved	—
CC	Reserved	—
CD	Reserved	—
CE	Reserved	—
CF	Reserved	—
D0	Reserved	—
D1	Reserved	—

Symptom Byte	Symptom Byte Description	Symptom Byte Definition
D2	Reserved	—
D3	Reserved	—
D4	Reserved	—
D5	Reserved	—
D6	Reserved	—
D7	Reserved	—
D8	Reserved	—
D9	Reserved	—
DA	Reserved	—
DB	Reserved	—
DC	Reserved	—
DD	Reserved	—
DE	Reserved	—
DF	Reserved	—
E0	Reserved	—
E1	Reserved	—
E2	Reserved	—
E3	Reserved	—
E4	Reserved	—
E5	Reserved	—
E6	Reserved	—
E7	Reserved	—
E8	Reserved	—
E9	Reserved	—
EA	Reserved	—
EB	Reserved	—
EC	Reserved	—
ED	Reserved	—
EE	Reserved	—
EF	Reserved	—
F0	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.
F1	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.
F2	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.
F3	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.
F4	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.
F5	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.
F6	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.
F7	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.

Symptom Byte	Symptom Byte Description	Symptom Byte Definition
F8	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.
F9	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.
FA	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.
FB	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.
FC	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.
FD	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.
FE	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.
FF	Manufacturer Defined	This value is reserved for vehicle manufacturer/system supplier use.

Symptoms - Vehicle

Body Repair

[Link target (target-id 266613-) not found]

Body Systems

- [Link target (target-id 157990-) not found]
- [Link target (target-id 48522-) not found]
- [Link target (target-id 157988-) not found]
- [Link target (target-id 157992-) not found]
- [Link target (target-id 157994-) not found]
- [Link target (target-id 61936-) not found]

Brakes

- [Link target (target-id 1496-) not found]
- [Link target (target-id 302729-) not found]
- [Link target (target-id 50306-) not found]
- [Link target (target-id 54639-) not found]

Driveline/Axle

- [Link target (target-id 64694-) not found]
- [Link target (target-id 64690-) not found]
- [Link target (target-id 150354-) not found]
- [Link target (target-id 64697-) not found]
- [Link target (target-id 64692-) not found]

Driver Information and Entertainment

- [Link target (target-id 149620-) not found]
- [Link target (target-id 47032-) not found]
- [Link target (target-id 158155-) not found]
- [Link target (target-id 284269-) not found]
- [Link target (target-id 158091-) not found]

Engine

- [Link target (target-id 10846-) not found]
- [Link target (target-id 305969-) not found]
- [Link target (target-id 37429-) not found]
- [Link target (target-id 304793-) not found]
- [Link target (target-id 37994-) not found]
- [Link target (target-id 37791-) not found]
- [Link target (target-id 213827-) not found]

General Information

[Link target (target-id 62604-) not found]

HVAC

- [Link target (target-id 169242-) not found]
- [Link target (target-id 49126-) not found]
- [Link target (target-id 49993-) not found]

Power and Signal Distribution

- [Link target (target-id 159675-) not found]
- [Link target (target-id 259572-) not found]
- [Link target (target-id 121150-) not found]
- [Link target (target-id 62211-) not found]

Roof

[Link target (target-id 56634-) not found]

Safety and Security

- [Link target (target-id 284270-) not found]
- [Link target (target-id 158595-) not found]
- [Link target (target-id 284271-) not found]
- [Link target (target-id 158156-) not found]
- [Link target (target-id 346599-) not found]

- [Link target (target-id 56800-) not found]
- [Link target (target-id 57885-) not found]
- [Link target (target-id 151732-) not found]

Seats

- [Link target (target-id 160302-) not found]
- [Link target (target-id 160303-) not found]

Steering

- [Link target (target-id 55202-) not found]
- [Link target (target-id 65643-) not found]

Suspension

- [Link target (target-id 62585-) not found]
- [Link target (target-id 59474-) not found]

Transmission

- [Link target (target-id 260585-) not found]
- [Link target (target-id 57472-) not found]
- [Link target (target-id 192283-) not found] – MP 3010/3015 (NP0)
- [Link target (target-id 161481-) not found] – MP 3023/3024/3025 (NQH)

Engine Does Not Crank

Refer to the appropriate diagnostic procedure below for the symptom observed.

- [Link target (target-id 306209-) not found]
- [Link target (target-id 37780-) not found]

Engine Cranks But Does Not Run

Refer to the appropriate diagnostic procedure below for the vehicle being serviced.

[Link target (target-id 306011-) not found]

Inspection/Maintenance System Check

Refer to the appropriate diagnostic procedure below for the vehicle being serviced.

[Link target (target-id 306161-) not found]

Diagnostic Repair Verification

Note: After a repair has been made, some DTCs require the ignition to be turned Off and then back On before the scan tool function will clear the DTC.

1. Ignition/Vehicle » Off
2. Install any components or connectors that have been removed or replaced during diagnosis.
3. Perform any adjustment, programming or setup procedures that are required when a component or module is removed or replaced.
4. Perform the following action:
   4.1. Ignition » On / Vehicle » In Service Mode
   4.2. Clear the DTCs.
   4.3. Ignition/Vehicle » Off
   4.4. Driver Door» Open& Close
   4.5. Wait for greater than 2 min. orInstrument Panel = Off
5. Perform the Circuit/System Verification and verify the result ends with an All OK — If available

   or

   If the repair was related to a DTC, duplicate the Conditions for Running the DTC and use the Freeze Frame/Failure Records, if applicable, in order to verify the DTC does not set. If the DTC sets or another DTC is present » Refer to: *Diagnostic Trouble Code (DTC) List - Vehicle 2-212*

   or

   If the repair was symptom related, duplicate the conditions under which the customer concern occurred to verify the repair. If the customer concern reoccurs or another symptom is present » Refer to: *Symptoms - Vehicle 2-259*

Proactive Alerts List

This master list includes all applicable Proactive Alert Identifiers in alphanumeric order.

Proactive alert identifiers are stored in the K73 Telematics Communication Interface Module and can only be cleared using a scan tool.

Note: If the concern is still present after following the steps for Diagnostics in any of the Proactive Alert Identifiers, contact GM TAC for further assistance. The GM TAC Agent will arrange for the stuck Proactive Alert to be cleared from OnStar Back Office.

Proactive Alerts List

Proactive Alert Service Message	Diagnostic Procedure
SAC001	12 V Starting and Charging- [Link target (target-id 276794-) not found]
SAC002	12 V Starting and Charging- [Link target (target-id 276795-) not found]
SAC003	12 V Starting and Charging- [Link target (target-id 276796-) not found]
SAC004	12 V Starting and Charging- [Link target (target-id 276797-) not found]
SAC005	12 V Starting and Charging- [Link target (target-id 276798-) not found]

Description and Operation

Proactive Alerts Description and Operation

Proactive Alert System Overview

Note: The customer must enroll their vehicle in this program through the OnStar website or with an OnStar advisor to receive Proactive Alerts. When the customer enrolls their vehicle, they select their notification preferences (email address, in-vehicle alert, and/or text message). They also identify their preferred service provider which is often the selling dealer.

This feature collects and stores specific system performance data each ignition cycle. The data is then transmitted via the cellular system (OnStar) when the On/Off Vehicle Switch has been in Run or Accessory power mode for ten minutes. The transmitted data is stored off-board the vehicle and analyzed by special algorithms to detect degraded performance. When monitored system performance degrades to predetermined levels, the off-board system sends a Proactive Alert identifier. The affected system is identified within the alert.

When a Proactive Alert is set, one or more of the following may occur:

- E-mail and/or text message is sent to the customer
- E-mail is sent to the preferred service provider (Customer Experience Manager at GM Dealers)
- A message is sent to the vehicle through the cellular system

When the vehicle receives the Proactive Alert identifier, it is stored in the Communication Interface Module. When stored, the Communication Interface Module may request a specific identifier to display on the radio and/or play an audio message. Each identifier is displayed and/or played one time only when the vehicle is started after the Alert has been set. If there is no performance improvement detected within seven days and then again at fourteen days, the system will send a reminder which contains the same identifier as the original.

When the collected data indicates component performance is normal again, no reminder alerts are sent and the system continues to monitor as before the active alert.

Proactive Alert identifiers stored in the Communication Interface Module will clear once the system is repaired. They can also be cleared using a scan tool, if desired. Ask the customer if they can produce the E-mail and check the date it was sent if you suspect that it is not active. If the customer is unable to provide the documentation, the Proactive Alert can be verified utilizing the scan tool: “Vehicle Diagnostics” >> “Vehicle Proactive Alerts”, or Service Workbench Alerts.

Note: The identifier will not be retained if the Communication Interface Module is replaced.

Note: If the concern is still present after following the steps for Diagnostics in any of the Proactive Alert Identifiers, contact GM TAC for further assistance. The GM TAC Agent will arrange for the stuck Proactive Alert to be cleared from OnStar Back Office.

Power of Green Overview

Note: Power of Green is only available for vehicles that are enrolled in Proactive Alerts.

“Power of Green” utilizes available vehicle data collected through OnStar to establish a history of 12V battery health and determine a Battery Condition. The history is based on Battery voltage, current, and other prognostic-related data, which is collected onboard during every ignition cycle. The current Battery Condition can be accessed for enrolled vehicles via the Dashboard in Techline Connect (TLC). Battery Condition will include a timestamp (date/time) with the OnStar logo if valid.

Battery Condition will be one of the following four statuses:

Green

- “OnStar monitoring indicated good battery condition.”
- No fault detected internal to Battery

- It is unlikely that the Battery will require replacement at this time

Red

- “Battery replacement recommended.”
- SAC001 – Battery Low Cranking Capability Due to Shorted Cell
- Battery testing is NOT required, therefore a print out of the Warranty Code when the battery is replaced for SAC001 is not required.
- Follow SI procedure for Proactive Alert Identifier SAC001

Yellow

- “Starting and Charging proactive alerts detected. Please consult Service Information to diagnose the concern.”
- One of the following:
  - SAC002 – Low Cranking Capability Due to Battery High Resistance
  - SAC003 – Low Cranking Capability Due to Battery Low State of Charge
  - SAC004 – Low Cranking Capability Due to High Resistance in Starter System
  - SAC005 – Low Cranking Capability Due to High Resistance in Battery or Short in Starter System
- Follow SI procedure for appropriate Proactive Alert Identifier

Grey

- “Not enough data available to determine battery condition.”
- One of the following:
  - Vehicle is not enrolled in OnStar Proactive Alerts
  - Inability to contact the Power of Green data service
  - Insufficient recent ignition cycles to make a Red/Yellow/Green determination
- If a Battery issue is suspected, proceed to Battery Inspection/Test

Updated Battery Condition data may be obtained by selecting “Refresh” button next to the timestamp.

Note: Since the Green status is dependent on a history of battery health, the Battery Condition may not update immediately and turn Green if the battery is replaced.

While the vehicle is being serviced, the Battery Condition may change from Green depending on Service actions (e.g. if battery is disconnected or becomes discharged, status may change).

Section 3

Driveline/Axle

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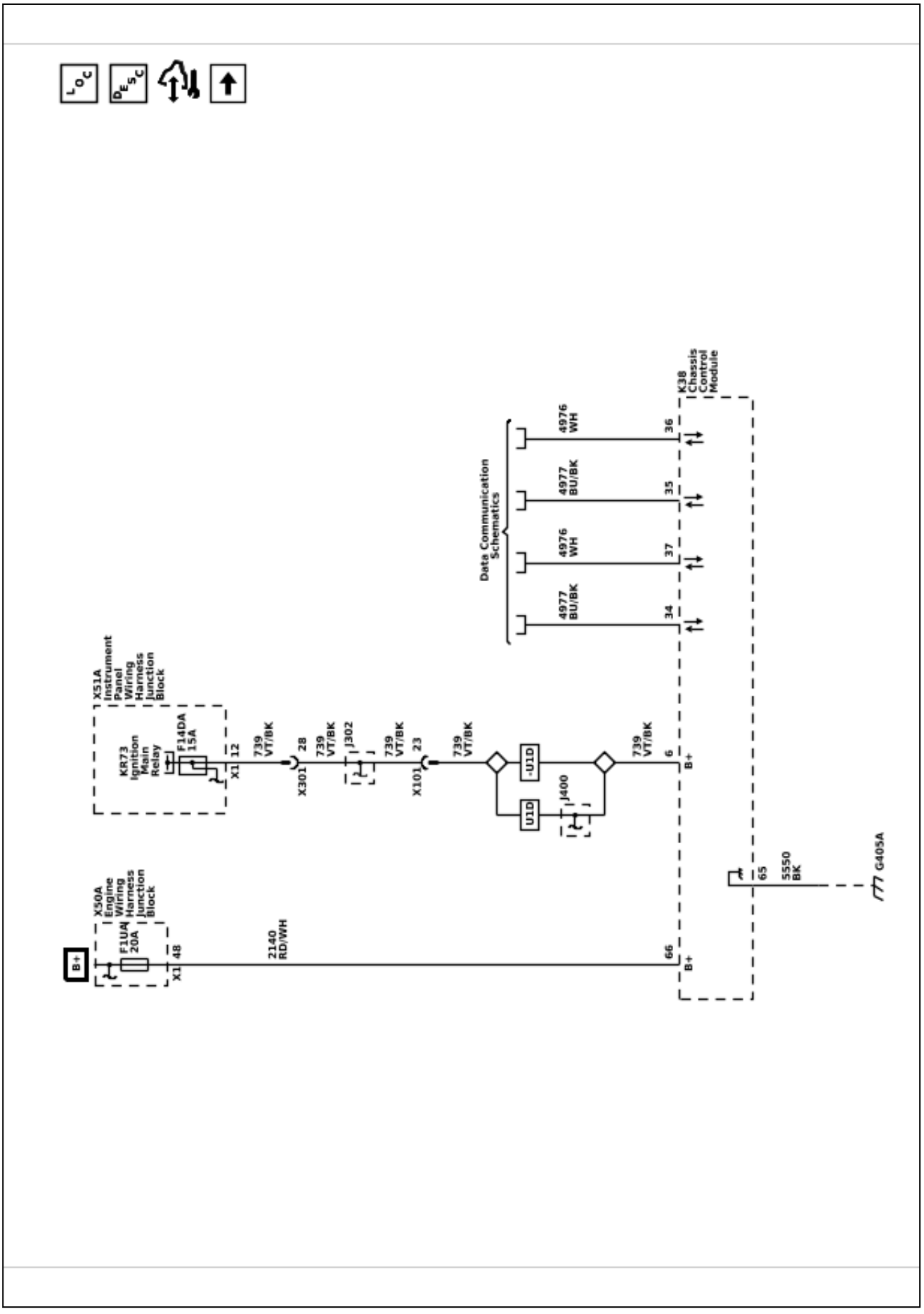
Driveline/Axle

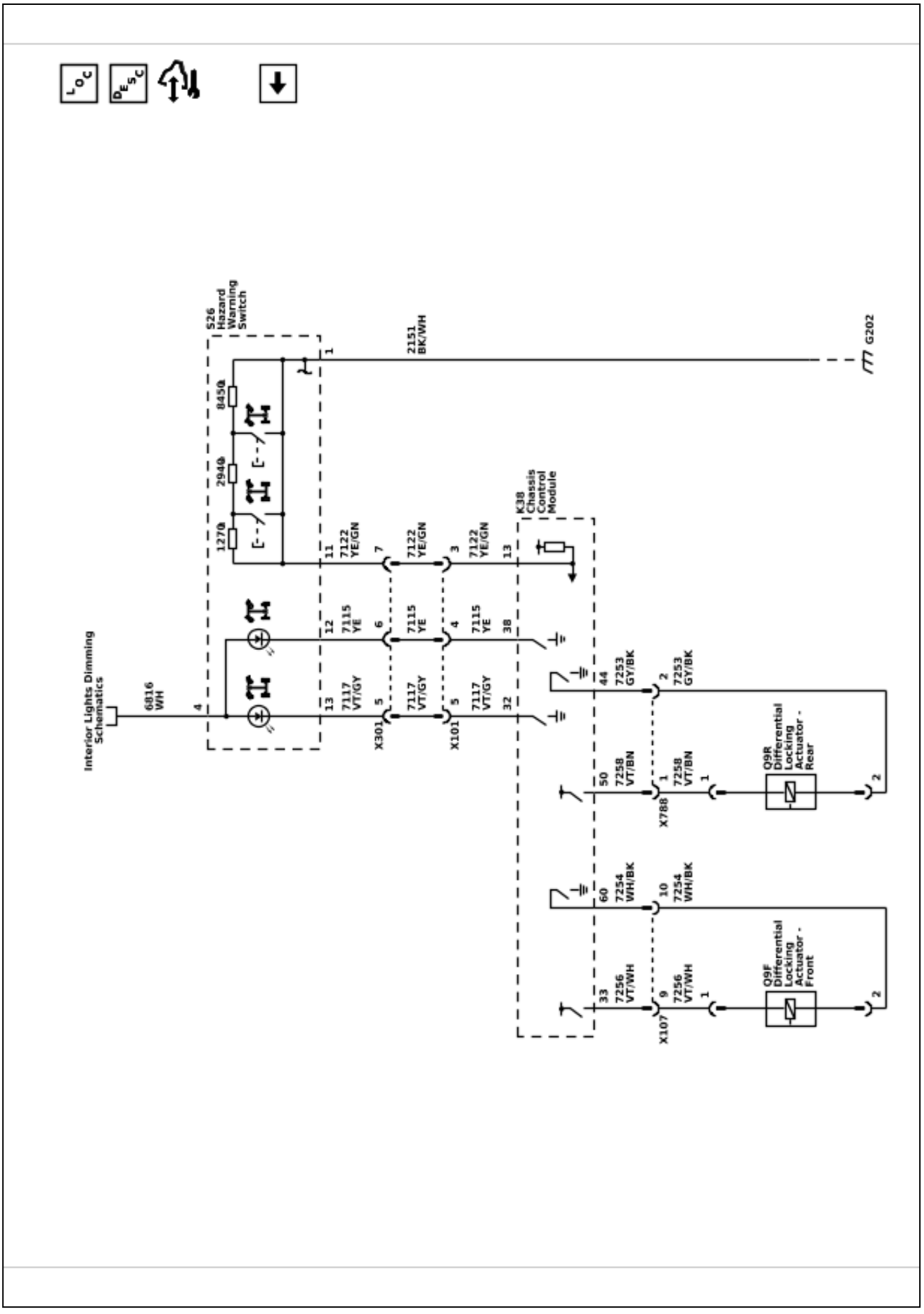
Front Drive Axle

Schematic and Routing Diagrams

Differential Lock Schematics (Module Power, Ground, Serial Data (G93 / G94))



Differential Lock Schematics (Controls, Indicators, and Locking Actuators (G93 / G94))



Description and Operation

Front Drive Axle Description and Operation

Selectable Four Wheel Drive (S4WD) Front Axle Description and Operation

The Selectable Four Wheel Drive (S4WD) Front Axle consist of the following components:

- Differential Carrier
- Differential Assembly
- Drive Axle Clutch Sleeve
- Electric Motor Actuator
- Inner Axle Shaft Housing
- Intermediate Axle Shaft
- Wheel Drive Shaft – Left
- Wheel Drive Shaft – Right

The front axle on a Selectable Four Wheel Drive system uses a central disconnect feature in order to engage and disengage the front axle. When the driver engages the 4WD system, the Transfer Case Control Module sends a signal to the electric motor actuator to energize and extend the plunger inside. The extended plunger moves the clutch fork and drive axle clutch sleeve across the intermediate axle shaft and the wheel drive shaft and locks the two shafts together. The locking of the two shafts allows the axle to operate in the same manner as a semi-floating rear axle. A propeller shaft connects the transfer case to the front axle. The differential assembly uses a conventional ring and pinion gear set to transmit the driving force of the engine to the wheels. An open differential allows the wheels to turn at different rates of speed while the axle continues to transmit the driving force. This prevents tire scuffing when going around corners and premature wear of internal axle parts. The ring and pinion set and the differential are contained within the carrier. The axle identification number is located on lower left of the differential cover. The front wheel drive half shafts are completely flexible assemblies consisting of inner and outer constant velocity CV joints protected by thermoplastic boots and connected by a wheel drive shaft.

Front Axle Electronic Locking Differential Description and Operation

The electronic locking differential functions as an open differential when not engaged while providing the capability to fully lock the differential based on driver request and vehicle engagement conditions. Locking of the front differential provides 100% of the available torque to both ends of the axle forcing the left and right wheels to rotate at the same speed. In order for the front axle differential lock actuator to energize, the vehicle must be operating under the following conditions:

- Transfer case 4 LO range is engaged
- Rear axle differential lock is engaged
- Hill Descent Control is not active

The Normal/Off-Road mode switch provides an input to the Body Control Module (BCM) which sends the selected vehicle mode to the Integrated Chassis Control Module (ICCM) through the High Speed GMLAN. The ICCM uses this message to determine front locker engagement/disengagement based upon vehicle speed:

- Normal mode engagement allowed if vehicle speed is less than 30 km/h (19 mph).
- Off road mode engagement allowed if vehicle speed is less than 30 km/h (19 mph).

In addition to engagement/disengagement of the differentials, the mode switch signal is used to disable the ABS and ESC features when the front axle is locked in Normal mode. The momentary Front Lock switch provides an ICCM input to energize the front axle differential lock high control and low control relays. The relays provide power to energize an electromagnetic actuator within the front differential. As the electromagnet is energized, torque is created on a drag plate which actuates a ramping mechanism. The ramping mechanism translates this rotational force into the axial motion of a locking mechanism. The locking mechanism engages the differential side gear which locks side gear rotation to the differential housing, providing a fully locked differential.

The ICCM uses wheel speed sensor signals from the Electronic Brake Control Module (EBCM) and a steering angle sensor signal from the Power Steering Control Module (PSCM) to determine if the axle is locked. The ICCM will illuminate the front axle lock switch indicator and send a Front Axle Locked indicator request to the BCM which transfers the message request to the Instrument Panel Cluster (IPC). The IPC will display a front axle locked state on the Off Road DIC screen. The front axle will remain in the locked position until one of the following events occur:

- A driver request to disengage

- Rear axle differential lock is disengaged
- Vehicle speed is greater than 40 km/h (25 mph) in Normal Mode
- Vehicle speed is greater than 56 km/h (35 mph) in Off-Road Mode
- Transfer case is shifted into 4 HI or NEUTRAL
- An ABS or ESC event in OFF Road Mode and vehicle speed is greater than 40 km/h (25 mph)

When the locking differential is deactivated, the ICCM will de-energize the front axle differential lock high control and low control relays. With the electromagnetic actuator deenergized, a series of return springs within the differential lock assembly forces the locking mechanism to disengage and the differential again operates as a fully open differential.

Section 4

Driver Information and Entertainment

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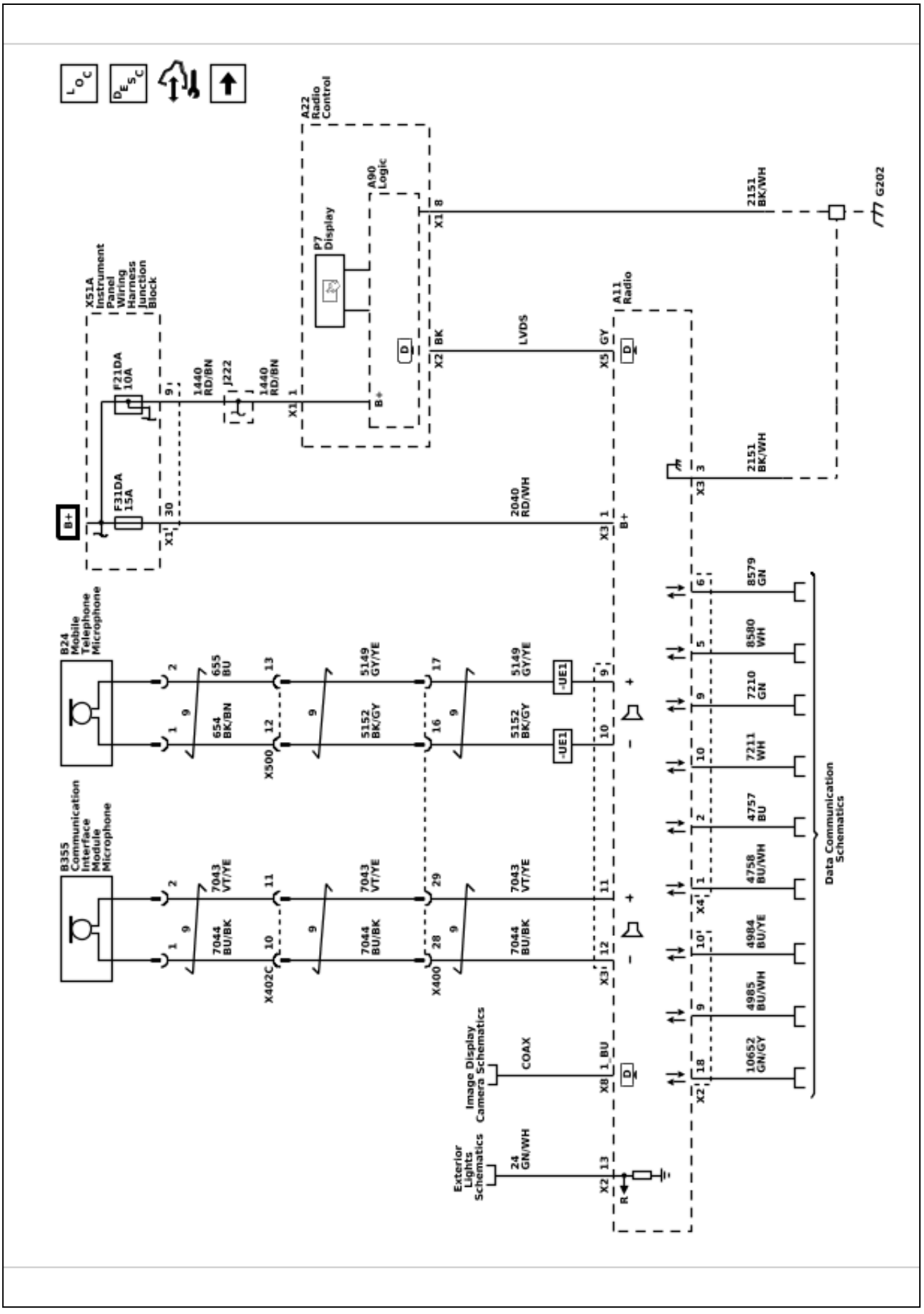
Driver Information and Entertainment

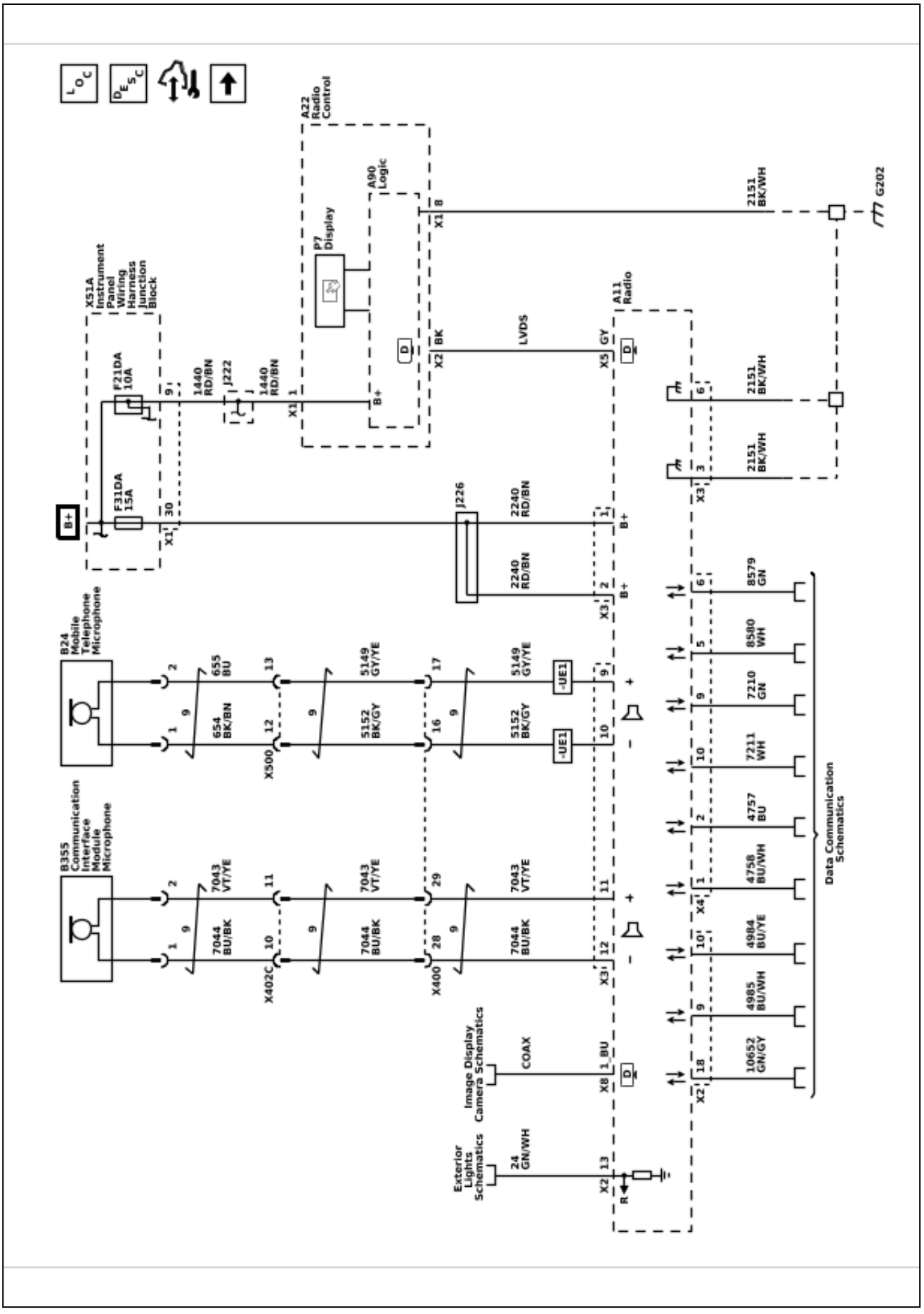
Cellular, Entertainment, and Navigation

Schematic and Routing Diagrams

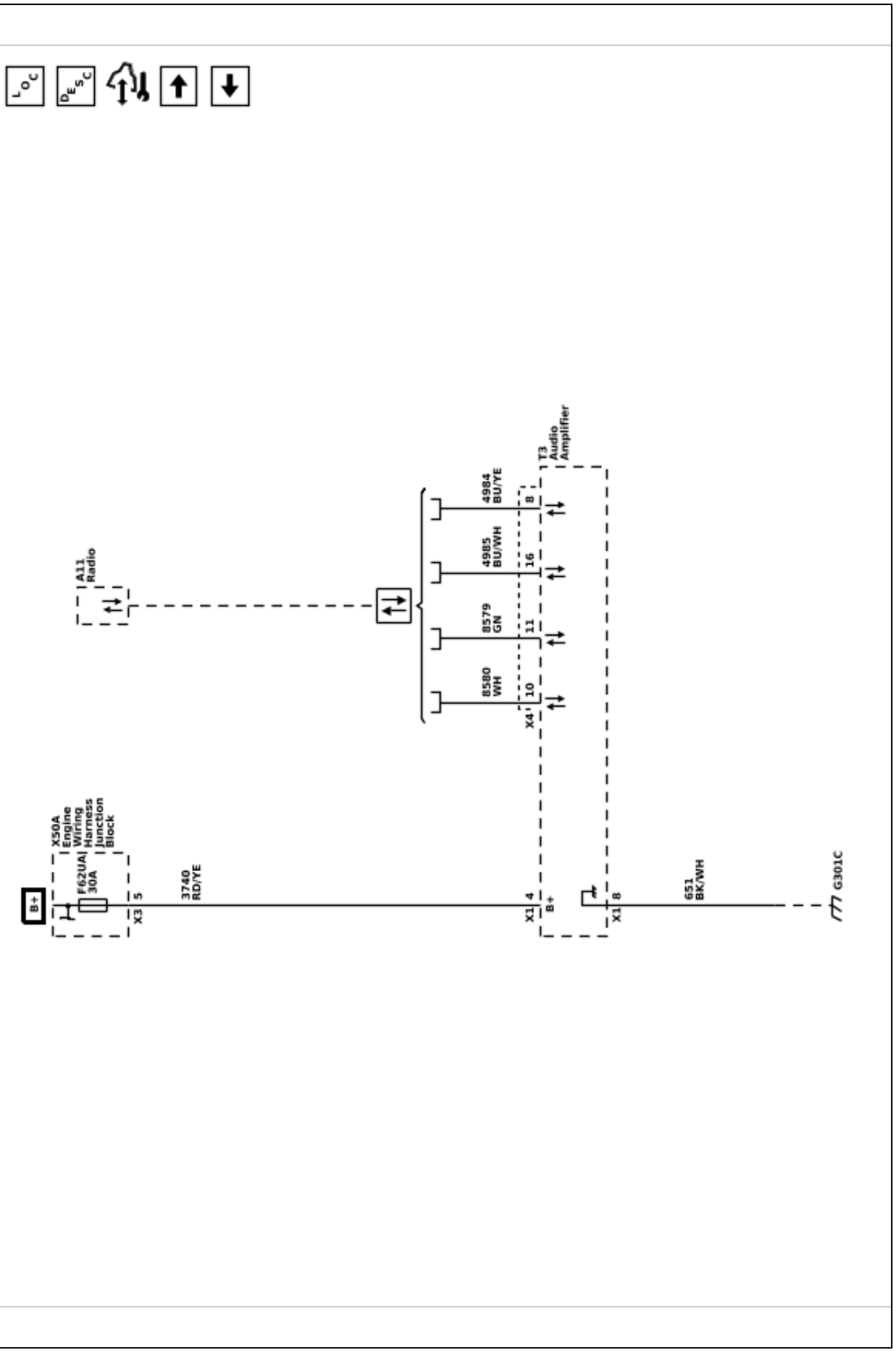
Radio/Navigation System Schematics (Power, Ground, Serial Data, Microphone, and Subsystem References (UQA))



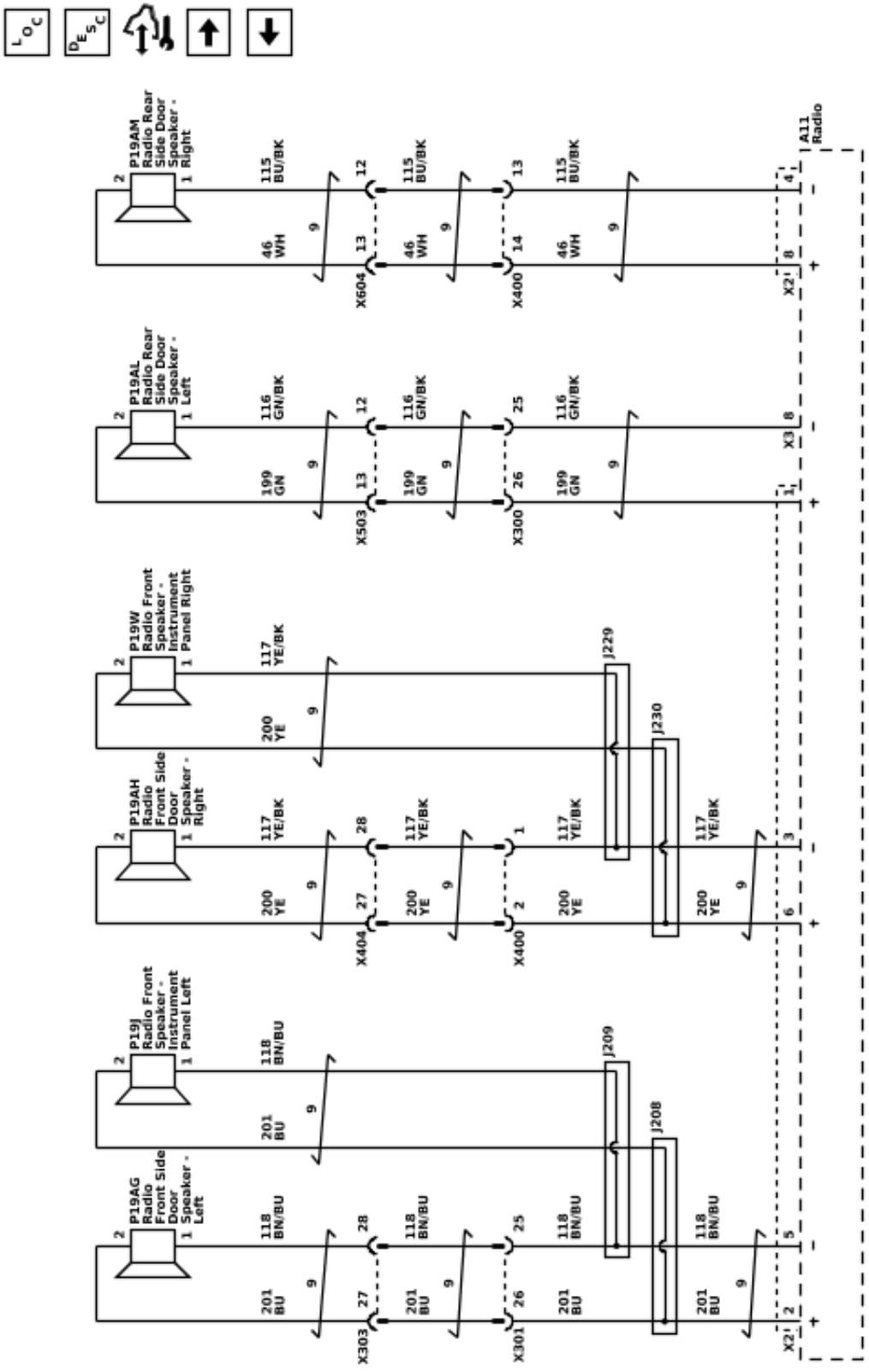
Radio/Navigation System Schematics (Power, Ground, Serial Data, Microphone, and Subsystem References (UQ3))



Radio/Navigation System Schematics (Audio Amplifier Power, Ground and Serial Data (UQA))



Radio/Navigation System Schematics (Speakers (UQ3))



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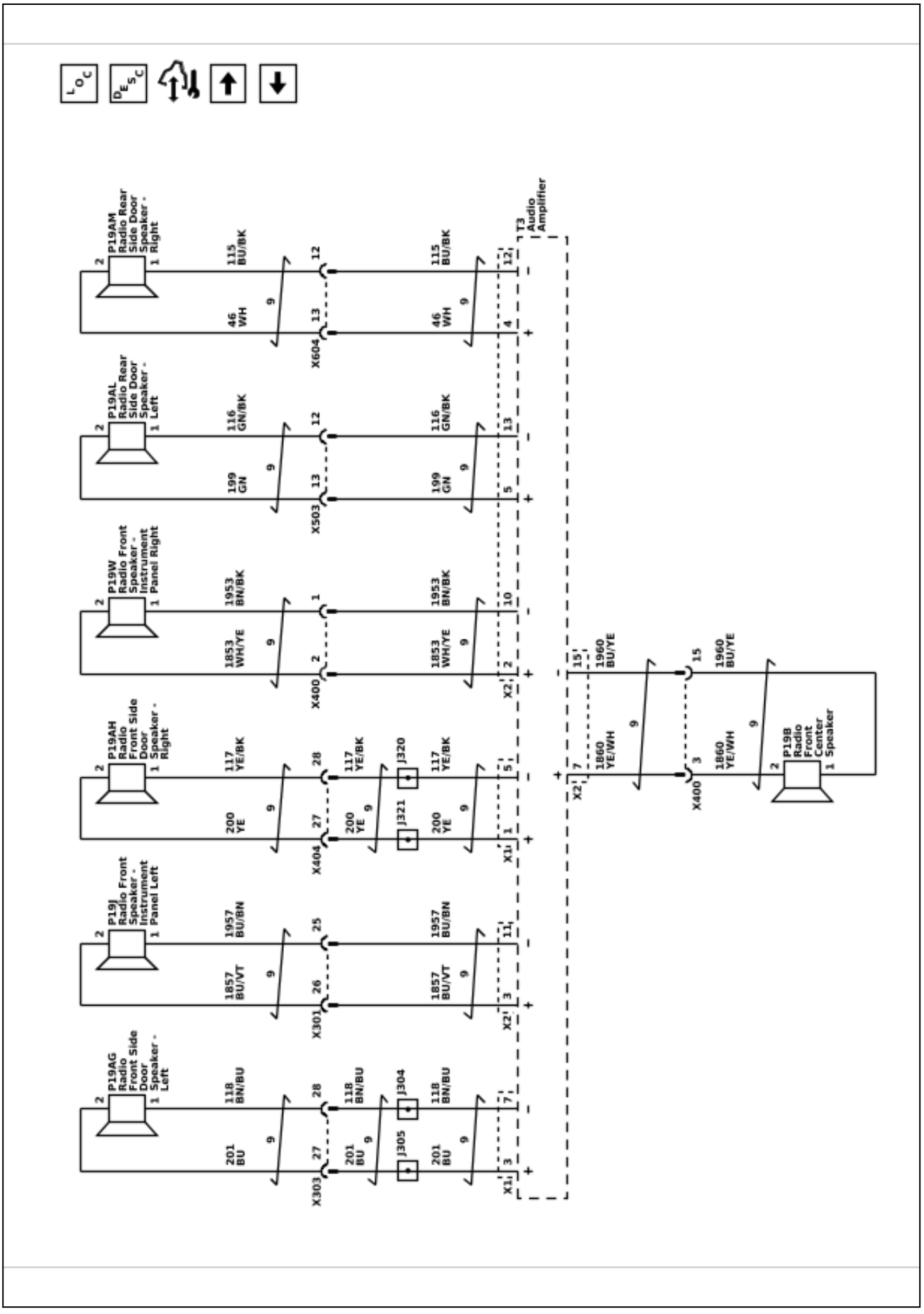
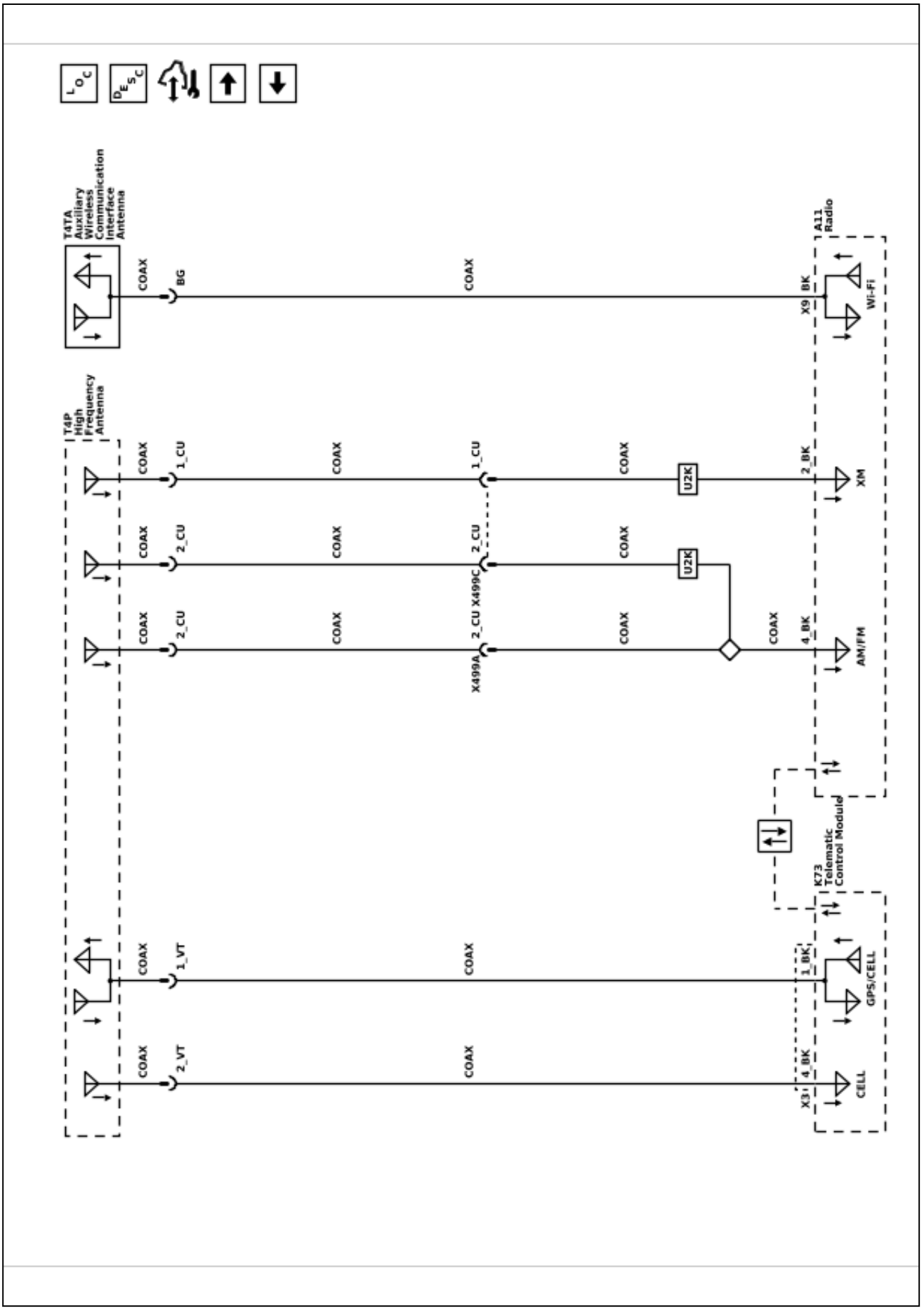
Radio/Navigation System Schematics (Speakers (UQA))



Radio/Navigation System Schematics (Antennas)



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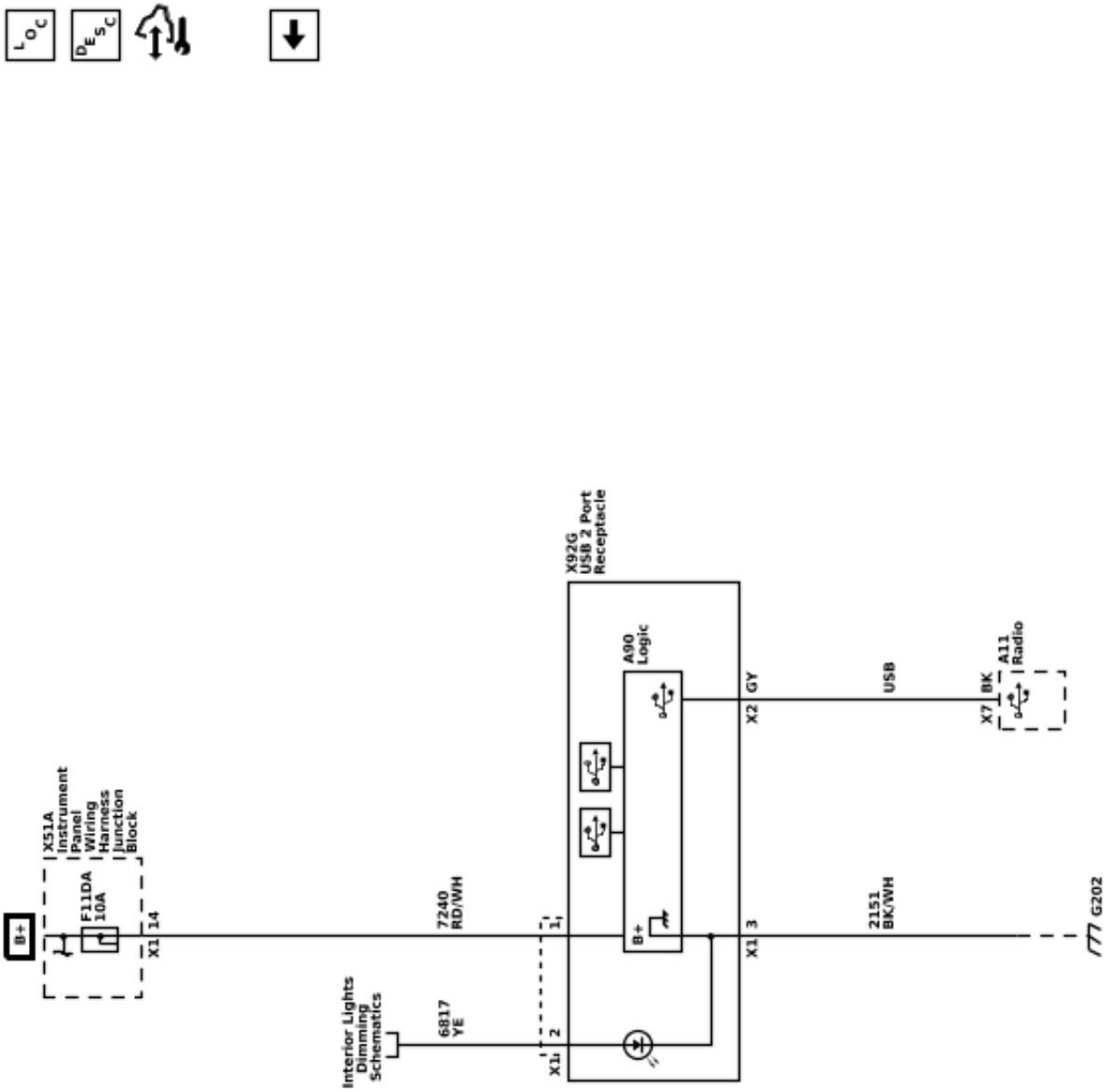
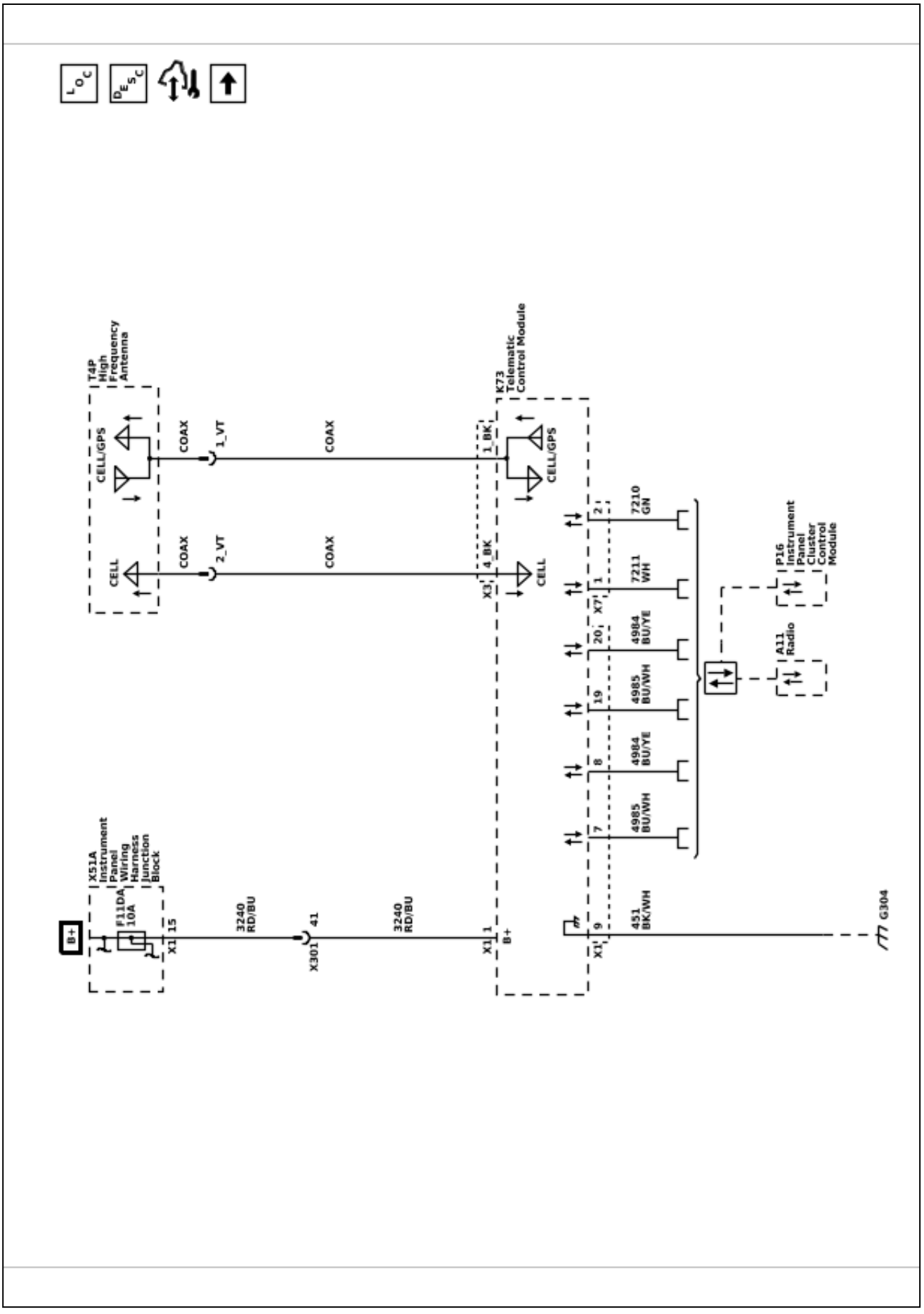
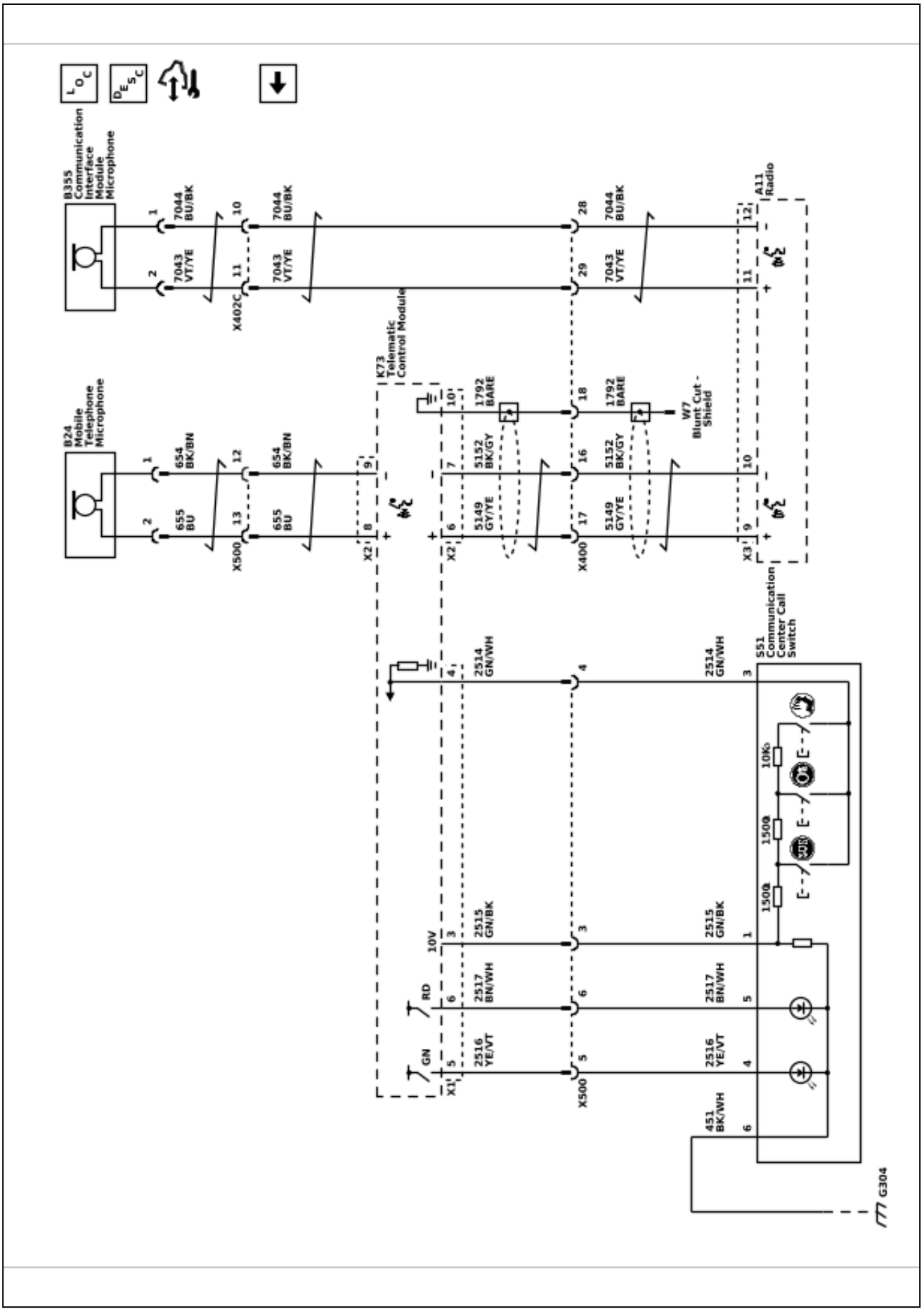
Radio/Navigation System Schematics (Auxiliary Input (UBI / UBP))



OnStar/Telematics Schematics (Power, Ground, Serial Data and Antennas (UE1))



OnStar/Telematics Schematics (Controls and Audio Signals (UE1))



Description and Operation

OnStar Description and Operation

The OnStar® system consists of the following components:

- Telematic Control Module
- OnStar® Three Button Assembly
- Microphones
- Cellular Antenna
- Navigation Antenna
- Back Up Battery

The OnStar® system supports the following capabilities:

- WiFi Support
- TTY (Teletypewriter)
- FOTA (Firmware Over The Air)

This system also interfaces with the factory installed vehicle audio system.

Telematic Control Module

The OnStar® Telecommunications Platform (TCP) system communicates with various infotainment components via ethernet. The OnStar® TCP uses Global System for Mobile Communication (GSM) to communicate data and voice signals over the national cellular network. The Telematic Control Module (TCM) supports entertainment WiFi Hotspots by providing a connection to the cellular network for internet access. The module is capable of up to 5G LTE speeds and houses 2 technology systems, one to process Global Positioning System (GPS) data, and another for cellular information. The module sends and receives all cellular communications over two cellular antennas and cellular antenna coax cables.

The OnStar® TCP system has two antenna inputs, a primary cellular signal and a combined GPS/secondary cellular signal. OnStar® can receive signals from multiple global navigation satellite systems, including the United States developed GPS and Russian developed Global Navigation Satellite System (GLONASS).

The module also has the capability of activating certain features such as, the horn, remote engine starting, initiating door lock/unlock, or activating the exterior lamps using the serial data circuits. These functions can be commanded by the OnStar® Call Center per a customer request or mobile device app depending on vehicle and customer subscription.

Dedicated circuits are used to connect the TCM to a microphone, the button assembly, and radio. When equipped, the TCM may contain a back up battery (BUB) which is internal to the control module and replaceable through an access cover. The TCM communicates with the rest of the vehicle over the serial data bus and Ethernet.

Power is provided by a dedicated, fused B+ circuit. Ground is provided through the vehicle wiring harness attached to the module. The power mode state is determined by the TCM through serial data messaging.

OnStar® Three Button Assembly

- The OnStar® button assembly may be part of the rearview mirror, or a separate, stand alone unit. The button assembly is comprised of 3 buttons or 3 capacitive touch buttons and status LED's or an error indicator. The buttons are defined as follows:
  - The answer/end button, which is black with a white phone icon or a white driver figure seated with voice signals near its face, allows the user to answer and end calls or initiate speech recognition.
  - The blue OnStar® call center button, which displays the OnStar® logo, allows the user to connect to the OnStar® call center.
  - The emergency button, which displays white letters "SOS" with red background, sends a high priority emergency call to the OnStar® call center when pressed.

If the green LED does not illuminate, this may indicate that the customers OnStar® subscription is not active or has expired. Push the blue OnStar® button to connect to an advisor who can then verify the account status.

The TCM supplies 10 volts to the OnStar® button assembly on the keypad supply voltage circuit. When pressed, each button completes a circuit across a resistor allowing a specific voltage to be returned to the TCM on the keypad signal circuit. Depending upon the voltage range returned the TCM is able to identify which button has been pressed.

The OnStar® status LED or error indicator is located near the buttons. The LED is green when the system is ON and operating normally. When any indicator is illuminated and flashing, it is an indication that a call is in progress. When the LED is red, this indicates a system malfunction is present. In the event there is a system malfunction and the OnStar® system is still able to make a call, the LED will flash red during the call.

Each LED or error indicator is controlled by either the TCM over dedicated LED signal circuits or by low speed CAN 5 serial data depending on the inside rearview mirror option. Ground for the LED is provided by the wiring harness attached to the button assembly.

Secondary OnStar® Controls

Some vehicles may have an additional button that when pushed can engage the OnStar® system. The button may be a symbol of a face with sound waves, or may say MUTE, or be a symbol of a radio speaker with a slash through it.

By engaging the OnStar® system with this feature, the user can interact with the system by use of voice commands. A complete list of these commands is supplied in the information provided to the customer. If the information is not available for reference, at any command prompt the user can say "HELP" and the TCM will return an audible list of available commands.

Microphones

This system utilizes two hands free audio microphones, the primary microphone on the driver side and a secondary/reference microphone for the front passenger side. The primary microphone is connected directly to the TCM. It is also connected by an analog pass-through circuit to the radio from the TCM. The secondary microphone is connected directly to the radio.

The primary microphone is used for emergency and OnStar® calls. During normal operating conditions it also provides Bluetooth® calls and speech recognition to the radio. The secondary microphone is used as a reference for the primary microphone for Barge-in and Passenger Interference Cancellation during speech recognition and also to enhance the driver side hands free calls. For model year 2018 and beyond the secondary microphone can also be used for front passenger hands free phone calls. Barge-in allows a user to speak over the system prompts. Passenger Interference Cancellation ignores unwanted inputs from cabin noise that is not related to the prompts given by the user.

The front passenger secondary microphone is never used as a direct source for an OnStar® call. The second microphone input modifies the primary microphone input to reduce background noise and other interference. An OnStar® call requires the microphone to be directly connected to the TCM. During a normal (non-emergency) OnStar® call the TCM receives an audio signal from the primary microphone and sends the signal to the radio via the Ethernet connection. The radio processes the OnStar® call audio and sends it back to the TCM via the Ethernet connection. During an emergency button call the TCM contacts the OnStar® call center directly and does not send the signal to the radio.

Cellular and GPS Antennas

The combination antenna will have any of the following antenna elements when equipped with OnStar®:

- Primary cellular element
- Secondary cellular element
- GPS element
- Digital radio element
- AM/FM element

The OnStar® Telematics Communication Platform (TCP) system uses 2 cellular antenna elements to send and receive cellular data, the primary cellular element and the secondary cellular element. The primary cellular signal is carried by a coax cable that connects the antenna directly to the TCM. Details of the secondary cellular signal are further described below.

The GPS antenna element is used to collect the signals of the orbiting GPS satellites. GPS signals are output from the TCM on Ethernet or CAN 5. Other modules on Ethernet may use the GPS latitude, longitude and satellite time data broadcast by the TCM. Using positioning information from the vehicle Ethernet avoids the use of a coaxial signal splitter to pass the analog GPS signal to other modules. Within the antenna is housed a low noise amplifier that allows for a more broad and precise reception of this data. Also housed within the antenna is circuitry to combine the GPS signal and the secondary cellular signal. The combination GPS/secondary cellular signal is carried by a coax cable that connects directly to the TCM. The cable also provides a path for DC current for powering the antenna.

Compass Heading

The TCM has a compass feature to calculate vehicle direction which is displayed via the instrument panel cluster or designated display. The compass heading is determined by dead reckoning until the GPS 3rd fix is established. The dead reckoning is accomplished by using the yaw rate sensors and wheel ticks to determine heading changes from a GPS known heading. The GPS 3rd fix heading is determined by the deferential of two locations.

Bluetooth®

With the OnStar® TCP system, Bluetooth® resides in the radio. Refer to Radio/Audio System Description and Operation for further details.

Phantom Phone Calls

A customer may report that the OnStar® system is attempting and/or completing phone calls which the operator of the vehicle did not initiate.

It is important to know which type of reported phantom phone call the operator is reporting. Some phone calls of this nature are considered normal and cannot be addressed other than through education, while others may require some remedial action to resolve. When attempting resolve, it is very important to determine under which circumstances the reported Phantom Phone Call resulted.

The following are different scenarios:

- The vehicle may receive an incoming call just like any other phone. Typically the customer will hear the phone ringing in the vehicle. This scenario also includes incoming Bluetooth® calls.
- Because the button assembly and associated wiring feeds voltage back to the OnStar® system based on the amount of voltage drop through each of the buttons, should the return line be partially shorted to voltage, the system could interpret this voltage as a key press. If one of the buttons voltage is simulated, such as the Blue button, the system will make a phone call just as if the button had been pressed by the operator of the vehicle. Refer to the OnStar® Button Malfunction document for diagnostics.
- Internal module fault. Some customers may report a condition where ″Phone Unavailable″ message is heard after the vehicle door is opened or key is cycled. The technician may find a DTC stored in the Telematic Control Module (example: U1500 or B1000). Refer to diagnostics for the DTC making sure to follow any applicable Bulletins or PIs.
- Unwanted Hands free calling activation. A customer may report that the ″Ready!″ or ″OnStar® Ready!″ message is heard while driving. The customer may also advise that this seems to happen mostly while making a turn. In some cases it has been found that the customer is inadvertently pressing the ″push to talk″ button on the steering wheel controls. On rare occasions, other issues in the steering column or Steering Wheel Control system may induce this event.

The majority of reported Phantom Phone Calls can be attributed to accidental button presses or customer induced concern. In some cases an incoming call may be mistaken as a phantom call concern. It is important to verify all aspects of the customer concern in order to properly duplicate and diagnose the condition. If the concern points to normal operation and customer induced concern, please communicate to the customer this condition is a normal operating characteristic of their vehicle.

Back-up Battery

In some vehicles, the telematics system is equipped with a Back-Up Battery (BUB) installed inside the TCM. This battery is a single-cell lithium-ion rechargeable battery assembly, connected with a short electrical harness, to the circuit board in the module. Contained within this single-cell battery package are a temperature-sensing thermistor, automatic-resetting circuit-overload protection, and a low-pressure vent valve. Nominal voltage of the battery pack is 3.0 - 3.4 volts.

The BUB is only switched into service when the telematics system is in normal On condition, Ignition » On / Vehicle » In Service Mode and main vehicle battery power (B+) at the TCM suddenly becomes near-zero. At this time BUB power is connected to the main circuit board power using solid-state power switching circuits. After initiating BUB for module power, the CAN 5 bus is monitored for a message confirming a collision-event, or near-collision event, has occurred. If a confirmation message is received, the TCM continues to use BUB as the power supply until it is depleted. If a confirmation message is not received within 10 seconds, the BUB power circuits are internally disconnected, preventing inadvertent dis-charge of the battery.

Charging circuitry within the TCM maintains the state of charge. The BUB charging occurs as determined by the module software, primarily based on temperature and state of charge. Battery state of charge is measured by the telematics module circuitry, and remaining energy capacity calculated by the module software. On-board diagnostic tests check for circuit faults, over-temperature conditions, and low-energy capacity. Current DTCs will set for each of these conditions. No component checks are required, and are not recommended, for BUB diagnosis.

WiFi Support

The TCM supports entertainment WiFi hotspots by providing a connection to the cellular network for internet access. The radio acts as the central WiFi router and connects hardwire Ethernet to the TCM. The TCM completes the connection to the internet through the cellular network. It has the ability to connect up to 7 devices at one time.

Audio System Interface

When the OnStar® requires audio output, a serial data message is sent to the audio system to mute all radio functions and transmit OnStar® originated audio. The OnStar® audio is transmitted to the vehicle audio system by the Ethernet and CAN 5 circuits.

The audio system will mute and an audible ring will be heard though the speakers if the vehicle receives a call with the radio ON.

On some vehicles, the HVAC blower speed may be reduced when the OnStar® system is active to aid in reducing interior noise. When the system is no longer active, the blower speed will return to its previous setting.

OnStar® Sleep Cycle

The OnStar® system uses a unique sleep cycle to allow the system to receive cellular calls while the vehicle is OFF and retained accessory power mode has ended. This cycle enables the TCM to perform remote functions, such as door unlock, as commanded over the air by the OnStar® Call Center, and to continue to maintain an acceptable level of battery electrical drain.

The OnStar® system uses 4 states of readiness, depending upon the type of cellular market the vehicle is in when the vehicle is Off:

- High power
- Low power
- Sleep
- Digital standby

The high power state is in effect whenever the vehicle is ON or in PROPULSION MODE, or retained accessory power is enabled, and the OnStar® system is sending or receiving calls or when the system is performing a remote function.

The low power state is in effect when the OnStar® system is idle with the vehicle is Ignition » On / Vehicle » In Service Mode, or with retained accessory power enabled.

The digital standby power state is entered after the vehicle has been shut off and the retained accessory power has timed out while in a digital cellular area. When in digital standby mode, the OnStar® module is able to perform all remote functions as commanded by an OnStar® advisor at any time, for a continuous 120 hours. After 120 hours, the OnStar® module will go into sleep mode until a wake up signal from the vehicle is seen by the TCM. If the OnStar® module loses the digital cellular signal it will revert to analog mode and follow the standard sleep state (9 minutes OFF, 1 minute standby) based on the time of the GPS signals, this will continue until a digital cellular signal is again received.

If the OnStar® system loses battery power while the system is in a standby or sleep mode, the system will remain OFF until battery power is restored and the vehicle is Ignition » On / Vehicle » In Service Mode.

Features

OnStar® Personal Calling

The hands free, OnStar® personal calling cellular phone feature is an additional feature of the OnStar® system. This feature is embedded within the TCM; however it must be activated by an OnStar® advisor. OnStar® personal calling operates similar to most hand held cellular phones in that the availability for its usage is based on minutes or units. The customer must have a current OnStar® subscription, as this feature cannot be utilized without it. To use OnStar® personal calling, the customer must also purchase units (minutes) as outlined in the owners guide provided with the OnStar® system. Units begin to deplete, 1 unit is equal to 1 minute, as the customer makes outbound phone calls, answers inbound phone calls, or while connected to the OnStar® virtual advisor. In addition, units may also have an expiration date, depending upon the type of units purchased.

Turn by Turn Navigation (if equipped)

Turn by Turn Navigation allows the driver to contact OnStar® to obtain directions for driving from a current location to a desired location. The Turn by Turn Navigation system stores your planned route and continually checks your position along that route, when you deviate from the planned route, the system will recognize this and prompt the driver with verbal prompts for how to proceed. .

Teletypewriter (TTY) Users

OnStar® has the ability to communicate to deaf, hard-of-hearing, or speech-impaired customers while in the vehicle. The available dealer-installed TTY system can provide in-vehicle access to all of the OnStar® services, except Virtual Advisor and OnStar® Turn-by-Turn Navigation.

Deactivated OnStar® Accounts

In the event a customer has not renewed their OnStar® account after expiration or the account was never activated, OnStar® will make a discrete cellular call to the vehicle to deactivate the OnStar® system. Before taking this action, customers are notified that the OnStar® system in their vehicle will be deactivated unless they elect to renew the account. After the OnStar® account has been deactivated, customers will experience the following:

- The OnStar® status LED will not illuminate.
- The OnStar® system will NOT attempt to connect to the OnStar® Call Center in the event of a collision or if the vehicle's front air bags deploy for any other reason.
- An emergency button press will play a demo message indicating the service has been deactivated.
- An OnStar® Call Center button press will connect the customer with a dedicated sales team who can sell an OnStar® subscription and reactivate the vehicle. Depending on the type of OnStar® hardware in the vehicle, the customer may first hear a demonstration message stating there is no current OnStar® subscription for the vehicle, and directing the customer what to do to activate services.
- OnStar® personal calling will not be available, as this feature requires the customer to have a current OnStar® account. Attempts to use this feature may result in cellular connection failure messages and the inability to connect to the number dialed.

Certain vehicles that have never had an active OnStar® account, or that have been deactivated, may be unable to establish a connection with the OnStar® Call Center. When normal published diagnostic procedures do not indicate a possible cause for the no connect concern, the vehicle may have been deactivated. For deactivated vehicles, a no connect response should be considered normal operation. Further diagnosis and subsequent repair is only necessary should the customer elect to become an active OnStar® subscriber or renew the account subscription.

OnStar® Cellular, GPS, and Diagnostic Limitations

The proper operation of the OnStar® System is dependent on several elements outside the components integrated into the vehicle. These include the National Cellular Network Infrastructure, the cellular telephone carriers within the network, and the GPS.

The cellular operation of the OnStar® system may be inhibited by factors such as the users range from an analog or digital cellular tower, the state of the cellular carrier’s equipment, and the location where the call is placed. Making an OnStar® key press in areas that lack sufficient cellular coverage or have a temporary equipment failure will result in either the inability of a call to complete with a data transfer or the complete inability to connect to the OnStar® Call Center. The OnStar® system may also experience connection issues if the identification numbers for the module, station identification number, electronic serial number or manufacturers electronic ID, are not recognized by the cellular carriers local signal receiving towers.

The satellites that orbit earth providing the OnStar® system with GPS data have almost no failures associated with them. In the event of a no GPS concern, the failure will likely lie with the inability of the system to gain GPS signals because of its location, i.e. in a parking structure, hardware failure, or being mistaken with an OnStar® call which has reached the Call Center without vehicle data.

During diagnostic testing of the OnStar® system, the technician should ensure the vehicle is located in an area that has a clear unobstructed view of the open sky, and preferably, an area where analog or digital cellular calls have been successfully placed. These areas can be found by successfully making an OnStar® keypress in a known good OnStar® equipped vehicle and confirming success with the OnStar® Call Center advisor. Such places can be used as a permanent reference for future OnStar® testing.

Mobile Identification Number and Mobile Directory Number

The TCM utilizes 2 numbers for cellular device identification, call routing and connection, a mobile identification number and a mobile directory number. The mobile identification number represents the number used by the cellular carrier for call routing purposes while the mobile directory number represents the number dialed to reach the cellular device.

Firmware Over The Air

The Firmware Over The Air feature was designed to reflash software remotely. Remote reflash is an in-vehicle feature that enables the installation of a software package to update the infotainment system without requiring service test equipment to be physically connected to the vehicle. Remote reflash will utilize a long range or short range connection from the host module to a remote IT system. There must be an active OnStar® account to receive Over The Air programming or updates. To verify the status of the account perform a blue button press and verify the account is active and connects with data and location. Customers need to accept the OnStar® terms and conditions, and must have an active OnStar® account to receive any Over The Air programming or updates.

Note: A data plan is not required to receive Over The Air programming or updates. Also the programming or updates do not consume a customers available data.

Note: Cold temperatures can cause the update to fail. Warm vehicle's interior to fix this issue.

Note: Low battery can cause the update to fail. Have battery charged before running update.

Note: Fleet vehicles must be activated as a Fleet account (not a business account) and require a separate Terms and Conditions agreement to be completed. Please see your fleet administrator for assistance with completing this agreement.

Radio/Audio System Description and Operation

The entertainment system on this vehicle may have several different configurations available to it. To determine the specific configuration of the vehicle, please see the Service Parts ID Label, and refer to [Link target (target-id 47866-) not found] .

Each item in the list below represents topics covered in detail below.

- Demo Mode
- Data Communications
- Remote Radio Receiver
- Speaker Operation
- Antenna System
- Radio Reception
- Active Noise Cancellation/Auto Volume Control (If equipped)
- Microphones
- Bluetooth® (if equipped)
- WiFi
- Back Office Registration
- Applications (if equipped)
- Speech Recognition
- Navigation System Components and Features (if equipped)
- Locations Services
- Valet Mode
- Teen Driver
- Theft Deterrent
- Audio Amplifier (if equipped)
- Infotainment Controls and Display
- Steering Wheel Controls (If equipped)
- USB port
- OnStar®
- OTA (Over The Air) Programming
- GAS (Google Automotive Services) if equipped
- Compass Data
- Media Disc Player (if equipped)
- Digital Rearview Camera (if equipped)

Demo Mode

The radio on new unsold vehicles received at the dealer will be in Demo Mode. In Demo Mode a phone will only stay paired for the current key cycle and lose pairing to the radio after the vehicle shuts down and restarted after 10 min. Additional operational characteristics of Demo Mode include no retention of the following:

- Stored favorites
- Last station tuned
- Bluetooth synced devices
- Volume level
- Last app or screen view
- Audio/equalizer settings

Note: If a device was originally paired while in Demo Mode, a similar condition could occur that randomly continues to drop Bluetooth pairing after exiting Demo Mode. If the vehicle is not in Demo Mode, but it is believed the device was originally paired while in Demo Mode, then delete the device from the radio, delete the radio from the device, and perform the pairing process again.

Loss of functionality on the above items may be due to the design intent of the vehicle while in Demo Mode, no correction is needed for these conditions. This is the normal operating characteristic of the Demo Mode of the vehicle. Once the vehicle is sold, select the option labeled "Not a Demo Vehicle" to exit Demo Mode.

Data Communications

The infotainment system communicates with other devices on multiple serial data networks during operation.

Ethernet AVB
At the core of the infotainment system is the Radio Ethernet AVB (Audio Video Bridging) switch, which communicates directly to each contributing Infotainment module terminator. The Ethernet harness consists of twisted pair wires from point to point. Each module on the Ethernet infotainment system sends/receives data at 100 megabit per second (Mbps) to/from a specified port at the Radio. Some system configurations support a 1 Gigabit per second (Gbps) connection at the Radio to/from the TCP (Telematics) module. The Radio/Ethernet will also be used to program USB S/W update files to the modules connected to the Ethernet ports. Some of the data services performed over Ethernet AVB include: Chime, Service Programming via Over-The-Air updates, OnStar Turn-by-Turn directions and all other OnStar data services.

Local Interconnect Network (LIN)
The Local Interconnect Network (LIN) Bus is a single wire communication system. This bus is used to exchange information between a master control module and other smart devices which provide supporting functionality.

The Remote Radio Receiver, Information Display, Infotainment Controls and the Multifunction (tunnel) Controls all communicate on the LIN bus.

Controller Area Network (CAN)
The Radio will communicate with other modules and systems in the vehicle via CAN and CAN5. Diagnostic Trouble Codes will be read on CAN/CAN5 to diagnose Ethernet, LIN and system faults. CAN will also be used for programming calibrations using Tech Line Connect (TLC)/SPS. CAN takes the place of GMLAN on Global-B architecture systems. CAN5 is a sub-system of the entire CAN network on a vehicle and is the specific network that connects the Infotainment modules on the vehicle.

For additional information refer to *Data Link Communications Description and Operation 7-48*

Automotive Audio Bus (A2B)
The Automotive Audio Bus (A2B) uses a radio and one or more nodes. It is a private, digital, and high speed serial bus. The system contains a master (radio) and one or more nodes connected by an unshielded twisted pair (UTP) wiring harness. Diagnostic Trouble Codes (DTCs) are set within the master node for all errors in the system, if the bus is up and communicating. The system operates on full duplex, where communication is possible over a single wire if the other wire is damaged or open. The network is daisy chained. A and B ports are isolated by the A2B transceiver. The A2B bus line doesn't require any terminator. The last device is configured as end node by the A2B master processor during the network discovery process.

Remote Radio Receiver

Overview

The Radio is the Ethernet master. The radio also communicates with other components and systems within the vehicle via CAN/CAN5 and LIN. The remote radio receiver communicates with the info display module via the LIN bus for control information, touch communications and dimming level. Digital video data is sent to the display through a dedicated video cable.

The Radio receiver contains internal antennas for Bluetooth ® and WiFi. The Radio also has an external WiFi antenna (on applicable systems) that is used to receive local WiFi signals at increased distances. This is mainly used to support Over-the-Air updates.The Radio must be mounted properly to obtain proper wireless signals and GPS position. The remote radio receiver is responsible for receiving all broadcast audio bands. Broadcast signals from AM, FM, XM and DAB bands are transmitted to the radio via the vehicle antenna systems. The remote radio receiver is also responsible for the following: Video for the infotainment display, Bluetooth ®, USB, memory card reader, and speech recognition functions.

The Radio has phone projection capabilities that can transmits information directly to the vehicle infotainment system through Bluetooth or a USB connection. Downloadable applications will be available based on distracted driver safety requirements.

Radio Power
The radio receives battery power and ground from the vehicle harness.

The radio does not use a discrete ignition feed circuit for power moding. The power mode master provides the system power mode to the radio via serial data messages. The power mode master determines the system power mode by processing power mode information from ignition switch inputs. Serial data power modes supported by the radio are OFF, ACCESSORY, RUN, and CRANK REQUEST.

The radio can be turned ON with the ignition OFF. After 10 minutes of inactivity the radio will power down. If any setting (e.g. changing the station) or volume has been changed or if the radio has been powered OFF than back ON the 10 minute timer will reset from that point.

Radio Audio Outputs
When not equipped with an amplifier, the radio outputs all audio signals to the speakers via the vehicle wiring harness.

When equipped with an amplifier, the radio outputs all audio signals digitally over Ethernet.

Speaker Operation

Speakers turn electrical energy into mechanical energy to move air, using a permanent magnet and an electro-magnet. The electromagnet is energized when the radio or amplifier (if equipped) delivers current to the voice coil on the speaker. The voice coil will form a north and south pole that will cause the voice coil and the speaker cone to move in relation to the permanent magnet. The current delivered to the speaker is rapidly changing alternating current (A/C). This causes the speaker cone to move in two directions producing sound.

Antenna System

Multi-Band Antenna
The multi-band antenna is located on the roof of the vehicle. This type of antenna may be used with the AM/FM radio, but is primarily for cellular, GPS signals, and XM, if the vehicle has these features. Keep this antenna clear of snow and ice for clear reception. If the vehicle has a sunroof, the performance of the system may be affected if the sunroof is open. Loading items onto the roof of the vehicle can interfere with the performance of the system, ensure the multi-band antenna is not obstructed.

Diversity Antenna
The diversity antenna system can use up to 2 antenna amplifiers and an AM/FM element that is part of the rear end spoiler assembly or applied as appliqués to the rear glass. With 2 antennas the right antenna 1 receives both AM and FM signals, while the left antenna 2 may receive FM and DAB signals only. The antenna amplifier receives the signals from the rear end spoiler antenna element or from the glass antenna element. Each antenna amplifier is connected to the radio by a coaxial cable.

The radio antenna amplifier is enabled when the radio is turned on. The radio provides battery voltage to the antenna amplifier using the center conductor of the antenna coaxial cable. When a 12 V signal is seen by the amplifier on the center conductor of the antenna coax, the received signals are amplified.

With a 2 antenna amplifier system when the AM band is selected on the radio, the antenna 1 amplifier connects the AM antenna to the radio. When the FM band is selected, both antenna amplifiers provide FM signals to the radio. The radio switches between the two FM antennas, monitoring the signal strength and combines the signals to create one stronger signal.

Global Positioning System (GPS) Antenna
The global positioning system (GPS) antenna is part of the multi-band antenna located on the roof of the vehicle. The GPS antenna is used to collect the signals of the orbiting GPS satellites. Within the antenna is housed a low noise amplifier that allows for a more broad and precise reception of this data. The GPS antenna amplifier is powered through the coaxial cable.

The GPS antenna is connected to the telematics communication interface control module via a coax cable. The GPS signal is sent to the navigation radio via an Ethernet harness.

External WiFi Antenna
On some system configurations, an external WiFi antenna is connected to the radio to support longer range reception, compared to the internal Wifi antenna. Over-the-air updates is the main feature supported by this antenna. Data transfers used for consumer media will also be supported by this antenna when connected to a local network. The antenna is connected to the radio via coaxial cable.

Radio Reception

AM/FM Radio Signal
The radio signal is sent from a broadcast station and is then received by an antenna. The strength of the signal received depends on the following:

- The power output (wattage) of the broadcasting station
- The location of the vehicle (or receiver) relative to the broadcast tower.
- Height of the broadcast antenna
- Height of the receiving antenna
- Obstacles between the tower and the receiver
- Atmospheric conditions
- What band (AM or FM) the station is broadcasting
- Type of antenna and the ground plane

Sirius XM (SXM) Digital Radio Receiver (If equipped)
A service fee is required in order to receive the XM service.

The XM satellite receiver is integrated into the radio. XM satellite radio provides digital radio reception. The XM signal is broadcast from two satellites and, where necessary, terrestrial repeaters. The high power satellites allow the antenna to receive the XM signal even when foliage and other partial obstructions block the antennas view of the satellite. Terrestrial repeaters are used in dense urban areas. These repeaters will receive the satellite signal and re-broadcast them at

much higher power levels in order to ensure reception in areas with densely packed tall buildings. Even with repeaters the signal can be compromised resulting in loss of XM.

SiriusXM 360L
SiriusXM with 360L interface has enhanced in-vehicle listening experience for subscribers. The experience now offers more categories and system learned recommendations toward discovering more personalized content.

To use the full SiriusXM 360L program, including streaming content and listening recommendations, OnStar Connected Access is required. Connected vehicle services vary by model and require a complete working electrical system, cell reception, and GPS signal. An active OnStar connected plan is required, if the customer declines OnStar Terms and Conditions the following message can be displayed: Connection Unavailable, Please call OnStar Agent.

Reference the SiriusXM user guide for use and subscription information.

SiriusXM Tune Start
SiriusXM Tune Start is a feature that begins playing the current song from the beginning when you tune to a SiriusXM music channel in the stored Favorites. This feature can be enabled/disabled through the radio Settings menu.

When equipped, Tune Start works with most SiriusXM music channels when the channel has been saved as a Favorite in the radio. The SiriusXM app in the radio also has a list of Favorites. Saving a SiriusXM music channel as a Favorite automatically saves it in the hidden SiriusXM Favorites list. If a SiriusXM music channel is not working in Tune Start ensure the channel exists in the SiriusXM Favorites list. SiriusXM Favorites can be found in the SiriusXM Settings menu under Listener Options. Note that SiriusXM channels stored by default in new vehicles are not stored in the SiriusXM Favorites list. These channels would need to be stored as Favorites by the user for them to appear in the Sirius XM Favorites list. The radio may require a sleep cycle before Tune Start will begin to function on newly saved Favorites. Tune Start will only begin to record SiriusXM Favorites with the Ignition On, so some buffering time is required before Tune Start can function after the vehicle is started.

Tune Start is a SiriusXM feature. Reference the SiriusXM user guide, or contact SiriusXM for use and subscription information.

High Definition (HD) Radio (If equipped)
HD Radio delivers subscription free local broadcasting in a digital format which may include song title, artist name, album art, weather, traffic data, etc., on AM/FM bands. Up to four stations could be available on a single frequency for e.g. if radio station is 96.9 FM, the HD enabled radio would have additional broadcasts on 96.9 HD1, HD2, HD3 and HD4. The digital technology allows for clear reception quality and additional information.

Active Noise Cancellation/Auto Volume Control (If equipped)

Active Noise Cancellation (or sometimes referred to as Auto Volume Control) may have several different configurations. To determine the specific configuration of the vehicle, please see the Service Parts ID Label, and refer to [Link target (target-id 47866-) not found] .

The main components of the Active Noise Cancellation system are:

- Microphones in the vehicle headliner. Use schematics to determine the number of microphones in each vehicle.
- An engine speed (RPM) signal from the engine control module to the amplifier/active noise cancellation module/radio.
- Active Noise Cancellation electronics and software integrated into the audio amplifier/active noise cancellation module/radio.
- The vehicle speaker system, connected to the amplifier/active noise cancellation module/radio, to output the desired cancellation frequencies.

The Active Noise Cancellation system is operational under the following conditions:

- The amplifier/active noise cancellation module/radio has passed all self diagnostic checks.
- All doors are closed.
- Battery voltage is between 9.5 V and 16 V.
- The vehicle cabin temperature is less than 140°F (60°C).
- For internal combustion engines- Engine speed is between 550 and 3000 RPM

The Active Noise Cancellation/Auto Volume Control system is a method used to reduce the perception of certain undesirable sounds generated by the engine into the vehicle cabin. The systems uses microphone and engine speed signals, software integrated into the amplifier/active noise cancellation module/radio, and the vehicle speakers to determine and generate the correct frequencies needed to achieve the desired reduction.

The microphones are located in the headliner to monitor noise/sounds in the vehicle cabin, and are directly connected to the amplifier/active noise cancellation module/radio. For internal combustion engines the amplifier/active noise cancellation module/radio also receives an engine speed (RPM) signal from the engine control module. The amplifier/active noise cancellation module/radio processes these inputs to determine the frequency of the undesirable sound. The amplifier/active noise cancellation module/radio then calculates the appropriate cancellation frequency and outputs a cancellation signal (audio tone) to the vehicle speakers to reduce the perception of undesirable sounds by the vehicle occupants so the vehicle cabin appears quieter and without vibration.

Microphones

There are two different microphone systems depending on the vehicle. The first system is the traditional analog two wire discrete circuits wired directly to the OnStar module or the radio depending on options. The second system uses microphone arrays and amplifier referred to as nodes that operate in tandem. The system typically uses six circuits also utilizing the two wire discrete analog circuits along with input and output of the Automotive Audio Bus (A2B) Serial Data 1 digital circuits.

First Microphone System
This system utilizes two hands free audio microphones, the primary microphone on the driver side and a secondary/reference microphone for the front passenger side. The primary microphone is connected directly to the Telematics Control Module. It is also connected by an analog pass-through circuit to the radio from the Telematics Control Module. Without OnStar the primary microphone is connected directly to the radio. The secondary microphone is always connected directly to the radio.

The primary microphone is used for emergency and OnStar calls. During normal operating conditions it also provides Bluetooth calls and speech recognition to the radio. The secondary microphone is used as a reference for the primary microphone for Barge-in and Passenger Interference Cancellation during speech recognition and also to enhance the driver side hands free calls. The secondary microphone can also be used for front passenger hands free phone calls. Barge-in allows a user to speak over the system prompts. Passenger Interference Cancellation ignores unwanted inputs from cabin noise that is not related to the prompts given by the user.

The front passenger secondary microphone is never used as a direct source for an OnStar call. The second microphone input modifies the primary microphone input to reduce background noise and other interference. An OnStar call requires the microphone to be directly connected to the Telematics Control Module. During a normal (non-emergency) OnStar call the Telematics Control Module receives an audio signal from the primary microphone and sends the signal to the radio via the Ethernet connection. The radio processes the OnStar call audio and sends it back to the Telematics Control Module via the Ethernet connection. During an emergency button call the Telematics Control Module contacts the OnStar call center directly and does not send the signal to the radio.

Second Microphone System
The microphone array system uses a master which is the radio and any number of microphones or amplifiers referred to as nodes. The nodes are connected to the master via the Automotive Audio Bus (A2B) Serial Data 1 circuits. The microphone array system also utilizes the traditional 2 wire analog discrete signal circuits wired to the OnStar module or the radio. These analog circuits are only used as a backup for emergency OnStar calls if the A2B 1 is down. The primary microphone uses a digital signal operating on the A2B serial data 1 circuits. The nodes will have a + and – A2B 1 input and a + and – A2B 1 output, except for the end node which only has a + and – A2B 1 input.

Bluetooth ® (If equipped)

Bluetooth ® wireless technology is a short-range communications technology intended to replace the cables connecting portable and/or fixed devices while maintaining high levels of security. The operating range of the signal is approximately 30 feet.

The available features and functions are determined by the type of device and the software within the devices being used. For a feature or function to operate, it must be supported in both devices.

The first connection between devices is established through a process called pairing. In order to pair two devices, a password (passkey) has to be exchanged between the two devices. One device will generate the password, the other device accepts the password to complete the process. Once the devices are paired, future connections between the devices will occur automatically when the devices are on and within range of each other.

The Bluetooth ® hardware is internal to the Remote Radio Receiver. The antenna is internal to the Remote Radio Receiver. The Remote Radio Receiver supports streaming of data (music, voice, information) from cellular phones and other mobile devices that support those features. The Remote Radio Receiver is also capable of interfacing with cellular phones for hands-free features.

- The device must be paired to the system to use the available Bluetooth ® feature(s). The pairing process must only be performed once for each device, unless that device's information is deleted.
- Depending on model year up to 10 devices can be paired, refer to owners manual for details.
- Streaming Audio allows playing music from the mobile device wirelessly. Music stored on the mobile device can be viewed and controlled from the display.
- To stream audio from a mobile device, the device must be unlocked, and any additional applications should be closed.

Refer to the owners manual, supplements, and the device manufacturers information for pairing instructions.

WiFi

The WiFi hardware is internal to the Remote Radio Receiver. The WiFi or WLAN antenna is called the Wireless Communication Antenna which is connected to the Remote Radio Receiver. WiFi expands the abilities of the vehicle as described below:

- Connect to home WiFi to update software.
- When used with OnStar 4G LTE HotSpot service, it provides internet access to devices in the vehicle when connected to the HotSpot. This requires the purchase of OnStar WiFi data plan.
- Enables in-vehicle networking between passengers' devices, like home WiFi network.
- Allows remote access to external connected device application data for vehicle internet application use.

Back Office Registration

The Radio must be registered with the GM Back Office in order to receive downloaded information such as approved applications, module software updates, weather and traffic information for current location. The vehicle must have a Cellular or WiFi connection to complete the initial registration process. This process will verify the assembly plant factory feed data from the BCM, CGM and Radio serial numbers to the VIN and if the security checks are met, then the user must complete the registration process by entering email and required personal information. The registration status can be verified through the Radio "Setting – About selection.

When any of these secured ECU's are replaced, a new serial number will be recorded during the service calibration process and appended to the vehicles history data for uninterrupted back office connection.

If the Radio is replaced, the user can recover settings/applications by reregistering the email account. During the initial registration process the user will enter an email/password. The user will then be sent a follow up verification email link to setup the account completely. If the complete account setup is not performed the password reset security questions will not be entered, which will prevent reregistering this email account in the future if the password is forgotten. The radio will operate in Demo Mode or as Guest until a user profile has been set up.

Applications (If equipped)

Note: For vehicles equipped with Google Automotive Services (GAS) refer to that section below.

When the system is equipped with Bluetooth ® or WiFI, the system is capable of using applications, commonly referred to as apps.

The term application refers to any piece of software that works on a system (hardware) that is being operated by it's own software. Applications are typically small software programs which uses the hardware to perform a specific task, as opposed to operating the entire system.

- For an application to be used, it must be installed on both the vehicle infotainment system and a compatible mobile device.
- The device must be connected to the system. this may be done wirelessly via Bluetooth ®, WiFi, or via the vehicle USB port. Refer to the device manufacturers information for the proper connection method.
- When the device is connected, the vehicle infotainment system is used to remotely access and control the application on the mobile device.

- The application must work correctly on the device to work with the vehicle infotainment system.
- The user may be required to log-in to the application on the mobile device before using the application from the vehicle controls.
- Using applications will use the device's data plan.
- The device must be unlocked, and any additional applications should be closed.

Refer to the owners manual and supplements for information on mobile devices, control, and operation.

Speech Recognition

The Speech Recognition feature is implemented only in a Mid/High System Radio- CSM module. There is no Speech Recognition in a Low System. Speech Recognition allows the user to command various features of the radio via voice commands. For addition information refer to the owners manual. For model year 2018 (and forward) Mid/High systems, part of the speech recognition functionality is controlled via off-board cloud connection. A speech icon in the radio allows user to see if an utterance has been received by the off-board cloud. Points-of-interest (POIs) data are also stored off-board. Any disruption in the connection to the cloud will cause a partial loss of functionality for these systems.

For model year 2018 (and forward) there will also be a new speech recognition feature called Barge-in. This allows the user to speak over the voice prompts generated by the system. This feature is turned off by default from the factory and must be enabled by the user.

Navigation System Components and Features (if equipped)

There navigation system uses the Google Maps app which is a subscription based service (depending on available options).

The navigation system provides the following:

- A global positioning system (GPS) signal, which provides the vehicle location information.
- Map data for navigation and map route guidance.
- Route guidance with verbal prompts to the operator.
- Traffic and weather information for display on the navigation system map (with active subscription, where available).

GPS signals are an output from the telematics communication interface control module on Ethernet. Other modules on Ethernet, such as the radio may use the GPS latitude, longitude and satellite time data broadcast by the telematics communication interface control module.

Route Guidance
The map will display the route to the selected destination. Voice prompts alert the operator of upcoming events (turns) and arrivals at the destination. The navigation system will automatically recalculate if the route is not followed. The remote radio receiver uses data received from the global positioning system (GPS) satellites, the vehicle speed signal, and serial data information to accurately display the current position of the vehicle.

Points of Interest
The map database provides point of interest information. Points of interests are locations that are frequently visited. Points of interest can be can be displayed on the map or set as a destination. The following are some of the available Points of interests:

- Gas Station
- Restaurant
- College
- Police Station

Locations Services

"Locations Services Off" also referred to as Location Masking, is a feature in select 2019 and beyond Infotainment 3 systems that allows customers to enable or disable location services in their vehicle. This allows customers to control what data is being sent from their vehicle, and has important implications for other connected services.

The default setting is "Locations Services On", however, customers can enable or disable Locations Masking in two ways:

1. Press and hold the white button next to the blue OnStar® button in the overhead console.
2. In the Setting menu, select System>Privacy>Location Services>ON or OFF.

- Look for the white LOCATIONS SERVICES icon in the status bar on the Home Screen, next to the clock and outside temperature in the lower right corner of the screen.
- When Locations Services are On, there will be no circle around the icon.
- When the Locations Services are Off, the icon will be circled in red.

Certain functions that require the vehicle's location may not operate properly when Location Services are Off, including:

- Connected Navigation services, if equipped and active, will not work (the system will operate as a non-connected Navigation system).
- Speech recognition may not offer full functionality.

- OnStar advisors will be unable to provide Turn-by-Turn Navigation services.
- Customers may receive error messages in their myChevrolet, myBuick, myGMC, or myCadillac mobile app when trying to use Vehicle Locate.
- Some features of Smart Driver may be inoperable or not work properly, including the score being replaced by dashes.

Note: Emergency services, such as Automatic Crash Notification and Stolen Vehicle Assistance, are NOT impacted by Location Masking.

Valet Mode (If equipped)

Valet Mode is a customer enabled feature of the infotainment system, found in the settings menu, if equipped. The customer creates and inputs a four digit code using the infotainment controls. Confirming the code and selecting LOCK will lock the infotainment system, steering wheel controls and other vehicle features, dependent on vehicle equipment. The vehicle will remain in valet mode until the same four digit code is re-entered.

In the event that the four digit code is forgotten, it can be reset with the scan tool under BCM.

Teen Driver

The teen driver feature puts the vehicle into a mode that can only be unlocked with a valid PIN. It allows various restrictive features for safer driving. Some of the features include Speed Limiter, Speed Warning, Register Key, Report Card, etc. For additional information refer to owners manual.

In the event that the four digit code is forgotten, it can be reset with the scan tool under BCM.

Theft Deterrent

The radio theft deterrent system is intended to disable or limit radio functionality if incorrect vehicle information is received by the radio. The radio disables functionality if the VIN information received by the radio does not match the VIN information that has been learned by the radio. The radio receives this information via serial data. A possible cause of incorrect VIN info could be the radio was originally installed in another vehicle.

The radio has the following theft operating modes as part of the theft deterrent system:

- Normal Mode: The radio has learned a correct VIN sequence and the VIN information received via serial data matches the learned VIN sequence. In this mode the radio has full functionality.
- No VIN Mode: The radio has not received or learned a correct VIN sequence. In this mode the radio has limited functionality.
- Theft Detected Mode: The radio has learned a correct VIN sequence and the VIN information received via serial data does NOT match the learned VIN sequence. In this mode the radio may be disabled or have limited functionality. The radio display will indicate that theft protection is active.

Audio Amplifier (If equipped)

Amplifier Interface

A fused battery voltage circuit provides the main amplifier power. The audio amplifier (when equipped) is a participant on the Ethernet bus. The audio amplifier receives audio signals and control information from the Radio. The Amplifier receives battery power and ground from the vehicle harness.

Amplifier Operation

The purpose of the amplifier is to increase the power of a voltage or current signal. The output signal of an amplifier may consist of the same frequencies as the input signal or it may consist of only a portion of the frequencies as in the case of a subwoofer or midrange speaker. The audio amplifier amplifies the signal and sends it to the appropriate speakers.

Each of the audio output channel circuits (+) and (−), at the audio amplifier have a DC bias voltage that is approximately one half of the battery voltage. When using a DMM, each of the audio output channel circuits will measure approximately 6.5V DC. The audio being played on the system is produced by a varying AC voltage that is centered around the DC bias voltage on the same circuit. The AC voltage is what causes the speaker cone to move and produce sound. Both the DC bias voltage and the AC voltage signals are needed for the audio system to properly produce sound.

The audio amplifier is also responsible for operation of active noise cancellation if equipped. Refer to Active Noise Cancellation Description and Operation for more information.

Infotainment Controls and Display

The infotainment display and controls are a separate component from the radio, combined into an assembly. The assembly contains the control knobs and buttons for all audio and HVAC functions and the information display. The assembly is supplied battery voltage and ground from the vehicle harness.

Control information, touch communications and dimming level for the display are communicated via a Low Speed serial data circuit or LVDS cable to the Radio.

The remote radio receiver sends the display digital video data for on-screen display through a dedicated video cable.

The information display provides a feedback on the touch screen and certain controls.

The controls communicate via a Low Speed serial data circuit or LVDS cable with the remote radio receiver . Messages communicated include the following:

- Wake-up/power state messages
- Diagnostic information
- Button presses/knob rotations
- Commands for the state of indicators
- Back-lighting dimming level

Steering Wheel Controls (If equipped)

Some audio functions are available using the steering wheel controls. The steering wheel controls duplicate the function of the primary controls available on the radio.

For additional information on steering wheel controls, refer to Steering Wheel Controls Description and Operation.

USB Port

The USB hub device interfaces directly with the remote radio receiver via a standard USB cable. A Mini type USB connector is used to connect the cable at the USB port and at the remote radio receiver and at the auxiliary input receptacle. Standard USB male to female connections are typically used for connecting USB cables together where an in-line connection is required. An in-line cable connection is typically found between the console and I/P harness.

USB Port
The USB port allows connectivity to the infotainment system from portable media players or a USB storage device (memory stick/ flash drive). When a device is connected to the USB port, the device can be controlled from the radio controls.

Not all portable media player devices or file types are compatible. Connection to USB HUB devices is not supported.

Refer to the owner's manual for information on USB devices, control, and operation.

OnStar ® (If equipped)

When OnStar is activated, a serial data message is sent to the radio that activates default audio settings. The fade will be set to the front, Bass and Treble are set to the mid range, the outputs are mono, when the audio source is OnStar. OnStar takes priority over any other audio source.

For additional OnStar information, refer to OnStar Description and Operation.

Over The Air Programming

The Over The Air Programming feature was designed to reflash software remotely. Remote reflash is an in-vehicle feature that enables the installation of a software package to update the infotainment system without requiring service test equipment to be physically connected to the vehicle. Remote reflash will utilize a long range or short range connection from the host module to a remote IT system. There must be an active OnStar account to receive Over The Air programming or updates. To verify the status of the account perform a blue button press and verify the account is active and connects with data and location. Customers need to accept the OnStar terms and conditions, and must have an active OnStar account to receive any Over The Air programming or updates.

Note: A data plan is not required to receive Over The Air programming or updates. Also the programming or updates do not consume a customers available data.

Note: Fleet vehicles must be activated as a Fleet account (not a business account) and require a separate Terms and Conditions agreement to be completed. Please see your fleet administrator for assistance with completing this agreement.

GAS (Google Assistant Services) if equipped

Some of the GAS features are:

- Maps – Benchmark maps, navigation, traffic and point of interest data and legal speed limit sign information.
- Assistant – Voice assistant cloud services with vehicle integration (e.g., radio, HVAC).
- Play Store – Access to favorite media streaming apps plus first party GM apps.
- Keyguard – similar to a code to unlock your cell phone. When this feature is enabled a customer created lock (pattern, PIN or password) will need to be entered to unlock the radio at every ignition cycle. When the radio is locked SPS diagnostics will be unavailable. To utilize SPS diagnostics when the radio is locked enter the "Guest Mode" feature.

A connectivity package needs to be purchased to have the full experience. Refer to the Owner Manual for further information on Google Automotive Services.

Compass Data

With the Base Radio the Telematics Control module provides compass and GPS position information on the Info-CAN bus when it is present.

In a Mid / High Radio System configuration without a Telematics Control Module and equipped with GPS, the radio shall provide the GPS and heading information on Info-CAN as shown below.

An external Remote Compass Module (RCM) is required to transmit the heading and position information on Info-CAN if either:

- The Base Radio is present in a system configuration with no Telematics control module.
- The radio variant without GPS is present in a system configuration with no Telematics control module.

Media Disc Player (if equipped)

The Remote Media Player feature sends information through a USB connection to the Rear Seat Infotainment and outputs digital audio/video to vehicle displays and to the Radio over the Ethernet bus. The Rear Seat Infotainment system also has a USB hub with an auxiliary port for digital media file access.

The media disc player receives battery power and ground from the vehicle harness.

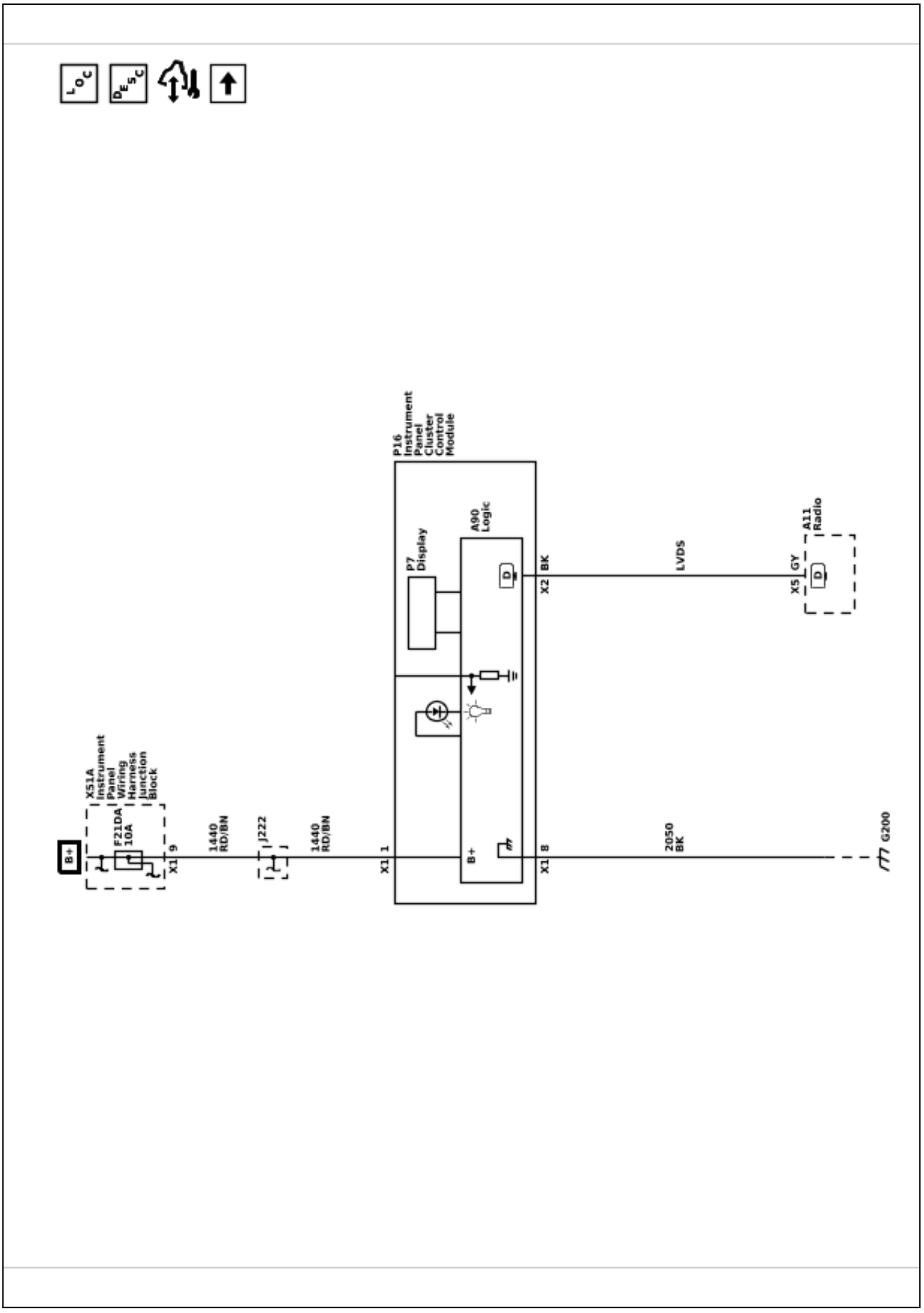
Digital Rearview Camera (if equipped)

The digital rearview camera is a direct input to the radio via coaxial cable. Camera and image activation are driven by reverse gear signal from the reverse lamp input. This function is used for reverse guidance. For radio systems that manage the camera signal, the system does not have video bypass module, as this functionality is managed onboard the radio.

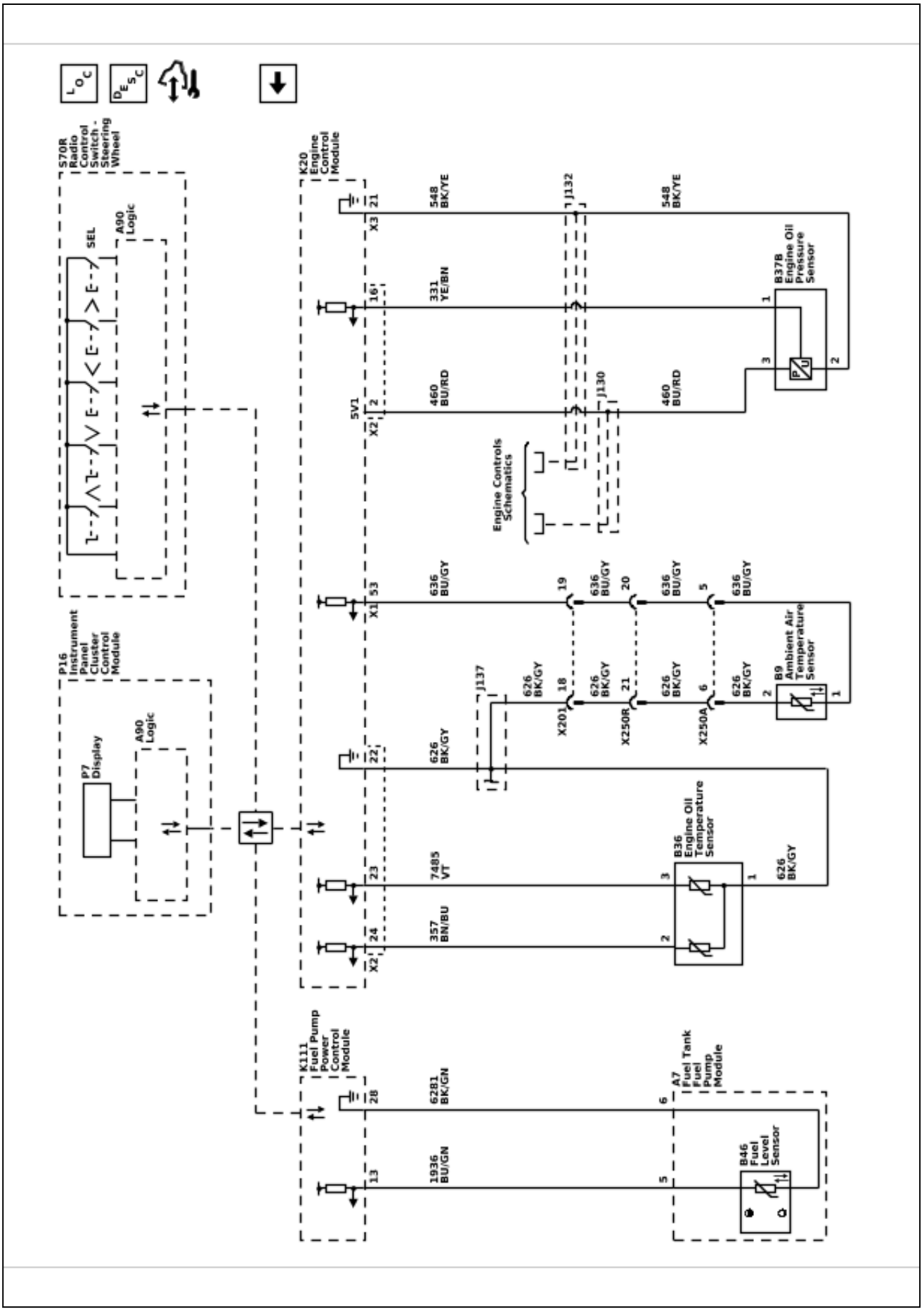
Displays and Gauges

Schematic and Routing Diagrams

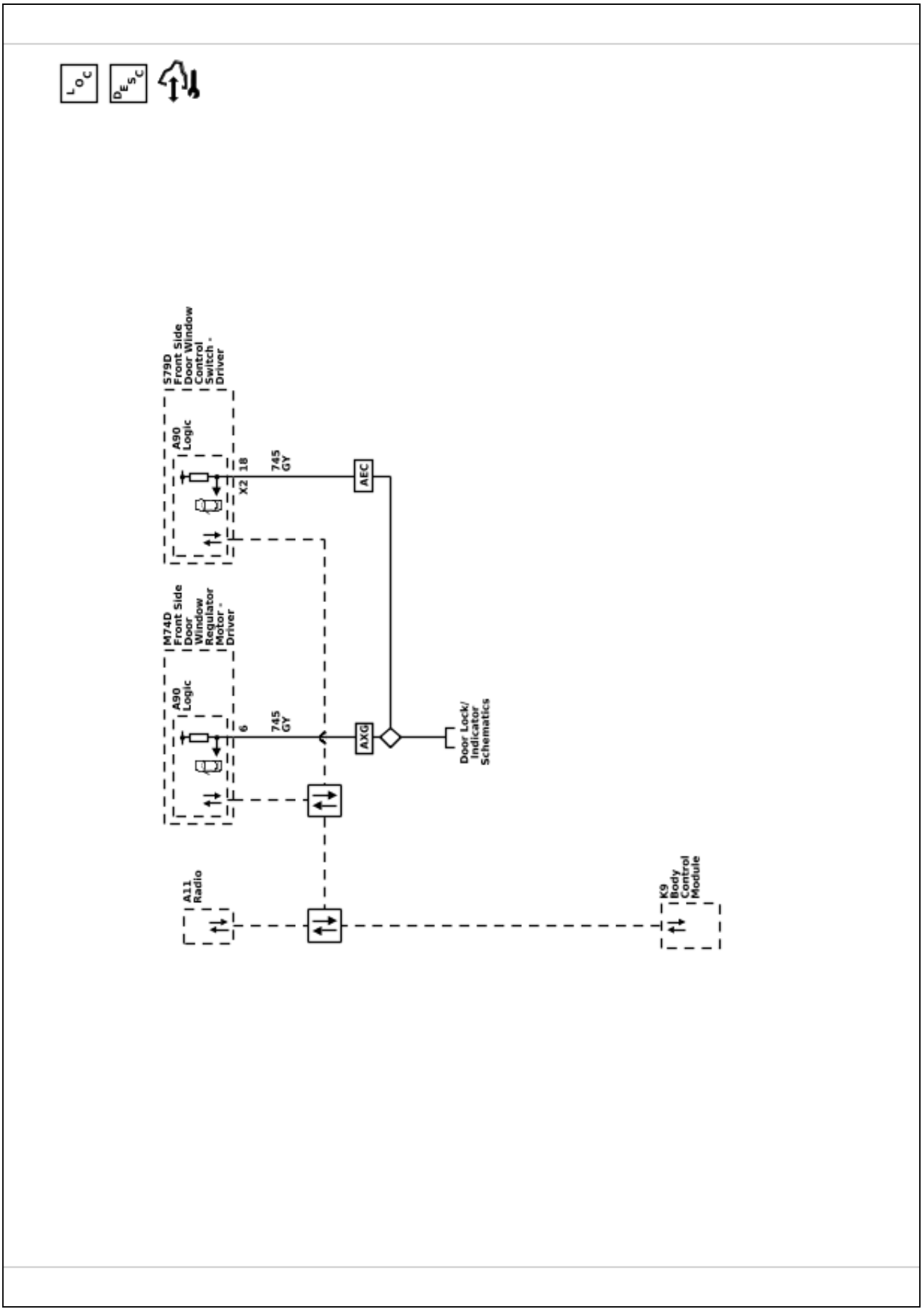
Instrument Cluster Schematics (Instrument Cluster)



Instrument Cluster Schematics (Gauges)



Audible Warnings Schematics (Audible Warnings)



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Description and Operation

Audible Warnings Description and Operation

The audible warnings alert the driver of a system concern or a critical vehicle condition. The radio generates the audible warnings through the speakers. The radio receives audible warning requests via the serial data circuit. If the radio receives multiple audible warning requests, the warning with the highest priority sounds first. On vehicles without a radio, a chime module generates the audible warnings and receives audible warning requests via the serial data circuit. Either the radio or the chime module is the chime producer. The following lists the audible warning sounds:

1. Single pulse gong
2. Multiple pulse gong
3. Single pulse beep
4. Multiple pulse beep
5. Click
6. Clack

Auto Stop Mode

The chime producer activates when the vehicle comes to a stop and the driver or passenger door is opened as requested by the body control module.

Fasten Safety Belt Warning

The chime producer activates the fasten safety belt audible warning as requested by the body control module (BCM). The BCM sends a serial data message to the chime producer indicating the chime as a multiple gong. The fasten safety belt warning sounds and the fasten safety belt indicator illuminates when the following occurs:

- The ignition switch transitions to ON.
- The inflatable restraint sensing and diagnostic module (SDM) detects that the drivers seat belt is not buckled and the signal is low. The SDM sends a serial data message to the BCM indicating the seat belt status. The instrument cluster receives a serial data message from the BCM indicating the driver seat belt status.

If the seat belt is buckled when the ignition is turned ON, the chime does not sound. If the seat belt is buckled while the chime is sounding, the chime stops. If the seat belt is unbuckled after the initial transition to ON, the chime does not sound.

Lights On Warning

The chime producer activates the lights on warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime as a multiple gong. The lights on warning sounds when the following occurs:

- The ignition is OFF.
- The BCM determines that the driver door is open and the signal circuit is low.
- The BCM determines that the headlamp switch is in the park or head position.

Brake Warning

The chime producer activates the brake audible warning as requested by multiple control modules. The BCM, electronic brake control module or the parking brake control module sends a serial data message to the chime producer indicating the chime as a multiple gong. The brake warning sounds and the BRAKE indicator illuminates when the following occurs:

- The ignition is ON.
- The vehicle speed is greater than 8 km/h (4.9 mph). The instrument cluster receives a serial data message from the Battery Energy Control Module indicating the vehicle speed.
- The BCM determines that the parking brake is engaged and the signal circuit is low.
- The brake fluid is low.

Door Ajar Warning

The chime producer activates the door ajar audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer indicating the chime frequency of a medium rate and continuous duration. The door ajar warning sounds and the appropriate door ajar indicator illuminates in the driver information center when the following occurs:

- The BCM determines that a door (driver door, passenger door, left rear door, right rear door) is open and the signal circuit is low. The instrument cluster also receives a serial data message from the BCM indicating the door ajar status.
- The vehicle is not in PARK. The BCM receives a serial data message indicating the gear position.

Object Detection

The chime producer activates the object detection audible warning as requested by the object alarm module. When an object is within the measuring range of the sensor, the ultrasonic pulse is reflected and is received by the sending or a neighboring sensor. The sensor converts this signal into a voltage signal and sends this signal to the object alarm module. The object alarm module evaluates the received sensor signals. As soon as an object is within the measuring range, the object alarm module sends a message via CAN-Bus to the chime producer in order to give out the acoustic distance signal. The measuring range is between 30–120 cm (11.81–47.24 in). From a distance of 120 cm (47.24 in), the acoustic signal is active. The frequency of the beep sound increases with decreasing distance. From a distance less than 30 cm (11.81 in), the sound becomes continuous.

Additional Warnings

The following warnings have an associated instrument cluster indicator or driver information center message:

- Turn Signal Indicators – The chime producer activates the audible warning as requested by the BCM. The chime produces two different chimes, one when the turn signal turns off and another when the turn signal turns on.
- Vehicle Overspeed Message – The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer.
- Fuel Level Low Message – The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer.
- Oil Pressure Indicator – The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer.
- Park Assist Fault Clean Rear Bumper Message – The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer.
- Tire Pressure Low Indicator – The chime producer activates the audible warning as requested by the BCM. The BCM sends a serial data message to the chime producer.

Refer to *Indicator/Warning Message Description and Operation 4-32*.

Indicator/Warning Message Description and Operation

Indicator LIGHT ON

Refer to the owner's manual for the descriptions and explanations of all indicator lights.

For diagnosis and repair information related to an indicator light, refer to the System Diagnosis and the Description of Operation that the message relates to.

Message Displayed

Refer to the owner's manual for descriptions and explanations of all messages displayed.

For diagnosis and repair information related to a displayed message, refer to the System Diagnosis and the Description of Operation that the message relates to.

Transmission Shift Lever Position Indicator

The transmission shift lever position indicator (if equipped) is located on the center console and indicates the current transmission shift lever position. The transmission shift lever position indicator receives power and ground and is controlled by the Body Control Module (BCM) via serial data. The Transmission Control Module/Powertrain Control Module determines transmission shift lever position based on signals from the transmission internal mode switch and sends the shift lever position information to the BCM via serial data.

Instrument Cluster Description and Operation

This vehicle does not contain a traditional Instrument Cluster to display vehicle information to the driver. This display is merely a display that is controlled by the A11 Radio. For more information, refer to *Instrument Panel Description 4-32*

Instrument Panel Description

P16 Instrument Cluster

The P16 Instrument Cluster is a display that provides the vehicle operator with information such as vehicle speed, engine RPM, fuel level, and coolant temperature in digital format which will be in various locations depending on display mode selected. This display is highly reconfigurable and also provides the operator with operational warnings and messages. Certain areas of the display is touchscreen which allows the user to access the cluster menu, vehicle information menus, and Head-up Display controls. The P16 Instrument Cluster is not on the vehicle serial data bus, and therefore does not directly report or store DTCs. The P16 Instrument Cluster is directly connected to the A11 Radio via an LVDS cable, and relies on the Radio for any information about the vehicle status, etc.

Indicators and Warning Messages

Refer to *Indicator/Warning Message Description and Operation 4-32*.

Speedometer

The P16 Instrument Cluster displays the vehicle speed based on the information from the BCM. The BCM sends the vehicle speed information via serial data to the Radio. The Radio then sends the vehicle speed information via an LVDS cable to the P16 Instrument Cluster to display the vehicle speed to the driver.

Odometer

The P16 Instrument Cluster displays the vehicle odometer information to the driver. The BCM send a distance rolling count message via serial data to the Radio. The Radio uses this information to calculate the vehicle odometer. This odometer value is then sent to the P16 Instrument Cluster. The P16 Instrument Cluster does not calculate the odometer value.

The odometer value is stored in multiple modules. The Radio is a secondary storage module for the odometer, while the BCM is the primary storage and accumulator.

Compass

The vehicle compass information is gather through the compass module or vehicle communication interface module (VCIM). The compass module or VCIM determines vehicle direction and communicates this with the BCM through serial data. The BCM sends the compass information to the P16 Instrument Cluster via serial data, where it is displayed.

Outside Air Temperature

The Ambient Air Temperature Sensor is located behind the grille and varies it’s resistance with temperature. The Engine Control Module/Powertrain Control Module reads the resistance value to determine temperature. The time of and rate of the temperature update is based on an algorithm in the Engine Control Module/ Powertrain Control Module software. Factors such as, last reading, current reading, length of time vehicle is been off/on, power mode, vehicle speed, driven distance, and sensor location are all considered by the Engine Control Module/Powertrain Control Module to know when to update the displayed temperature. For example, if the sensor is located near the engine compartment, and the vehicle has been turned off for only 10 minutes then restarted, the Engine Control Module/Powertrain Control Module will wait until the vehicle is driven to get more accurate air flow across the sensor before it updates the display.

Image Display Cameras

Schematic and Routing Diagrams

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Image Display Camera Schematics (Rearview Driver Information Camera (UVB))

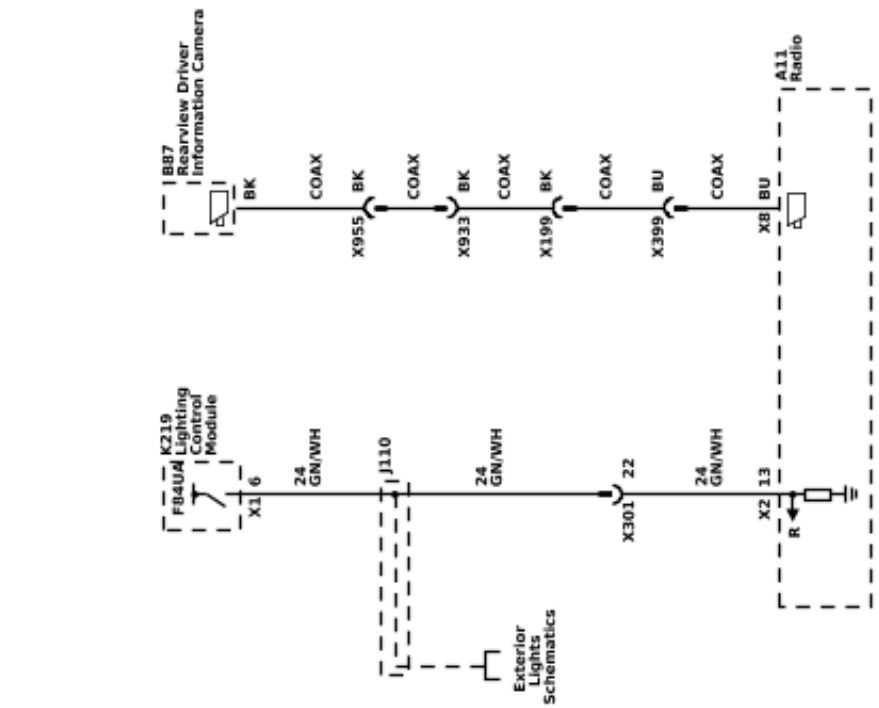


Image Display Camera Schematics (360 Degree Vision (UV2 / UXA))

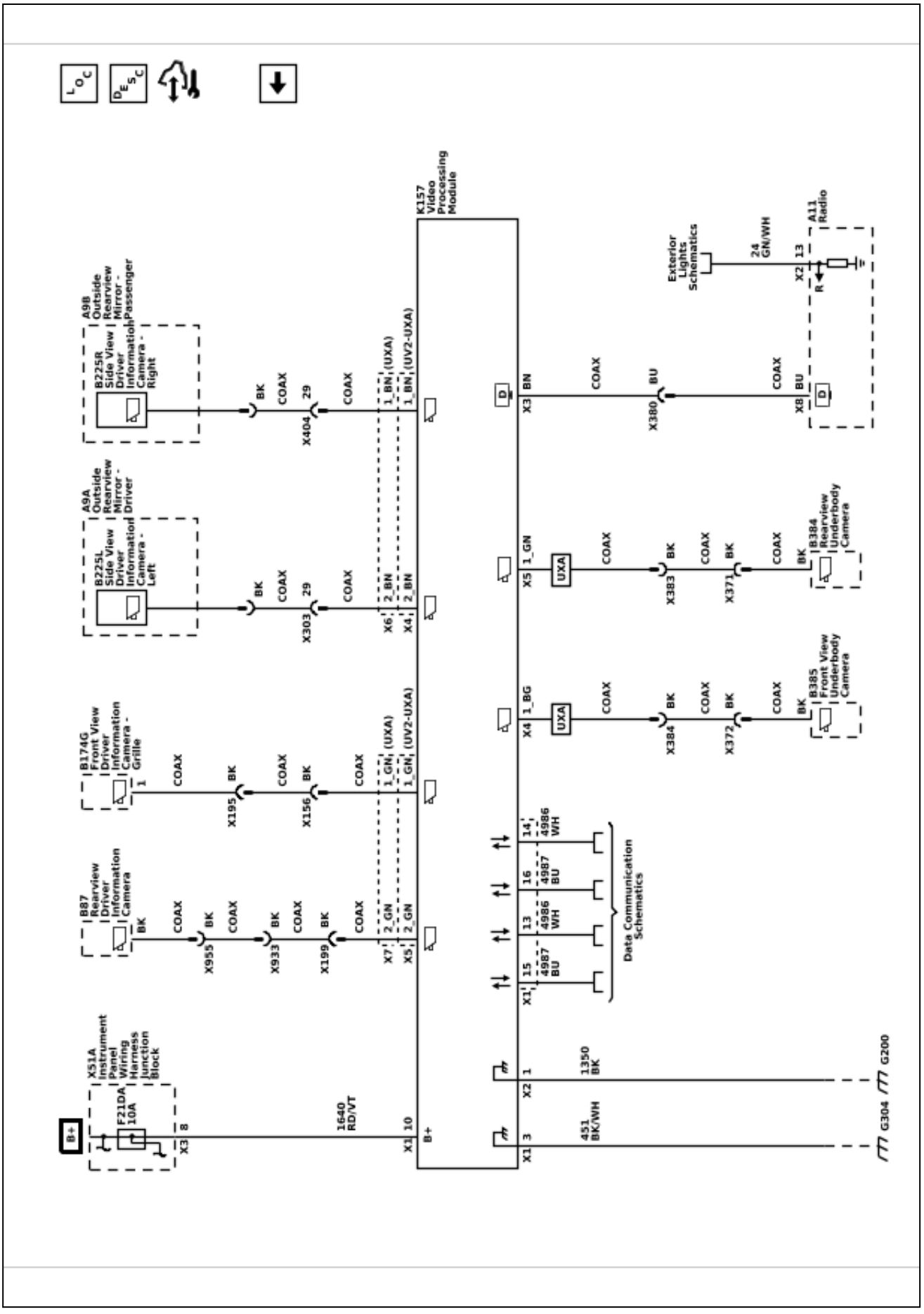


Image Display Camera Schematics (360 Degree Vision (UV2 / UXA))

Description and Operation

Rearview Camera Full Display Mirror Description and Operation

If equipped, full display mirror provides a wider field of view than normally seen from the inside rearview mirror to assist when driving and changing lanes. When the tab under the inside rearview mirror is pulled rearward, a view of the area behind the vehicle displays on the mirror. The inside rearview camera full display mirror is connected to the outside rearview camera via a shielded coaxial cable.

When the tab under the inside rearview mirror is pulled rearward, a view of the area behind the vehicle displays on the mirror.

Adjust the rearview mirror for a clear view of the area behind the vehicle before turning on full display mirror. Use the three buttons on the bottom of the mirror to adjust the brightness, zoom, and tilt of the display. Make sure the light sensor is not covered when adjusting the brightness.

The inside rearview camera full display mirror may not work properly or display a clear image if:

- It is dark.
- The sun or the beam of headlamps are shining directly into the camera lens.
- Ice, snow, mud, or anything else builds up on the camera lens. Clean the lens, rinse it with water, and wipe it with a soft cloth.

When the mirror detects that the camera is not sending a valid video signal, it “blue screens” with a “no video” decal for 3 seconds, then reverts back to the mirror.

Rear Vision Camera Description and Operation

Rear Vision Camera System Operation

The rear vision camera system consists of a video camera located at the rear of the vehicle and the A11 Radio.

When the transmission is placed into REVERSE, a signal is sent to the A11 Radio indicating that camera operation is requested. The rearview camera sends video information to the A11 Radio through a coax cable. The coax cable also provides power from the A11 Radio to the rearview camera.

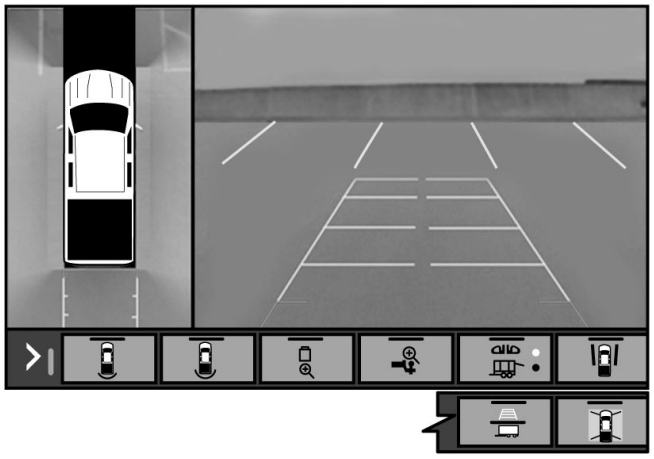
The following conditions may cause a degraded rear vision camera image:

- Ice, snow, or mud has built up on the rear vision camera
- Dark conditions
- Extreme light conditions, such as glare from the sun or the headlights of another vehicle
- Damage to the rear of the vehicle
- Extreme high temperatures or extreme temperature changes

If a malfunction is detected in the system, SERVICE REAR VISION CAMERA may be displayed on the Info Display Module as an indicator to the customer that a problem exists that requires service.

Surround Vision Camera Description and Operation (UV2/UXP & UXA)

Warning: The Surround Vision cameras have blind spots and will not display all objects near the corners of the vehicle. Folding outside mirrors that are out of position may not display surround view correctly. Always check around the vehicle when parking or backing.



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The Surround Vision- Trailer/Underbody Vision camera system (TRG) consists of the following components:

- K157 Video Processing Control Module
- A11 Radio
- B87 Rearview Driver Information Camera
- B225L Sideview Driver Information Camera – Left
- B225R Sideview Driver Information Camera – Right
- B174G Frontview Driver InformationCamera – Grille
- Trailer Rearview Camera (if customer installed)
- Front View Underbody Camera
- Rearview Underbody Camera

Features of the Surround Vision– Trailer Vision System

- Rear camera (B87 Rearview Camera) alongside overhead view is displayed in reverse
- Trailer Rearview Camera (if customer installed) image is displayed when selected via the Trailering application on the Infotainment screen.
- Front View Underbody Camera image and Rearview Underbody Camera image are displayed when selected via the application on the Infotainment screen.
- Hitch View (when selected) displays a rear view camera image with a single guideline, which aids in aligning the truck to the trailer. If the driver shifts into PARK while in Hitch View, the parking brake is engaged to keep the vehicle from rocking when the driver gets out of the vehicle to hitch the trailer.
- Surround Vision displays an overhead view of the area surrounding the vehicle, along with the rear camera views in the center stack. The side cameras are on the bottom of the outside rearview mirrors, the rear vision camera is above the license plate, a rearview trailer camera can be mounted on the rear of a trailer, and a trailer interior camera can be mounted on the rear of a trailer.

Note: Images from the Sideview Cameras are only displayed when both front doors are properly closed.

System Operation
The video processing control module is connected to each camera via a shielded coaxial cable. The coaxial cable provides power for the camera and also carries the video image from the cameras to the video processing control module for processing. The video processing control module will then send the processed image output to infotainment system via another coaxial cable.

The video processing control module receives CAN information from Rear Park Assist object detection module and Steering Wheel angle from body control module during Reverse. A warning triangle may display during the surround view screen if Rear Parking Assist has detected an object during a reverse. This triangle changes from amber to red and increases in size the closer the object. Also a dynamic guideline is displayed in Reverse to show the projected path of the vehicle.

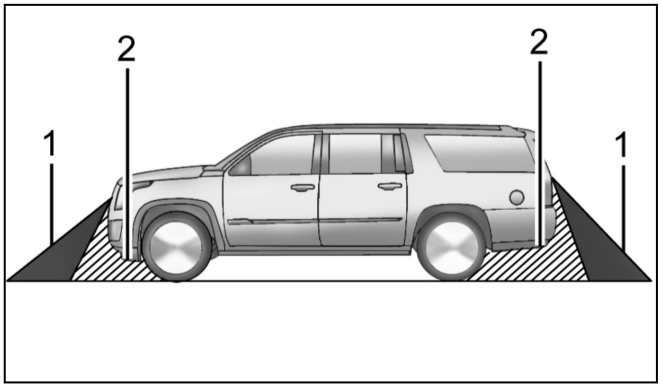
When the vehicle is traveling at speeds slower than 6 mph (10kph) the video processing control module will power up the cameras and send a video signal to the radio.

The following conditions may cause a degraded surround vision camera image:

- Ice, snow, or mud has built up on any camera
- Dark conditions
- Extreme light conditions, such as glare from the sun or the headlights of another vehicle
- Body damage to the vehicle
- Extreme high temperatures or extreme temperature changes

Surround Vision Camera Description and Operation (UV2/UXP - UXA)

Warning: The Surround Vision cameras have blind spots and will not display all objects near the corners of the vehicle. Folding outside mirrors that are out of position may not display surround view correctly. Always check around the vehicle when parking or backing.



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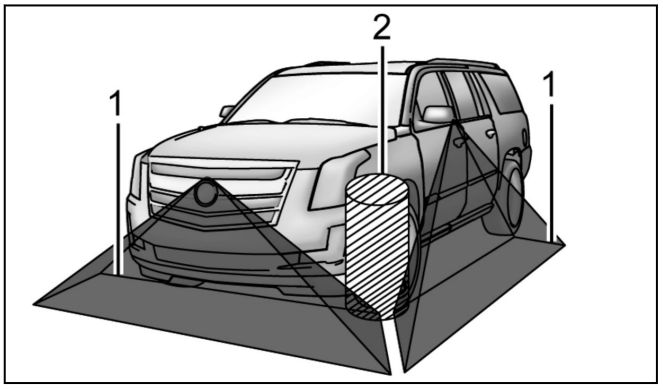
1. View displayed by the surround vision camera
2. Area not shown



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1. View displayed by the surround vision camera
2. Area not shown

The surround vision camera system consists of the following components:

- B87 Rearview Camera
- B174G Frontview Camera – Grille
- K157 Video Processing Control Module
- A11 Radio **OR** K74 Human Machine Interface Module
- B225L Sideview Camera – Left

- B225R Sideview Camera – Right
- X20 Memory Card Receptacle (with XVR)

When the vehicle is traveling at speeds slower than 6 mph (10kph) the video processing control module will power up the cameras and send a video signal to the radio or human machine interface module.

The following conditions may cause a degraded surround vision camera image:

- Ice, snow, or mud has built up on the rear vision camera
- Dark conditions
- Extreme light conditions, such as glare from the sun or the headlights of another vehicle
- Damage to the rear of the vehicle
- Extreme high temperatures or extreme temperature changes

Surround Vision displays an overhead view of the area surrounding the vehicle, along with the front or rear camera views in the center stack. The front camera is in the grille or near the front emblem, the side cameras are on the bottom of the outside rearview mirrors, and the rear vision camera is above the license plate.

Note: Images from the Sideview Cameras are only displayed when both front doors are properly closed.

Features of the Surround Vision System

- Rear camera (B87 Rearview Camera) view alongside overhead view is displayed in reverse
- Front camera (B174G Frontview Camera – Grille) view alongside overhead view is displayed after shifting out of reverse to Neutral or Drive
- Will display front view when front park assist object is within trigger range calibration value (30 cm (12 in) in a forward gear
- Image is removed from display when vehicle speed exceeds speed calibration (10kph/6 mph) or button press / screen touch

System Operation

The video processing control module is connected to each camera via a shielded coaxial cable. The coaxial cable provides power for the camera and also carries the video image from the cameras to the video processing control module for processing. The video processing control module will then send the processed image output to infotainment system via another coaxial cable.

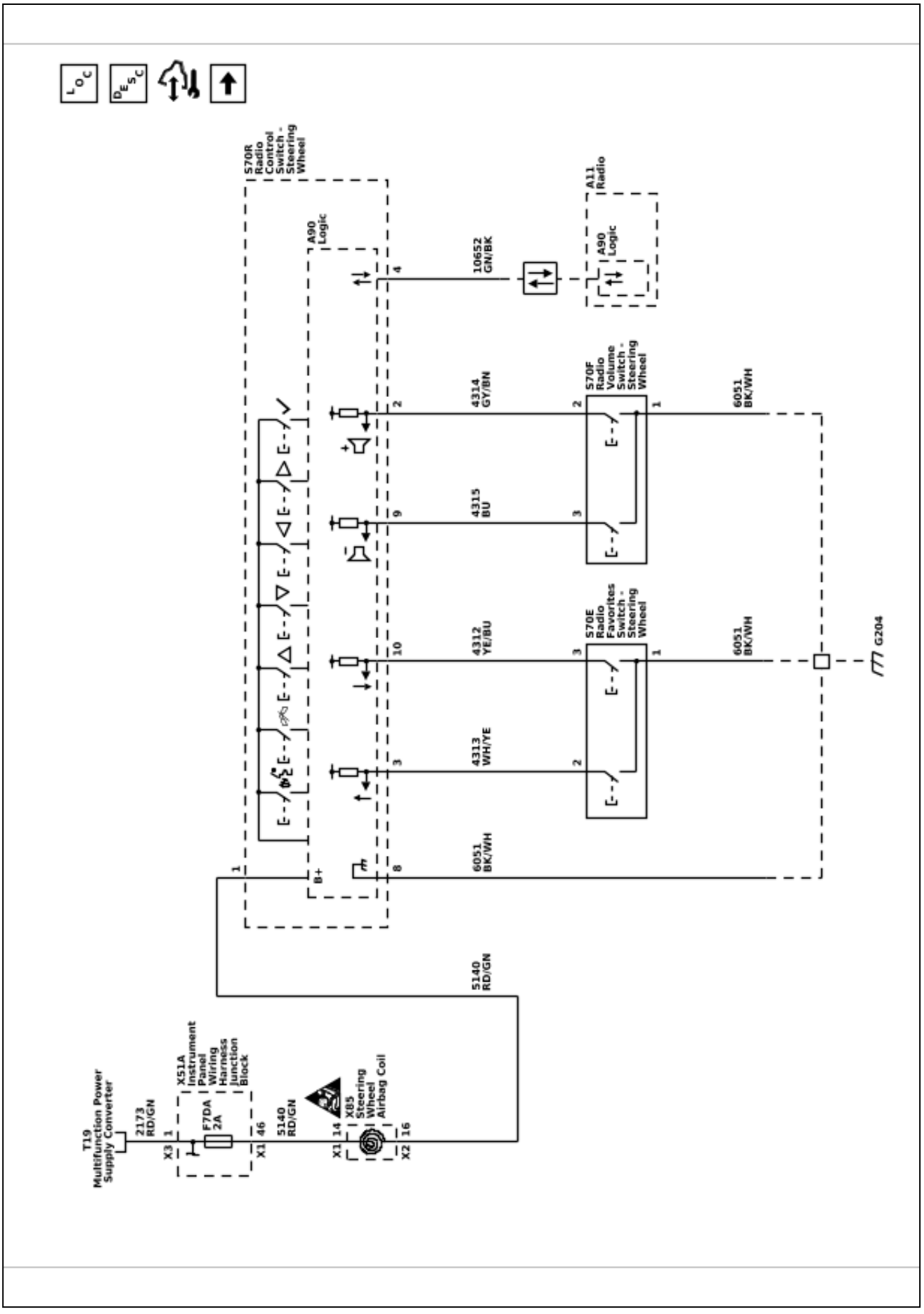
The video processing module receives various vehicle information (such as steering wheel angle, object detection, etc) from other sources such as parking assist modules and the Body Control Module via serial data. This information is used to produce the enhanced surround vision system images that include a warning triangle that may display if an object is detected nearby. This triangle changes from amber to red and increases in size as the object gets closer to the vehicle. Also, dynamic guidelines are displayed in Reverse to show the projected path of the vehicle based on steering wheel angle. Due to this use of vehicle information, any faults or DTCs in these related systems can prohibit proper surround vision operation.

If equipped, the video processing control module system may have a memory card receptacle (with XVR) located in the trunk. The memory card receptacle interfaces with the video processing control module via a USB cable. The memory card receptacle also receives fused battery voltage and ground from the video processing control module. The video processing control module uses the memory card as a mass storage device, similar to a USB storage device.

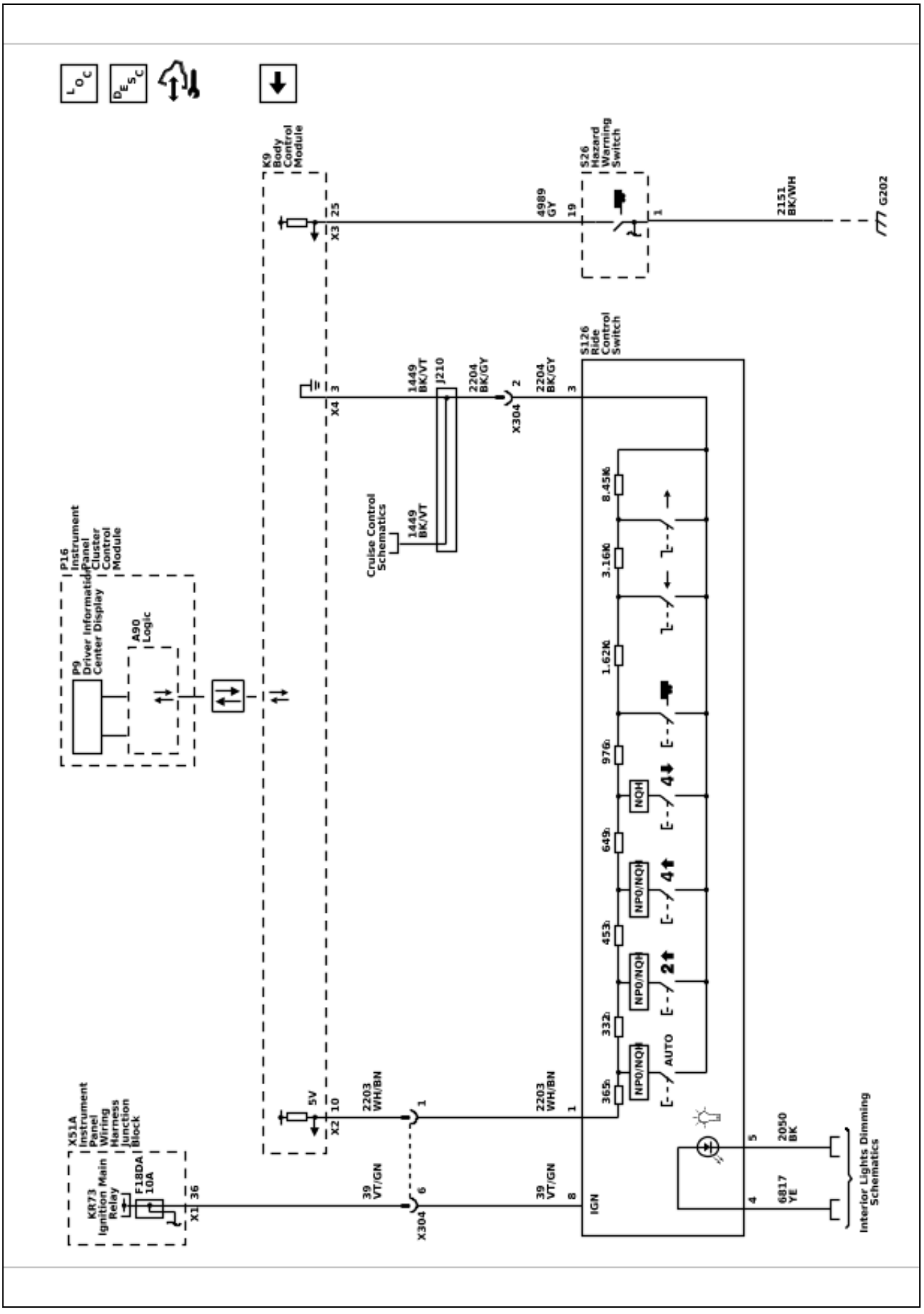
Secondary and Configurable Customer Controls

Schematic and Routing Diagrams

Steering Wheel Secondary/Configurable Control Schematics (Steering Wheel Controls)



Steering Wheel Secondary/Configurable Control Schematics (Ride Control and Tow/Haul Mode Switch)



Description and Operation

Drive Mode Description and Operation

The drive mode system is a customer configurable control that allows the vehicle operator to tailor the vehicle operation and driveability parameters based on driving conditions. The drive mode is controlled by the vehicle operator through a Drive Mode Switch. The Drive Mode Switch may be a single switch or a part of a switch bank. It may also be a rotary knob or found in the Driver Information Center.

The Drive Mode Switch is an input to the Engine Control Module. The Engine Control Module will change operating parameters based on this input. The Engine Control Module will also broadcast a message to all modules indicating the requested drive mode. Control modules that are involved in changing their operation based on differing drive modes will then change their operating values.

The main components of the drive mode system are:

- Drive Mode Switch
- Engine Control Module
- Body Control Module

Other control modules or components that may respond to the commanded drive mode are:

- Electronic Brake Control Module
- Power Steering Control Module
- Rear Differential Clutch Control Module
- Transmission Control Module

Steering Wheel Controls Description and Operation

The steering wheel control switches duplicate the function of the primary controls of the associated component, through a network of momentary contact switches.

The steering wheel controls are divided into a right-hand set and left-hand set. The switches are connected to a LIN serial data circuit and provide input to the A11 Radio or K9 Body Control Module.

- The S70E Favorites Switch consists of favorite up and favorite down functions.
- The S70F Radio Volume Switch consists of volume up and volume down control.
- The S70L Cruise Control Switch consists of various cruise control specific functions.
- The S70R Radio Control Switch controls various audio, communication and vehicle systems

Refer to the owners manual for more detailed operation of each steering wheel switch.

Steering Wheel Control Components

S70E Radio Favorites Switch - Steering Wheel
The S70E Favorites Switch is a momentary contact switch located on the left rear side of the steering wheel. When one of the switches is depressed the signal is grounded, the signal is sent through the S70R Radio Control Switch which outputs a request through the LIN serial data circuit to the A11 Radio to perform the requested function.

Note: In vehicles with RPO 5W4 (Special Service Package) or RPO 9C1 (Sales Package-Police Vehicle), the steering wheel controls on the left rear side do not control radio favorites. Instead, momentary output in blunt cut harness for two-way radio microphone and latching output in blunt cut siren/light.

S70F Radio Volume Switch - Steering Wheel
The S70F Radio Volume Switch is a momentary contact switch located on the right rear side of the steering wheel. When one of the switches is depressed the signal is grounded, the signal is sent through the S70R Radio Control Switch which outputs a request through the LIN serial data circuit to the A11 Radio to perform the requested function.

S70L Cruise Control Switch
The S70L Cruise Control Switch is a resistive ladder design, with each cruise control function switch having a different resistance value. The distance sensing cruise control gap up/down has its own 5V reference circuit from the K9 Body Control Module. The cruise control set/coast/resume/accelerate switch has its own 5V reference circuit from the K9 Body Control Module. The K9 Body Control Module detects a specific voltage value that is associated with the cruise control function switch being activated and sends the appropriate serial data message to the K9 Body Control Module to complete the request.

For information on Cruise Control, refer to *Cruise Control Description and Operation 5-4*

S70R Radio Control Switch - Steering Wheel
The S70R Radio Control Switch is a set of momentary contact switches located on the right side of the steering wheel. When a switch is depressed the signal is grounded, the S70R Radio Control Switch sends a request through the LIN serial data circuit to the A11 Radio to perform the requested function.

Section 5

Engine/Propulsion

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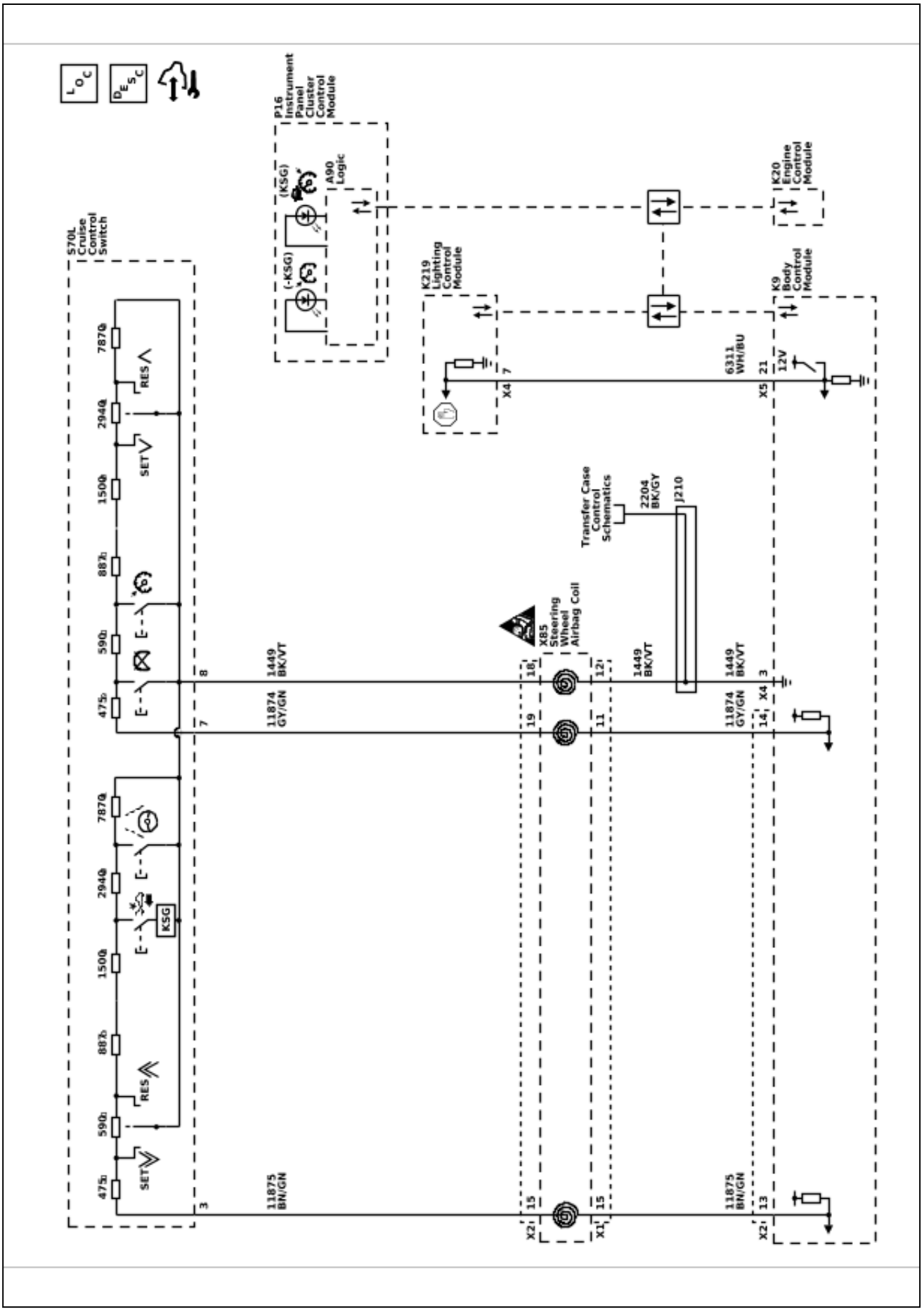
Engine/Propulsion

Cruise Control

Schematic and Routing Diagrams

Cruise Control Schematics (Cruise Control)



Description and Operation

Cruise Control Description and Operation

Note: If the vehicle is equipped with RPO KSG, it also has Adaptive Cruise Control. Refer to the Object Detection or the Driver Assistance Systems subsection for schematics, diagnostics, and description and operation related to Adaptive Cruise Control functions.

Cruise control is a speed control system that maintains a desired vehicle speed under normal driving conditions at speeds above 40 km/h (25 mph). Steep grades may cause variations in the selected vehicle speeds.

The following are the main components of the Cruise Control System:

- The accelerator pedal
- The brake pedal position (BPP) sensor
- The body control module (BCM)
- The cruise on/off switch
- The cruise control cancel switch
- The + RES switch (equivalent to resume/accelerate switch)
- The − SET switch (equivalent to set/coast switch)
- The engine control module (ECM)
- The throttle actuator control (TAC) motor (gasoline engines only)
- The vehicle speed sensor

The body control module (BCM) monitors the signal circuit of the cruise control switches, which are located on the steering wheel. The BCM relays the cruise control switch status to the engine control module (ECM) via the serial data circuit. The ECM uses the status of the cruise control switch to determine when to capture and maintain the vehicle speed. The ECM monitors the vehicle speed signal circuit in order to determine the desired vehicle speed.

Voltage is supplied to the cruise control switch via the steering wheel control switch reference voltage circuit supplied by the BCM. The cruise control function switches are arranged in a resistive ladder design, with each cruise control function switch having a different resistance value. The BCM detects a specific voltage value that is associated with the cruise control function switch being activated. The BCM sends a serial data message to the ECM indicating that the on/off switch is active. Similarly, when the normally open + RES switch or the normally open − SET switch are pressed, the switch closes and the BCM detects the predetermined voltage signal on the cruise control resume/accel and set/coast switch signal circuit. The BCM sends a serial data message to the ECM indicating that the + RES switch or the − SET switch is active.

Cruise Control Engaged

The Cruise Control System will engage and adjust vehicle speeds, based on the activation of the following cruise control switches, which are located on the steering wheel:

- On/Off
- + RES
- − SET

To engage the Cruise Control System, ensure that the vehicle speed is above 40.2 km/h (25 mph), turn the cruise On/Off switch ON and momentarily press the − SET switch. The ECM will engage the Cruise Control System and record the vehicle speed. The ECM sends a serial data message to the instrument panel cluster (IPC) in order to illuminate the Cruise Engaged indicator in the IPC. Refer to the vehicle owner's manual for the location and operation of the cruise control On/Off indicators and driver information center (DIC) messages.

Pressing the accelerator pedal while the Cruise Control System is engaged, allows the driver to override the Cruise Control System in order to accelerate the vehicle beyond the current set vehicle speed. When the accelerator pedal is released, the vehicle will decelerate and resume the current set vehicle speed.

The driver can also override the current set vehicle speed via the − SET switch and the + RES switch. When the Cruise Control System is engaged, pressing and holding the − SET switch will allow the vehicle to decelerate from the current set vehicle speed without deactivating the Cruise Control System. When the − SET switch is released, the ECM will record the vehicle speed and maintain the vehicle speed as the new set vehicle speed. When the Cruise Control System is engaged, momentarily pressing the − SET switch will allow the vehicle to decelerate at a vehicle specific calibratable increment, commonly 1 km/h or 1 mph, each time that the − SET is momentarily pressed, with a minimum vehicle speed of 38 km/h (24 mph). Refer to the vehicle Owner's Manual for more information.

Pressing and holding the + RES switch, when the Cruise Control System is engaged, will allow the vehicle to accelerate to a greater vehicle speed than the current set vehicle speed. When the + RES switch is released, the ECM will record the vehicle speed and maintain the vehicle speed as the new set vehicle speed. When the Cruise Control System is engaged, momentarily pressing the + RES switch will allow the vehicle to accelerate at a vehicle specific calibratable increment, commonly 1 km/h or 1 mph, each time that the + RES switch is momentarily pressed. Momentarily activating the + RES switch will recall the previous vehicle speed, after the cruise control system has been disengaged by pressing the brake pedal, or CANCEL switch. Refer to the vehicle Owner's Manual for more information.

Cruise Control Disengaged

The engine control module (ECM) disengages the cruise control operation based on the signals from the following switches:

- The brake pedal position (BPP) sensor
- The On/Off switch
- The cruise control cancel switch

The Cruise Control System will disengage when the brake pedal is applied. The body control module (BCM) monitors the BPP sensor via the BPP sensor signal circuit as the voltage signal increases while the pedal is further applied. The ECM monitors the BPP signal through a discrete input and a serial data message signal from the BCM indicating the brake status. When either signal indicates the brake pedal is applied, the ECM will disengage the cruise control system.

The Cruise Control System will also disengage when the cruise control on/off switch is switched OFF, or the cruise control cancel switch is activated. The body control module (BCM) determines when the cruise control cancel switch is activated. When the normally open cancel switch is closed, the BCM detects the predetermined voltage signal on the cruise control function switch circuit. The vehicle speed stored in the memory of the engine control module will be erased when the cruise control On/Off switch is turned OFF, or the ignition switch is turned OFF. The BCM sends a serial data message to the ECM in order to disengage the cruise control system. When the Cruise Control System has been disengaged, the ECM sends a serial message to the instrument panel cluster (IPC) in order to turn OFF the Cruise Engaged indicator.

Every time the Cruise Control System is disengaged, the ECM will keep track of the reason for system disengagement. The last 8 disengagement reasons will be recorded within the ECM memory. The scan tool will display the last 8 Cruise Disengage History parameters, in which one out of approximately 50 possible reasons will be displayed in each of these 8 parameters. For the disengagement reason to be displayed within the scan tool parameter the Cruise Control System is active and disengagement is requested.

When engagement of the system is requested but an engagement inhibit is present, the most recent inhibit reason is recorded in the ECM history. The scan tool will display the most recent inhibit reason, in which one out of approximately 50 possible reasons will be displayed.

Cruise Control Inhibited

The engine control module (ECM) inhibits the cruise control operation when any of the following conditions exist:

- The ECM has not detected a brake pedal activation from the body control module (BCM) this ignition cycle.
- A Cruise Control System DTC has been set.
- The vehicle speed is less than 38.6 km/h (24 mph).
- The vehicle speed is too high.
- The vehicle is in PARK, REVERSE, NEUTRAL, or 1st gear.
- The engine RPM is low.
- The engine RPM is high.
- The system voltage is not between 9 volts and 16 volts.
- The Antilock Brake System (ABS)/Traction Control System (TCS) is active for more than a calibratable time (typically 0.3 to 0.7 seconds).

Cruise Control Inhibit Reasons

This is a general list of inhibit reasons. Not every inhibit reason is applicable to all vehicles. Refer to the scan tool inhibit reason list for the last 8 reasons that have been recorded during the current ignition cycle.

Scan Tool Name	Description	Long Description
Acceleration Rate too High	High acceleration	The vehicle acceleration rate is too high.
TRAILER BRAKES APPLIED	Trailer brakes applied	The trailer brake system has been activated.

Scan Tool Name	Description	Long Description
Acceleration Time	Rate limiting fault	Cruise torque request rate limiting active too long.
Adaptive Cruise Control Configuration Incorrect	Adaptive cruise control option mismatch	The cruise control type (adaptive cruise or conventional cruise) is mismatched between the engine control module (ECM) and the body control module (BCM).
Antilock Braking System Active	Antilock Braking System Active	The antilock braking system was active. Only reported on enhanced cruise control vehicles.
Automatic Braking Engine Torque Request Signal Communication Malfunction	Automatic braking engine torque request signal communication malfunction	An engine control module to electronic brake control module (EBCM) serial data fault is active or communication has been lost between the modules.
Automatic Braking Malfunction	Brake system malfunction	The electronic brake control module has detected a failure that does not allow automatic braking to be performed.
Axle Torque Serial Communication Malfunction	Axle Torque Serial Communication Malfunction	The adaptive cruise control is being inhibited by the ECM because a serial data signal timeout error has occurred with the hybrid max/min torque signals.
Battery Voltage Too High	Voltage above high voltage threshold	The ignition voltage is too high at the engine control module (typically 18 volts).
Battery Voltage Too Low	Voltage below low voltage threshold	The ignition voltage is low at the engine control module (typically 9 volts).
Brake Pedal Applied	Brake pedal apply	The brake pedal was applied.
Brake Pedal Not Initialized	Brake before cruise	The brake pedal has not been seen as applied prior to driver request to engage cruise with set switch. A brake pedal apply must be seen before allowing cruise engagement during each key cycle. On a vehicle equipped with a manual transmission, a clutch pedal apply may satisfy the brake pedal apply criteria.
Brake Pedal Position Malfunction	Brake pedal position signal invalid	A brake pedal apply circuit fault has been detected.
Brake Pedal Position Signal Malfunction	DTC P0703 is active or maximum time elapsed without receiving a valid Brake Pedal Position signal.	A serial data fault is active or communication has been lost with the module sending the brake pedal apply state.
Brake Pedal Pressure Detected	Brake pedal driver applied pressure detected	A brake pedal apply has been detected based on brake pedal pressure as measured by the electronic brake control module.
Brake Pedal Released Position Not Learned	Brake apply sensor home position not learned	The brake pedal position sensor released position is not learned.
Brake System Malfunction	Adaptive cruise control automatic braking failed	Adaptive cruise control automatic braking inoperative.
Calculated Torque	Calculated engine torque	The engine torque calculation is incorrect.
Clutch Pedal Applied	Clutch switch active	The clutch pedal was applied.
Coast Below Minimum Speed	Coast below low speed inhibit	The Set/Coast switch was depressed and the vehicle slowed below the minimum cruise control operating speed.
Coast Mode	Coast disengage	Cruise control is in coast mode with the Set/ Coast switch depressed and is requesting no throttle.
Control Function Active	DLC override	A scan tool is plugged into the Data Link Connector (DLC) connector.
Control Module Memory Malfunction	Memory failure	A control module memory failure has been detected.
Control Module Processor Malfunction	Processor integrity fault (random access memory corruption)	An engine control module software error has occurred.

Scan Tool Name	Description	Long Description
Crawl Mode Active	Crawl Mode Active	Crawl mode is active and inhibiting cruise control.
Cruise Control Cancel Switch Active	Cancel switch active	The cruise control cancel switch was depressed.
Cruise Control Software Malfunction	Sequence of completion checks	A cruise control software execution error has occurred.
Cruise Control Switch Inactive	On/Off switch in Off state	The cruise control On/Off switch is turned off.
Cruise Control Switch Invalid	Analog cruise switch input out of range	The cruise control switch voltage signal is in an invalid range.
Cruise Control Switch Serial Communication Malfunction	Serial data fault (cruise switch serial communication fault)	The cruise control switch serial data fault is active or communication has been lost with the module sending cruise control switch states.
Deceleration Rate Too High	High deceleration	The vehicle deceleration rate is too high.
Diagnostic Trouble Code (DTC) Set	Malfunction in PCM/ECM (DTC active)	A DTC is active or in history that inhibits cruise control operation.
Distance Sensing Cruise Control Brake Pedal Applied	Distance Sensing Cruise Control Brake Pedal Applied	Adaptive cruise control is being inhibited by the ECM because a brake pedal apply has occurred.
Distance Sensing Cruise Control Cancel Switch Active	Distance Sensing Cruise Control Cancel Switch Active	Adaptive cruise control is being inhibited by the ECM because the driver applied the cancel switch.
Distance Sensing Cruise Control Data	Serial data fault for adaptive cruise control throttle control and brake control signals sent by the distance sensing cruise control module	A distance sensing cruise control module serial data fault is active or communication has been lost between the distance sensing cruise control module and the engine control module.
Distance Sensing Cruise Control Inhibit	Distance sensing cruise control inhibited	The distance sensing cruise control system is inhibited.
Distance Sensing Cruise Control Invalid Engage	Distance Sensing Cruise Control Invalid Engage	Adaptive cruise control is being inhibited by the ECM because an invalid sequence of cruise control applies, brake pedal applies, or an invalid speed range has been detected.
Distance Sensing Cruise Control Off	Distance Sensing Cruise Control Off	Adaptive cruise control is being inhibited by the ECM because the driver has turned off the cruise on/off switch.
Distance Sensing Cruise Control Reduced Engine Power	Distance Sensing Cruise Control Reduced Engine Power	Adaptive cruise control is being inhibited by the ECM due to a fault resulting in “Reduced Engine Power”.
Driven Wheel Speed Higher Than Non Driven Wheel Speed	Driven wheel speed greater (wheel slip detection)	The driven wheel speed is greater than the non driven wheel speed (slip detection).
Engine Control Module	PCM/ECM inhibit (RAM corruption)	Engine control module internal communication error.
Engine Control Module (ECM) Reset	ECM running reset	An engine control module running reset has occurred.
Engine Overspeed Protection Active	Injectors disabled (engine overspeed fuel cut-off active)	Engine RPM limiter active with fuel cut off active.
Engine Overtemperature Protection Active	Engine metal overtemp active	The engine is over temperature. The engine is overheated.
Engine Run Time	Engine run time not elapsed	The engine has not been running long enough, typically five seconds.
Engine Speed	Engine speed too low or too high	The engine RPM is too low (near stall) or too high (near engine RPM fuel shutoff).
Excessive Accelerator Position Override	Pedal greater than cruise (override)	The driver has overridden cruise control set speed with accelerator pedal for greater than an allowable time.
1st Gear	First Gear	Transmission is engaged in 1st gear.

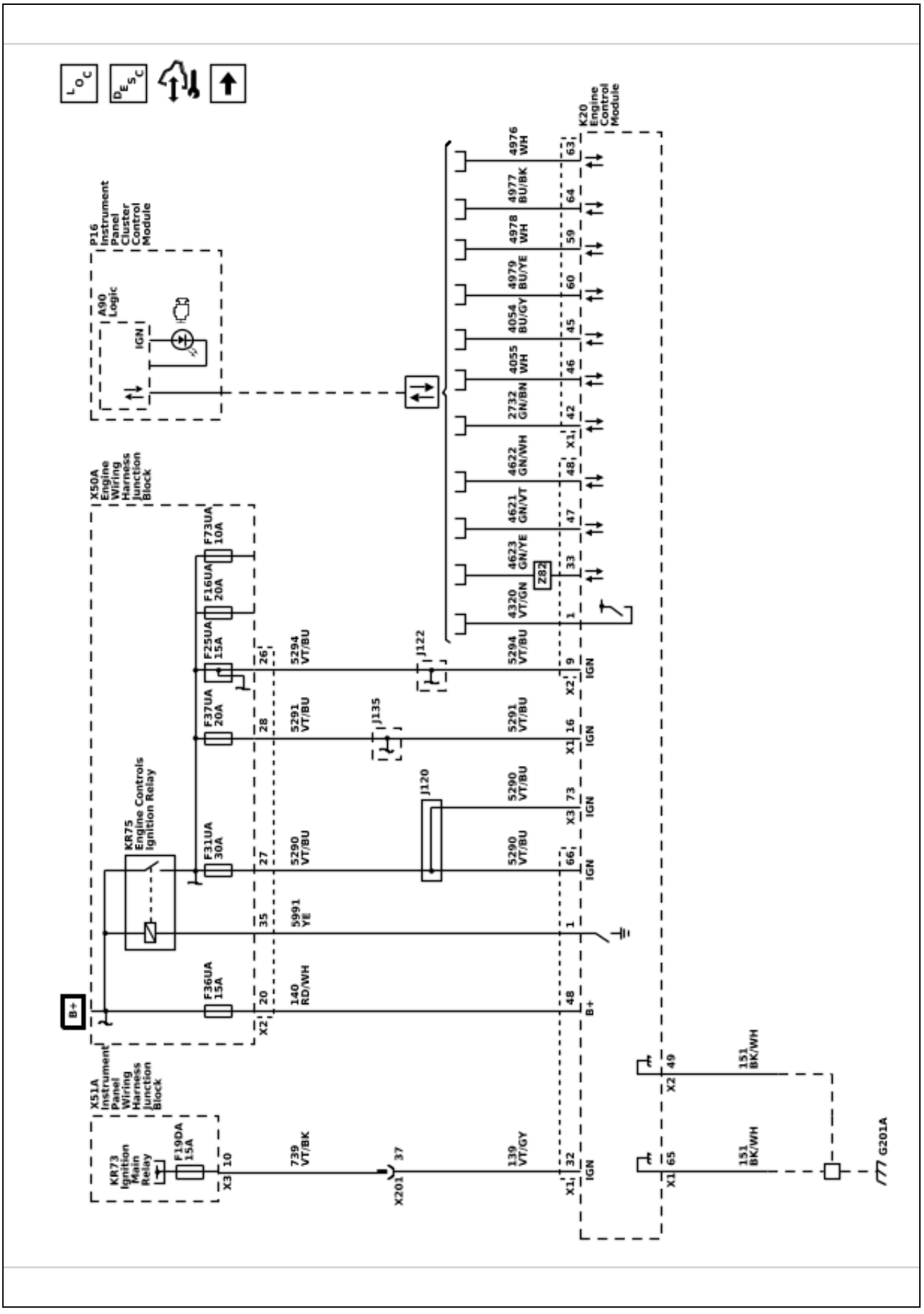
Scan Tool Name	Description	Long Description
Gear Change without Applied Clutch Pedal	Manual transmission out of gear with no clutch pedal apply	Manual transmission shifted to Neutral without clutch pedal being applied.
Hill Descent Control Active	Hill Descent Control System Active	The hill descent control system has gone active.
Hill Descent Control Serial Communication Malfunction	Hill Descent Control Serial Communication Malfunction	An electronic brake control module serial data fault is active or communication has been lost between the EBCM and ECM.
Hybrid/EV System	Hybrid Cruise Disengage	Cruise control is inhibited on hybrid applications when “Regen on Demand” is requested by the driver via the tap-up/tap-down paddles.
Illegal Mode	Illegal cruise mode	The cruise control mode is incorrect based on switch states.
Lane Center Control Serial Data Error	Lane Center Control Serial Communication Malfunction	Adaptive cruise control is being inhibited by the ECM because a serial data error has been detected on a vehicle with Lane Center Control.
Non Driven Wheel Speed Higher Than Drive Wheel Speed	Non-driven wheel speed greater	The non driven wheel speed is greater than the driven wheel speed.
None	None	This disengagement reason may be displayed after a dead battery repair or module replacement.
Park Brake Applied	Park brake switch signal active	The parking brake is applied.
Power Take-Off Active	Power Take Off active	The Power Take Off (PTO) system is active.
Rear Axle in Low Range	Rear axle in low	The rear axle is in low range.
Set/Coast and Resume/Accelerate Switches Active Simultaneously	SET and RESUME switches simultaneously active	The Set/Coast and Resume/Accelerate switches were pressed simultaneously.
Set/Coast Switch Active With Vehicle Speed Higher Than Set Point	Over schedule tap-down	The Set/Coast switch is selected, vehicle speed is above set speed and does not decrease. May be due to traveling down hill.
Speed Limiting/Warning System On	Speed limiter/warning On/Off switch turned on	Driver has turned on the Speed Limiter/Warning on/off switch. Cruise is disabled/inhibited and cruise on/off switch will be set to Off.
Throttle Actuator Control System	Electronic throttle control prevents cruise operation	The electronic throttle control system has detected a failure in the throttle control hardware.
Traction Control Active	Traction control active	The traction control system was active.
Traction Control System Malfunction	Traction Control System Malfunction	A fault is present in the traction control system.
Traction Control System Off	Traction Control System Off	The traction control system has been turned off by the driver.
Transfer Case in 4WD Low Range	Transfer case in 4WD Low	The transfer case is in low range.
Transmission Gear Ratio Malfunction	Transmission gear fault	A transmission DTC is active or in history, that inhibits cruise control operation.
Transmission Not in Forward Gear	Transmission in neutral, reverse or park	The transmission gear selector is not in a forward gear.
Vehicle Overspeed Protection Active	MPH limited fuel (vehicle overspeed fuel cut-off active)	The vehicle overspeed protection is active with fuel cut off active.
Vehicle Speed Higher Than Set Point	Over schedule	Vehicle speed has exceeded driver selected set speed by more than an allowable amount. This may occur while driving down a significant grade or driver overriding cruise while performing a passing maneuver.
Vehicle Speed Lower Than Set Point	Under schedule	The vehicle speed is below cruise control set speed by more than an allowable amount.
Vehicle Speed Too High	Vehicle speed exceeds high speed threshold	Vehicle speed has exceeded maximum cruise operating speed.

Scan Tool Name	Description	Long Description
Vehicle Speed Too Low	Vehicle speed drops below low speed threshold	Vehicle speed dropped below the cruise control minimum operating speed. May be due to hilly terrain and low vehicle speed. Manual transmission gear selection and engine torque may contribute to this disengagement reason.
Vehicle Stability System Active	Vehicle stability control active	The vehicle stability control system was active.
Vehicle Stability System Malfunction	Vehicle Stability System Malfunction	A fault has been detected in the vehicle stability control system.
Vehicle Stability System Off	Vehicle Stability System Off	The vehicle stability control system has been turned off by the driver.

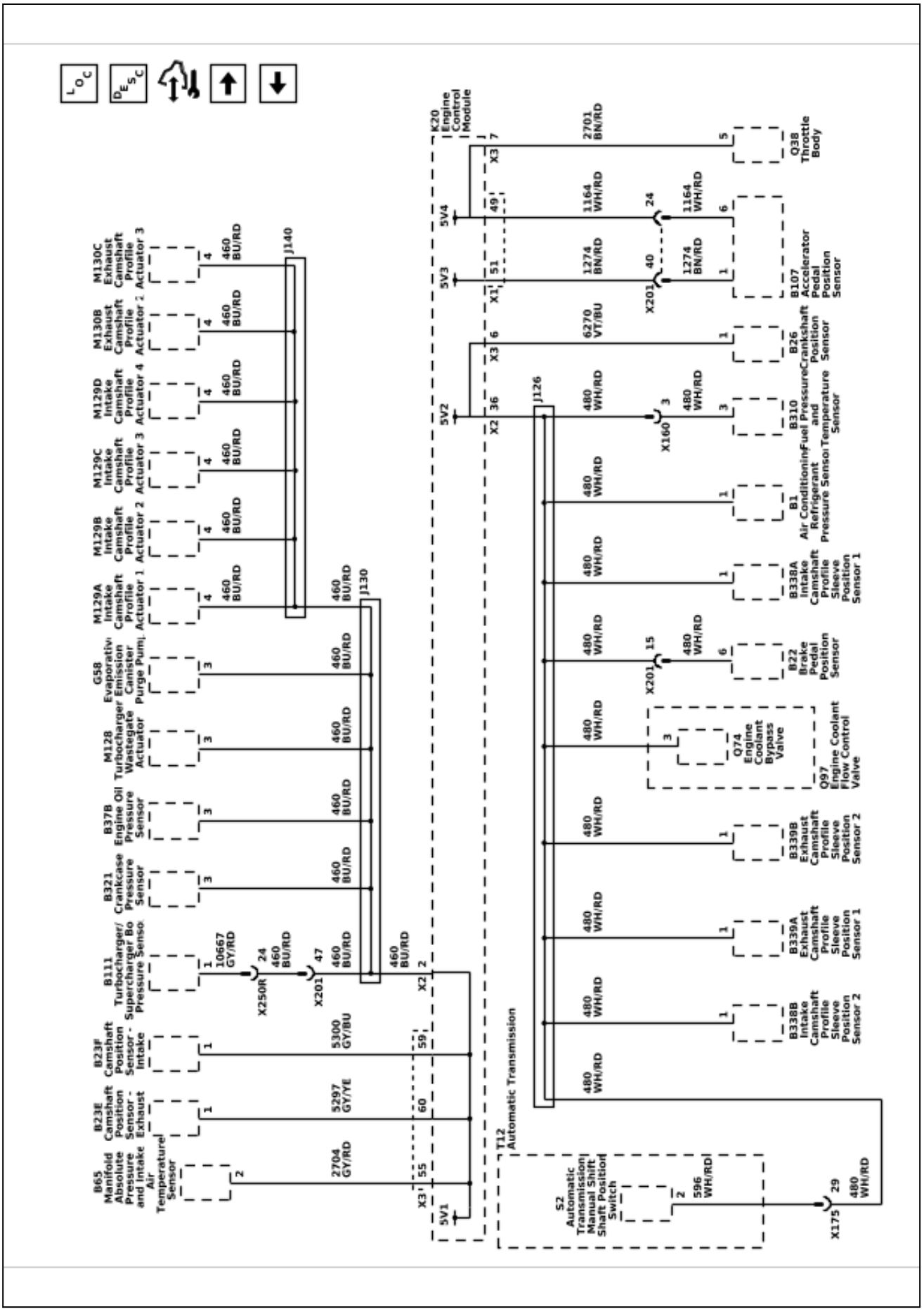
Engine Controls and Fuel - 2.7L

Schematic and Routing Diagrams

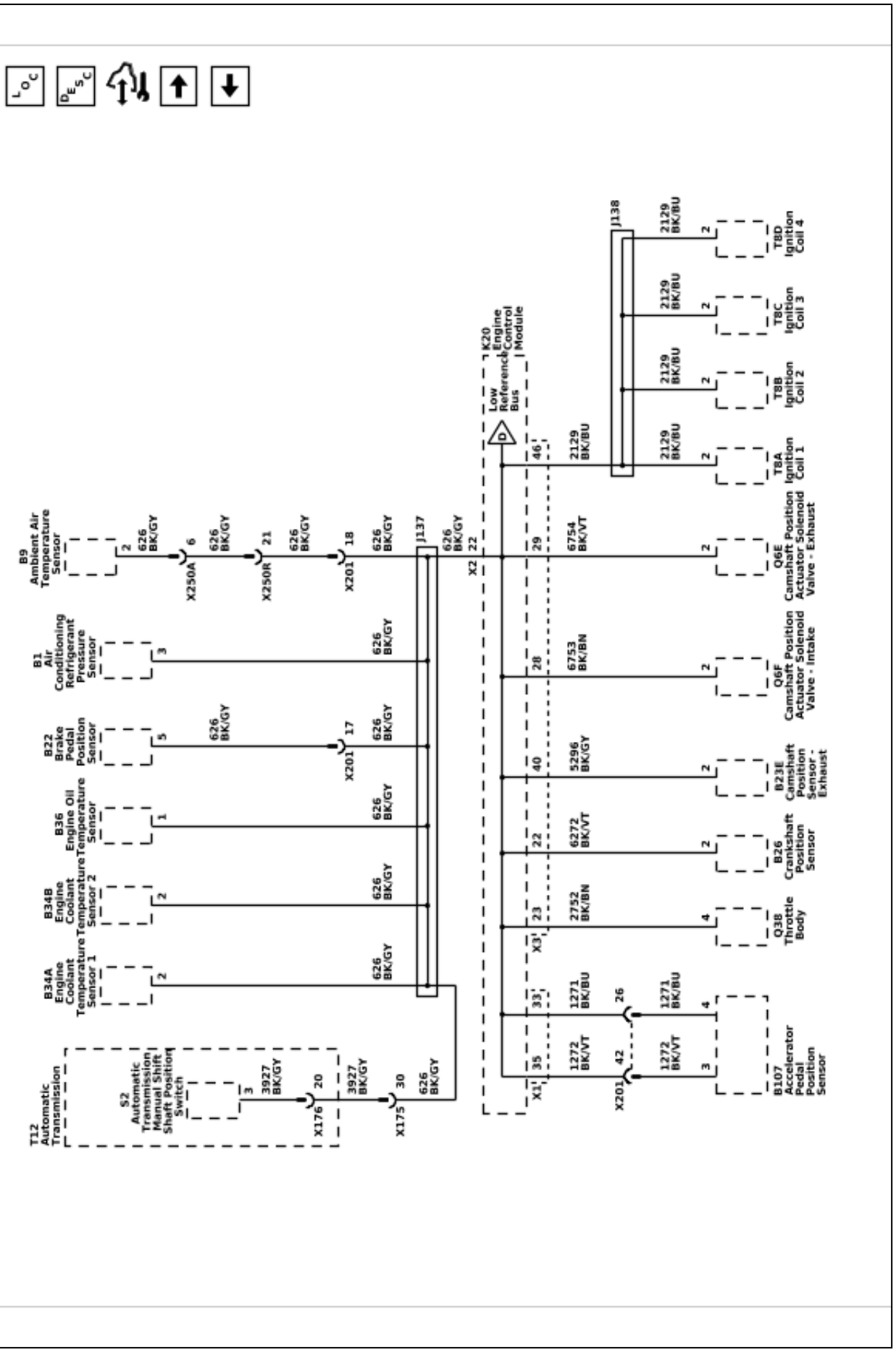
Engine Controls Schematics (Power, Ground, Serial Data, and MIL)



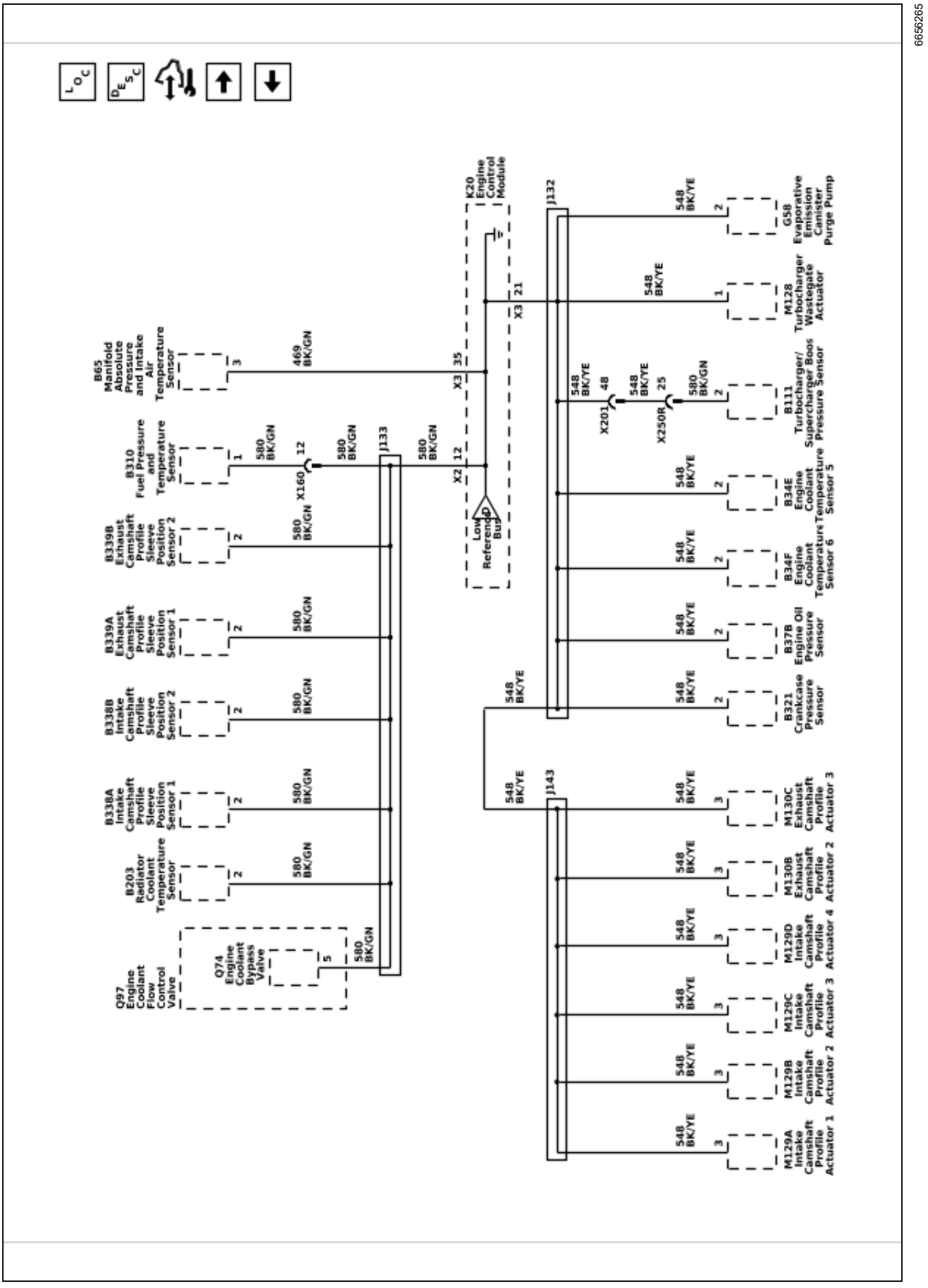
Engine Controls Schematics (5V Reference Bus)



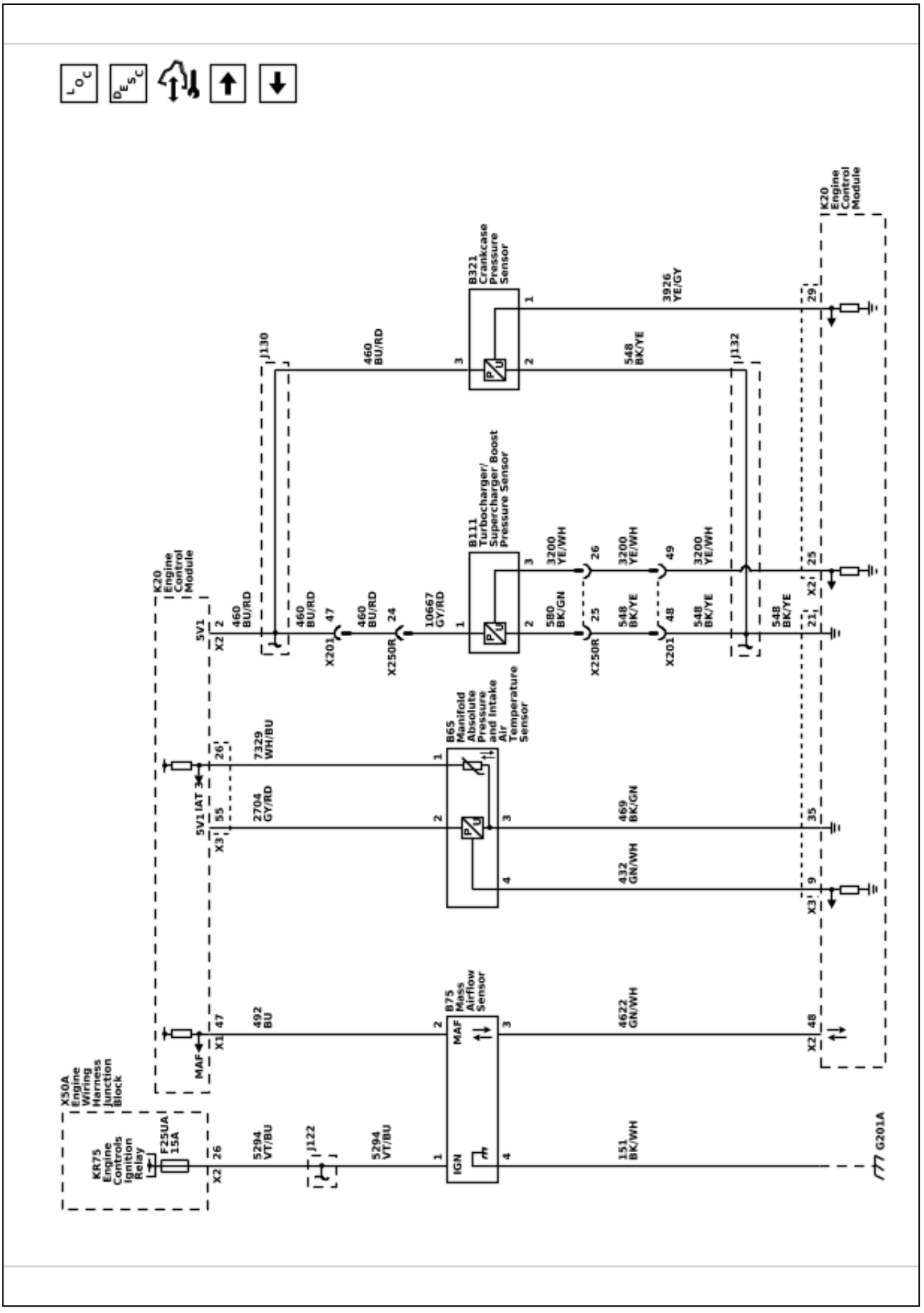
Engine Controls Schematics (Low Reference Bus 1 of 2)



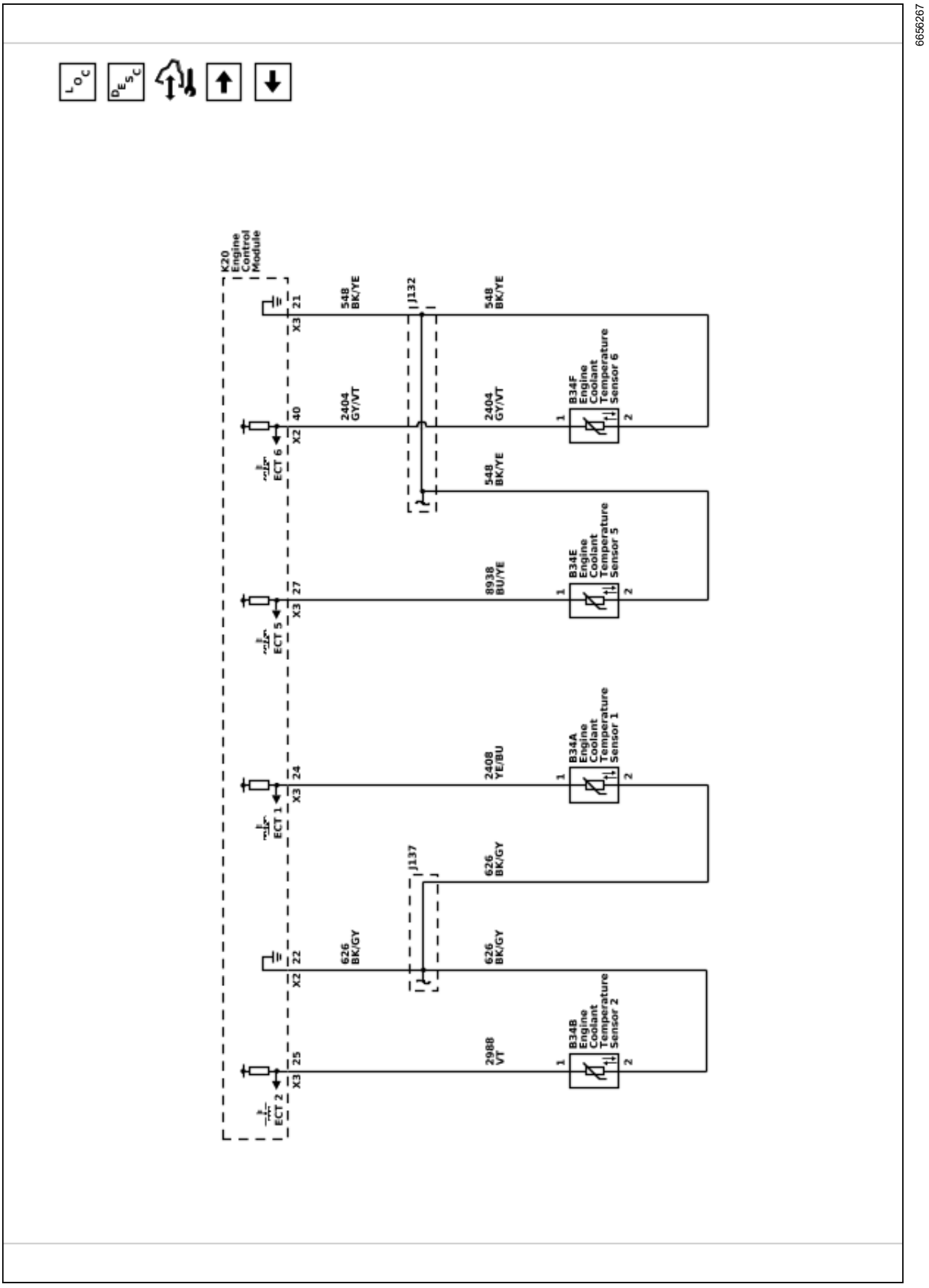
Engine Controls Schematics (Low Reference Bus 2 of 2)



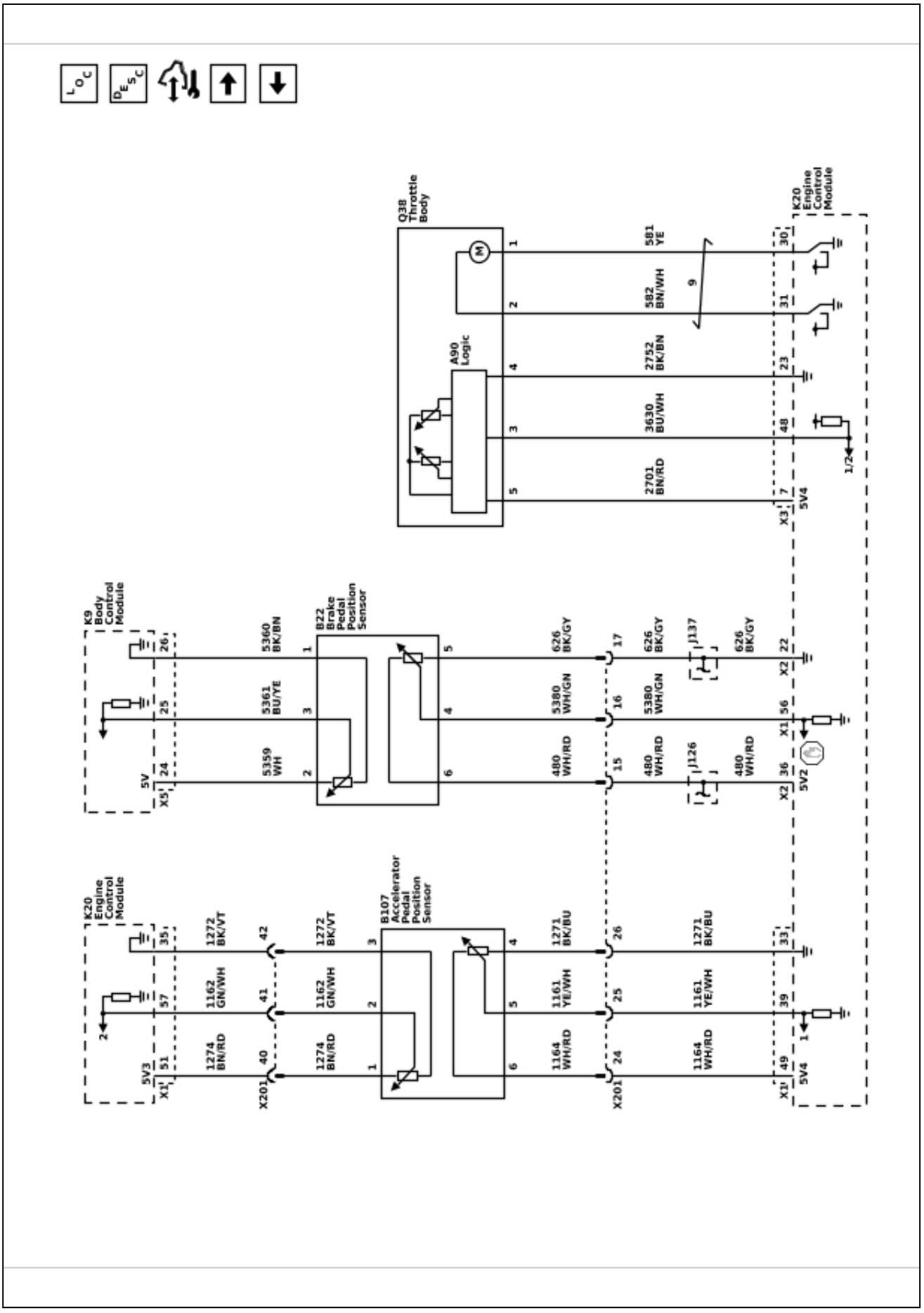
Engine Controls Schematics (Engine Data Sensors - Air Pressure, Crankcase Pressure and Temperature)



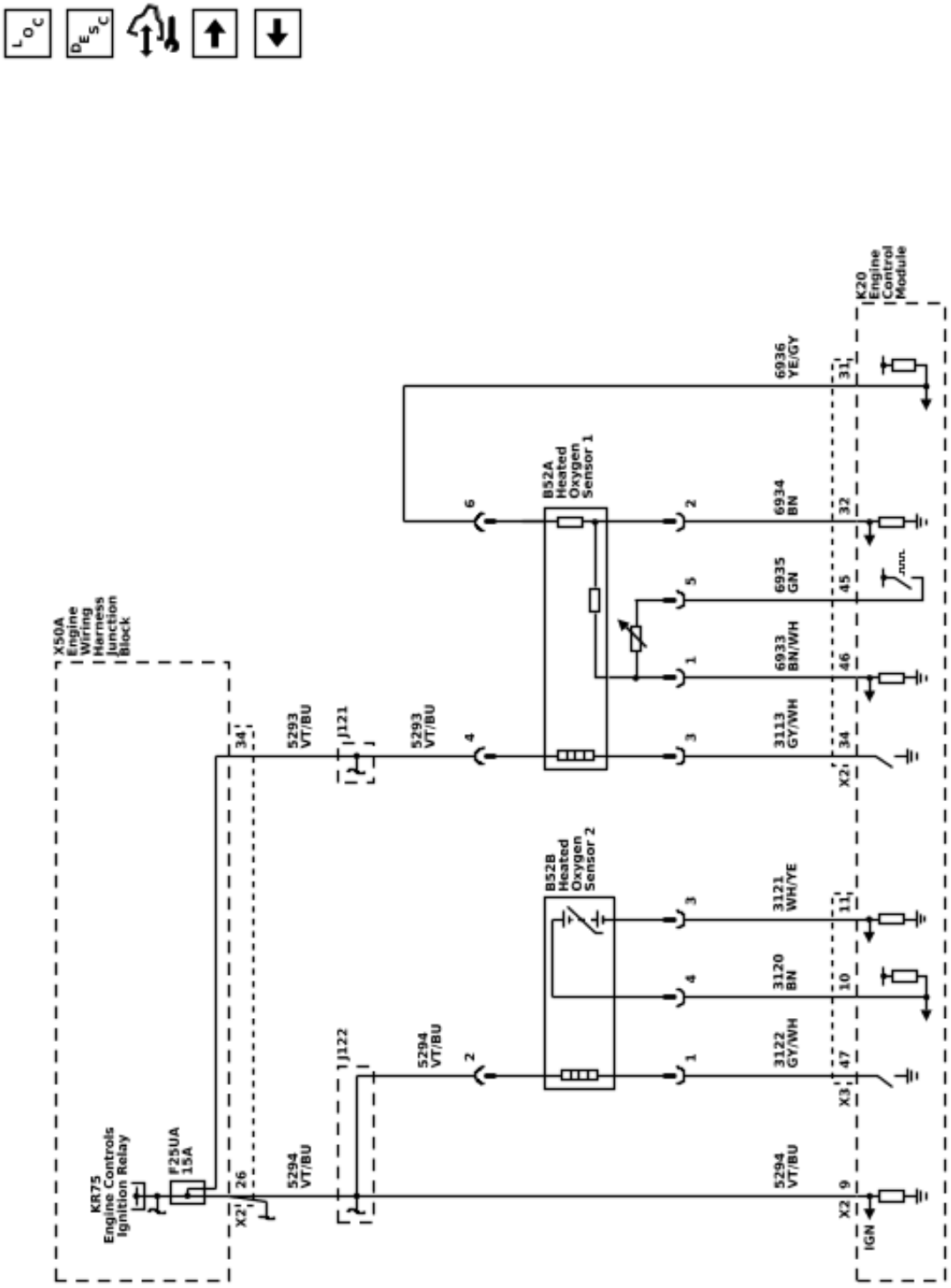
Engine Controls Schematics (Engine Data Sensors - Coolant Temperature)



Engine Controls Schematics (Engine Data Sensors - Throttle Controls and Override)



Engine Controls Schematics (Engine Data Sensors - Oxygen Sensors)



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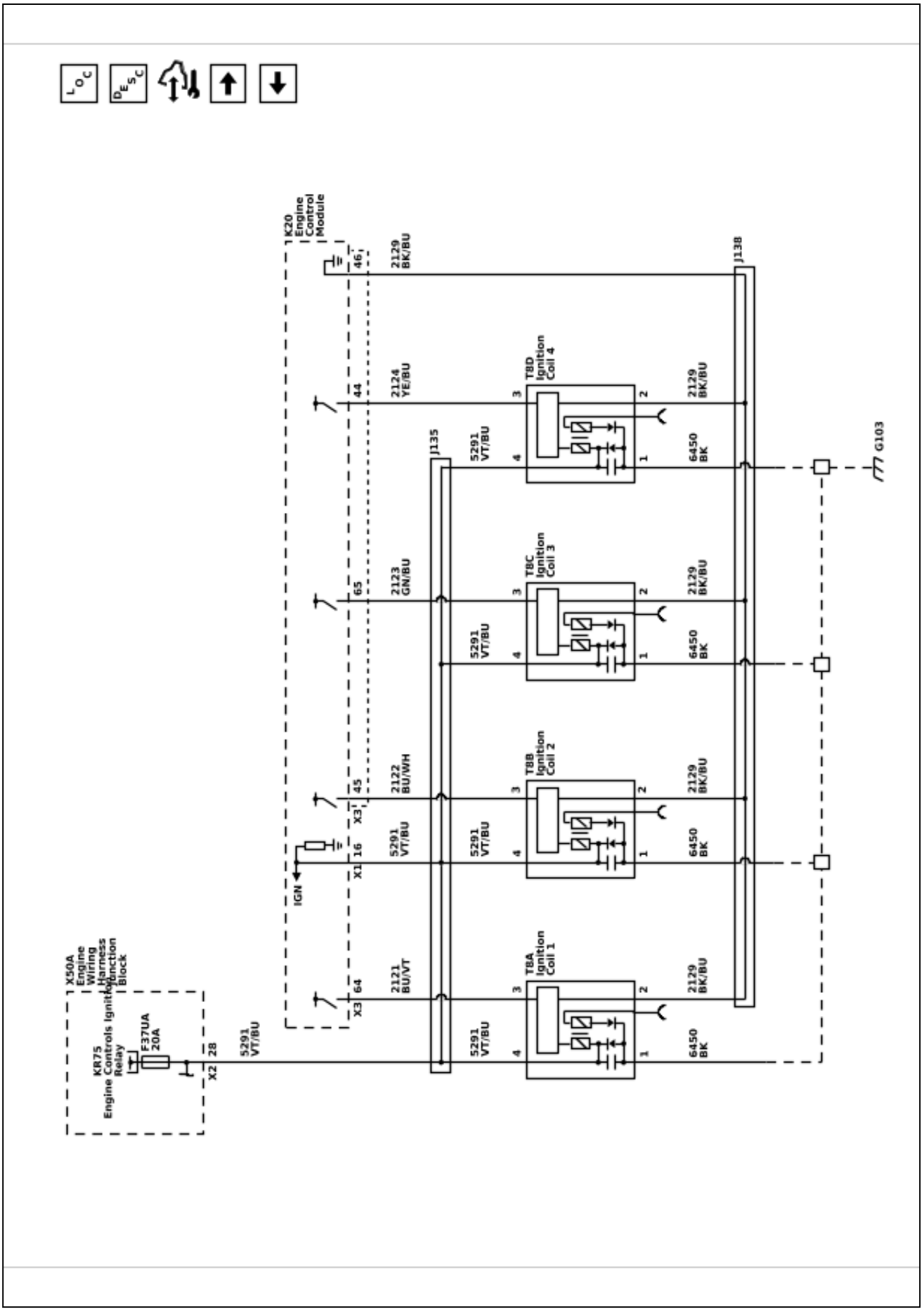
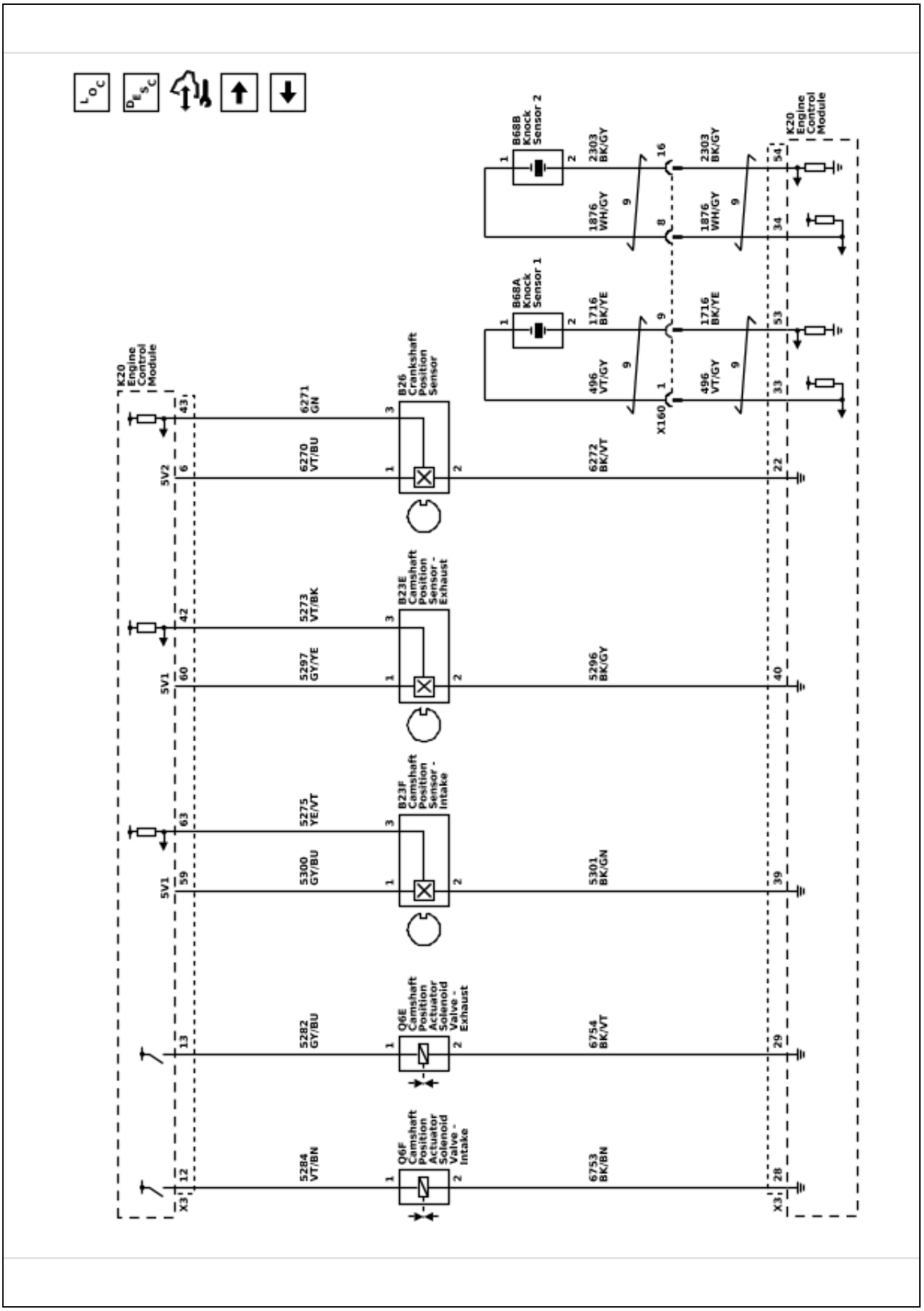
Engine Controls Schematics (Ignition Controls - Ignition Coils)



Engine Controls Schematics (Ignition Controls - Crankshaft Position, Camshaft Position, Knock Sensors and Camshaft Position Actuator)



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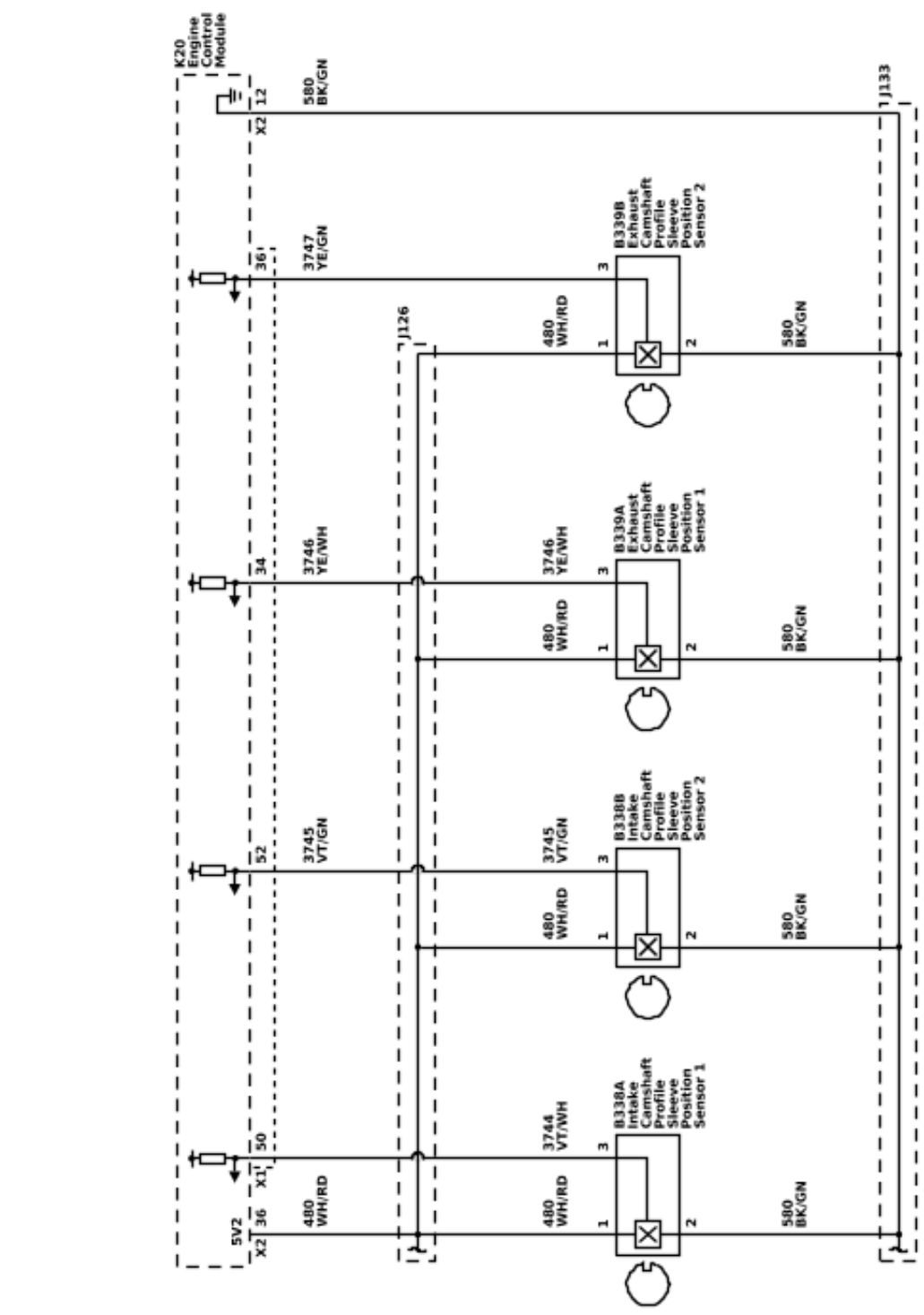
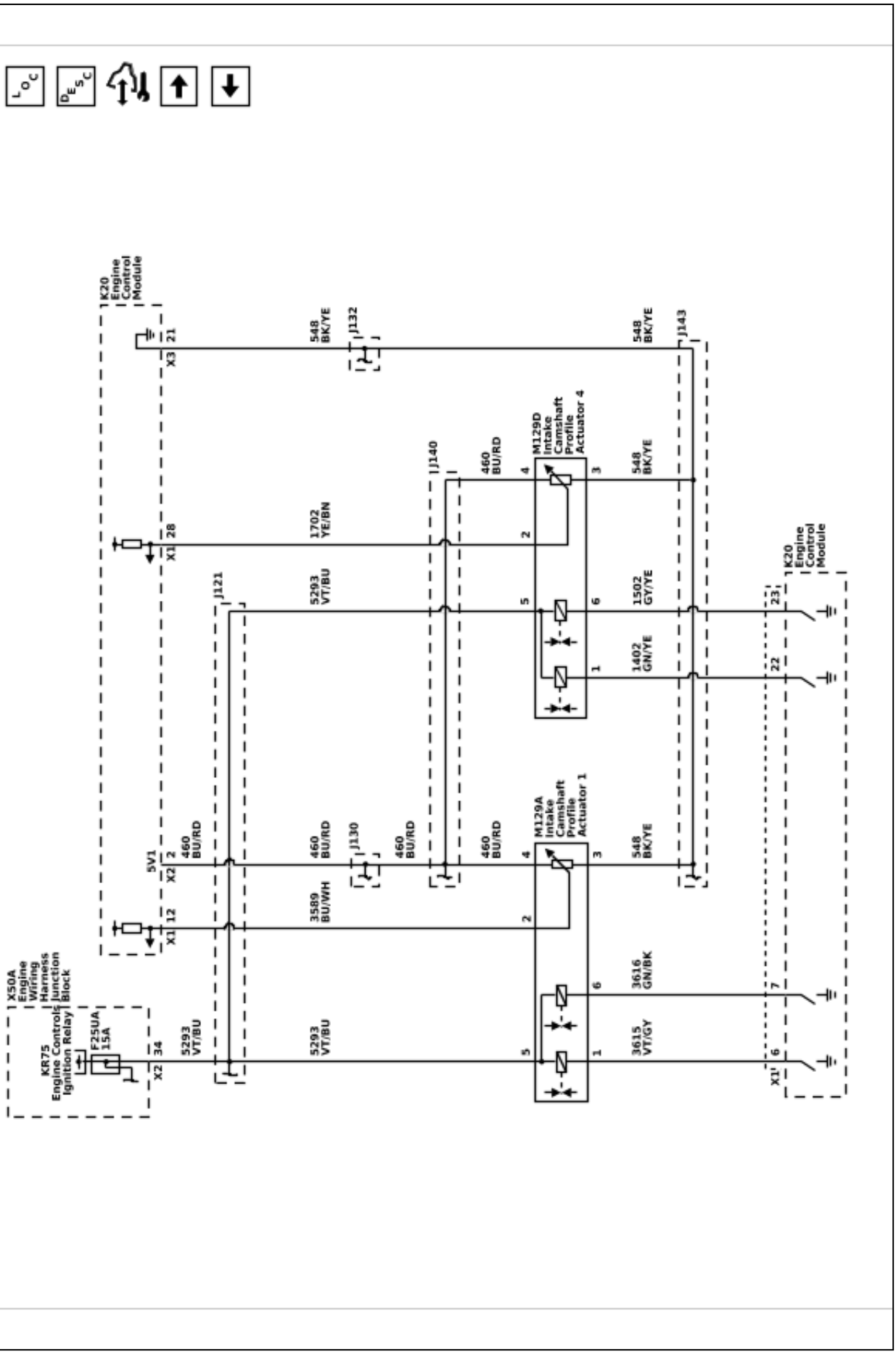
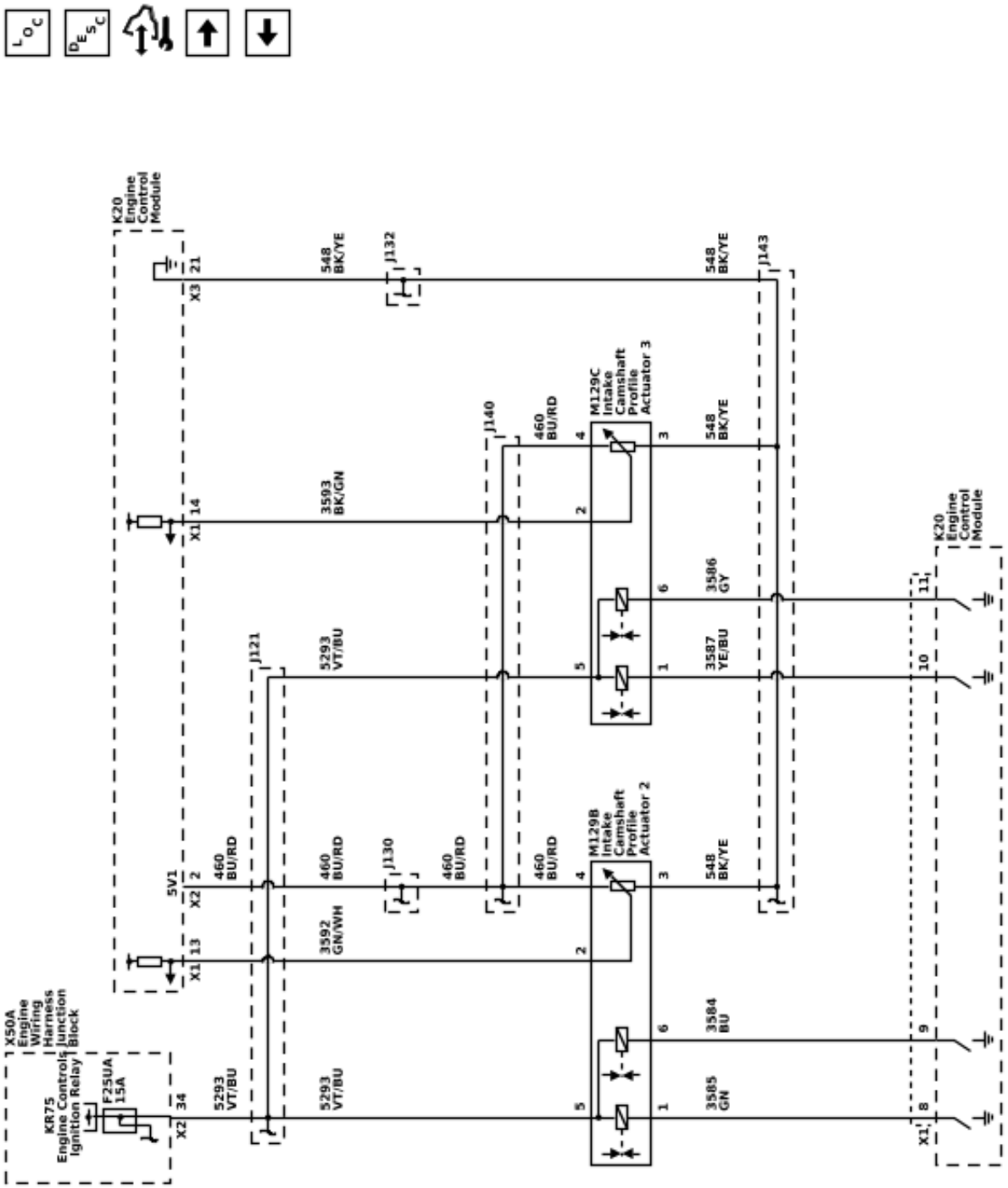
Engine Controls Schematics (Camshaft Profile Controls - Position Sensors)



Engine Controls Schematics (Camshaft Profile Controls - Intake Actuators 1 of 2)



Engine Controls Schematics (Camshaft Profile Controls - Intake Actuators 2 of 2)



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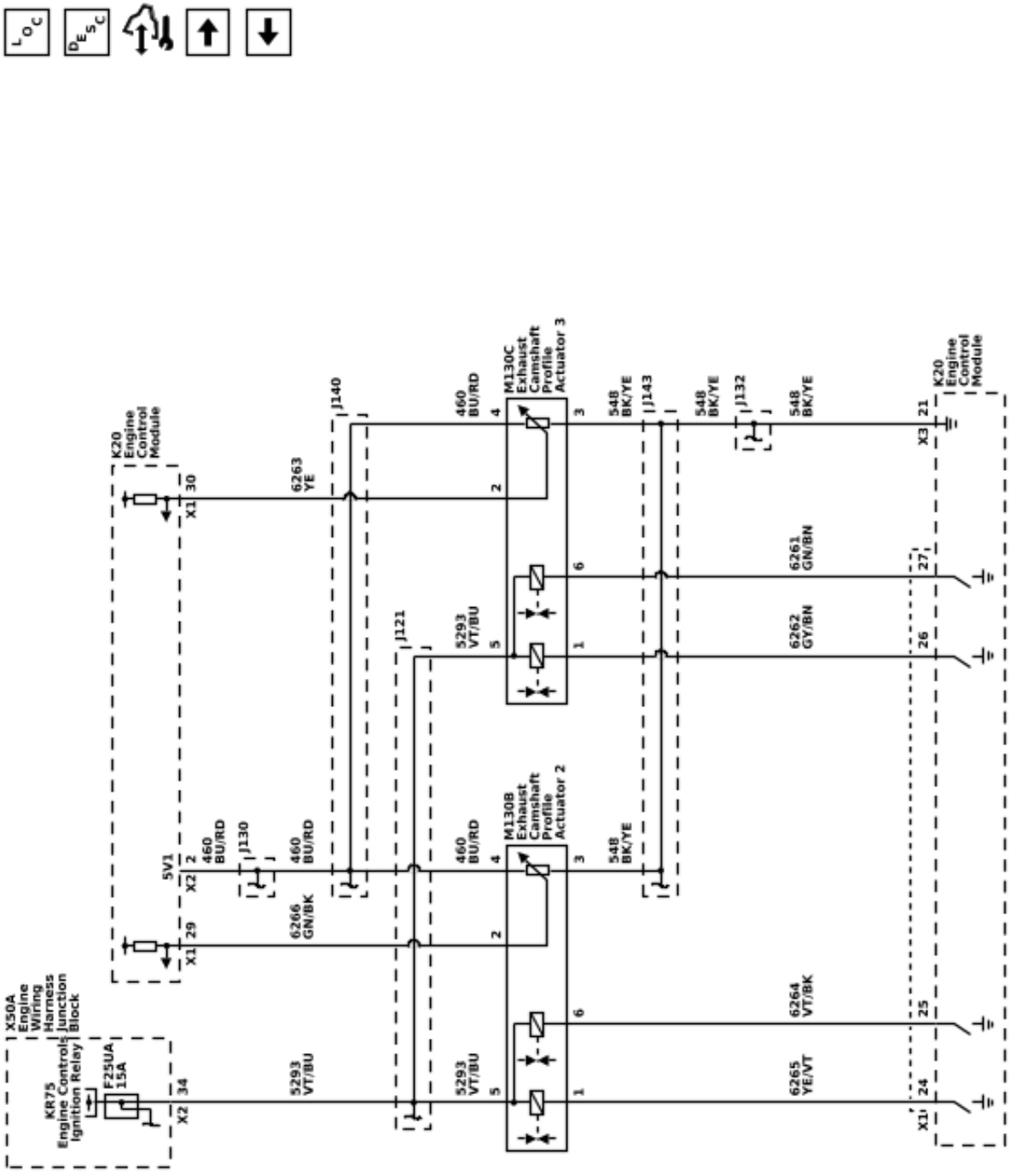
Engine Controls Schematics (Camshaft Profile Controls - Exhaust Actuators)



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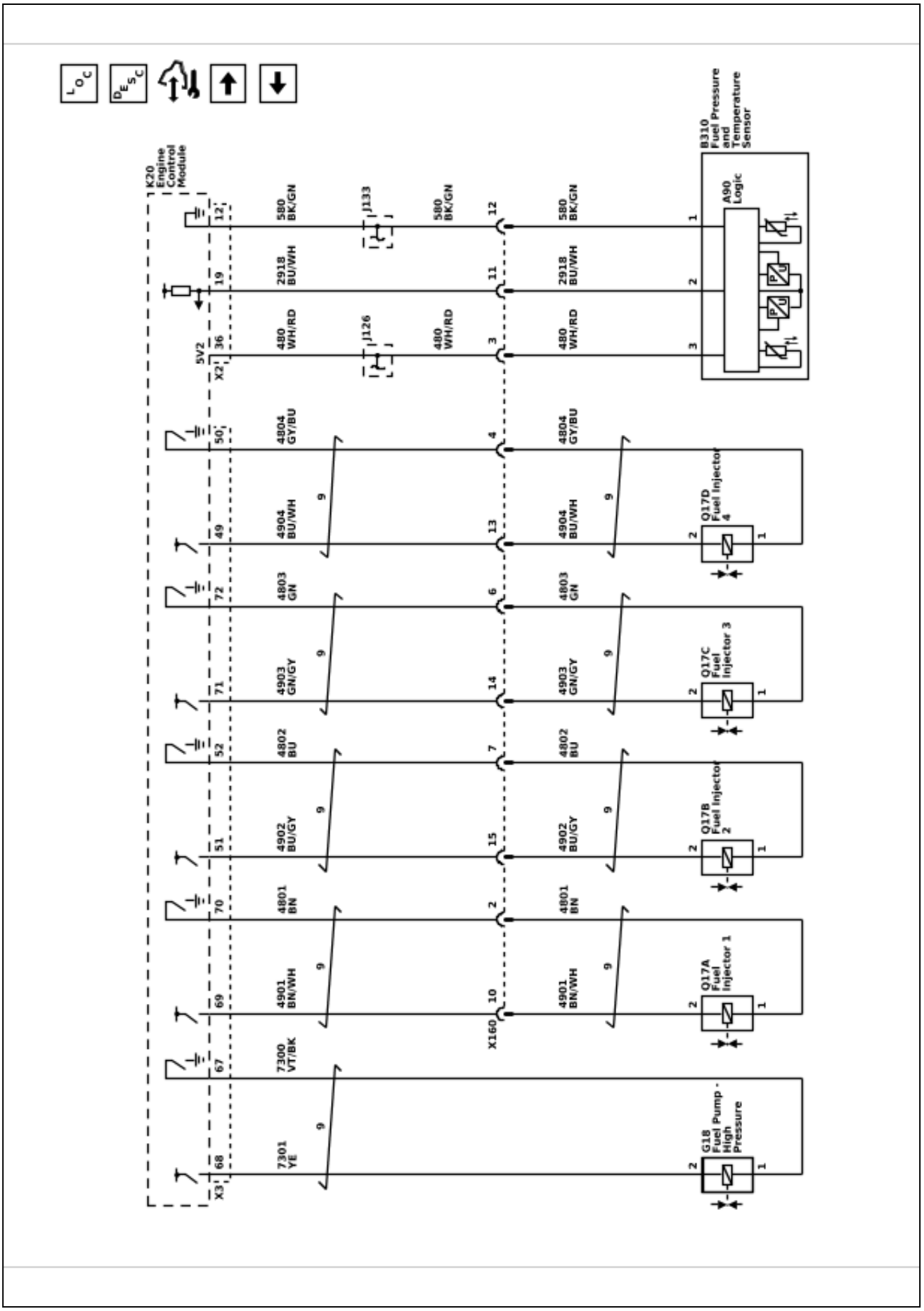
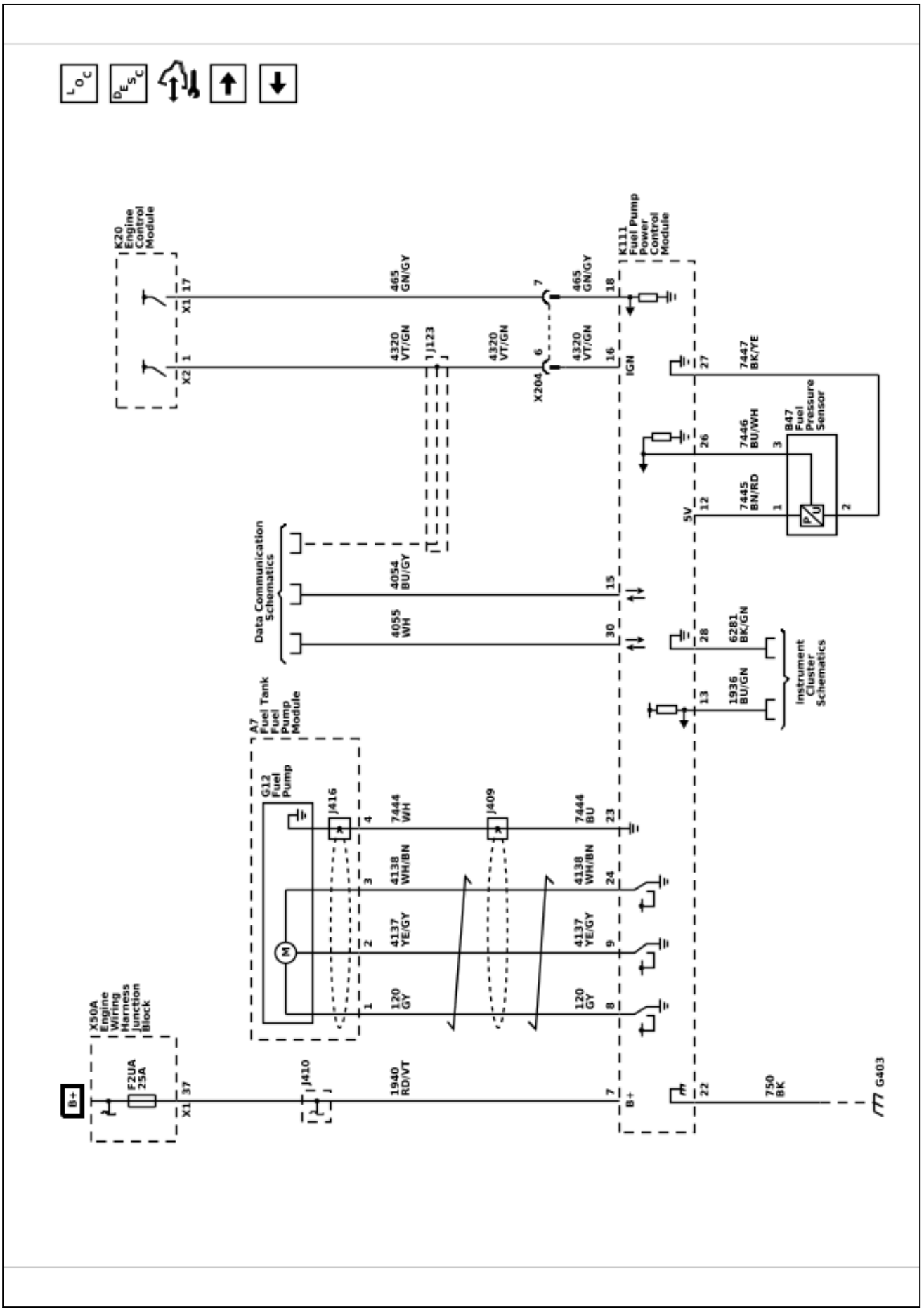
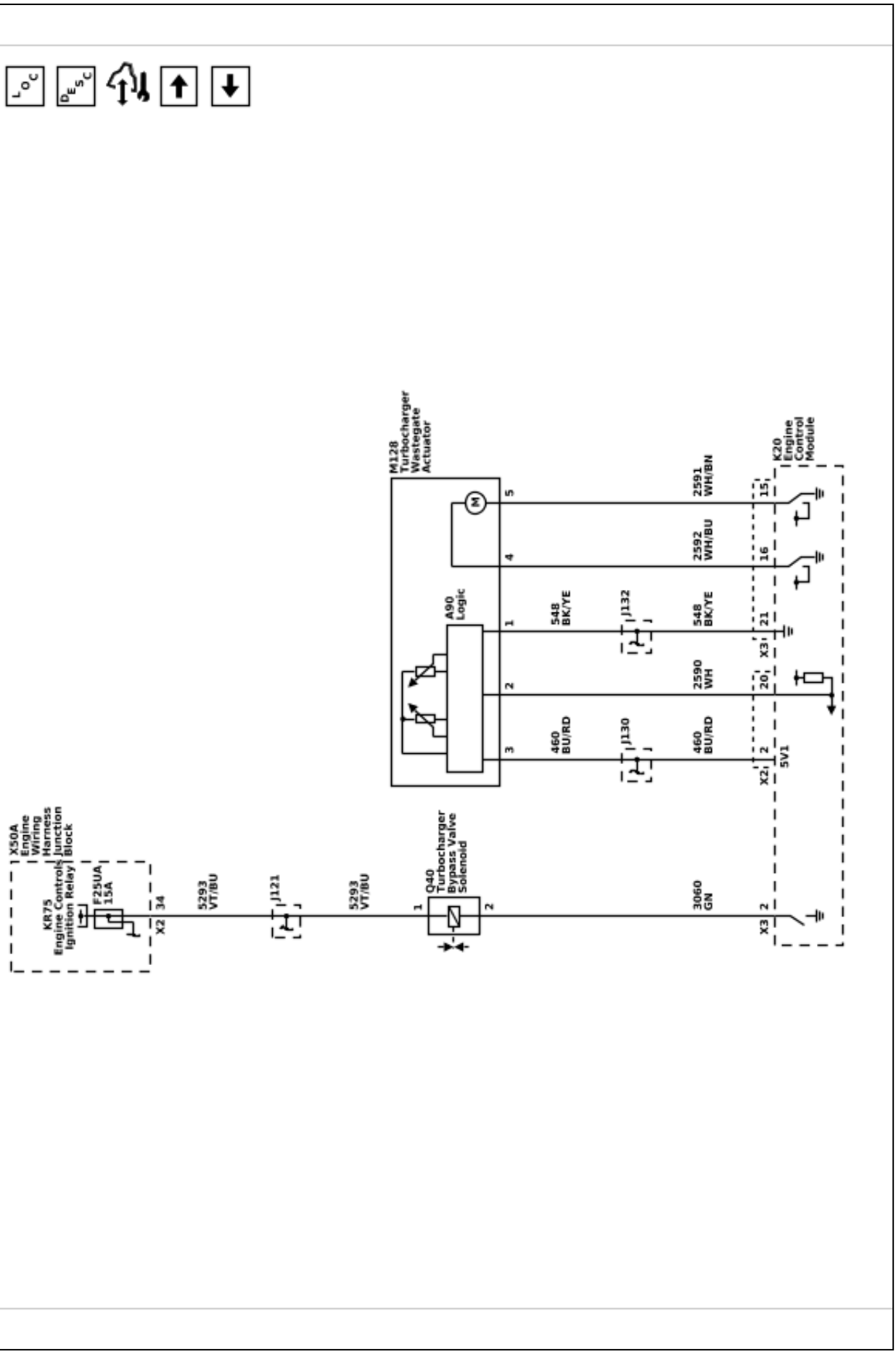
Engine Controls Schematics (Fuel Controls - Fuel Injectors and Fuel Pressure)



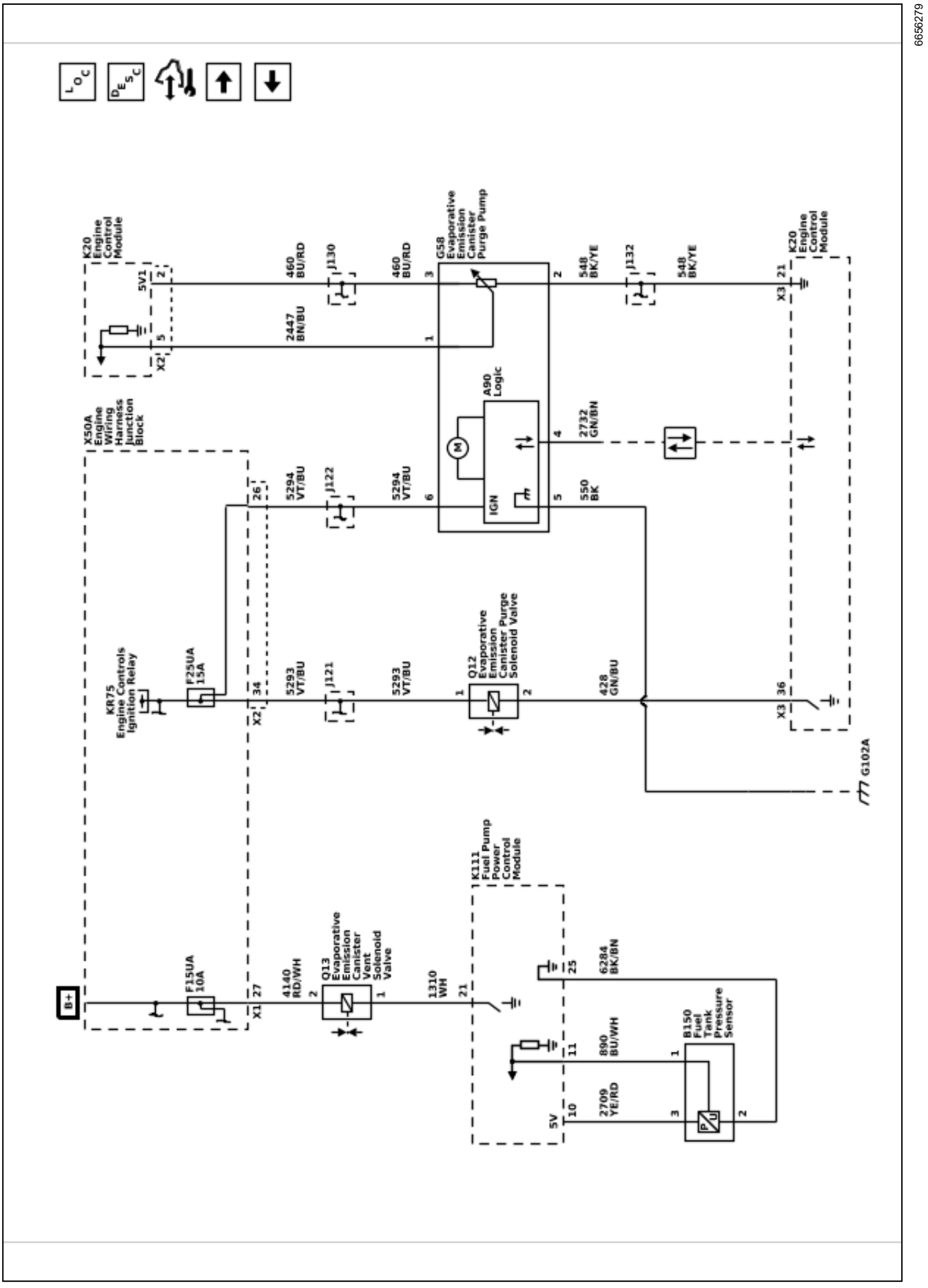
Engine Controls Schematics (Fuel Controls - Fuel Pump Control)



Engine Controls Schematics (Fuel Controls - Turbocharger Controls)



Engine Controls Schematics (Fuel Controls - Evaporative Emission Controls)



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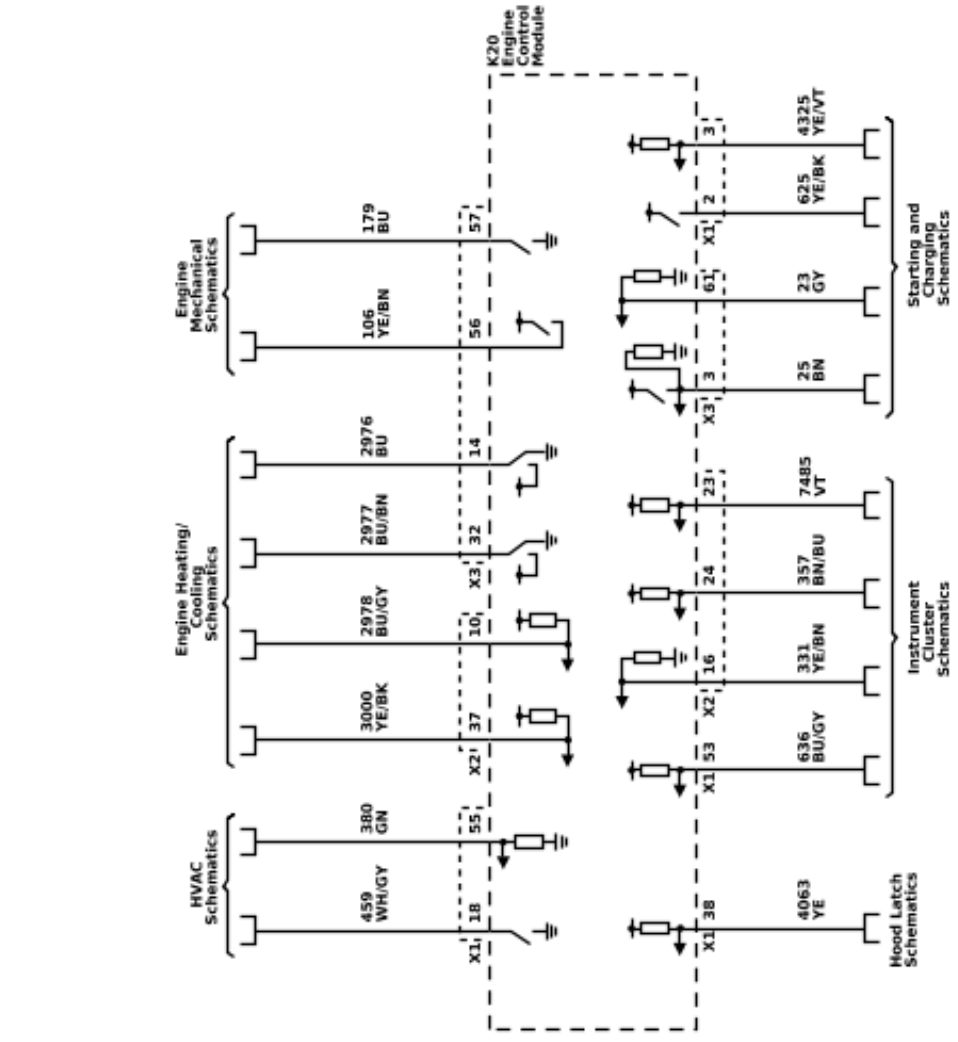
Engine Controls Schematics (Controlled/Monitored Subsystem References)



Description and Operation

Catalytic Converter Description and Operation

Three-Way Catalytic Converter

A three-way catalyst is designed to reduce the levels of hydrocarbons, carbon monoxide and nitrogen oxide.

Catalytic Converter

Catalyst Conversion

The catalyst within the converter promotes a chemical reaction, which oxidizes the hydrocarbons and the carbon monoxide that are present in the exhaust gas. This process converts the hydrocarbons and the carbon monoxide into water vapor and carbon dioxide, and reduces the nitrogen oxide, converting the nitrogen oxide into nitrogen.

Oxygen Storage

The catalyst stores oxygen. The engine control module (ECM) monitors this process by using heated oxygen sensors that are in the exhaust stream before and after the catalyst. The heated oxygen sensors produces an output signal that the ECM uses to calculate the oxygen storage capacity of the catalyst. This indicates the ability of the catalyst to convert the exhaust emissions efficiently. The ECM monitors the efficiency of the catalyst by monitoring the heated oxygen sensors during an off-idle, deceleration fuel cut-off event. When the catalyst is functioning properly, the post catalyst heated oxygen sensors response to the fuel conditions during the deceleration fuel cut-off event is slow compared to the response of the pre catalyst heated oxygen sensors. When the post heated oxygen sensors response is near that of the pre heated oxygen sensors, the oxygen storage capability and efficiency of the catalyst may be degraded below an acceptable threshold.

Cold Start Strategy

The catalyst must be warmed to efficiently reduce the emissions. The cold start strategy is to reduce the amount of time it takes to warm the catalyst. During a cold start, the engine spark timing and fuel injection are altered to allow the catalyst to warm quickly. The ECM monitors the following to build an exhaust energy model:

- Engine airflow
- Engine coolant temperature
- Engine idle speed
- Engine run time
- Fuel Injection
- Spark advance

The actual model is then compared to the expected exhaust energy model.

Fuel Trim Bias

Fuel trim bias is used to keep the post catalyst air/fuel ratio within a predetermined range. This allows optimal catalyst efficiency under various operating conditions. The ECM constantly monitors how lean or rich the fuel trim bias is commanded, to determine if the fuel trim bias is greater than a calibrated amount.

Heated Oxygen Sensor Description and Operation

The engine control module (ECM) controls a closed loop air/fuel metering system in order to provide the best possible combination of driveability, fuel economy, and emission control. The ECM monitors the heated oxygen sensor (HO2S) signal and adjusts the fuel delivery based on the signal while in closed loop operation. The short term fuel trim values change rapidly in response to the HO2S signal. These changes fine tune the engine fueling. The long term fuel trim values change in response to trends in the short term fuel trim. The long term fuel trim makes coarse adjustments to fueling in order to re-center and restore control to short term fuel trim.

Heated Oxygen Sensor

When the engine is started, the ECM operates in an Open Loop mode, ignoring the HO2S signal voltage while calculating the air-to-fuel ratio. While the engine runs, the HO2S heats up and begins to generate a voltage within a range of 0–1,000 mV. Once sufficient HO2S voltage fluctuation is observed by the ECM, Closed Loop mode is entered. The ECM uses the HO2S voltage to determine the air-to-fuel ratio. An HO2S voltage that increases toward 1,000 mV indicates a rich fuel mixture. An HO2S voltage that decreases toward 0 mV indicates a lean fuel mixture.

Heated oxygen sensors are used for fuel control and post catalyst monitoring. Each HO2S compares the oxygen content of the surrounding air with the oxygen content in the exhaust stream. The HO2S must reach operating temperature to provide an accurate voltage signal. A heating element inside the HO2S minimizes the time required for the sensor to reach operating temperature. This allows the system to enter Closed Loop earlier and the ECM to calculate the air-to-fuel ratio sooner. Voltage is provided to the heater by an ignition voltage circuit through a fuse. With the engine running, ground is provided to the heater by the HO2S heater low control circuit through a low side driver within the ECM. The ECM uses pulse width modulation (PWM) to control the HO2S heater operation to maintain a specific HO2S operating temperature range.

Wide Band Heated Oxygen Sensor

The wide band heated oxygen sensor (HO2S) measures the amount of oxygen in the exhaust system and provides more information than the switching style HO2S. The wide band sensor consists of an oxygen sensing cell, an oxygen pumping cell, and a heater. The exhaust gas sample passes through a diffusion gap between the sensing cell and the pumping cell. An electronic circuit within the ECM controls the pump current through the oxygen pumping cell in order to maintain a constant voltage in the oxygen sensing cell. The ECM monitors the voltage variation in the sensing cell and attempts to keep the voltage constant by increasing or decreasing the amount of current flow, or oxygen ion flow, from the pumping cell. By measuring the amount of current required to maintain the voltage in the sensing cell, the ECM can determine the concentration of oxygen in the exhaust. The HO2S pumping current is displayed as a lambda value. A lambda value of 1 is equal to a stoichiometric air fuel ratio of 14.7:1. Under normal operating conditions, the lambda value will remain around 1. When the fuel system is lean, the oxygen level will be high and the lambda signal will be high or more than 1. When the fuel system is rich, the oxygen level will be low, and the lambda signal will be low or less than 1. The ECM uses this information to maintain the correct air/fuel ratio. If the ECM detects that the HO2S signal is out of range a DTC will set.

The heating element inside each HO2S heats the sensor to bring it up to operating conditions faster. This allows the system to enter Closed Loop mode earlier and the ECM to calculate the air-to-fuel ratio sooner.

Inspection/Maintenance Description and Operation

Some state/provincial and local governments require that a vehicle pass on-board diagnostic (OBD) system tests and the Inspection/Maintenance (I/M) emission inspection in order to renew license plates. This is accomplished by viewing the I/M System monitors on a scan tool and confirming that no Permanent DTCs are set.

The OBD II system monitors all emission control systems that are on-board. The OBD II regulations require monitoring of the following:

Monitor	Diesel	Gasoline
Boost System Monitor - Since Diagnostic Trouble Codes Cleared	X	—
Catalytic Converter Monitor - Since Diagnostic Trouble Codes Cleared	X	X
Evaporative Emission Monitor - Since Diagnostic Trouble Codes Cleared	—	X
Exhaust Aftertreatment Monitor - Since Diagnostic Trouble Codes Cleared	X	—
Exhaust Gas Recirculation Valve/Camshaft Position Monitor - Since Diagnostic Trouble Codes Cleared	X	X
Exhaust Gas Sensor Monitor - Since Diagnostic Trouble Codes Cleared	X	—
Fuel System Monitor - Since Diagnostic Trouble Codes Cleared	X	X
Heated Catalytic Converter Monitor - Since Diagnostic Trouble Codes Cleared	—	X
Misfire Monitor - Since Diagnostic Trouble Codes Cleared	X	X
Oxygen Sensor Heater Monitor - Since Diagnostic Trouble Codes Cleared	—	X
Oxygen Sensor/Heated Oxygen Sensor Monitor - Since Diagnostic Trouble Codes Cleared	—	X
Particulate Filter Monitor - Since Diagnostic Trouble Codes Cleared	X	X

I/M System Status

Each system monitor requires at least one, and sometimes several diagnostic tests. The result of each test is reported by a DTC. A system monitor is Complete when either all of the DTCs comprising the monitor have run and passed, or when any one of the DTCs comprising the monitor has illuminated the malfunction indicator lamp (MIL). For example, when the Oxygen Sensor Heater Monitor indicates Complete, all of the oxygen sensor heaters have been diagnosed. If the vehicle has 4 heated oxygen sensors, all 4 heaters have been diagnosed.

Once the system monitor is complete, the I/M System Status parameter will display Complete in the value column of the scan tool. Any monitor that is not applicable to a vehicle will display Not Supported in the scan tool value column. The I/M System Status parameter will display Incomplete in the value column when any of the required tests for that system have not run. The following is a list of conditions that would set the I/M System Status monitor to Incomplete:

- The vehicle is new from the factory and has not yet been driven through the necessary drive conditions to complete the tests.
- The battery has been disconnected or discharged below operating voltage.

- The control module power or ground has been interrupted.
- The control module has been programmed.
- The control module DTCs have been cleared.

Permanent DTCs

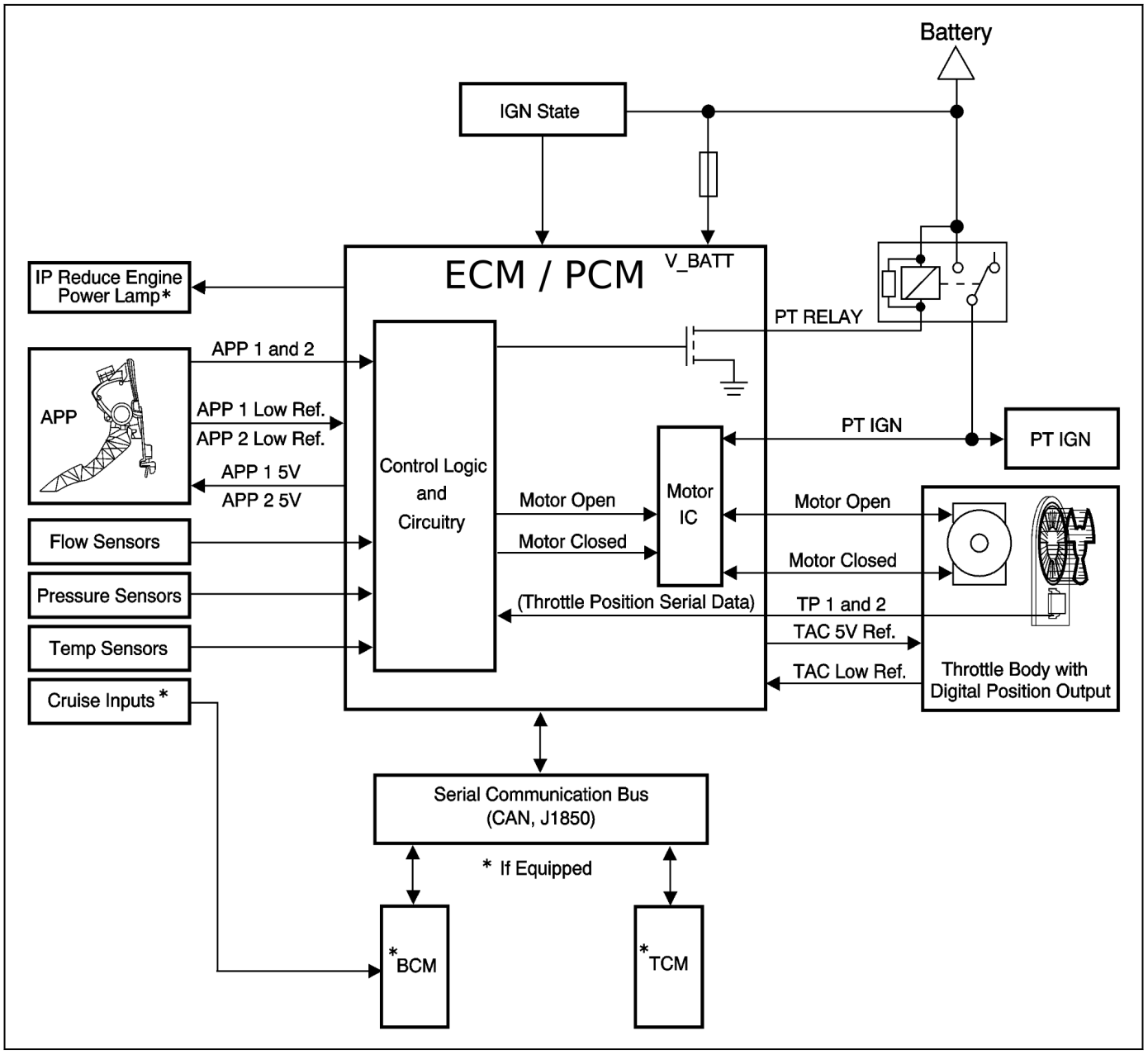
Permanent DTCs are defined as confirmed fault codes that are currently commanding the MIL on and stored in non-volatile memory. Permanent DTCs cannot be erased by any scan tool command or by disconnecting power to the controller.

The intended use of this data is to prevent vehicles from passing an I/M inspection by disconnecting the battery or clearing codes with a scan tool prior to the inspection. The presence of Permanent DTCs at an inspection without the MIL illuminated is an indication that a proper repair was not verified by the OBD II system.

Only the OBD II system can clear Permanent DTCs. The OBD II system must determine that the malfunction that caused the Permanent DTC to be stored no longer exists and is not commanding the MIL.

- If the MIL goes out naturally due to 3 passing drive cycles (scan tool code clear is not used), then the Permanent DTC is cleared at power down of the last drive cycle.
- If a scan tool code clear is used to turn off the MIL then the Permanent DTC is not cleared, the DTC must PASS and not FAIL. The Permanent DTC is cleared at power down of the drive cycle.
- If the controller is programmed, all Permanent DTCs are cleared.

Throttle Actuator Control (TAC) System Description



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The engine control module (ECM) is the control center for the throttle actuator control (TAC) system. The ECM determines the driver's intent based on input from the accelerator pedal position sensors, then calculates the appropriate throttle response based on the throttle position sensors. The ECM achieves throttle positioning by providing a pulse width modulated voltage to the throttle actuator motor. The throttle blade is spring loaded in both directions, and the default position is slightly open.

The throttle body actuator contains a contact-less inductive blade position sensing element that is managed by a customized integrated circuit. The throttle body actuator position sensor is mounted within the throttle body and is not serviceable. The ECM supplies the throttle body with a 5 V reference circuit, a low reference circuit, an H-bridge motor directional control circuit, and an asynchronous signal/serial data circuit. Asynchronous means communication is only going from the throttle body to the ECM. The throttle body cannot receive data from the ECM over the signal/serial data circuit. The throttle body actuator position sensor provides a signal that changes relative to throttle blade angle. The customized integrated circuit translates the signal based position information into serial data using the Society of Automotive

Engineers (SAE) J2716 Single Edge Nibble Transmission (SENT) protocol. The throttle body actuator position sensor information is transmitted between the throttle body and the ECM on the signal/serial data circuit. The ECM decodes the serial data signal and the throttle position information is displayed on the scan tool.

Modes Of Operation

Normal Mode
During the operation of the TAC system, several modes, or functions, are considered normal. The following modes may be entered during normal operations:

- Minimum pedal value—At key-up, the ECM updates the learned minimum pedal value.
- Minimum throttle position values—At key-up, the ECM updates the learned minimum throttle position value. In order to learn the minimum throttle position value, the throttle blade is moved to the closed position.
- Ice break mode—If the throttle blade is not able to reach a predetermined minimum throttle position, the ice break mode is entered. During the ice break mode, the ECM commands the maximum pulse width several times to the throttle actuator motor in the closing direction.
- Battery saver mode—After a predetermined time without engine speed, the ECM commands the battery saver mode. During the battery saver mode, the TAC system removes the voltage from the motor control circuits, which removes the current draw used to maintain the idle position and allows the throttle to return to the spring loaded default position.

Reduced Engine Power Mode
When the ECM detects a condition with the TAC system, the ECM may enter a reduced engine power mode. Reduced engine power may cause one or more of the following conditions:

- Acceleration limiting—The ECM will continue to use the accelerator pedal for throttle control, however, the vehicle acceleration is limited.
- Limited throttle mode—The ECM will continue to use the accelerator pedal for throttle control, however, the maximum throttle opening is limited.
- Throttle default mode—The ECM will turn OFF the throttle actuator motor and the throttle will return to the spring loaded default position.
- Forced idle mode—The ECM will perform the actions listed below:
  - Limit engine speed to the idle position
  - Ignore the accelerator pedal input.

Engine Shutdown Mode
There are 4 reasons the ECM commands engine shutdown. All 4 reasons involve a throttle that has been commanded to default position – Reduced Engine Power. Default Throttle is latched for the key-cycle, disabling the throttle motor and letting the spring return the throttle to its default position. Default Throttle by itself does not cause a commanded shutdown. Shutdown will only occur with Default Throttle and another issue. A throttle is commanded to Default Throttle when any of the following occurs:

- SENT Sensor Communication Faults — P16A0–P16A2, U0606, or U0607
- Performance Faults — P0068, P2101, or P2176
- Sensor Reference Voltage Fault — P06A3
- Internal Sensor Faults — P0122, P0123, P0222, P0223, or P2135

The ECM commands engine shutdown when any of the following occurs:

- Default Throttle & Catalyst Temperature to high — In order to idle in Default Throttle the spark is often retarded quite a bit, dumping a lot of heat into the catalyst.
- Default Throttle & P2119 — The throttle sensors detect that the throttle position is higher than default position and throttle hasn't safely returned to default position.
- Default Throttle & P16F3 or P0606 — The calibration does not trust the ECM to determine if the throttle has safely returned to default position.
- P0068 and any SENT Communication Fault, Reference Voltage Fault, or any of the 5 Sensor Faults — The ECM detects excess air flow based on expected default throttle position indicating the throttle position is higher than the default throttle position. The calibration does not trust the faulted throttle sensors to determine if the throttle has safely returned to default position.

Throttle/Idle Learn or Throttle Body Idle Air Flow Compensation Reset
The ECM learns the airflow through the throttle body to ensure the correct idle. The learned airflow values are stored within the ECM. These values are learned to adjust for production variation and will continuously learn during the life of the vehicle to compensate for reduced airflow due to throttle body coking. Anytime the throttle body airflow rate changes, for example due to cleaning or replacing, the values must be relearned.

An engine that had a heavily coked throttle body that has been cleaned or replaced may take several drive cycles to unlearn the coking. To accelerate the process, the scan tool has the ability to reset the learned value back to zero. A new ECM will also have values set to

zero. Cleaning the throttle body when the ECM is replaced can reduce the time it takes for the ECM to relearn the minimum idle speed.

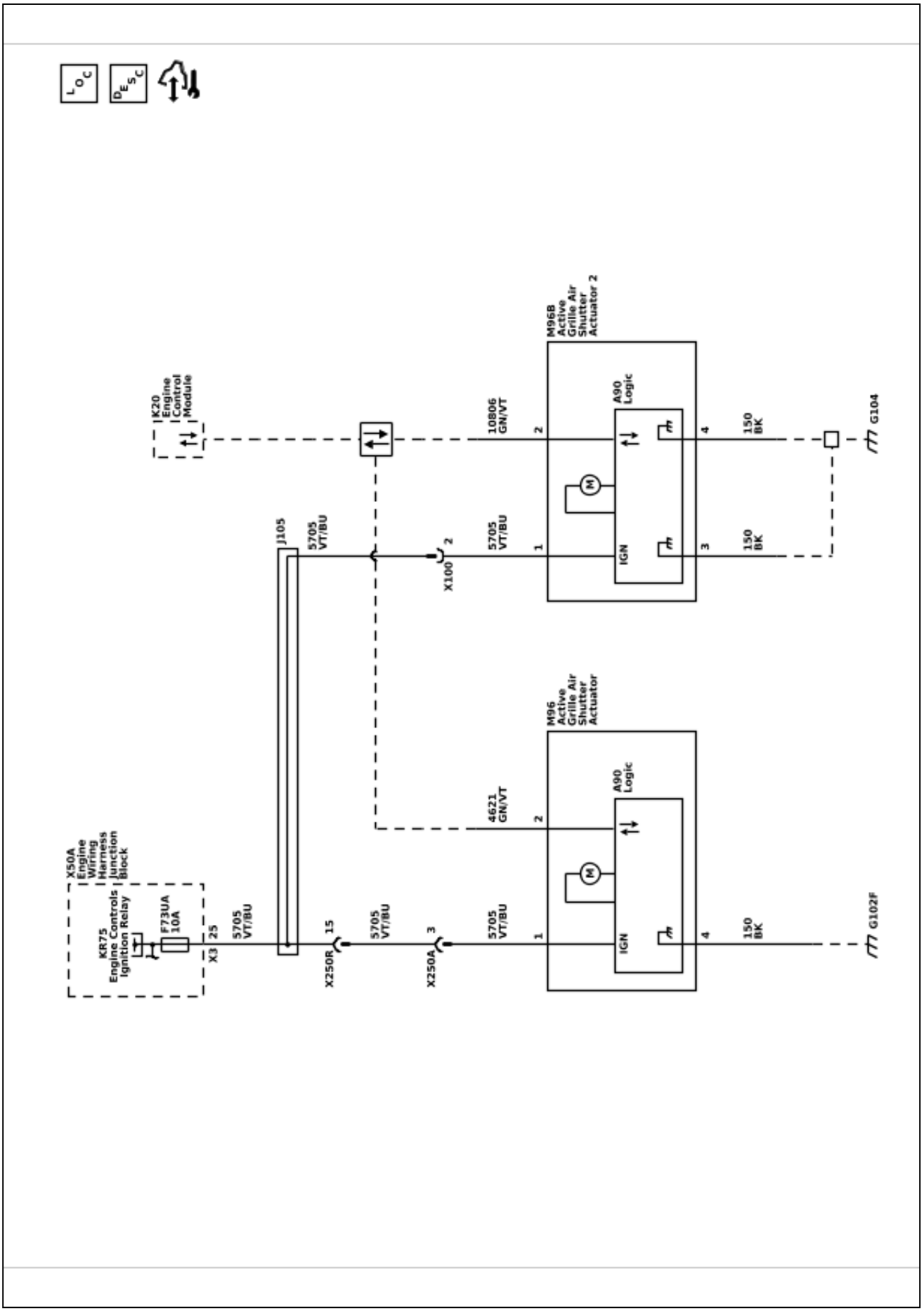
The idle may be unstable or a DTC may set if the learned values do not match the actual airflow.

A un-metered air leak in the induction system or a small vacuum leak may not set a DTC. If the condition goes undetected, the ECM may learn an incorrect Throttle Body Idle Airflow Compensation value over time. The incorrectly learned value may cause various symptoms to occur such as rough or unstable idle speeds, and/or engine stall. If this condition is detected and repaired it will be necessary to perform the Throttle/Idle Learn or Throttle Body Idle Air Flow Compensation Reset procedure to ensure any symptoms are corrected.

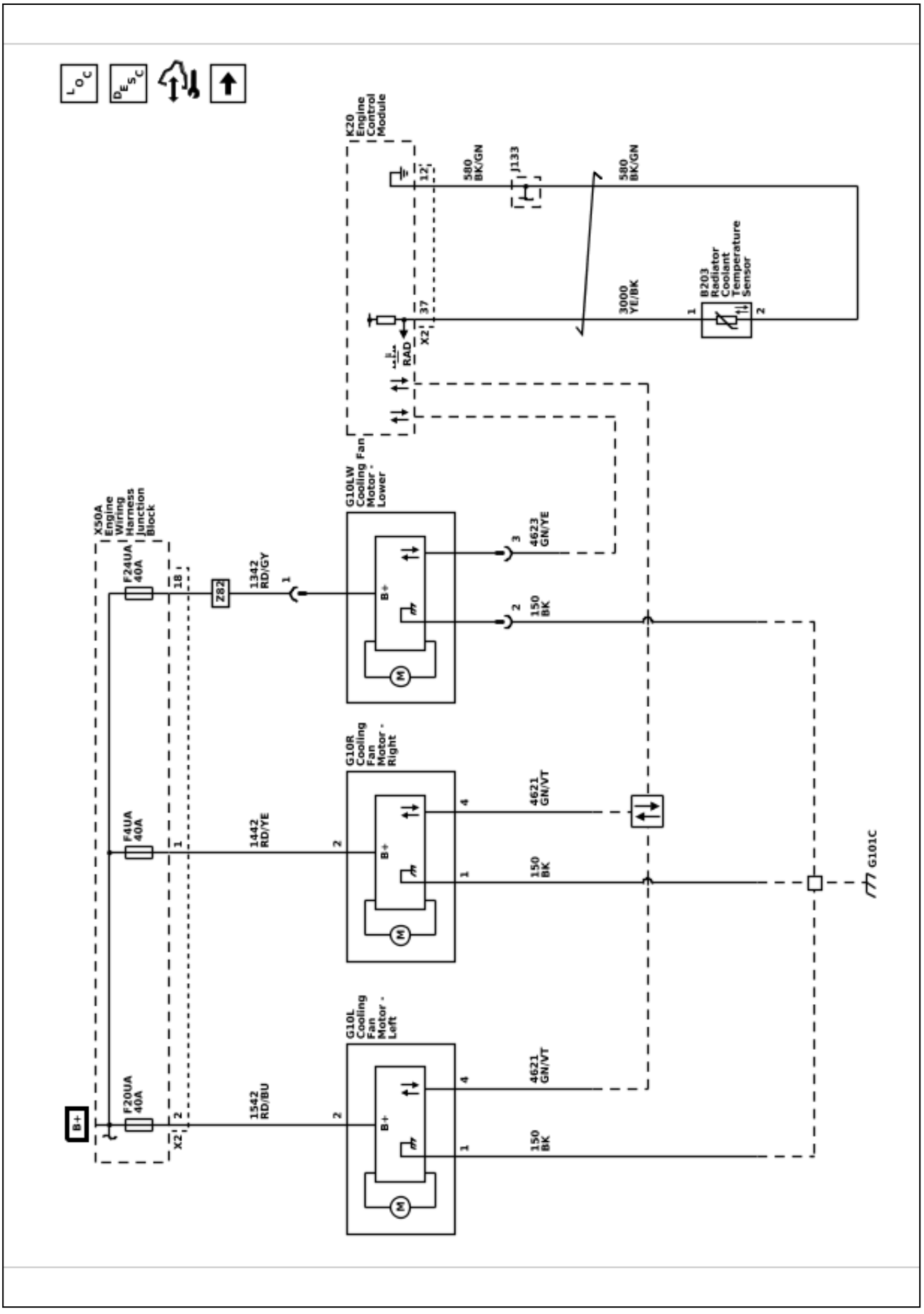
Engine Heating and Cooling

Schematic and Routing Diagrams

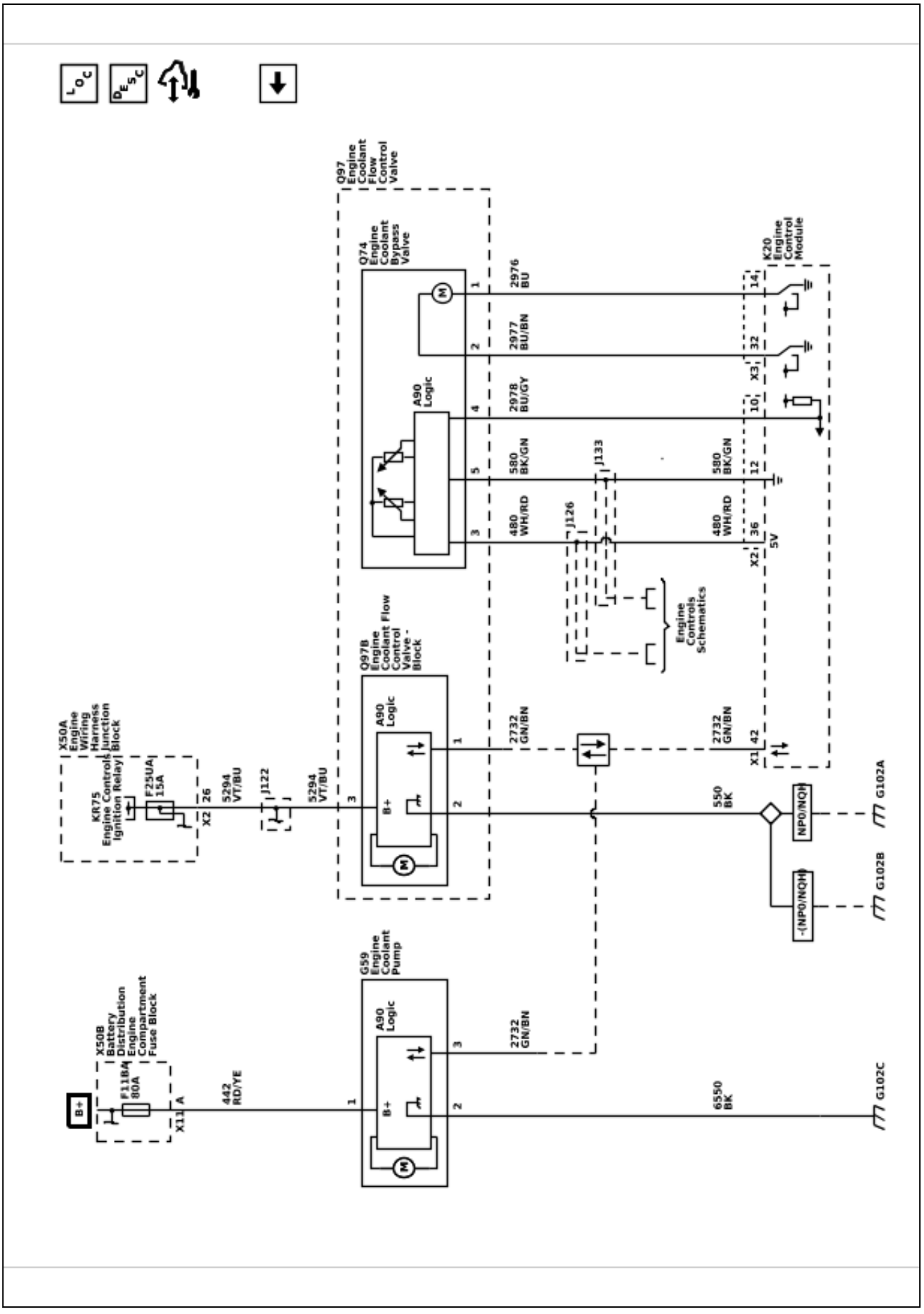
Engine Heating/Cooling Schematics (Active Grille Air Shutter)



Engine Heating/Cooling Schematics (Engine Cooling Fans)



Engine Heating/Cooling Schematics (Coolant Circulation)



Description and Operation

Cooling Fan Description and Operation

Cooling Fan Control

The engine cooling fan system is composed of 2 electric LIN (Local Interconnect Network) based cooling fans and 1 control module. The engine control module (ECM) controls the fan speed by sending a pulse width modulated (PWM) signal to the cooling fan control modules over one serial data circuit (LIN Bus01). The cooling fan control module varies the voltage drop across the cooling fan motors in relation to the pulse width modulated signal, which allows the cooling fans to operate at variable speeds.

Each cooling fan is specifically addressed with in the system. If the cooling fans are not connected to their specific connector, the fans will operate with out a DTC, but there will be noise or performance issues that will occur.

The cooling fan speed is effected by many different conditions and the ECM will adjust the duty cycle from 0–100 percent based on cooling system requirements. The scan tool output control is only capable of operating the cooling fan increments, between 10–90 percent. 90 percent is considered high speed fan. When multiple cooling fan speed requests are received, the ECM operates the fan at the highest of speed requests. The ECM commands the fans ON under the following conditions:

- The engine coolant temperature is warmer than a predetermined temperature.
- The engine oil temperature is warmer than a predetermined temperature.
- The A/C pressure reaches a predetermined pressure.
- If the engine coolant temperature at key-off is warmer than a predetermined value, or the A/C pressure is greater than a predetermined value, the cooling fan will operate at a low speed. The fan will shut OFF if the temperature or pressure drops below the predetermined value, but will only operate for 2 minutes, regardless of the coolant temperature or A/C pressure.

Cooling Fan Description and Operation

Cooling Fan Control

The engine cooling fan system is composed of 3 electric cooling fans. Each fan motor assembly contains an integral cooling fan control module. The cooling fan control modules communicate with the engine control module (ECM) independently, via a local interconnect network (LIN). The ECM controls the fan speed of each fan by sending a digital signal to the cooling fan control modules over two different serial data circuits. Each cooling fan control module decodes it’s respective signal to control the voltage drop across the cooling fan motor in relation to the speed request, using a pulse width modulated (PWM) signal. This allows each of the cooling fans to operate at variable speeds independent of each other.

Each cooling fan and module is programed to its location within the system. If the cooling fans are not connected to their specific connector, the fans will operate without a DTC, but there may be noise or performance issues that occur. The cooling fans may not operate at equal speeds for a given cooling fan command to prevent unwanted noise or vibration.

The cooling fan speed is affected by many different conditions and the ECM will adjust the duty cycle from 0–100 percent based on cooling system requirements. The actual commanded cooling fan speed is based on a number of inputs from the ECM, and cooling fan requests from other modules, such as the BCM, TCM, and HPCM, if equipped. When multiple cooling fan speed requests are received, the ECM commands the cooling fan control module to operate the fan at the highest requested speed.

The scan tool Cooling Fan Request Source parameter identifies the predominant sub-system requiring cooling fan operation. The scan tool output control is only capable of operating a cooling fan in increments between 20–80 percent. 80 percent is considered high speed. The increments and ranges found within the scan tool function may vary from vehicle to vehicle.

The ECM commands the fan On under the following conditions:

- The engine coolant temperature is warmer than a predetermined temperature.
- The engine oil temperature is warmer than a predetermined temperature.
- The A/C pressure reaches a predetermined pressure.
- If the engine coolant temperature at key-off is warmer than a predetermined value, or the A/C pressure is greater than a predetermined value, the cooling fan will operate at a low speed. The fan

will shut OFF if the temperature or pressure drops below the predetermined value, but will only operate for 2 minutes, regardless of the coolant temperature or A/C pressure.

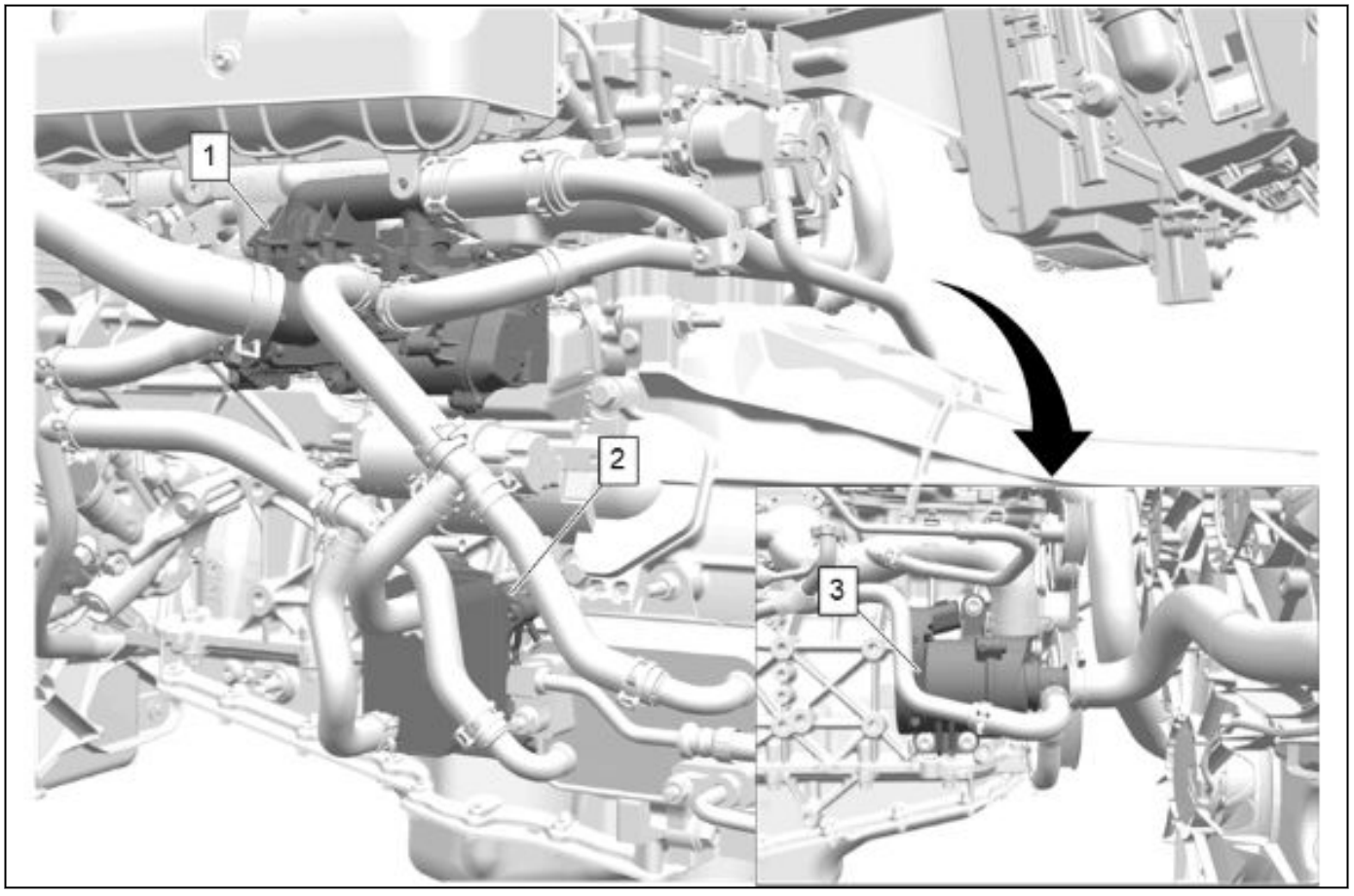
Cooling System Description and Operation

Active Thermal Management

This vehicle uses Advance Technology cooling system design, which makes use of Active Thermal Management (ATM) strategy. The difference between conventional cooling systems that use mechanical water pumps and active thermal management is that the predominant goal of the ATM strategy is to prioritize fuel economy by maintaining an ideal engine operating temperature during all engine speeds and operating conditions, while still meeting customer expectations for vehicle performance and reducing vehicle emissions.

The key features of ATM include:

- **Engine: Internal**
  - Integrated manifold that pulls heat from the engine exhaust.
  - Improved engine coolant jacket that targets hot spots in the engine.
- **Engine Mounted**



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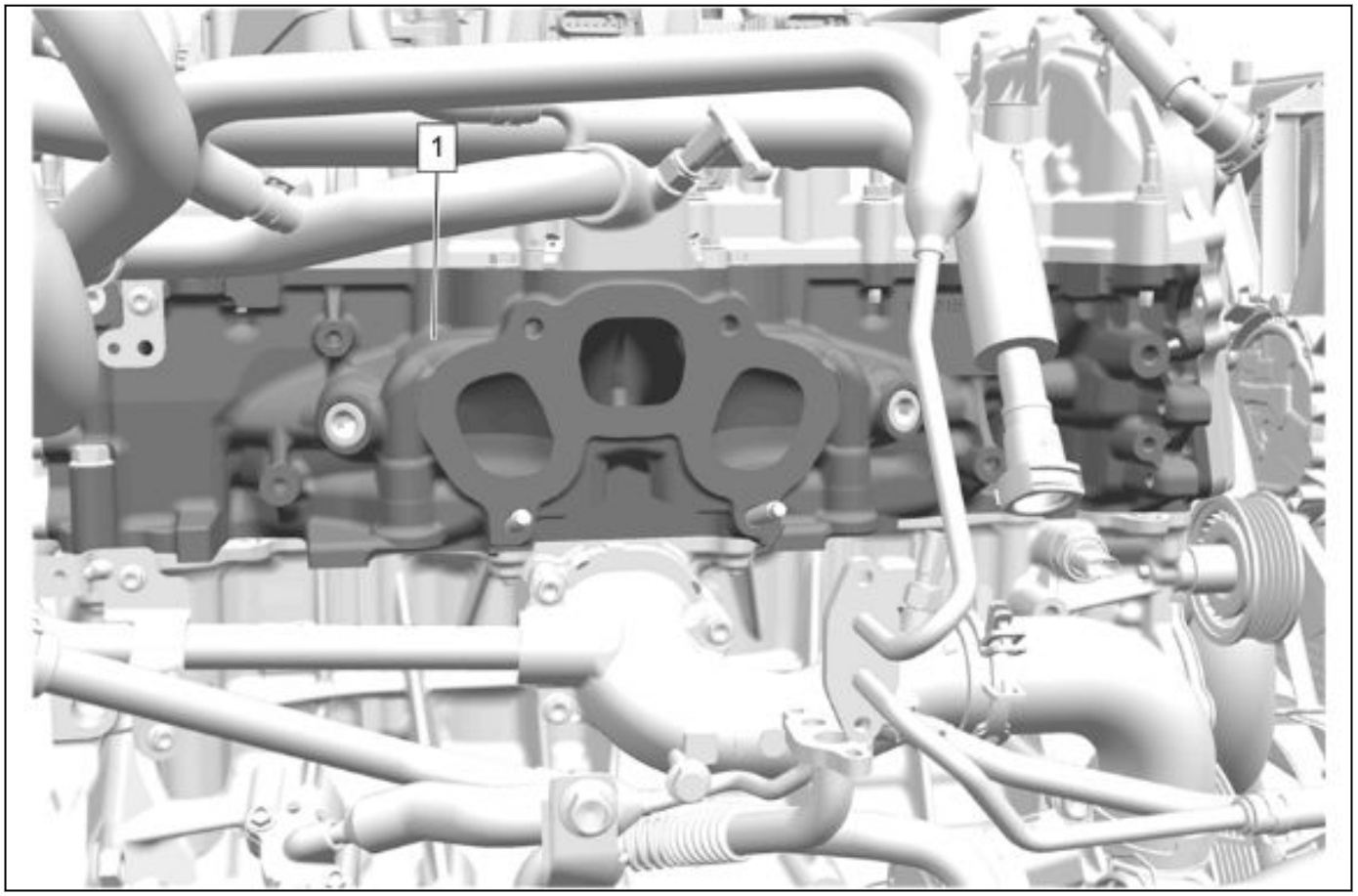
  - Electric water pump (1) that replaces the conventional mechanical water pump.
  - The Coolant Control Valve assembly (2) contains two rotary control valves. The Block Rotary Coolant Valve and the Main Rotary Coolant Valve both eliminate the need for the conventional cooling system thermostat.
  - Engine oil cooler (3) that uses coolant to heat or cool the engine oil as required.
- **Temperature and Position Sensors**
  - The Engine control module, which controls the complete ATM system using feedback from numerous sensors:
  - Engine Block Coolant Temperature Sensor
  - Engine Cylinder Head Coolant Temperature Sensor
  - Engine Inlet Coolant Temperature Sensor
  - Engine Outlet Coolant Temperature Sensor

- − Engine Oil Temperature Sensor 1 and 2
- − Transmission Oil Temperature Sensor
- − Radiator Outlet Coolant Temperature Sensor
- − Engine Coolant Flow Control Valve Position Sensor

- **Integrated Manifold**



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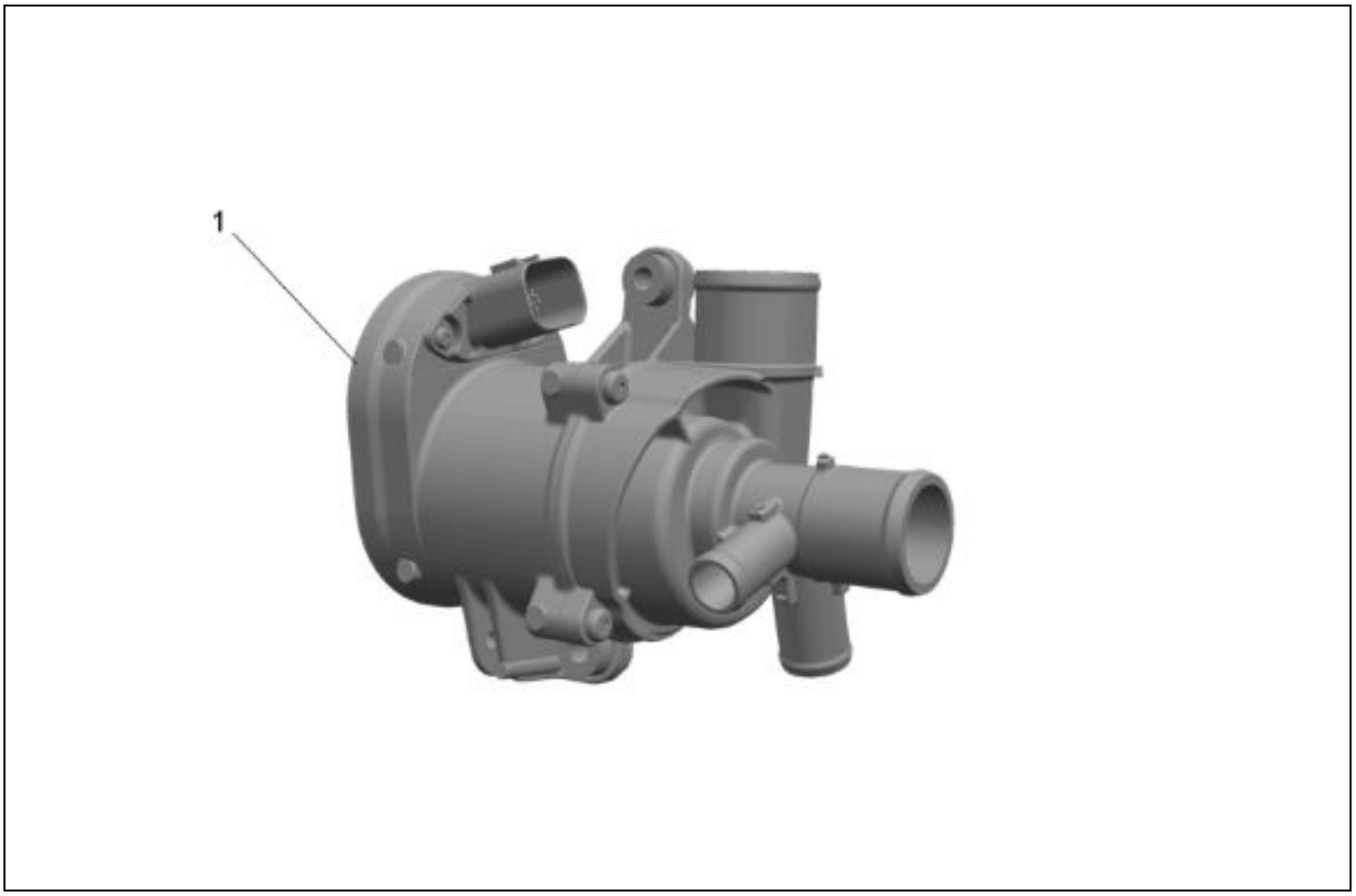
- − The integrated manifold (1) is part of the cylinder head and is used to extract heat from the exhaust, which can then be directed to either the engine, engine oil cooler, automatic transmission fluid cooling exchanger, or the passenger compartment heater core. The integrated manifold provides a large portion of recuperated heat to the coolant.

- **Electric Water Pump**



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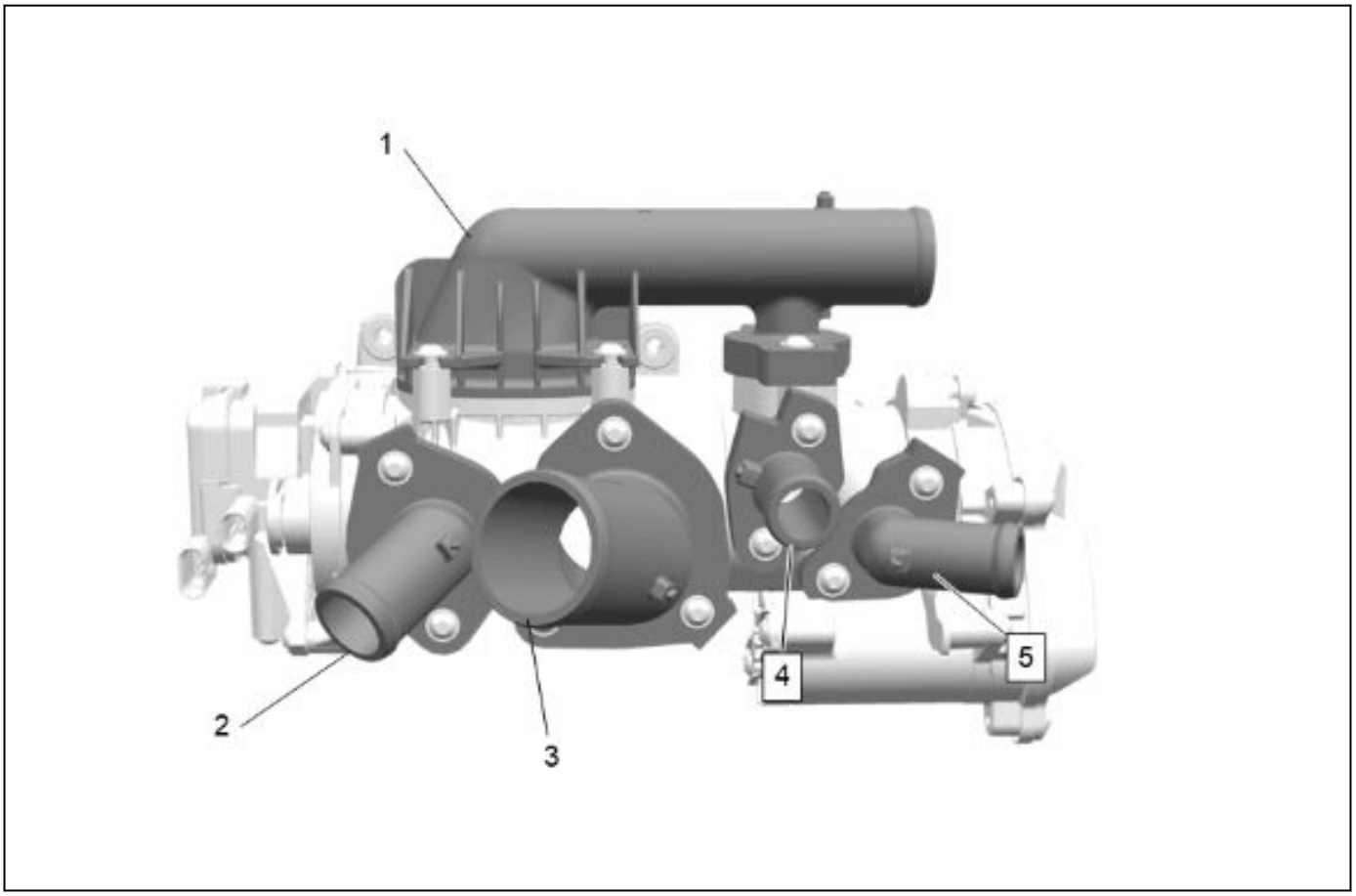
- The electric water pump (1) is attached to the side of the engine and controls the coolant flow through the entire coolant system. The electric water pump replaces the conventional belt or chain driven pump whose speed is directly coupled to the engine speed. The coolant flow from the electric water pump is not related to engine speed but it is independently controlled by the engine control module.

- **Engine Coolant Flow Control Valve**



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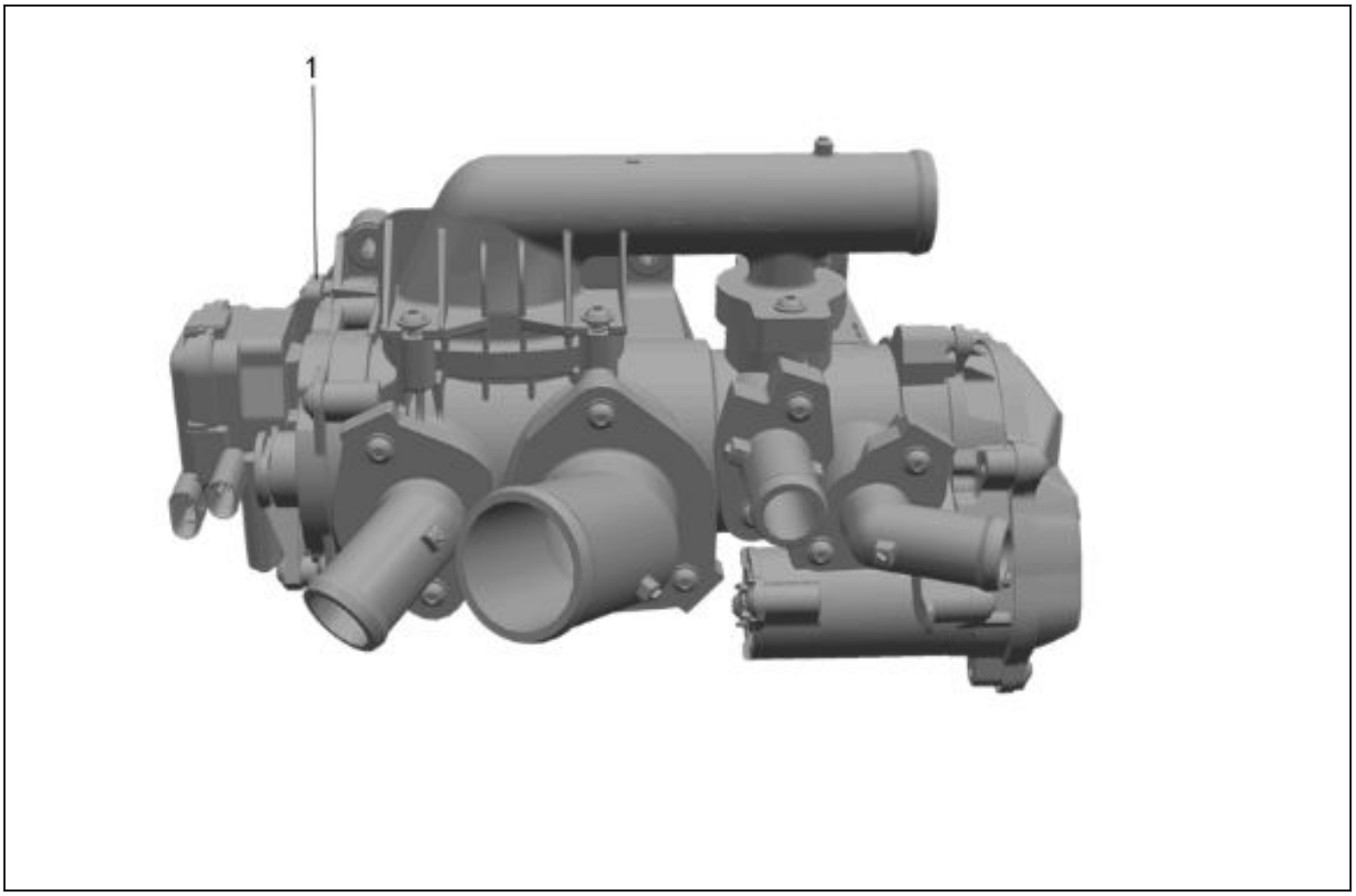
- The engine coolant flow control valve controls coolant flow to the radiator as well as the engine and transmission oil heat exchangers eliminating the need for a conventional wax-operated thermostat and is controlled by the engine control module, through sensor feedback. Hot coolant from the Integrated Exhaust Manifold (IEM) is brought in through the port on the top of the valve (1). The left most port (2) is the bypass port and sends hot coolant back to the water pump. The port that is second from the left, and the biggest port (3), is the radiator port and sends hot coolant to the radiator. The right two ports (4, 5) are for the engine and transmission oil heat exchangers and the ports send hot coolant to the oil heat exchangers when the oils are cold, and cold coolant to the oil heat exchangers when the oils are hot.

- **Engine Coolant Flow Control Valve (Block Rotary Coolant Valve)**



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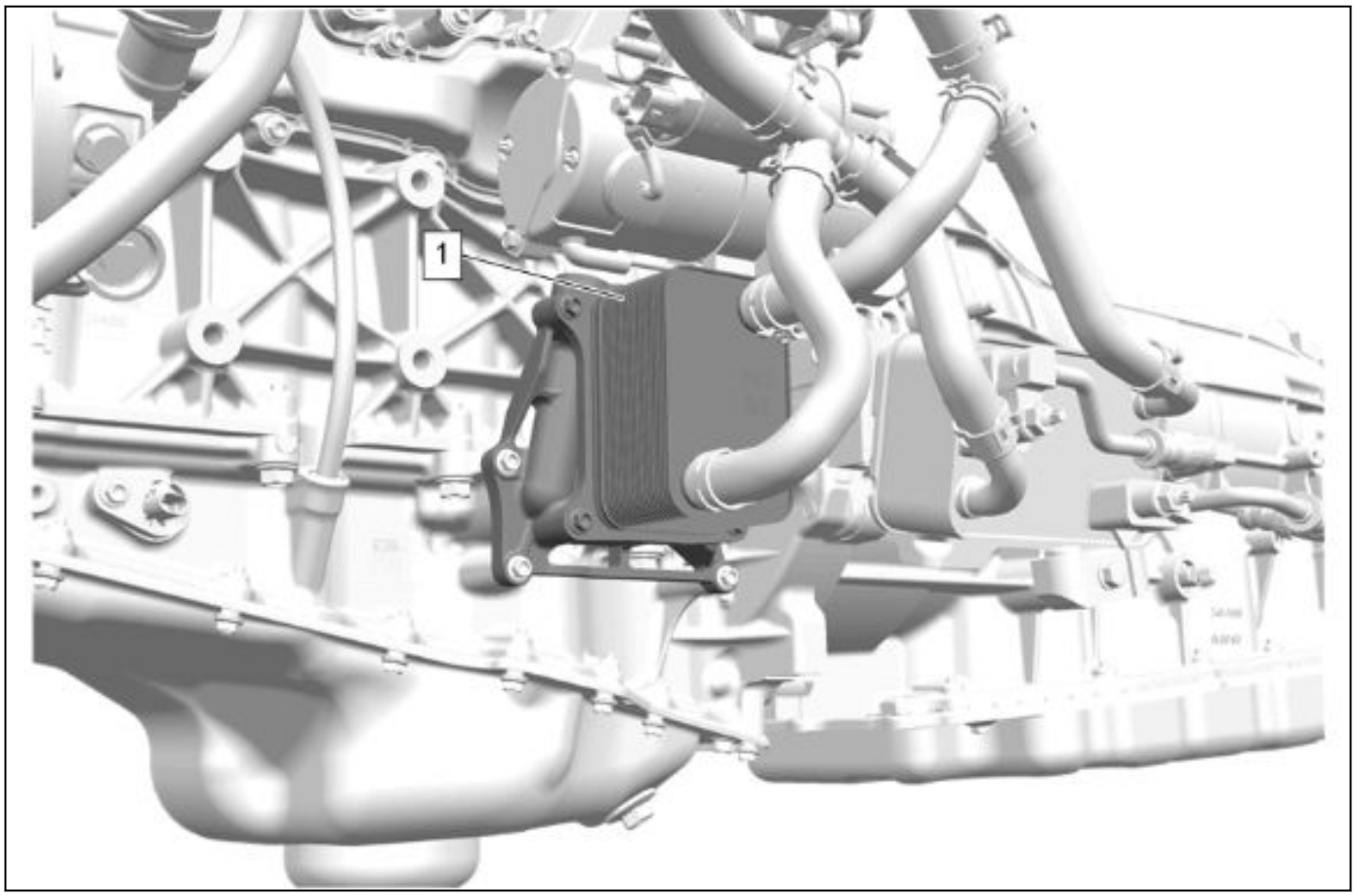
- The main rotary coolant rotary valve is part of the engine coolant flow control valve and is located on the right side of the valve assembly (1). The main rotary valve controls coolant flow to the radiator, bypass and oil heat exchangers.
- The block rotary coolant valve is part of the engine coolant flow control valve and is located on the left side of the valve assembly. The block rotary control valve has its own actuator and allows independent/separate control of the block temperature and can be activated at any point during vehicle operation.
  - The combination of the main rotary coolant valve and the block rotary coolant valve is critical to achieving optimal combustion chamber temperatures as quickly as possible during engine warm up.

- **Engine Oil Cooler**



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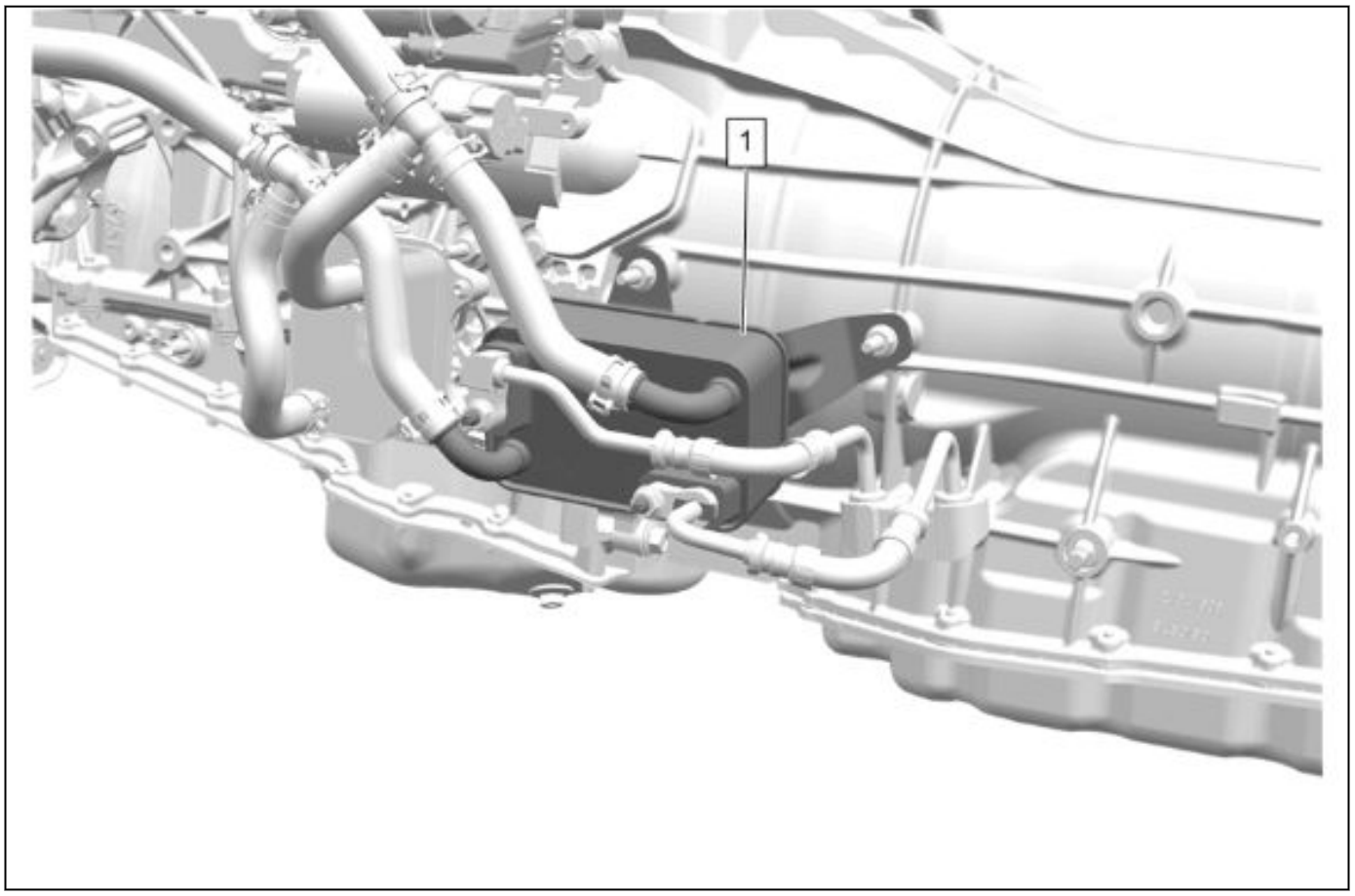
- The engine oil cooler (1) is a heat exchanger that is attached to the side of the engine and exchanges heat between the engine oil and engine coolant. The engine oil fluid cooling exchanger can flow no coolant, provide hot coolant for transmission oil heating (during engine warm-up) or provide cooled coolant for transmission oil cooling (under high thermal loads).

- **Automatic Transmission Fluid Cooling Exchanger**



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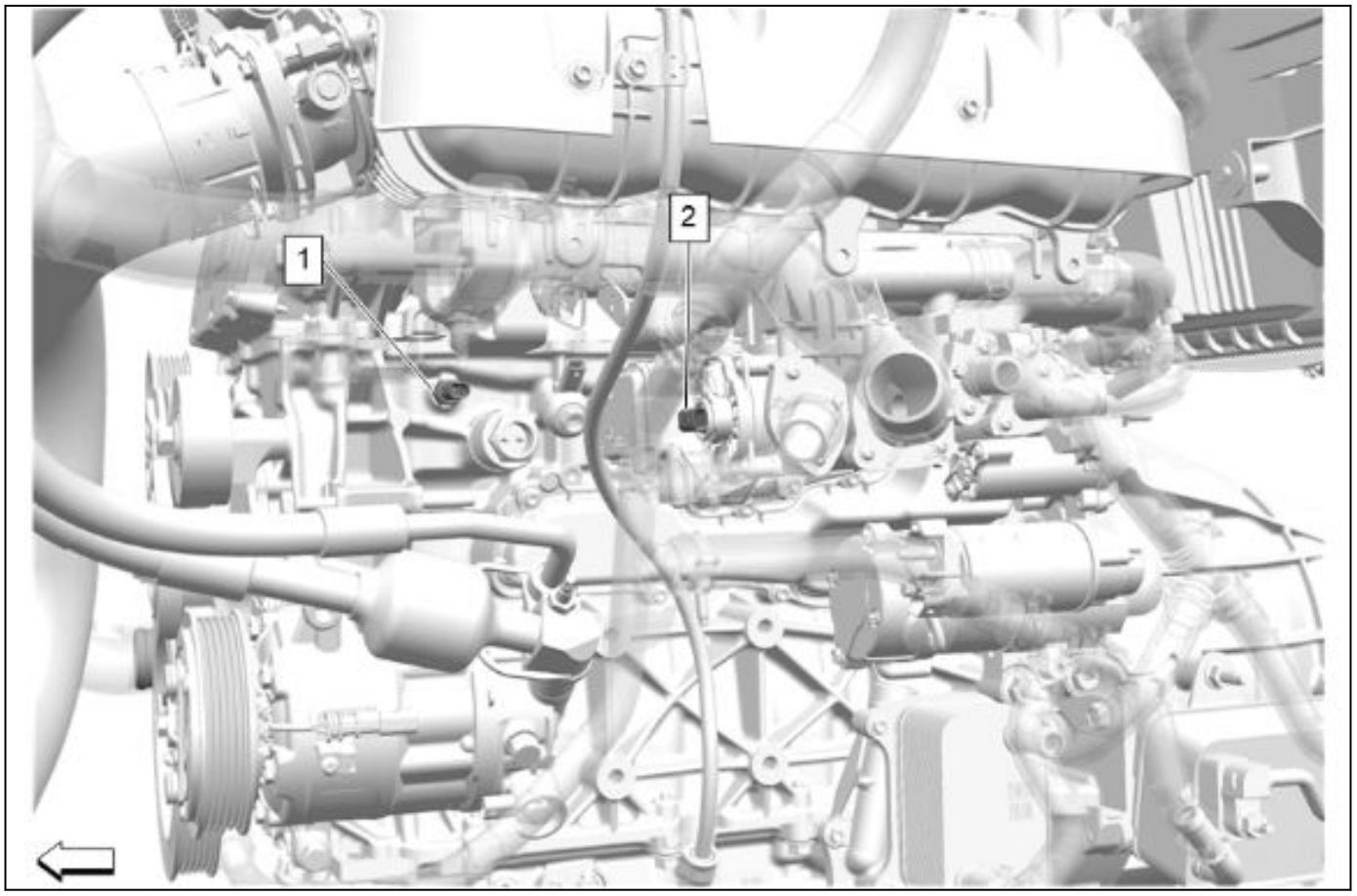
- The automatic transmission fluid cooling exchanger is a heat exchanger that is attached to the front of the transmission and exchanges heat between the transmission oil and engine coolant. The automatic transmission fluid cooling exchanger can flow no coolant, provide hot coolant for transmission oil heating (during engine warm-up) or provide cooled coolant for transmission oil cooling (under high thermal loads).

- **Automatic Coolant Service Fill Description**
  - Active Thermal Management Systems are more difficult to fill with coolant than traditional thermostat based systems, therefor the vehicle is equipped with an automatic coolant service fill that can be activated via the scan tool or driver controls that will cycle the electric water pump and coolant valves to de-aerate the coolant system.

Component Locator - Engine View



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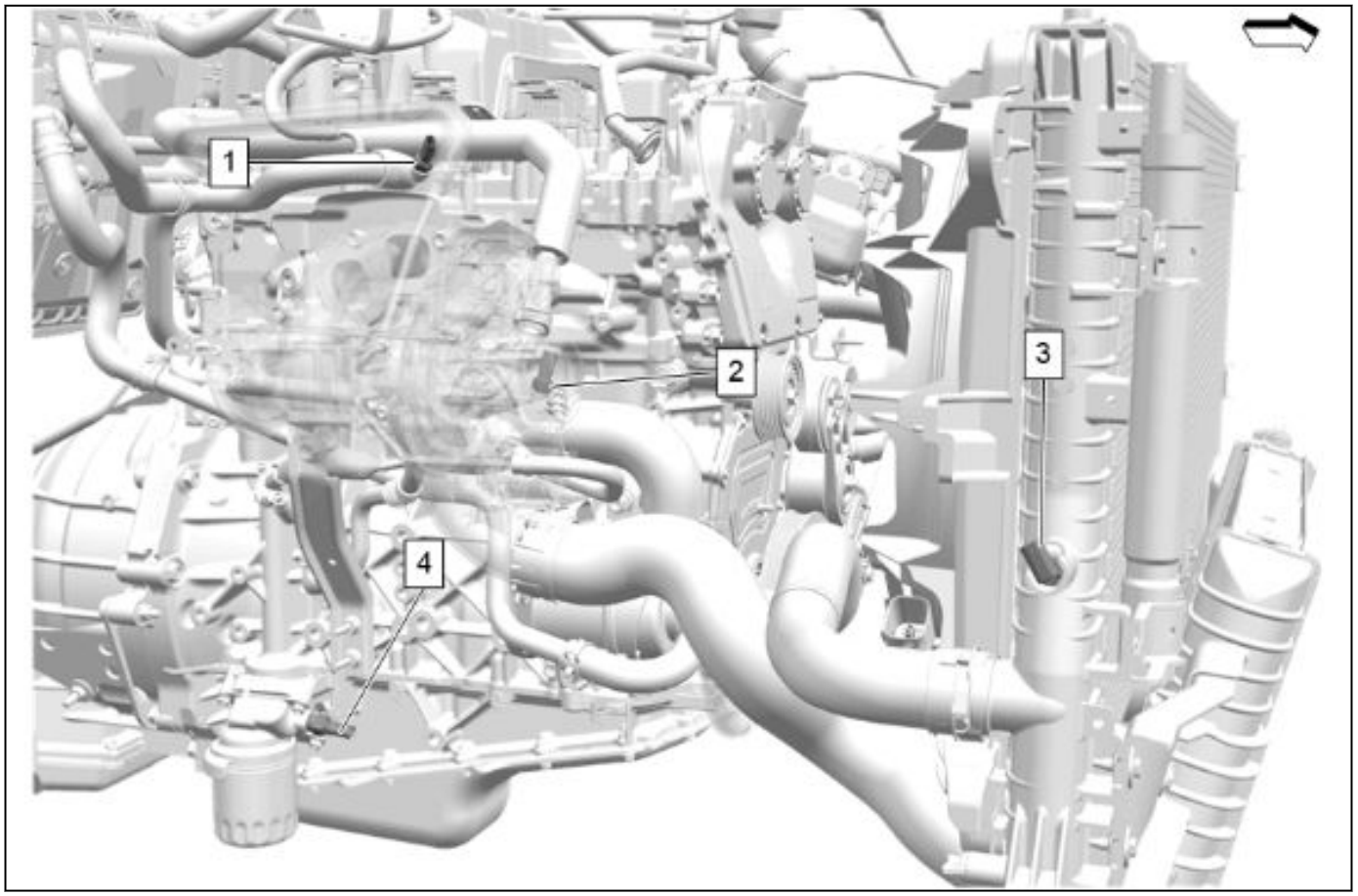
Left side of engine view

Callout	Scan Tool Reference	Service Information Part Name or Electronic Part Catalog Name
1	Engine Coolant Temperature Sensor 6	Engine Block Coolant Temperature Sensor
2	Engine Coolant Temperature Sensor 1	Engine Outlet Coolant Temperature Sensor
—	Engine Block Coolant Control Valve Position Sensor	Part of Engine Coolant Flow Control Valve
—	Engine Coolant Control Valve Position Sensor	Part of Engine Coolant Flow Control Valve



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Right side of engine view

Callout	Scan Tool Reference	Service Information Part Name or Electronic Part Catalog Name
1	Engine Coolant Temperature Sensor 5	Engine Cylinder Head Coolant Temperature Sensor
2	Engine Coolant Temperature Sensor 2	Engine Inlet Coolant Temperature Sensor
3	Radiator Coolant Temperature Sensor	Radiator Outlet Coolant Temperature Sensor
4	Engine Oil Temperature Sensor	Engine Oil Temperature Sensor 1 and 2
Internal to the transmission	Transmission Oil Temperature Sensor	Transmission Oil Temperature Sensor

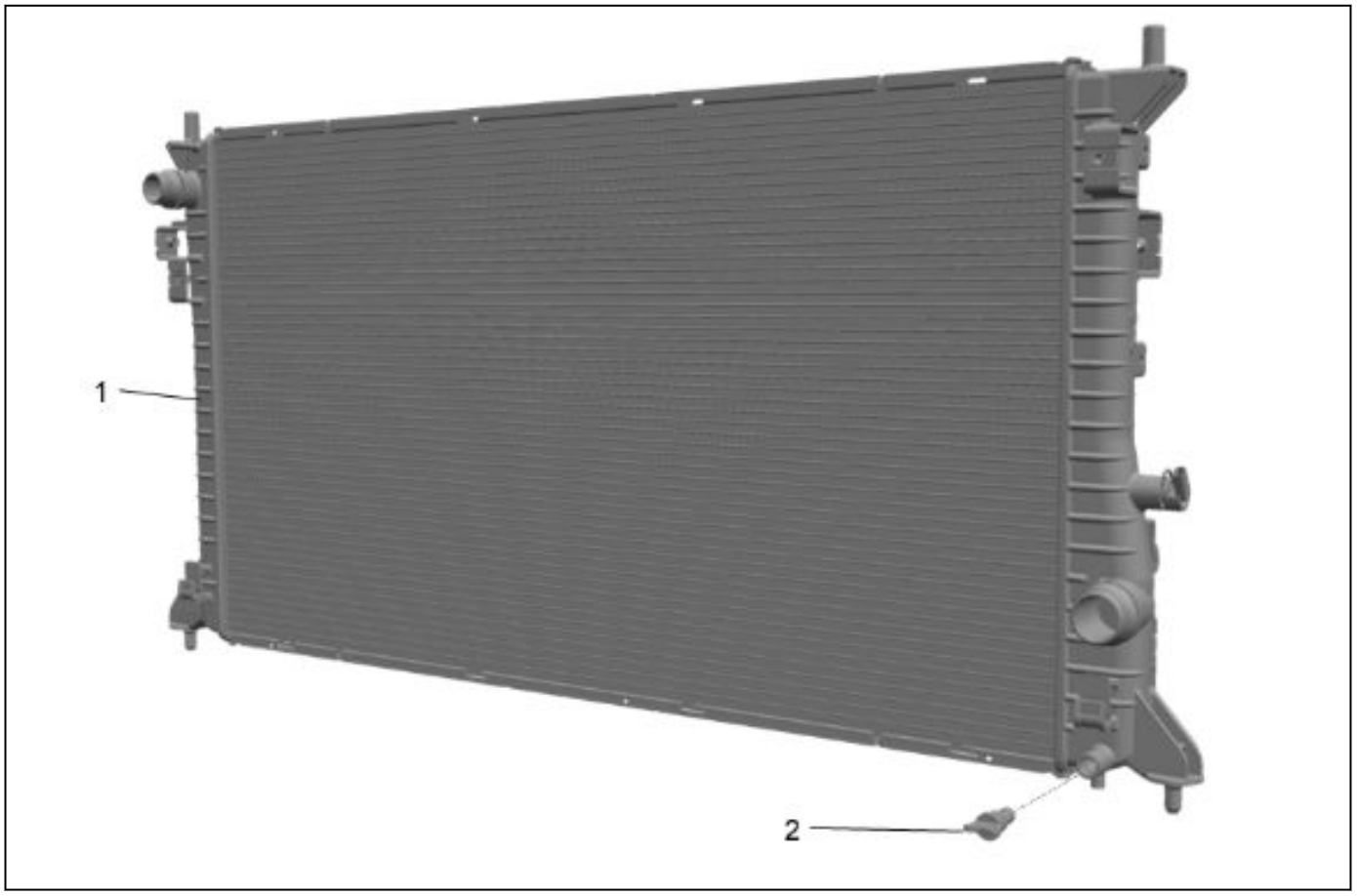
Cooling System Components

- Various temperature and position sensors provide data back to the engine control module.
- ATM still uses many of the conventional cooling system features, including:
  - − Coolant
  - − Coolant Hoses
  - − Radiator
  - − Radiator Bypass Route
  - − Radiator Surge Tank
  - − Surge Tank Pressure Cap
  - − Engine Coolant Indicators
  - − Air Baffles/Guides and Seals
  - − Cabin Heater Core Route, if equipped with Rear Cabin Heater

Coolant

The engine coolant is a solution made up of a 50-50 mixture of DEX-COOL® and suitable drinking water. The coolant solution transfers heat between the components of the engine heating/cooling system.

Radiator

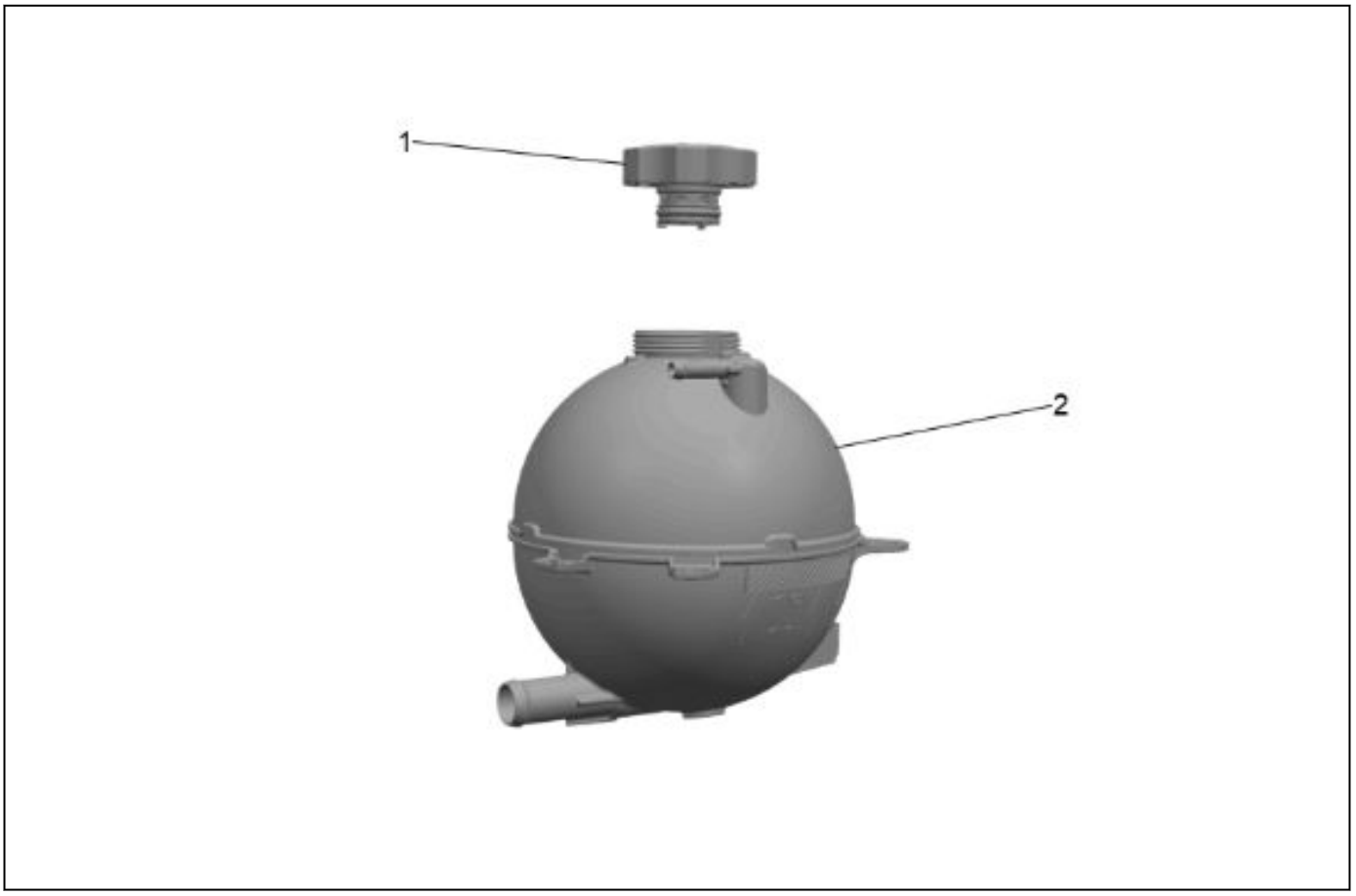


6637073

The radiator (1) is a heat exchanger. It consists of a core and two end tanks. The aluminum core is a tube and fin crossflow design that extends from the inlet tank to the outlet tank. Fins are placed around the outside of the tubes to improve heat transfer to the atmosphere. The inlet and outlet tanks are a molded high temperature nylon reinforced plastic material. A high temperature rubber gasket seals the tank flange edge to the aluminum core. The tanks are clamped to the core with clinch tabs. The tabs are part of the aluminum header at each end of the core. The fins on the core transfer heat from the coolant passing through the tubes. Air passing between the fins absorbs the heat and cools the coolant. Heat is removed from the coolant as the coolant passes through the radiator.

The radiator also has a drain cock (2) located in the bottom of the left or right hand tank. The drain cock unit includes the drain cock and drain cock seal.

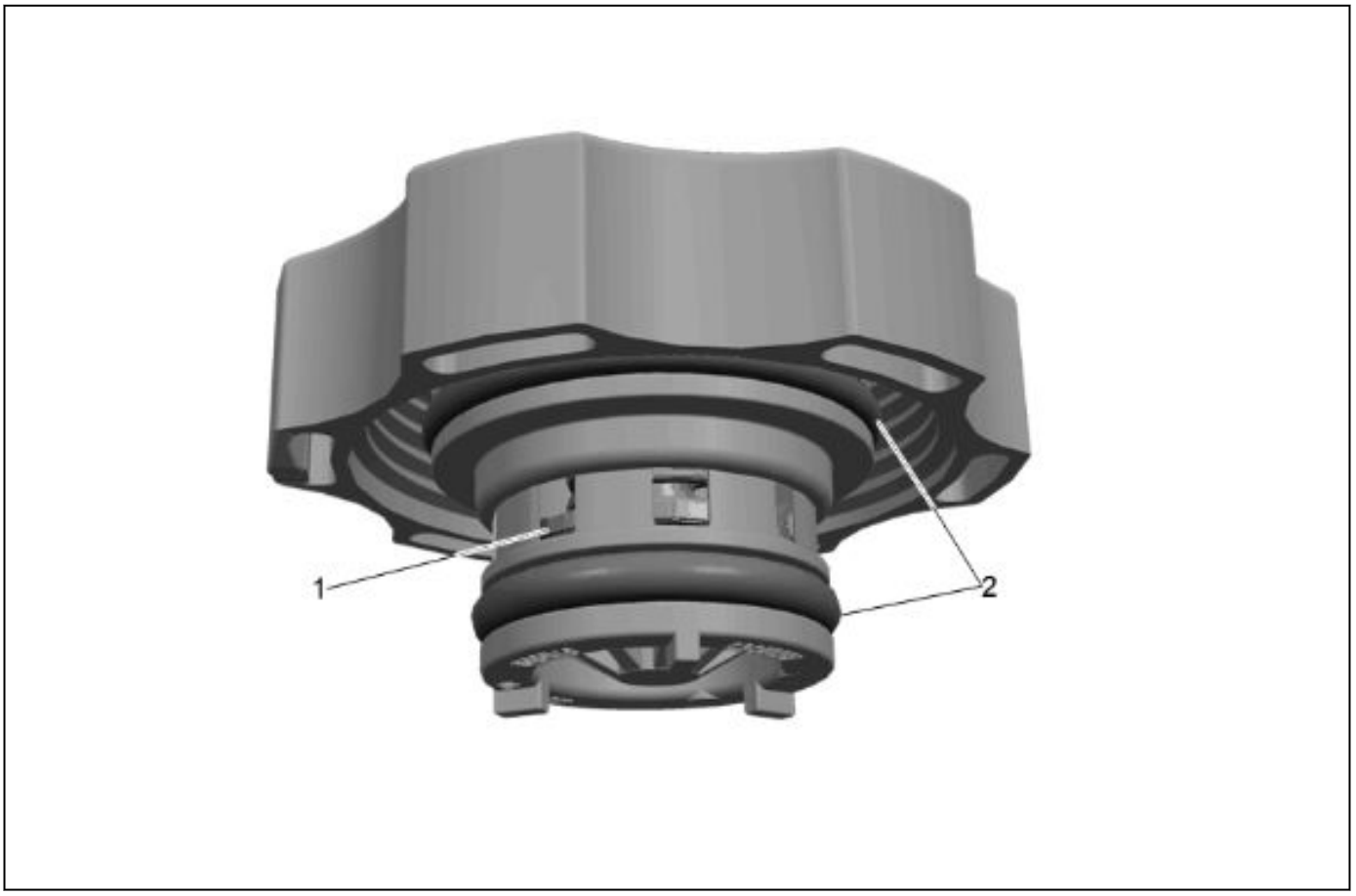
Radiator Surge Tank



6636997

The radiator surge tank (2) is a plastic tank with a pressure cap (1) mounted to it. The tank is mounted at a point higher than all other coolant passages. The surge tank provides an air space in the cooling system. The air space allows the coolant to expand and contract. The surge tank also provides a coolant fill point and a central air bleed location. During vehicle use, the coolant heats and expands. The coolant that is displaced by this expansion flows into the surge tank. As the coolant circulates, air is allowed to exit. This is an advantage to the cooling system. Coolant without air bubbles absorbs heat much better than coolant with air bubbles.

Radiator Surge Tank Cap

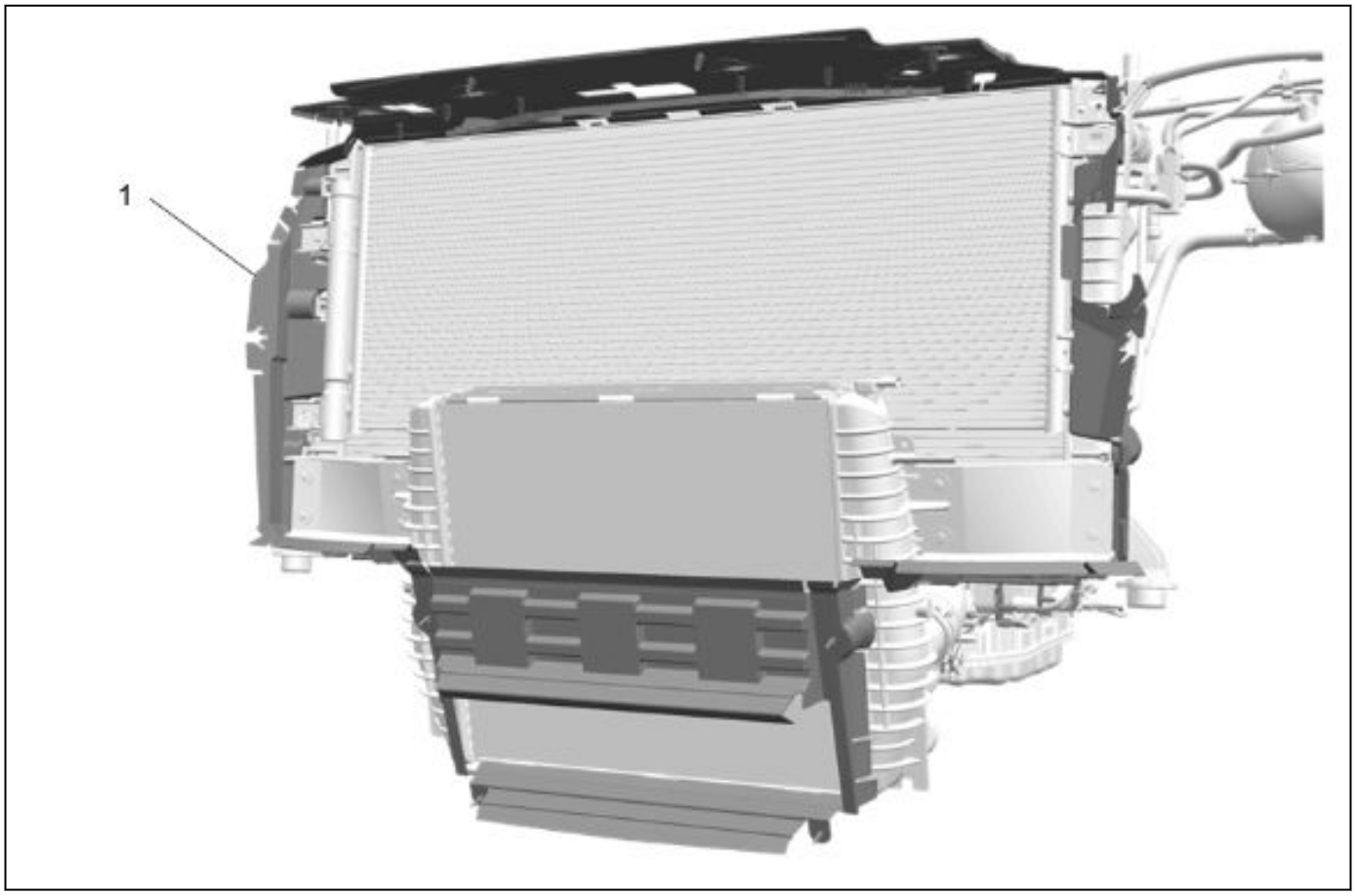


6636994

The radiator surge tank cap is a pressure cap that seals (2) and pressurizes the cooling system. It contains a blow off or pressure valve (1) and a vacuum or atmospheric valve.

- The pressure valve is held against its seat by a spring and protects the radiator by relieving pressure if it exceeds 20 psi.
- The vacuum valve is held against its seat by a spring, which permits opening of the valve to relieve vacuum created in the cooling system as it cools off. The vacuum, if not relieved, could cause the radiator hoses to collapse.
- The pressure cap allows pressure in the cooling system to build up. As the pressure builds, the boiling point of the coolant goes up as well. Therefore, the coolant can be safely run at a temperature higher than the boiling point of the coolant at atmospheric pressure.
- The hotter the coolant is, the faster the heat moves from the radiator to the cooler passing air. However, if the pressure exceeds the strength of the spring, the pressure valve rises so that the excess pressure can escape.
- When the engine cools down, the temperature of the coolant drops and a vacuum is created in the cooling system. This vacuum causes the vacuum valve to open, allowing outside air into the cooling system. This equalizes the pressure in the cooling system with atmospheric pressure, thus preventing the radiator hoses from collapsing.

Air Baffles/Guides and Seals



6637263

The cooling system uses deflectors, air baffles/guides and air seals to increase cooling system capability. Deflectors are installed under the vehicle to redirect airflow beneath the vehicle and through the radiator to increase engine cooling. Air baffles/guides are also used to direct airflow through the radiator and increase cooling capability. Air seals prevent air from bypassing the radiator and air conditioning condenser, and prevent recirculation of hot air for better hot weather cooling and air conditioning condenser performance.

Engine Coolant Indicators
The instrument panel cluster (IPC) shows the engine temperature on the temperature gauge. The value is sent on the data communication line from engine control module. When the coolant temperature is hot, the IPC receives a discrete input from engine control module requesting illumination.

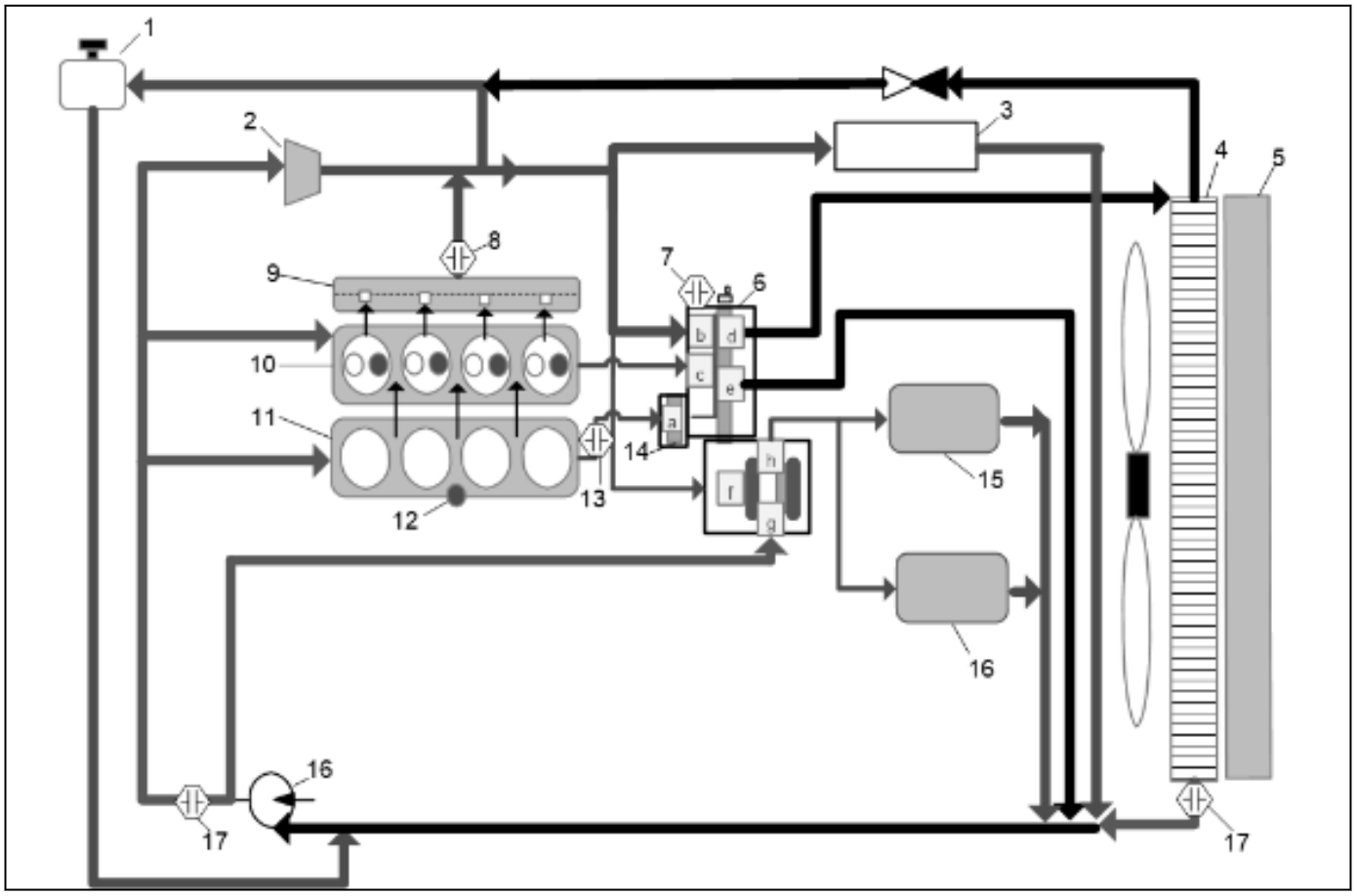
The IPC performs the display test at the start of each ignition cycle. The IPC illuminates the TEMP indicator.

Coolant Heater (If Equipped)
The optional coolant heater (RPO K05) operates using 110 V AC external power and is designed to warm the coolant in the engine block area for improved starting in very cold weather. The coolant heater also helps reduce fuel consumption when a cold engine is warming up. The unit is equipped with a detachable AC power cord. There is an internal thermal switch in the coolant heater cord that prevents operation above **-18°C (0°F)**. A weather shield on the cord is provided to protect the plug when not in use.

Cooling Cycle
Coolant flows from the electric water pump outlet and into the engine circuit and turbocharger cooling circuit. It also provides cooled coolant flow from the radiator to the engine coolant flow control valve to be used as necessary to manage transmission and engine oil temperature. In the engine, the coolant flow direction and volume is controlled by the engine coolant flow control valve and the block control valve to provide necessary flow for optimal engine block, cylinder head, and exhaust manifold cooling. The engine coolant flow control valve can also provide the transmission and engine oil circuits warmed coolant from the engine to optimize the oil temperatures. Excess heat is removed from the coolant in the radiator and the cooled coolant returns to the electric water pump.

Mode 1 (Low Flow):

Flow Diagram - Mode 1



6752510

(1) Surge Tank
(2) Turbocharger
(3) Heater Core
(4) Radiator
(5) Condenser
(6) Main Rotary Valve
(7) Engine Outlet Coolant Temperature Sensor
(8) Engine Cylinder Head Coolant Temperature Sensor
(9) Integrated Exhaust Manifold
(10) Cylinder Head
(11) Engine Block
(12) Engine Block Heater
(13) Engine Block Coolant Temperature Sensor
(14) Block Rotary Valve
(15) Engine Oil Hear Exchanger
(16) Transmission Oil Heat Exchanger
(17) Radiator Outlet Coolant Temperature Sensor
(18) Electric Water Pump
(19) Engine Inlet Coolant Temperature Sensor
Valve Port A
Valve Port B

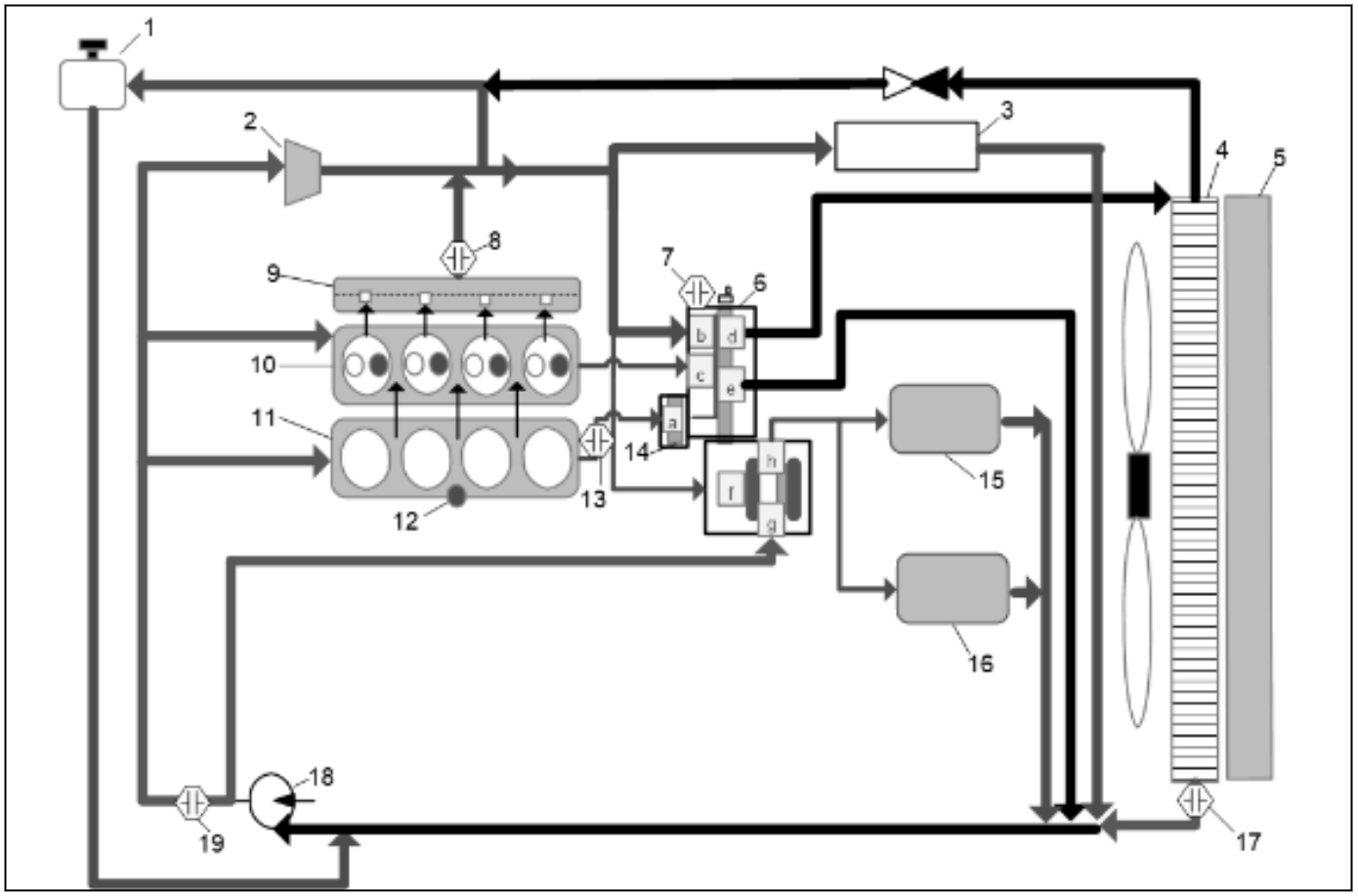
Valve Port C
Valve Port D
Valve Port E
Valve Port F
Valve Port G
Valve Port H

If the engine is started cold, the system will go to low flow mode, which means the electric water pump runs just enough for the sensors to provide reliable information on the state of the system. As the engine warms up, the heat stays around the combustion chamber and is not taken away by coolant flow. Low flow mode is the fastest method for engine warm up. Low flow mode will not enable if the interior HVAC is turned on.

COMPONENT	CONDITION
Electric Water Pump	Low Speed, Low Flow
Main Rotary Coolant Valve	Low Speed, Low Flow
Block Rotary Coolant Control Valve	Low Speed, Low Flow

Mode 2 (Engine Warm Up With Cabin Heating Only):

Flow Diagram - Mode 2



6752533

(1) Surge Tank
(2) Turbocharger
(3) Heater Core
(4) Radiator
(5) Condenser
(6) Main Rotary Valve
(7) Engine Outlet Coolant Temperature Sensor
(8) Engine Cylinder Head Coolant Temperature Sensor
(9) Integrated Exhaust Manifold

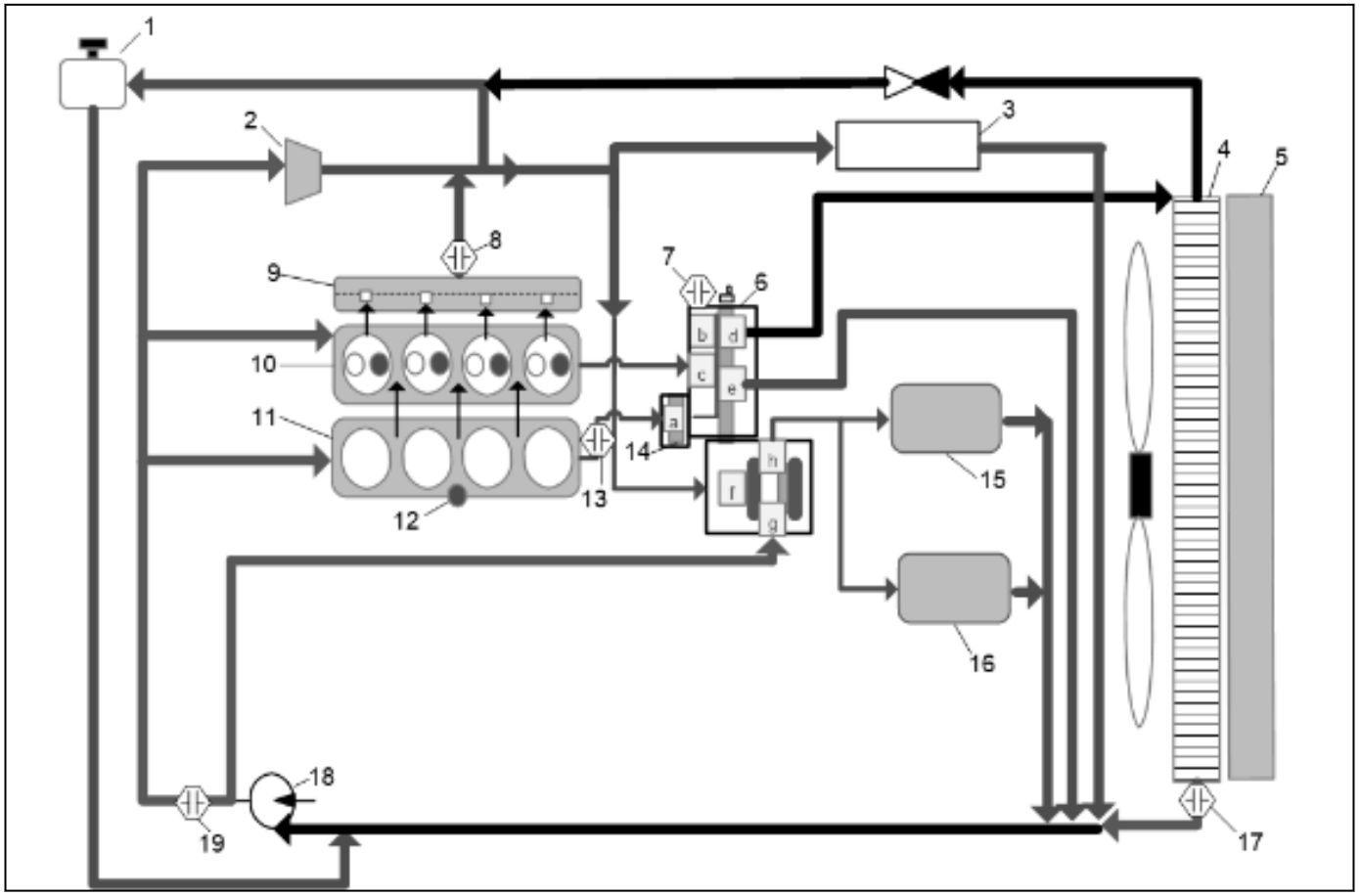
(10) Cylinder Head
(11) Engine Block
(12) Engine Block Heater
(13) Engine Block Coolant Temperature Sensor
(14) Block Rotary Valve
(15) Engine Oil Hear Exchanger
(16) Transmission Oil Heat Exchanger
(17) Radiator Outlet Coolant Temperature Sensor
(18) Electric Water Pump
(19) Engine Inlet Coolant Temperature Sensor
Valve Port A
Valve Port B
Valve Port C
Valve Port D
Valve Port E
Valve Port F
Valve Port G
Valve Port H

When the driver requests passenger compartment heat or windshield defrosting, the electric water pump will control flow to maximize coolant heat transfer from engine to passenger compartment. This heater circuit is fed by a combination of warmed coolant from the cylinder head, integrated manifold and turbocharger cooler. The engine coolant flow control valve is at an all-closed position at this time. The warmed coolant goes directly to the passenger compartment heater core. Heater core flow returns to the electric water pump.

COMPONENT	CONDITION
Electric Water Pump	Low Speed or Speed-Controlled to Heater Core Demand
Main Rotary Coolant Valve	Low Speed, Low Flow
Block Rotary Control Valve	Low Speed, Low Flow

Mode 3 (Engine Warm Up With Cabin Heating And Radiator Bypass):

Flow Diagram - Mode 3



6752542

(1) Surge Tank
(2) Turbocharger
(3) Heater Core
(4) Radiator
(5) Condenser
(6) Main Rotary Valve
(7) Engine Outlet Coolant Temperature Sensor
(8) Engine Cylinder Head Coolant Temperature Sensor
(9) Integrated Exhaust Manifold
(10) Cylinder Head
(11) Engine Block
(12) Engine Block Heater
(13) Engine Block Coolant Temperature Sensor

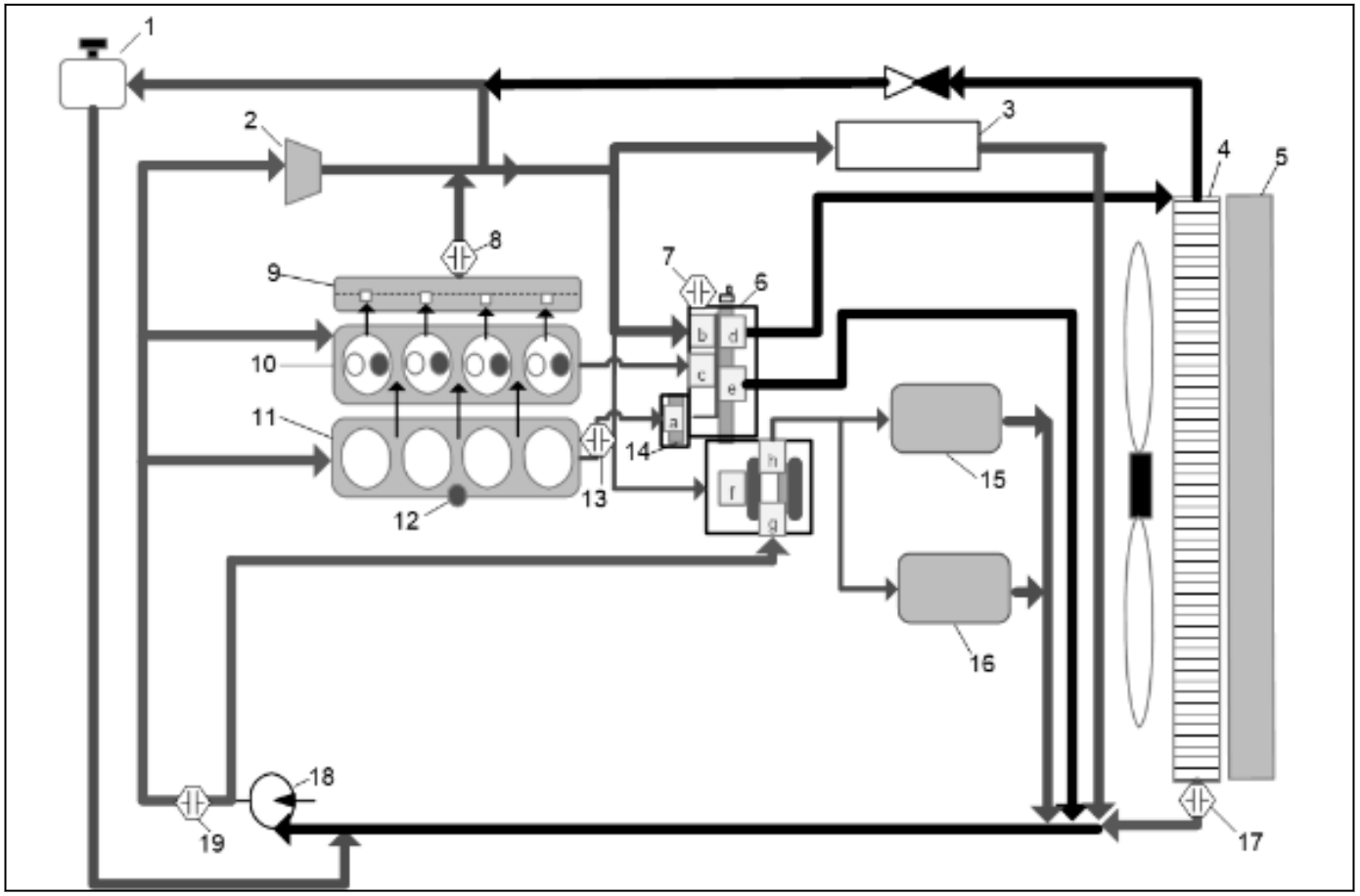
(14) Block Rotary Valve
(15) Engine Oil Hear Exchanger
(16) Transmission Oil Heat Exchanger
(17) Radiator Outlet Coolant Temperature Sensor
(18) Electric Water Pump
(19) Engine Inlet Coolant Temperature Sensor
Valve Port A
Valve Port B
Valve Port C
Valve Port D
Valve Port E
Valve Port F
Valve Port G
Valve Port H

The cylinder head, integrated manifold and turbo-charger cooler passages are still flowing and providing warmed coolant directly to the passenger compartment heater core, if requested. As combustion chamber temperatures get hotter, it is necessary to flow coolant through the cylinder head without losing heat to the radiator or engine/transmission oil heat exchangers. The Block Rotary Coolant Valve will allow flow through the cylinder head by opening the radiator bypass loop, which returns coolant directly to the electric water pump.

COMPONENT	CONDITION
Electric Water Pump	Speed-Controlled to Engine Demand
Main Rotary Coolant Valve	Bypass Radiator
Block Rotary Control Valve	Position-Controlled

Mode 4 (Engine Warm Up With Cabin Heating, Radiator Bypass And Oil Heating):

Flow Diagram - Mode 4



6752547

(1) Surge Tank
(2) Turbocharger
(3) Heater Core
(4) Radiator
(5) Condenser
(6) Main Rotary Valve
(7) Engine Outlet Coolant Temperature Sensor
(8) Engine Cylinder Head Coolant Temperature Sensor
(9) Integrated Exhaust Manifold
(10) Cylinder Head
(11) Engine Block
(12) Engine Block Heater
(13) Engine Block Coolant Temperature Sensor

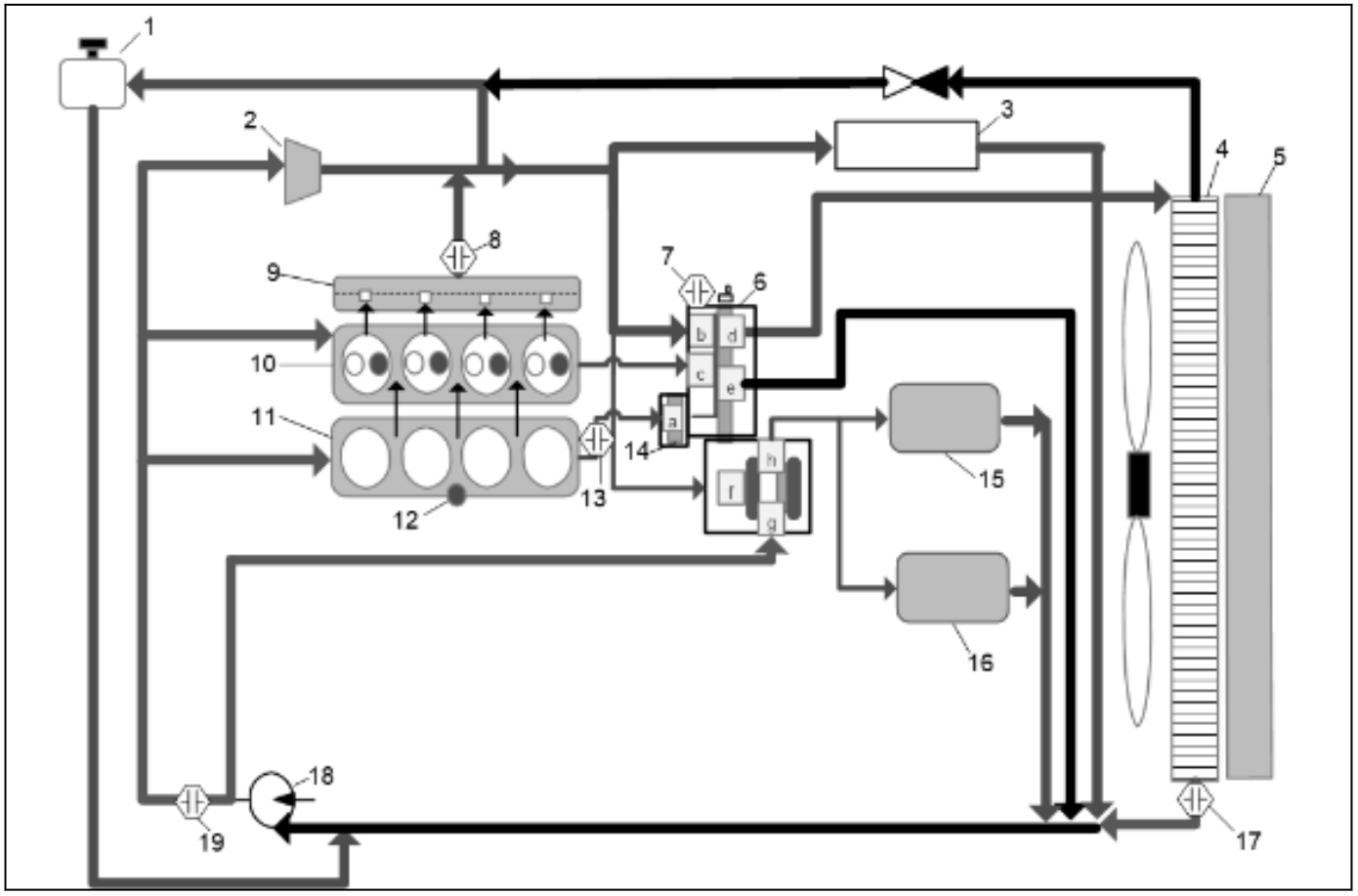
(14) Block Rotary Valve
(15) Engine Oil Hear Exchanger
(16) Transmission Oil Heat Exchanger
(17) Radiator Outlet Coolant Temperature Sensor
(18) Electric Water Pump
(19) Engine Inlet Coolant Temperature Sensor
Valve Port A
Valve Port B
Valve Port C
Valve Port D
Valve Port E
Valve Port F
Valve Port G
Valve Port H

The cylinder head, integrated manifold and turbo-charger cooler passages are still flowing and providing warmed coolant directly to the passenger compartment heater core, if requested. Once the optimal combustion chamber temperature has been reached, warmed coolant can be used to quickly raise the engine and transmission to their optimal temperatures. The engine coolant flow control valve will still allow flow through the cylinder head with the open radiator bypass loop but will now also allow coolant flow to the engine/trans-mission oil heat exchangers. Coolant flow from the bypass and heat exchangers returns to the electric water pump.

Flow Diagram - Mode 5

COMPONENT	CONDITION
Electric Water Pump	Speed-Controlled to Engine Demand
Main Rotary Coolant Valve	Bypass Radiator and Oil Heating
Block Rotary Control Valve	Position-Controlled

Mode 5 (Engine-Demand Cooling With Cabin Heating And Oil Heating):



6752552

(1) Surge Tank
(2) Turbocharger
(3) Heater Core
(4) Radiator
(5) Condenser
(6) Main Rotary Valve
(7) Engine Outlet Coolant Temperature Sensor
(8) Engine Cylinder Head Coolant Temperature Sensor
(9) Integrated Exhaust Manifold
(10) Cylinder Head
(11) Engine Block
(12) Engine Block Heater

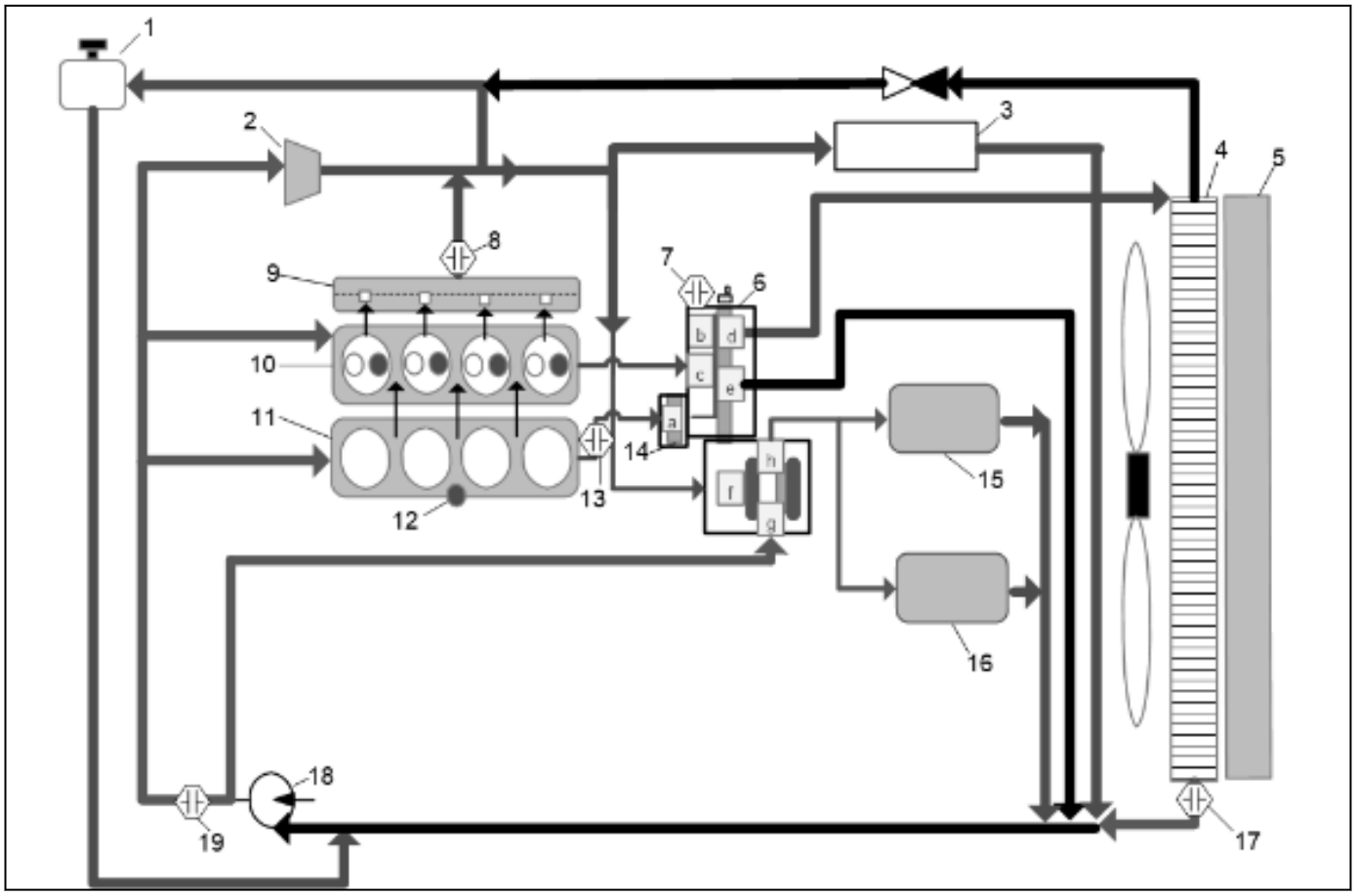
(13) Engine Block Coolant Temperature Sensor
(14) Block Rotary Valve
(15) Engine Oil Hear Exchanger
(16) Transmission Oil Heat Exchanger
(17) Radiator Outlet Coolant Temperature Sensor
(18) Electric Water Pump
(19) Engine Inlet Coolant Temperature Sensor
Valve Port A
Valve Port B
Valve Port C
Valve Port D
Valve Port E
Valve Port F
Valve Port G
Valve Port H

The cylinder head, integrated manifold and turbocharger cooler passages are still flowing and providing warmed coolant directly to the passenger compartment heater core, if requested. At this point, the combustion chamber temperature has reached its optimal temperature and the engine needs to dissipate heat through the radiator. Based on engine temperature, the engine coolant flow control valve will split the flow between the radiator and bypass in a ratio necessary to maintain optimal engine temperatures. Additionally, coolant flow will continue to flow to the engine/transmission oil heat exchangers. Engine oil and transmission oil can take significantly longer time to reach optimal temperatures after the engine is already warmed. Coolant flow from the radiator, bypass, and heat exchangers returns to the electric water pump.

COMPONENT	CONDITION
Electric Water Pump	Speed-Controlled to Engine Demand
Main Rotary Coolant Valve	Position-Controlled with Oil Heating
Block Control Valve	Position-Controlled

Mode 6 (Engine-Demand Cooling With Cabin Heating And Oil Cooling):

Flow Diagram - Mode 6



6752554

(1) Surge Tank
(2) Turbocharger
(3) Heater Core
(4) Radiator
(5) Condenser
(6) Main Rotary Valve
(7) Engine Outlet Coolant Temperature Sensor
(8) Engine Cylinder Head Coolant Temperature Sensor
(9) Integrated Exhaust Manifold
(10) Cylinder Head
(11) Engine Block

(12) Engine Block Heater
(13) Engine Block Coolant Temperature Sensor
(14) Block Rotary Valve
(15) Engine Oil Hear Exchanger
(16) Transmission Oil Heat Exchanger
(17) Radiator Outlet Coolant Temperature Sensor
(18) Electric Water Pump
(19) Engine Inlet Coolant Temperature Sensor
Valve Port A
Valve Port B
Valve Port C
Valve Port D
Valve Port E
Valve Port F
Valve Port G
Valve Port H

The cylinder head, integrated manifold and turbocharger cooler passages are still flowing and providing warmed coolant directly to the passenger compartment heater core, if requested. In extreme hot driving conditions, the engine and transmission become extremely hot and their oils need to be cooled. The engine coolant flow control valve will continue to split the flow between the radiator and bypass in a ratio necessary to maintain optimal engine temperatures and will now allow colder coolant directly from the electric water pump to flow to the engine/transmission oil heat exchangers. Coolant flow from the radiator, bypass, and heat exchangers returns to the electric water pump.

COMPONENT	CONDITION
Electric Water Pump	Speed-Controlled to Engine Demand
Main Rotary Coolant Valve	Position-Controlled with Oil Cooling
Block Control Valve	Position-Controlled

Mode 7 (After Run Cooling):

The after run mode is after key off and is needed only after extreme hot conditions with high engine, oil and coolant temperatures. For after run mode, the same valve positions are used as in Mode 6, but the electric water pump is run at a lower speed to continue cooling.

COMPONENT	CONDITION
Electric Water Pump	Low Speed
Main Rotary Coolant Valve	Max Cooling
Block Control Valve	Open

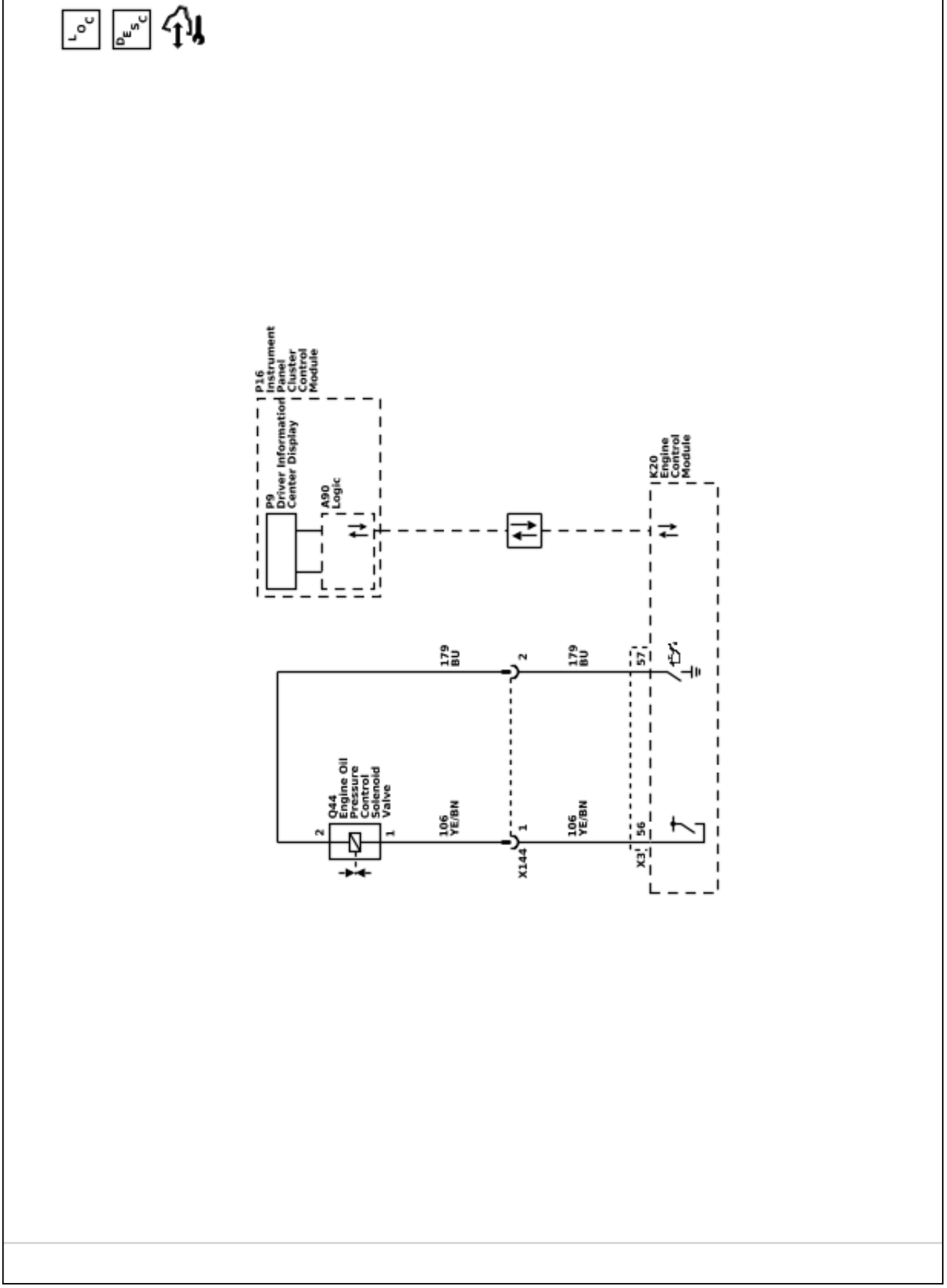
SHUT DOWN

At engine shutdown, the control valves remain open to permit radiator flow and allow coolant service fill by gravity alone. Both control valves also undergo an diagnostic check after engine shutdown, which is sometimes audible.

Engine Mechanical - 2.7L

Schematic and Routing Diagrams

Engine Mechanical Schematics (Engine Oil Pressure Control)



Description and Operation

Compressor Air Intake Turbocharger System Description

Turbocharger Description and Operation

A turbocharger is a compressor that is used to increase the power output of an engine by increasing the mass of the oxygen and therefore the fuel entering the engine. A turbocharger is mounted either to the exhaust manifold or directly to the head. The turbine is driven by the energy generated by the flow of the exhaust gases. The turbine is connected by a shaft to the compressor which is mounted in the induction system of the engine. The centrifugal compressor blades compress the intake air above atmospheric pressure, thereby increasing the density of the air entering the engine.

The turbocharger incorporates a wastegate that is controlled by a pressure differential that is determined by the engine control module (ECM) by means of a PWM solenoid, in order to control boost pressure. A compressor recirculation valve, also controlled by the ECM, prevents compressor surging and damage by opening during sudden throttle closures. When the recirculation valve is opened it allows the air to recirculate back to the turbocharger compressor inlet.

The turbocharger is connected to the engine oiling system by a supply and drain pipe. Oil is required for the bearing system function and also serves to carry some heat from the turbocharger. There is a cooling system circuit in the turbocharger that further reduces operating temperatures and passively dissipates bearing housing heat away from the turbocharger on shut down.

Charge Air Cooler Description

The turbocharger engine system is supported by an air-to-air charge air cooler system, which uses fresh air drawn through a heat exchanger to reduce the temperature of the hot compressed air exiting the turbo compressor, prior to delivery to the engine combustion system. Inlet air temperature can be reduced by up to 100°C (180°F), enhancing performance because cooler air is denser in oxygen and promotes optimal combustion. The charge air cooler is connected to the turbocharger and to the throttle body by flexible ductwork that requires the use of special high torque fastening clamps. In order to prevent any type of air leak when servicing the ductwork, the tightening specifications, cleanliness and proper positioning of the clamps is critical, and must be strictly adhered to.

Benefits of Dual Cam Phasing

The camshafts of the 2.5L liter and the 2.7L liter turbocharged engine have camshaft position sensors and camshaft position actuators that the ECM uses to accurately control the continuously variable intake and exhaust valve timing. This allows the combustion process to be optimized by the ECM to increase the response of the turbocharger, providing a more immediate feeling of power to the driver.

Benefits of Gasoline Direct Injection

In the 2.5L liter and the 2.7L liter turbocharged engine, the fuel is introduced directly into the combustion chamber during the intake stroke. As the piston approaches top-dead center, the mixture is ignited by the spark plug, thereby giving the name spark ignition direct injection. Direct injection allows the mixture to be leaner, with less fuel and more air at full power, and allows a slightly higher compression ratio, resulting in improved fuel consumption at part and full throttle.

The fact that the fuel is injected after the exhaust valve closes allows particularly high valve overlap values in certain engine operating ranges. This enhances the turbocharger response time. This would not be possible in a port fuel injection engine due to the fact that unburned fuel would escape through the open exhaust valve.

Direct injection’s precise fuel delivery enables more complete combustion which reduces emissions particularly on cold starts.

Electronic Vacuum Pump

The purpose of the electronic vacuum pump, if equipped, is to keep the vacuum in the brake booster at an acceptable level under various operating conditions. The ECM monitors the input signal from the brake booster pressure sensor. When the vacuum in the brake booster is not in an acceptable range the control module will command the relay ON that controls the vacuum pump.

Recommendations for Service

The turbocharger is designed so that it does not require any special maintenance, and inspection is limited to a few periodic procedures. To ensure that the turbocharger's lifetime corresponds to that of the engine, the following engine manufacturer's service instructions must be strictly adhered to:

- Oil and filter change intervals
- Air filter change intervals
- Engine coolant change intervals
- Ignition system maintenance
- Injection system maintenance

The following causes are responsible for a majority of all turbocharger failures:

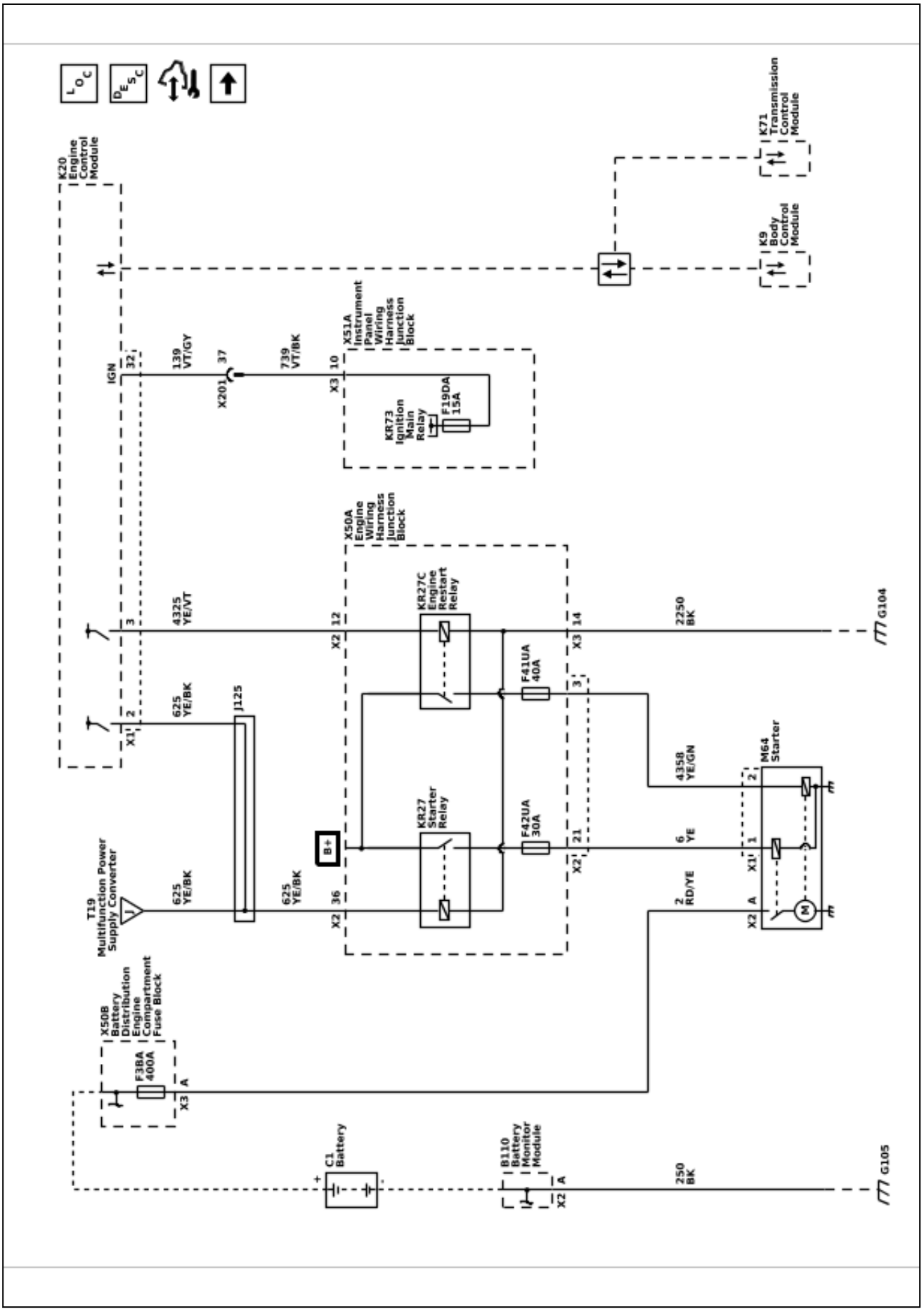
- Misdiagnosis of a non-failed turbocharger
- Penetration of foreign bodies into the turbine or the compressor
- Dirt or contaminants in the oil
- Inadequate oil supply and/or pressure
- Clogged oil return
- Higher than normal exhaust gas temperatures due to improper operation of the following:
  - The ignition system
  - The fuel injection system
  - The exhaust system

These failures can be avoided by regular maintenance.

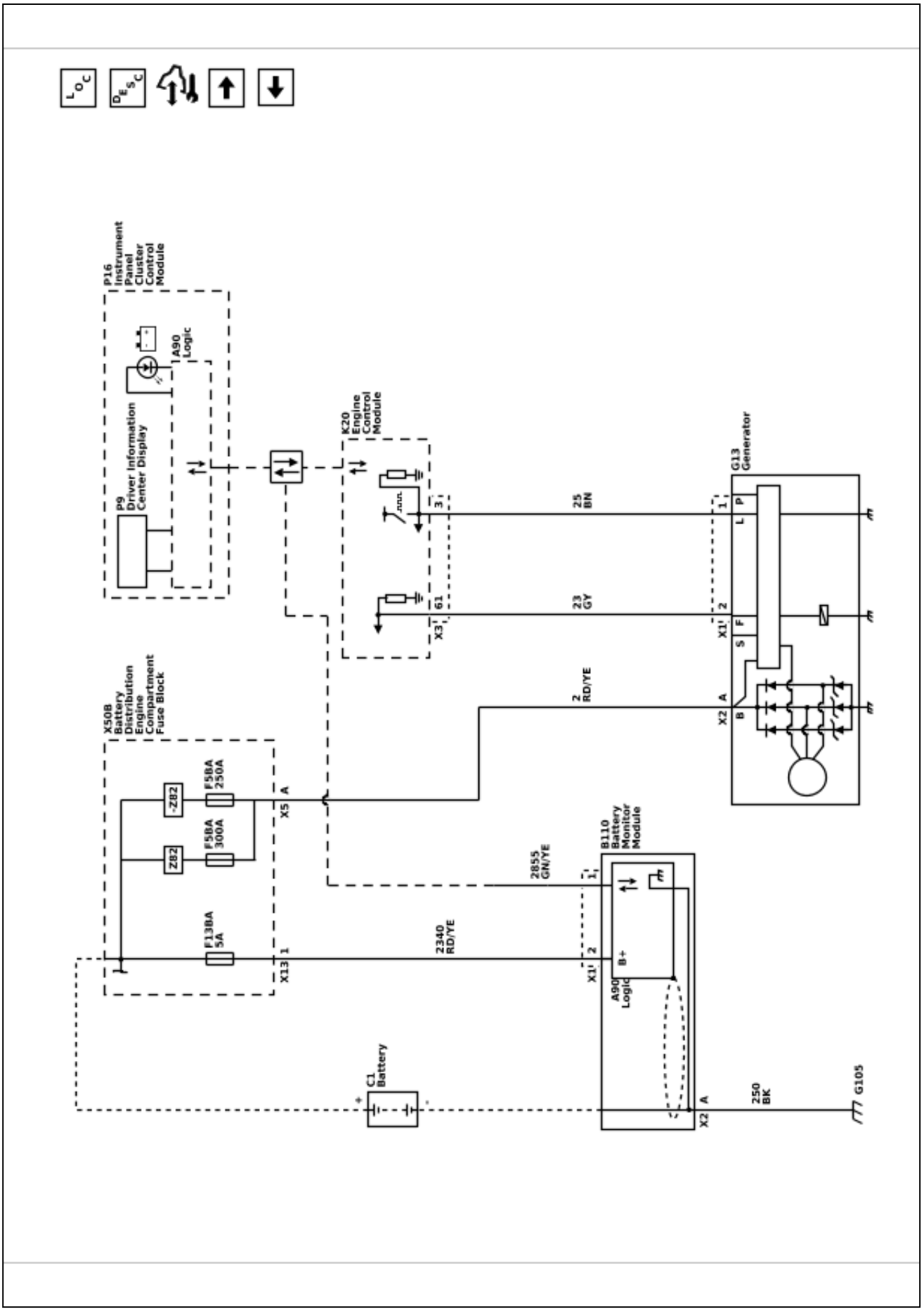
Starting, Charging, and Low Voltage Energy Storage

Schematic and Routing Diagrams

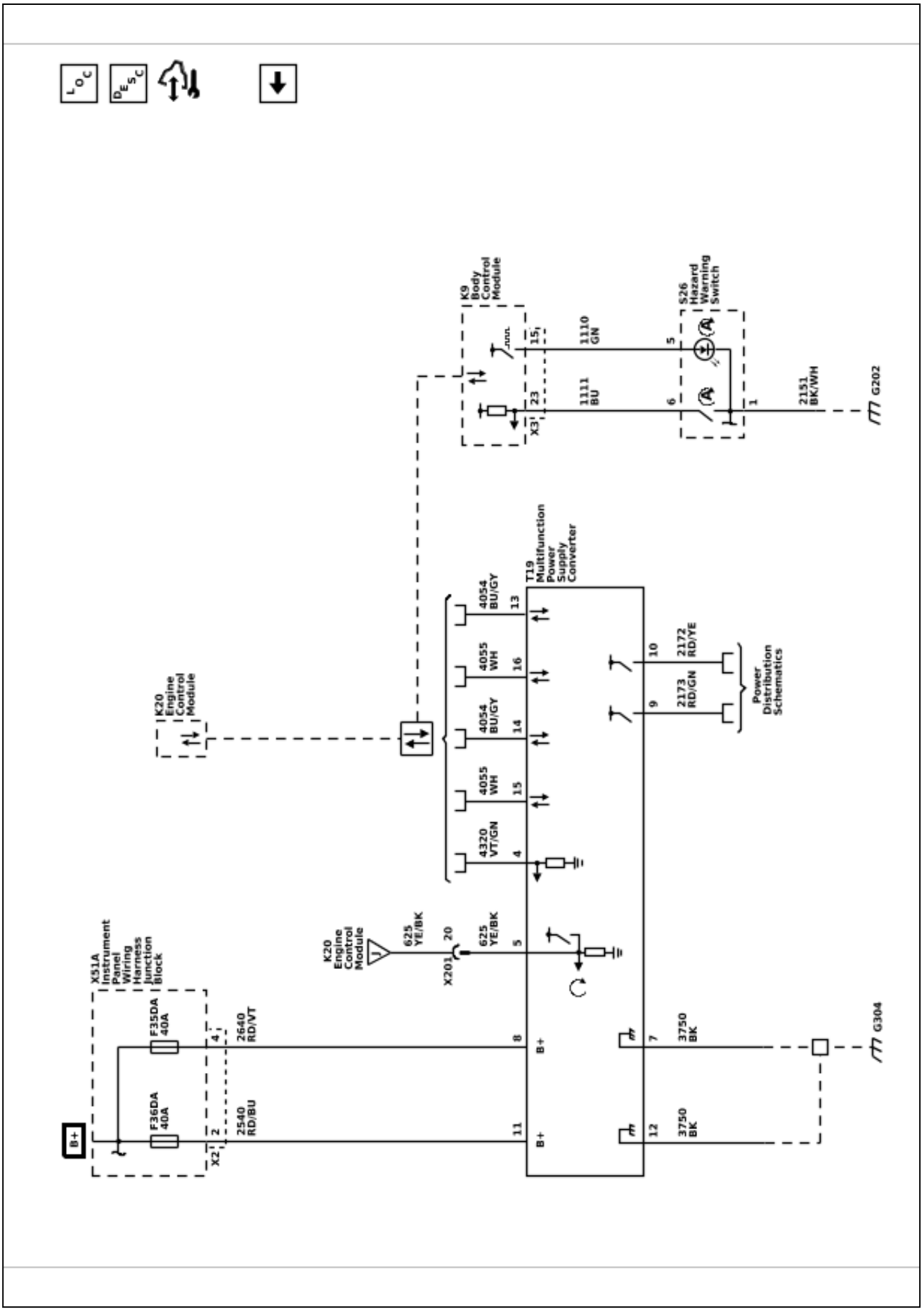
Starting and Charging Schematics (Starting)



Starting and Charging Schematics (Charging)



Starting and Charging Schematics (Stop/Start System)



Description and Operation

Battery Description and Operation

Warning: Batteries produce explosive gases, contain corrosive acid, and supply levels of electrical current high enough to cause burns. Therefore, to reduce the risk of personal injury when working near a battery:

- ***Always shield your eyes and avoid leaning over the battery whenever possible.***
- ***Do not expose the battery to open flames or sparks.***
- ***Do not allow the battery electrolyte to contact the eyes or the skin. Flush immediately and thoroughly any contacted areas with water and get medical help.***
- ***Follow each step of the jump starting procedure in order.***
- ***Treat both the booster and the discharged batteries carefully when using the jumper cables.***

Batteries that are no longer wanted must be disposed of by an approved battery recycler and must never be thrown in the trash or sent to a landfill.

Batteries that are not part of the vehicle itself, not the battery under the hood, must only be transported on public streets for business purposes via approved hazardous material transportation procedures.

Battery storage, charging and testing facilities in repair shops must meet various requirements for ventilation, safety equipment, material segregation, etc.

The maintenance free battery is standard. There are no vent plugs in the cover. The battery is completely sealed except for 2 small vent holes in the side. These vent holes allow the small amount of gas that is produced in the battery to escape.

The battery has 3 functions as a major source of energy:

- Engine cranking
- Voltage stabilizer
- Alternate source of energy with generator overload

Battery Low Start Vehicle Message

The body control module (BCM) monitors battery positive voltage to determine battery state of charge. If one or more of the BCM battery positive voltage terminals measure less than approximately 11.6V compared to the BCM ground circuits, this message will display and four chimes may sound. Start the vehicle immediately. If the vehicle is not started and the battery continues to discharge, the climate controls, heated seats, and audio systems will shut off and the vehicle may require a jump start. These systems will function again after the vehicle is started.

Battery Ratings

A battery has 2 ratings:

- Cold cranking amperage
- Amperage hours

When a battery is replaced use a battery with similar ratings. See battery specification label on the original battery.

Amperage Hours

The amperage hour rating tells you how much amperage is available when discharged evenly over a 20 hour period. The amperage hour rating is cumulative, so in order to know how much constant amperage the battery will output for 20 h, you have to divide the amperage hour rating by 20. Example: If a battery has an amperage hour rating of 74, dividing by 20 = 3.75. Such a battery can carry a 3.75 A load for 20 hours before dropping to 10.5 V. (10.5 V is the fully discharged level, at which point the battery needs to be recharged). A battery with an amperage hour rating of 55 will carry a 2.75 A load for 20 hours before dropping to 10.5 V.

Cold Cranking Amperage

The cold cranking amperage is an indication of the ability of the battery to crank the engine at cold temperatures. The cold cranking amperage rating is the minimum amperage the battery must maintain for 30 seconds at −18°C (0°F) while maintaining at least 7.2 V. See battery label for the cold cranking amperage rating of this battery.

Charging System Description and Operation

Electrical Power Management Overview

The electrical power management system is designed to monitor and control the charging system and send diagnostic messages to alert the driver of possible problems with the battery and generator. This electrical power management system primarily utilizes existing on-board computer capability to maximize the effectiveness of the generator, to manage the load, improve battery state-of-charge and life, and minimize the system's impact on fuel economy. The electrical power management system performs 3 functions:

- Monitor the battery voltage and estimate the battery condition
- Take corrective actions by boosting idle speeds, and adjusting the regulated voltage
- Perform diagnostics and driver notification

The battery condition is estimated during ignition/vehicle off and during ignition/vehicle on. During ignition/vehicle off the state-of-charge of the battery is determined by measuring the open-circuit voltage. The state-of-charge is a function of the acid concentration and the internal resistance of the battery, and is estimated by reading the battery open circuit voltage when the battery has been at rest for several hours.

Any time the ignition/vehicle is on, the vehicle algorithm continuously estimates battery state-of-charge based on adjusted net amp hours, battery capacity, initial state-of-charge, and calculated temperature.

While the engine is running, the battery degree of discharge is primarily determined by the integrated battery current sensor, to obtain net amp hours.

In addition, the electrical power management function is designed to perform regulated voltage control to improve battery state-of-charge, battery life, and fuel economy. This is accomplished by using knowledge of the battery state-of-charge and temperature to set the charging voltage to an optimum battery voltage level for recharging without detriment to battery life.

Charging System Components

G13 Generator
The engine drive belt drives the generator. When the rotor is spun, it induces an alternating current (AC) into the stator windings. The AC voltage is then sent through a series of diodes for rectification. The rectified voltage has been converted into a direct current (DC) for use by the vehicles electrical system to maintain electrical loads and the battery charge.
The voltage regulator integral to the generator controls the output of the generator; It is not serviceable.
The voltage regulator controls the amount of current provided to the rotor. If the generator has field control circuit fault, the generator defaults to an output voltage of 13.8 V.

The generator is serviced as a complete assembly. If there is a diagnosed fault in the generator, it must be replaced as an assembly.

Generator Pulley
The pulley drives the Generator via the engine drive belt. There are 2 types of pulleys:

1. Conventional solid Pulley which is bolted to the Generator stator shaft. This Pulley can be serviced separately.

2. One Way Clutch Pulley or Overrunning Alternator Decoupler Pulley allows the Generator to spin freely when the engine rapidly slows down on sudden deceleration. This part is not serviceable and the Generator needs to be replaced as an assembly.

K9 Body Control Module (BCM)
The K9 Body Control Module communicates with the K20 Engine Control Module and the instrument cluster for electrical power management operation. The BCM determines the output of the generator and sends the information to the ECM for control of the generator turn on signal circuit. It monitors the generator field duty cycle signal circuit information sent from the ECM for control of the generator. It monitors the battery current sensor, the battery positive voltage circuit, and estimates battery temperature to determine battery state of charge. The BCM also performs idle boost.

B110 Battery Monitor Module
The Battery Monitor Module communicates to the BCM via LIN. The BCM shares this information with the ECM. The purpose of the battery sensor module is to transmit battery information that the BCM/ECM can use to make decisions regarding stop/start, battery saver mode, and load shedding.

K20 Engine Control Module (ECM)
When the engine is running, the generator turn-on signal is sent to the generator from the ECM, turning on the regulator. The generator's voltage regulator controls current to the rotor, thereby controlling the output voltage. The rotor current is proportional to the electrical pulse width supplied by the regulator. When the engine is started, the regulator senses generator rotation by detecting AC voltage at the stator through an internal wire. Once the engine is running, the regulator varies the field current by controlling the pulse width. This regulates the generator output voltage for proper battery charging and electrical system operation. The generator field duty terminal is connected internally to the voltage regulator and externally to the ECM. When the voltage regulator detects a charging system problem, it grounds this circuit to signal the ECM that a problem exists. The ECM monitors the generator field duty cycle signal circuit,

and receives control decisions based on information from the BCM.

P16 Instrument Cluster
As a means of displaying the charging system functions, some vehicles may be equipped with a voltmeter gauge on the instrument cluster and/or a system voltage display in the driver information center. These will indicate the current vehicle system voltage.

The instrument cluster also provides customer notification if there is a concern with the charging system. There are two means of notification: a charge indicator on the instrument cluster and/or a service system message displayed on the Driver Information Center (DIC) if equipped.

Charging System Operation

The purpose of the charging system is to maintain the battery charge and vehicle loads. There are 6 modes of operation and they include:

- Battery Sulfation Mode
- Charge Mode
- Fuel Economy Mode
- Head lamp Mode
- Start Up Mode
- Voltage Reduction Mode

The ECM Controls the Generator through the generator turn–on signal circuit, also known as the Generator L-terminal. The ECM monitors the generator performance though the Generator field duty cycle signal circuit, also known as the generator F-terminal.

The Generator turn–on signal (Generator L-terminal) is a Pulse Width Modulation (PWM) signal of 128 Hz with a duty cycle of 0–100%. Normal duty cycle is between 5–95%. 0–5% and 95–100% are for diagnostic purposes, with 0–5% monitoring for an open circuit and 95–100% monitoring for a short to ground at a fixed 13.8 V. The following table shows the commanded duty cycle and output voltage of the Generator:

Commanded Duty Cycle	Generator Output Voltage (+/- .25 V)
0–5%	13.8 V
10%	11 V
20%	11.56 V
30%	12.13 V
40%	12.69 V
50%	13.25 V
60%	13.81 V
70%	14.38 V
80%	14.94 V
90%	15.5 V
95–100%	13.8 V

The Generator provides a PWM feedback signal of the Generator voltage output through the Generator field duty cycle signal circuit to the ECM. This information is sent to the Body Control Module (BCM). The Generator field duty cycle signal (Generator F-terminal) is a PWM signal of 60–460 Hz with a duty cycle of 0–100%. Normal duty cycle is between 5–100%. 0–5% is reserved for diagnostic purposes.

As the charging systems works to maintain the battery charge and manage vehicle electrical loads, it is normal for the voltmeter gauge on the instrument cluster or the system voltage displayed in the DIC to fluctuate or change. This does not indicate a malfunction. Depending on the battery state of charge and the vehicle electrical load, these values may be anywhere from 12.5 V to 15.5 V.

Charging System Modes

Battery Sulfation Mode
The BCM will enter this mode when the interpreted Generator output voltage is less than 13.2 V for 45 minutes. When this condition exists the BCM will enter Charge Mode for 2–3 minutes. The BCM will then determine which mode to enter depending on voltage requirements.

Charge Mode
The BCM will enter Charge Mode when ever one of the following conditions are met:

- Windshield wipers are ON for more than 3 s.
- Climate Control Voltage Boost Mode Request is true, as sensed by the HVAC control module via serial data. High speed cooling fan, rear defogger, and HVAC high speed blower operation can cause the BCM to enter the Charge Mode.
- The estimated battery temperature is less than 0°C (32°F).
- Battery State of Charge is less than 80%.
- Vehicle speed is greater than 145 km/h (90 mph)
- A current sensor malfunction exists.
- System voltage is determined to be below 12.56 V

When any one of these conditions is met, the system will set targeted generator output voltage to a charging voltage between 13.9–15.5 V, depending on the battery state of charge and estimated battery temperature.

Fuel Economy Mode
The BCM will enter Fuel Economy Mode when the estimated battery temperature is at least 0°C (32°F) but less than or equal to 80°C (176°F), the calculated battery current is less than 15 A and greater than −8 A, and the battery state-of-charge is greater than or equal to 80%. Its targeted generator output voltage is the open circuit voltage of the battery and can be between 12.5–13.1 V. When fuel economy mode is active, the generator is not charging, only maintaining open circuit battery voltage. The BCM will exit this mode and enter Charge Mode when any of the conditions described above are present.

Headlamp Mode
The BCM will enter Headlamp Mode when ever the head lamps are ON (high or low beams). Voltage will be regulated between 13.9–14.5 V.

Start Up Mode
When the engine is started the BCM sets a targeted generator output voltage of 14.5 V for 30 s.

Tow/Haul Mode (if applicable)
Pressing the Tow/Haul Mode button located on the center stack, the vehicle system voltage is raised and the remote (non-vehicle) battery will be charged. Having the headlamps on will raise the system voltage and if the Tow/Haul button is applied it will not serve any purpose. The voltage is regulated between 13.9-14.5 V.

Instrument Cluster Operation

Charge Indicator Operation
The instrument cluster illuminates the charge indicator and displays a warning message in the driver information center if equipped, when the one or more of the following occurs:

- The ECM detects that the generator output is less than 11 V or greater than 16 V. The instrument cluster receives a serial data message from the ECM requesting illumination.
- The instrument cluster determines that the system voltage is less than 11 V or greater than 16 V for more than 30 s. The instrument cluster receives a serial data message from the BCM indicating there is a system voltage range concern.
- The instrument cluster performs the displays test at the start of each ignition cycle. The indicator illuminates for approximately 3 s.

Driver Information Center Message: BATTERY NOT CHARGING SERVICE CHARGING SYSTEM or SERVICE BATTERY CHARGING SYSTEM
The BCM and the ECM will send a serial data message to the driver information center for the BATTERY NOT CHARGING SERVICE CHARGING SYSTEM or SERVICE BATTERY CHARGING SYSTEM message to be displayed. It is displayed when a charging system DTC is a current DTC. The message is turned off when the conditions for clearing the DTC have been met.

Voltmeter Gauge and/or System Voltage Display (if equipped)
As a means of displaying the charging system functions, some vehicles may be equipped with a voltmeter gauge on the instrument cluster and/or a system voltage display in the driver information center. These will indicate the current vehicle system voltage.

As the charging systems works to maintain the battery charge and manage vehicle electrical loads, it is normal for the voltmeter gauge on the instrument cluster or the system voltage display in the driver information center to fluctuate or change. This does not indicate a malfunction. Depending on the battery state of charge and the vehicle electrical load, these values may be anywhere from 12.5 V to 15.5 V.

Electrical Power Management Description and Operation

Electrical Power Management

The electrical power management is used to monitor and control the charging system and alert the driver of possible problems within the charging system. The electrical power management system makes the most efficient use of the generator output, improves the battery state-of-charge, extends battery life, and manages system electrical loads.

The load shed operation is a means of reducing electrical loads during a low voltage or low battery state-of-charge condition.

The idle boost operation is a means of improving generator performance during a low voltage or low battery state-of-charge condition.

Each electrical power management function, either idle boost or load shed, is activated in incremental steps. For example, idle boost 1 must be active before idle boost 2 can be active. The criteria used by the body control module (BCM) to regulate electrical power management are outlined below:

Idle Boost and Load Shed With Current Sensor

Function	Battery Temperature Calculation	Battery Voltage Calculation	Amp-Hour Calculation	Action Taken
Idle Boost 1 Start	Less Than −15°C (5°F)	Less Than 13 V	—	First level Idle boost requested
Idle Boost 1 Start	—	—	Battery has a net loss greater than 0.6 Ah	First level Idle boost requested
Idle Boost 1 Start	—	Less Than 11 V	—	First level Idle boost requested
Idle Boost 1 End	Greater Than −10°C (14°F)	Greater Than 12 V	Battery has a net loss less than 0.2 Ah	First level Idle boost request cancelled
Idle Boost 2 Start	—	—	Battery has a net loss greater than 1.6 Ah	Second level Idle boost requested
Idle Boost 2 Start	—	Less Than 11 V	—	Second level Idle boost requested
Idle Boost 2 End	—	Greater Than 12 V	Battery has a net loss less than 0.8 Ah	Second level Idle boost request cancelled
Load Shed 1 Start	—	—	Battery has a net loss of 4 Ah	Rear Defrost, Heated Mirrors, Heated Seats, HVAC cycled OFF for 20% of their cycle
Load Shed 1 Start	—	Less Than 11 V	—	Rear Defrost, Heated Mirrors, Heated Seats, HVAC cycled OFF for 20% of their cycle
Load Shed 1 End	—	Greater Than 12 V	Battery has a net loss of less than 2 Ah	Clear Load Shed 1
Idle Boost 3 Start	—	—	Battery has a net loss of 10 Ah	Third level Idle boost requested
Idle Boost 3 Start	—	Less Than 11 V	—	Third level Idle boost requested
Idle Boost 3 End	—	Greater Than 12 V	Battery has a net loss of less than 6.0 Ah	Third level Idle boost request cancelled
Load Shed 2 Start	—	—	Battery has a net loss greater than 12 Ah	Rear Defrost, Heated Mirrors, Heated Seats, HVAC cycled OFF for 50% of their cycle. The BATTERY SAVER ACTIVE message will be displayed on the DIC
Load Shed 2 Start	—	Less Than 11 V	—	Rear Defrost, Heated Mirrors, Heated Seats, HVAC cycled OFF for 50% of their cycle. The BATTERY SAVER ACTIVE message will be displayed on the DIC
Load Shed 2 End	—	Greater Than 12 V	Battery has a net loss of less than 8 Ah	Clear Load Shed 2
Load Shed 3 Start	—	Less Than 11.9 V	Battery has a net loss greater than 20 Ah	Rear Defrost, Heated Mirrors, Heated Seats, HVAC cycled OFF for 100% of their cycle. The BATTERY SAVER ACTIVE message will be displayed on the DIC

Function	Battery Temperature Calculation	Battery Voltage Calculation	Amp-Hour Calculation	Action Taken
Load Shed 3 Start	—	Less Than 11 V	—	Rear Defrost, Heated Mirrors, Heated Seats, HVAC cycled OFF for 100% of their cycle. The BATTERY SAVER ACTIVE message will be displayed on the DIC
Load Shed 3 End	—	Greater Than 12.6 V	Battery has a net loss of less than 13 Ah	Clear Load Shed 3

Idle Boost and Load Shed Without Current Sensor (based on battery voltage)

Function	Battery Temperature Calculation	Battery Voltage Calculation	Action Taken
Idle Boost 1 Start	Less Than −15°C (5°F)	Less Than 13 V	First level Idle boost requested
Idle Boost 1 Start	—	Less Than 12.6 V	First level Idle boost requested
Idle Boost 1 End	Greater Than −15°C (5°F)	—	First level Idle boost request cancelled
Idle Boost 1 End	—	Greater Than 13 V	First level Idle boost request cancelled
Idle Boost 2 Start	—	Less Than 12.4 V	Second level Idle boost requested
Idle Boost 2 End	—	Greater Than 12.5 V	Second level Idle boost request cancelled
Load Shed 1 Start	—	Less Than 12.3 V	Rear Defrost, Heated Mirrors, Heated Seats, HVAC cycled OFF for 20% of their cycle
Load Shed 1 End	—	Greater Than 12.4 V	Clear Load Shed 1
Idle Boost 3 Start	—	Less Than 10 V	Third level Idle boost requested
Idle Boost 3 End	—	Greater Than 12.3 V	Third level Idle boost request cancelled
Load Shed 2 Start	—	Less Than 12.1 V	Rear Defrost, Heated Mirrors, Heated Seats, HVAC cycled OFF for 50% of their cycle. The BATTERY SAVER ACTIVE message will be displayed on the DIC
Load Shed 2 End	—	Greater Than 12.2 V	Clear Load Shed 2
Load Shed 3 Start	—	Less Than 11.9 V	Rear Defrost, Heated Mirrors, Heated Seats, HVAC cycled OFF for 100% of their cycle. The BATTERY SAVER ACTIVE message will be displayed on the DIC
Load Shed 3 End	—	Greater Than 12.0 V	Clear Load Shed 3

Starting System Description and Operation

Starter Motor Operation (Without KL9)

The starter motors are non-repairable. They have pole pieces that are arranged around the armature. Both solenoid windings are energized. The pull-in winding circuit is completed to the ground through the starter motor. The windings work together magnetically to pull and hold in the plunger. The plunger moves the shift lever. This action causes the starter drive assembly to rotate on the armature shaft spline as it engages with the flywheel ring gear on the engine. Moving at the same time, the plunger also closes the solenoid switch contacts in the starter solenoid. Full battery voltage is applied directly to the starter motor and it cranks the engine.

As soon as the solenoid switch contacts close, current stops flowing thorough the pull-in winding because battery voltage is applied to both ends of the windings. The hold-in winding remains energized. Its magnetic field is strong enough to hold the plunger, shift lever, starter drive assembly, and solenoid switch contacts in place to continue cranking the engine. When the engine starts, pinion overrun protects the armature from excessive speed until the switch is opened.

When the crank signal is removed, the starter relay opens and battery voltage is removed from the starter solenoid S terminal. Current flows from the motor contacts through both windings to the ground at the end of the hold-in winding. However, the direction of the current flow through the pull-in winding is now opposite the direction of the current flow when the winding was first energized.

The magnetic fields of the pull-in and hold-in windings now oppose one another. This action of the windings, along with the help of the return spring, causes the starter drive assembly to disengage and the solenoid switch contacts to open simultaneously. As soon as the contacts open, the starter circuit is turned off.

Enhanced Starter Motor Operation (KL9)

The Engine Stop/Start system in GM vehicles automatically turns off the engine when the vehicle comes to a stop under certain driving conditions, and can quickly restart the engine in about 0.3 seconds when commanded to do so.

In order to smoothly restart the engine as quickly as possible while managing the greater number of engine starts, the Stop/Start system uses an enhanced starter motor that operates differently from a conventional starter motor. It has a high performance electric motor and a stronger pinion engagement mechanism than a conventional starter. It also has independent control of the pinion and motor.

The enhanced starter motor continues using the typical pinion engagement mechanism with a starter solenoid that drives the pinion gear to engage or disengage the flywheel of the engine. When engaged, the starter motor can rotate the engine flywheel and, in turn, the crankshaft.

On the enhanced starter of a Stop/Start system the operation is done in two separate functions inside the solenoid, Starter Motor and Pinion Actuator. Each function controlled individually by the ECM. There are two separate relays to control the two separate parts of the enhanced solenoid:

- KR27 Starter Motor Relay
- KR27C Starter Pinion Actuator Relay

The two individually-controlled relays allow for smooth engagement of the pinion gear into the flywheel with minimum noise and wear.

When the vehicle is coming to a stop, just before the engine stops rotating (at approximately 50 RPM) during stop/start operation, the ECM energizes the Starter Pinion Solenoid Actuator Relay to easily push the pinion gear into the flywheel gear without gear clash. (Fig. 8) When the engine stops rotating during Stop/Start operation (Auto Stop mode), the starter pinion gear is fully engaged, ready for the starter motor to become energized to quickly start the engine again.

A secondary need for the starter pinion to be driven into the flywheel gear before the engine stops rotating is to address quickly changing demands on the engine. For example, when a driver is slowing nearly to a stop — and the Stop/Start system is preparing for Auto Stop mode — but suddenly decides to release the brake and accelerate

In this situation, the engine has already stopped rotating, or nearly so. A conventional starter cannot restart the engine until the engine has completely stopped. However, with the enhanced starter, the starter pinion gear is fully engaged and ready to begin rotating the engine even before it fully stops turning. Otherwise, the engine would actually have to stop rotating before the pinion can engage smoothly to begin a restart.

To prevent a lag in engine operation, the ECM uses predictive speed matching of the flywheel gear speed and the pinion gear speed to engage the pinion gear into the flywheel gear without gear clash before the engine fully stops. By predicting how long it takes the starter motor to spin up using an algorithm, the pinion gear speed can be matched to the flywheel gear speed. The result is an almost instant restart that is possible at extremely low engine speeds.

Ignition Switch

Keyless Start

When the Ignition mode switch is placed in the crank position, a discrete signal is supplied to the body control module (BCM) notifying it that the ignition is in the crank position. The BCM then sends a serial data message to the engine control module (ECM) that crank has been requested. The ECM then verifies that the brake pedal is applied and for manual transmission the clutch is fully depressed or for automatic transmission is in Park/Neutral. If it is, the ECM then supplies 12 V to the control circuit of the starter relay. When this occurs, battery positive voltage is supplied through the switch side of the crank relay to the S terminal of the starter solenoid.

Key Start

When the ignition switch is placed in the Start position, a discrete signal is supplied to the body control module (BCM) notifying it that the ignition is in the Start position. The BCM then sends a message to the engine control module (ECM) notifying it that CRANK has been requested. The ECM verifies that the transmission is in Park or Neutral. If it is, the ECM then supplies 12 V to the control circuit of the crank relay. When this occurs, battery positive voltage is supplied through the switch side of the crank relay to the S terminal of the starter solenoid.

Stop/Start System Description and Operation

The Stop/Start System is used to improve fuel efficiency in stop/start driving. The vehicle automatically shuts down the engine in appropriate conditions at a traffic light, for example, resulting in zero tail pipe emissions and saving fuel which otherwise is used idling the engine when stationary. The engine instantly restarts when the driver is ready to move away.

As soon as the driver prepares to move away (by releasing the brake pedal and/or depressing the accelerator pedal), the engine will start; it only takes the system around 0.3 s to start the engine.

To support the increased number of engine starts, the starter motor is upgraded with a high performance electric motor and a stronger pinion engagement mechanism with reduced noise levels.

Along with the upgraded starter motor, advanced battery technology is required to ensure the vehicles battery can handle the frequent charge and discharge cycles common with stop/start operation. There is battery sensor module connected to the battery which continually monitors the battery charge and healthy state. The Engine Control Module (ECM) uses this information from the battery sensor module to determine if the battery charge and health is sufficient for an Stop/Start condition.

The Stop/Start system can reduce fuel consumption and carbon dioxide (CO2) emissions by up to 5% in mixed driving conditions. In an urban environment and in heavy traffic with frequent stops the savings may increase to as much as 10%.

There are also sophisticated controls in place to help ensure the Stop/Start System does not compromise the needs of either the driver or vehicle. For the engine to shutdown, the vehicle must be below 5 km/h (3 MPH), the selector lever in position D, and brake pedal depressed. To restart, the driver simply releases the brake pedal and the enhanced starter motor engages the engine. When the engine has been shut down by the Stop/Start System, a control indicator will be illuminated in the Driver Information Center (DIC). When the engine is restarted, the control indicator in the DIC extinguishes.

To ensure neither the needs of the driver or vehicle are compromised the engine will not shut down in the following circumstances:

- Ambient and coolant temperature correlation does not match specified values.
- Ambient temperature is less than −10°C (14°F)
- Battery temperature is less than 0°C (32°F) or greater than 55°C (131°F)
- Driver seat belt is not fastened and the drivers door is not fully closed (not applicable to vehicles in North America)
- HVAC system demand is high
- HVAC defrost has been selected
- Battery charge is low

Likewise the engine will automatically restart if:

- Driver door opened and driver seat belt unbuckled (not applicable to vehicles in North America)
- Engine hood opened
- Battery charge is low
- HVAC demand increases
- Vehicle speed increases
- Brake booster vacuum has been reduced
- Engine coolant temperature is greater than 125°C (257°F)
- Economy mode turned OFF by driver
- Autostop time exceeded 2 min

When the Stop/Start System has shut down the engine, and the ambient temperature is below 15°C (59°F), the ECM will activate the Stop/Start auxiliary relay which controls the electric engine coolant pump motor to continually circulate the engine coolant through the engine while the engine is off. This is to ensure the engine and passenger compartment temperature is maintained while off. Once the Stop/Start System has restarted the engine, the ECM will turn off the electric coolant pump motor, thus allowing the engines internal coolant pump to circulate the engine coolant. The Stop/Start System is automatically activated each time the ignition switch is turned on.

Through the climate control system, the vehicle can be cycled between off, comfort, and eco air conditioning modes (if equipped). In comfort mode, the priority for Stop/Start operation is on customer comfort. Depending on ambient temp, humidity, cabin temperature and cabin temperature setpoint, the least amount of autostops occur in this mode. In eco mode, the priority is on fuel economy. There are more frequent autostops with some sacrificing of cabin temperature control. With the HVAC turned off, the maximum autostops occur since there will be no A/C compressor requests.

Autostop Criteria

The ECM will send an Autostop state message to the body control module (BCM) and shut down the engine when all of the following criteria is met. The BCM will transmit the Autostop state message to the instrument cluster which will display the Autostop indicator in the tachometer display.

- Initial minimum vehicle speed during drive cycle must be 19 km/h (12 MPH) or greater. Subsequent autostop minimum speed may vary from 2-10 km/h (1-6 MPH), depending on vehicle
- Ambient and engine coolant temperature correlation meets specified values.
- Ambient and transmission fluid temperature correlation meets specified values.
- Hood switch status is closed
- Driver door status is closed
- Driver seat belt status is buckled
- Brake booster vacuum is greater than 45 kPa (7 PSI)
- Transmission gear selector is in the Drive position
- Vehicle speed is less than 5 km/h (3 MPH)
- Engine speed is below 1,500 RPM
- Engine coolant temperature is less than 120°C (248°F)
- Ambient temperature is greater than −10°C (14°F)
- No A/C compressor request from HVAC (A/C or Defrost modes)
- Battery voltage greater than 12 V
- Battery state of charge greater than 75% (changes with state of health)

Autostop Enable Ambient and Engine Coolant Temperature Table

Ambient Temperature	inimum Coolant Temperature	Autostop Enable
−10°C (14°F)	60°C (140°F)	Yes
0°C (32°F)	50°C (122°F)	Yes
6°C (43°F)	40°C (104°F)	Yes
12°C (54°F)	30°C (86°F)	Yes
20°C (68°F)	18°C (64°F)	Yes
30°C (86°F)	18°C (64°F)	Yes

Autostart Criteria

The ECM will send an Autostart state message to the BCM. If all of the following conditions are true the ECM and BCM will restart the vehicle.

Driver Enabled Conditions that will engage Autostart:

- Driver removes pressure from the brake or depresses the accelerator pedal while the vehicle is in the forward Drive gear

System Enabled Conditions that will engage Autostart

Note: If one or more of the following conditions occur, the system will force the engine to restart.

- Brake booster vacuum is less than 40 kPa (6 PSI)
- A/C compressor request from HVAC (A/C or Defrost modes)
- Battery voltage less than 11 V,
- Battery state of charge is less than 73% (changes with state of health)

- Driver door status changes to open and driver seat belt status changes to unbuckled (not applicable to vehicles in North America)
- Hood switch status changes to open
- Autostop time exceeded 2 min

If the crank time exceeds 2 s, a manual ignition switch restart will be necessary.

System Components

Engine Control Module (ECM)
The ECM monitors the inputs from the Engine Coolant Temperature (ECT) sensor, Vehicle Speed Sensor (VSS), Battery Sensor Module, hood ajar switch, brake booster vacuum sensor, and engine speed to determine Autostart and Autostop conditions. The ECM also controls the auxiliary coolant pump motor (if equipped).

Transmission Control Module (TCM)
The TCM monitors the inputs from the transmission neutral safety switch to determine the driver selected gear. This information is transmitted to the ECM via serial data to support the Auto Stop Start algorithm.

Engine Coolant Temperature sensor (ECT)
The ECT sensor is used to determine engine operating temperature.

Intake Air Temperature Sensor (IAT)
The ECM uses this sensor to monitor ambient air temperature. If too cold, the Autostop will not occur.

Inside air temperature sensor
The HVAC control module monitors the passenger compartment temperature sensor to determine the temperature inside the passenger compartment. The HVAC control module sends this temperature reading to the ECM on the data communication circuit. The ECM uses this temperature values to determine if a restart is requires based on the temperature inside the passenger compartment.

Vehicle speed sensor
The vehicle speed sensor is used to determine vehicle speed. If vehicle speed is detected above a calculated value during an Autostop condition, the ECM will start the engine.

Hood Ajar Switch
If the hood switch is in the open position, the vehicle will not Autostop. If the hood is opened during Autostop, the vehicle will automatically restart.

Brake Booster Vacuum Sensor
The ECM monitors vacuum in order to ensure proper power assist for the brake pedal. If the ECM determines vacuum is too low, it will restart the engine.

Brake Pedal Position Sensor (BPPS) & Accelerator Pedal Position Sensor (APP)
The ECM monitors both the brake pedal position sensor and the accelerator pedal position sensor to determine the level of activation for each. While the accelerator pedal is in it's at rest position with no pressure applied by the operator, a partially depressed Brake pedal will cause the ECM to prepare the engine for an Autostop event. When the vehicle is in an auto stop event and the status of the brake pedal position sensor changes from meeting the autostop criteria to not meeting this criteria the engine will be restarted provided all of the other conditions to allow an autostart are met. If the Accelerator pedal is moved from its at rest position the vehicle will also enter an auto start event if all other conditions to support an autostart event, except for the brake pedal position, are met.

Transmission Gear Shift Position Switch
The transmission gear shift position switch is used to determine if the transmission is in the proper state to allow an auto stop/start event. The ECM will not allow Autostop until the brake is engaged, the transmission is in the forward gear position and then the vehicle slows to below the minimum speed required to allow and autostop while meeting all of the other minimum criteria to support an autostop event.

Coolant Pump Motor
The ECM will turn on the auxiliary coolant pump motor during Autostop to maintain engine operating temperature and HVAC temperature. Once the engine is running, the ECM will turn off the coolant pump motor.

Body Control Module (BCM)
The Body Control Module (BCM) monitors the Autostop Disable switch in order to enable or disable the system. It sends the appropriate messages to the ECM Via serial data to enable or disable the system.

Battery Sensor Module
The Battery Sensor Module monitors the battery current load, state of health, and state of charge, the information is sent to the BCM Via LIN then to the ECM Via Serial Data. If the module detects high current load, the battery is in a poor state of health or a low charge condition, the ECM will not allow Autostop to occur.

Autostop Disable Switch
The disable switch is an input to the BCM, it allows the customer to disable or re-enable the Autostop system. After the vehicle is turned off the Autostop system will turn back on the next time the vehicle is started.

Power Supply Transformer
The DC to DC converter monitors battery voltage and will maintain operating voltage to the radio, instrument cluster and instrument panel displays. The DC to DC converter will provide a boosted voltage to sensitive

loads during Autostart to ensure proper operation of the driver informational displays.

Instrument Cluster
In order to differentiate between a normal engine shut down (engine speed 0 RPM) and when the engine has been shut down by the Stop/Start System, the tachometer needle will rest at the Autostop indicator icon (500 RPM point) indicating the engine has been shut down by the Stop/Start System. Once the engine is restarted, or the ECO button has disengaged Autostop, the tachometer will function normally.

Section 6

HVAC

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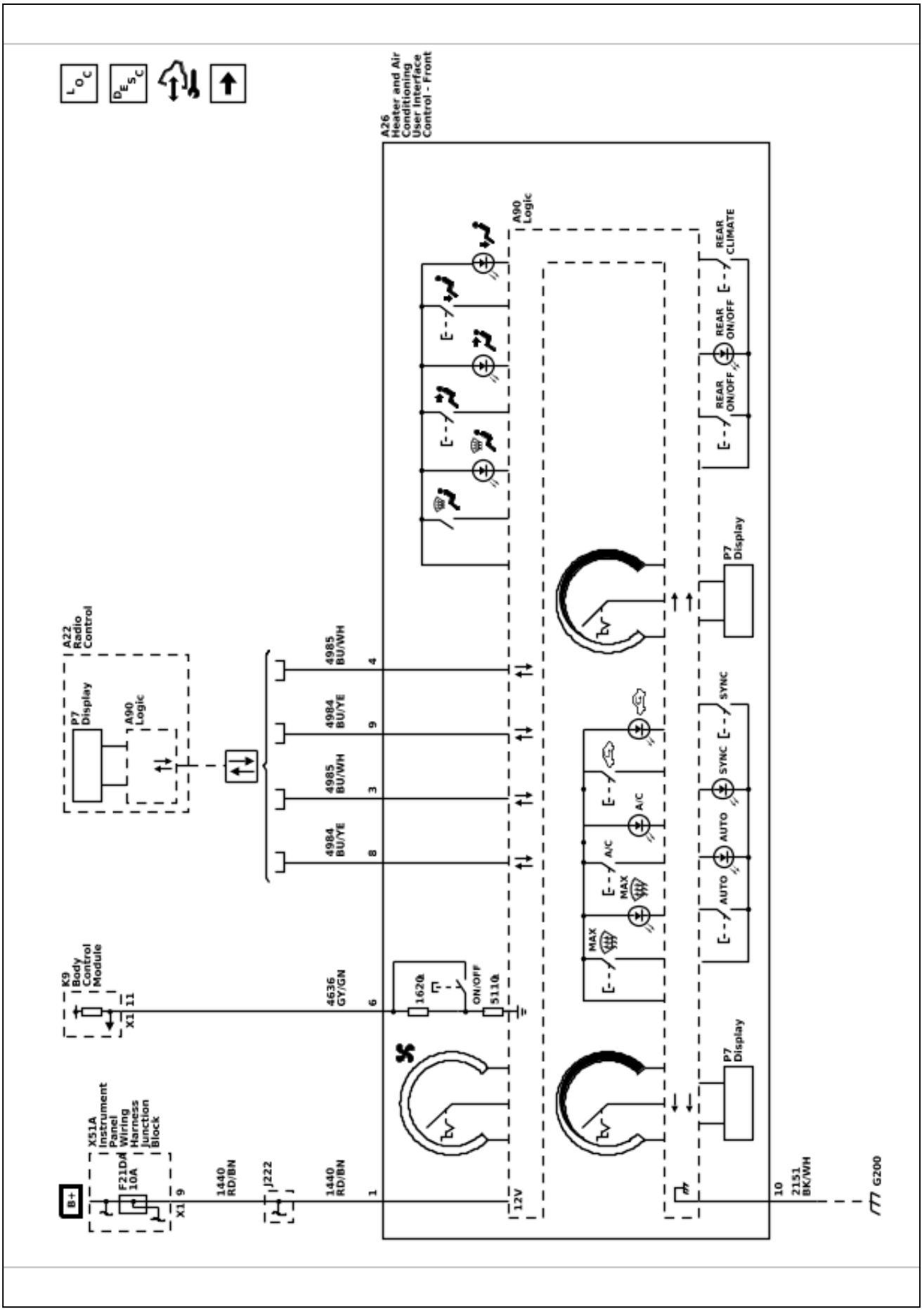
HVAC

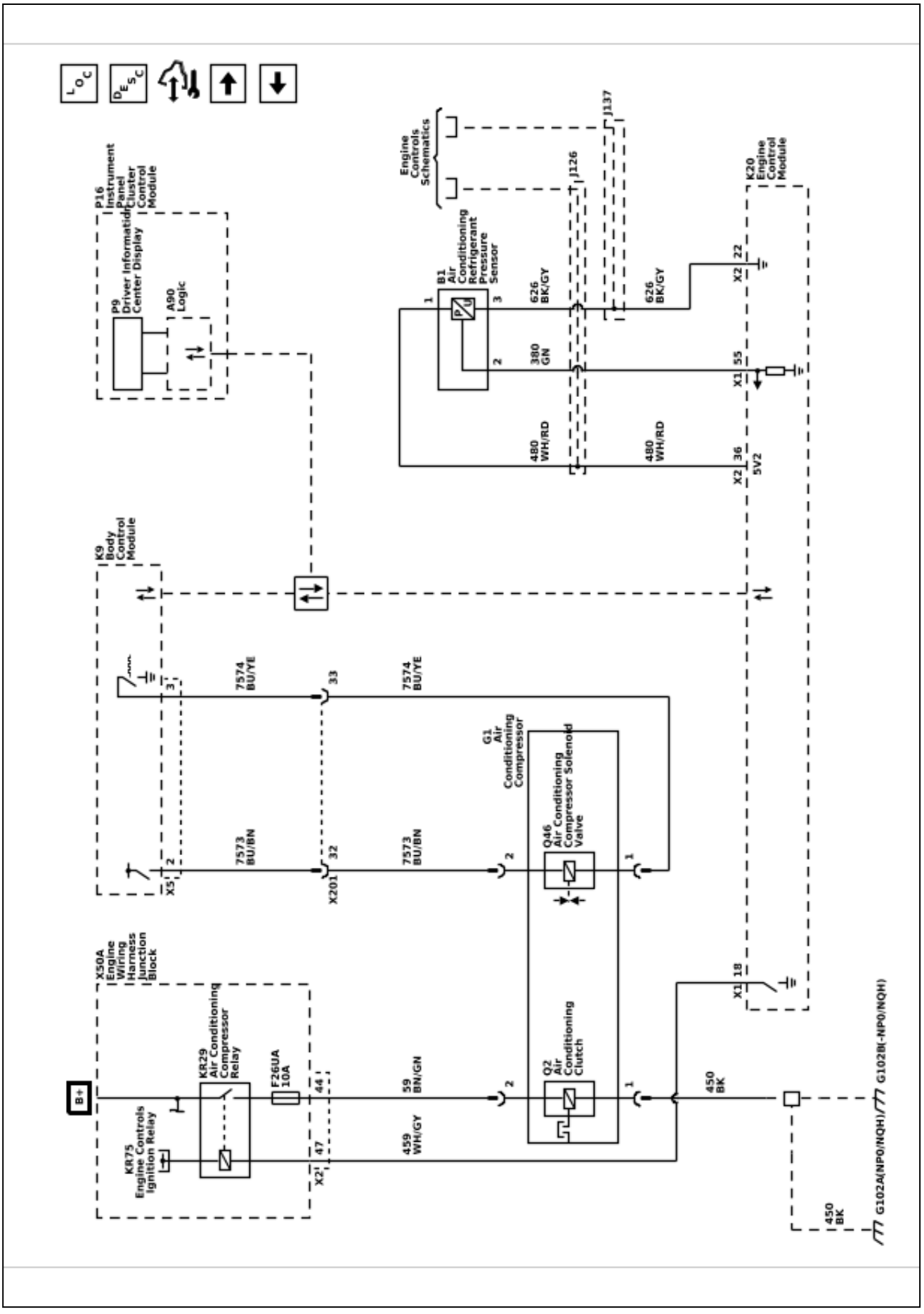
HVAC - Automatic

Schematic and Routing Diagrams

HVAC Schematics (Power, Ground, Serial Data and HVAC Controls)



HVAC Schematics (A/C Compressor Controls)



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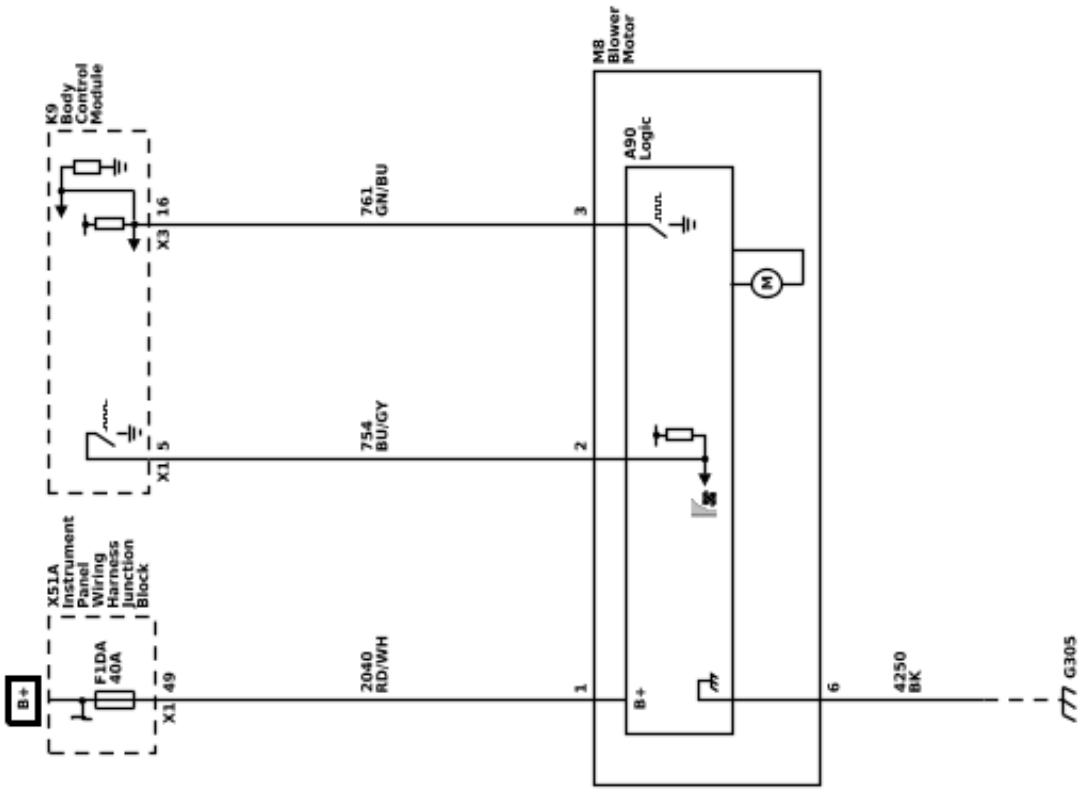
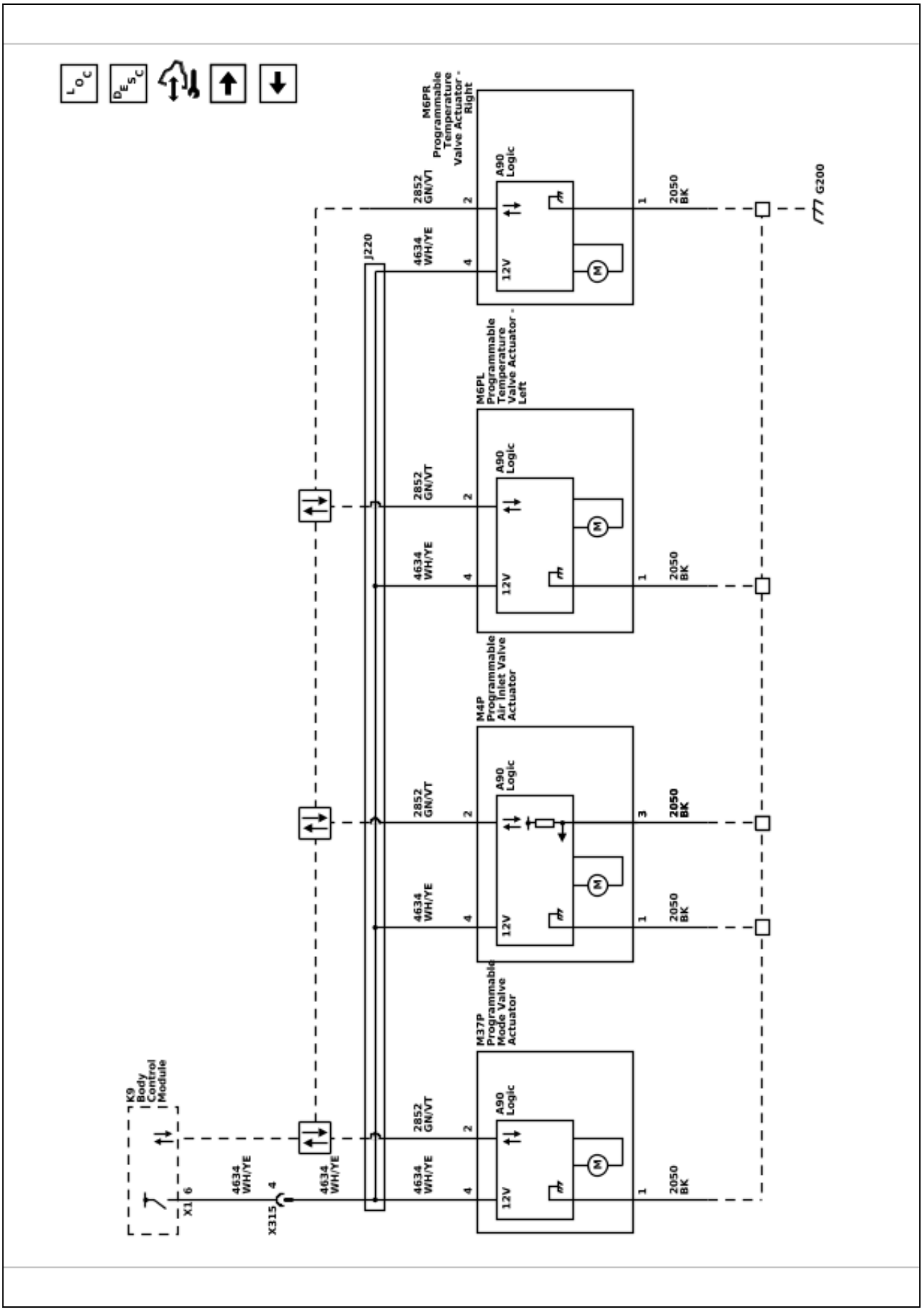
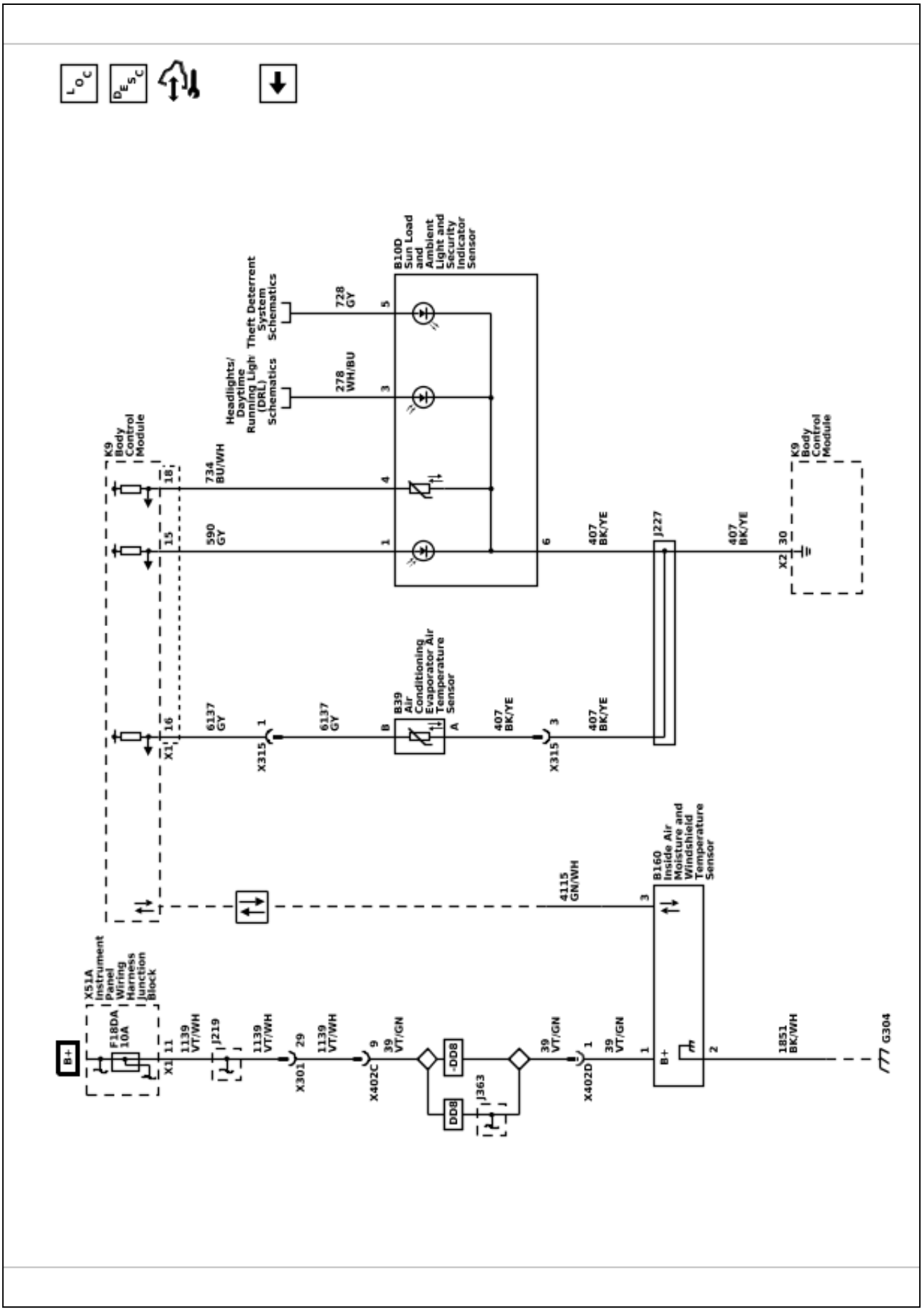
HVAC Schematics (Blower Motor)



HVAC Schematics (Mode and Temperature Control Actuators)



HVAC Schematics (Windshield Sensors and A/C Evaporator Temperature Sensor)



Description and Operation

Automatic HVAC Description and Operation

The air temperature and the air delivery description and operation are divided into the following:

- HVAC Control Components
- Air Speed and Blower Motor
- Air Delivery
- Heating and A/C Operation
- Recirculation Operation
- Automatic Operation
- Engine Coolant and A/C System Refrigerant

HVAC Control Components

K9 Body Control Module

The body control module (BCM) is a CAN device that interfaces between the operator and the HVAC system to maintain and control desired air temperature and air distribution settings. The BCM provides a device ON-Signal for the HVAC controls. The BCM provides blower, air delivery mode and air temperature control.

A26 Heater and Air Conditioning User Interface Control - Front

The HVAC control contains all switches which are required to control the functions of HVAC and serve as interface between the operator and the BCM. The selected values are passed to the BCM via serial data.

Actuators

Doors in the HVAC case assembly are used to control air flow. The BCM operates the doors through the use of actuators, with one actuator being used for each door. The system has the following air control doors and associated actuators: mode, left and right temperature, and recirculation.

Each actuator used in the system is a LIN device controlled by the BCM. The BCM supplies a 12 V reference voltage to the actuators, and ground is provided by the wiring harness. When the BCM sends a request message to the actuator, the actuator then operates internal stepper motors to move the door to the required position.

Air Speed and M8 Blower Motor

The selected blower motor speed is passed from the controls to the BCM via serial data.

The motor uses a fused B+, ground, control, and speed output signal circuits to operate. The blower motor speed is controlled by increasing or decreasing the voltage drop on the ground side of the blower motor speed control circuit. The BCM provides a low side pulse width modulation (PWM) signal to the blower motor to request a specific motor speed. The blower motor internal circuitry translates the PWM signal and drives the motor accordingly.

The blower motor has a signal wire used to output a speed signal. The signal is monitored by the BCM. The BCM monitors the blower motor speed to modify the total commanded engine coolant flow rate, which is a percentage of available coolant flow sent to the heater core for occupant comfort and windshield defrosting. The HVAC Blower Speed is monitored so that the ECM can optimize engine coolant flow for fuel economy and emissions.

Afterblow

Afterblow is a feature that dries the evaporator core by operating the blower motor after the engine is turned OFF under certain conditions. This reduces the amount of moisture that can create undesirable odors. For additional information on afterblow, the default setting, and changing the setting, refer to [Link target (target-id 328146-) not found] .

Duct Air Temperature

Physical duct air temperature sensors are not used with the front system. The air temperature in the air distribution ducts is calculated by the BCM based on the engine coolant temperature, coolant flow, evaporator temperature, outside air temperature, solar load, blower motor speed, air inlet door position, and temperature door position information. The BCM uses the values to calculate actuator position.

B39 Air Conditioning Evaporator Air Temperature Sensor

The evaporator temperature sensor is a 2-wire negative temperature coefficient thermistor. The sensor operates within a temperature range of −40 to +85°C (−40 to +185°F). The sensor is installed near the evaporator core to measure the air temperature exiting the core.

Based on vehicle operating conditions and operator settings, the HVAC software algorithms will determine a target evaporator air temperature. The operation of the compressor solenoid will be adjusted as needed to quickly reach and maintain the targeted temperature.

B1 Air Conditioning Refrigerant Pressure Sensor

The A/C refrigerant pressure sensor is a 3-wire piezoelectric pressure transducer. A 5 V reference voltage, low reference, and signal circuits enable the sensor to operate. The A/C pressure signal can be between 0.2–4.8 V. When the A/C refrigerant pressure is low, the signal value is near 0 V. When the A/C refrigerant pressure is high, the signal value is near 5 V. The engine control module (ECM) converts the voltage signal to a pressure value. When pressure is too high or too low, the ECM will not allow the A/C compressor clutch to engage.

G1 Air Conditioning Compressor
The A/C compressor uses a conventional belt driven magnetic clutch to engage and mechanically turn the compressor. When the A/C switch is pressed, the BCM sends an A/C request message to the ECM via serial data. If specific criteria is met, the ECM then grounds the A/C compressor clutch relay control circuit, which will switch the A/C compressor clutch relay. With the relay contacts closed, battery voltage is supplied to the permanently grounded A/C compressor clutch. The A/C compressor clutch will then be activated.

This A/C system utilizes a variable displacement solenoid valve to alter the amount of displacement created by the turning of the compressor. The BCM provides both battery voltage and a pulse width modulated ground to the Q46 Air Conditioning Compressor Solenoid Valve. When the A/C switch is pressed, the BCM grounds the variable displacement solenoid using a (PWM) signal in order to determine the amount of compressor displacement. The performance of the A/C compressor is regulated based on cooling load.

B160 Inside Air Moisture and Windshield Temperature Sensor
The windshield temperature and inside moisture sensor includes the relative humidity sensor, windshield temperature sensor and humidity sensing element temperature sensor.

This sensor assembly provides information about:

- Relative humidity level at windshield (passenger compartment side)
- Temperature of the windshield (passenger compartment side)
- Temperature of the humidity sensor element

The relative humidity sensor measures the relative humidity of the passenger compartment side of the windshield. It also detects the temperature of the windshield surface on the passenger compartment side. Both values are used as control inputs for the BCM application to calculate the fog risk on windshield compartment side and ability to reduce fuel consumption by decreasing A/C compressor power to a minimum without causing any fog. The sensor will also enable partial recirculation mode in order to improve heat-up performance of the passenger compartment under cold ambient temperature conditions without the risk of mist build-up on the windshield. The humidity sensor element temperature sensor supplies the temperature of the humidity sensor element. It is only needed if the thermal contact between the humidity sensing element and the inside windshield surface is not sufficient.

The sensor is a LIN device, and the sensor values are transmitted to the BCM via serial data.

When equipped with CE1, the sensor is part of the B117A Windshield Outside Moisture/Ambient Light and Humidity Sensor LIN windshield sensor array, and the windshield temperature and humidity values are transmitted to the BCM via serial data.

B10D Sun Load Temperature and Ambient Light and Security Indicator Sensor
The ambient light/sunload sensor includes the solar sensor and passenger compartment temperature sensor.

The solar sensor is connected to a low reference and 5 V supply through the BCM. As the sunload increases, the sensor signal voltage also increases and vice versa. The signal provided to the BCM varies between 1.2–4.85 V.

The passenger compartment temperature sensor is a negative temperature coefficient thermistor, connected to a low reference and 5 V supply through the BCM. As the air temperature increases, the sensor resistance decreases. The signal varies between 0–5 V.

Bright or high intensity light can cause the vehicles interior temperature to increase. The HVAC system uses the sensor values and compensates for the increased temperature to maintain the system settings.

Air Delivery

The BCM controls the distribution of air by the use of recirculation and mode door actuators. The modes that may be selected are:

- Defrost: windshield outlet
- Panel: dashboard outlets
- Floor: front footwell outlets
- Defog: defrost + floor
- Bi-level: panel + floor
- Tri-level: panel + defrost + floor
- Hi-level: panel + defrost

The desired air distribution mode can be selected with the air distribution switches at the HVAC control. The HVAC control delivers the values to the BCM via serial data. The BCM sends a request to the mode door actuator to move the door to the required position. Depending on the position of the door, air is distributed through various ducts leading to the outlets in the dash. When defrost airflow is active, the BCM will move the recirculation actuator to outside air, to aid in reducing window fogging. When defrost is selected the blower motor will be activated, regardless of the coolant temperature. A/C is available in all modes.

Refer to the owners manual for operation of the HVAC controls and mode selection.

Recirculation Operation
The recirculation switch is integrated into the HVAC control. The selected recirculation setting is sent to the BCM via serial data. The BCM controls the air intake using the recirculation actuator. In recirculation mode the recirculation door is positioned to block outside air from entering and circulate the air within the vehicle. In outside air mode the recirculation door is positioned to route outside air into the vehicle.

Recirculation is only available if the defrost mode is not active. When the defrost mode is active, the recirculation actuator positions the recirculation door so that outside air is circulated to the windshield to reduce fogging.

In automatic mode the values of the sensors are used as inputs for the BCM to calculate the fog risk on the passenger compartment side of the windshield. The A/C compressor and the defrost mode may be activated to prevent or remove fog on the passenger compartment side of the windshield.

In automatic mode, a partial recirculation mode may be commanded to accelerate cabin heating or cooling and reduce energy usage. The recirculation indicator remains illuminated at all times, regardless of the actual operating mode determined by the system.

Heating and A/C Operation

The purpose of the heating and A/C system is to provide heated and cooled air to the interior of the vehicle. The A/C system will also remove humidity from the interior and reduce windshield fogging. Regardless of the temperature setting, the following may affect the rate that the HVAC system can achieve the desired temperature:

- Recirculation setting
- Difference between inside and desired temperature
- Blower motor speed setting
- Mode setting
- Dashboard outlet open/closed position

When the A/C switch or the AUTO switch is pressed, the HVAC control sends a signal to the BCM via serial data. The BCM evaluates this signal and sends an A/C request signal to the ECM via CAN-Bus. The ECM checks all preconditions before releasing and if all conditions are met sends a release signal back to the BCM. The A/C compressor is activated by the BCM. The BCM supplies battery voltage to the A/C compressor solenoid. When the A/C switch is pressed, the BCM provides a pulse width modulation (PWM) signal to the A/C compressor solenoid in order to command the performance of the A/C compressor. The performance of the A/C compressor is regulated using evaporator temperature and engine load.

The A/C indicator does not indicate the compressor is currently active. The A/C indicator shows that A/C has been requested and the system will activate the compressor as needed.

The following conditions must be met in order to activate the A/C compressor:

- Battery voltage is between 9–18 V
- Engine coolant temperature is less than 124°C (255°F)
- Engine speed is greater than 600 RPM
- Engine speed is less than 5 500 RPM
- A/C high side pressure is between 269–2 929 kPa (39–425 PSI)
- Throttle position is less than 100%
- Evaporator temperature is greater than 3°C (38°F)
- ECM does not detect immoderate torque load
- ECM does not detect insufficient idle quality
- The ambient temperature is above 1°C (34°F)

The sensor information is used by the ECM to determine the following:

- The A/C high side pressure
- An A/C system load on the engine
- An immoderate A/C high side pressure
- The heat load at the A/C condenser

The air streams into the passenger compartment through the heater core and the evaporator core. The air temperature actuator drives the mixed air door to direct the airflow. If the interior temperature should be increased, the mixed air door is put into the position in which more air streams through the heater core. If the interior temperature should be decreased, the mixed air door is put into the position in which more air streams through the evaporator core.

Automatic Operation

In automatic operation, the BCM maintains the comfort level inside of the vehicle by controlling the A/C compressor solenoid, the blower motor, the air temperature actuators, mode actuator and recirculation actuator.

The automatic mode indicator shows that the system is in full automatic operation. If an individual setting is changed (excluding temperature), the automatic indicator will turn off, and that function will enter manual control. All other functions will remain under automatic control unless manually changed.

To put the HVAC system in automatic mode, the following is required:

1. The auto switch must be activated.

2. The air temperature switch must not be in either the full hot or full cold position.

Once the desired temperature is reached, the blower motor, mode, recirculation and temperature actuators automatically adjust to maintain the temperature selected. The BCM performs the following functions to maintain the desired air temperature:

- Monitors the following:
  - Ambient (outside) air temperature sensor
  - Passenger compartment temperature sensor
  - Calculated front duct air temperatures
  - Windshield temperature and inside moisture sensor
  - Evaporator temperature sensor
  - Ambient light/sunload sensor
- Regulate the blower motor speed
- Position the air temperature actuators
- Position the mode door actuators
- Position the recirculation actuator
- Control of the A/C compressor solenoid

When the temperature setting is set to full hot, the blower speed will increase gradually as the coolant warms to normal operating temperature. When normal engine operating temperature is reached the blower stays on high speed and the air temperature actuators stays in the full heat position.

When the temperature setting is set to full cold, the blower will immediately operate at high speed and the air temperature actuators move to full cold position. The mode actuator moves to the panel position and the recirculation actuator moves to the recirculation position.

Under cold ambient temperatures, the automatic HVAC system provides heat in the most efficient manner. The operator can select an extreme temperature setting but the system will not warm the vehicle any faster. Under warm ambient temperatures, the automatic HVAC system also provides air conditioning in the most efficient manner. Selecting an extreme cool temperature will not cool the vehicle any faster.

In automatic mode the values of the windshield temperature and inside moisture sensor are used as control inputs for the BCM application to calculate the fog risk on the passenger compartment side of the windshield and ability to reduce fuel consumption by decreasing A/C compressor power to a minimum without causing any fog. The A/C compressor and the defrost mode are activated to prevent or remove fog on the passenger compartment side of the windshield. The sensor will also enable partial recirculation mode in order to improve heat-up performance of the passenger compartment under cold ambient temperature conditions without the risk of mist build-up on the windshield.

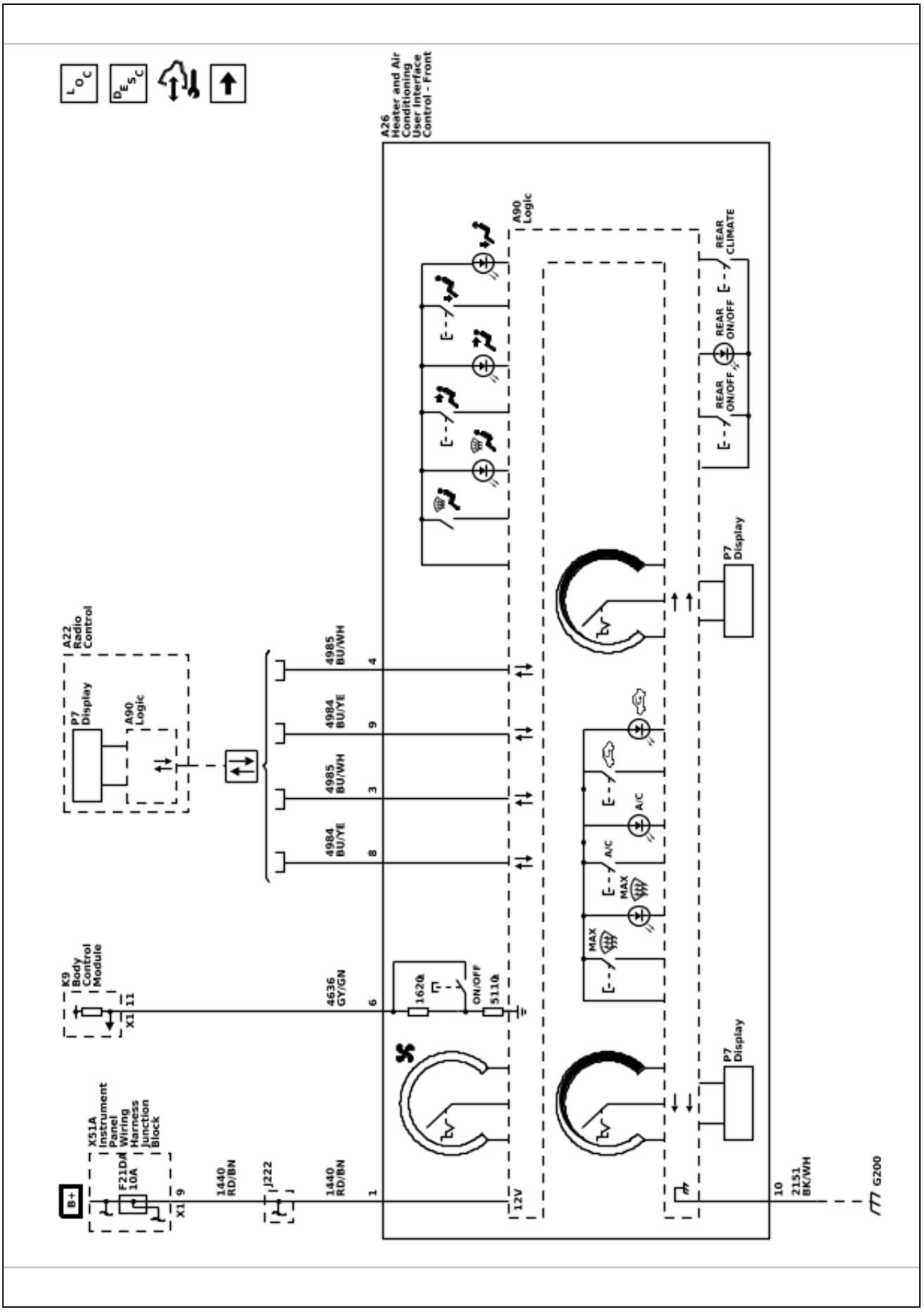
Engine Coolant and A/C System Refrigerant

For information on engine coolant, coolant flow, A/C refrigerant, and the A/C refrigerant cycle, refer to [Link target (target-id 162334-) not found] .

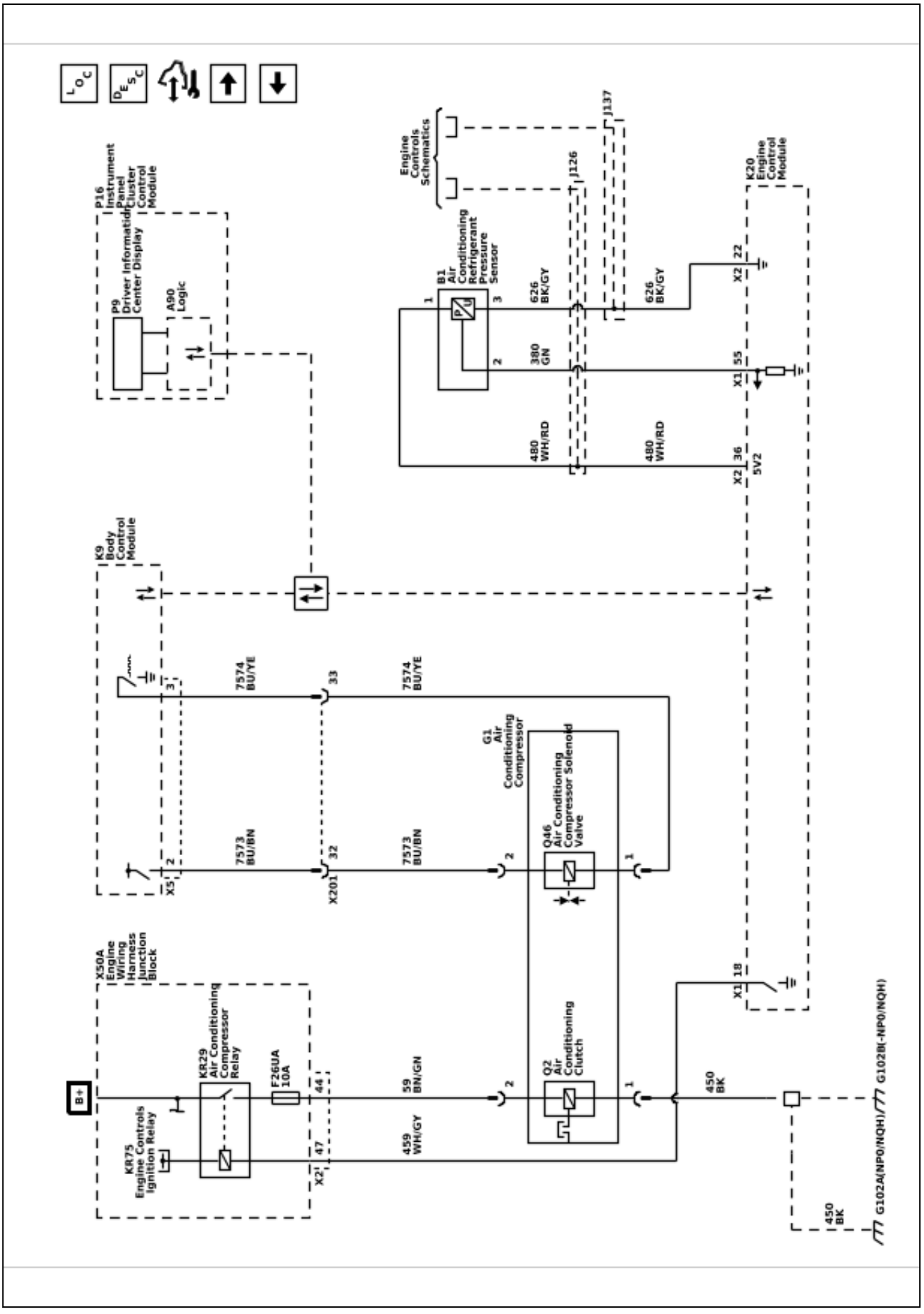
HVAC - Manual

Schematic and Routing Diagrams

HVAC Schematics (Power, Ground, Serial Data and HVAC Controls)



HVAC Schematics (A/C Compressor Controls)



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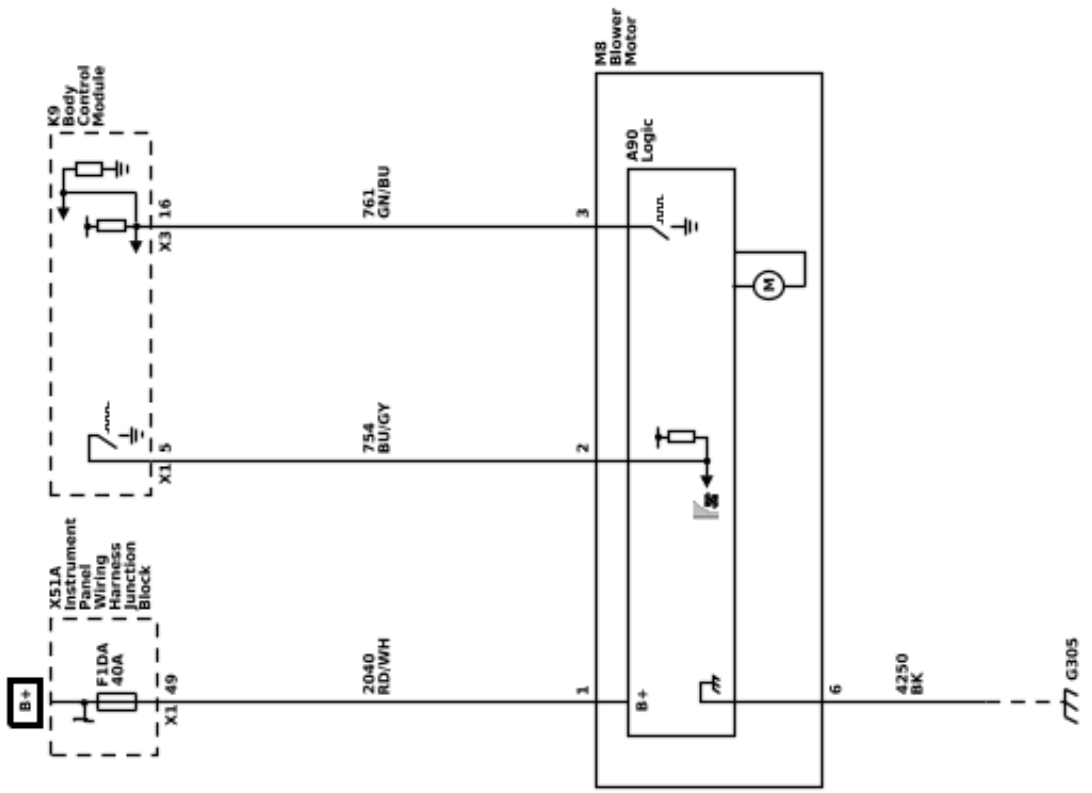
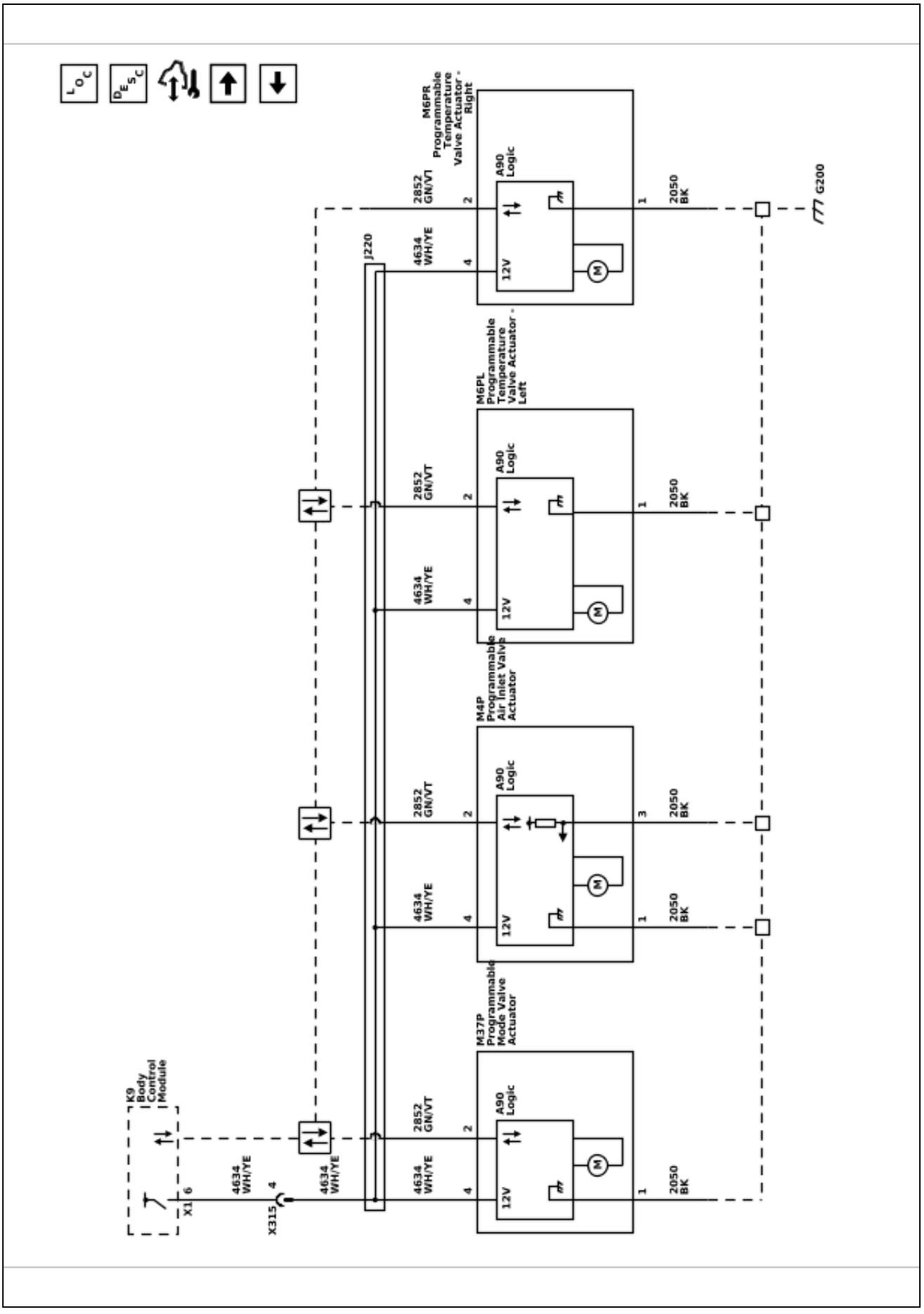
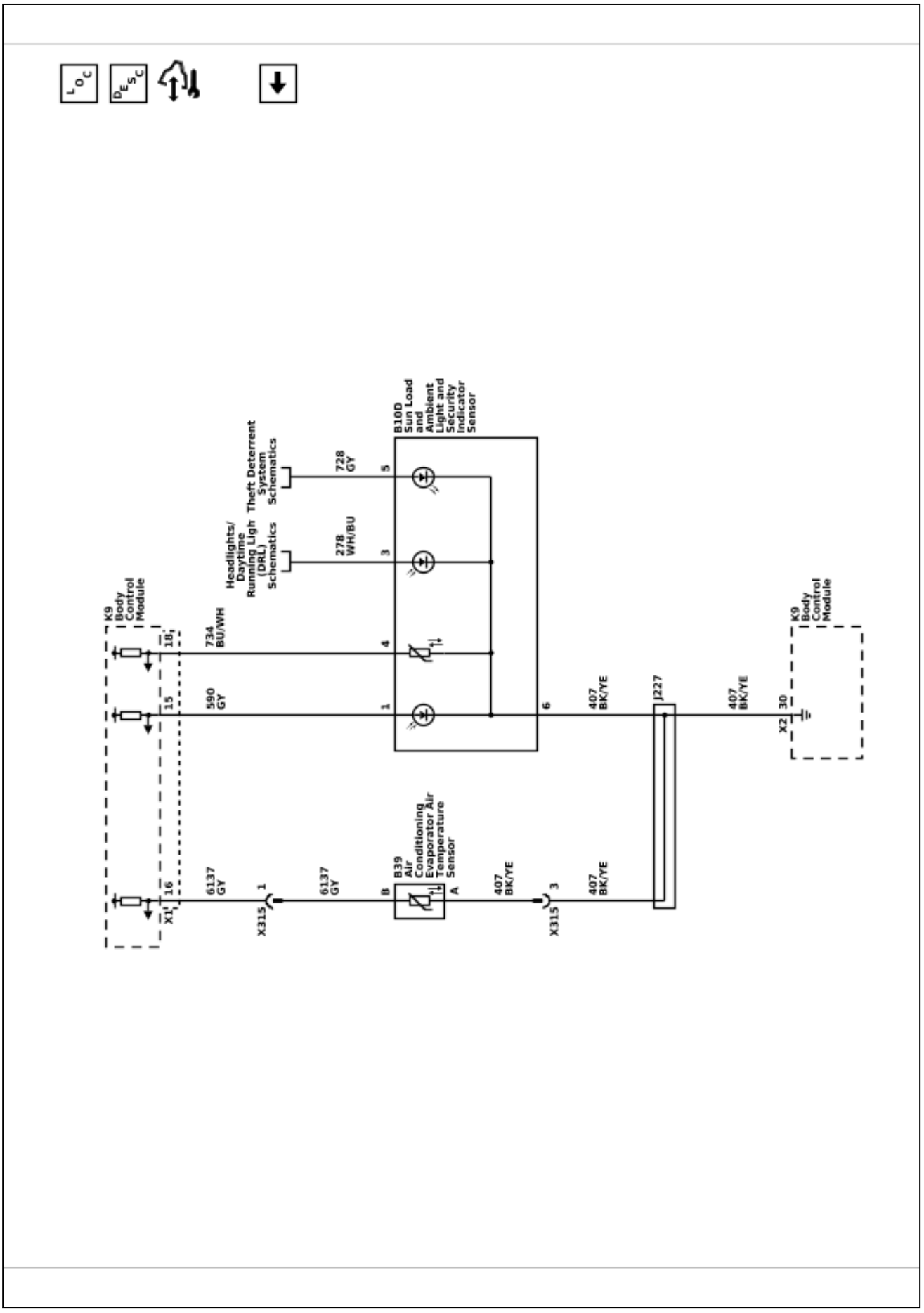
HVAC Schematics (Blower Motor)



HVAC Schematics (Mode and Temperature Control Actuators)



HVAC Schematics (Windshield Sensors and A/C Evaporator Temperature Sensor)



Description and Operation

Manual HVAC Description and Operation

The air temperature and the air delivery description and operation are divided into the following:

- HVAC Control Components
- Air Speed and Blower Motor
- Air Delivery
- Heating and A/C Operation
- Recirculation Operation
- Engine Coolant and A/C System Refrigerant

HVAC Control Components

K9 Body Control Module

The body control module (BCM) is a CAN device that interfaces between the operator and the HVAC system to maintain and control desired air temperature and air distribution settings. The BCM provides a device ON-Signal for the HVAC controls. The BCM provides blower, air delivery mode and air temperature control.

A26 Heater and Air Conditioning User Interface Control - Front

The HVAC control contains all switches which are required to control the functions of HVAC and serve as interface between the operator and the BCM. The selected values are passed to the BCM via serial data.

Actuators

Doors in the HVAC case assembly are used to control air flow. The BCM operates the doors through the use of actuators, with one actuator being used for each door. The system has the following air control doors and associated actuators: mode, temperature, and recirculation.

Each actuator used in the system is a LIN device controlled by the BCM. The BCM supplies a 12 V reference voltage to the actuators, and ground is provided by the wiring harness. When the BCM sends a request message to the actuator, the actuator then operates internal stepper motors to move the door to the required position.

Air Speed and M8 Blower Motor

The selected blower motor speed is passed from the controls to the BCM via serial data.

The motor uses a fused B+, ground, control, and speed output signal circuits to operate. The blower motor speed is controlled by increasing or decreasing the voltage drop on the ground side of the blower motor speed control circuit. The BCM provides a low side pulse width modulation (PWM) signal to the blower motor to request a specific motor speed. The blower motor internal circuitry translates the PWM signal and drives the motor accordingly.

The blower motor has a signal wire used to output a speed signal. The signal is monitored by the BCM. The BCM monitors the blower motor speed to modify the total commanded engine coolant flow rate, which is a percentage of available coolant flow sent to the heater core for occupant comfort and windshield defrosting. The HVAC Blower Speed is monitored so that the ECM can optimize engine coolant flow for fuel economy and emissions.

Afterblow

Afterblow is a feature that dries the evaporator core by operating the blower motor after the engine is turned OFF under certain conditions. This reduces the amount of moisture that can create undesirable odors. For additional information on afterblow, the default setting, and changing the setting, refer to [Link target (target-id 328147-) not found] .

B39 Air Conditioning Evaporator Air Temperature Sensor

The evaporator temperature sensor is a 2-wire negative temperature coefficient thermistor. The sensor operates within a temperature range of −40 to +85°C (−40 to +185°F). The sensor is installed near the evaporator core to measure the air temperature exiting the core.

Based on vehicle operating conditions and operator settings, the HVAC software algorithms will determine a target evaporator air temperature. The operation of the compressor solenoid will be adjusted as needed to quickly reach and maintain the targeted temperature.

B1 Air Conditioning Refrigerant Pressure Sensor

The A/C refrigerant pressure sensor is a 3-wire piezo-electric pressure transducer. A 5 V reference voltage, low reference, and signal circuits enable the sensor to operate. The A/C pressure signal can be between 0.2–4.8 V. When the A/C refrigerant pressure is low, the signal value is near 0 V. When the A/C refrigerant pressure is high, the signal value is near 5 V. The engine control module (ECM) converts the voltage signal to a pressure value. When pressure is too high or too low, the ECM will not allow the A/C compressor clutch to engage.

G1 Air Conditioning Compressor

The A/C compressor uses a conventional belt driven magnetic clutch to engage and mechanically turn the compressor. When the A/C switch is pressed, the BCM sends an A/C request message to the ECM via serial data. If specific criteria is met, the ECM then grounds the A/C compressor clutch relay control circuit, which will switch the A/C compressor clutch relay. With the relay contacts closed, battery voltage is supplied to the permanently grounded A/C compressor clutch. The A/C compressor clutch will then be activated.

This A/C system utilizes a variable displacement solenoid valve to alter the amount of displacement

created by the turning of the compressor. The BCM provides both battery voltage and a pulse width modulated ground to the Q46 Air Conditioning Compressor Solenoid Valve. When the A/C switch is pressed, the BCM grounds the variable displacement solenoid using a (PWM) signal in order to determine the amount of compressor displacement. The performance of the A/C compressor is regulated based on cooling load.

Air Delivery

The BCM controls the distribution of air by the use of recirculation and mode door actuators. The modes that may be selected are:

- Defrost: windshield outlet
- Panel: dashboard outlets
- Floor: front footwell outlets
- Defog: defrost + floor
- Bi-level: panel + floor
- Tri-level: panel + defrost + floor
- Hi-level: panel + defrost

The desired air distribution mode can be selected with the air distribution switches at the HVAC control. The HVAC control delivers the values to the BCM via serial data. The BCM sends a request to the mode door actuator to move the door to the required position. Depending on the position of the door, air is distributed through various ducts leading to the outlets in the dash. When defrost airflow is active, the BCM will move the recirculation actuator to outside air, to aid in reducing window fogging. When defrost is selected the blower motor will be activated, regardless of the coolant temperature. A/C is available in all modes.

Refer to the owners manual for operation of the HVAC controls and mode selection.

Recirculation Operation

The recirculation switch is integrated into the HVAC control. The selected recirculation setting is sent to the BCM via serial data. The BCM controls the air intake using the recirculation actuator. In recirculation mode the recirculation door is positioned to block outside air from entering and circulate the air within the vehicle. In outside air mode the recirculation door is positioned to route outside air into the vehicle.

Recirculation is only available if the defrost mode is not active. When the defrost mode is active, the recirculation actuator positions the recirculation door so that outside air is circulated to the windshield to reduce fogging.

Heating and A/C Operation

The purpose of the heating and A/C system is to provide heated and cooled air to the interior of the vehicle. The A/C system will also remove humidity from the interior and reduce windshield fogging. Regardless of the temperature setting, the following may affect the rate that the HVAC system can achieve the desired temperature:

- Recirculation setting
- Difference between inside and desired temperature
- Blower motor speed setting
- Mode setting
- Dashboard outlet open/closed position

When the A/C switch or the AUTO switch is pressed, the HVAC control sends a signal to the BCM via serial data. The BCM evaluates this signal and sends an A/C request signal to the ECM via CAN-Bus. The ECM checks all preconditions before releasing and if all conditions are met sends a release signal back to the BCM. The A/C compressor is activated by the BCM. The BCM supplies battery voltage to the A/C compressor solenoid. When the A/C switch is pressed, the BCM provides a pulse width modulation (PWM) signal to the A/C compressor solenoid in order to command the performance of the A/C compressor. The performance of the A/C compressor is regulated using evaporator temperature and engine load.

The A/C indicator does not indicate the compressor is currently active. The A/C indicator shows that A/C has been requested and the system will activate the compressor as needed.

The following conditions must be met in order to activate the A/C compressor:

- Battery voltage is between 9–18 V
- Engine coolant temperature is less than 124°C (255°F)
- Engine speed is greater than 600 RPM
- Engine speed is less than 5 500 RPM
- A/C high side pressure is between 269–2 929 kPa (39–425 PSI)
- Throttle position is less than 100%
- Evaporator temperature is greater than 3°C (38°F)
- ECM does not detect immoderate torque load
- ECM does not detect insufficient idle quality
- The ambient temperature is above 1°C (34°F)

The sensor information is used by the ECM to determine the following:

- The A/C high side pressure

- An A/C system load on the engine
- An immoderate A/C high side pressure
- The heat load at the A/C condenser

The air streams into the passenger compartment through the heater core and the evaporator core. The air temperature actuator drives the mixed air door to direct the airflow. If the interior temperature should be increased, the mixed air door is put into the position in which more air streams through the heater core. If the interior temperature should be decreased, the mixed air door is put into the position in which more air streams through the evaporator core.

Engine Coolant and A/C System Refrigerant

For information on engine coolant, coolant flow, A/C refrigerant, and the A/C refrigerant cycle, refer to [Link target (target-id 162334-) not found] .

Section 7

Power and Signal Distribution

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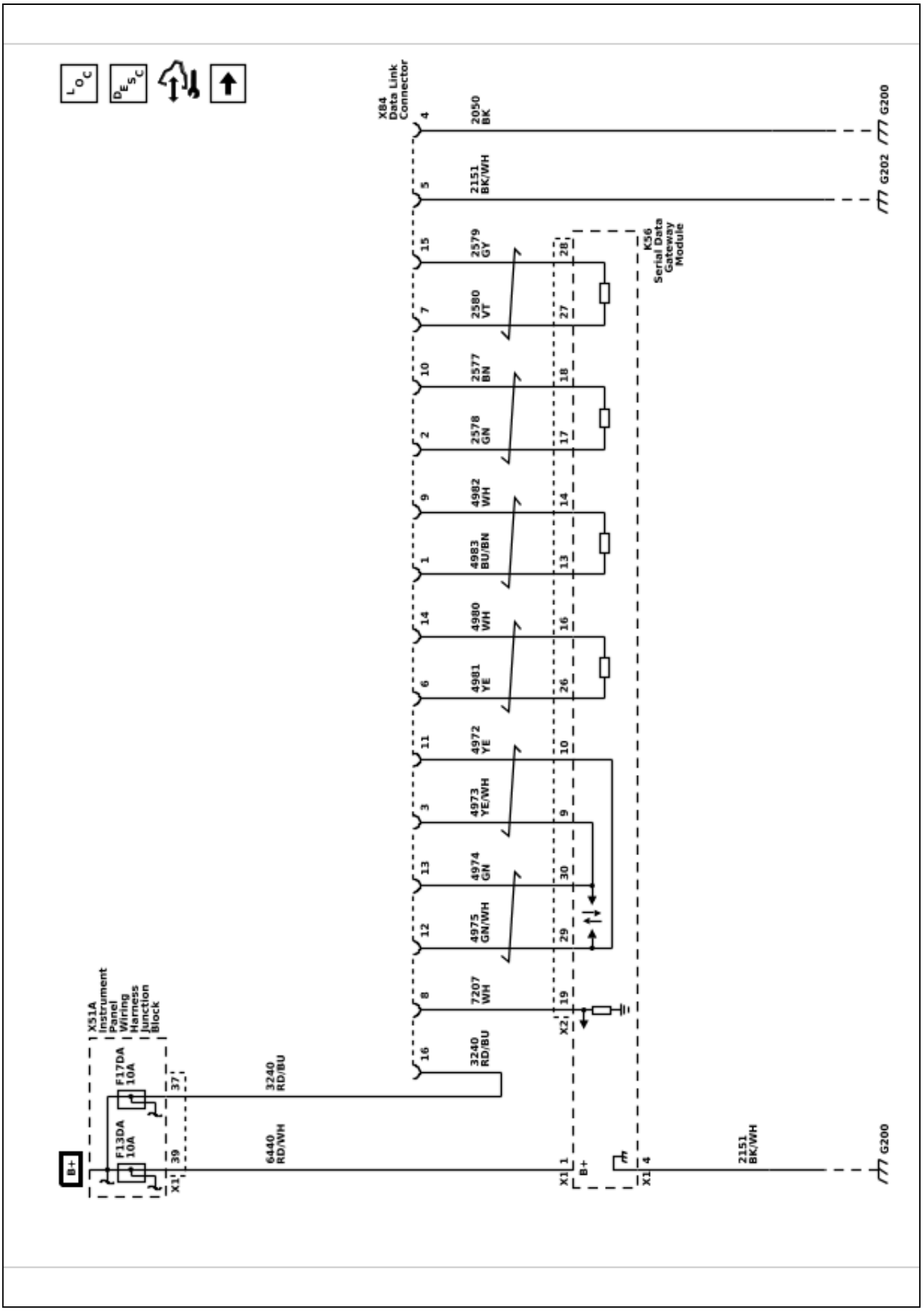
Power and Signal Distribution

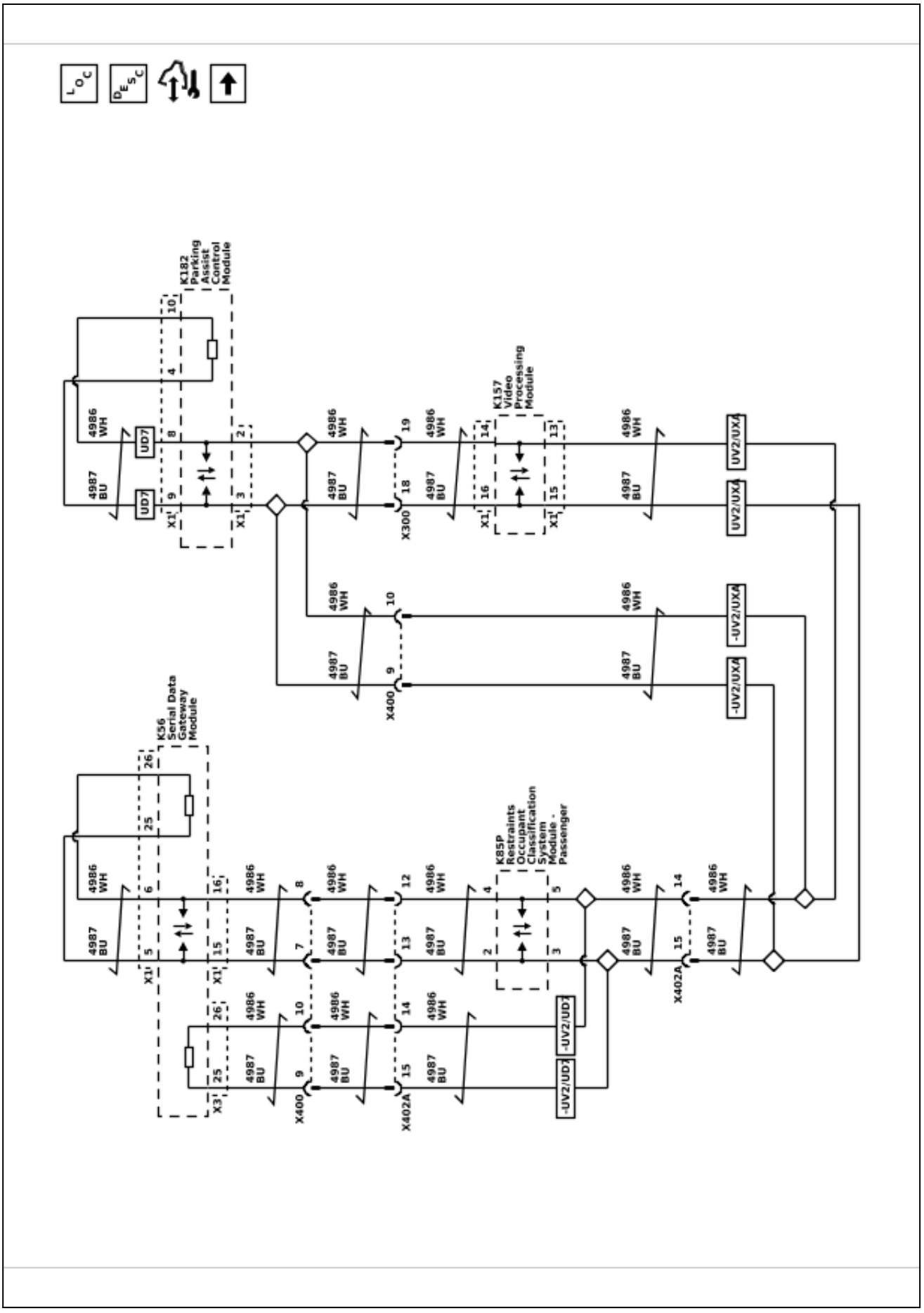
Data Communications

Schematic and Routing Diagrams

Data Communication Schematics (Serial Data Gateway Module and Data Link Connector Power and Ground)

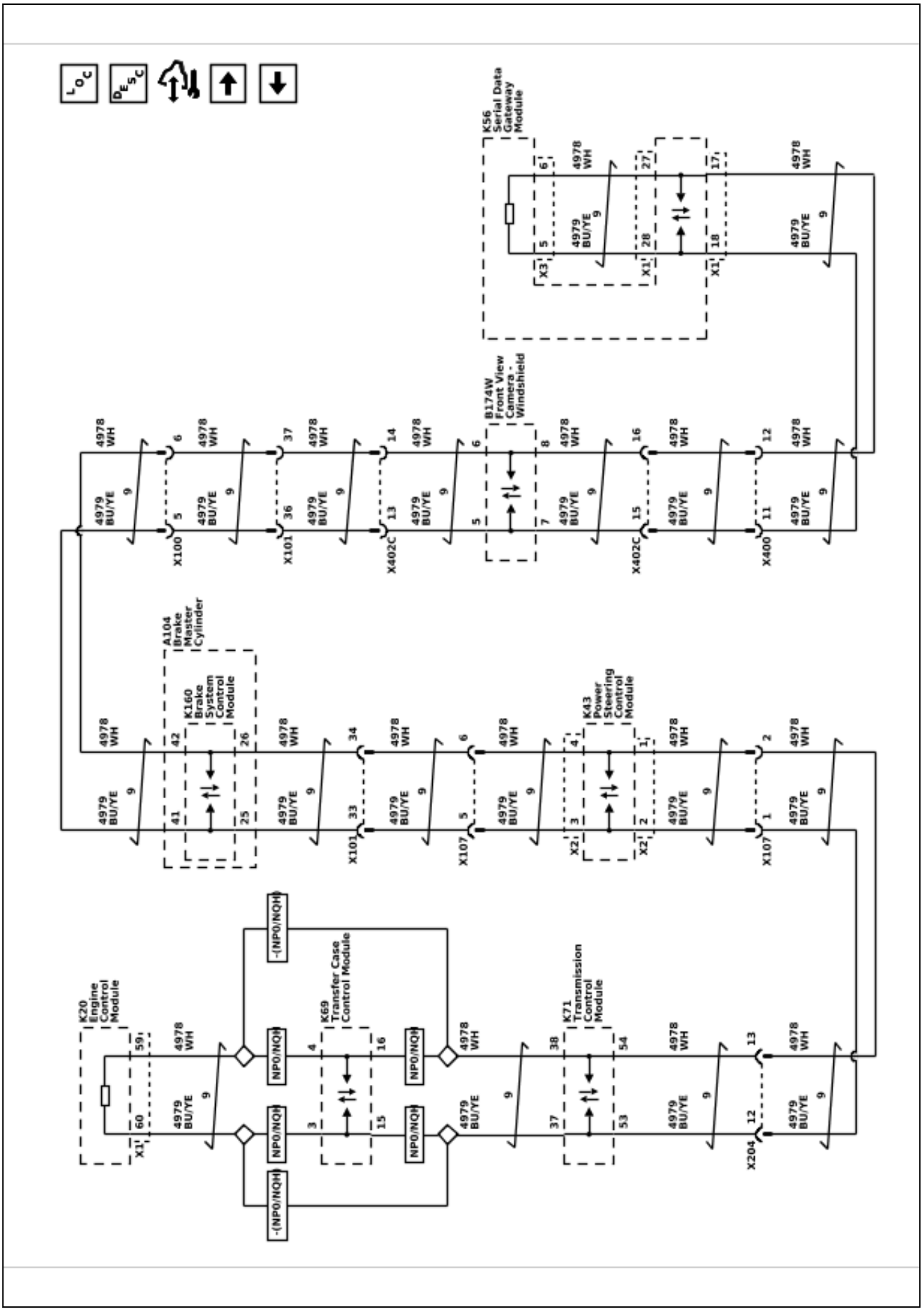


Data Communication Schematics (CAN 1)

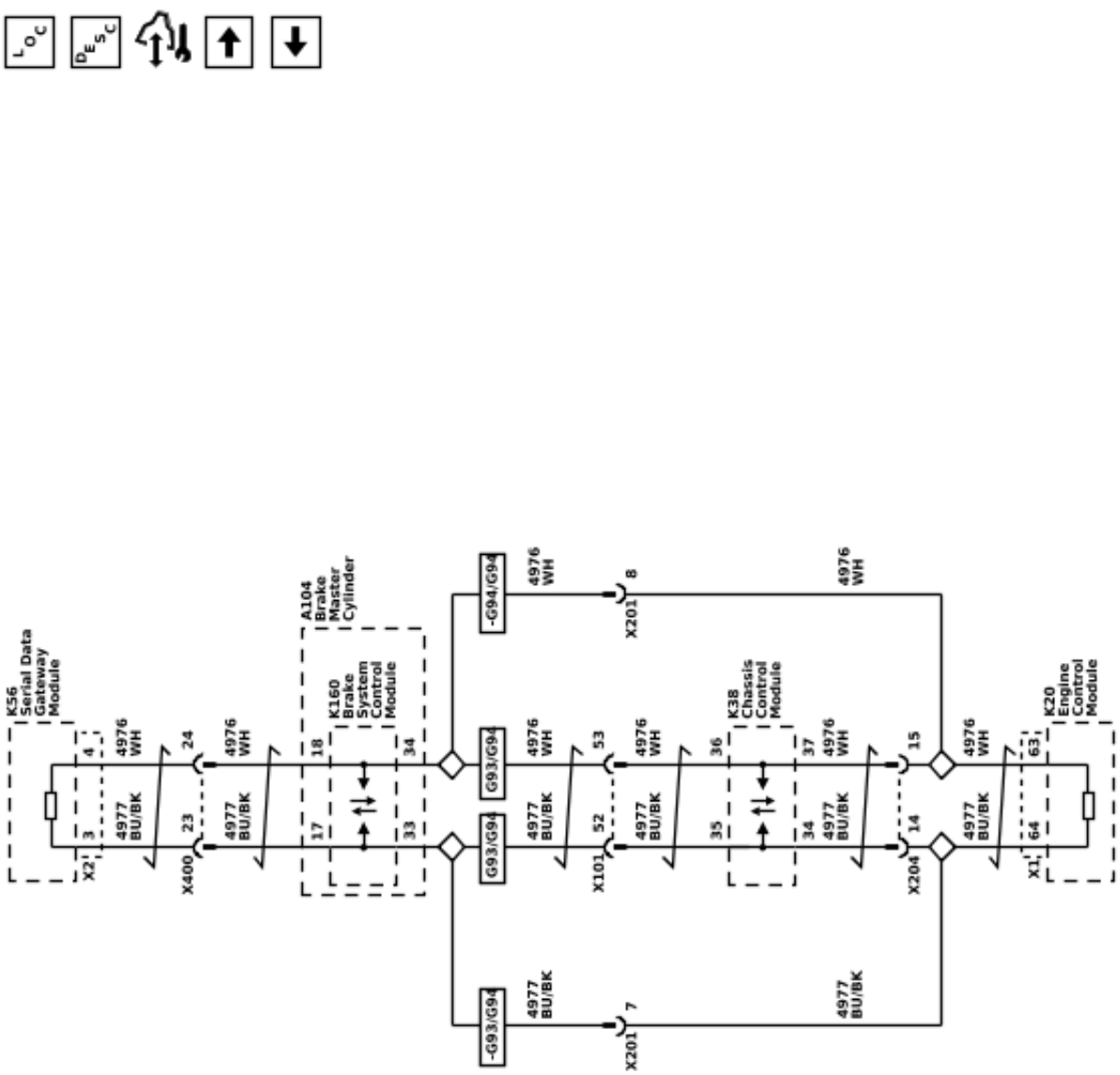


6656295

Data Communication Schematics (CAN 2)

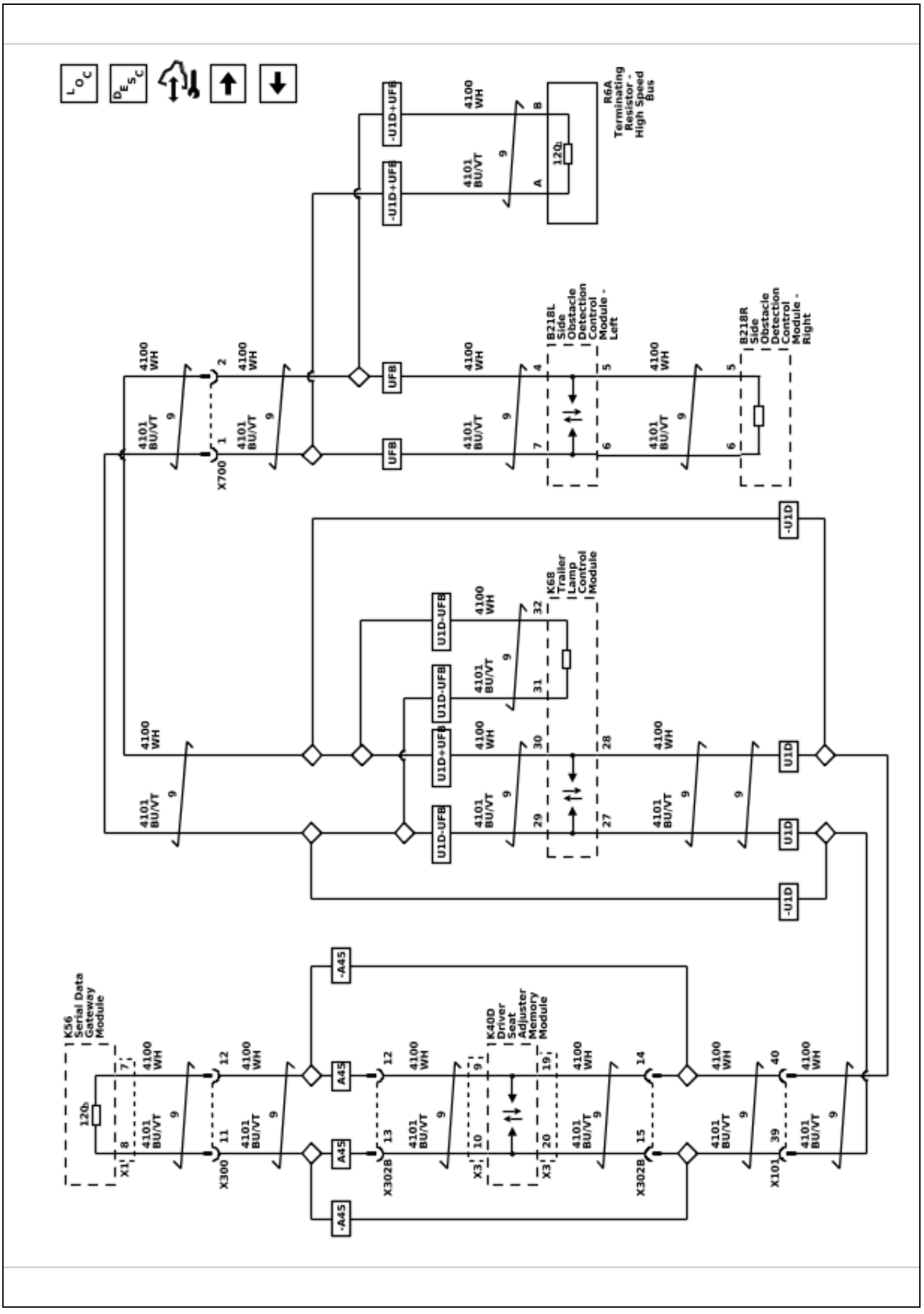


Data Communication Schematics (CAN 3)



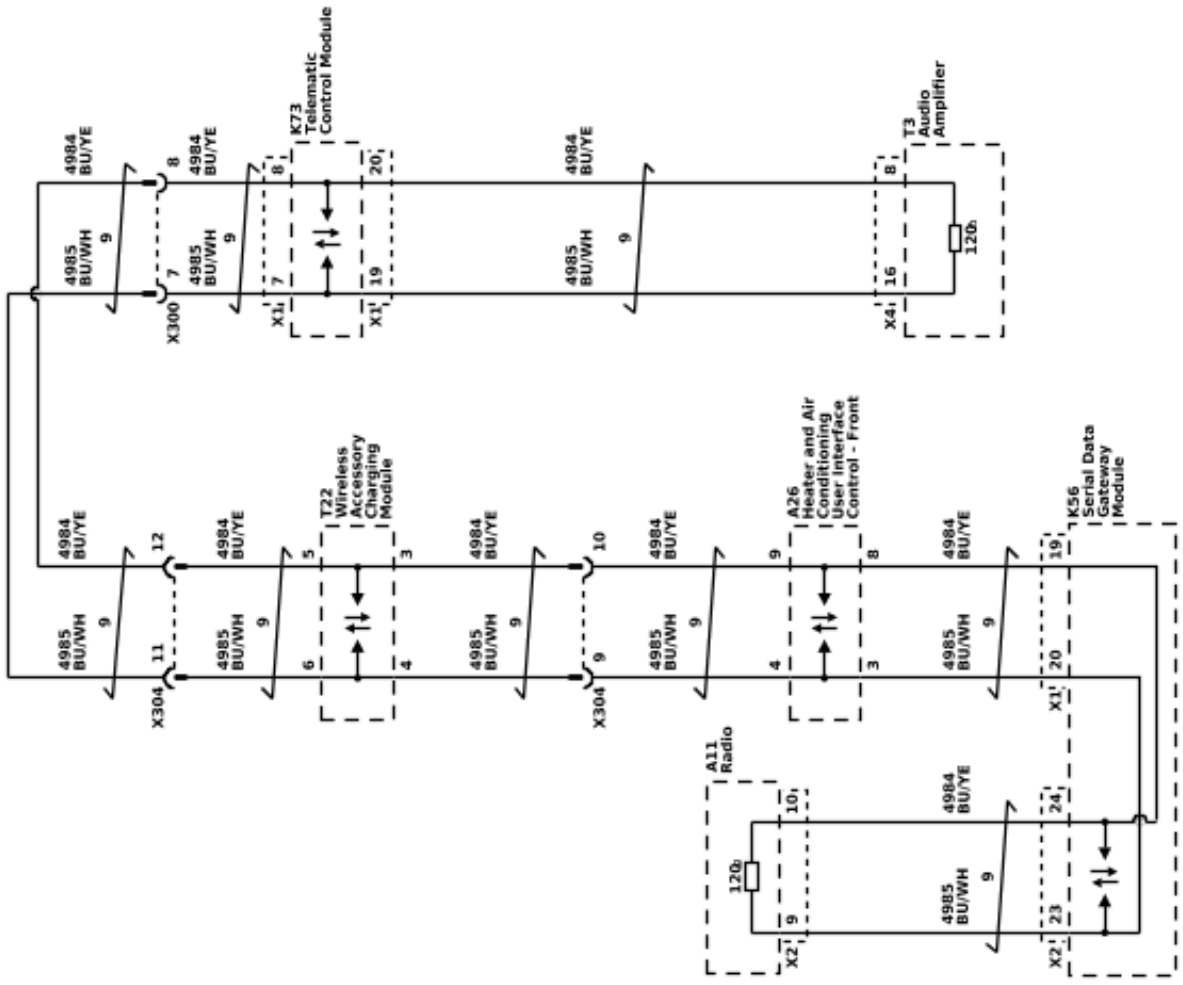
6656297

Data Communication Schematics (CAN 4)

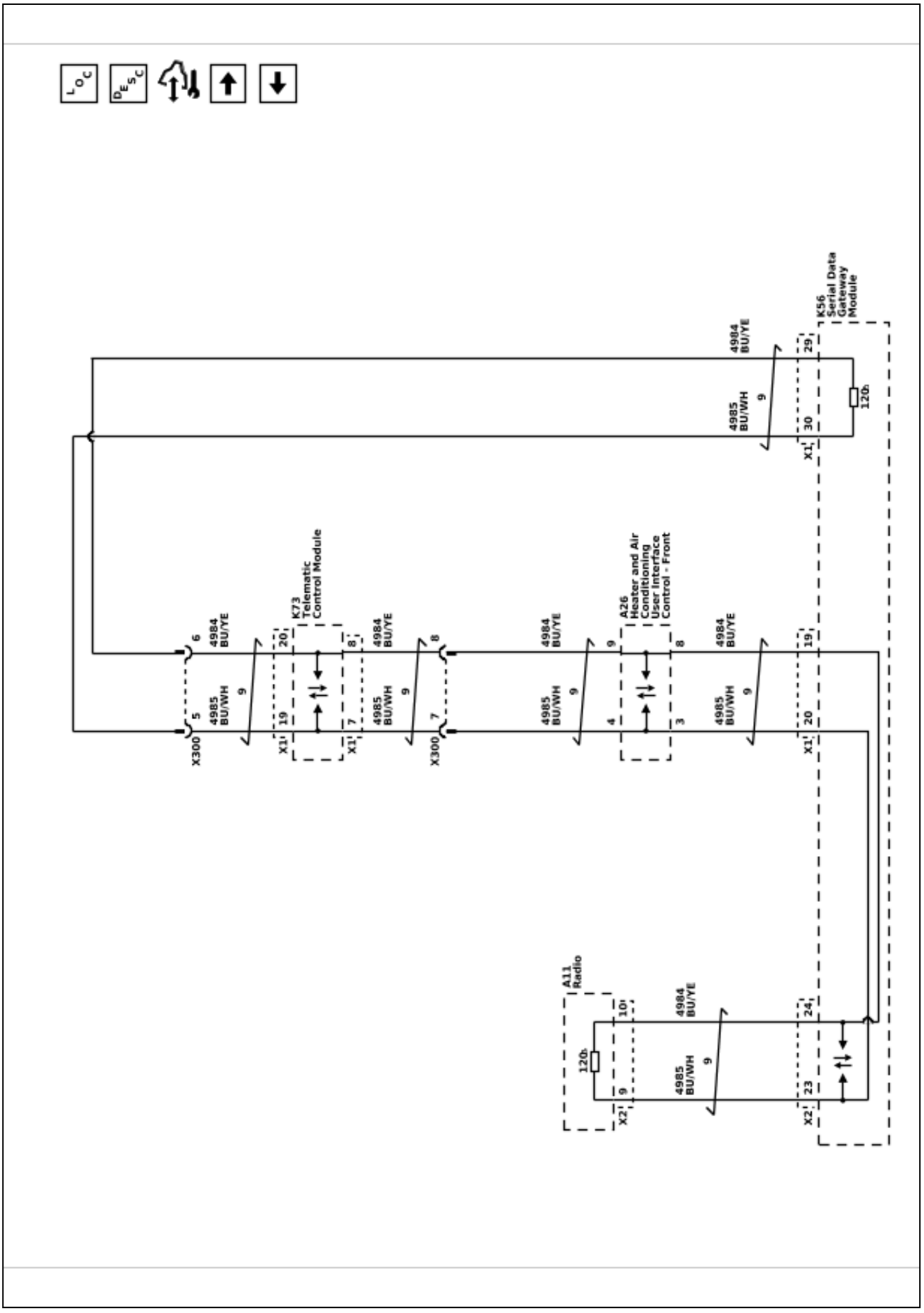


6656299

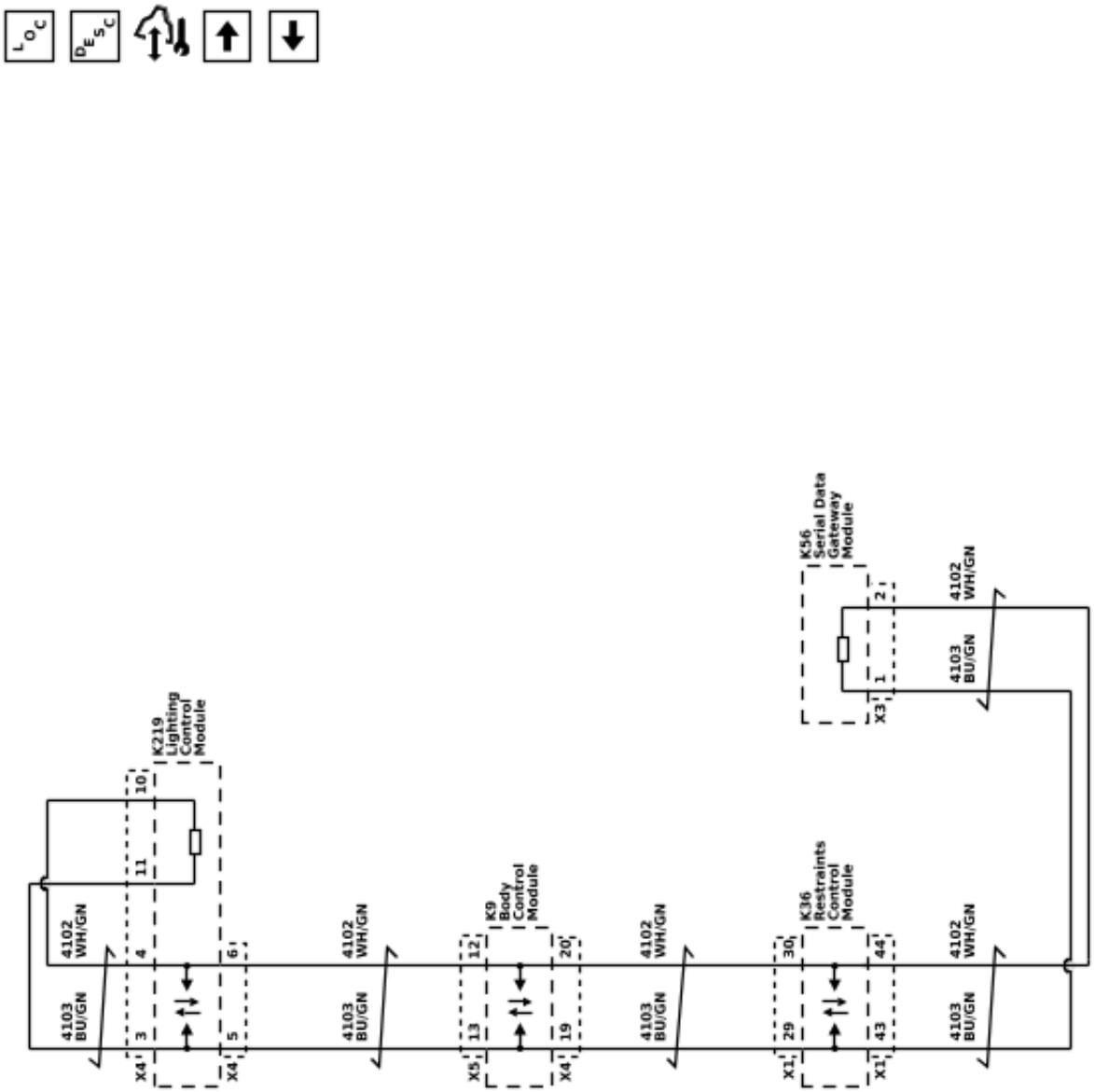
Data Communication Schematics (CAN 5 (UE1 / UQA))



Data Communication Schematics (CAN 5 (- (UE1 / UQA)))

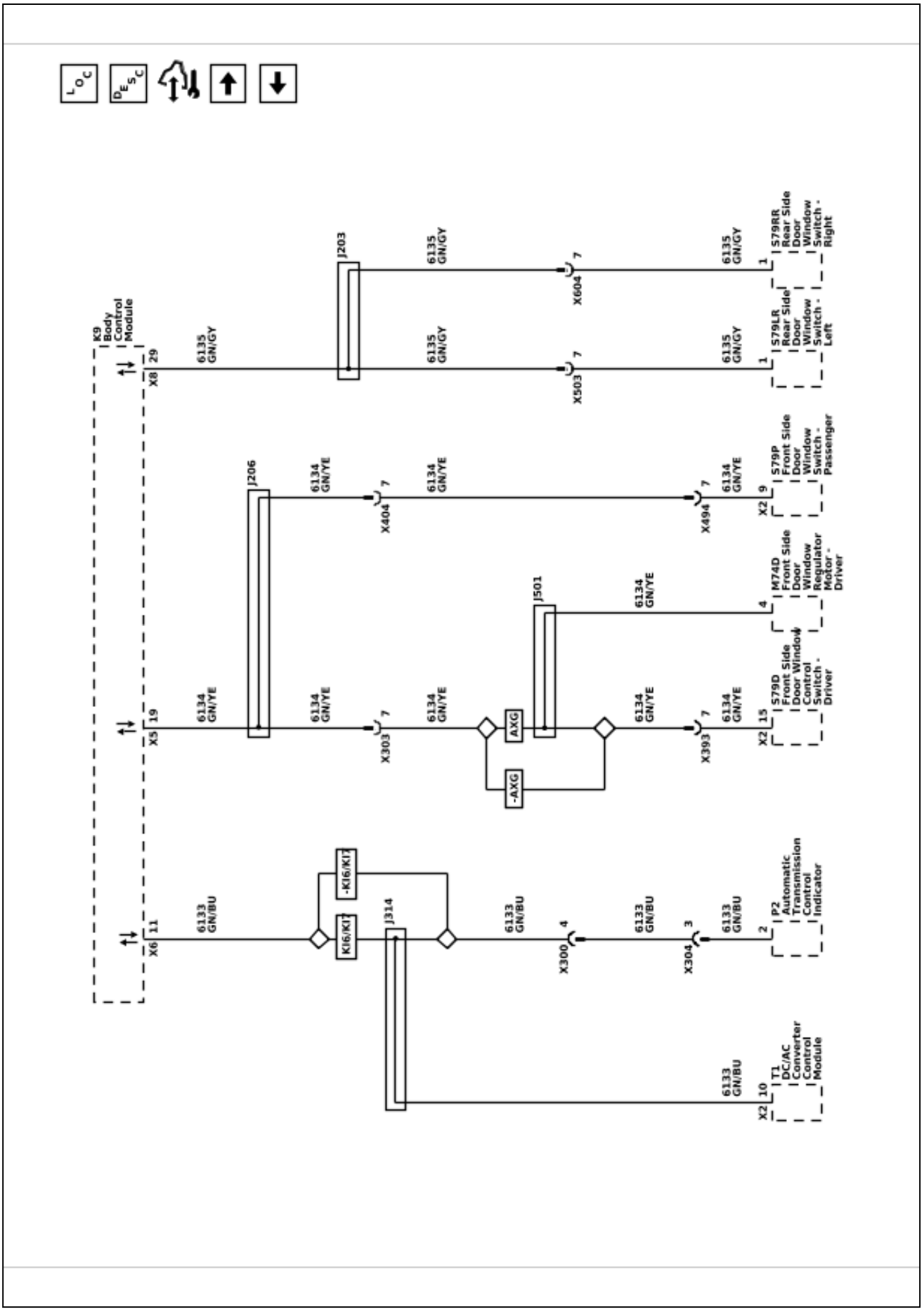


Data Communication Schematics (CAN 9)

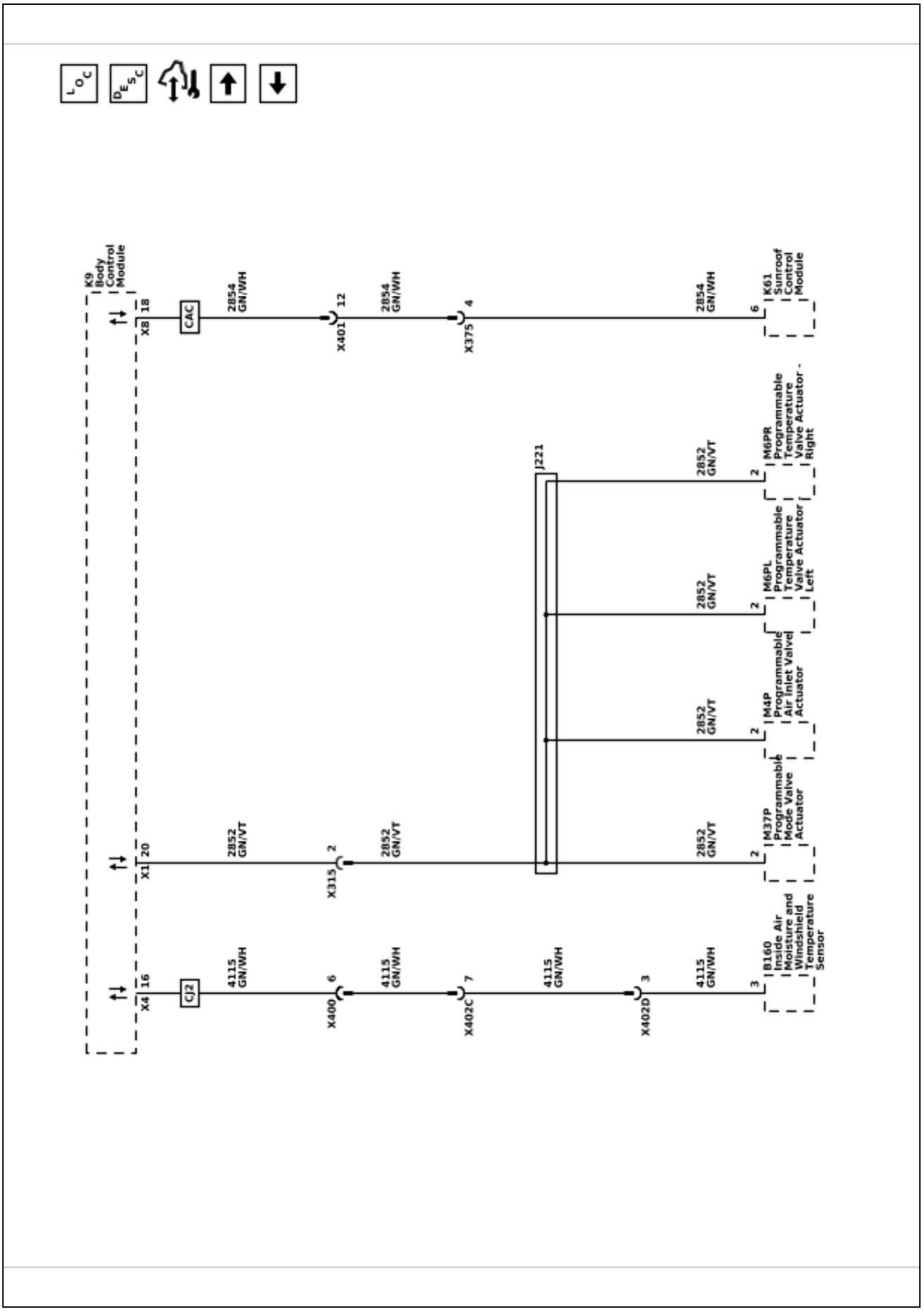


6656301

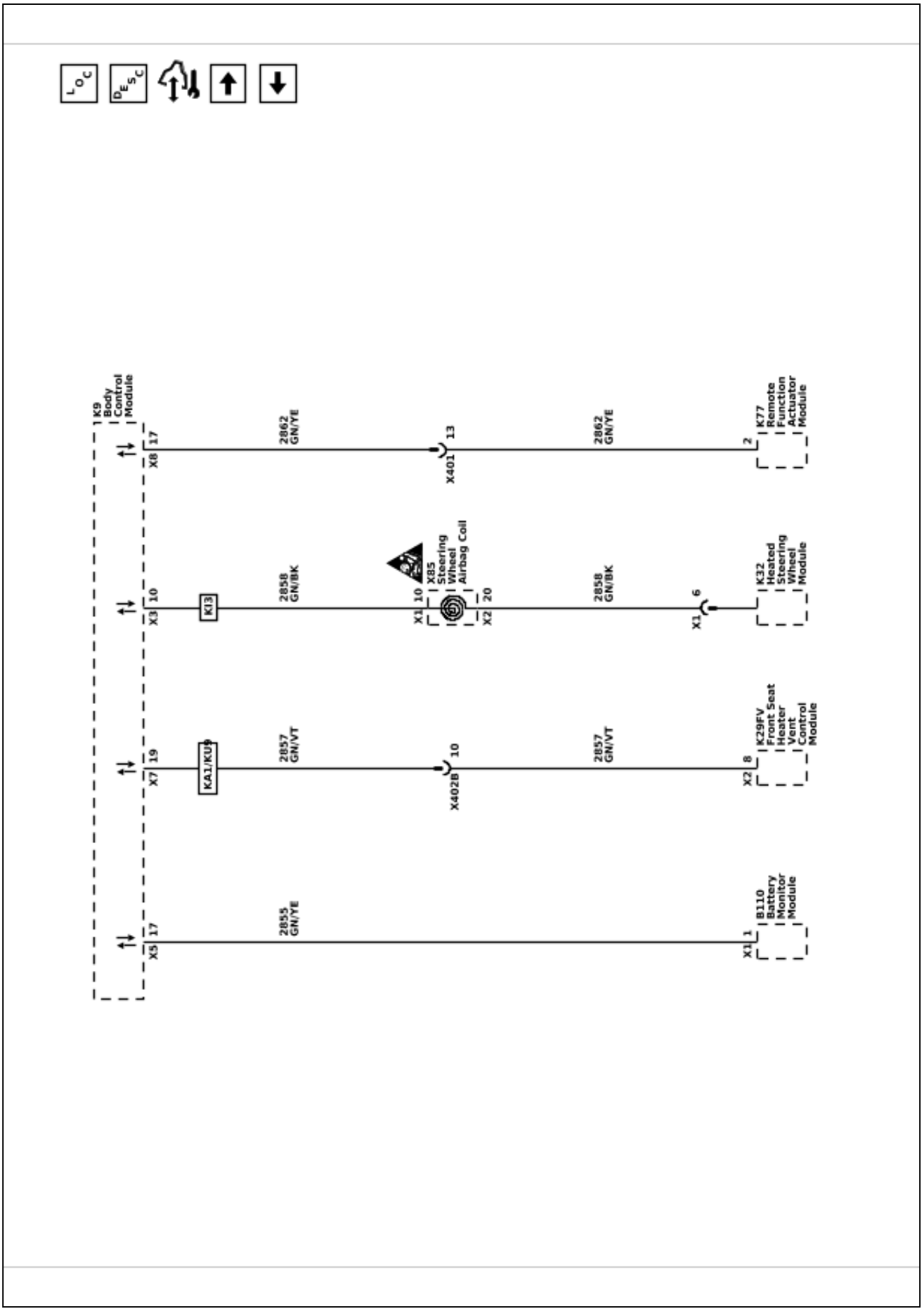
Data Communication Schematics (Body Control Module Local Interconnect Network LIN Busses 2, 3, and 4)



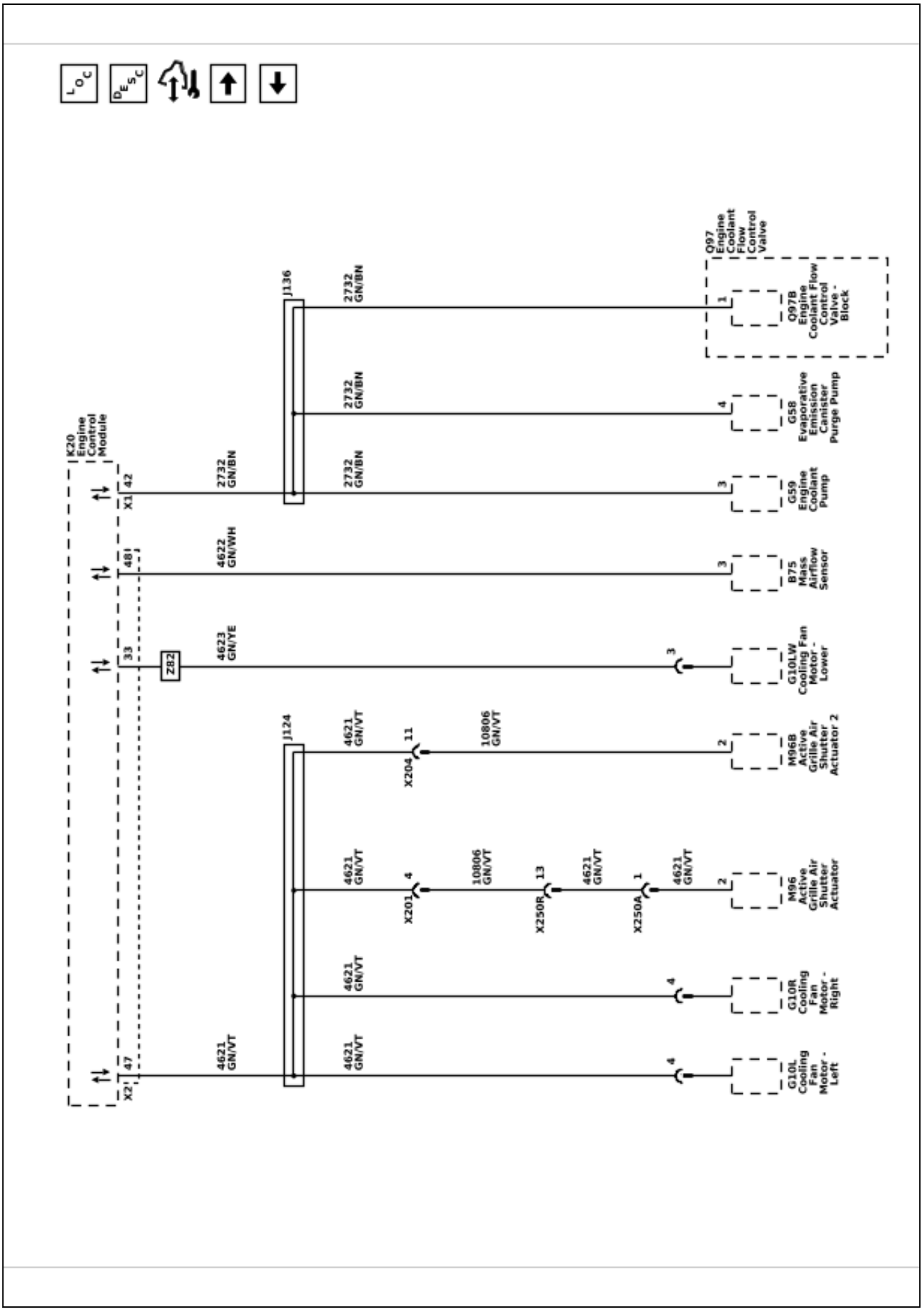
Data Communication Schematics (Body Control Module Local Interconnect Network LIN Busses 5, 6, and 8)



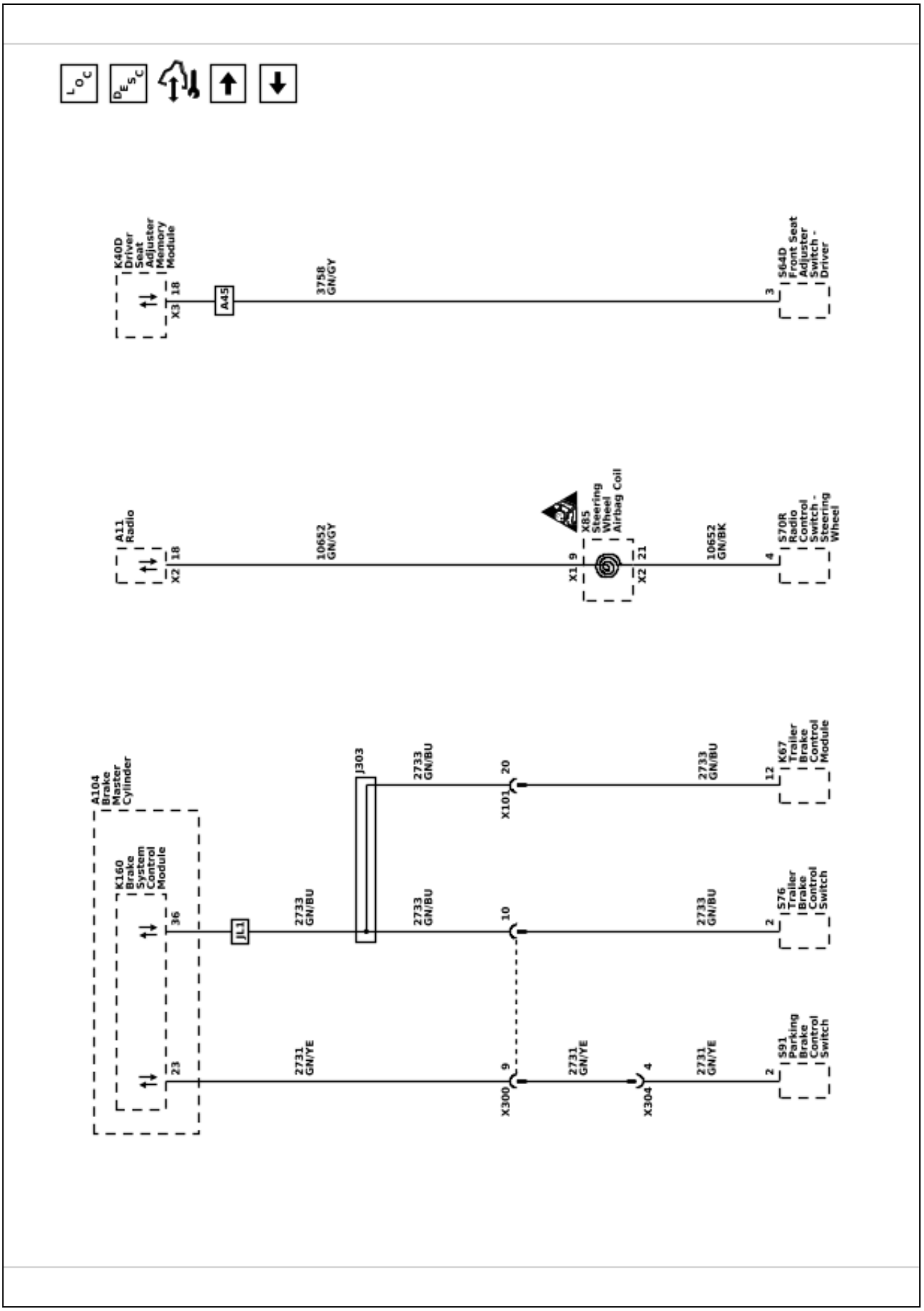
Data Communication Schematics (Body Control Module Local Interconnect Network LIN Busses 9, 11, 12, and 16)



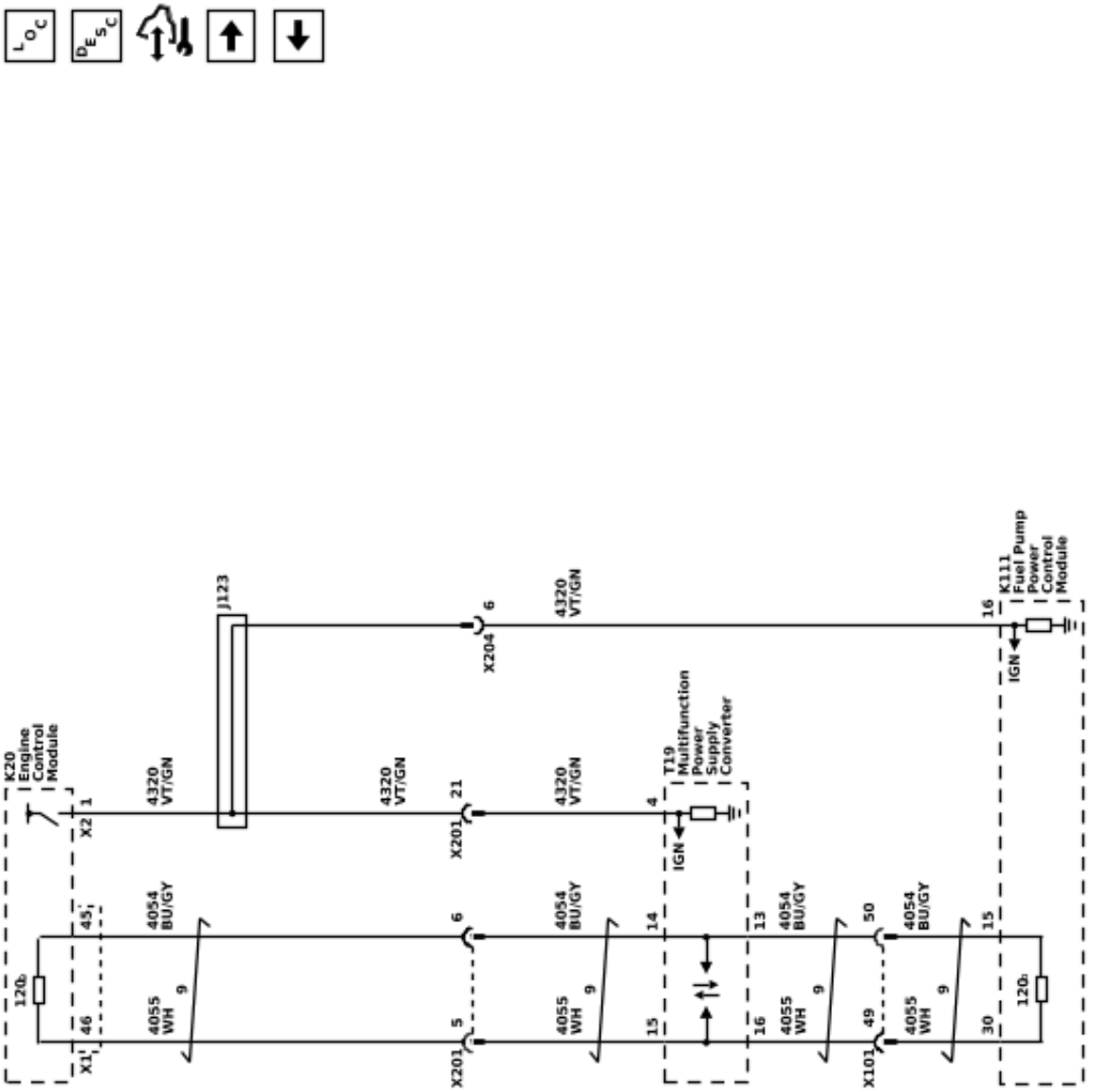
Data Communication Schematics (Engine Control Module Local Interconnect Network LIN Busses)



Data Communication Schematics (General Local Interconnect Network - LIN Busses)



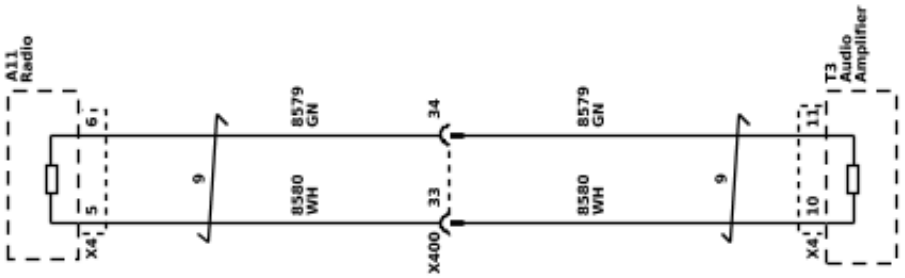
Data Communication Schematics (Powertrain and Enable CAN)



6656307

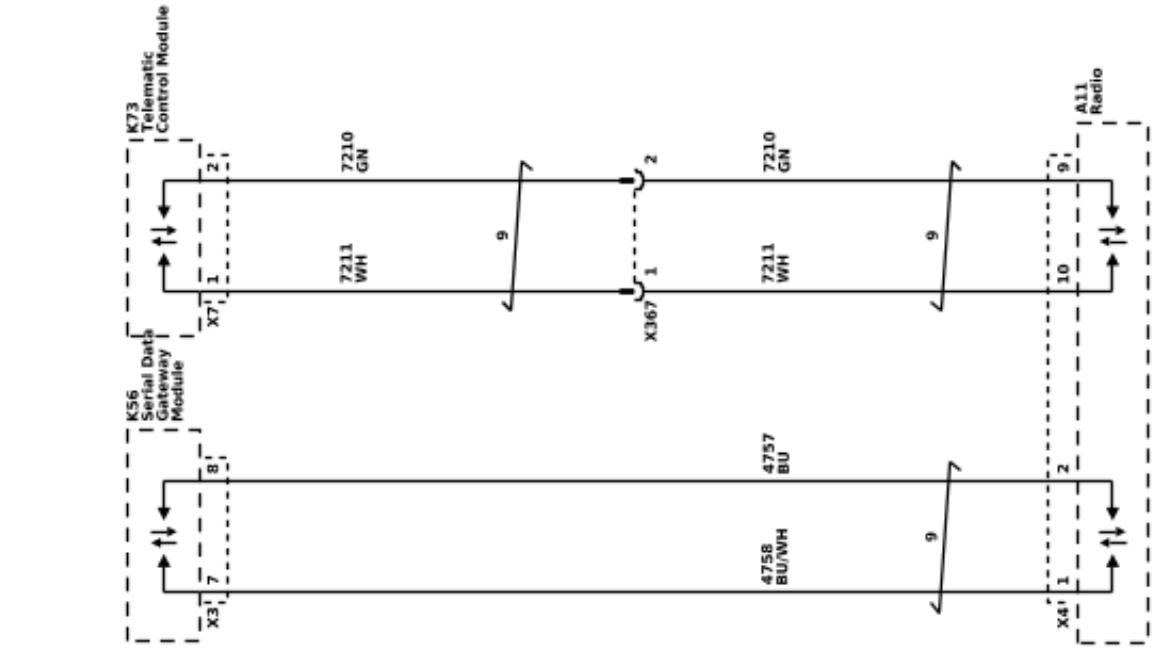
6656308

Data Communication Schematics (Automotive Audio Bus A2B Serial Data 1 (UQA))

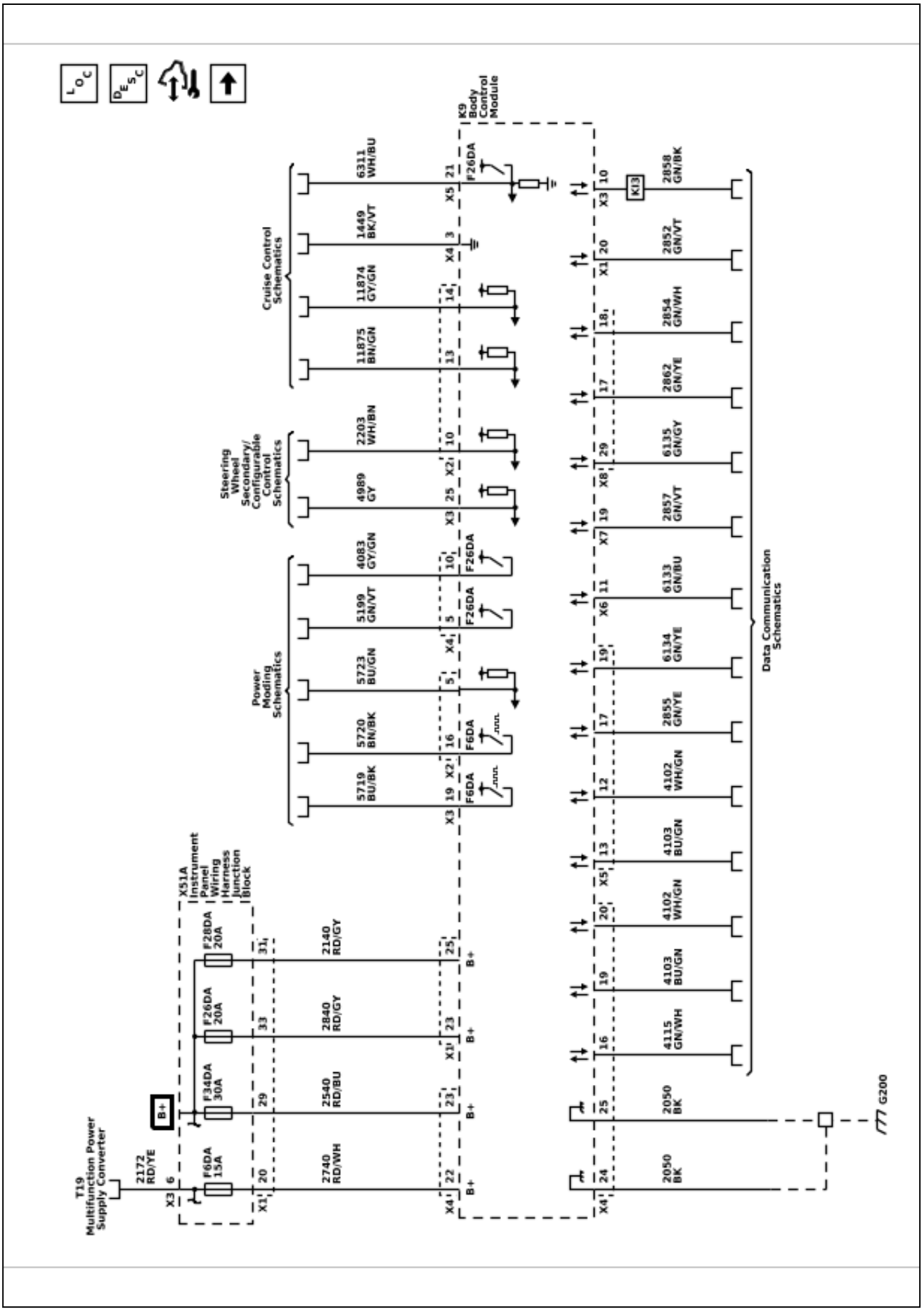


6656309

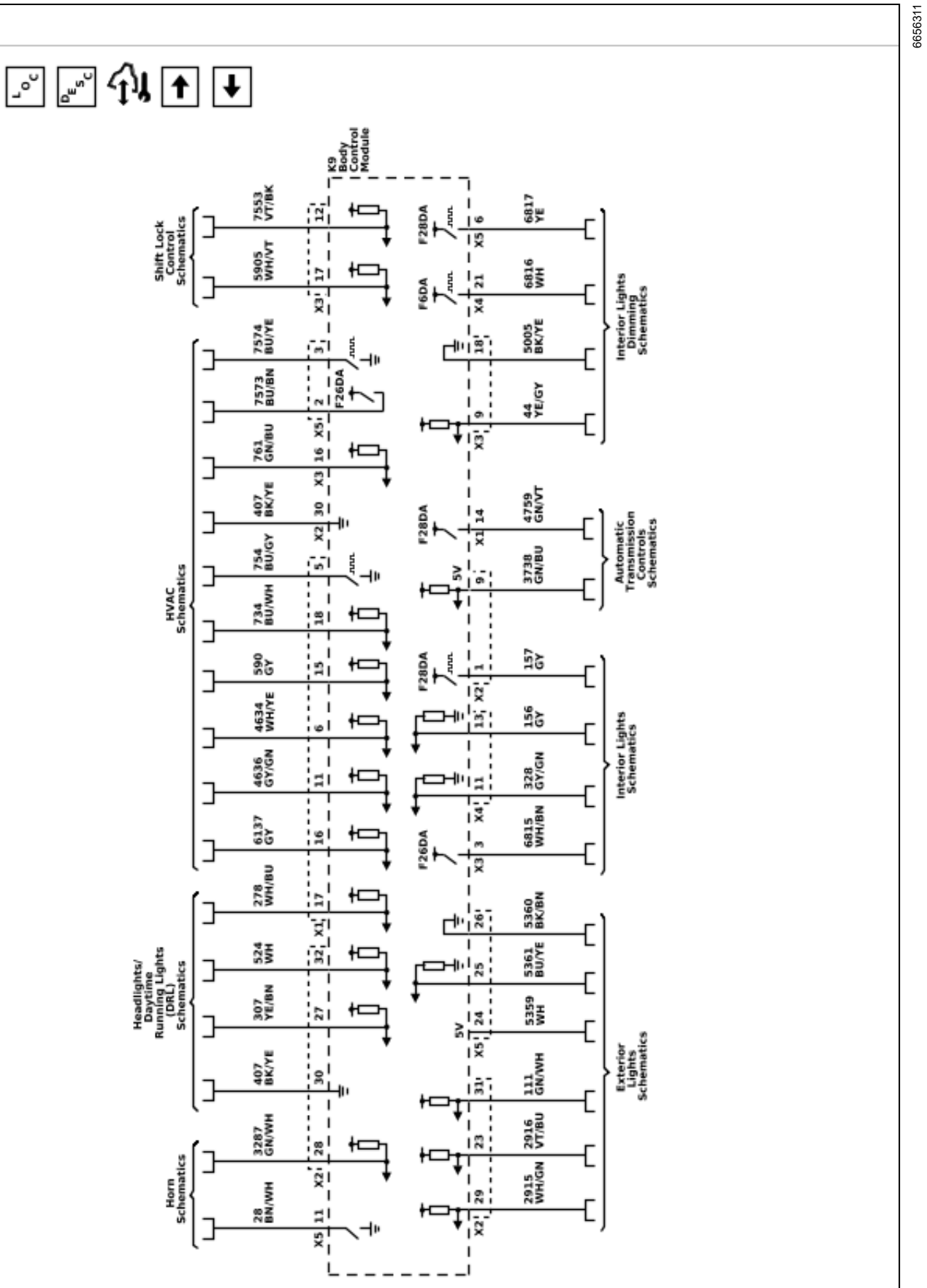
Data Communication Schematics (Ethernet Bus)



Body Control System Schematics (Power, Ground, Serial Data, and Subsystem References 1 of 3)



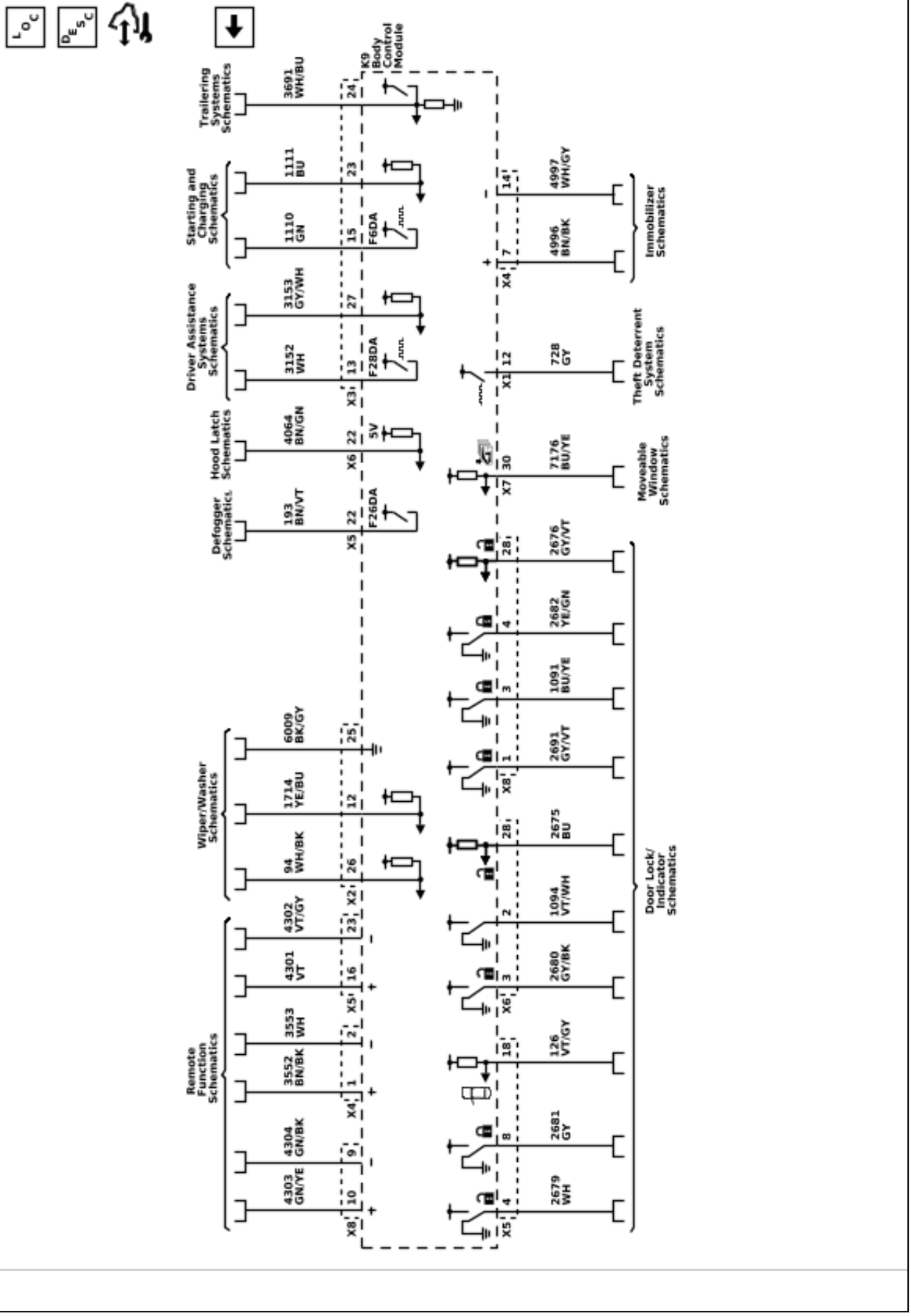
Body Control System Schematics (Subsystem References 2 of 3)



6656311

6656312

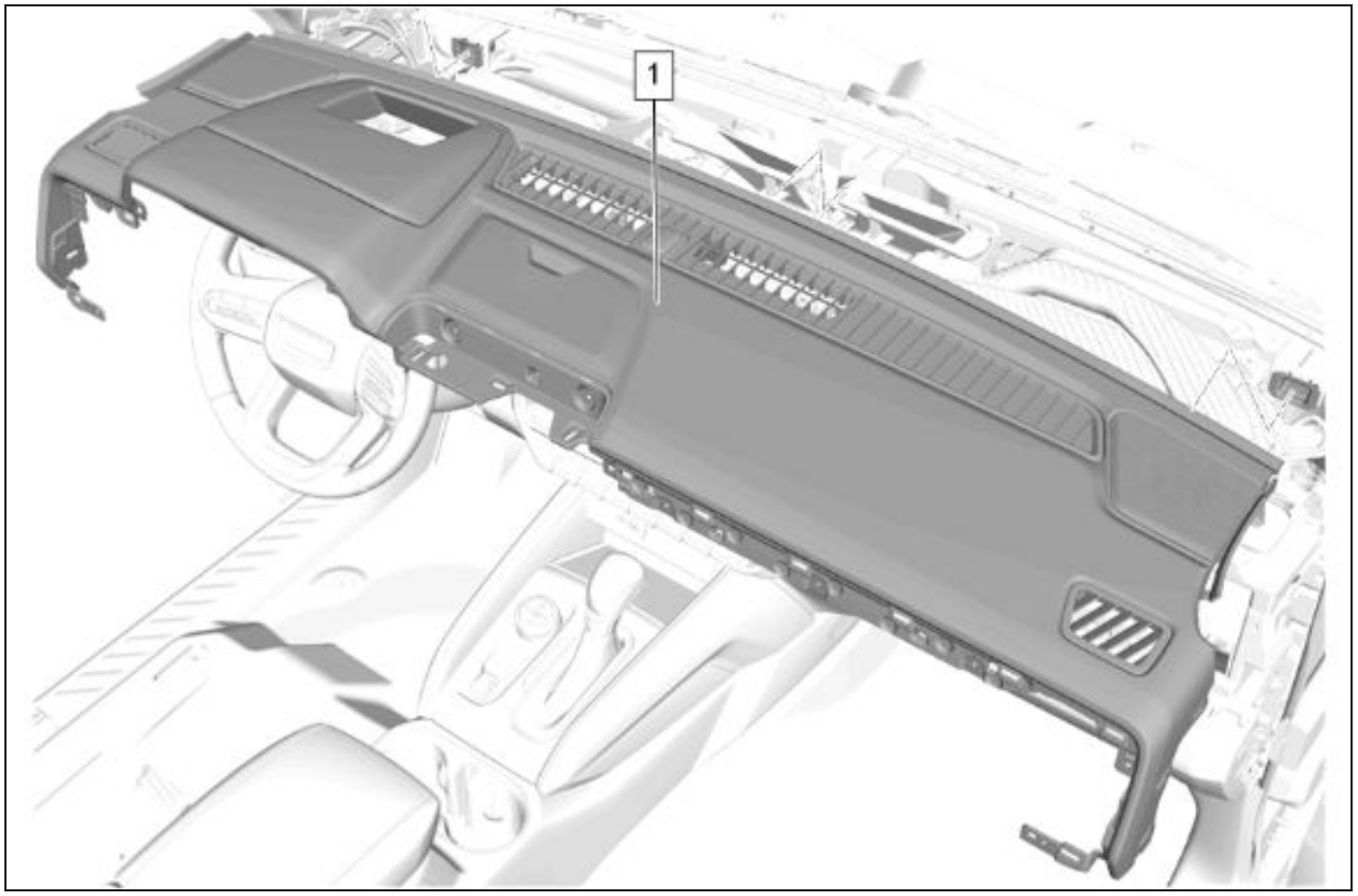
Body Control System Schematics (Subsystem References 3 of 3)



Repair Instructions

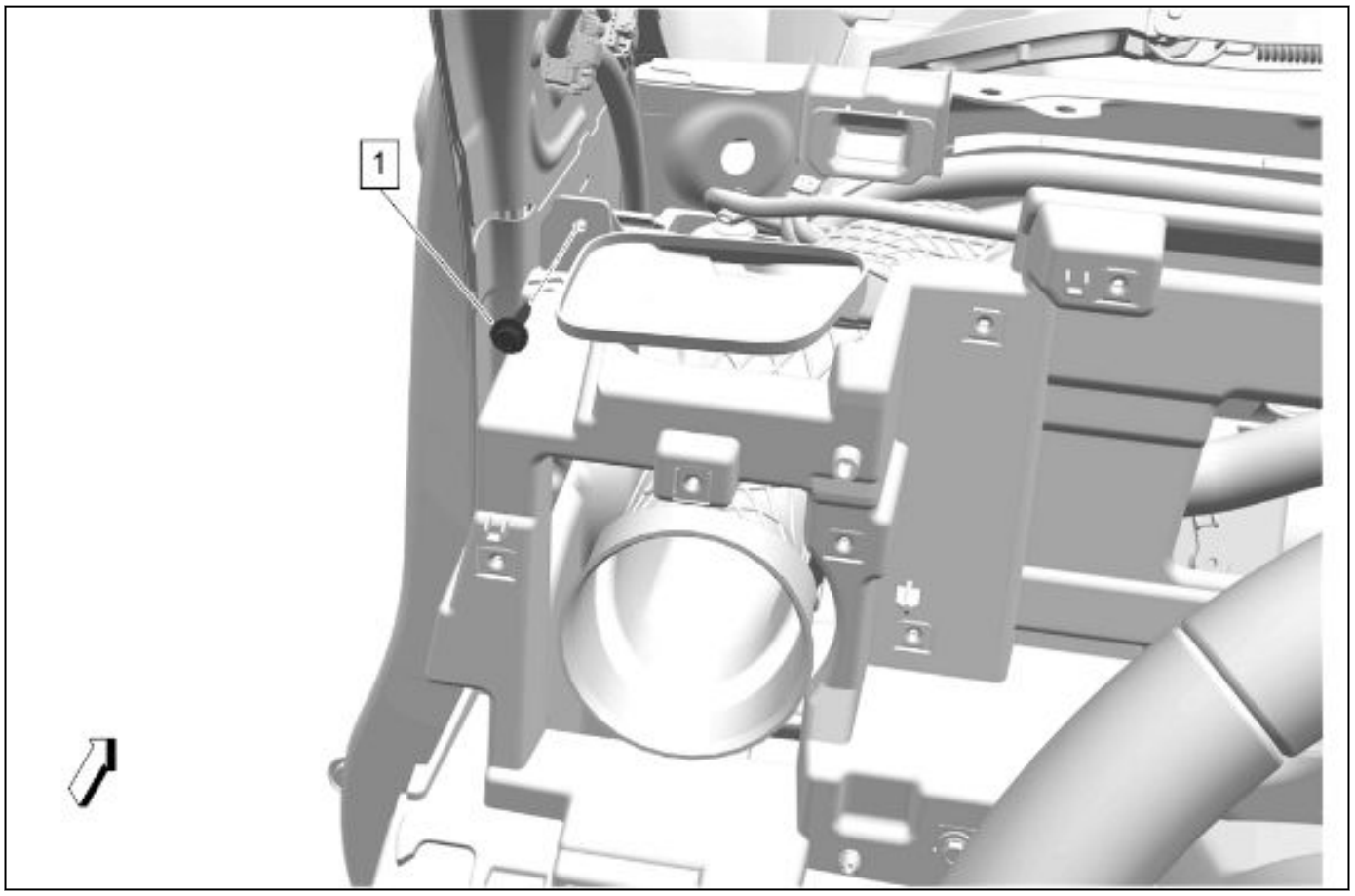
Body Control Module Replacement

Removal Procedure



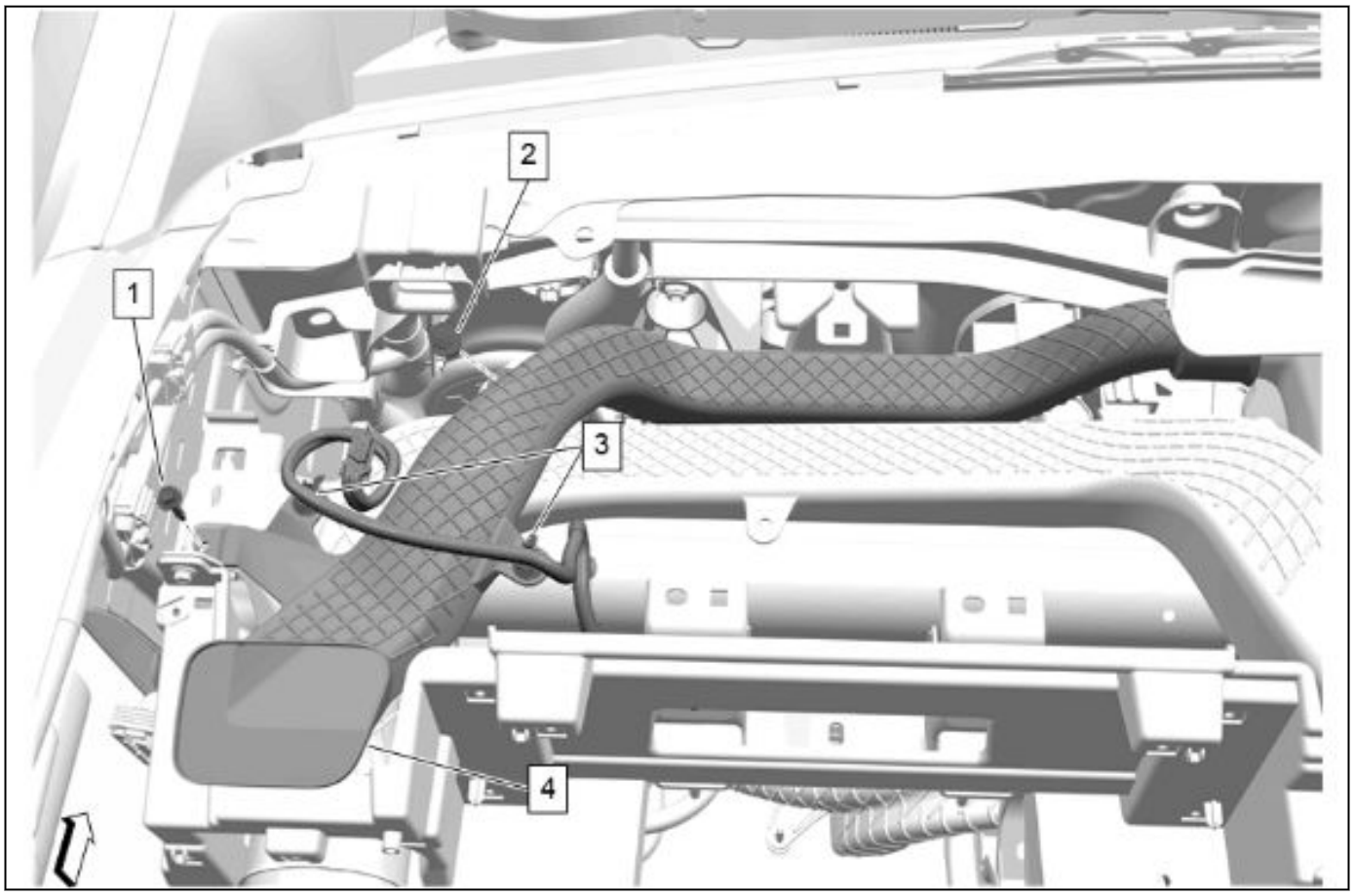
6132763

1. Instrument Panel Upper Trim Panel (1) » Remove
   — [Link target (target-id 328968-) not found]



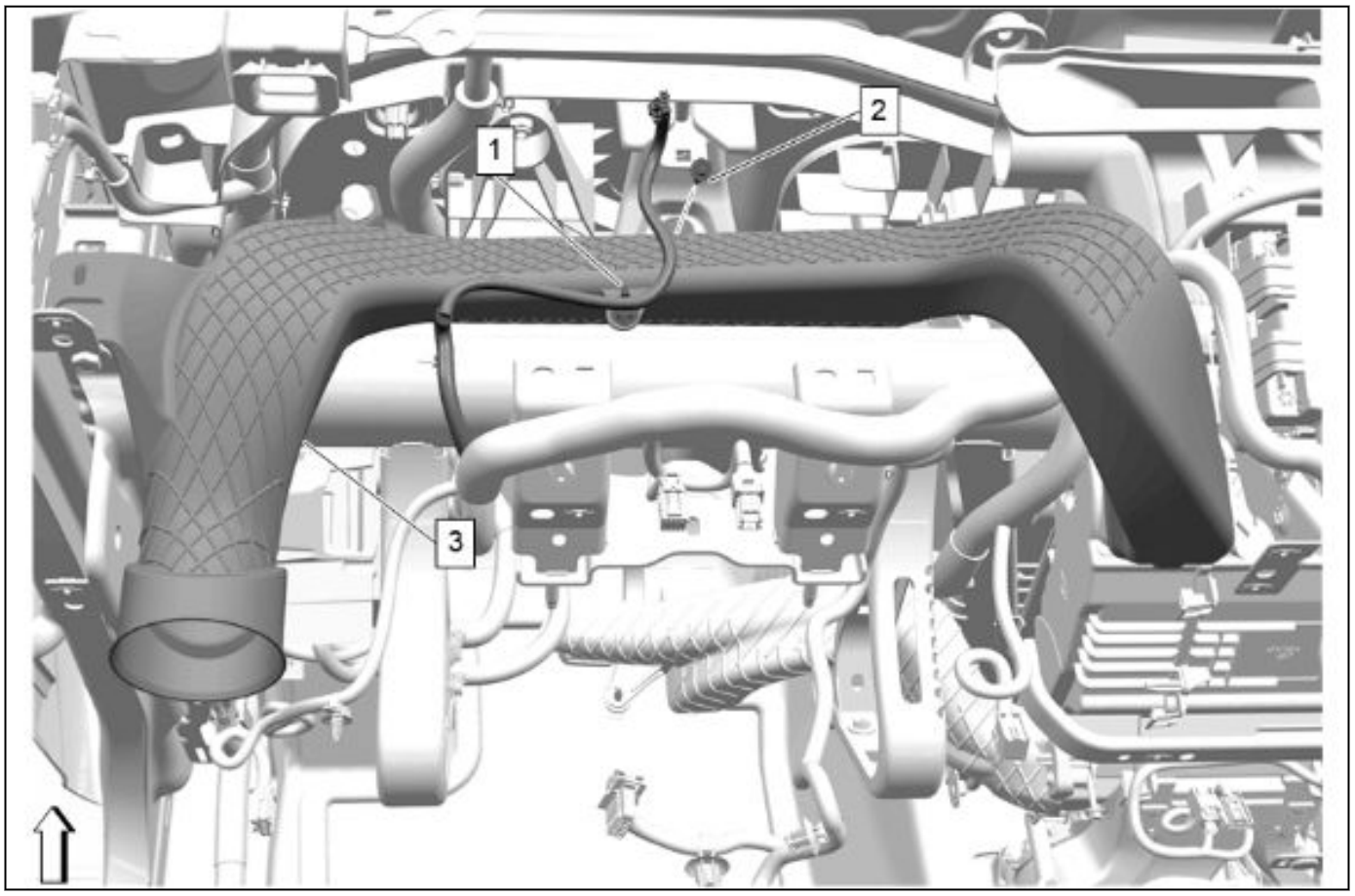
6205796

2. Instrument Panel Carrier Bolt (1) » Remove



6140327

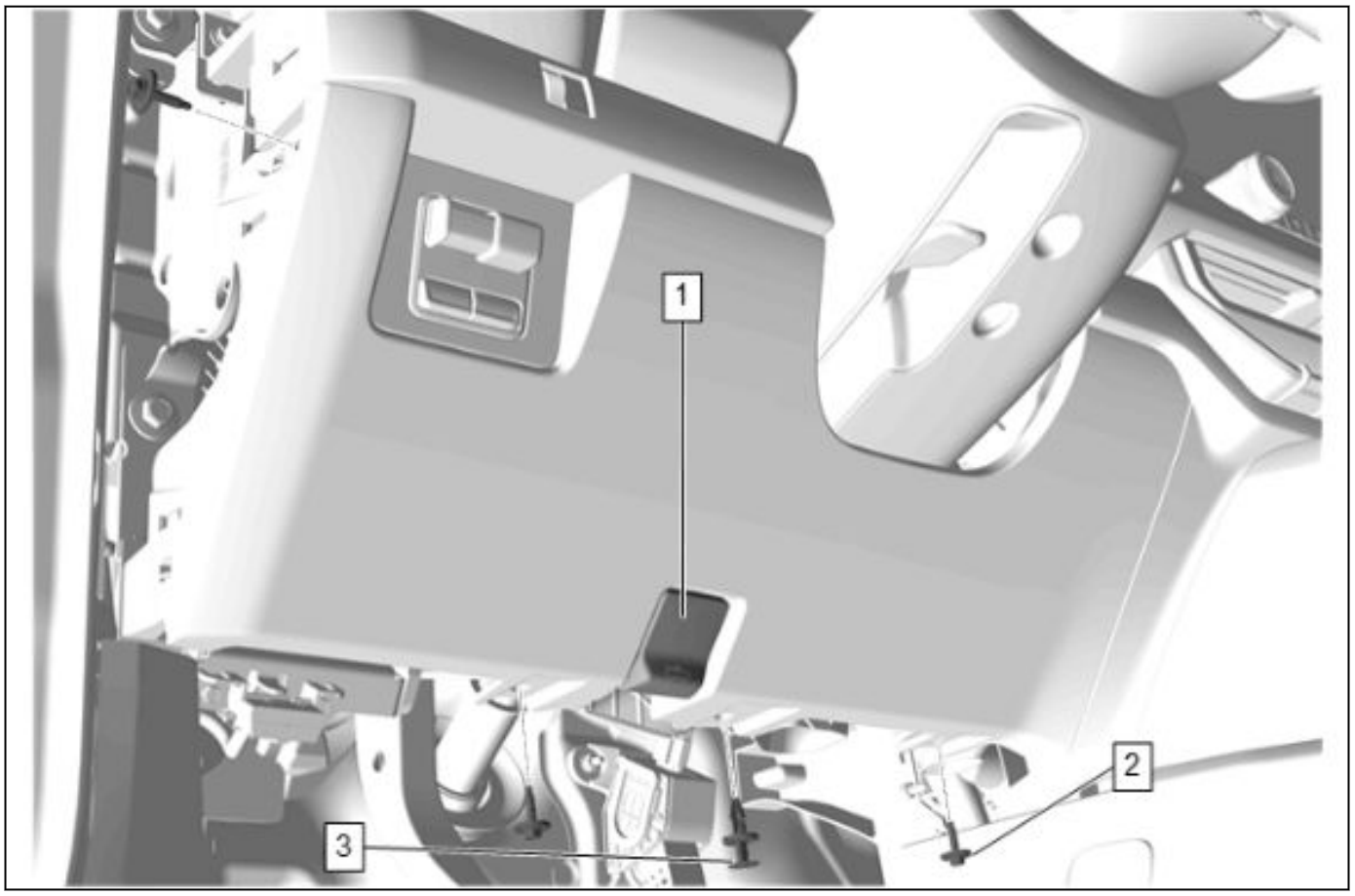
3. Instrument Panel Outer Air Outlet Duct Bolt (1) » Remove
4. Side Window Defogger Outlet Duct Retainer (2) » Remove
5. Disconnect the instrument panel wire harness retainers (3) from the side window defogger outlet - left side (4).
6. Side Window Defogger Outlet Duct - Left Side (4) » Remove



6140731

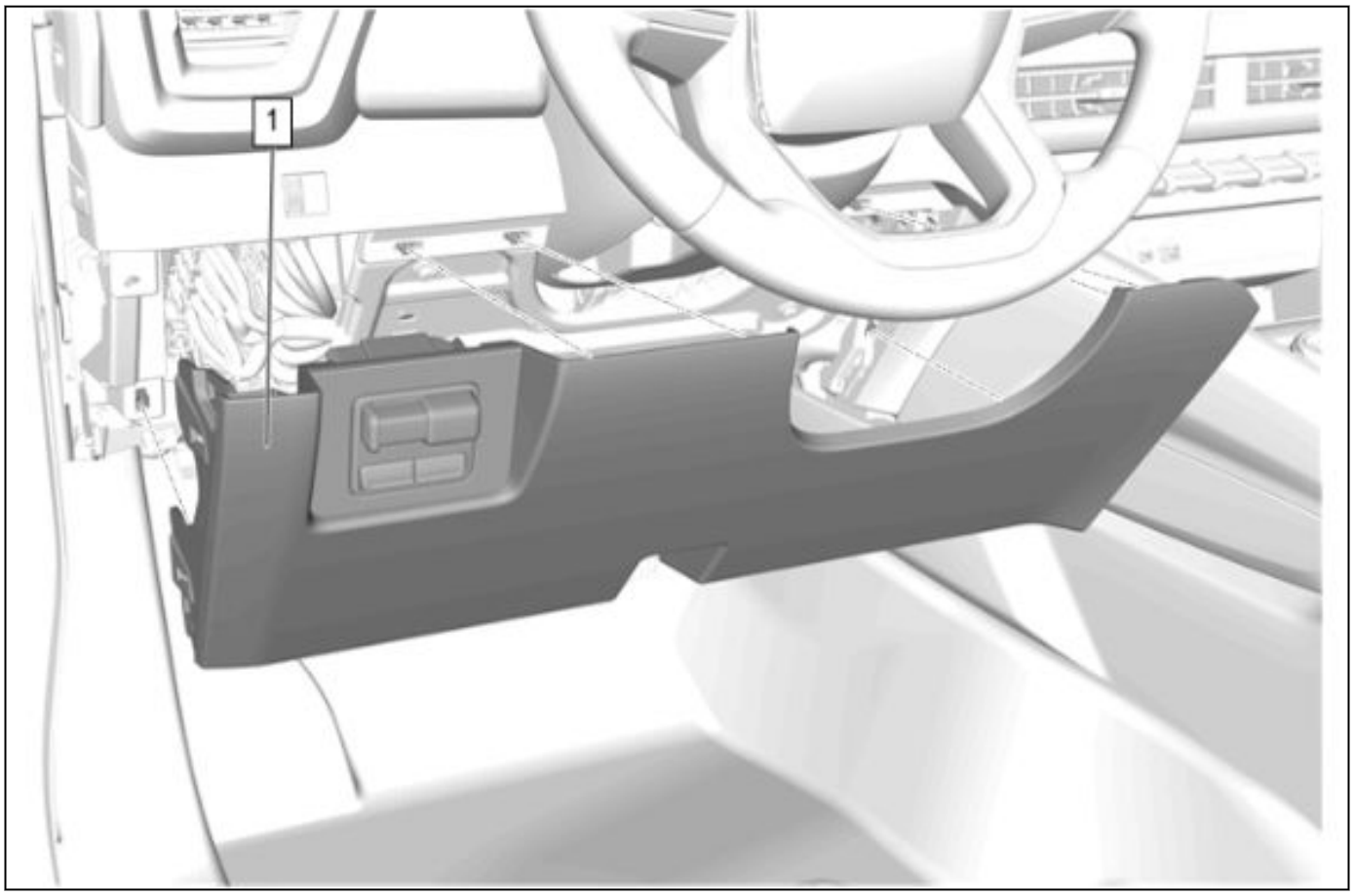
Note: Some components not shown for graphic clarity.

7. Disconnect the wire harness retainer (1) from the instrument panel outer air outlet duct (3).
8. Instrument Panel Outer Air Outlet Duct Bolt (2) » Remove
9. Instrument Panel Outer Air Outlet Duct - Left Side (3) » Remove



6139338

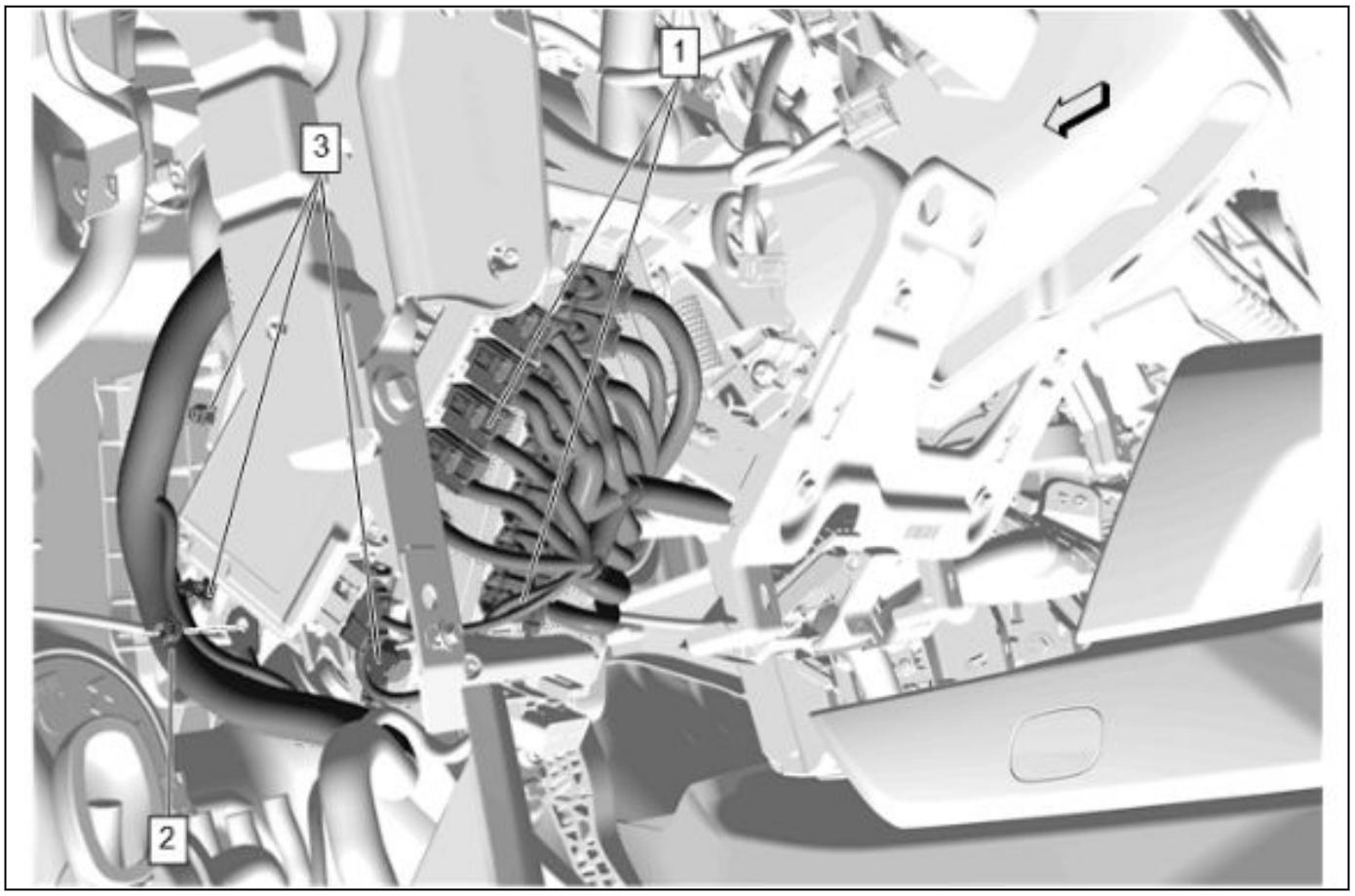
10. Hood Primary Latch Release Cable Handle (1) » Remove
11. Instrument Panel Knee Bolster Bolt (2) » Remove[3x]
12. Floor Front Air Outlet Duct Retainer (3) » Remove



6139339

Warning: When removing, handling or installing this component wear protective gloves. The sharp edges on the component may be very sharp and may cause injury.

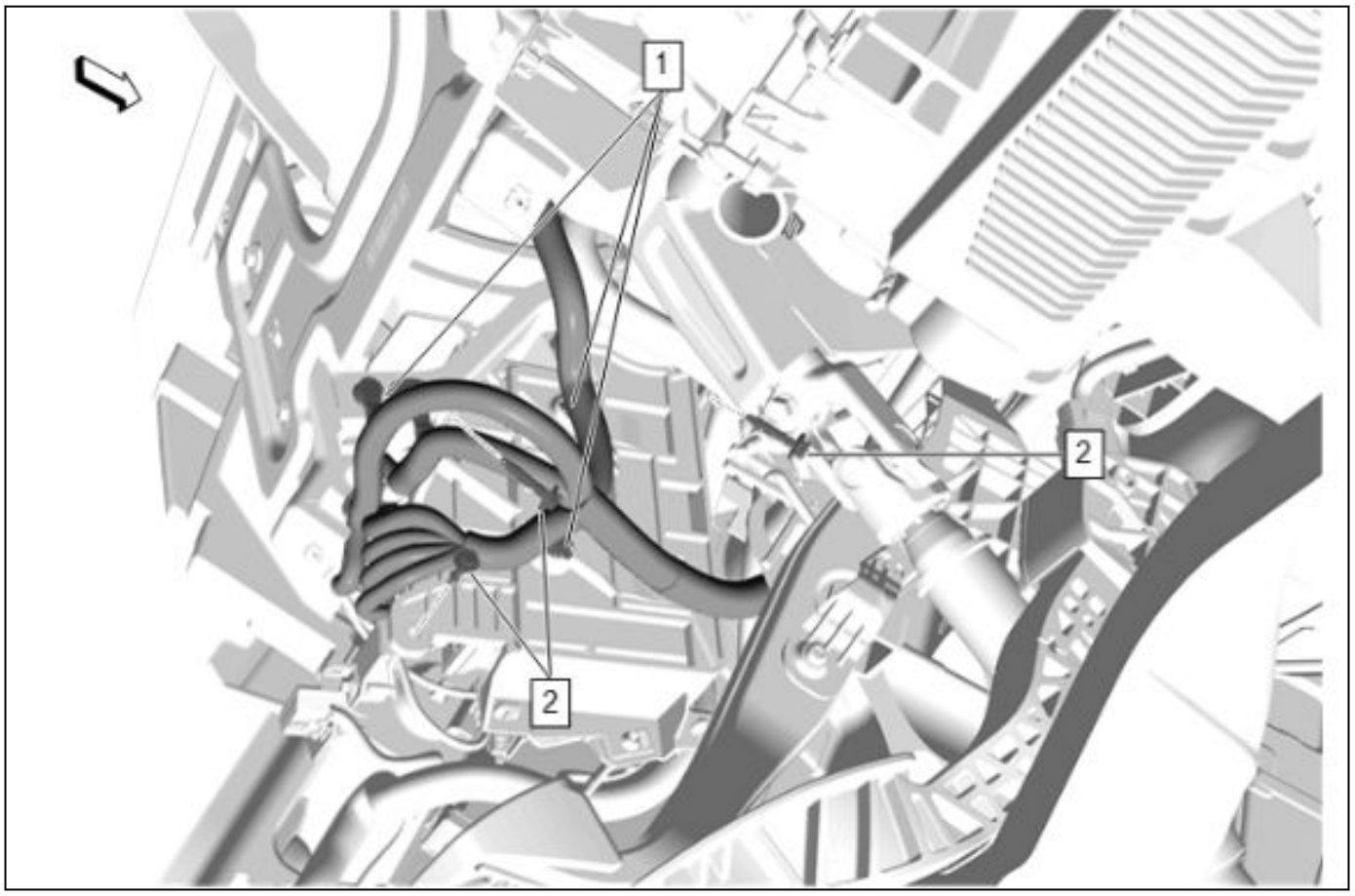
13. Using a flat bladed plastic trim tool, release the retaining clips.
14. Reposition the component to access the electrical connector.
15. Disconnect the electrical connector.
16. Instrument Panel Knee Bolster (1) » Remove



6177261

Note: Some components not shown for graphic clarity.

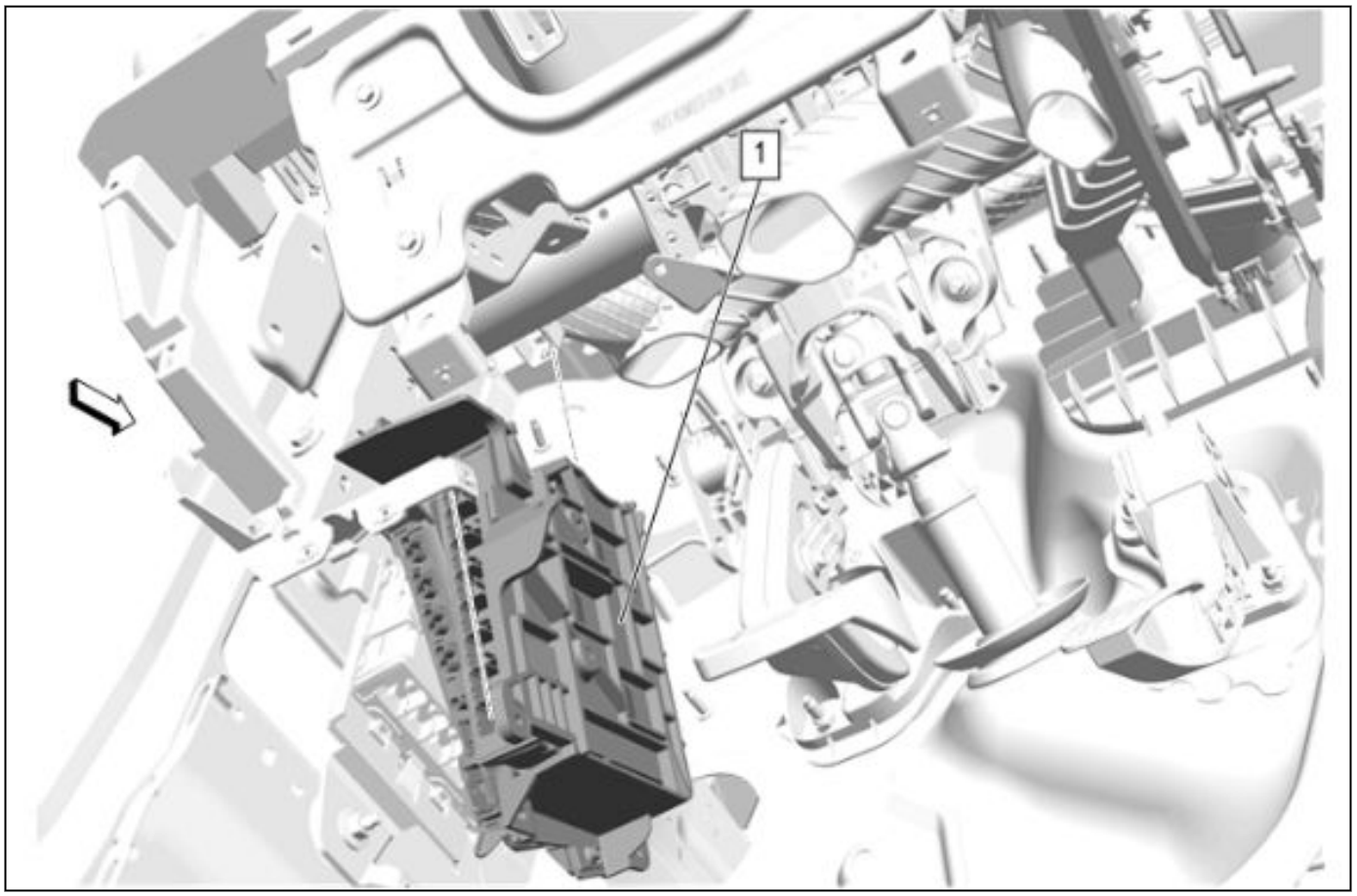
17. Disconnect the instrument panel wiring harness and body wiring harness connectors (1).
18. Disconnect the instrument panel wiring harness retainers (3).



6177262

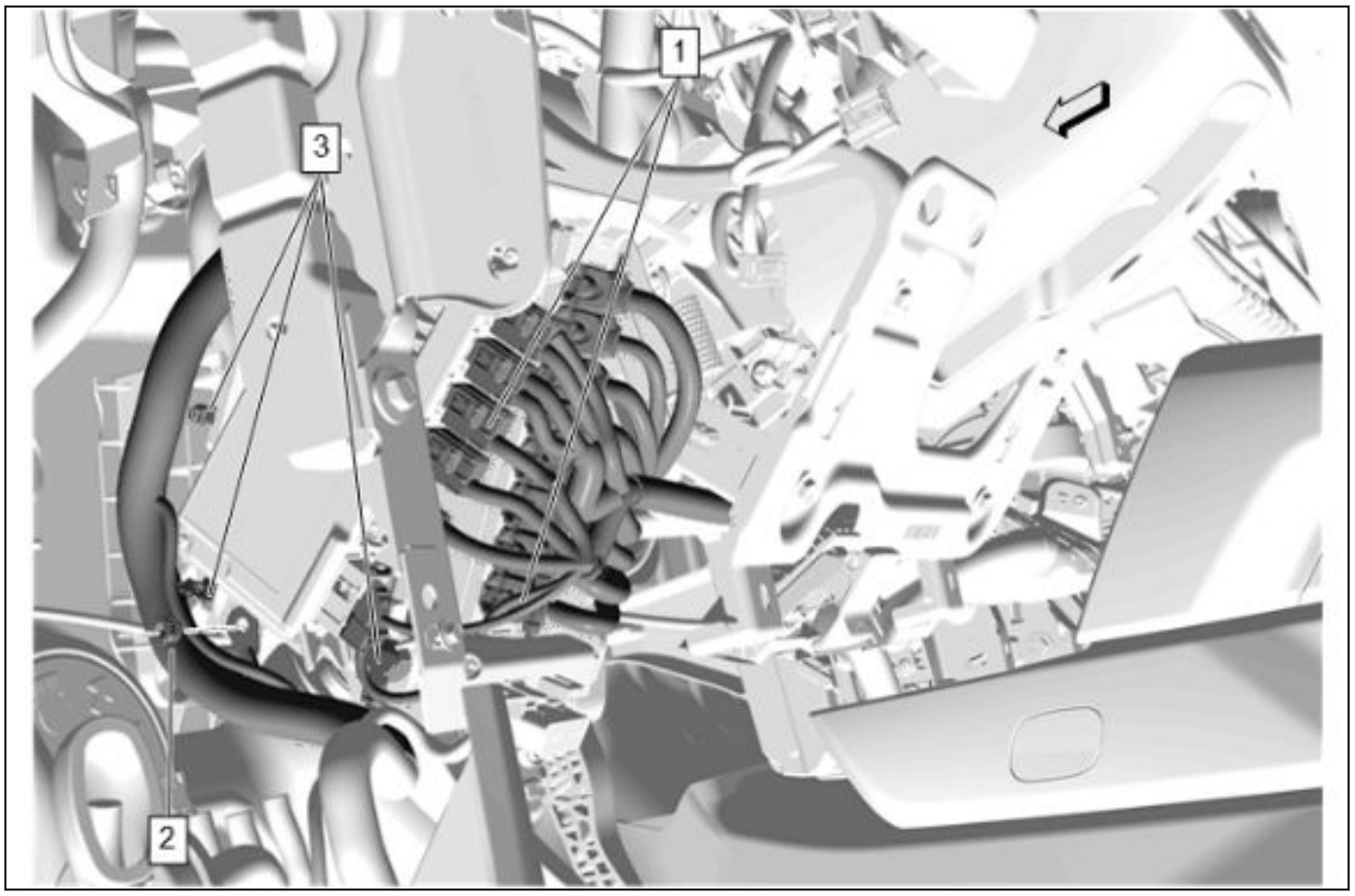
Note: Some components not shown for graphic clarity.

19. Disconnect the instrument panel wiring harness and body wiring harness retainers (1).
20. Video Processing Module Bracket Bolt (2) » Remove[3x]



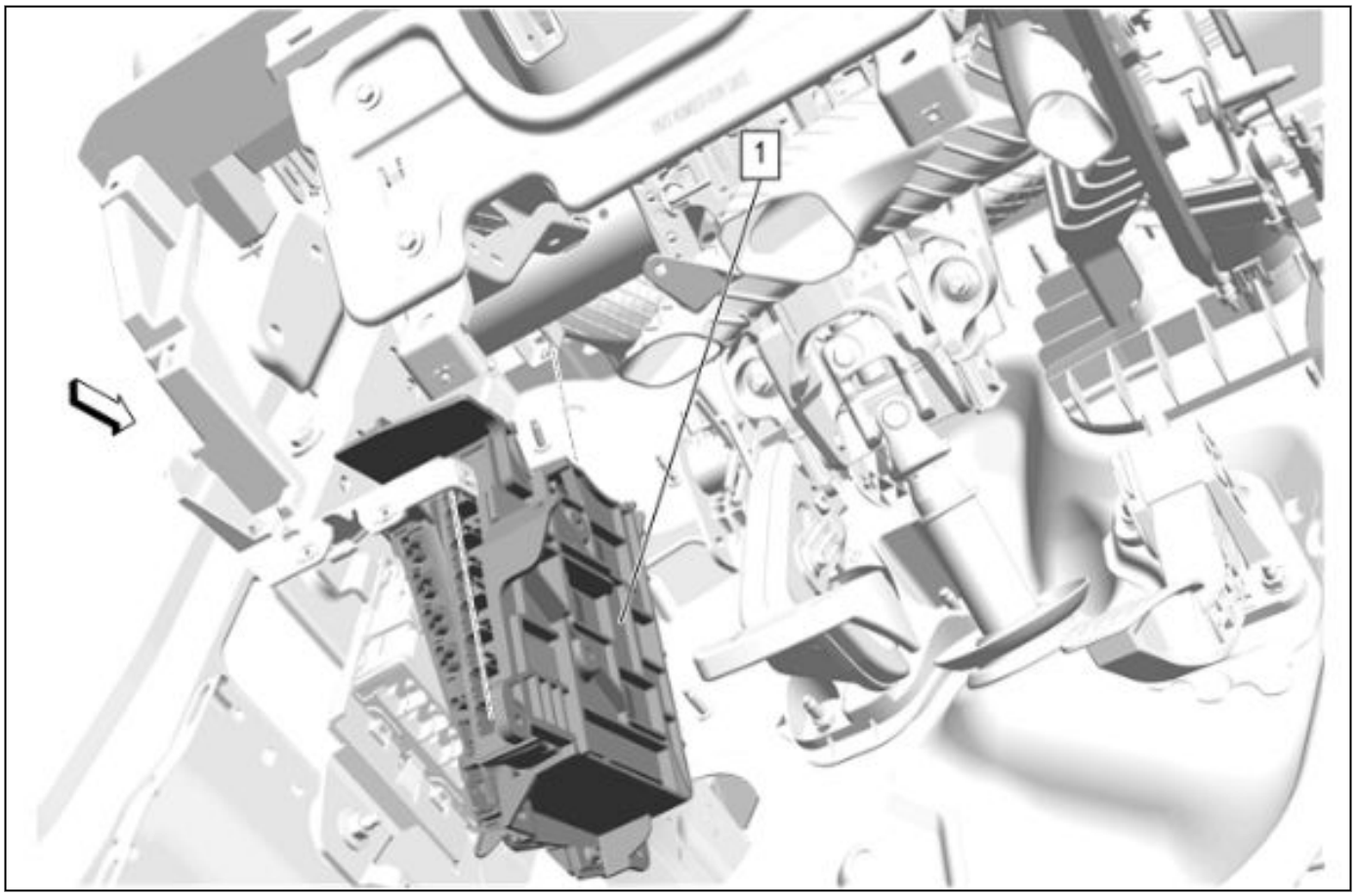
6177263

21. Reposition the body control module bracket (1) to gain access to the instrument panel wiring harness ground nut.



6177261

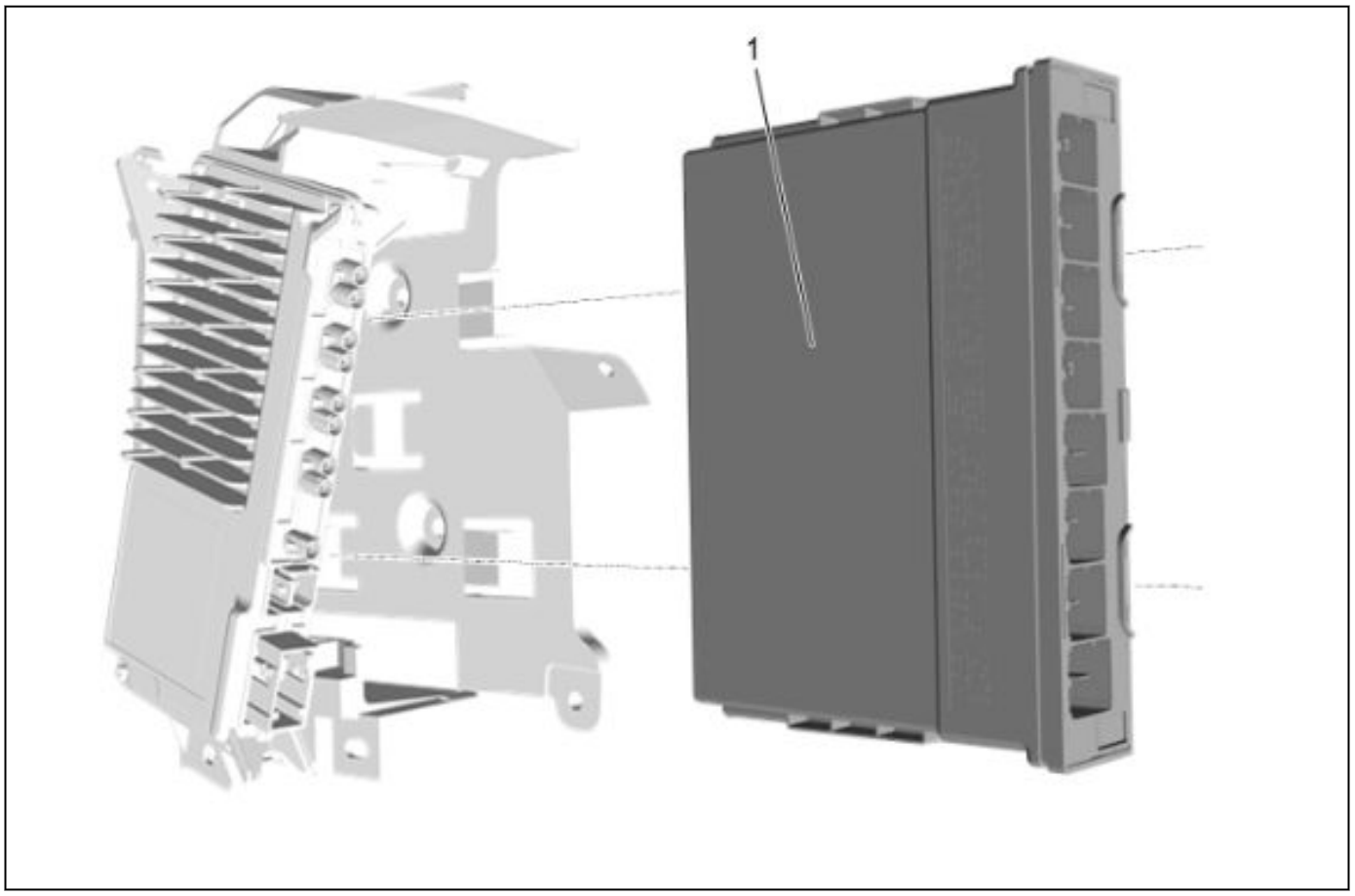
22. Instrument Panel Wiring Harness Ground Nut (2) » Remove



6177263

Note: Some components not shown for graphic clarity.

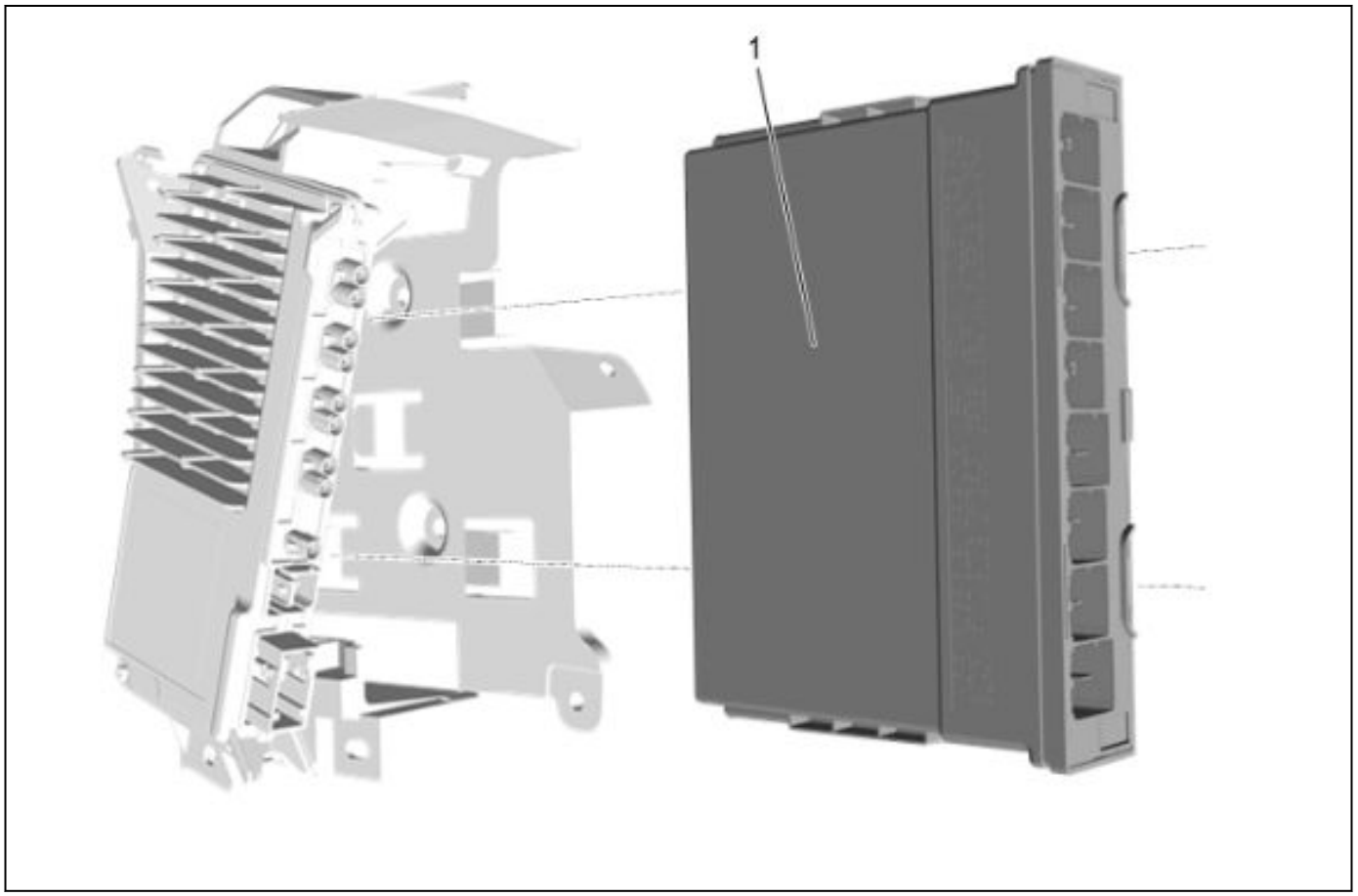
23. Body Control Module Bracket (1) » Remove



6177264

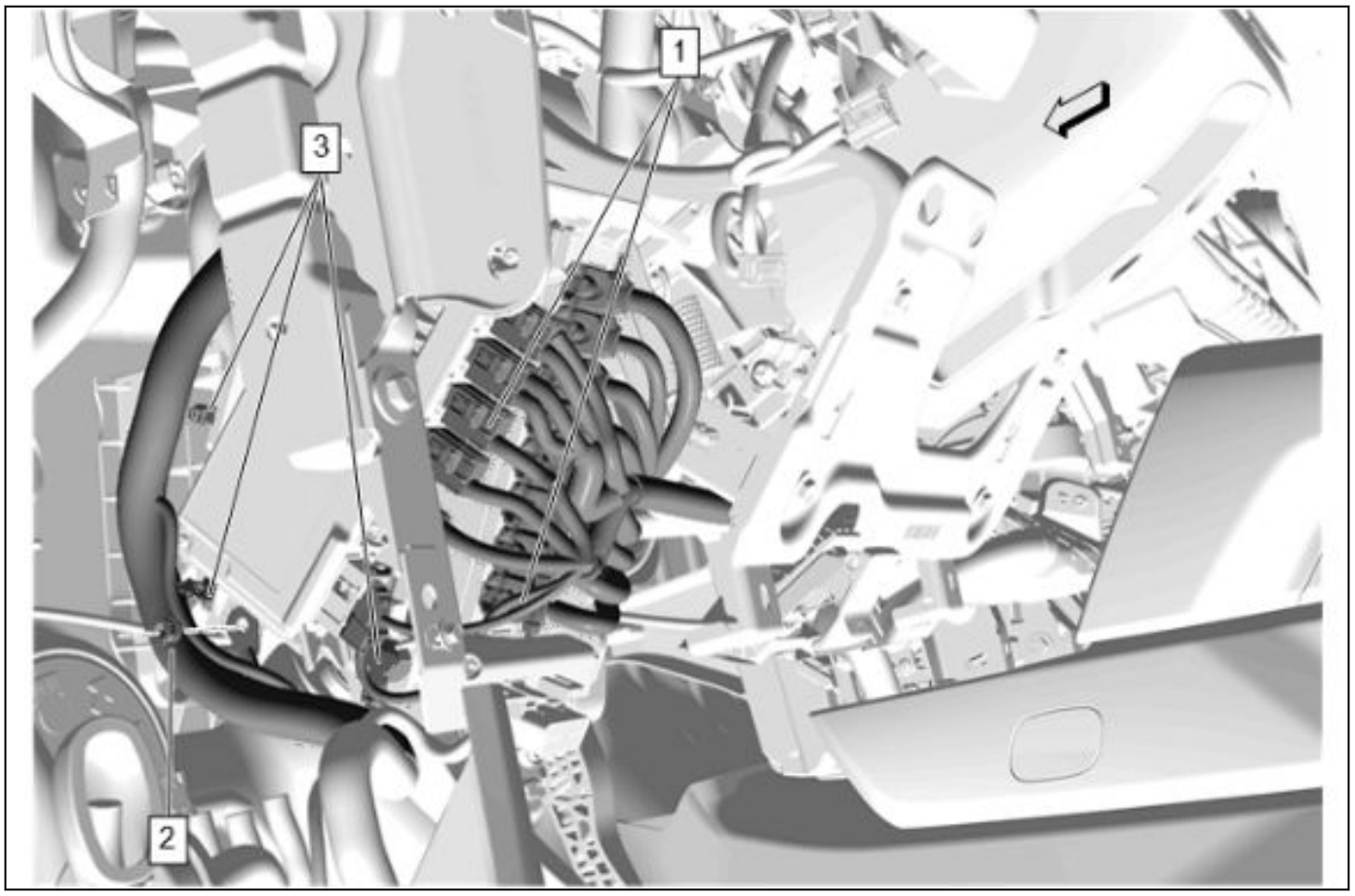
24. Push tabs to release the body control module from the bracket. (1)

Installation Procedure



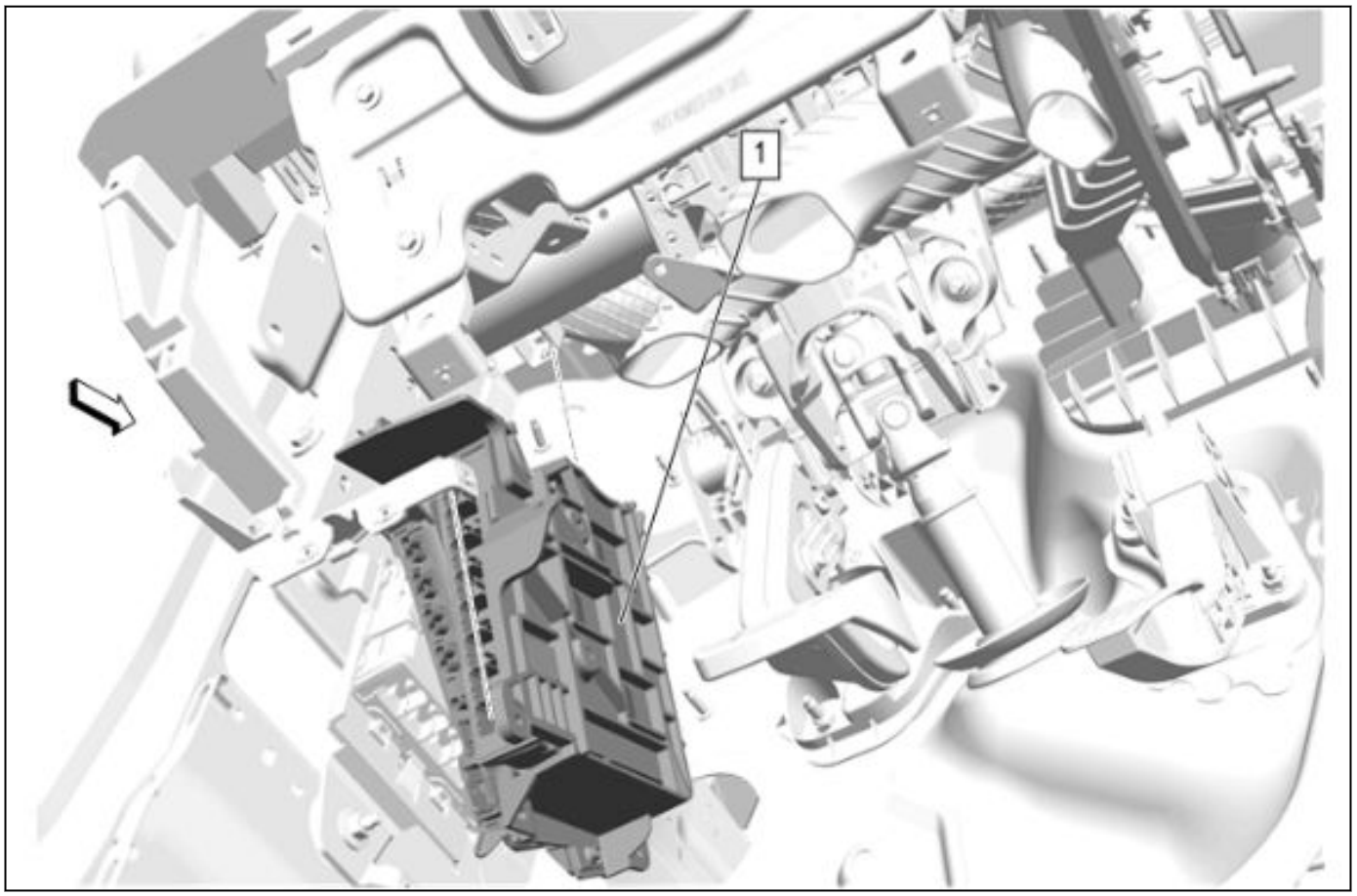
6177264

1. Body Control Module (1) » Install
2. Secure the retaining tabs.



6177261

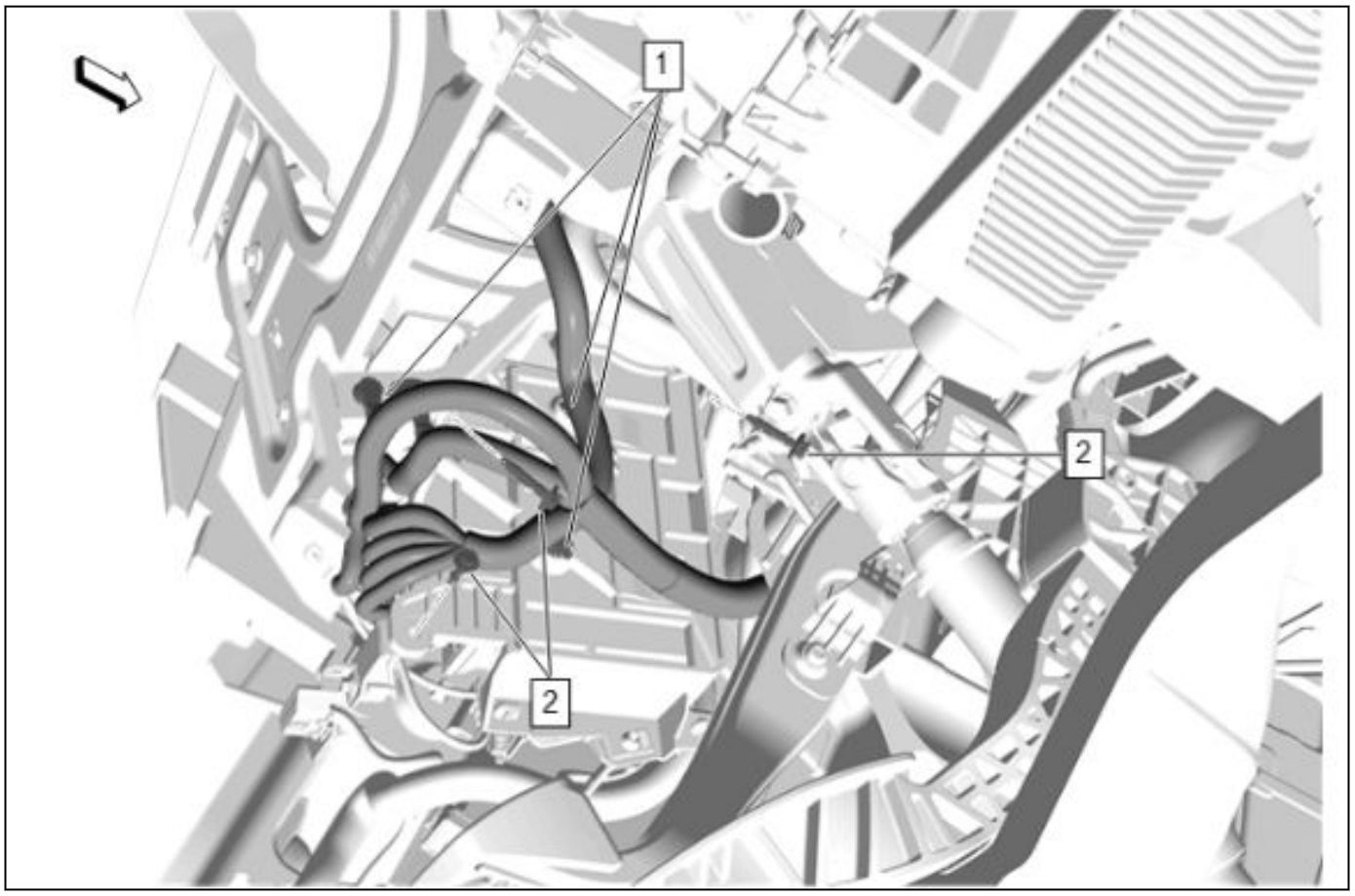
3. Instrument Panel Wiring Harness Ground Nut (2) » Install and tighten— [Link target (target-id 148102-) not found]



6177263

Note: Some components not shown for graphic clarity.

4. Body Control Module Bracket (1) » Install

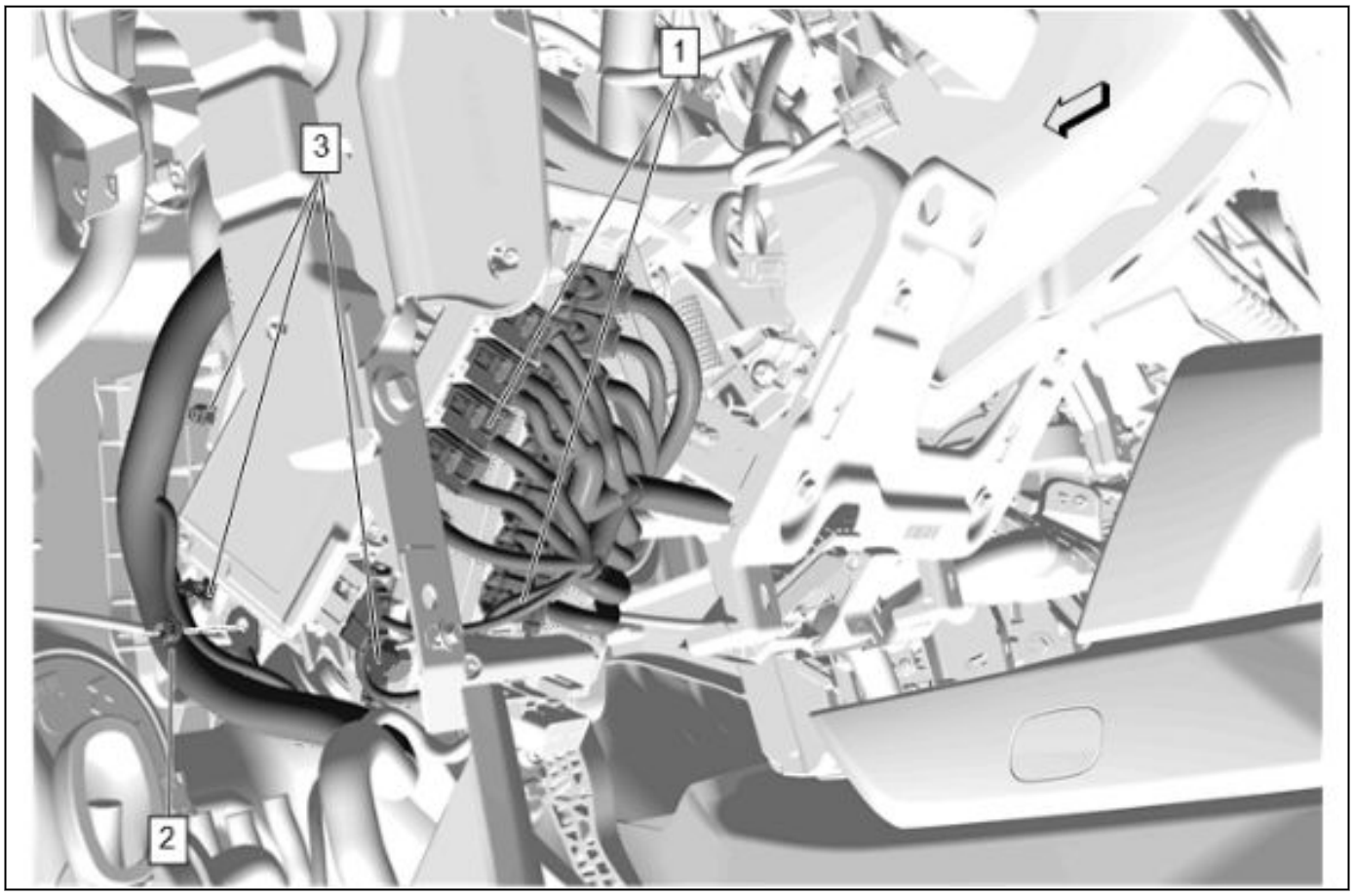


6177262

Note: Some components not shown for graphic clarity.

Caution: Refer to [Link target (target-id 178169-) not found] .

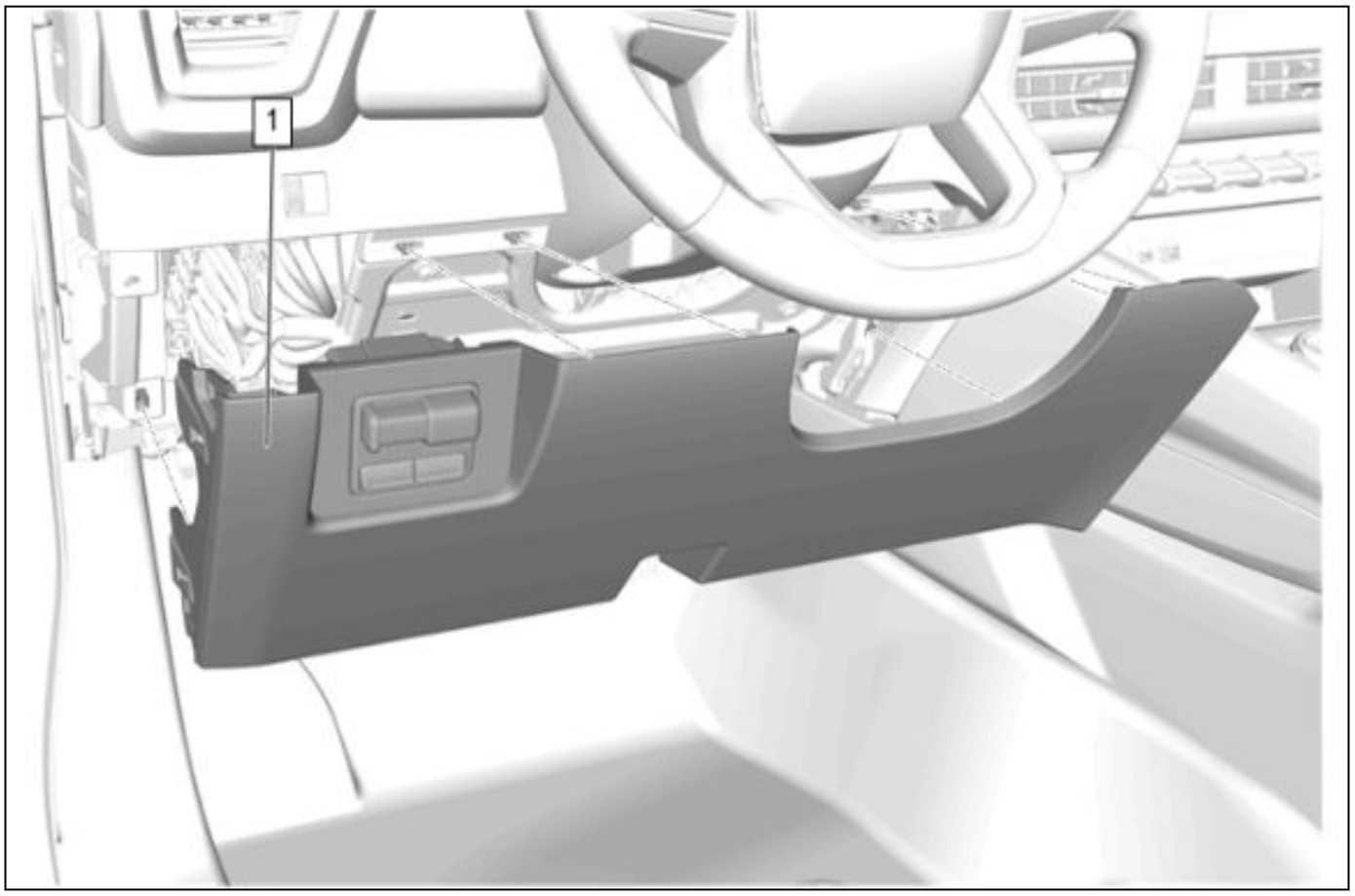
5. Video Processing Module Bracket Bolt (2) » Install and tighten[3x] — [Link target (target-id 154124-) not found]
6. Connect the instrument panel wiring harness and body wiring harness retainers (1).



6177261

Note: Some components not shown for graphic clarity.

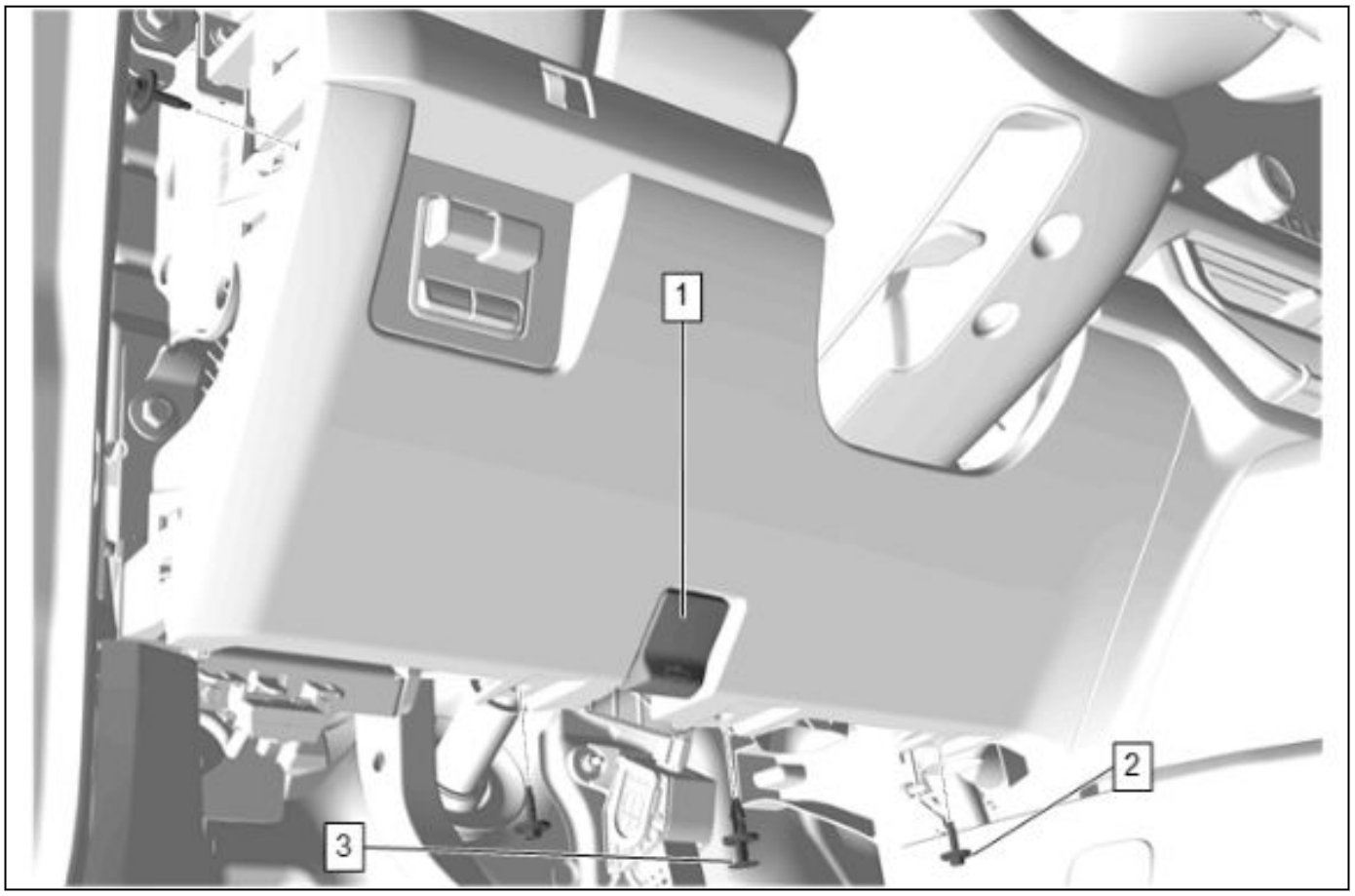
7. Connect the instrument panel wiring harness retainers (3).
8. Connect the instrument panel wiring harness and body wiring harness connectors (1).



6139339

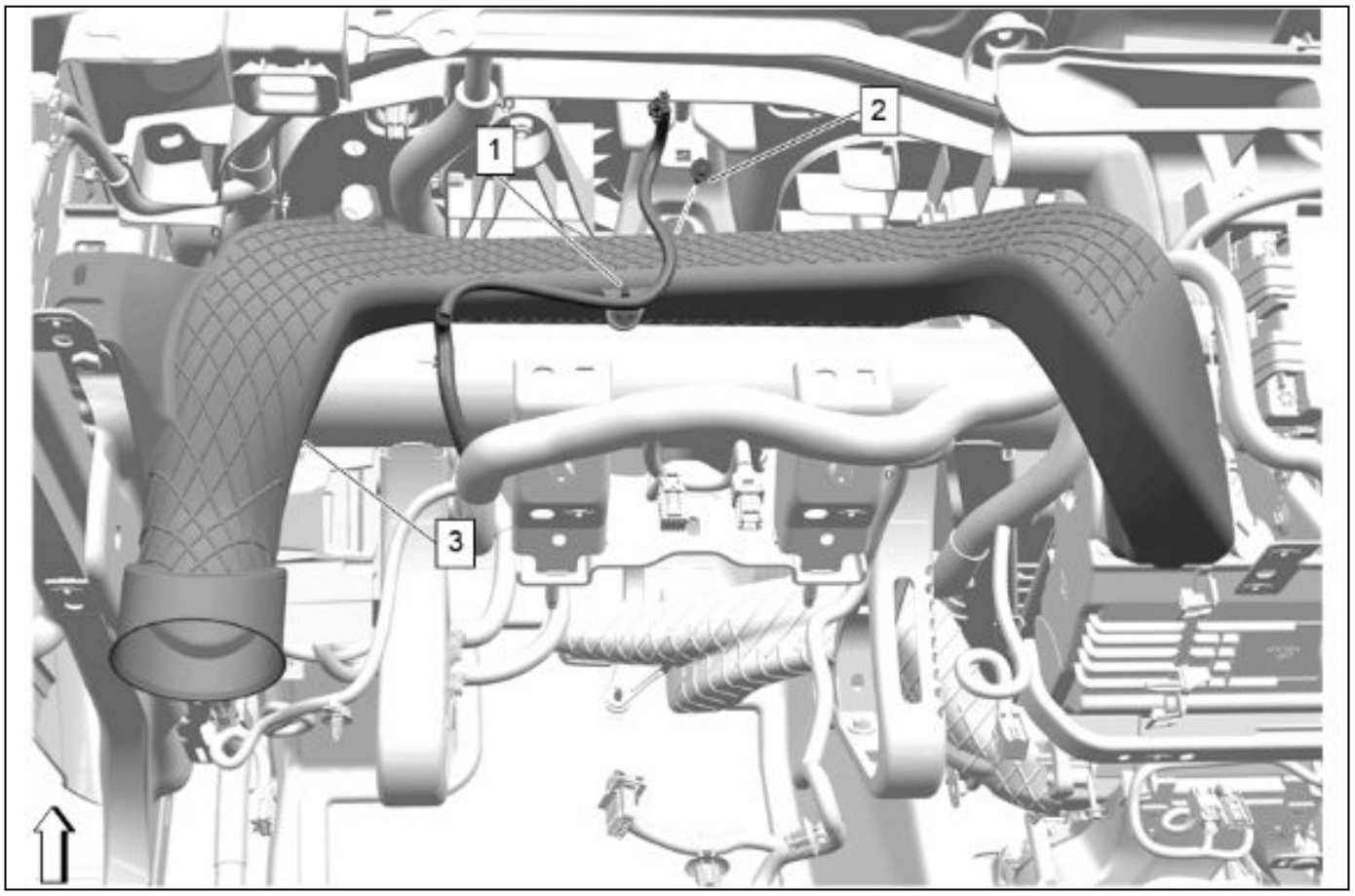
Warning: When removing, handling or installing this component wear protective gloves. The sharp edges on the component may be very sharp and may cause injury.

9. Connect the electrical connector.
10. Instrument Panel Knee Bolster (1) » Install



6139338

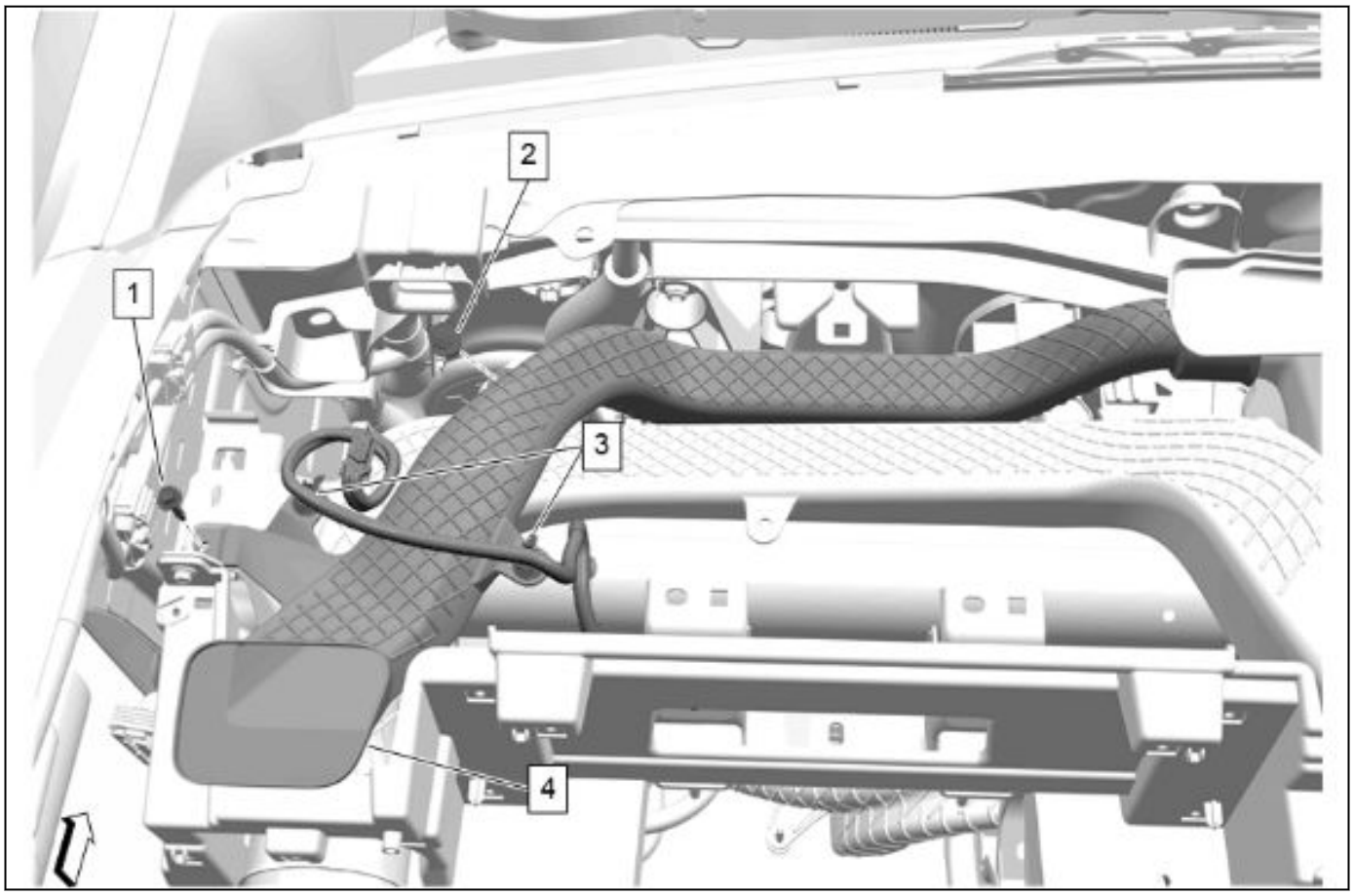
11. Floor Front Air Outlet Duct Retainer (3) » Install
12. Instrument Panel Knee Bolster Bolt (2) » Install and tighten[3x] — [Link target (target-id 148102-) not found]
13. Hood Primary Latch Release Cable Handle (1) » Install



6140731

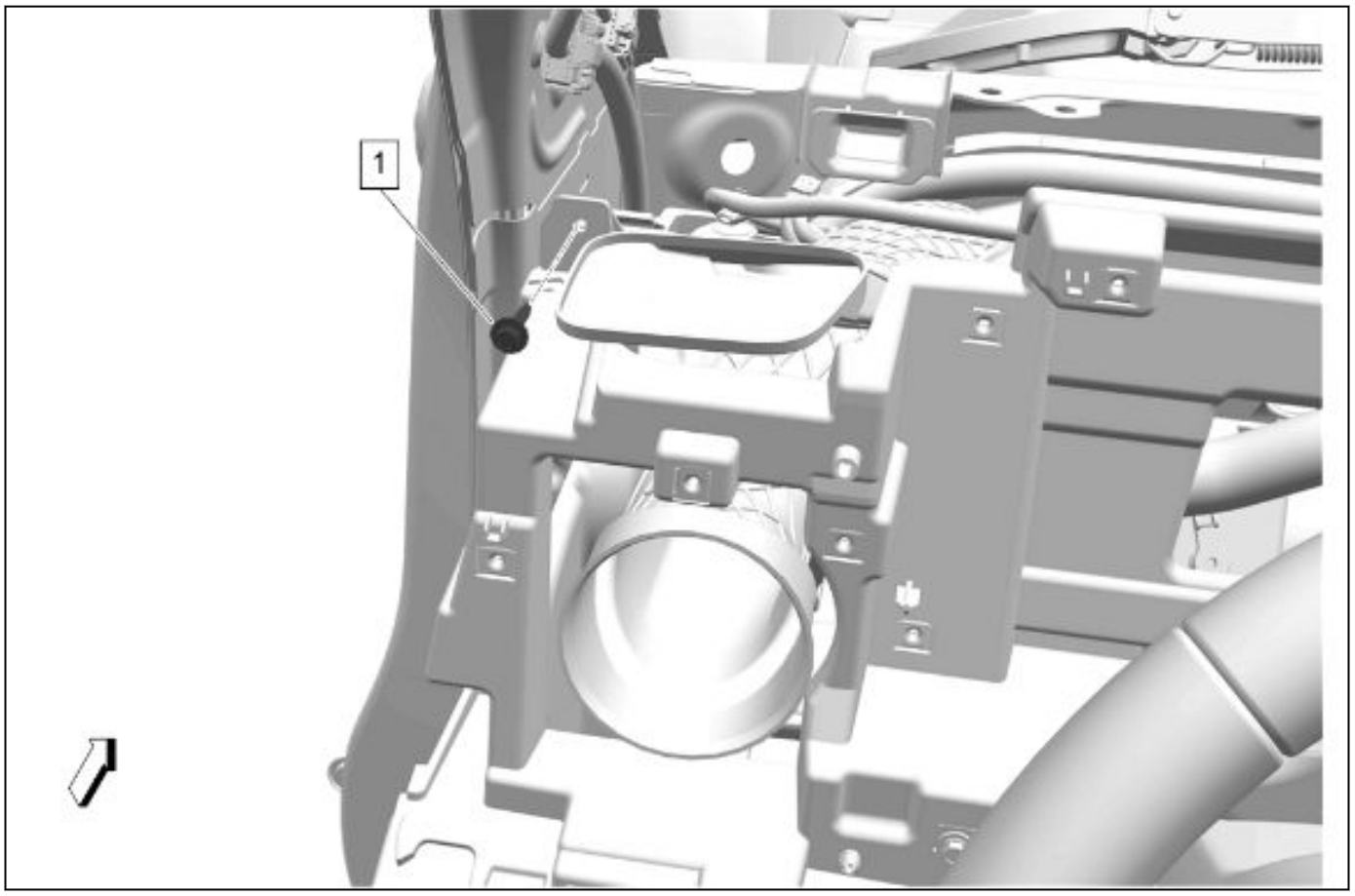
Note: Some components not shown for graphic clarity.

14. Instrument Panel Outer Air Outlet Duct - Left Side (3) » Install
15. Instrument Panel Outer Air Outlet Duct Bolt (2) » Install and tighten— [Link target (target-id 48114-) not found]
16. Connect the wire harness retainer (1) to the instrument panel outer air outlet duct (3).



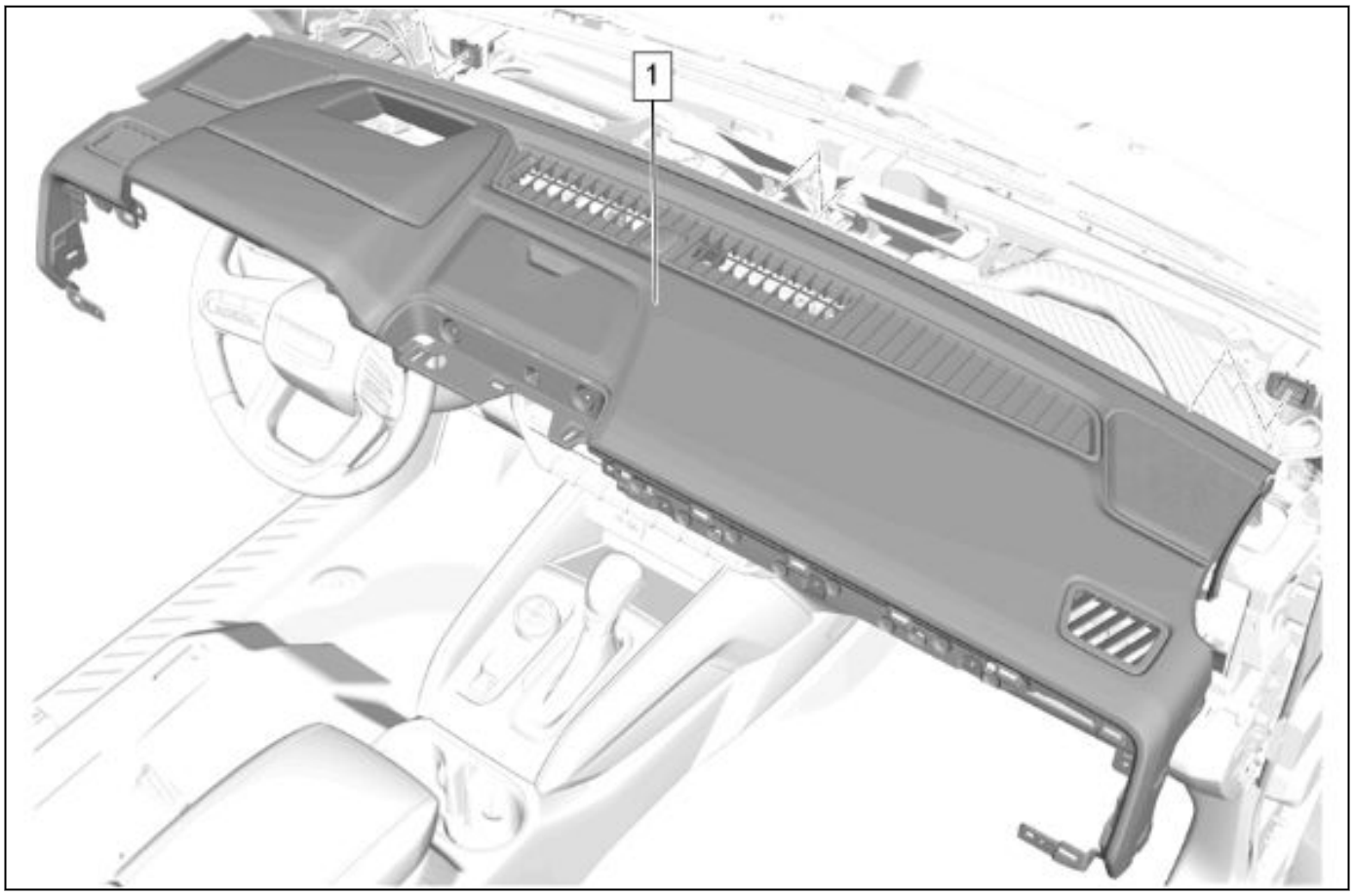
6140327

17. Side Window Defogger Outlet Duct - Left Side (4) » Install
18. Connect the instrument panel wire harness retainers (3) to the side window defogger outlet - left side (4).
19. Side Window Defogger Outlet Duct Retainer (2) » Install
20. Instrument Panel Outer Air Outlet Duct Bolt (1) » Install and tighten— [Link target (target-id 48114-) not found]



6205796

21. Instrument Panel Carrier Bolt (1) » Install and tighten— [Link target (target-id 148102-) not found]



6132763

22. Instrument Panel Upper Trim Panel » Install—[Link target (target-id 328968-) not found]
23. Perform the necessary programming and setup procedure: *Control Module References 2-3*.

Serial Data Gateway Module Replacement

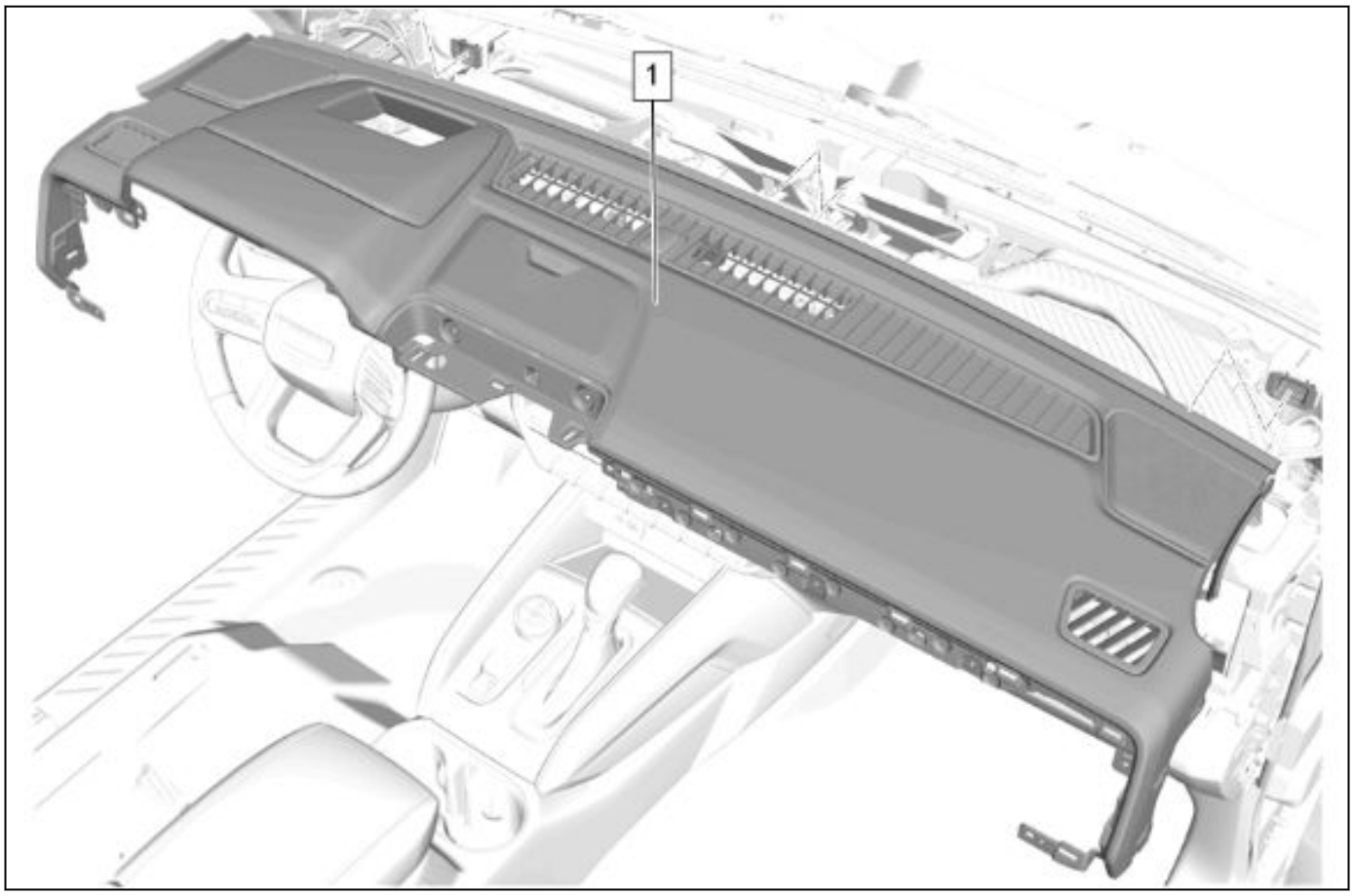
Removal Procedure

Warning: Refer to [Link target (target-id 178083-) not found] .

Caution: If a vehicle is equipped with a head curtain inflator module ensure that the inflator module and tether are undamaged. If tether or curtain airbag are damaged in any way, they must be replaced.

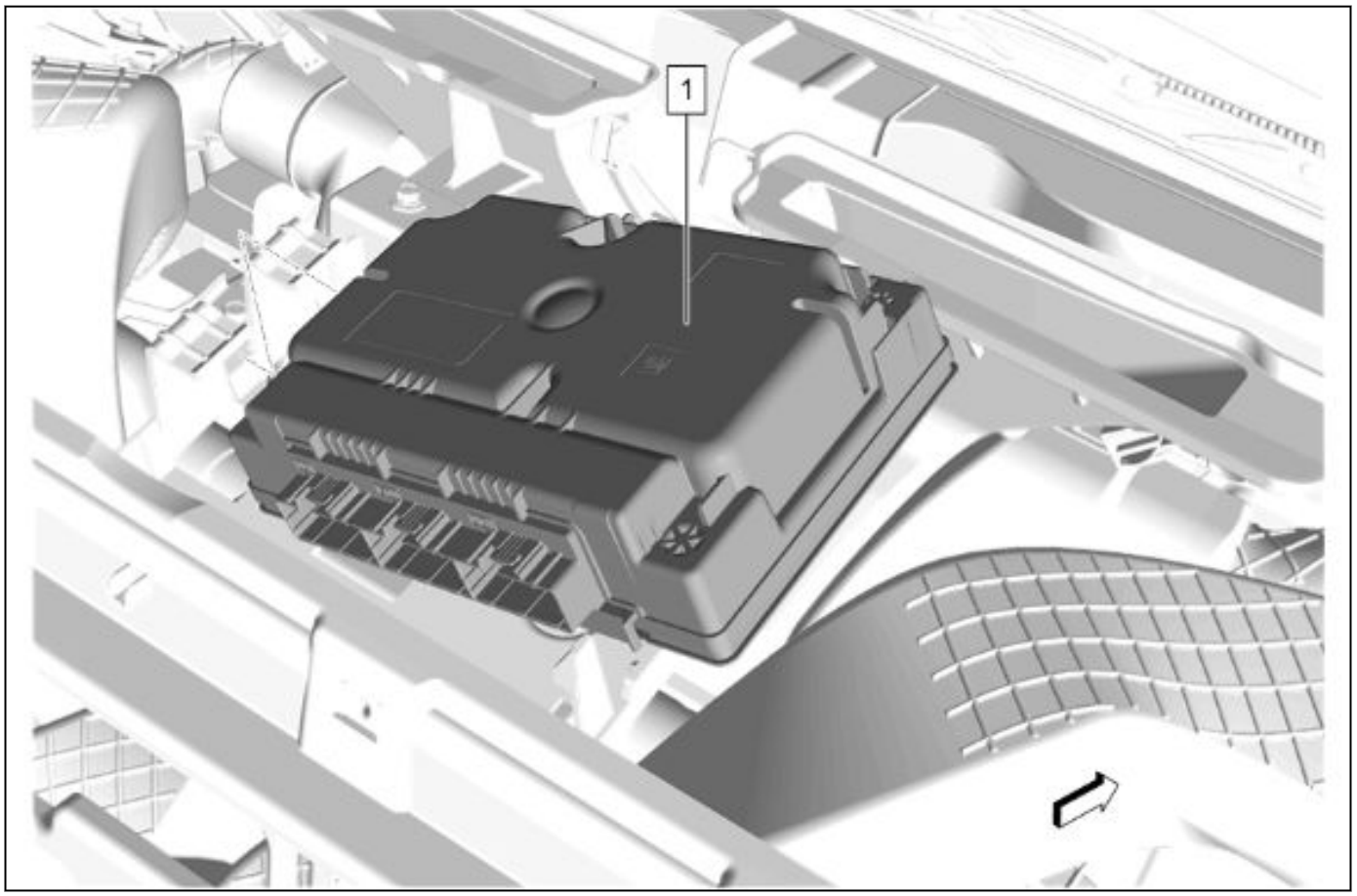
Caution: Use care when working around the head curtain inflator module. Sharp tools may puncture the curtain airbag. If the head curtain inflator module is damaged in any way, it must be replaced.

1. Disable the SIR system. [Link target (target-id 149662-) not found]



6132763

2. Instrument Panel Upper Trim Panel (1) » Remove
   — [Link target (target-id 328968-) not found]

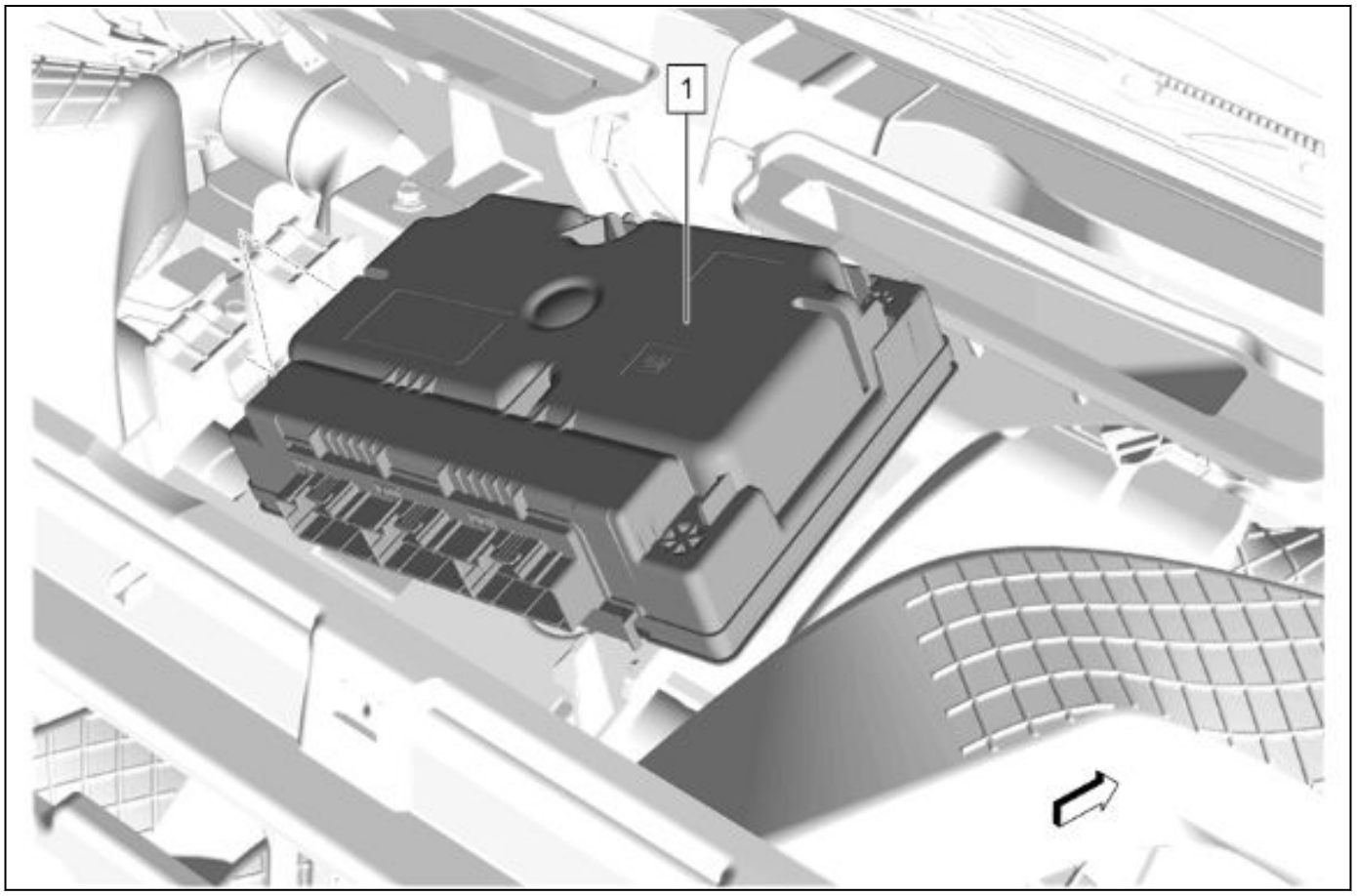


6154475

3. Disconnect the electrical connectors.
4. Release the retaining tabs.

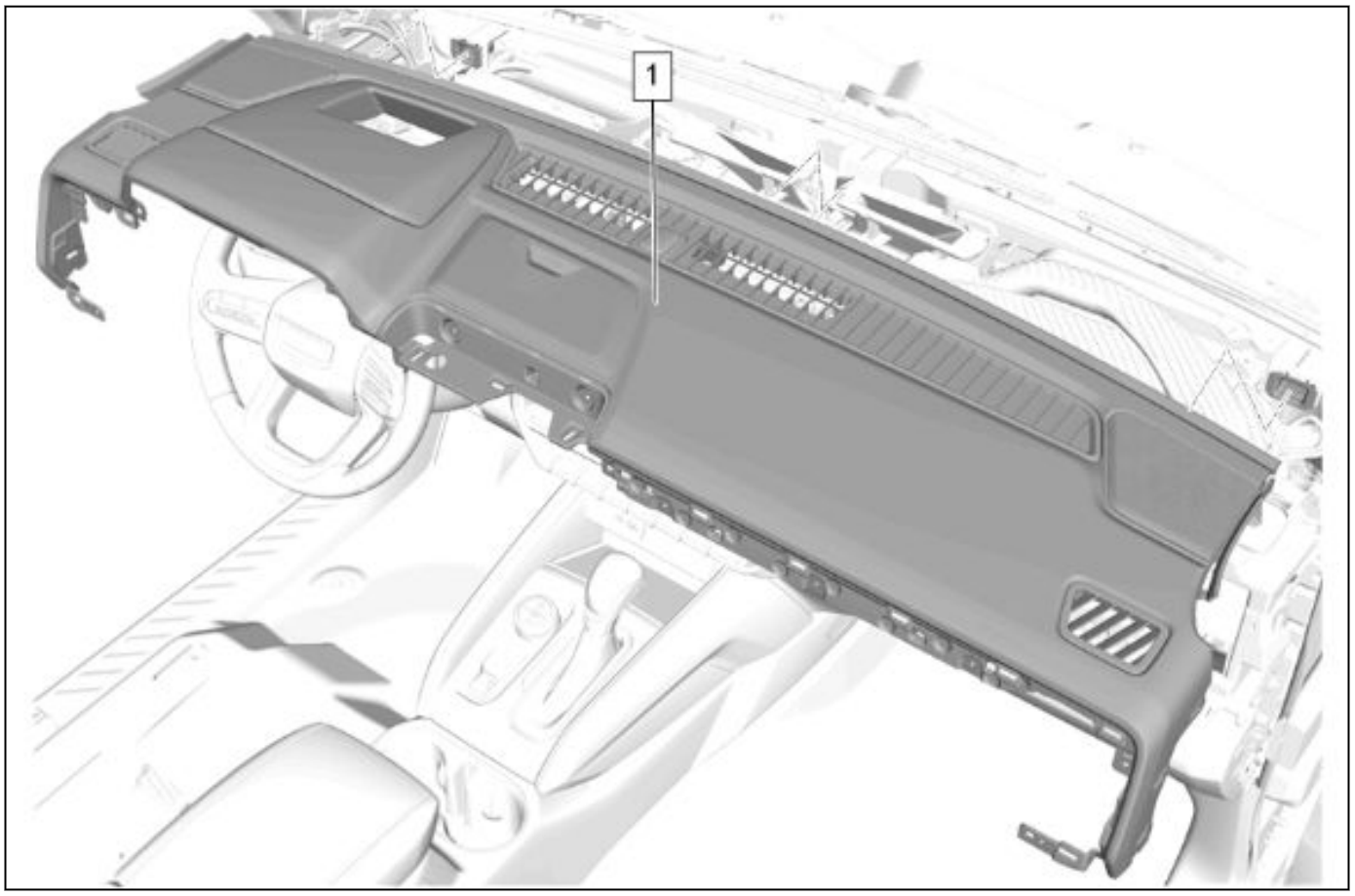
5. Serial Data Gateway Module (1) » Remove

Installation Procedure



6154475

1. Serial Data Gateway Module (1) » Install
2. Ensure that the retaining tabs are fully secured.
3. Connect the electrical connectors.



6132763

4. Instrument Panel Upper Trim Panel (1) » Install—[Link target (target-id 328968-) not found]
5. Enable the SIR System. [Link target (target-id 149662-) not found]

Description and Operation

Data Link Communications Description and Operation

Note: This is an overview of different serial data buses used by control modules to communicate with each others. Use *Data Communication Schematics 7-3* to find out which serial data buses are configured for a specific vehicle.

Data Link Communications Overview

There are many components in a vehicle that rely on information from other sources, transmit information to other sources, or both. Serial data communication networks provide a reliable, cost effective, way for various components of the vehicle to “talk” to one another and share information.

General Motors uses a number of different communication buses to ensure the timely and efficient exchange of information between control modules. When compared to each other, some of these buses are different in nature as far as speed, signal characteristics, and behavior.

On the other hand, when other buses are compared to each other they have similar characteristics and simply operate in parallel. In this case they are used to group together components which have high interaction. Examples are the Controller Area Network (CAN), private CAN, and Local Interconnect Network (LIN) buses. This allows them to communicate with each other on a bus with reduced message congestion insuring faster and the more timely exchange of information than if all vehicle control modules were on a single bus.

The majority of information that exists within a given network generally stays local; however some information will have to be shared on other networks. Control modules designated as Gateways perform the function of transferring information between the various buses. A Gateway module is connected to at least 2 buses and will interact with each network according to its message strategy and transmission models.

CAN provides the capability for a receiving control module to monitor message transmissions from other control modules in order to determine if messages of interest are not being received. The primary purpose is to allow reasonable default values to be substituted for the information no longer being received. Additionally, a control module may set a Diagnostic Trouble Code (DTC) to indicate that the control module it is expecting information from is no longer communicating.

K9 Body Control Module (BCM)

The body control system consists of the K9 Body Control Module, communications, and various input and outputs. Some inputs, outputs and messages require other control modules to interact with the K9 Body Control Module. The K9 Body Control Module also has discrete input and output terminals to control the vehicle's body functions. The K9 Body Control Module is wired to CAN bus and multiple LIN buses and acts as a gateway between them.

The various K9 Body Control Module input and output circuits are illustrated in the corresponding functional areas on the K9 Body Control Module electrical schematics. Refer to the *Body Control System Schematics 7-19* for more detailed information.

K56 Serial Data Gateway Module

The K56 Serial Data Gateway Module gates messages between the CAN networks described in the Controller Area Network (CAN) Bus Description section below. The K56 Serial Data Gateway Module needs to know what CAN control modules are present on a given vehicle in order to enable/disable loss of communication DTCs and to know which CAN control modules to track for their communication status. The K56 Serial Data Gateway Module has the ability to learn the diagnostic addresses list of CAN control modules to identify what CAN control modules are equipped on the vehicle and what CAN buses they are on. If the K56 Serial Data Gateway Module is replaced, this learn/verification process will have to be done again through K56 Serial Data Gateway Module programming and setup procedure in SPS. This learn process will not cause any previously learned contents to be forgotten/overwritten. If the learn process is not done on a new K56 Serial Data Gateway Module, DTC U1977 will be set until the learn procedure is executed. If the learn is invalid due to control module internal malfunction or a K56 Serial Data Gateway Module swap, DTC U3000 42 or DTC U3002 56 will be set. If any of these DTCs sets, the K56 Serial Data Gateway Module will enable loss of communication for all CAN control modules. This will result in loss of communication DTCs being set against CAN control modules that are not equipped on the vehicle.

A fault can be localized by monitoring the normal mode messages on a CAN bus. The K56 Serial Data Gateway Module will monitor one signal per CAN control module per CAN bus to determine control module status. When a signal times out, a loss of communication event will be started.

Controller Area Network (CAN) Bus Description

The CAN buses are used where data needs to be exchanged at a high enough rate to minimize the delay between the occurrence of a change in sensor value and the reception of this information by a control device using the information to adjust vehicle system performance.

Each CAN serial data network consists of two twisted wires. One signal circuit is identified as CAN-High and the other signal circuit is identified as CAN-Low. At each end of the data bus there is a 124 Ω termination resistor between the CAN-High and CAN-Low circuits. Most CAN control modules have an internal resistance of 4.950K Ω. There may be one or two CAN control modules that have a higher internal resistance like the K60 Column Lock Module which has an internal resistance of 77.4K Ω. The internal resistance of CAN control modules causes lower terminating resistor reading when splitting the CAN network to check for faults. The more CAN control modules on the network the lower the terminating resistor will read.

The data to be transmitted over a CAN bus is represented by the voltage difference between the CAN-High signal voltage and the CAN-Low signal voltage. Data symbols (1’s and 0’s) are transmitted sequentially at the following rate:

- CAN 1 (circuits 4986 & 4987) = 500 Kbit/s
- CAN 2 (circuits 4978 & 4979) = 2 Mbit/s
- CAN 3 (circuits 4976 & 4977) = 500 Kbit/s
- CAN 4 (circuits 4100 & 4101) = 500 Kbit/s
- CAN 5 (circuits 4984 & 4985) = 500 Kbit/s
- CAN 6 (circuits 4980 & 4981) = 5 Mbit/s
- CAN 7 (circuits 4982 & 4983) = 5 Mbit/s
- CAN 8 (circuits 4104 & 4105) = 2 Mbit/s
- CAN 9 (circuits 4102 & 4103) = 2 Mbit/s
- CAN 10 (circuits 10800 & 10801) = 2 Mbit/s

Classical CAN: CAN 1, CAN 3, CAN 4, and CAN 5 are Classical CAN buses. In Classical CAN, the entire message is transmitted at the same baud rate. The size of the data field is limited to 8 bytes.

CAN FD: CAN 2, CAN 8, CAN 9, and CAN 10 are CAN FD buses (FD = Flexible Data-Rate). In CAN FD, the data field of the message is transmitted at the same or at a faster baud rate. The size of the data field can be up to 64 bytes in length.

When the two wire bus is at rest the CAN-High and CAN-Low signal circuits are not being driven and this represents a logic “1”. In this state both signal circuits are at the same voltage of 2.5 V. The differential voltage is approximately 0 V.

When a logic “0” is to be transmitted, the CAN-High signal circuit is driven higher to about 3.5 V and the CAN-Low circuit is driven lower to about 1.5 V. The differential voltage becomes approximately 2.0 (+/- 0.5) V.

The CAN 1, CAN 2, CAN 3, CAN 4, CAN 5, CAN 8, CAN 9, and CAN 10 buses are used to communicate between the K56 Serial Data Gateway Module and other CAN control modules.

The CAN 8 and CAN 9 buses are reserved for the following systems:

- The CAN 8 bus is reserved for most control modules and sensors related to active safety system, if applicable.
- The CAN 9 bus is reserved for most control modules and sensors related to Hybrid/EV system, if applicable.

The following CAN buses are between the X84 Data Link Connector and the K56 Serial Data Gateway Module:

- The CAN 6 bus is used for CAN diagnostics and programming.
- The CAN 7 bus is used for programming by assembly plant only.
- The Private Presentation CAN 1 bus (circuits 2577 & 2578) is used by Engineering to observe data communications on CAN buses not directly accessible at the X84 Data Link Connector. It requires special security access and will not be used in a service environment.
- The Private Presentation CAN 2 bus (circuits 2579 & 2580) is used by Engineering to observe data communications on CAN buses not directly accessible at the X84 Data Link Connector. It requires special security access and will not be used in a service environment.

Private Powertrain CAN Bus Description

The Private Powertrain CAN bus (circuits 4054 & 4055) is reserved for Powertrain components. It has a transmission rate of 500 Kbit/s. Sometimes communication is required between the Private Powertrain CAN bus and another CAN bus. This is accomplished by using the K20 Engine Control Module / K45 Powertrain Control Module (for gas vehicles) or K16 Battery Energy Control Module (for electric vehicles) as the Gateway module. Since the Private Powertrain CAN bus and other CAN buses operate in the same manner, the diagnostics for each are similar.

Local Interconnect Network (LIN) Bus Description

The LIN Bus consists of a single wire with a transmission rate of 10.417 Kbit/s or 19.23 Kbit/s. This bus is used to exchange information between a master control module and other smart devices which provide supporting functionality. This type of configuration does not require the capacity or speed of a CAN bus and is thus relatively simpler.

The data symbols (1’s and 0’s) to be transmitted are represented by different voltage levels on the communication bus. When the LIN Bus is at rest and is not being driven, the signal is in a high voltage state of approximately Vbatt. This represents a logic “1”. When a logic “0” is to be transmitted, the signal voltage is driven low to about ground (0.0 V).

Ethernet Bus Description

Ethernet is a data communication technology that uses a single twisted copper pair of wires at speeds of 100 Mbit/s and 1000 Mbit/s. The Ethernet system uses point-to-point communication that is connected via an Ethernet switch [Module <--> Switch <--> Module]. The Ethernet bus does not use terminating resistors.

The K56 Serial Data Gateway Module and the A11 Radio have an Ethernet switch that connects to other Ethernet modules. The K56 Serial Data Gateway Module and the A11 Radio communicate with other devices and systems in the vehicle via CAN and LIN buses. Diagnostic Trouble Codes will be read on CAN to diagnose Ethernet, LIN and system faults.

Note: Ethernet harness failures should only be repaired using an appropriate kit to perform de-pin/re-pin overlays or in cases where the wiring harness repair kits are not available, the entire harness should be replaced. No crimps or splicing should be performed on the Ethernet wiring harness.

Ethernet 1

Ethernet bus 1 consists of 2 twisted pair of wires [1 pair for Ethernet bus 1R (circuits 4972 & 4973) and 1 pair for Ethernet bus 1T (circuits 4974 & 4975)]. It is connected between X84 Data Link Connector (DLC) and K56 Serial Data Gateway Module. This bus is used for diagnostics and service programming of control modules using Ethernet instead of CAN. The K56 Serial Data Gateway Module will convert Ethernet serial data to CAN as necessary, and vice versa. There is an Ethernet enable circuit (circuit 7207) which can be used to wake up the K56 Serial Data Gateway Module for Ethernet diagnostic and programming.

Ethernet 2

Ethernet bus 2 (circuits 4757 & 4758) is for connection between the A11 Radio and the K56 Serial Data Gateway Module.

Ethernet 3

Ethernet bus 3 (circuits 7208 & 7209) is for connection between the following control modules depending on vehicle configuration:

- K56 Serial Data Gateway Module and K179 Automated Driving Mapping Module.
- K56 Serial Data Gateway Module and K124 Image Processing Module.
- K56 Serial Data Gateway Module and B174W Front View Camera - Windshield.

Ethernet 4

Ethernet bus 4 (circuits 7210 & 7211) is for connection between the following control modules:

- K56 Serial Data Gateway Module and K73 Telematic Control Module for vehicles equipped with IOR radio.
- A11 Radio and K73 Telematic Control Module for vehicles equipped with other radios.

Ethernet 5

Ethernet bus 5 (circuits 7212 & 7213) is for connection between the A11 Radio and P22F Video Display - Right Front Seat Back.

Ethernet 6

Ethernet bus 6 (circuits 7214 & 7215) is for connection between the A11 Radio and T3 Audio Amplifier.

Ethernet 7

Ethernet bus 7 (circuits 7216 & 7217) is for connection between the K56 Serial Data Gateway Module and P16 Instrument Panel Cluster Control Module or K190 Off-Board Charger Control Module.

Ethernet 11

Ethernet bus 11 (circuits 7224 & 7225) is for connection between the K124 Image Processing Module and K179 Automated Driving Mapping Module.

Ethernet 14

Ethernet bus 14 (circuits 7230 & 7231) is for connection between the A11 Radio and P29 Head-Up Display.

Ethernet 15

Ethernet bus 15 (circuits 7232 & 7233) is for connection between the K56 Serial Data Gateway Module, K161 Vehicle Performance Data Recorder, and P22F Video Display - Passenger Seat Back.

X84 Data Link Connector (DLC)

The X84 Data Link Connector is a standardized 16-cavity connector. Connector design and location is dictated by an industry wide standard, and is required to provide the following:

- Terminal 1: CAN Bus 7 Serial Data [+]
- Terminal 2: Private Presentation CAN Bus 1 Serial Data [+]
- Terminal 3: Ethernet Bus 1R [+]
- Terminal 4: Scan tool power ground
- Terminal 5: Common signal ground
- Terminal 6: CAN Bus 6 Serial Data [+]
- Terminal 7: Private Presentation CAN Bus 2 Serial Data [+]
- Terminal 8: Ethernet Bus 1 Enable Signal
- Terminal 9: CAN Bus 7 Serial Data [-]
- Terminal 10: Private Presentation CAN Bus 1 Serial Data [-]
- Terminal 11: Ethernet Bus 1R [-]
- Terminal 12: Ethernet Bus 1T [+]
- Terminal 13: Ethernet Bus 1T [-]
- Terminal 14: CAN Bus 6 Serial Data [-]
- Terminal 15: Private Presentation CAN Bus 2 Serial Data [-]
- Terminal 16: Scan tool power, B+

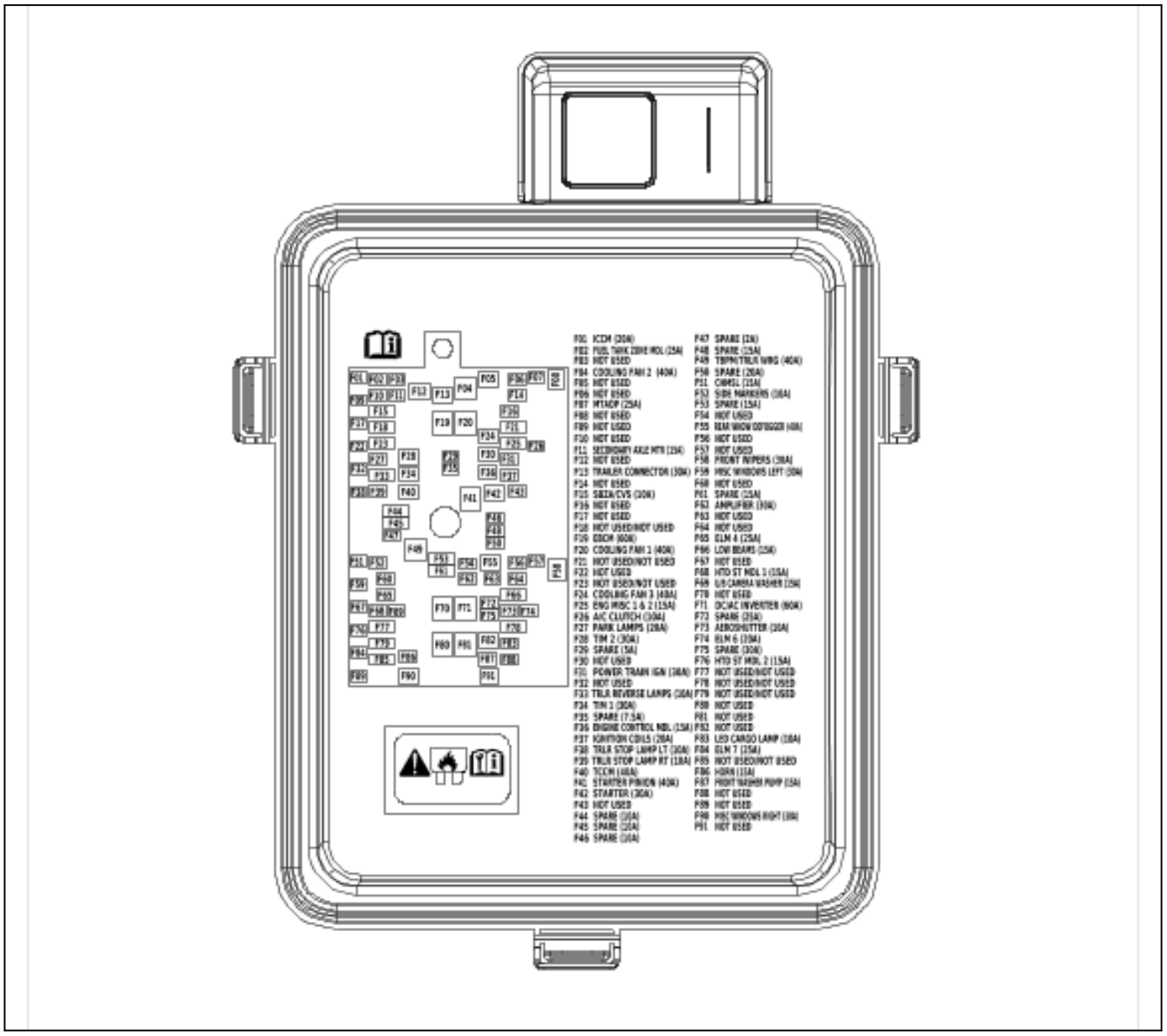
Serial Data Reference

The scan tool communicates over the various buses on the vehicle. When a scan tool is installed on a vehicle, the scan tool will try to communicate with every control module that could be optioned into the vehicle. If an option is not installed on the vehicle, the scan tool will display No Communication for that optional control module. In order to avert misdiagnoses of No Communication with a specific control module, refer to [Link target (target-id 148085-) not found] for a list of control modules and the buses they communicate with. Use schematics and specific vehicle build RPO codes to determine optional control modules.

Electrical Component and Inline Harness Connector End Views

Component Locator

X50A Engine Wiring Harness Junction Block Label



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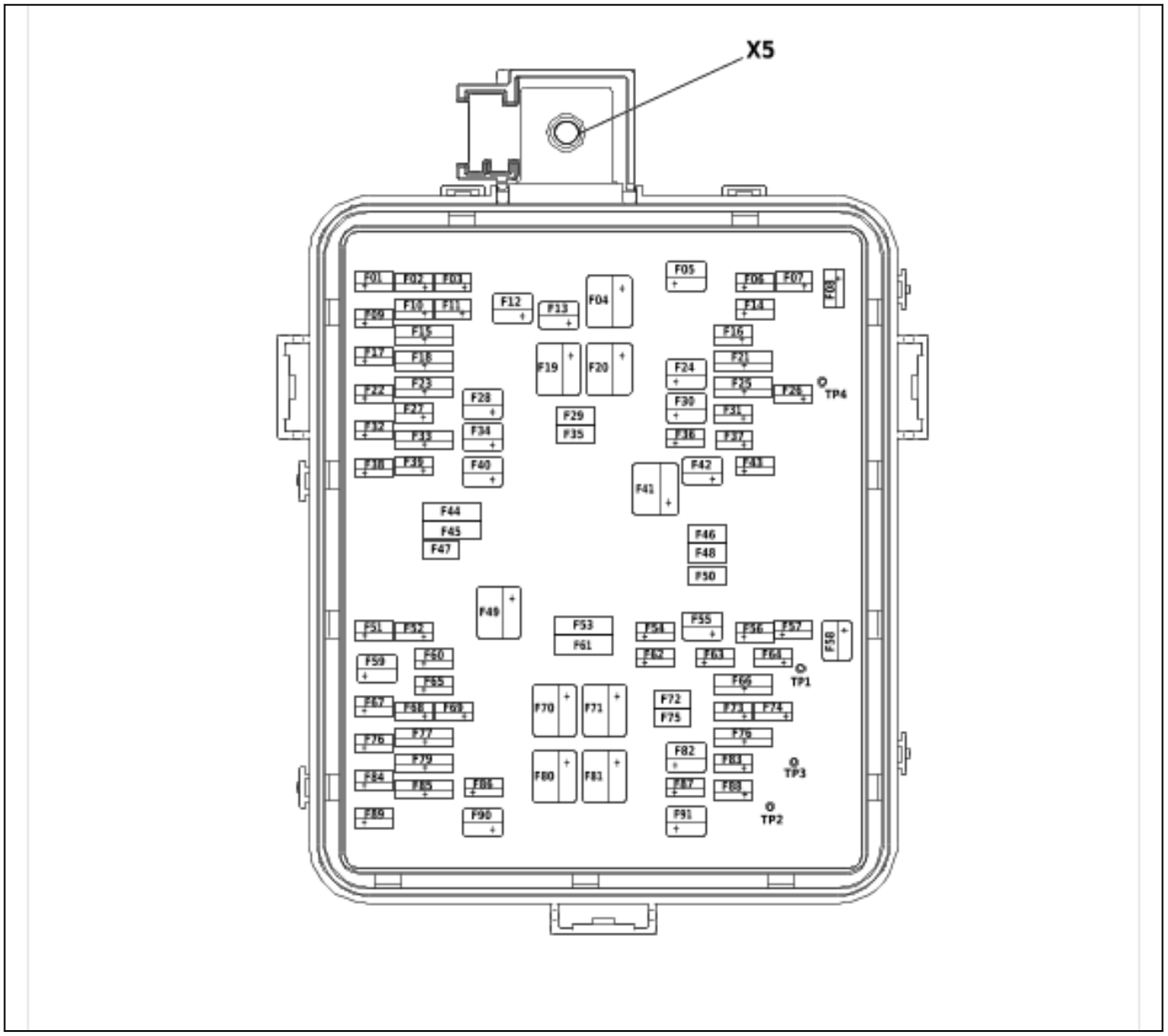
X50A Engine Wiring Harness Junction Block Top View



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Usage Table

No.	Device Label Name	Device Assigned Name	Rating	Description
Fuses				
F1	ICCM	F1UA	20A	• K38 Chassis Control Module
F2	FUEL TANK ZONE MDL	F2UA	25A	• K111 Fuel Pump Power Control Module
F3	NOT USED	F3UA	—	• Not Used
F4	COOLING FAN 2	F4UA	40A	• G10R Cooling Fan Motor - Right
F5	NOT USED	F5UA	—	• Not Used
F6	NOT USED	F6UA	—	• Not Used

No.	Device Label Name	Device Assigned Name	Rating	Description
F7	MTAOP	F7UA	25A	• G5 Automatic Transmission Auxiliary Fluid Pump (KL9)
F8	NOT USED	F8UA	—	• Not Used
F9	NOT USED	F9UA	—	• Not Used
F10	NOT USED	F10UA	—	• Not Used
F11	SECONDARY AXLE MTR	F11UA	15A	• M26 Front Drive Axle Actuator (NP0/NQH)
F12	NOT USED	F12UA	—	• Not Used
F13	TRAILER CONNECTOR	F13UA	30A	• X88B Tow Vehicle Electrical Receptacle
F14	NOT USED	F14UA	—	• Not Used
F15	SBZA/CVS	F15UA	10A	• B218L Side Obstacle Detection Control Module - Left (UFB/UKI) • B218R Side Obstacle Detection Control Module - Right (UFB/UKI) • Q13 Evaporative Emission Canister Vent Solenoid Valve
F16	NOT USED	F16UA	—	• Not Used
F17	NOT USED	F17UA	—	• Not Used
F18	NOT USED/NOT USED	F18UA	—	• Not Used
F19	EBCM	F19UA	60A	• K160 Brake System Control Module
F20	COOLING FAN 1	F20UA	40A	• G10L Cooling Fan Motor - Left
F21	NOT USED/NOT USED	F21UA	—	• Not Used
F22	NOT USED	F22UA	—	• Not Used
F23	NOT USED/NOT USED	F23UA	—	• Not Used
F24	COOLING FAN 3	F24UA	40A	• G10LW Cooling Fan Motor - Lower (Z82)
F25	ENG MISC 1 and 2	F25UA	15A	• B52A Heated Oxygen Sensor 1 • B52B Heated Oxygen Sensor 2 • B75 Mass Airflow Sensor • K20 Engine Control Module • G58 Evaporative Emission Canister Purge Pump • M129A Intake Camshaft Profile Actuator 1 • M129B Intake Camshaft Profile Actuator 2 • M129C Intake Camshaft Profile Actuator 3 • M129D Intake Camshaft Profile Actuator 4 • M130B Exhaust Camshaft Profile Actuator 2 • M130C Exhaust Camshaft Profile Actuator 3 • Q12 Evaporative Emission Canister Purge Solenoid Valve • Q40 Turbocharger Bypass Valve Solenoid • Q97B Engine C26uaoolant Flow Control Valve - Block
F26	A/C CLUTCH	F26UA	10A	• Q2 Air Conditioning Clutch
F27	PARK LAMPS	F27UA	20A	• X88B Tow Vehicle Electrical Receptacle (Z82-U1D)
F28	TIM 2	F28UA	30A	• K68 Trailer Lamp Control Module (U1D+Z82)

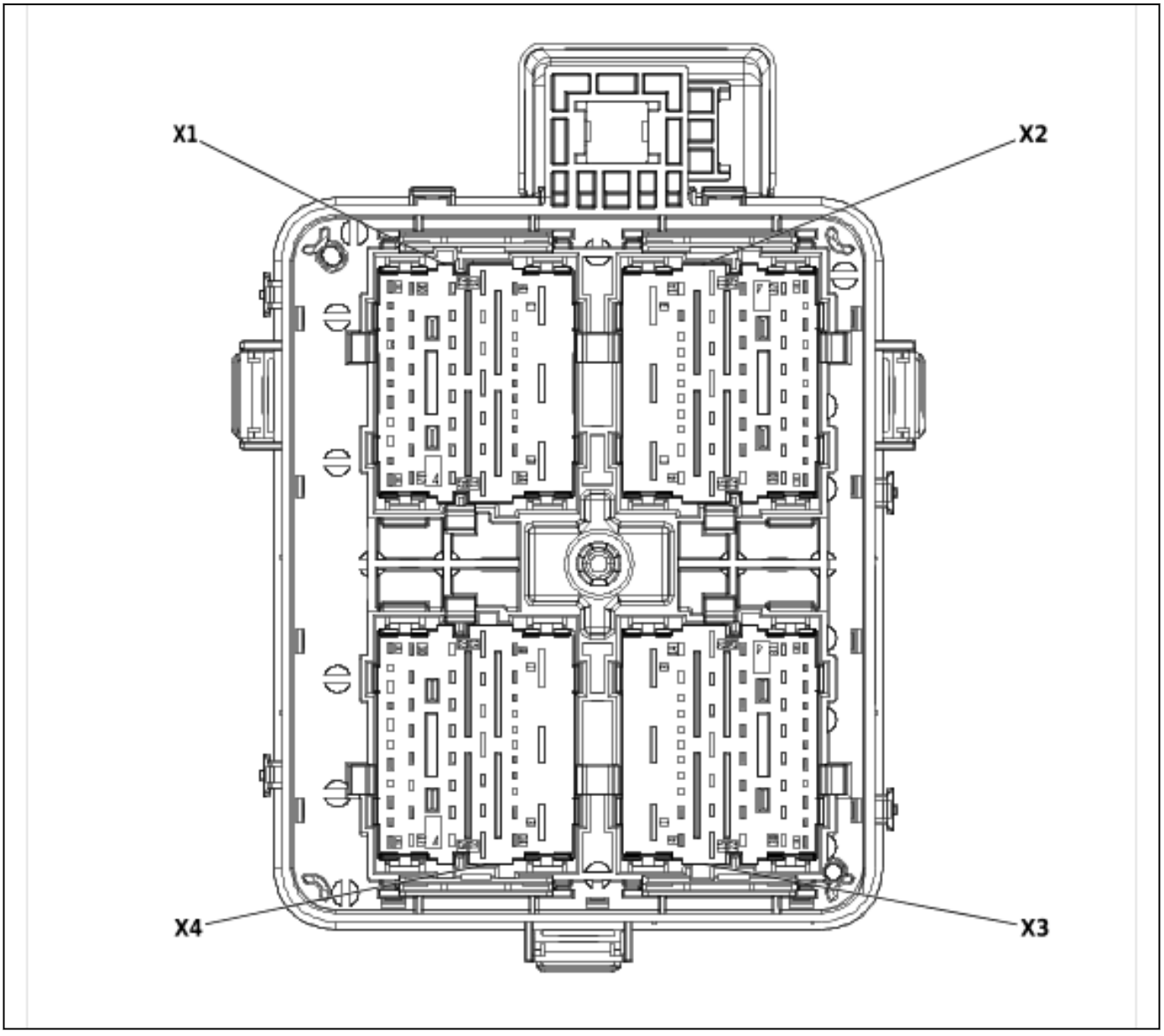
No.	Device Label Name	Device Assigned Name	Rating	Description
F29	SPARE	F29UA	5A	• Not Used
F30	NOT USED	F30UA	—	• Not Used
F31	POWER TRAIN IGN 1	F31UA	30A	• K20 Engine Control Module
F32	NOT USED	F32UA	—	• Not Used
F33	TRLR REVERSE LAMPS	F33UA	10A	• X88B Tow Vehicle Electrical Receptacle (Z82-U1D)
F34	TIM 1	F34UA	30A	• K68 Trailer Lamp Control Module (U1D+Z82)
F35	SPARE	F35UA	7.5A	• Not Used
F36	ENGINE CONTROL MDL	F36UA	15A	• K20 Engine Control Module
F37	IGNITION COILS	F37UA	20A	• K20 Engine Control Module • T8A Ignition Coil 1 • T8B Ignition Coil 2 • T8C Ignition Coil 3 • T8D Ignition Coil 4
F38	TRAIL STOP LAMP LT	F38UA	10A	• X88B Tow Vehicle Electrical Receptacle (Z82-U1D)
F39	TRAIL STOP LAMP RT	F39UA	10A	• X88B Tow Vehicle Electrical Receptacle (Z82-U1D)
F40	TCCM	F40UA	40A	• K69 Transfer Case Control Module (NP0/NQH)
F41	STARTER PINON	F41UA	40A	• M64 Starter
F42	STARTER	F42UA	30A	• M64 Starter
F43	SPARE	F43UA	10A	• Not Used
F44	SPARE	F44UA	10A	• Not Used
F45	SPARE	F45UA	10A	• Not Used
F46	SPARE	F46UA	10A	• Not Used
F47	SPARE	F47UA	2A	• Not Used
F48	SPARE	F48UA	15A	• Not Used
F49	TBPM/TRLR WRG	F49UA	40A	• K67 Trailer Brake Control Module (JL1+Z82) • W24 Blunt Cut -Trailer Brakes Provisions (Z82-JL1)
F50	SPARE	F50UA	20A	• Not Used
F51	CHMSL	F51UA	15A	• E6 High Mount Stop Lamp
F52	SIDE MARKERS	F52UA	10A	• Not Used
F53	SPARE	F53UA	15A	• Not Used
F54	NOT USED	F54UA	—	• Not Used
F55	REAR WNDS DEFOGGER	F55UA	40A	• E18 Rear Window Defogger Grid
F56	NOT USED	F56UA	—	• Not Used
F57	NOT USED	F57UA	—	• Not Used
F58	FRONT WIPERS	F58UA	30A	• KR12B Windshield Wiper Motor Relay • KR12C Windshield Wiper Motor Speed Control Relay
F59	MISC WINDOWS LEFT	F59UA	30A	• S79D Front Side Door Window Control Switch - Driver • S79LR Rear Side Door Window Switch - Left

No.	Device Label Name	Device Assigned Name	Rating	Description
F60	NOT USED	F60UA	—	• Not Used
F61	SPARE	F61UA	15A	• Not Used
F62	AMPLIFIER	F62UA	30A	• T3 Audio Amplifier (UQA)
F63	NOT USED	F63UA	—	• Not Used
F64	NOT USED	F64UA	—	• Not Used
F65	ELM 4	F65UA	25A	• K219 Lighting Control Module
F66	LOW BEAMS	F66UA	15A	• K221L Headlamp LED Driver Module - Left (T4L) • K221R Headlamp LED Driver Module - Right (T4L)
F67	NOT USED	F67UA	—	• Not Used
F68	HTD ST MDL 1	F68UA	15A	• K29FV Front Seat Heater Vent Control Module (KA1)
F69	U/B CAMERA WASHER	F69UA	15A	• KR204 Camera Washer Fluid Pump Relay - Underbody Cameras (UXA)
F70	NOT USED	F70UA	—	• Not Used
F71	DC/AC INVERTER	F71UA	60A	• T1 DC/AC Converter Control Module
F72	SPARE	F72UA	25A	• Not Used
F73	AEROSHUTTER	F73UA	10A	• M96 Active Grille Air Shutter Actuator • M96B Active Grille Air Shutter Actuator 2
F74	ELM 6	F74UA	20A	• K219 Lighting Control Module
F75	SPARE	F75UA	30A	• Not Used
F76	HTD ST MDL 2	F76UA	15A	• K29FV Front Seat Heater Vent Control Module (KA1)
F77	NOT USED/NOT USED	F77UA	—	• Not Used
F78	NOT USED/NOT USED	F78UA	—	• Not Used
F79	NOT USED/NOT USED	F79UA	—	• Not Used
F80	NOT USED	F80UA	—	• Not Used
F81	NOT USED	F81UA	—	• Not Used
F82	NOT USED	F82UA	—	• Not Used
F83	LED CARGO LAMP	F83UA	10A	• W26 Blunt Cut - Cargo Lamps Provision (S0Y)
F84	ELM 7	F84UA	25A	• K219 Lighting Control Module
F85	NOT USED/NOT USED	F85UA	—	• Not Used
F86	HORN	F86UA	15A	• P13 Horn
F87	FRONT WASHER PUMP	F87UA	15A	• KR11 Windshield Washer Pump Relay
F88	NOT USED	F88UA	—	• Not Used
F89	NOT USED	F89UA	—	• Not Used
F90	MISC WINDOWS RIGHT	F90UA	30A	• S79P Front Side Door Window Switch - Passenger • S79RR Rear Side Door Window Switch - Right
F91	NOT USED	F91UA	—	• Not Used
Note: Relays listed below are non-serviceable Printed Circuit Board (PCB) relays and are internal to the block.				
—	—	KR3 Horn Relay	—	• F86UA

No.	Device Label Name	Device Assigned Name	Rating	Description
—	—	KR5 Rear Window Defogger Relay	—	• F55UA • F63UA
—	—	KR11 Windshield Washer Pump Relay	—	• G24 Windshield Washer Pump
—	—	KR12B Windshield Wiper Motor Relay	—	• M75 Windshield Wiper Motor
—	—	KR12C Windshield Wiper Motor Speed Control Relay	—	• M75 Windshield Wiper Motor
—	—	KR27 Starter Motor	—	• F42UA
—	—	KR27C Engine Restart Relay	—	• F41UA
—	—	KR29 A/C Compressor Clutch Relay	—	• F26UA
—	—	KR41 High Mount Stop Lamp Relay	—	• F51UA
—	—	KR53 Parking Lamp Relay	—	• F27UA • F25UA • F60UA
—	—	KR61 Trailer Backup Lamp Relay	—	• F33UA
—	—	KR63L Trailer Stop/ Turn Signal Lamp Relay - Left	—	• F38UA
—	—	KR63R Trailer Stop/ Turn Signal Lamp Relay - Right	—	• F39UA
—	—	KR75 Engine Controls Ignition Relay	—	• F14UA • F16UA • F21UA • F25UA • F31UA • F37UA • F43UA • F73UA
—	—	KR203 Front Drive Axle Actuator Relay	—	• F11UA
—	—	KR202 Accessory AC and DC Power Control Module Relay	—	• F71UA
—	—	KR204 Camera Washer Fluid Pump Relay - Underbody Cameras	—	• G24 Windshield Washer Pump
Note: Items listed below are diagnostic test points for Wiper/Washer				
TP1	—	TP1	—	• Front Wiper Control
TP2	—	TP2	—	• Front Wiper High

No.	Device Label Name	Device Assigned Name	Rating	Description
TP3	—	TP3	—	• Front Wiper Low
Note: Items listed below are diagnostic test points not used				
TP4	—	TP4	—	• Not Used

X50A Engine Wiring Harness Junction Block Bottom View



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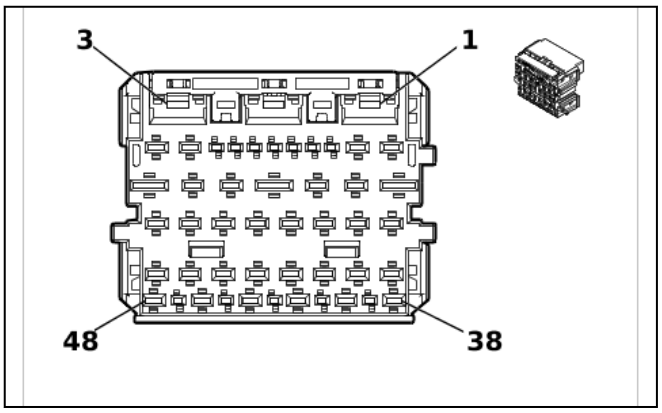
X50A Engine Wiring Harness Junction Block X1



5834300

Connector Part Information

- Harness Type: Chassis Wiring Harness
- OEM Connector: 7298-4594-60
- Service Connector: 85595153
- Description: 48-Way F 1.5, 2.8, 6.3 MCP, 9.5 YESC Series(GN)

Terminal Part Information

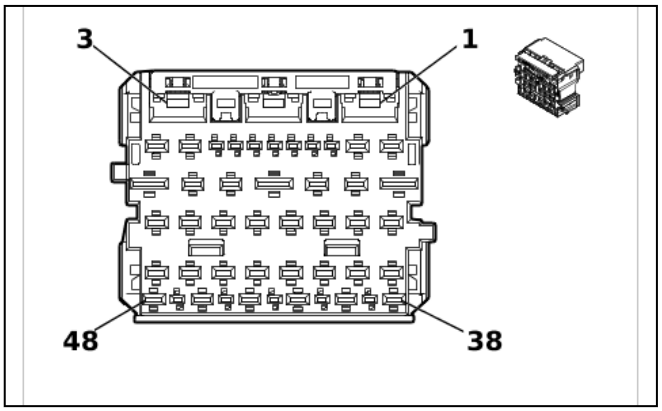
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19333301	J-35616-22 (RD)	J-38125-215A
II	84764078	J-35616-42 (RD)	J-38125-215A
III	84779405	J-35616-35 (VT)	J-38125-215A

X50A Engine Wiring Harness Junction Block X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 4	(1) RD / VT	(1) 1242	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 6	(2) RD / BN	(2) 440	(2) Battery Positive Voltage	(2) I	(2) —
3 - 14	—	—	—	Not Occupied	—	—
(15) 15	(15) 3	(15) RD / WH	(15) 2242	(15) Battery Positive Voltage	(15) II	(15) —
(16) 16	(16) 2.5	(16) RD / YE	(16) 5840	(16) Battery Positive Voltage	(16) III	(16) —
(17) 17	(17) 2.5	(17) RD / VT	(17) 5640	(17) Battery Positive Voltage	(17) III	(17) —
18	—	—	—	Not Occupied	—	—
(19) 19	(19) 3	(19) RD / GY	(19) 1042	(19) Battery Positive Voltage	(19) III	(19) —
20 - 26	—	—	—	Not Occupied	—	—
(27) 27	(27) 0.5	(27) RD / WH	(27) 4140	(27) Battery Positive Voltage	(27) III	(27) —
(28) 28	(28) 0.5	(28) GN	(28) 8016	(28) Secondary Axle Motor Control	(28) III	(28) —
29	—	—	—	Not Occupied	—	—
(30) 30	(30) 0.75	(30) GN / VT	(30) 1619	(30) Right Rear Trailer Stop/Turn Lamp Control	(30) III	(30) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(31) 31	(31) 0.75	(31) WH / GN	(31) 1624	(31) Trailer Backup Lamp Control	(31) III	(31) —
(32) 32	(32) 1.5	(32) GY / BN	(32) 2109	(32) Trailer Park Lamp Control	(32) III	(32) —
33 - 34	—	—	—	Not Occupied	—	—
(35) 35	(35) 0.5	(35) RD / BN	(35) 4940	(35) Battery Positive Voltage	(35) III	(35) —
36	—	—	—	Not Occupied	—	—
(37) 37	(37) 3	(37) RD / VT	(37) 1940	(37) Battery Positive Voltage	(37) III	(37) —
(38) 38	(38) 0.75	(38) YE / GY	(38) 1618	(38) Left Rear Trailer Stop/Turn Lamp Control	(38) III	(38) —
39 - 47	—	—	—	Not Occupied	—	—
(48) 48	(48) 1	(48) RD / WH	(48) 2140	(48) Battery Positive Voltage	(48) III	(48) —

X50A Engine Wiring Harness Junction Block X2



5838162

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 7298-4593-40
- Service Connector: 85595155
- Description: 48-Way F 1.5, 2.8, 6.3 MCP, 9.5 YESC Series(GY)

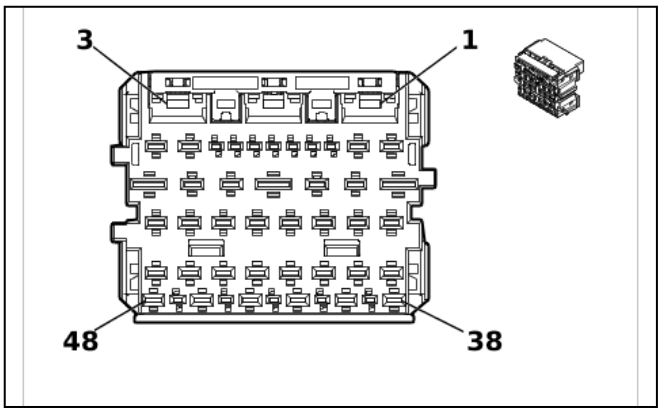
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19333301	J-35616-22 (RD)	J-38125-215A
II	19369711	J-35616-14 (GN)	EL-38125-560A
III	84764078	J-35616-42 (RD)	J-38125-215A
IV	84779405	J-35616-35 (VT)	J-38125-215A

X50A Engine Wiring Harness Junction Block X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 5	(1) RD / YE	(1) 1442	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 5	(2) RD / BU	(2) 1542	(2) Battery Positive Voltage	(2) I	(2) —
(3) 3	(3) 4	(3) YE / GN	(3) 4358	(3) Starter Pinion Solenoid Voltage	(3) I	(3) —
4 - 9	—	—	—	Not Occupied	—	—
(10) 10	(10) 0.5	(10) VT / GY	(10) 8017	(10) Secondary Axle Motor Relay Control	(10) II	(10) —
11	—	—	—	Not Occupied	—	—
(12) 12	(12) 0.5	(12) YE / VT	(12) 4325	(12) Starter Pinion Solenoid Actuator Relay Control	(12) II	(12) —
13 - 17	—	—	—	Not Occupied	—	—
(18) 18	(18) 5	(18) RD / GY	(18) 1342	(18) Battery Positive Voltage	(18) III	(18) —
19	—	—	—	Not Occupied	—	—
(20) 20	(20) 0.5	(20) RD / WH	(20) 140	(20) Battery Positive Voltage	(20) IV	(20) —
(21) 21	(21) 2.5	(21) YE	(21) 6	(21) Starter Solenoid Crank Ignition Voltage	(21) III	(21) —
22 - 25	—	—	—	Not Occupied	—	—
(26) 26	(26) 0.5	(26) VT / BU	(26) 5294	(26) Powertrain Main Relay Fused Supply Voltage 5	(26) IV	(26) —
(27) 27	(27) 2	(27) VT / BU	(27) 5290	(27) Powertrain Main Relay Fused Supply Voltage 1	(27) IV	(27) —
(28) 28	(28) 1	(28) VT / BU	(28) 5291	(28) Powertrain Main Relay Fused Supply Voltage 2	(28) IV	(28) —
29 - 33	—	—	—	Not Occupied	—	—
(34) 34	(34) 0.5	(34) VT / BU	(34) 5293	(34) Powertrain Main Relay Fused Supply Voltage 4	(34) IV	(34) —
(35) 35	(35) 0.5	(35) YE	(35) 5991	(35) Powertrain Relay Coil Control	(35) IV	(35) —
(36) 36	(36) 1	(36) YE / BK	(36) 625	(36) Starter Enable Relay Control	(36) IV	(36) —
37	—	—	—	Not Occupied	—	—
(38) 38	(38) 1.5	(38) RD / BU	(38) 840	(38) Battery Positive Voltage	(38) IV	(38) —
39 - 43	—	—	—	Not Occupied	—	—
(44) 44	(44) 0.75	(44) BN / GN	(44) 59	(44) Air Conditioning Compressor Clutch Control	(44) IV	(44) —
45 - 46	—	—	—	Not Occupied	—	—
(47) 47	(47) 0.5	(47) WH / GY	(47) 459	(47) Air Conditioning Compressor Clutch Relay Control	(47) II	(47) —
48	—	—	—	Not Occupied	—	—

X50A Engine Wiring Harness Junction Block X3



5833039

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 7298-4633-90
- Service Connector: 85595154
- Description: 48-Way F 1.5, 2.8, 6.3 MCP, 9.5 YESC Series(BU)

Terminal Part Information

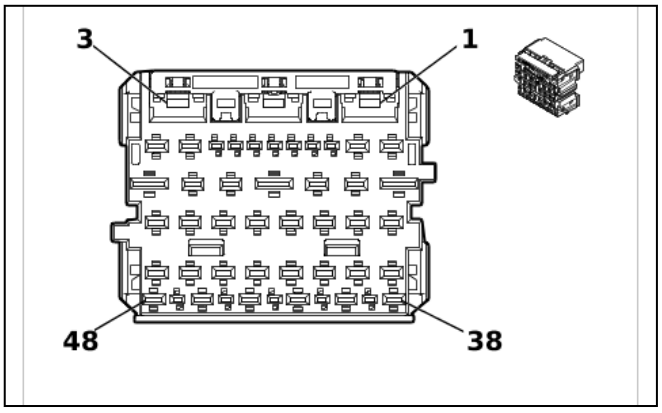
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19333301	J-35616-22 (RD)	J-38125-215A
II	19369711	J-35616-14 (GN)	EL-38125-560A
III	84764078	J-35616-42 (RD)	J-38125-215A
IV	84779405	J-35616-35 (VT)	J-38125-215A

X50A Engine Wiring Harness Junction Block X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	—
(2) 2	(2) 5	(2) BN / BK	(2) 4629	(2) DC/AC Inverter Control	(2) I	(2) —
3 - 4	—	—	—	Not Occupied	—	—
(5) 5	(5) 3	(5) RD / YE	(5) 3740	(5) Battery Positive Voltage	(5) IV	(5) —
(6) 6	(6) 0.35	(6) BN / VT	(6) 193	(6) Rear Defogger Relay Control	(6) II	(6) —
7 - 10	—	—	—	Not Occupied	—	—
(11) 11	(11) 0.5	(11) WH / GN	(11) 4628	(11) DC/AC Inverter Relay Control	(11) II	(11) —
12	—	—	—	Not Occupied	—	—
(13) 13	(13) 0.35	(13) BN / GY	(13) 2268	(13) Windshield Washer Relay Control	(13) IV	(13) —
(14) 14	(14) 0.75	(14) BK	(14) 2250	(14) Ground	(14) IV	(14) —
(15) 15	(15) 2.5	(15) BN / VT	(15) 293	(15) Rear Defogger Grid Control	(15) III	(15) —
16 - 19	—	—	—	Not Occupied	—	—
(20) 20	(20) 0.75	(20) GY / VT	(20) 228	(20) Windshield Washer Pump Control	(20) IV	(20) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
21 - 23	—	—	—	Not Occupied	—	—
(24) 24	(24) 0.75	(24) RD / WH	(24) 640	(24) Battery Positive Voltage	(24) IV	(24) —
(25) 25	(25) 0.5	(25) VT / BU	(25) 5705	(25) Powertrain Main Relay Control	(25) IV	(25) —
26	—	—	—	Not Occupied	—	—
(27) 27	(27) 0.75	(27) RD / BU	(27) 840	(27) Battery Positive Voltage	(27) IV	(27) —
28 - 31	—	—	—	Not Occupied	—	—
(32) 32	(32) 0.75	(32) RD / YE	(32) 740	(32) Battery Positive Voltage	(32) IV	(32) —
(33) 33	(33) 1	(33) RD / VT	(33) 1640	(33) Battery Positive Voltage	(33) IV	(33) —
34 - 40	—	—	—	Not Occupied	—	—
(41) 41	(41) 0.35	(41) GY	(41) 91	(41) Windshield Wiper Motor Relay Coil Control	(41) II	(41) —
42 - 43	—	—	—	Not Occupied	—	—
(44) 44	(44) 2.5	(44) BK	(44) 150	(44) Ground	(44) IV	(44) —
45	—	—	—	Not Occupied	—	—
(46) 46	(46) 2.5	(46) YE / BN	(46) 95	(46) Windshield Wiper Motor Low Speed Control	(46) IV	(46) —
(47) 47	(47) 0.35	(47) WH / VT	(47) 860	(47) Windshield Wiper Switch High Signal	(47) II	(47) —
(48) 48	(48) 2.5	(48) WH	(48) 92	(48) Windshield Wiper Motor High Speed Control	(48) IV	(48) —

X50A Engine Wiring Harness Junction Block X4



5830395

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 7298-4588-30
- Service Connector: 85650078
- Description: 48-Way F 1.5, 2.8, 6.3 MCP, 9.5 YESC Series(BK)

Terminal Part Information

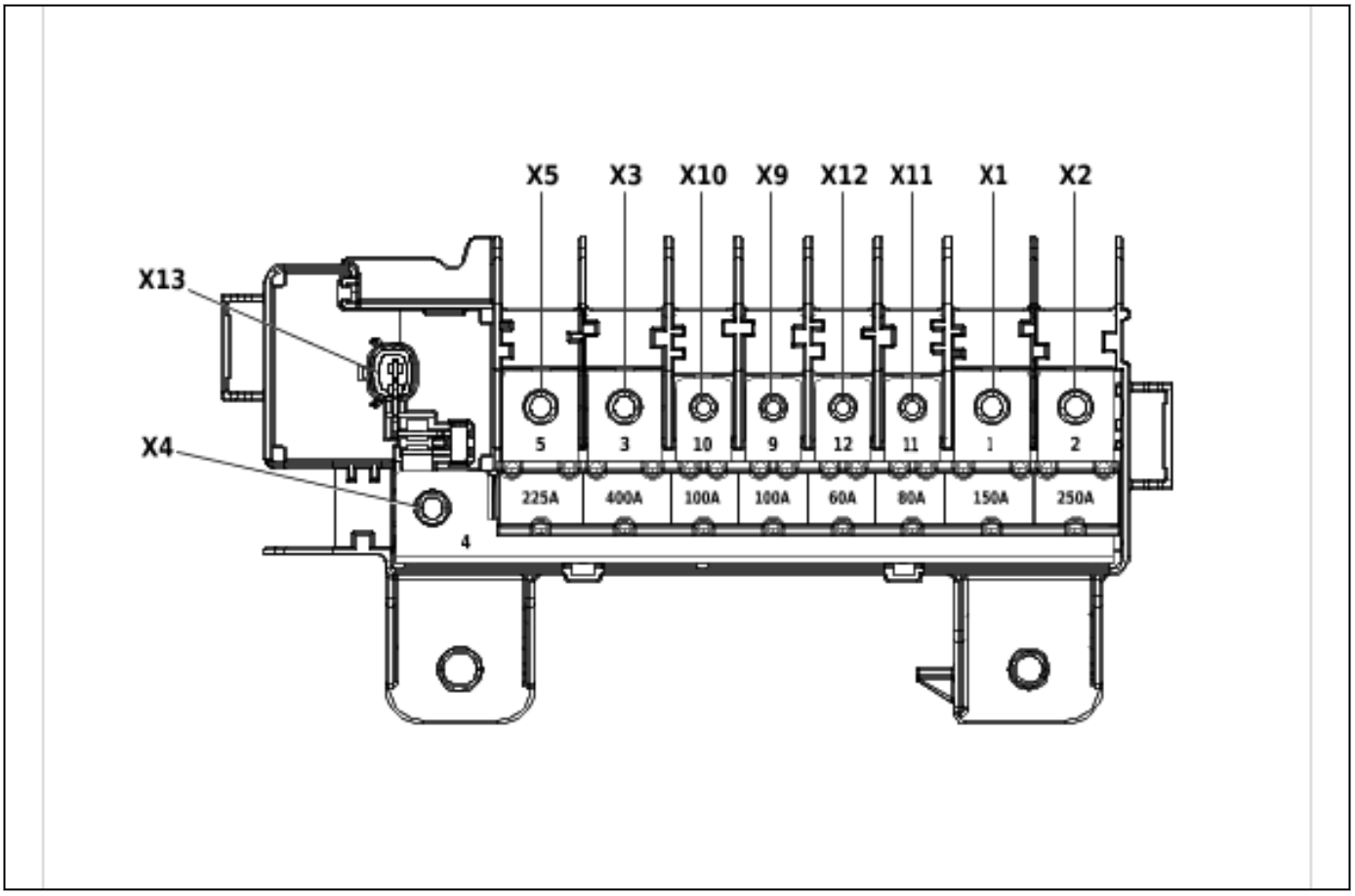
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19333301	J-35616-22 (RD)	J-38125-215A
II	19369711	J-35616-14 (GN)	EL-38125-560A
III	84764078	J-35616-42 (RD)	J-38125-215A
IV	84779405	J-35616-35 (VT)	J-38125-215A

X50A Engine Wiring Harness Junction Block X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	—
(3) 3	(3) 4	(3) RD / BN	(3) 4142	(3) Primary Fused Battery Positive Voltage	(3) I	(3) —
(4) 4	(4) 2.5	(4) BK	(4) 2250	(4) Ground	(4) IV	(4) —
(5) 5	(5) 0.35	(5) BN / WH	(5) 28	(5) Horn Relay Control	(5) IV	(5) —
6 - 14	—	—	—	Not Occupied	—	—
(15) 15	(15) 2.5	(15) RD / GY	(15) 3540	(15) Battery Positive Voltage	(15) III	(15) —
(16) 16	(16) 0.75	(16) BN / GY	(16) 29	(16) Horn Control	(16) IV	(16) —
(17) 17	(17) 0.5	(17) RD / VT	(17) 3340	(17) Battery Positive Voltage	(17) IV	(17) —
18	—	—	—	Not Occupied	—	—
(19) 19	(19) 0.35	(19) GN / WH	(19) 2270	(19) Rear Window Washer Relay Control	(19) IV	(19) —
20 - 21	—	—	—	Not Occupied	—	—
(22) 22	(22) 2.5	(22) RD / GY	(22) 3540	(22) Battery Positive Voltage	(22) IV	(22) —
23 - 25	—	—	—	Not Occupied	—	—
(26) 26	(26) 0.75	(26) BU / VT	(26) 392	(26) Rear Window Washer Pump Control	(26) IV	(26) —
(27) 27	(27) 1.5	(27) RD / BN	(27) 1440	(27) Battery Positive Voltage	(27) IV	(27) —
28	—	—	—	Not Occupied	—	—
(29) 29	(29) 0.35	(29) BU / BN	(29) 38	(29) Backup Lamp Relay Control	(29) IV	(29) —
(30) 30	(30) 2.5	(30) RD / YE	(30) 4340	(30) Battery Positive Voltage	(30) IV	(30) —
31 - 33	—	—	—	Not Occupied	—	—
(34) 34	(34) 0.75	(34) RD / BU	(34) 4540	(34) Battery Positive Voltage	(34) IV	(34) —
(35) 35	(35) 0.35	(35) WH / BN	(35) 7055	(35) Auxiliary Park Lamp Relay Control	(35) IV	(35) —
36 - 39	—	—	—	Not Occupied	—	—
(40) 40	(40) 1.5	(40) RD / GY	(40) 1740	(40) Battery Positive Voltage	(40) IV	(40) —
41	—	—	—	Not Occupied	—	—
(42) 42	(42) 0.75	(42) RD / VT	(42) 4640	(42) Battery Positive Voltage	(42) IV	(42) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(43) 43	(43) 0.35	(43) GN / BN	(43) 319	(43) Right Rear Trailer Stop/Turn Lamp Control	(43) II	(43) —
44	—	—	—	Not Occupied	—	—
(45) 45	(45) 0.35	(45) BN / YE	(45) 820	(45) Center High Mounted Stop Lamp Supply Voltage	(45) II	(45) —
(46) 46	(46) 2.5	(46) RD / BU	(46) 1240	(46) Battery Positive Voltage	(46) IV	(46) —
(47) 47	(47) 0.35	(47) YE / BU	(47) 318	(47) Left Rear Trailer Stop/Turn Lamp Control	(47) II	(47) —
(48) 48	(48) 0.5	(48) BU / BK	(48) 1053	(48) Center High Mounted Stop Lamp Control 3	(48) IV	(48) —

X50B Battery Distribution Engine Compartment Fuse Block Top View



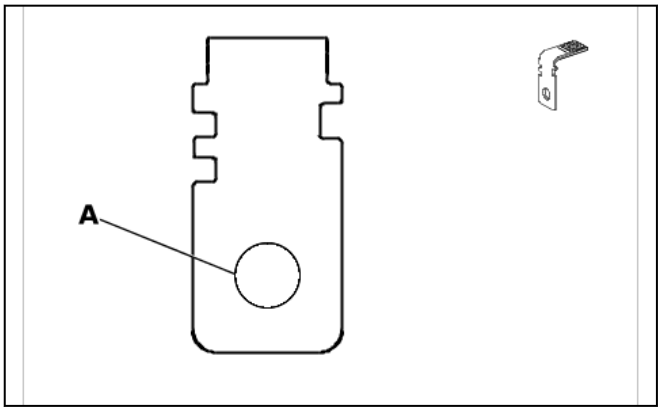
6181031

Usage Table

No.	Device Label Name	Device Assigned Name	Rating	Description
Fuses				
1	—	F1BA	150A	• K43 Power Steering Control Module
2	—	F2BA	250A	• X50A Engine Wiring Harness Junction Block
3	—	F3BA	400A	• M64 Starter

No.	Device Label Name	Device Assigned Name	Rating	Description
5	—	F5BA	225A	• G13 Generator (-Z82)
5	—	F5BA	300A	• G13 Generator (Z82)
9	—	F9BA	100A	• X51A Instrument Panel Wiring Harness Junction Block
10	—	F10BA	100A	• X51A Instrument Panel Wiring Harness Junction Block
11	—	F11BA	80A	• G59 Engine Coolant Pump
12	—	F12BA	60A	• K160 Brake System Control Module
13	—	F13BA	5A	• B110 Battery Monitor Module

X50B Battery Distribution Engine Compartment Fuse Block X1



5877003

Connector Part Information
- Harness Type: Power Steering Wiring Harness
- OEM Connector: 84809754
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way Ring Terminal

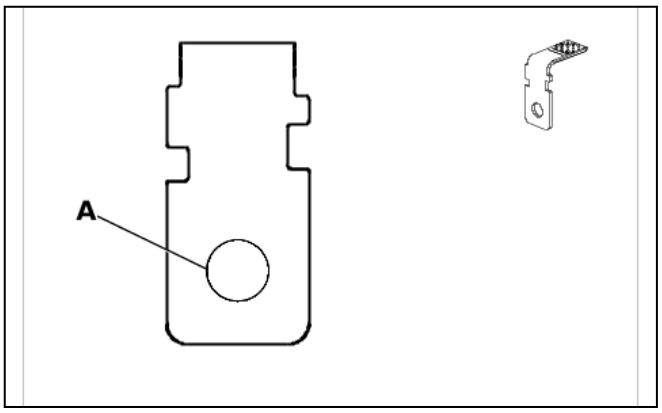
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X50B Battery Distribution Engine Compartment Fuse Block X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	35	RD / VT	542	Battery Positive Voltage	I	—

X50B Battery Distribution Engine Compartment Fuse Block X2



5902836

Connector Part Information
- Harness Type: X1-84809755
- OEM Connector: 84809755
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way Ring Terminal

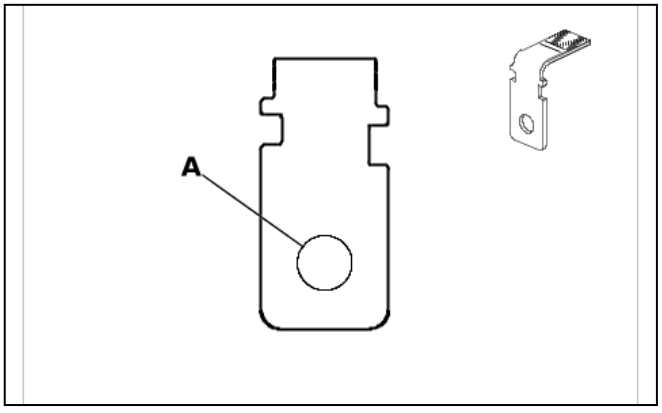
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X50B Battery Distribution Engine Compartment Fuse Block X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	35	RD / WH	4042	Battery Positive Voltage	I	—

X50B Battery Distribution Engine Compartment Fuse Block X3



6239421

Connector Part Information
- Harness Type: X1-84809753
- OEM Connector: 84809753
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way Ring Terminal

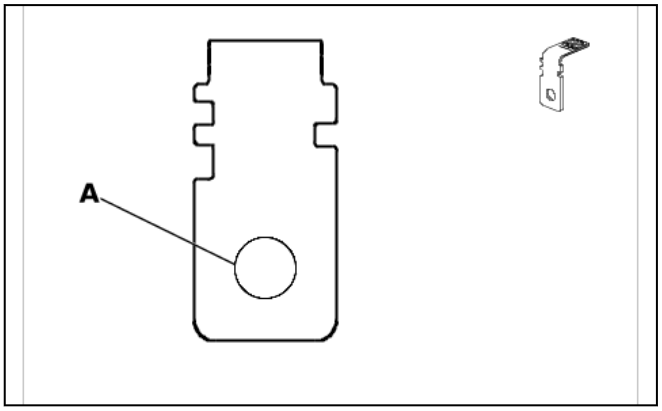
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X50B Battery Distribution Engine Compartment Fuse Block X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	35	RD / YE	2	Battery Positive Voltage	I	—

X50B Battery Distribution Engine Compartment Fuse Block X5 (Z82)



5876995

Connector Part Information

- Harness Type: X1-84809752
- OEM Connector: 84809752
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way Ring Terminal

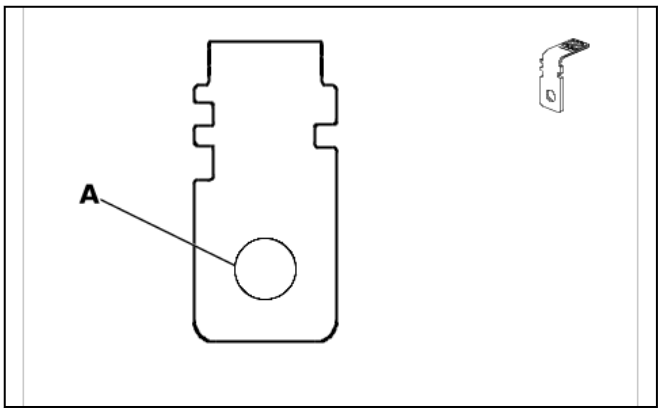
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X50B Battery Distribution Engine Compartment Fuse Block X5 (Z82)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	35	RD / YE	2	Battery Positive Voltage	I	—

X50B Battery Distribution Engine Compartment Fuse Block X5 (-Z82)



5876995

Connector Part Information
- Harness Type: X1-84809752
- OEM Connector: 84809752
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way Ring Terminal

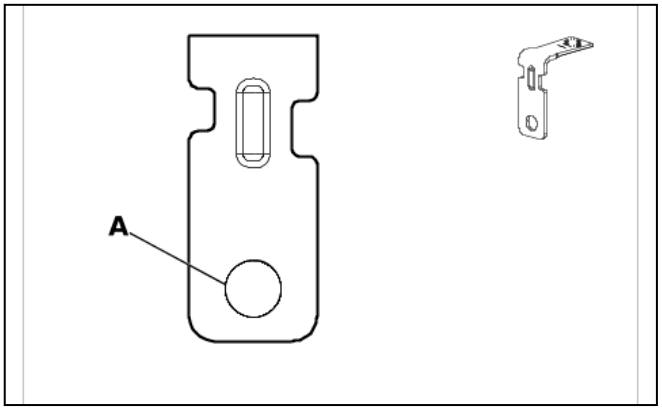
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X50B Battery Distribution Engine Compartment Fuse Block X5 (-Z82)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	35	RD / YE	2	Battery Positive Voltage	I	—

X50B Battery Distribution Engine Compartment Fuse Block X9



6143257

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 1136802
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way Ring Terminal

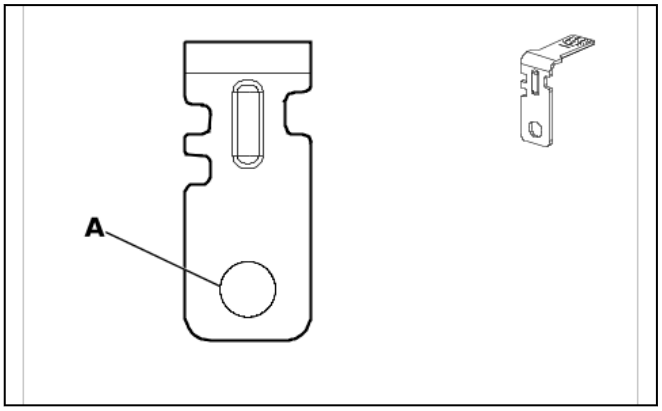
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X50B Battery Distribution Engine Compartment Fuse Block X9

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	10	RD / GN	742	Battery Positive Voltage	I	—

X50B Battery Distribution Engine Compartment Fuse Block X10



6143262

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 1136902
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way Ring Terminal

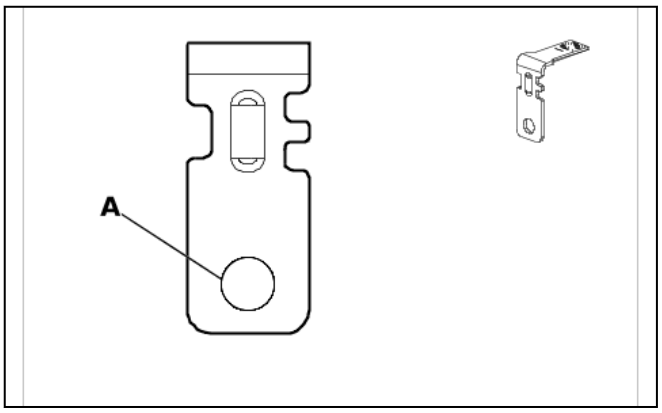
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X50B Battery Distribution Engine Compartment Fuse Block X10

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	10	RD / VT	542	Battery Positive Voltage	I	—

X50B Battery Distribution Engine Compartment Fuse Block X11



6143251

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 85528456
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way Ring Terminal

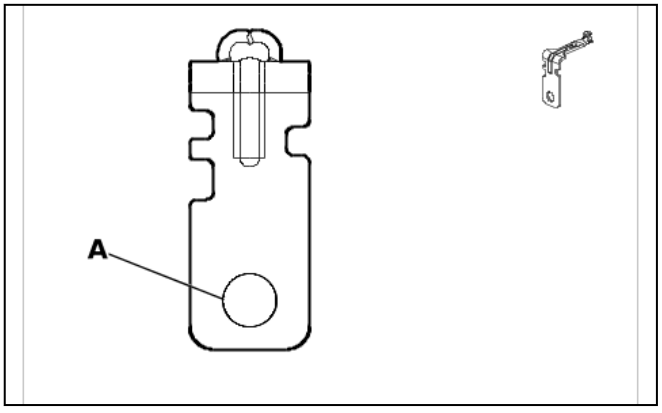
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X50B Battery Distribution Engine Compartment Fuse Block X11

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	10	RD / YE	442	Battery Positive Voltage	I	—

X50B Battery Distribution Engine Compartment Fuse Block X12



5877012

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 84841283
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way Ring Terminal

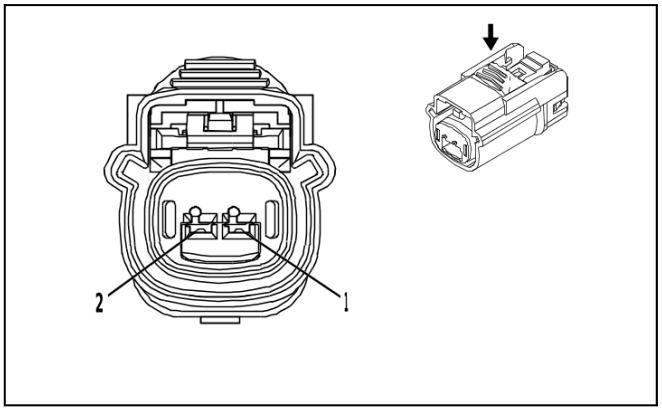
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X50B Battery Distribution Engine Compartment Fuse Block X12

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	6	RD / WH	342	Battery Positive Voltage	I	—

X50B Battery Distribution Engine Compartment Fuse Block X13



4332222

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 33314786
- Service Connector: 19368124
- Description: 2-Way F 1.5 OCS Series, Sealed(BK)

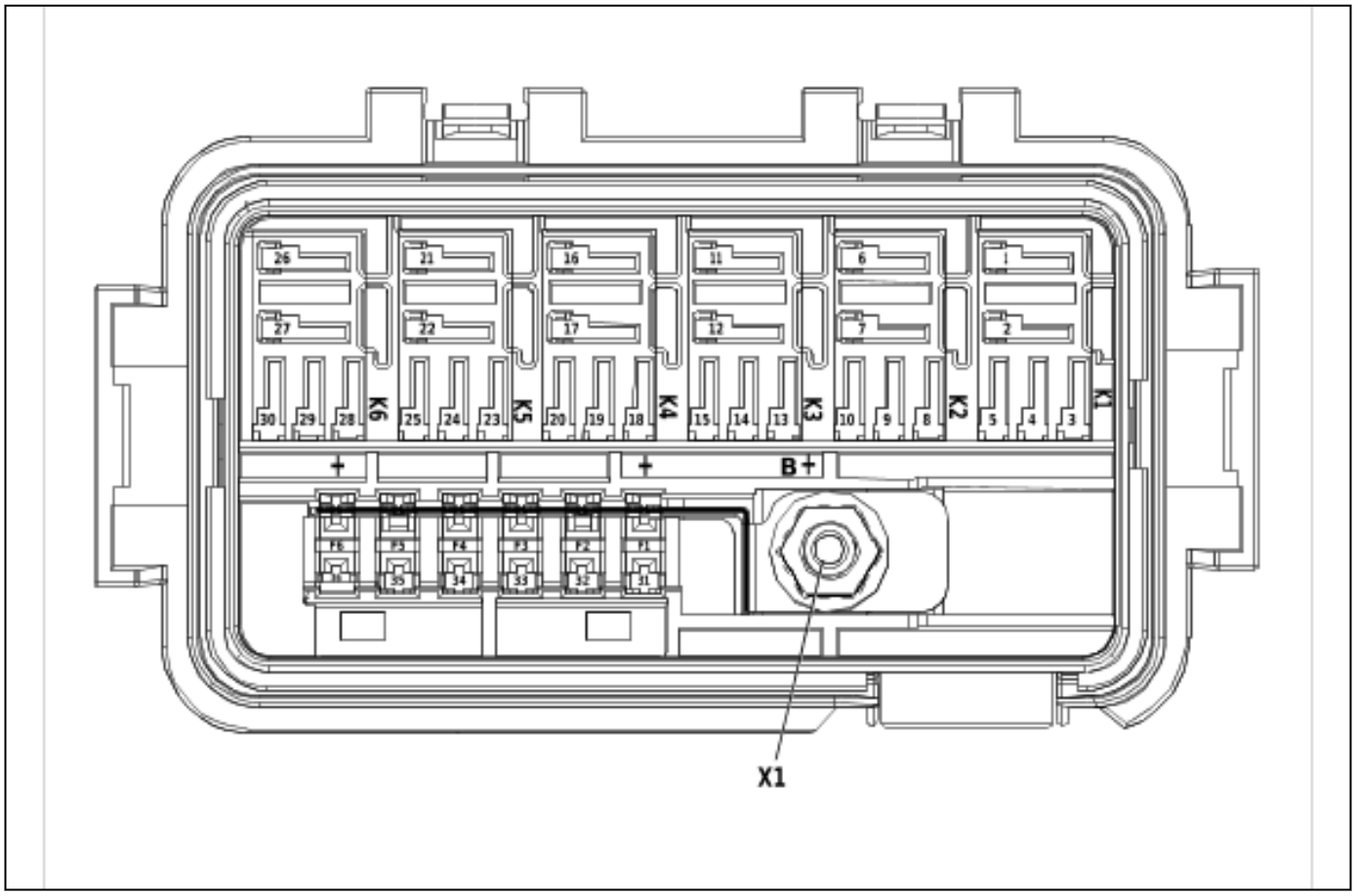
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-2A (GY)	No Tool Required

X50B Battery Distribution Engine Compartment Fuse Block X13

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) RD / YE	(1) 2340	(1) Battery Positive Voltage	(1) I	(1) —
2	—	—	—	Not Occupied	—	—

X50UA Accessory Wiring Junction Block - Underhood Top View (VBP)



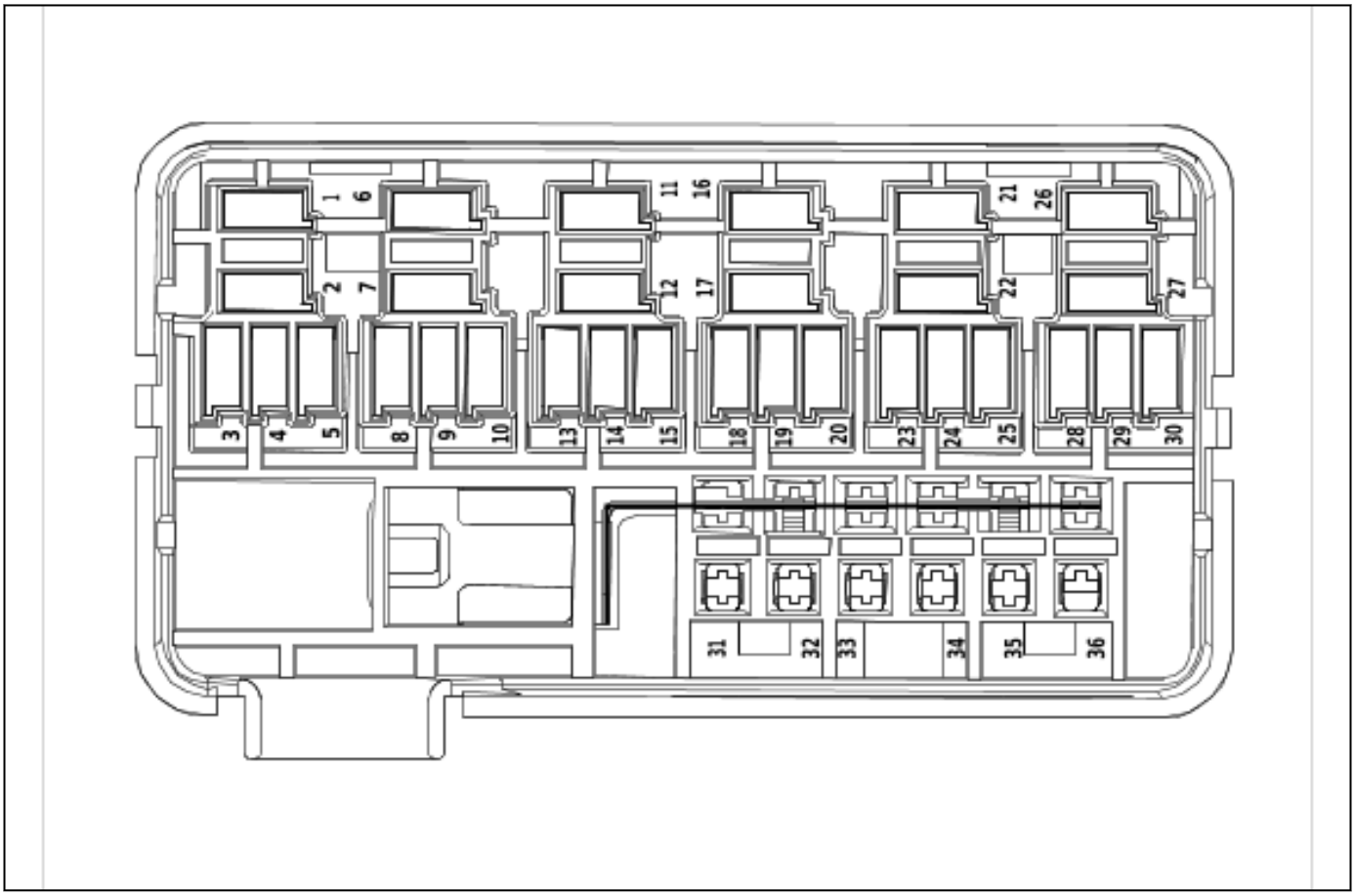
6730490

Usage Table

No.	Device Label Name	Device Assigned Name	Rating	Description
Fuses				
F1	—	F1UB	maximum 25A	• KR161AA Configurable/Accessory Provision Relay 1
F2	—	F2UB	maximum 25A	• KR161BA Configurable/Accessory Provision Relay 2
F3	—	F3UB	maximum 25A	• KR161CA Configurable/Accessory Provision Relay 3
F4	—	F4UB	maximum 25A	• KR161DA Configurable/Accessory Provision Relay 4
F5	—	F5UB	maximum 25A	• KR161EA Configurable/Accessory Provision Relay 5
F6	—	F6UB	maximum 25A	• KR161FA Configurable/Accessory Provision Relay 6
Relays				
K1	—	KR161AA Configurable/ Accessory Provision Relay 1	—	• X79A Configurable/Accessory Provision Supply Connector (Pin 1)

No.	Device Label Name	Device Assigned Name	Rating	Description
K2	—	KR161BA Configurable/ Accessory Provision Relay 2	—	• X79A Configurable/Accessory Provision Supply Connector (Pin 2)
K3	—	KR161CA Configurable/ Accessory Provision Relay 3	—	• X79A Configurable/Accessory Provision Supply Connector (Pin 3)
K4	—	KR161DA Configurable/ Accessory Provision Relay 4	—	• X79A Configurable/Accessory Provision Supply Connector (Pin 4)
K5	—	KR161EA Configurable/ Accessory Provision Relay 5	—	• X79A Configurable/Accessory Provision Supply Connector (Pin 5)
K6	—	KR161FA Configurable/ Accessory Provision Relay 6	—	• X79A Configurable/Accessory Provision Supply Connector (Pin 6)

X50UA Accessory Wiring Junction Block - Underhood Wire Entry (VBP)



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X50UA Accessory Wiring Junction Block - Underhood X1 (VBP)

—

Connector Part Information
- Harness Type: HARNESS ASM-AUX BAT WRG
- OEM Connector: 00240
- Service Connector: Service by Harness - See Part Catalog
- Description:

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X50UA Accessory Wiring Junction Block - Underhood X1 (VBP)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	5	RD	1342	Battery Positive Voltage	I	—

X55ACC Wiring Harness Fuse Holder - Accessory Wiring Junction Block (VBP)

—

Connector Part Information
- Harness Type: HARNESS ASM-AUX BAT WRG
- OEM Connector: 00318
- Service Connector: Service by Harness - See Part Catalog
- Description:

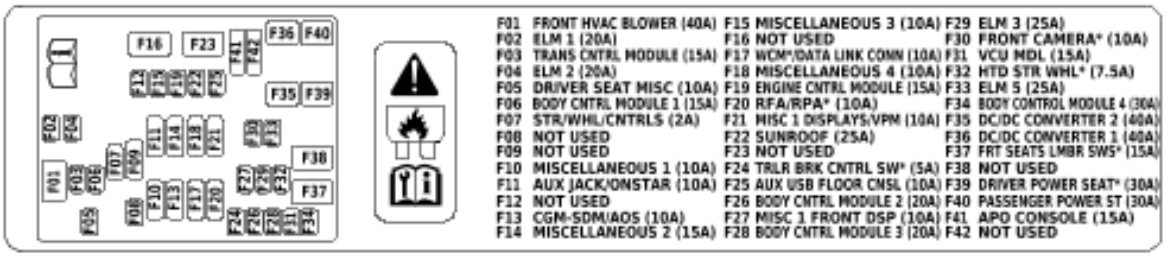
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X55ACC Wiring Harness Fuse Holder - Accessory Wiring Junction Block (VBP)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	5	RD	1342	Battery Positive Voltage	I	—

X51A Instrument Panel Wiring Harness Junction Block Label



F01	FRONT HVAC BLOWER (40A)	F15	MISCELLANEOUS 3 (10A)	F29	ELM 3 (25A)
F02	ELM 1 (20A)	F16	NOT USED	F30	FRONT CAMERA* (10A)
F03	TRANS CNTRL MODULE (15A)	F17	WCM*/DATA LINK CONN (10A)	F31	VCU MDL (15A)
F04	ELM 2 (20A)	F18	MISCELLANEOUS 4 (10A)	F32	HTD STR WHL* (7.5A)
F05	DRIVER SEAT MISC (10A)	F19	ENGINE CNTRL MODULE (15A)	F33	ELM 5 (25A)
F06	BODY CNTRL MODULE 1 (15A)	F20	RFA/RPA* (10A)	F34	BODY CONTROL MODULE 4 (30A)
F07	STR/WHL/CNTRLS (2A)	F21	MISC 1 DISPLAYS/VPM (10A)	F35	DC/DC CONVERTER 2 (40A)
F08	NOT USED	F22	SUNROOF (25A)	F36	DC/DC CONVERTER 1 (40A)
F09	NOT USED	F23	NOT USED	F37	FRT SEATS LMBR SWS* (15A)
F10	MISCELLANEOUS 1 (10A)	F24	TRLR BRK CNTRL SW* (5A)	F38	NOT USED
F11	AUX JACK/ONSTAR (10A)	F25	AUX USB FLOOR CNSL (10A)	F39	DRIVER POWER SEAT* (30A)
F12	NOT USED	F26	BODY CNTRL MODULE 2 (20A)	F40	PASSENGER POWER ST (30A)
F13	CGM-SDM/AOS (10A)	F27	MISC 1 FRONT DSP (10A)	F41	APO CONSOLE (15A)
F14	MISCELLANEOUS 2 (15A)	F28	BODY CNTRL MODULE 3 (20A)	F42	NOT USED

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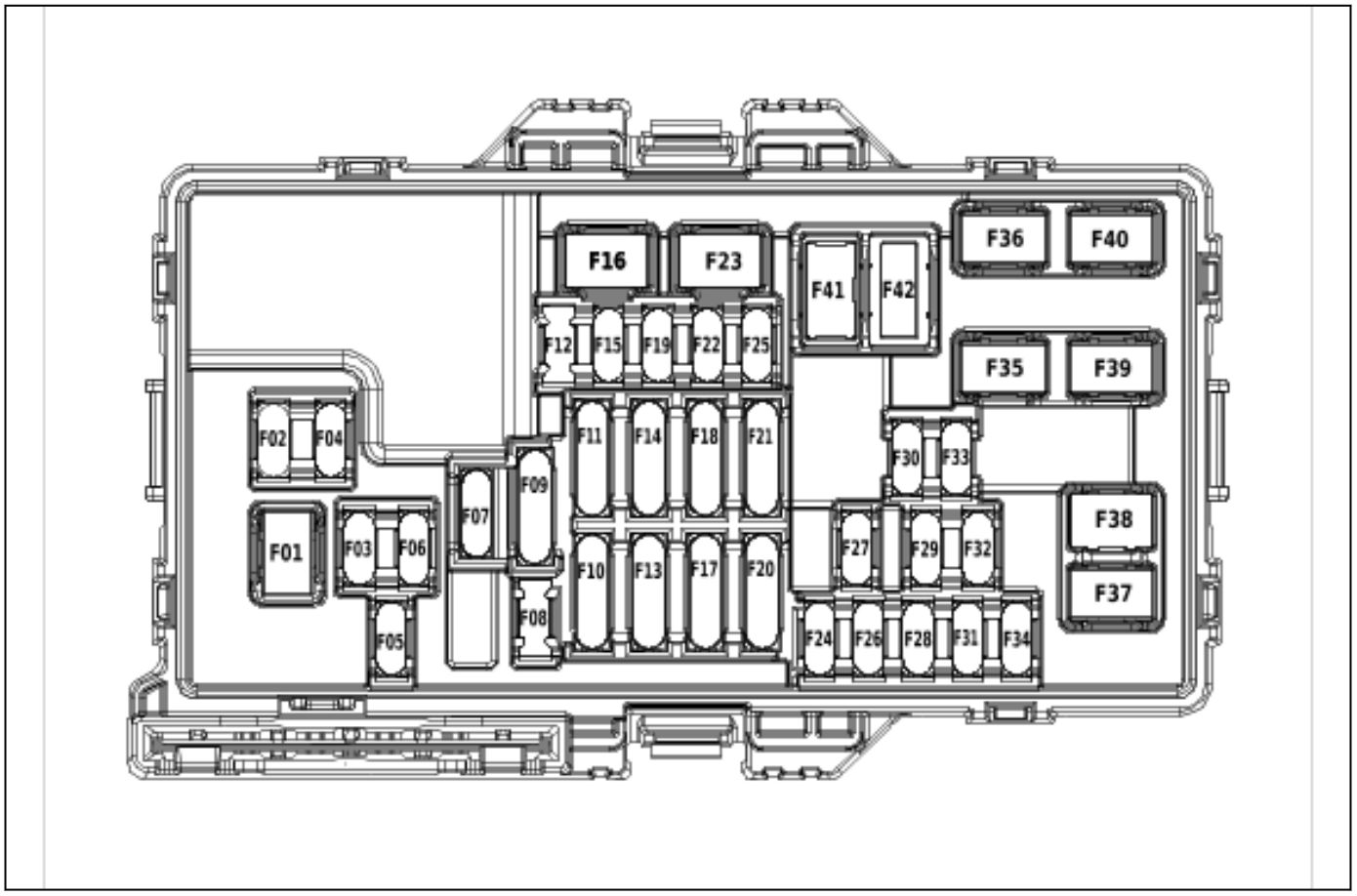
X51A Instrument Panel Wiring Harness Junction Block Top View



6181034

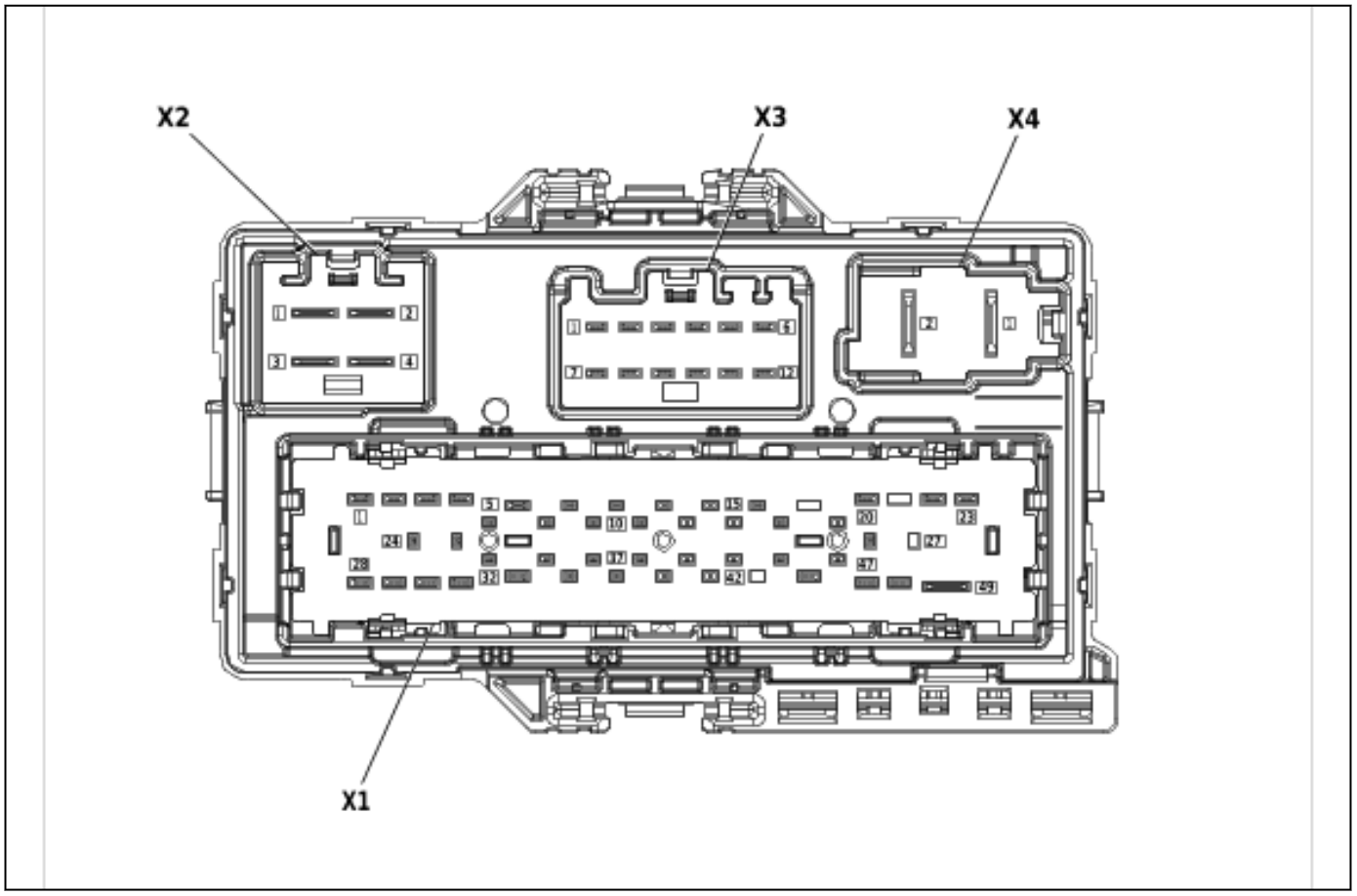
Usage Table

No.	Device Label Name	Device Assigned Name	Rating	Description
Fuses				
F1	FRONT HVAC BLOWER	F1DA	40A	• M8 Blower Motor
F2	ELM 1	F2DA	20A	• K219 Lighting Control Module
F3	TRANS CNTRL MODULE	F3DA	15A	• K71 Transmission Control Module
F4	ELM 2	F4DA	20A	• K219 Lighting Control Module
F5	DRIVER SEAT MISC	F5DA	10A	• K40D Driver Seat Adjuster Memory Module (A45) • S64D Front Seat Adjuster Switch - Driver (A45)
F6	BODY CNTRL MODULE 1	F6DA	20A	• K9 Body Control Module
F7	STR/WHL/CNTRLS	F7DA	2A	• S70R Radio Control Switch - Steering Wheel
F8	NOT USED	F8DA	—	• Not Used
F9	NOT USED	F9DA	—	• Not Used
F10	MISCELLANEOUS 1	F10DA	10A	• P14 Instrument Panel Airbag Arming Status Display • S91 Parking Brake Control Switch
F11	AUX JACK/ ONSTAR	F11DA	10A	• K73 Telematic Control Module • X92G USB 2 Port Receptacle

No.	Device Label Name	Device Assigned Name	Rating	Description
F12	NOT USED	F12DA	—	• Not Used
F13	CGM-SCM/AOS	F13DA	10A	• K36 Restraints Control Module • K56 Serial Data Gateway Module • K85P Restraints Occupant Classification System Module - Passenger
F14	MISCELLANEOUS 2	F14DA	15A	• K38 Chassis Control Module (G93/G94) • K71 Transmission Control Module • K160 Brake System Control Module
F15	MISCELLANEOUS 3	F15DA	10A	• K219 Lighting Control Module • M73D Front Seat Cushion Ventilation Blower - Driver (KU9) • M73P Front Seat Cushion Ventilation Blower - Passenger (KU9) • T1 DC/AC Converter Control Module
F16	NOT USED	F16DA	—	• Not Used
F17	WCM/DATA LINK CONN	F17DA	10A	• T22 Wireless Accessory Charging Module (K4C) • X84 Data Link Connector
F18	MISCELLANEOUS 4	F18DA	10A	• A10 Inside Rearview Mirror (DD8) • B160 Inside Air Moisture and Windshield Temperature Sensor • K36 Restraints Control Module • P43 Forward Collision Alert Display (UIT- UV6) • S126 Ride Control Switch (NP0/NPQ)
F19	ENGINE CNTRL MODULE	F19DA	15A	• K20 Engine Control Module
F20	RFA / RPA	F20DA	10A	• K77 Remote Function Actuator Module • K182 Parking Assist Control Module (UD7)
F21	MISC 1 DISPLAYS/VPM	F21DA	10A	• A22 Radio Control • A26 Heater and Air Conditioning User Interface Control • K157 Video Processing Module (UV2/UXA-UVB) • P16 Instrument Panel Cluster Control Module
F22	SUNROOF	F22DA	25A	• K61 Sunroof Control Module (CAC)
F23	NOT USED	F23DA	—	• Not Used
F24	TRLR BRK CNRTL SW	F24DA	5A	• S76 Trailer Brake Control Switch (JL1+Z82)
F25	AUS USB FLOOR CNSL	F25DA	10A	• X92C Single Charge Only 2nd Row Receptacle - Floor Console Rear
F26	BODY CNTRL MODULE 2	F26DA	20A	• K9 Body Control Module
F27	MISC 1 FRONT DSP	F27DA	10A	• S79D Front Side Door Window Control Switch - Driver
F28	BODY CNTRL MODULE 3	F28DA	20A	• K9 Body Control Module
F29	ELM 3	F29DA	25A	• K219 Lighting Control Module
F30	FRONT CAMERA	F30DA	10A	• B174W Front View Camera - Windshield
F31	VCU MDL	F31DA	15A	• A11 Radio

No.	Device Label Name	Device Assigned Name	Rating	Description
F32	HTD STR WHL	F32DA	7.5A	• K32 Heated Steering Wheel Module (KI3)
F33	ELM 5	F33DA	25A	• K219 Lighting Control Module
F34	BODY CNTRL MODULE 4	F34DA	30A	• K9 Body Control Module
F35	DC/DC CONVERTER 2	F35DA	40A	• T19 Multifunction Power Supply Converter
F36	DC/DC CONVERTER 1	F36DA	40A	• T19 Multifunction Power Supply Converter
F37	FRT SEATS LMBR SWS	F37DA	15A	• S65D Front Seat Lumbar Switch - Driver (AL9) • S65P Front Seat Lumbar Switch - Passenger (AT9)
F38	NOT USED	F38DA	—	• Not Used
F39	DRIVER POWER SEAT	F39DA	30A	• K40D Driver Seat Adjuster Memory Module (A45) • S64D Front Seat Adjuster Switch - Driver (A2X)
F40	PASSENGER POWER ST	F40DA	30A	• S64P Front Seat Adjuster Switch - Passenger (A7J)
F41	APO CONSOLE	CB41DA	15A	• X80L Front Floor Console Accessory Power Rear Receptacle
F42	NOT USED	CB42DA	—	• Not Used
Note: Relays listed below are non-serviceable Printed Circuit Board (PCB) relays and are internal to the block.				
—	—	KR73 Ignition Main Relay	—	• F12DA • F14DA • F15DA • F19DA • F18DA
—	—	KR76 Accessory Time Delay Cutoff Relay	—	• F23DA • F25DA • CB41DA • CB42DA

X51A Instrument Panel Wiring Harness Junction Block Bottom View



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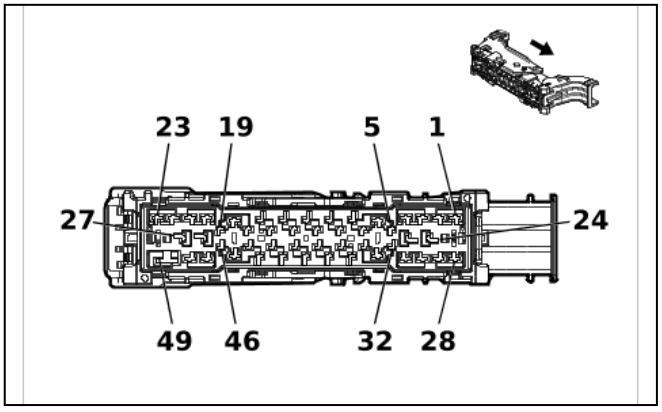
X51A Instrument Panel Wiring Harness Junction Block X1



5835272

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 13537037
- Service Connector: 85564872
- Description: 49-Way F 1.5, 2.8, 6.3 Kaizen Series(BK)

Terminal Part Information

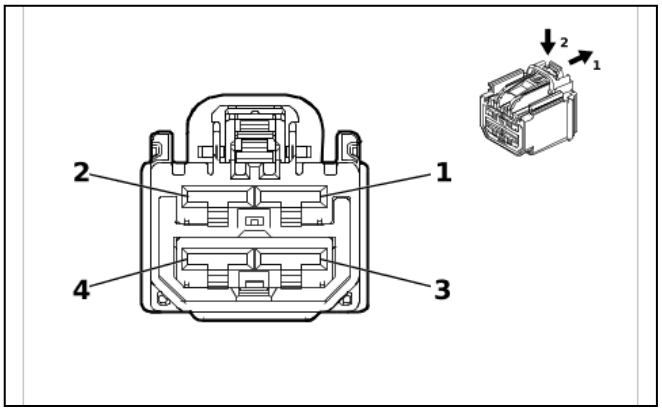
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13575835	J-35616-42 (RD)	J-38125-11A
II	13575850	J-35616-2A (GY)	J-38125-557
III	19368264	J-35616-4A (PU)	J-38125-11A

X51A Instrument Panel Wiring Harness Junction Block X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	—
(3) 3	(3) 1.5	(3) RD / GN	(3) 1540	(3) Battery Positive Voltage	(3) III	(3) —
(4) 4	(4) 1.5	(4) RD / WH	(4) 1340	(4) Battery Positive Voltage	(4) III	(4) —
(5) 5	(5) 0.5	(5) RD / VT	(5) 1940	(5) Battery Positive Voltage	(5) II	(5) —
(6) 6	(6) 1	(6) VT	(6) 1001	(6) Retained Accessory Power Ignition Voltage	(6) III	(6) —
7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.5	(8) VT	(8) 4701	(8) Retained Accessory Power Control	(8) II	(8) —
(9) 9	(9) 0.35	(9) RD / BN	(9) 1440	(9) Battery Positive Voltage	(9) II	(9) —
10	—	—	—	Not Occupied	—	—
(11) 11	(11) 0.5	(11) VT / WH	(11) 1139	(11) Run/Crank Ignition 1 Voltage	(11) II	(11) —
(12) 12	(12) 0.5	(12) VT / BK	(12) 739	(12) Run/Crank Ignition 1 Voltage	(12) II	(12) —
13	—	—	—	Not Occupied	—	—
(14) 14	(14) 0.35	(14) RD / WH	(14) 7240	(14) Battery Positive Voltage	(14) II	(14) —
(15) 15	(15) 0.5	(15) RD / BU	(15) 3240	(15) Battery Positive Voltage	(15) II	(15) —
16 - 18	—	—	—	Not Occupied	—	—
(19) 19	(19) 0.35	(19) GN / VT	(19) 5199	(19) Run/Crank Relay Coil Control	(19) II	(19) —
(20) 20	(20) 0.75	(20) RD / WH	(20) 2740	(20) Battery Positive Voltage	(20) III	(20) —
21	—	—	—	Not Occupied	—	—
(22) 22	(22) 1	(22) RD / BU	(22) 1240	(22) Battery Positive Voltage	(22) III	(22) —
(23) 23	(23) 1	(23) RD / BN	(23) 1140	(23) Battery Positive Voltage	(23) III	(23) —
(24) 24	(24) 0.35	(24) RD / BN	(24) 10040	(24) Battery Positive Voltage	(24) II	(24) —
25	—	—	—	Not Occupied	—	—
(26) 26	(26) 0.35	(26) GY / GN	(26) 4083	(26) Retained Accessory Power Relay 2 Coil Control	(26) II	(26) —
(27) 27	(27) 0.75	(27) RD / GN	(27) 1840	(27) Battery Positive Voltage	(27) II	(27) —
(28) 28	(28) 0.75	(28) RD / WH	(28) 3440	(28) Battery Positive Voltage	(28) III	(28) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(29) 29	(29) 2	(29) RD / BU	(29) 2540	(29) Battery Positive Voltage	(29) III	(29) —
(30) 30	(30) 0.75 (30) 0.75	(30) RD / WH (30) RD / BN	(30) 2040 (30) 2240	(30) Battery Positive Voltage (30) Battery Positive Voltage	(30) III (30) III	(30) UQA (30) - UQA
(31) 31	(31) 1	(31) RD / GY	(31) 2140	(31) Battery Positive Voltage	(31) III	(31) —
32	—	—	—	Not Occupied	—	—
(33) 33	(33) 1	(33) RD / GY	(33) 2840	(33) Battery Positive Voltage	(33) III	(33) —
(34) 34	(34) 0.35	(34) RD / VT	(34) 4040	(34) Battery Positive Voltage	(34) II	(34) —
(35) 35	(35) 0.35	(35) RD / WH	(35) 4740	(35) Battery Positive Voltage	(35) II	(35) —
(36) 36	(36) 0.35	(36) VT / GN	(36) 39	(36) Run/Crank Ignition 1 Voltage	(36) II	(36) —
(37) 37	(37) 0.5	(37) RD / BU	(37) 3240	(37) Battery Positive Voltage	(37) II	(37) —
(38) 38	(38) 0.5	(38) RD / VT	(38) 6340	(38) Battery Positive Voltage	(38) II	(38) —
(39) 39	(39) 0.35	(39) RD / WH	(39) 6440	(39) Battery Positive Voltage	(39) II	(39) —
(40) 40	(40) 0.5	(40) RD / GN	(40) 4440	(40) Battery Positive Voltage	(40) II	(40) —
41	—	—	—	Not Occupied	—	—
(42) 42	(42) 0.5	(42) RD / GN	(42) 5140	(42) Battery Positive Voltage	(42) II	(42) —
43 - 45	—	—	—	Not Occupied	—	—
(46) 46	(46) 0.35	(46) RD / GN	(46) 5140	(46) Battery Positive Voltage	(46) II	(46) —
47	—	—	—	Not Occupied	—	—
(48) 48	(48) 0.35	(48) RD / VT	(48) 3340	(48) Battery Positive Voltage	(48) III	(48) —
(49) 49	(49) 5	(49) RD / WH	(49) 2040	(49) Battery Positive Voltage	(49) I	(49) —

X51A Instrument Panel Wiring Harness Junction Block X2



5492913

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 7289-7459-40
- Service Connector: 84766433
- Description: 4-Way F 6.3 YESC Series(GY)

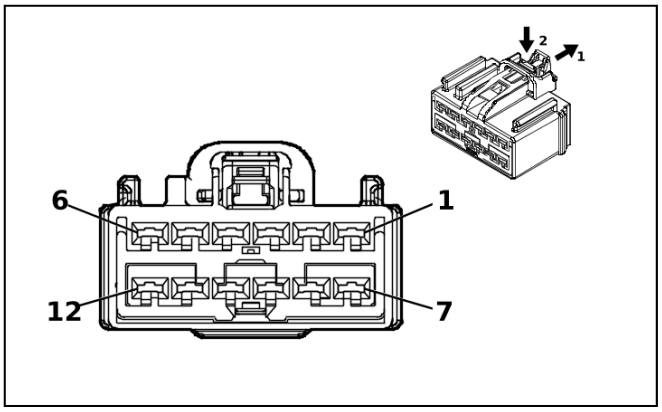
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-42 (RD)	No Tool Required

X51A Instrument Panel Wiring Harness Junction Block X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) RD / YE	(1) 4340	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 2.5	(2) RD / BU	(2) 2540	(2) Battery Positive Voltage	(2) I	(2) —
(3) 3	(3) 2.5	(3) RD / GY	(3) 3540	(3) Battery Positive Voltage	(3) I	(3) —
(4) 4	(4) 2.5	(4) RD / VT	(4) 2640	(4) Battery Positive Voltage	(4) I	(4) —

X51A Instrument Panel Wiring Harness Junction Block X3



5254826

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 7289-9152-40
- Service Connector: 13518424
- Description: 12-Way F 2.8 Kaizen Series(L-GY)

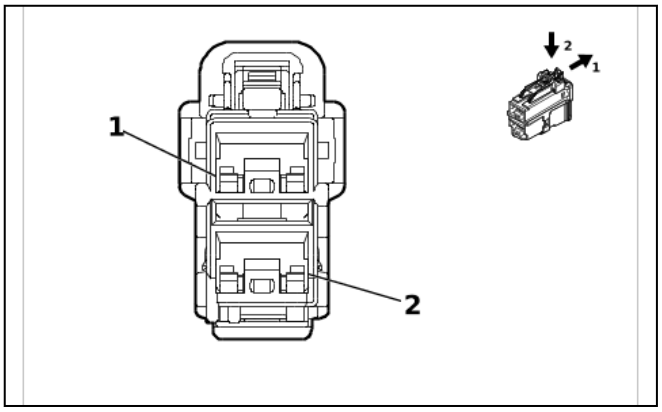
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19368264	J-35616-4A (PU)	J-38125-11A

X51A Instrument Panel Wiring Harness Junction Block X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) RD / GN	(1) 2173	(1) 12V Regulated Supply Voltage 2	(1) I	(1) —
(2) 2	(2) 1.5	(2) RD / YE	(2) 2340	(2) Battery Positive Voltage	(2) I	(2) —
3 - 4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.5	(5) BK / WH	(5) 451	(5) Signal Ground	(5) I	(5) —
(6) 6	(6) 2.5	(6) RD / YE	(6) 2172	(6) 12V Regulated Supply Voltage 1	(6) I	(6) —
(7) 7	(7) 0.35	(7) RD / YE	(7) 240	(7) Battery Positive Voltage	(7) I	(7) —
(8) 8	(8) 0.5	(8) RD / VT	(8) 1640	(8) Battery Positive Voltage	(8) I	(8) —
(9) 9	(9) 0.35	(9) RD / VT	(9) 1640	(9) Battery Positive Voltage	(9) I	(9) —
(10) 10	(10) 0.5	(10) VT / BK	(10) 739	(10) Run/Crank Ignition 1 Voltage	(10) I	(10) —
(11) 11	(11) 0.5 (11) 0.35	(11) VT / BK (11) VT / WH	(11) 739 (11) 1139	(11) Run/Crank Ignition 1 Voltage (11) Run/Crank Ignition 1 Voltage	(11) I (11) I	(11) (KI7/ KCA/ KI6/ KC9/ KU9) (11) - (KI7/ KCA/ KI6/ KC9/ KU9)
12	—	—	—	Not Occupied	—	—

X51A Instrument Panel Wiring Harness Junction Block X4



5835292

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 7289-8732-30
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 9.5 YESC Series(BK)

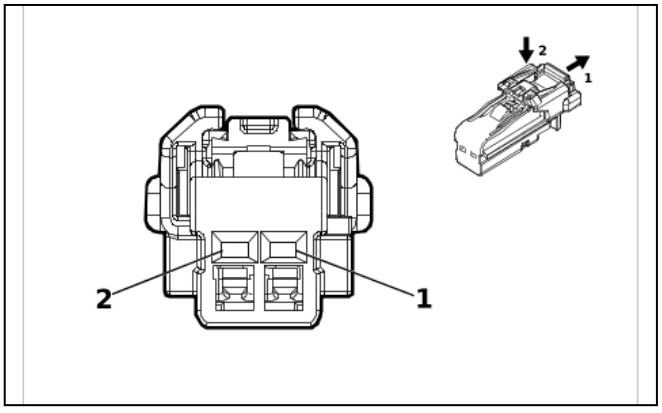
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-42 (RD)	No Tool Required

X51A Instrument Panel Wiring Harness Junction Block X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 10	(1) RD / VT	(1) 542	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 10	(2) RD / GN	(2) 742	(2) Battery Positive Voltage	(2) I	(2) —

A3L Sunshade - Left (DEG)



4115691

Connector Part Information
- Harness Type: Roof Wiring Harness
- OEM Connector: 6098-8988
- Service Connector: 87816612
- Description: 2-Way F 1.2 MCON Series(BK)

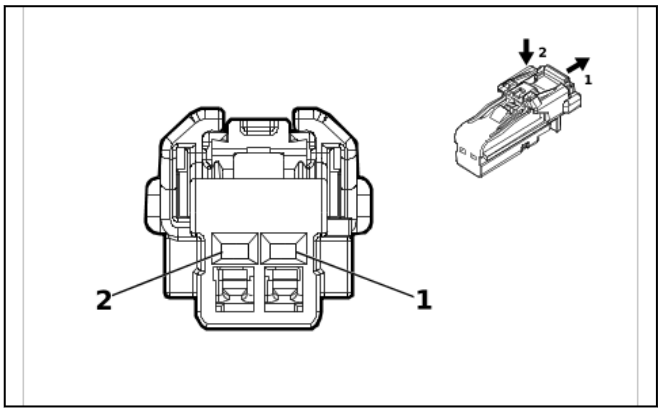
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

A3L Sunshade - Left (DEG)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) WH / BN	(1) 6815	(1) Inadvertent Load Control	(1) I	(1) —
(2) 2	(2) 0.35	(2) BK	(2) 4250	(2) Ground	(2) I	(2) —

A3R Sunshade - Right (DEG)



4115691

Connector Part Information
- Harness Type: Roof Wiring Harness
- OEM Connector: 6098-8988
- Service Connector: 87816612
- Description: 2-Way F 1.2 MCON Series(BK)

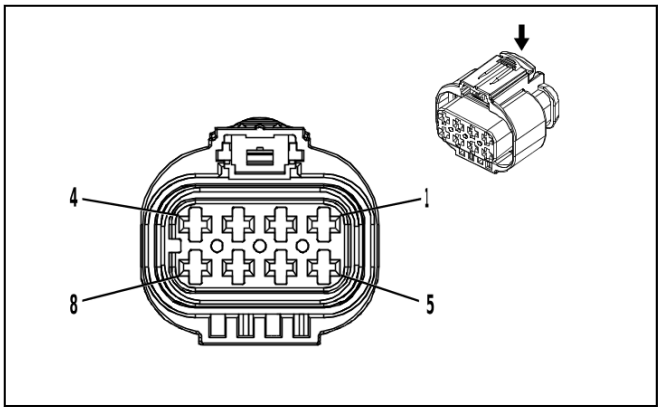
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

A3R Sunshade - Right (DEG)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) WH / BN	(1) 6815	(1) Inadvertent Load Control	(1) I	(1) —
(2) 2	(2) 0.35	(2) BK	(2) 4250	(2) Ground	(2) I	(2) —

A7 Fuel Tank Fuel Pump Module



3749582

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 2-2109441-5
- Service Connector: 19354078
- Description: 8-Way F 2.8 Series, Sealed(L-GY)

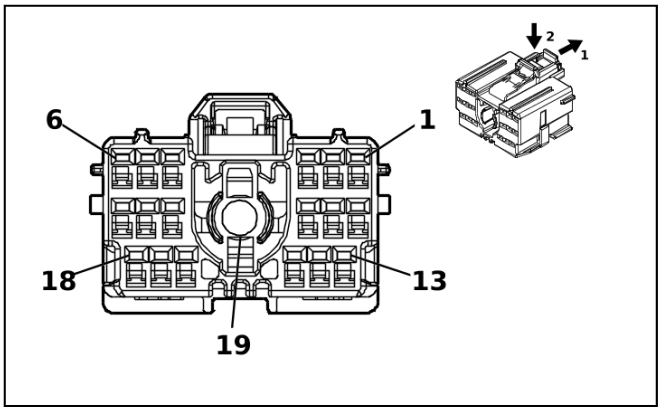
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-35 (VT)	No Tool Required
II	Not required	J-35616-4A (PU)	No Tool Required

A7 Fuel Tank Fuel Pump Module

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) GY	(1) 120	(1) Fuel Pump Control	(1) I	(1) —
(2) 2	(2) 2.5	(2) YE / GY	(2) 4137	(2) Fuel Pump Supply Voltage Phase 2	(2) I	(2) —
(3) 3	(3) 2.5	(3) WH / BN	(3) 4138	(3) Fuel Pump Supply Voltage Phase 3	(3) I	(3) —
(4) 4	(4) 0.5	(4) WH	(4) 7444	(4) Fuel Pump Assembly Shield Ground	(4) II	(4) —
(5) 5	(5) 0.5	(5) BU / GN	(5) 1936	(5) Primary Fuel Level Sensor Signal	(5) II	(5) —
(6) 6	(6) 0.5	(6) BK / GN	(6) 6281	(6) Fuel Level Sensor Low Reference	(6) II	(6) —
7 - 8	—	—	—	Not Occupied	—	—

A9A Outside Rearview Mirror - Driver



5253439

Connector Part Information

- Harness Type: Front Side Door Door Wiring Harness - Driver
- OEM Connector: 6098-8386
- Service Connector: Service by Harness - See Part Catalog
- Description: 19-Way F 1.2 MCON, Coaxial Series(BK)

Terminal Part Information

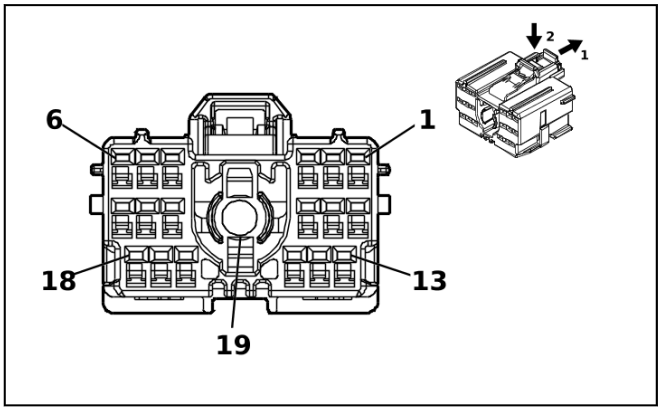
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required
II	Service by Cable	No Tool Required	No Tool Required

A9A Outside Rearview Mirror - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BN / BK	(1) 2790	(1) Left Front Mirror Motor Right [+] Left [-] Control	(1) I	(1) —
(2) 2	(2) 0.35	(2) VT / BU	(2) 2788	(2) Left Front Mirror Motor Up [+] Down [-] Control	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.35	(4) GY / YE	(4) 1760	(4) Left Side Object Detection LED Control	(4) I	(4) —
5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.35	(6) WH / YE	(6) 2792	(6) Left Front Mirror Position Sensor Left [-] Right [+] Signal	(6) I	(6) —
(7) 7	(7) 0.5	(7) WH	(7) 606	(7) Left Outside Rearview Mirror Heater Control	(7) I	(7) —
8	—	—	—	Not Occupied	—	—
(9) 9	(9) 0.35	(9) BK	(9) 3750	(9) Ground	(9) I	(9) —
(10) 10	(10) 0.35	(10) VT / RD	(10) 2791	(10) Left Front Mirror Position Sensor High Reference	(10) I	(10) —
(11) 11	(11) 0.35	(11) GY / BN	(11) 2787	(11) Left Front Mirror Position Sensor Up [+] Down [-] Signal	(11) I	(11) —
12 - 13	—	—	—	Not Occupied	—	—
(14) 14	(14) 0.35	(14) YE / BN	(14) 2789	(14) Left Front Mirror Motor Common Control	(14) I	(14) —
15 - 17	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(18) 18	(18) 0.35	(18) BK / BN	(18) 673	(18) Left Outside Rearview Mirror Position Sensor Low Reference	(18) I	(18) —
(19) 19	(19) 0 (19) 0	(19) BARE (19) WH	(19) 4725 (19) 4725	(19) Left Sideview Camera LVDS (Low Voltage Differential Signaling) Coaxial Signal (19) Left Sideview Camera LVDS (Low Voltage Differential Signaling) Coaxial Signal	(19) II (19) II	(19) — (19) —

A9B Outside Rearview Mirror - Passenger



5253439

Connector Part Information

- Harness Type: Front Side Door Door Wiring Harness - Passenger
- OEM Connector: 6098-8386
- Service Connector: Service by Harness - See Part Catalog
- Description: 19-Way F 1.2 MCON, Coaxial Series(BK)

Terminal Part Information

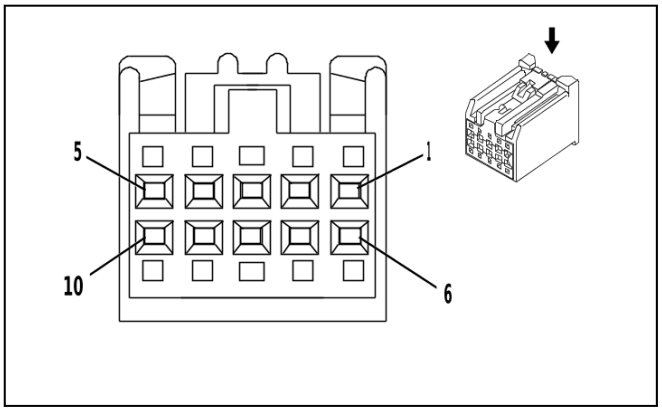
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required
II	Service by Cable	No Tool Required	No Tool Required

A9B Outside Rearview Mirror - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GN / BK	(1) 2798	(1) Right Front Mirror Motor Right [+] Left [-] Control	(1) I	(1) —
(2) 2	(2) 0.35	(2) YE / VT	(2) 2796	(2) Right Front Mirror Motor Up [+] Down [-] Control	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.35	(4) GY	(4) 1761	(4) Right Side Object Detection LED Control	(4) I	(4) —
5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.35	(6) VT / WH	(6) 2800	(6) Right Front Mirror Position Sensor Left [-] Right [+] Signal	(6) I	(6) —
(7) 7	(7) 0.5	(7) BN / VT	(7) 607	(7) Right Outside Rearview Mirror Heater Control	(7) I	(7) —
8	—	—	—	Not Occupied	—	—
(9) 9	(9) 0.35	(9) BK	(9) 4450	(9) Ground	(9) I	(9) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(10) 10	(10) 0.35	(10) YE / RD	(10) 2799	(10) Right Front Mirror Position Sensor High Reference	(10) I	(10) —
(11) 11	(11) 0.35	(11) BU / YE	(11) 2795	(11) Right Front Mirror Position Sensor Up [+] Down [-] Signal	(11) I	(11) —
12 - 13	—	—	—	Not Occupied	—	—
(14) 14	(14) 0.35	(14) WH	(14) 2797	(14) Right Front Mirror Motor Common Control	(14) I	(14) —
15 - 17	—	—	—	Not Occupied	—	—
(18) 18	(18) 0.35	(18) BK / GN	(18) 675	(18) Right Outside Rearview Mirror Position Sensor Low Reference	(18) I	(18) —
(19) 19	(19) 0	(19) WH	(19) 4724	(19) Right Sideview Camera LVDS (Low Voltage Differential Signaling) Coaxial Signal	(19) II	(19) —

A10 Inside Rearview Mirror



2180211

Connector Part Information
- Harness Type: Roof Wiring Harness
- OEM Connector: AIT2PB-10P-2AK
- Service Connector: 13577390
- Description: 10-Way F 0.64 Kaizen Series(BK)

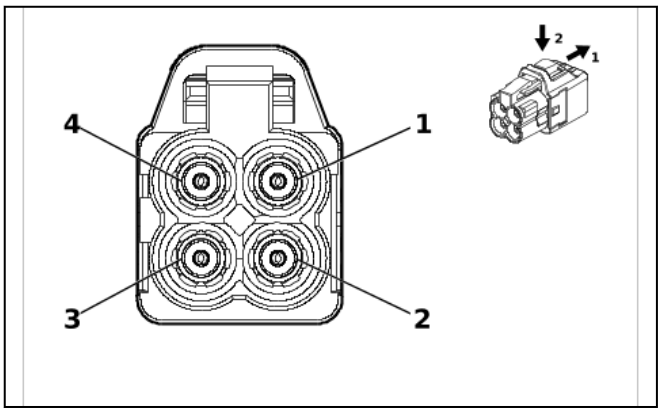
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13575742	J-35616-64B (L-BU)	J-38125-215A

A10 Inside Rearview Mirror

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GN / WH	(1) 24	(1) Backup Lamp Control	(1) I	(1) —
(2) 2	(2) 0.35	(2) VT / WH	(2) 1139	(2) Run/Crank Ignition 1 Voltage	(2) I	(2) —
3 - 4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.35	(5) BK / WH	(5) 1851	(5) Signal Ground	(5) I	(5) —
6 - 10	—	—	—	Not Occupied	—	—

A11 Radio X1



5835118

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness COAX
- OEM Connector: 13563020
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 4-Way F Mini Coax Type(BK)

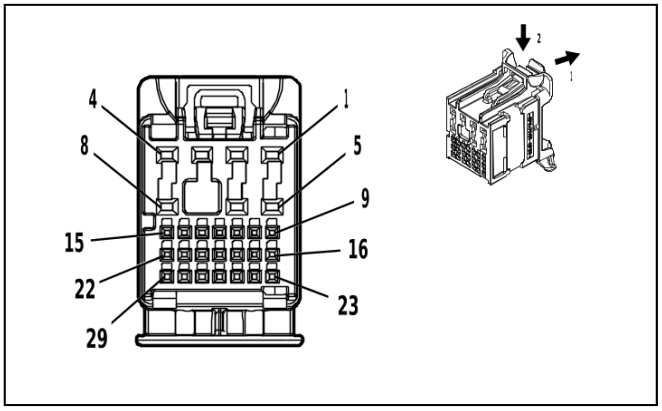
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

A11 Radio X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	Coax Cable	—	(AM/FM) Antenna RF Signal	I	—

A11 Radio X2



4578560

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 160014-0011
- Service Connector: 13534971
- Description: 29-Way F 0.5 NANO, 1.2 MCON, stAK50h Series(DK GY with GY Inner Connector)

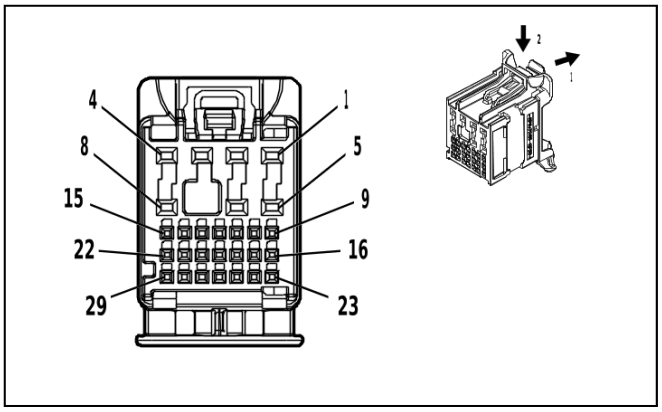
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58
II	84729890	J-35616-12 (BU)	J-38125-215A

A11 Radio X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) GN	(1) 199	(1) Left Rear Speaker [+] Control	(1) II	(1) —
(2) 2	(2) 0.75	(2) BU	(2) 201	(2) Left Front Speaker 1 [+] Control	(2) II	(2) —
(3) 3	(3) 0.75	(3) YE / BK	(3) 117	(3) Right Front Speaker [-] Control 1	(3) II	(3) —
(4) 4	(4) 0.75	(4) BU / BK	(4) 115	(4) Right Rear Speaker [-] Control	(4) II	(4) —
(5) 5	(5) 0.75	(5) BN / BU	(5) 118	(5) Left Front Speaker [-] Control 1	(5) II	(5) —
(6) 6	(6) 0.75	(6) YE	(6) 200	(6) Right Front Speaker 1 [+] Control	(6) II	(6) —
7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.75	(8) WH	(8) 46	(8) Right Rear Speaker [+] Control	(8) II	(8) —
(9) 9	(9) 0.35	(9) BU / WH	(9) 4985	(9) AUTOSAR CAN Bus [+] 5 Serial Data	(9) I	(9) —
(10) 10	(10) 0.35	(10) BU / YE	(10) 4984	(10) AUTOSAR CAN Bus [-] 5 Serial Data	(10) I	(10) —
11 - 12	—	—	—	Not Occupied	—	—
(13) 13	(13) 0.35	(13) GN / WH	(13) 24	(13) Backup Lamp Control	(13) I	(13) —
14 - 17	—	—	—	Not Occupied	—	—
(18) 18	(18) 0.35	(18) GN / GY	(18) 10652	(18) Radio LIN Bus 1	(18) I	(18) —
19 - 21	—	—	—	Not Occupied	—	—
(22) 22	(22) 0.35	(22) GY / YE	(22) 3885	(22) Forward Collision Alert LED Control	(22) I	(22) —
(23) 23	(23) 0.35	(23) GY / BK	(23) 4787	(23) Day Night LED Control	(23) I	(23) —
24 - 29	—	—	—	Not Occupied	—	—

A11 Radio X3



4496253

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 160014-0014
- Service Connector: 13534974
- Description: 29-Way F 0.5 NANO, 1.2 MCON, stAK50h Series(BK with GY Inner Connector)

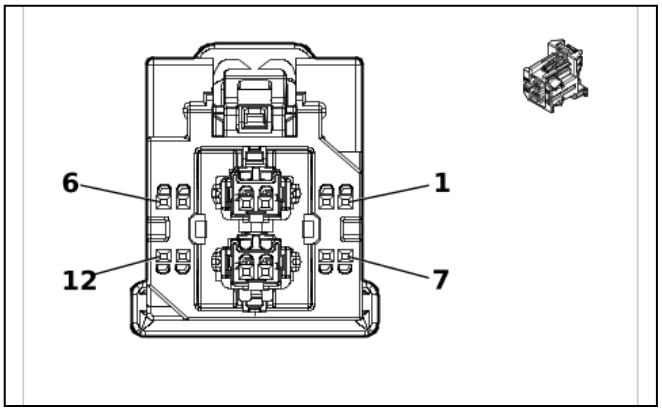
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58
II	84729890	J-35616-12 (BU)	J-38125-215A

A11 Radio X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75 (1) 0.75	(1) RD / WH (1) RD / BN	(1) 2040 (1) 2240	(1) Battery Positive Voltage (1) Battery Positive Voltage	(1) II (1) II	(1) UQA (1) - UQA
(2) 2	(2) 0.75	(2) RD / BN	(2) 2240	(2) Battery Positive Voltage	(2) II	(2) —
(3) 3	(3) 0.75	(3) BK / WH	(3) 2151	(3) Signal Ground	(3) II	(3) —
4 - 5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.75	(6) BK / WH	(6) 2151	(6) Signal Ground	(6) II	(6) —
7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.75	(8) GN / BK	(8) 116	(8) Left Rear Speaker [-] Control	(8) II	(8) —
(9) 9	(9) 0.35	(9) GY / YE	(9) 5149	(9) Voice Recognition Audio Signal	(9) I	(9) —
(10) 10	(10) 0.35	(10) BK / GY	(10) 5152	(10) Voice Recognition Audio [-] Control	(10) I	(10) —
(11) 11	(11) 0.35	(11) VT / YE	(11) 7043	(11) Microphone [+] Signal	(11) I	(11) —
(12) 12	(12) 0.35	(12) BU / BK	(12) 7044	(12) Microphone [-] Signal	(12) I	(12) —
13 - 29	—	—	—	Not Occupied	—	—

A11 Radio X4



5902882

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 35552567
- Service Connector: 86555356
- Description: 12-Way F 0.5 CTS, AMEC High Speed Data Series(BK)

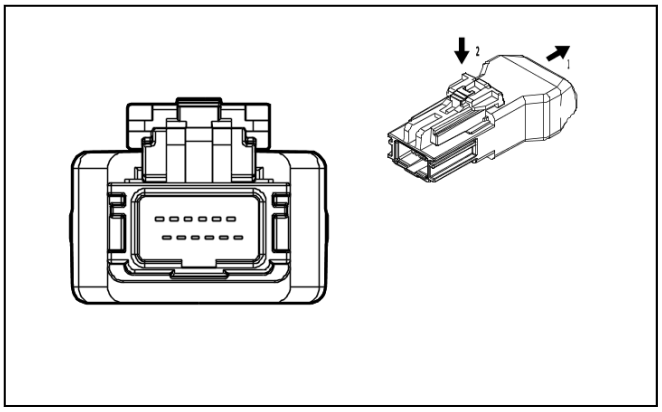
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Service by Cable	EL-35616-58 (BK)	EL-38125-58

A11 Radio X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0	(1) BU / WH	(1) 4758	(1) Ethernet Bus 2 [+]	(1) I	(1) —
(2) 2	(2) 0	(2) BU	(2) 4757	(2) Ethernet Bus 2 [-]	(2) I	(2) —
3 - 4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.1	(5) WH	(5) 8580	(5) Automotive Audio Bus A2B Serial Data 1 [+]	(5) I	(5) —
(6) 6	(6) 0.1	(6) GN	(6) 8579	(6) Automotive Audio Bus A2B Serial Data 1 [-]	(6) I	(6) —
7 - 8	—	—	—	Not Occupied	—	—
(9) 9	(9) 0.1	(9) GN	(9) 7210	(9) Ethernet Bus 4 [-]	(9) I	(9) —
(10) 10	(10) 0.1	(10) WH	(10) 7211	(10) Ethernet Bus 4 [+]	(10) I	(10) —
11 - 12	—	—	—	Not Occupied	—	—

A11 Radio X5



4584321

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 13551162
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 12-Way M 2.0 HSAL-2 Series(GY)

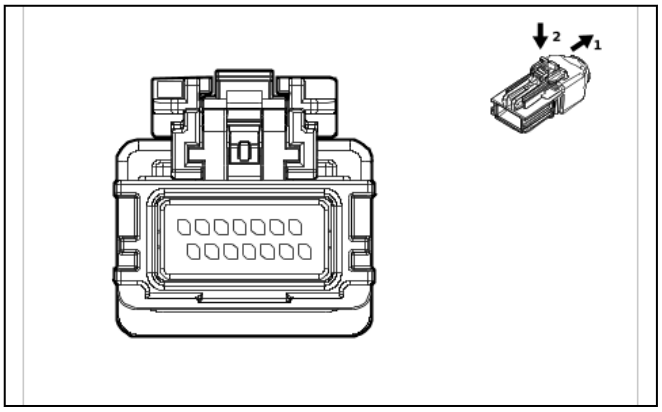
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

A11 Radio X5

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0	(1) BARE	(1) 10624	(1) Virtual Cockpit Unit Virtual Cockpit Display LVDS (Low Voltage Differential Signaling) Low Reference	(1) I	(1) —
(2) 2	(2) 0	(2) BU	(2) 10625	(2) Virtual Cockpit Unit Virtual Cockpit Display LVDS (Low Voltage Differential Signaling) Signal [+]	(2) I	(2) —
(3) 3	(3) 0	(3) WH	(3) 10626	(3) Virtual Cockpit Unit Virtual Cockpit Display LVDS (Low Voltage Differential Signaling) Signal [-]	(3) I	(3) —
4 - 6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0	(7) BU	(7) 10604	(7) Virtual Cockpit Unit Instrument Panel Display LVDS (Low Voltage Differential Signaling) Signal [+]	(7) I	(7) —
(8) 8	(8) 0	(8) WH	(8) 10605	(8) Virtual Cockpit Unit Instrument Panel Display LVDS (Low Voltage Differential Signaling) Signal [-]	(8) I	(8) —
(9) 9	(9) 0	(9) BARE	(9) 10603	(9) Virtual Cockpit Unit Instrument Panel Display LVDS (Low Voltage Differential Signaling) Low Reference	(9) I	(9) —
10 - 12	—	—	—	Not Occupied	—	—

A11 Radio X7



6002723

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness USB
- OEM Connector: 13535353
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 14-Way M 2.0 HSAL-2 Series(BK)

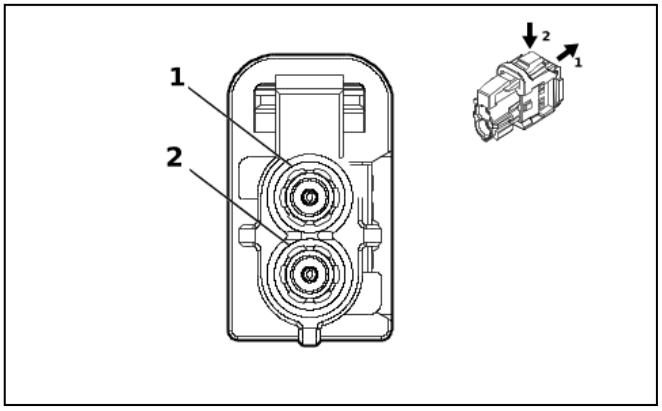
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

A11 Radio X7

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	USB	—	USB Serial Data	I	—

A11 Radio X8 (UXA)



6154796

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness COAX
- OEM Connector: 13544814
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 2-Way F Mini Coax Type(BU)

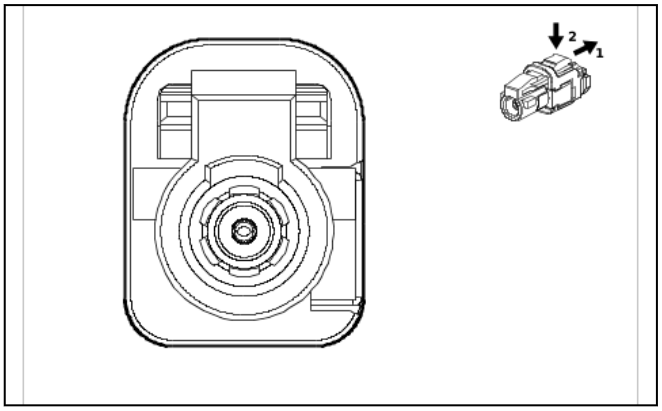
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

A11 Radio X8 (UXA)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	Coax Cable	—	Video Processing Module Coaxial Video Signal	I	—

A11 Radio X9



5926227

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness COAX
- OEM Connector: 13544788
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Mini Coax Type(BK)

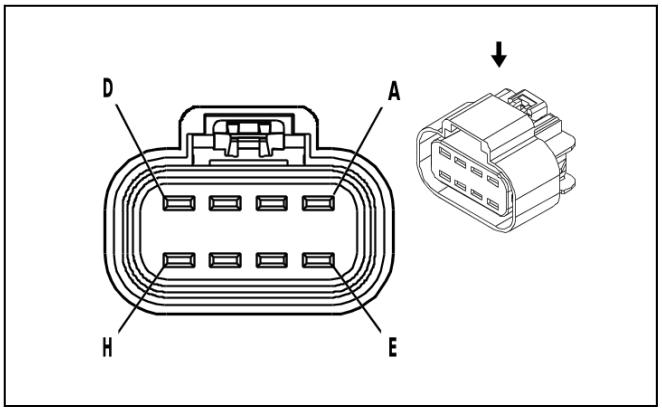
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

A11 Radio X9

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	Coax Cable	—	WiFi Antenna Coaxial Signal	I	—

A16 Transfer Case Four Wheel Drive Actuator



646372

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 13538370
- Service Connector: 19369184
- Description: 8-Way F 280 GT Series, Sealed(BK)

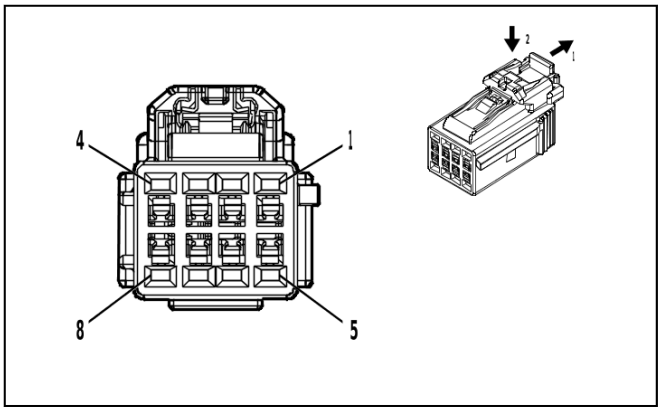
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-4A (PU)	No Tool Required

A16 Transfer Case Four Wheel Drive Actuator

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	2.5	YE / GY	1552	Transfer Case Motor Clockwise Control	I	—
B	0.75	BU	8013	Transfer Case Lock Solenoid Control 2	I	—
C	0.75	YE / BN	1569	Transfer Case Lock Solenoid Valve Control	I	—
D	2.5	YE / VT	1553	Transfer Case Motor Counter Clockwise Control	I	—
E	0.5	YE	7474	Incremental Encoder Direction Signal	I	—
F	0.5	BU / GY	7473	Incremental Encoder Impulse Signal	I	—
G	0.5	WH / GN	7475	Incremental Encoder Sensor Voltage Reference	I	—
H	0.5	VT	7476	Incremental Encoder Sensor Low Reference	I	—

A22 Radio Control X1



5086387

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 6098-8443
- Service Connector: 84613126
- Description: 8-Way F 1.2 Series(BK)

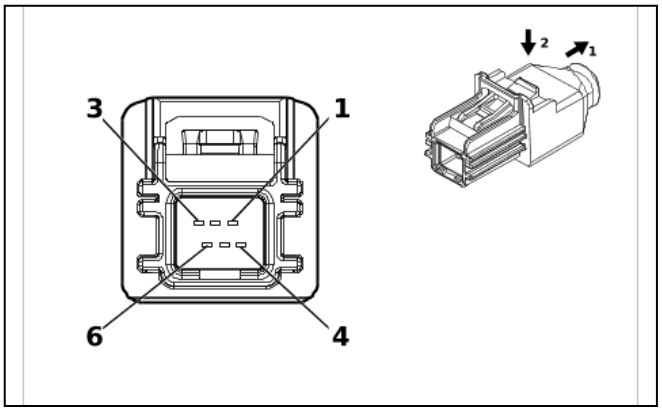
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

A22 Radio Control X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) RD / BN	(1) 1440	(1) Battery Positive Voltage	(1) I	(1) —
2 - 7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.35	(8) BK / WH	(8) 2151	(8) Signal Ground	(8) I	(8) —

A22 Radio Control X2



5278781

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 13551198
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 6-Way M HSAL-2 Series(GY)

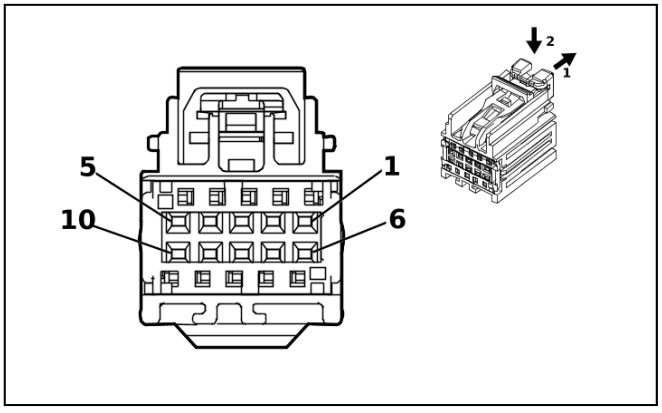
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

A22 Radio Control X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	LVDS	—	Virtual Cockpit Unit Virtual Cockpit Display	I	—

A23LR Rear Side Door Latch - Left



4622549

Connector Part Information
- Harness Type: Rear Side Door Door Wiring Harness - Left
- OEM Connector: 7289-5068-60
- Service Connector: Service by Harness - See Part Catalog
- Description: 10-Way F 0.64 Kaizen Series(GN)

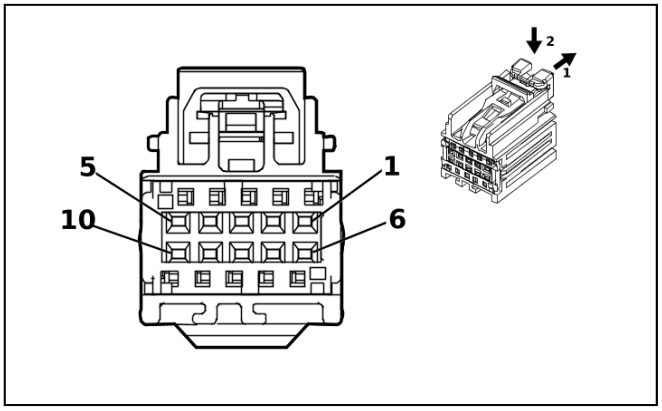
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

A23LR Rear Side Door Latch - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GY	(1) 747	(1) Left Rear Door Ajar Switch Signal	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.75	(3) BK	(3) 1150	(3) Ground	(3) I	(3) —
4 - 6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.75	(7) BU / YE	(7) 1091	(7) Left Rear Door Lock Actuator Lock Control	(7) I	(7) —
(8) 8	(8) 0.75	(8) WH	(8) 2679	(8) Lock Actuators Unlock Control 1	(8) I	(8) —
9 - 10	—	—	—	Not Occupied	—	—

A23P Front Side Door Latch - Passenger



4622549

Connector Part Information

- Harness Type: Front Side Door Door Wiring Harness - Passenger
- OEM Connector: 7289-5068-60
- Service Connector: Service by Harness - See Part Catalog
- Description: 10-Way F 0.64 Kaizen Series(GN)

Terminal Part Information

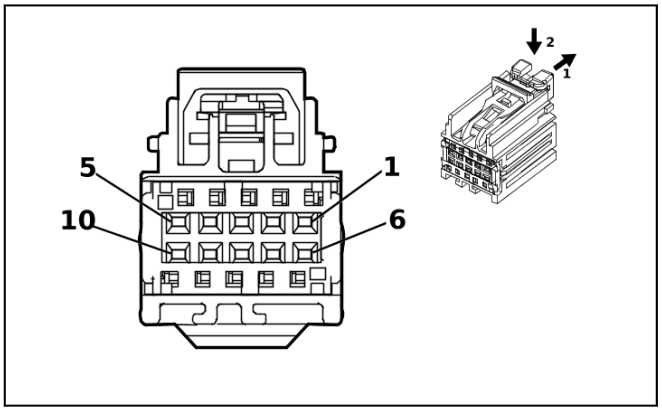
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

A23P Front Side Door Latch - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	—
(2) 2	(2) 0.35	(2) VT	(2) 4259	(2) Right Front Door Lock Status Signal	(2) I	(2) —
(3) 3	(3) 0.35	(3) BK	(3) 1250	(3) Ground	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(5) 5	(5) 0.35	(5) GY	(5) 746	(5) Right Front Door Ajar Switch Signal	(5) I	(5) —
6 - 7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.75	(8) GY / BK	(8) 2680	(8) Lock Actuators Unlock Control 2	(8) I	(8) —
(9) 9	(9) 0.75	(9) YE / GN	(9) 2682	(9) Right Front Door Lock Actuator Lock Control	(9) I	(9) —
10	—	—	—	Not Occupied	—	—

A23RR Rear Side Door Latch - Right



4622549

Connector Part Information
- Harness Type: Rear Side Door Door Wiring Harness - Right
- OEM Connector: 7289-5068-60
- Service Connector: Service by Harness - See Part Catalog
- Description: 10-Way F 0.64 Kaizen Series(GN)

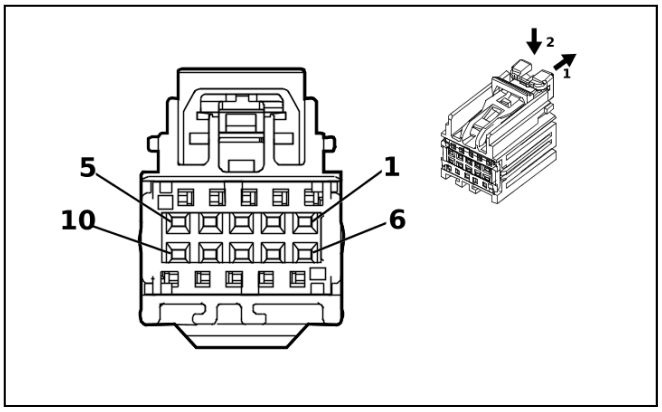
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

A23RR Rear Side Door Latch - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.75	(3) BK	(3) 1250	(3) Ground	(3) I	(3) —
4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.35	(5) GY	(5) 748	(5) Right Rear Door Ajar Switch Signal	(5) I	(5) —
6 - 7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.75	(8) GY / BK	(8) 2680	(8) Lock Actuators Unlock Control 2	(8) I	(8) —
(9) 9	(9) 0.75	(9) VT / WH	(9) 1094	(9) Right Rear Door Lock Actuator Lock Control	(9) I	(9) —
10	—	—	—	Not Occupied	—	—

A23SL Front Side Door Latch Striker - Left



4622549

Connector Part Information

- Harness Type: Front Side Door Door Wiring Harness - Driver
- OEM Connector: 7289-5068-60
- Service Connector: Service by Harness - See Part Catalog
- Description: 10-Way F 0.64 Kaizen Series(GN)

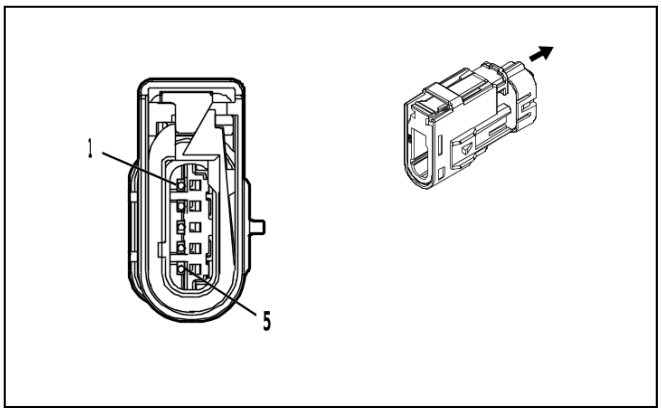
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

A23SL Front Side Door Latch Striker - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GY	(1) 745	(1) Left Front Door Ajar Switch Signal	(1) I	(1) —
(2) 2	(2) 0.35	(2) VT / GY	(2) 126	(2) Left Front Door Open Switch Signal	(2) I	(2) —
(3) 3	(3) 0.75	(3) BK	(3) 1150	(3) Ground	(3) I	(3) —
(4) 4	(4) 0.35	(4) WH / VT	(4) 4258	(4) Left Front Door Lock Status Signal	(4) I	(4) —
5 - 6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.75	(7) GY	(7) 2681	(7) Left Front Door Lock Actuator Lock Control	(7) I	(7) —
(8) 8	(8) 0.75	(8) WH	(8) 2679	(8) Lock Actuators Unlock Control 1	(8) I	(8) —
9 - 10	—	—	—	Not Occupied	—	—

A24D Front Side Door Outside Handle - Left



4808321

Connector Part Information

- Harness Type: Front Side Door Door Wiring Harness - Driver
- OEM Connector: SRVWSB-04A-BS
- Service Connector: Service by Harness - See Part Catalog
- Description: 5-Way M 1.2 Series, Sealed(NA)

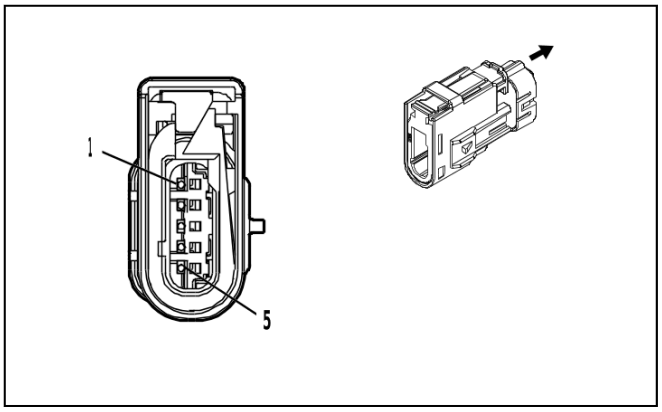
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-13 (BU)	No Tool Required
II	Not required	J-35616-17 (L-GN)	No Tool Required

A24D Front Side Door Outside Handle - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BU	(1) 2675	(1) Left Front Exterior Door Handle Switch Unlock Signal	(1) II	(1) —
(2) 2	(2) 0.5	(2) VT	(2) 4301	(2) Passive Entry Left Antenna Signal High	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.5	(4) VT / GY	(4) 4302	(4) Passive Entry Left Antenna Signal Low	(4) I	(4) —
(5) 5	(5) 0.35	(5) BK	(5) 1150	(5) Ground	(5) II	(5) —

A24P Front Side Door Outside Handle - Right



4808321

Connector Part Information

- Harness Type: Front Side Door Door Wiring Harness - Passenger
- OEM Connector: SRVWSB-04A-BS
- Service Connector: Service by Harness - See Part Catalog
- Description: 5-Way M 1.2 Series, Sealed(NA)

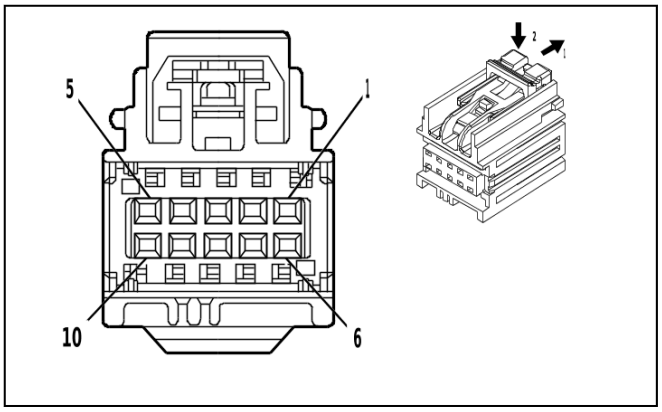
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-13 (BU)	No Tool Required
II	Not required	J-35616-17 (L-GN)	No Tool Required

A24P Front Side Door Outside Handle - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GY / VT	(1) 2676	(1) Right Front Door Exterior Switch Unlock Signal	(1) II	(1) —
(2) 2	(2) 0.5	(2) GN / YE	(2) 4303	(2) Passive Entry Right Antenna Signal High	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.5	(4) GN / BK	(4) 4304	(4) Passive Entry Right Antenna Signal Low	(4) I	(4) —
(5) 5	(5) 0.35	(5) BK	(5) 2250	(5) Ground	(5) II	(5) —

A26 Heater and Air Conditioning User Interface Control - Front



4891168

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 7289-4885
- Service Connector: 13509649
- Description: 10-Way F 0.64 Kaizen Series(NA)

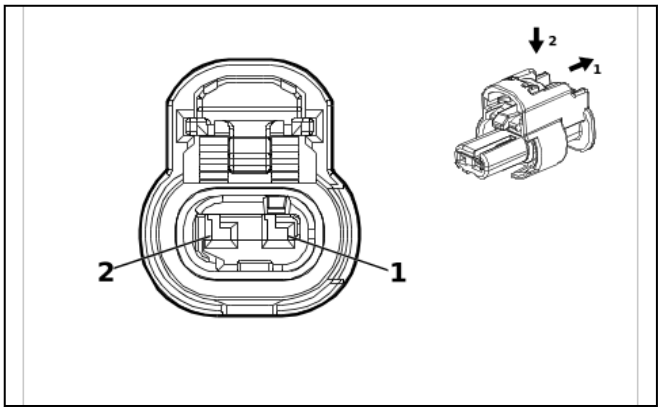
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19300629	J-35616-64B (L-BU)	J-38125-215A

A26 Heater and Air Conditioning User Interface Control - Front

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) RD / BN	(1) 1440	(1) Battery Positive Voltage	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.35	(3) BU / WH	(3) 4985	(3) AUTOSAR CAN Bus [+] 5 Serial Data	(3) I	(3) —
(4) 4	(4) 0.35	(4) BU / WH	(4) 4985	(4) AUTOSAR CAN Bus [+] 5 Serial Data	(4) I	(4) —
5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.35	(6) GY / GN	(6) 4636	(6) HVAC System Enable Signal	(6) I	(6) —
7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.35	(8) BU / YE	(8) 4984	(8) AUTOSAR CAN Bus [-] 5 Serial Data	(8) I	(8) —
(9) 9	(9) 0.35	(9) BU / YE	(9) 4984	(9) AUTOSAR CAN Bus [-] 5 Serial Data	(9) I	(9) —
(10) 10	(10) 0.35	(10) BK / WH	(10) 2151	(10) Signal Ground	(10) I	(10) —

A99 Pickup Box Endgate Latch



4649903

Connector Part Information
- Harness Type: Liftgate Jumper Wiring Harness
- OEM Connector: 1-2296694-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

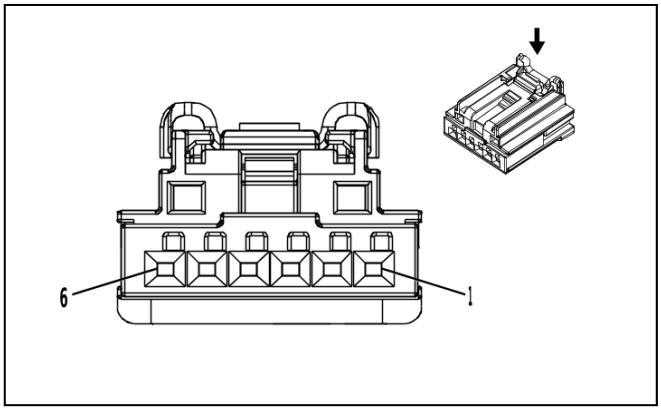
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

A99 Pickup Box Endgate Latch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / VT	(1) 2691	(1) Rear Closure Actuator Lock Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) GY / BK	(2) 2680	(2) Lock Actuators Unlock Control 2	(2) I	(2) —

A103 Roof Console



4145138

Connector Part Information
- Harness Type: Roof Wiring Harness
- OEM Connector: 2035363-2
- Service Connector: 19356359
- Description: 6-Way F 0.64 Generation Y Series(BK)

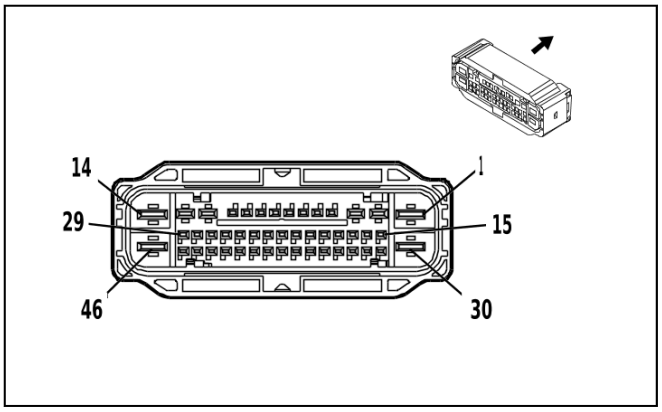
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

A103 Roof Console

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	—
(2) 2	(2) 0.35	(2) WH / BN	(2) 6815	(2) Inadvertent Load Control	(2) I	(2) —
(3) 3	(3) 0.35	(3) GY	(3) 157	(3) Interior Lamp Control	(3) I	(3) —
(4) 4	(4) 0.35	(4) BK	(4) 4250	(4) Ground	(4) I	(4) —
(5) 5	(5) 0.35	(5) GY	(5) 156	(5) Courtesy Lamp Switch Signal	(5) I	(5) —
(6) 6	(6) 0.35	(6) GY / GN	(6) 328	(6) Interior Lamp Defeat Switch Signal	(6) I	(6) —

A104 Brake Master Cylinder



4162046

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 35740396
- Service Connector: 85090369
- Description: 46-Way F 1.2 OCS, 2.8, 6.3 CTS Series, Sealed(GY)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13575368	J-35616-35 (VT)	J-38125-36
II	19370818	J-35616-12 (BU)	J-38125-215A
III	84634921	J-35616-42 (RD)	J-38125-212

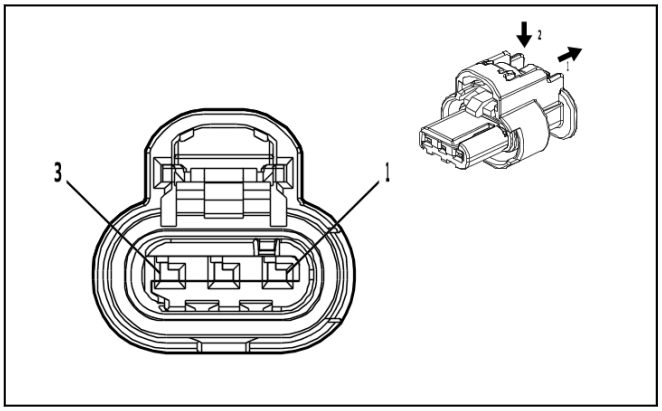
A104 Brake Master Cylinder

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 6	(1) BK	(1) 150	(1) Ground	(1) III	(1) —
(2) 2	(2) 2.5	(2) WH	(2) 2001	(2) Left Park Brake Motor Apply Control	(2) I	(2) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(3) 3	(3) 2.5	(3) GY / BK	(3) 4369	(3) Left Park Brake Motor Low Reference	(3) I	(3) —
(4) 4	(4) 0.5	(4) GY / WH	(4) 7064	(4) Left Front Wheel Speed Sensor Control	(4) II	(4) —
(5) 5	(5) 0.5	(5) GY	(5) 830	(5) Left Front Wheel Speed Sensor Signal	(5) II	(5) —
6 - 8	—	—	—	Not Occupied	—	—
(9) 9	(9) 0.5	(9) VT / WH	(9) 639	(9) Run/Crank Ignition 1 Voltage	(9) II	(9) —
(10) 10	(10) 0.5	(10) GY / BN	(10) 7065	(10) Right Front Wheel Speed Sensor Control	(10) II	(10) —
(11) 11	(11) 0.5	(11) YE	(11) 872	(11) Right Front Wheel Speed Sensor Signal	(11) II	(11) —
(12) 12	(12) 2.5	(12) GN / VT	(12) 1988	(12) Right Park Brake Motor Apply Control	(12) I	(12) —
(13) 13	(13) 2.5	(13) GY	(13) 4368	(13) Right Park Brake Motor Low Reference	(13) I	(13) —
(14) 14	(14) 6	(14) RD / BN	(14) 440	(14) Battery Positive Voltage	(14) III	(14) —
(15) 15	(15) 0.5	(15) GY / BK	(15) 7127	(15) Left Rear Wheel Speed Sensor Control	(15) II	(15) —
(16) 16	(16) 0.5	(16) BU	(16) 884	(16) Left Rear Wheel Speed Sensor Signal	(16) II	(16) —
(17) 17	(17) 0.5	(17) BU / BK	(17) 4977	(17) AUTOSAR CAN Bus [+] 3 Serial Data	(17) II	(17) —
(18) 18	(18) 0.5	(18) WH	(18) 4976	(18) AUTOSAR CAN Bus [-] 3 Serial Data	(18) II	(18) —
(19) 19	(19) 0.5	(19) YE / BK	(19) 2224	(19) Trailer Brake Enable Signal	(19) II	(19) —
(20) 20	(20) 0.5	(20) WH / BK	(20) 2223	(20) Trailer Brake Apply Signal	(20) II	(20) —
21 - 22	—	—	—	Not Occupied	—	—
(23) 23	(23) 0.35	(23) GN / YE	(23) 2731	(23) Brake System Control Module LIN Bus 1	(23) II	(23) —
24	—	—	—	Not Occupied	—	—
(25) 25	(25) 0.5	(25) BU / YE	(25) 4979	(25) AUTOSAR CAN Bus [+] 2 Serial Data	(25) II	(25) —
(26) 26	(26) 0.5	(26) WH	(26) 4978	(26) AUTOSAR CAN Bus [-] 2 Serial Data	(26) II	(26) —
(27) 27	(27) 0.5	(27) GN / YE	(27) 1616	(27) Rear Brake Pad Wear Sensor Signal	(27) II	(27) —
(28) 28	(28) 0.5	(28) GY / YE	(28) 7128	(28) Right Rear Wheel Speed Sensor Control	(28) II	(28) —
(29) 29	(29) 0.5	(29) VT	(29) 882	(29) Right Rear Wheel Speed Sensor Signal	(29) II	(29) —
(30) 30	(30) 6	(30) BK	(30) 3550	(30) Ground	(30) III	(30) —
(31) 31	(31) 0.5	(31) GN / GY	(31) 333	(31) Brake Fluid Level Signal	(31) II	(31) —
32	—	—	—	Not Occupied	—	—
(33) 33	(33) 0.5	(33) BU / BK	(33) 4977	(33) AUTOSAR CAN Bus [+] 3 Serial Data	(33) II	(33) —
(34) 34	(34) 0.5	(34) WH	(34) 4976	(34) AUTOSAR CAN Bus [-] 3 Serial Data	(34) II	(34) —
(35) 35	(35) 0.5	(35) BN / BU	(35) 1602	(35) Front Brake Pad Wear Sensor Signal	(35) II	(35) —
(36) 36	(36) 0.5	(36) GN / BU	(36) 2733	(36) Brake System Control Module LIN Bus 2	(36) II	(36) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
37 - 40	—	—	—	Not Occupied	—	—
(41) 41	(41) 0.5	(41) BU / YE	(41) 4979	(41) AUTOSAR CAN Bus [+] 2 Serial Data	(41) II	(41) —
(42) 42	(42) 0.5	(42) WH	(42) 4978	(42) AUTOSAR CAN Bus [-] 2 Serial Data	(42) II	(42) —
43 - 45	—	—	—	Not Occupied	—	—
(46) 46	(46) 6	(46) RD / WH	(46) 342	(46) Battery Positive Voltage	(46) III	(46) —

B1 Air Conditioning Refrigerant Pressure Sensor



4581126

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296695-1
- Service Connector: 86792094
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

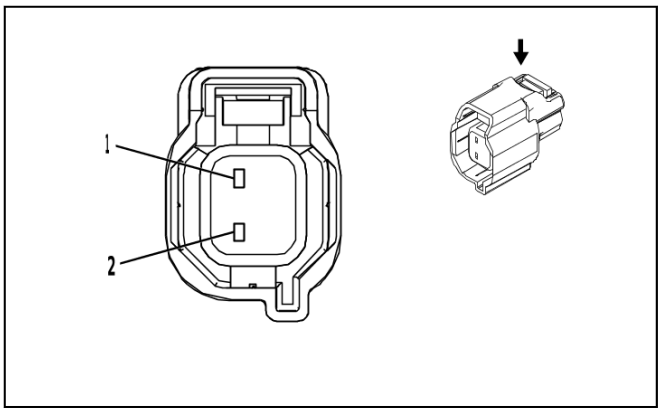
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

B1 Air Conditioning Refrigerant Pressure Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH / RD	(1) 480	(1) Engine Control Vehicle Sensors 5 Volt Reference 1	(1) I	(1) —
(2) 2	(2) 0.5	(2) GN	(2) 380	(2) Air Conditioning Refrigerant Pressure Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / GY	(3) 626	(3) Engine Control Vehicle Sensors Low Reference 1	(3) I	(3) —

B5LF Front Wheel Speed Sensor - Left



2900396

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 34062-0026
- Service Connector: 19366856
- Description: 2-Way F 1.5 Series, Sealed(L-GY)

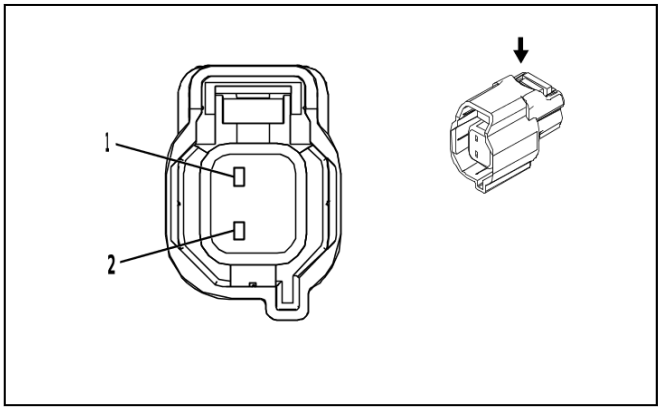
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

B5LF Front Wheel Speed Sensor - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / WH	(1) 7064	(1) Left Front Wheel Speed Sensor Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) GY	(2) 830	(2) Left Front Wheel Speed Sensor Signal	(2) I	(2) —

B5LR Rear Wheel Speed Sensor - Left



2900396

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 34062-0026
- Service Connector: 19366856
- Description: 2-Way F 1.5 Series, Sealed(L-GY)

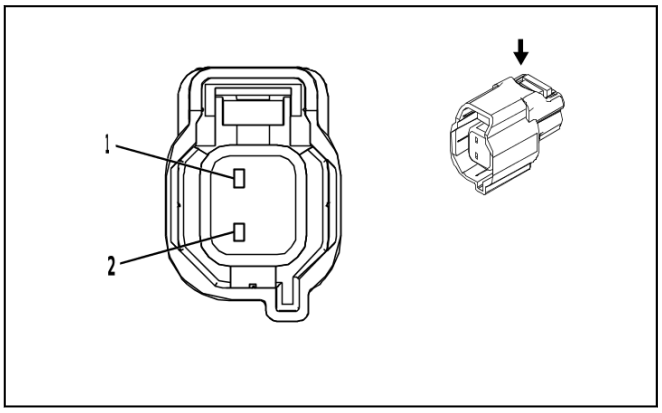
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

B5LR Rear Wheel Speed Sensor - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / BK	(1) 7127	(1) Left Rear Wheel Speed Sensor Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU	(2) 884	(2) Left Rear Wheel Speed Sensor Signal	(2) I	(2) —

B5RF Front Wheel Speed Sensor - Right



2900396

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 34062-0026
- Service Connector: 19366856
- Description: 2-Way F 1.5 Series, Sealed(L-GY)

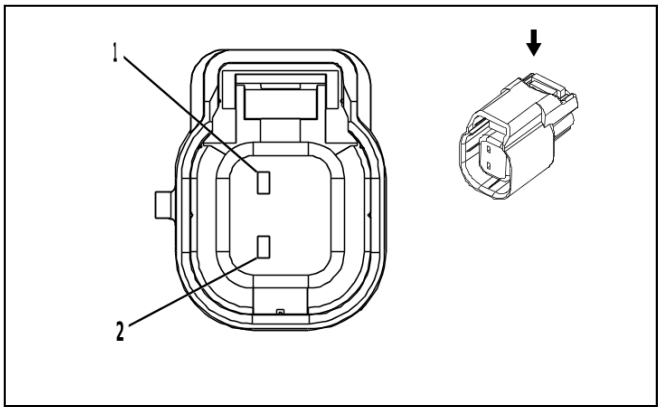
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

B5RF Front Wheel Speed Sensor - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / BN	(1) 7065	(1) Right Front Wheel Speed Sensor Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) YE	(2) 872	(2) Right Front Wheel Speed Sensor Signal	(2) I	(2) —

B5RR Rear Wheel Speed Sensor - Right



4115616

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 34062-0046
- Service Connector: 19366860
- Description: 2-Way F 1.5 Series, Sealed(BK)

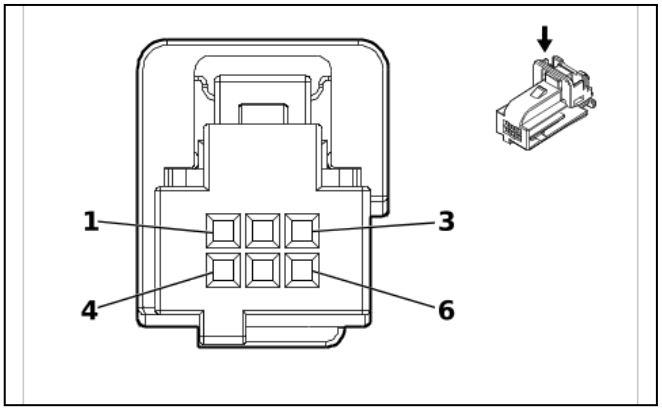
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

B5RR Rear Wheel Speed Sensor - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / YE	(1) 7128	(1) Right Rear Wheel Speed Sensor Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) VT	(2) 882	(2) Right Rear Wheel Speed Sensor Signal	(2) I	(2) —

B10D Sun Load and Ambient Light and Security Indicator Sensor



2282896

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 2294663-1
- Service Connector: 85587649
- Description: 6-Way F 0.64 Micro-Quadlock Series(BK)

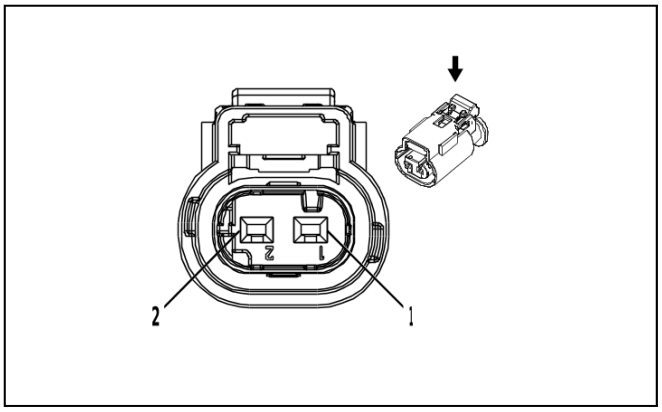
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

B10D Sun Load and Ambient Light and Security Indicator Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GY	(1) 590	(1) Driver Solar Sensor Signal	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.35	(3) WH / BU	(3) 278	(3) Ambient Light Sensor Signal	(3) I	(3) —
(4) 4	(4) 0.35	(4) BU / WH	(4) 734	(4) Inside Air Temperature Sensor Signal	(4) I	(4) —
(5) 5	(5) 0.35	(5) GY	(5) 728	(5) Security Indicator Control	(5) I	(5) —
(6) 6	(6) 0.35	(6) BK / YE	(6) 407	(6) Sensor Low Reference	(6) I	(6) —

B20A Brake Fluid Level Indicator Switch



2717066

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 10010337
- Service Connector: 13587326
- Description: 2-Way F 1.2 Multilock Series, Sealed(BK)

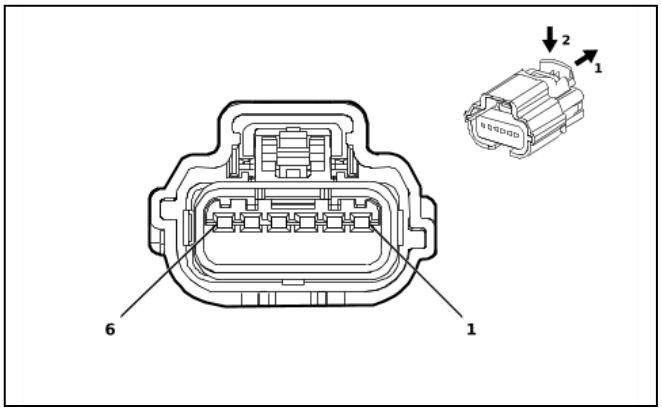
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

B20A Brake Fluid Level Indicator Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GN / GY	(1) 333	(1) Brake Fluid Level Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / WH	(2) 2251	(2) Signal Ground	(2) I	(2) —

B22 Brake Pedal Position Sensor



4773396

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 31404-7810
- Service Connector: 84683650
- Description: 6-Way F 64 Series, Sealed(NA)

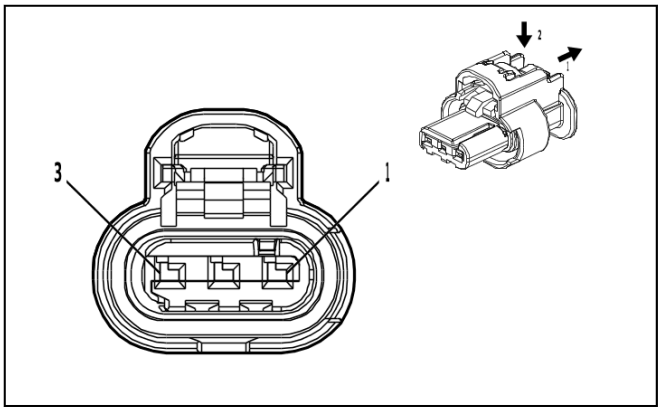
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

B22 Brake Pedal Position Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BK / BN	(1) 5360	(1) Brake Apply Sensor Low Reference	(1) I	(1) —
(2) 2	(2) 0.35	(2) WH	(2) 5359	(2) Brake Apply Sensor Control	(2) I	(2) —
(3) 3	(3) 0.35	(3) BU / YE	(3) 5361	(3) Brake Apply Sensor Signal	(3) I	(3) —
(4) 4	(4) 0.5	(4) WH / GN	(4) 5380	(4) Brake Position Sensor Signal	(4) I	(4) —
(5) 5	(5) 0.5	(5) BK / GY	(5) 626	(5) Engine Control Vehicle Sensors Low Reference 1	(5) I	(5) —
(6) 6	(6) 0.5	(6) WH / RD	(6) 480	(6) Engine Control Vehicle Sensors 5 Volt Reference 1	(6) I	(6) —

B23E Camshaft Position Sensor - Exhaust



4581126

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296695-1
- Service Connector: 86792094
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

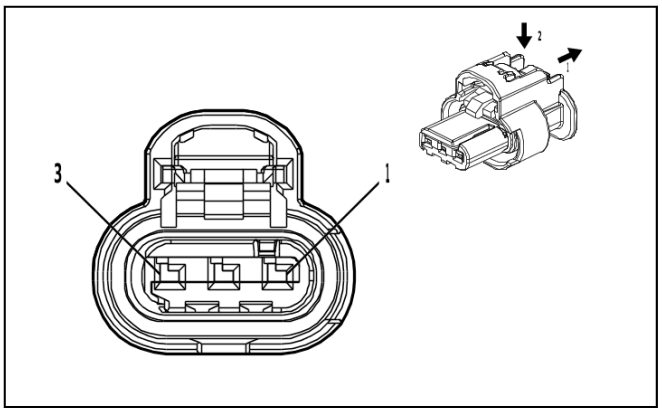
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B23E Camshaft Position Sensor - Exhaust

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / YE	(1) 5297	(1) Exhaust Camshaft Position Sensor 1 Voltage Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / GY	(2) 5296	(2) Exhaust Camshaft Position Sensor Low Reference 1	(2) I	(2) —
(3) 3	(3) 0.5	(3) VT / BK	(3) 5273	(3) Exhaust Camshaft Position Sensor 1	(3) I	(3) —

B23F Camshaft Position Sensor - Intake



4581126

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296695-1
- Service Connector: 86792094
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

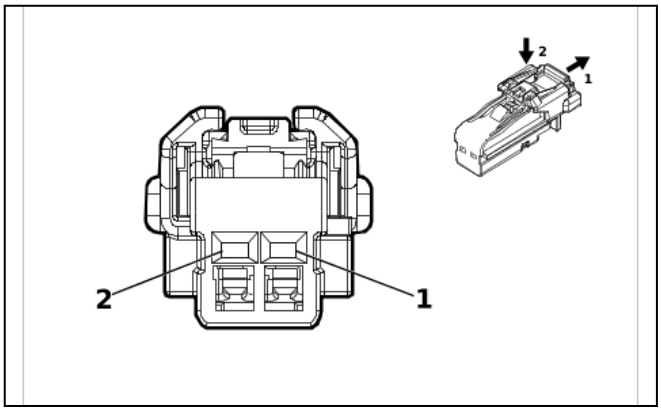
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B23F Camshaft Position Sensor - Intake

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / BU	(1) 5300	(1) Intake Camshaft Position Sensor 1 Voltage Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / GN	(2) 5301	(2) Intake Camshaft Position Sensor Low Reference 1	(2) I	(2) —
(3) 3	(3) 0.5	(3) YE / VT	(3) 5275	(3) Intake Camshaft Position Sensor 1	(3) I	(3) —

B24 Mobile Telephone Microphone



4115691

Connector Part Information
- Harness Type: Roof Wiring Harness
- OEM Connector: 6098-8988
- Service Connector: 87816612
- Description: 2-Way F 1.2 MCON Series(BK)

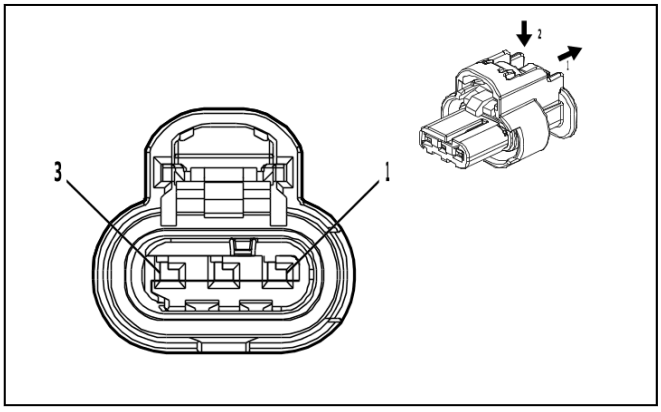
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B24 Mobile Telephone Microphone

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BK / BN	(1) 654	(1) Cellular Telephone Microphone Low Reference	(1) I	(1) —
(2) 2	(2) 0.35	(2) BU	(2) 655	(2) Cellular Telephone Microphone Signal	(2) I	(2) —

B26 Crankshaft Position Sensor



4778903

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296695-2
- Service Connector: 86792095
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

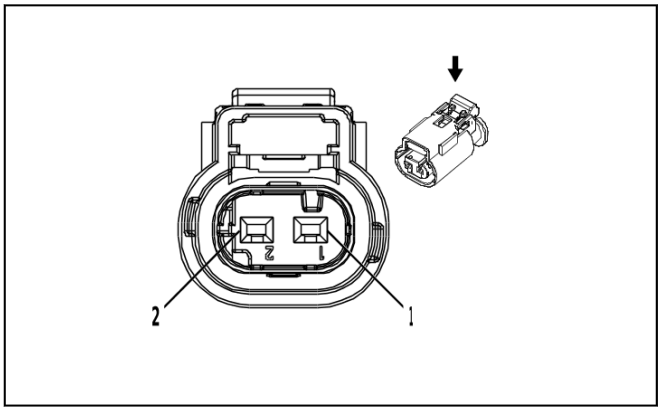
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B26 Crankshaft Position Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / BU	(1) 6270	(1) Crankshaft Position Sensor Voltage	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / VT	(2) 6272	(2) Crankshaft Position Sensor Low Reference	(2) I	(2) —
(3) 3	(3) 0.5	(3) GN	(3) 6271	(3) Crankshaft Position Sensor Signal	(3) I	(3) —

B34A Engine Coolant Temperature Sensor 1



2717066

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 10010337
- Service Connector: 13587326
- Description: 2-Way F 1.2 Multilock Series, Sealed(BK)

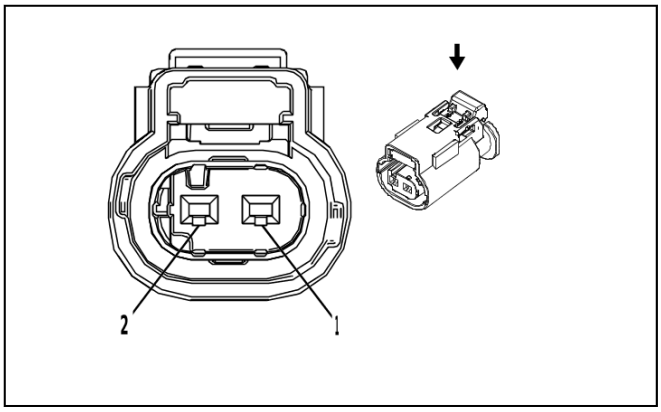
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B34A Engine Coolant Temperature Sensor 1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) YE / BU	(1) 2408	(1) Engine Inlet Coolant Temperature Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / GY	(2) 626	(2) Engine Control Vehicle Sensors Low Reference 1	(2) I	(2) —

B34B Engine Coolant Temperature Sensor 2



2830969

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 10010339
- Service Connector: 13587321
- Description: 2-Way F 1.2 Multilock Series, Sealed(D-GY)

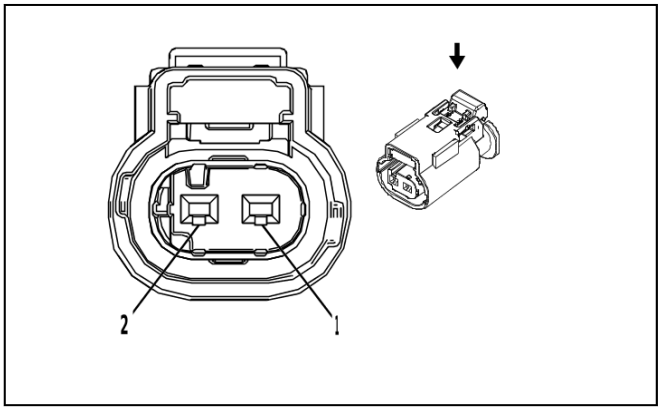
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B34B Engine Coolant Temperature Sensor 2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT	(1) 2988	(1) Engine Outlet Coolant Temperature Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / GY	(2) 626	(2) Engine Control Vehicle Sensors Low Reference 1	(2) I	(2) —

B34E Engine Coolant Temperature Sensor 5



2830969

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 10010339
- Service Connector: 13587321
- Description: 2-Way F 1.2 Multilock Series, Sealed(D-GY)

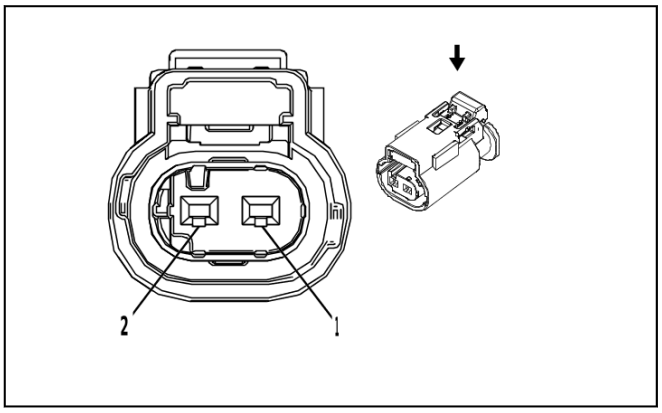
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B34E Engine Coolant Temperature Sensor 5

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BU / YE	(1) 8938	(1) Engine Integrated Exhaust Manifold Temperature Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / YE	(2) 548	(2) Engine Control Sensors Low Reference 1	(2) I	(2) —

B34F Engine Coolant Temperature Sensor 6



2830969

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 10010339
- Service Connector: 13587321
- Description: 2-Way F 1.2 Multilock Series, Sealed(D-GY)

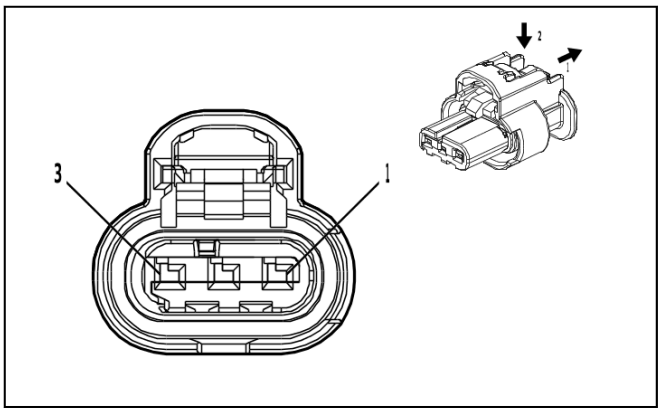
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B34F Engine Coolant Temperature Sensor 6

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / VT	(1) 2404	(1) Engine Block Coolant Temperature Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / YE	(2) 548	(2) Engine Control Sensors Low Reference 1	(2) I	(2) —

B36 Engine Oil Temperature Sensor



4994602

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296695-3
- Service Connector: 19371199
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

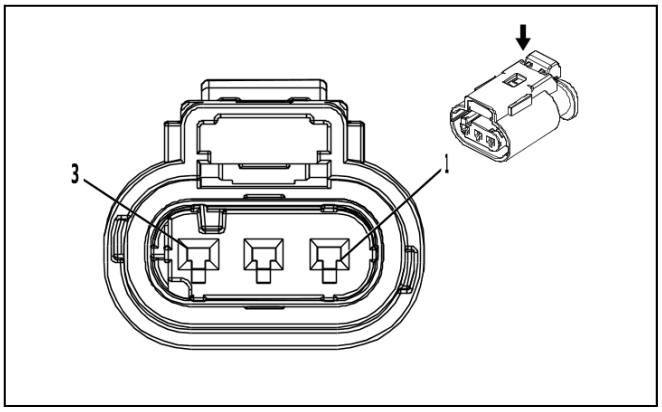
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B36 Engine Oil Temperature Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BK / GY	(1) 626	(1) Engine Control Vehicle Sensors Low Reference 1	(1) I	(1) —
(2) 2	(2) 0.5	(2) BN / BU	(2) 357	(2) Oil Temperature Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) VT	(3) 7485	(3) Engine Oil Temperature Sensor 2 Signal	(3) I	(3) —

B37B Engine Oil Pressure Sensor



3240107

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 10010344
- Service Connector: 19301717
- Description: 3-Way F 1.2 Multilock Series, Sealed(BK)

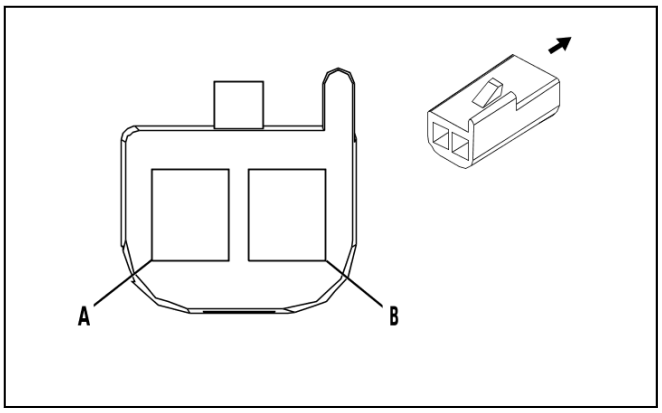
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B37B Engine Oil Pressure Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) YE / BN	(1) 331	(1) Oil Pressure Sensor Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / YE	(2) 548	(2) Engine Control Sensors Low Reference 1	(2) I	(2) —
(3) 3	(3) 0.5	(3) BU / RD	(3) 460	(3) Engine Control Sensors 5 Volt Reference 1	(3) I	(3) —

B39 Air Conditioning Evaporator Air Temperature Sensor



82383

Connector Part Information
- Harness Type: Air Conditioning Wiring Harness
- OEM Connector: 12059247
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 150 Metri-Pack Series(GY)

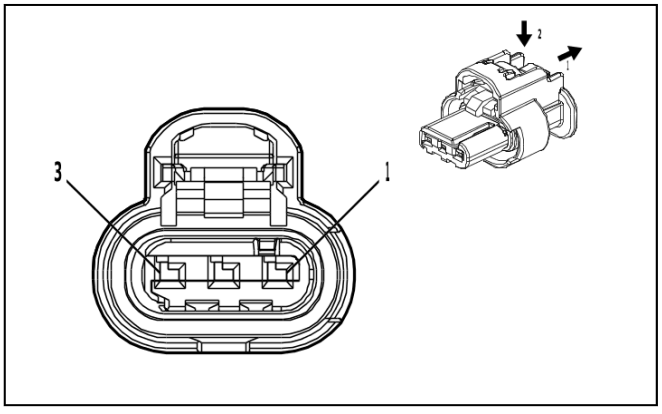
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-2A (GY)	No Tool Required

B39 Air Conditioning Evaporator Air Temperature Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.35	BK / YE	407	Sensor Low Reference	I	SZ/ DZ
B	0.35	GY	6137	Air Conditioning Evaporator Temperature Sensor Signal	I	SZ/ DZ

B47 Fuel Pressure Sensor



4581126

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 1-2296695-1
- Service Connector: 86792094
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

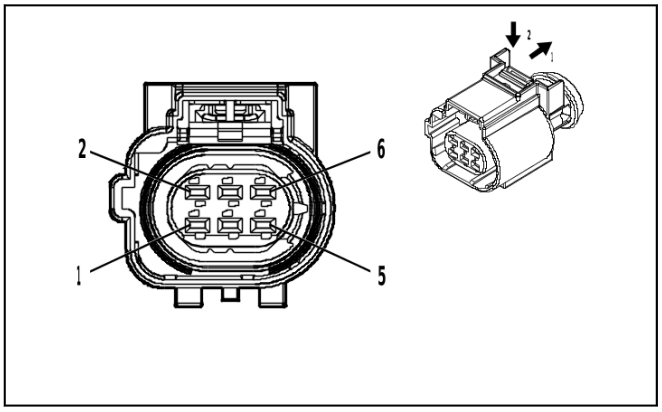
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

B47 Fuel Pressure Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BN / RD	(1) 7445	(1) Fuel Line Pressure Sensor 5V Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / YE	(2) 7447	(2) Fuel Pressure Sensor Low Reference	(2) I	(2) —
(3) 3	(3) 0.5	(3) BU / WH	(3) 7446	(3) Fuel Pressure Sensor Signal	(3) I	(3) —

B52A Heated Oxygen Sensor 1



5086832

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 2-2309220-8
- Service Connector: 84613131
- Description: 6-Way F 1.5 MCP Series, Sealed(GY)

Terminal Part Information

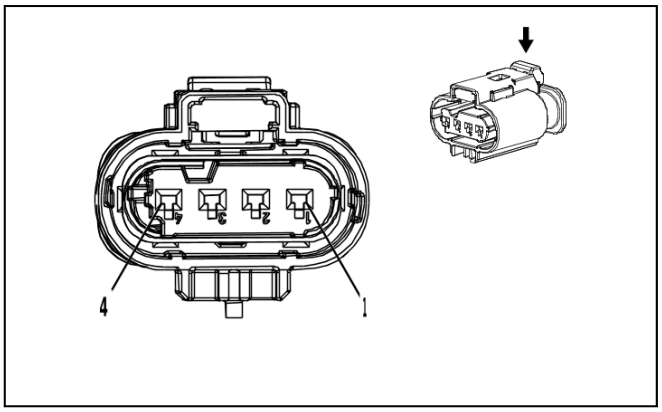
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

B52A Heated Oxygen Sensor 1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BN / WH	(1) 6933	(1) HO2S Pump Current Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BN	(2) 6934	(2) HO2S Ground	(2) I	(2) —
(3) 3	(3) 0.5	(3) WH / WH	(3) 3121	(3) HO2S Low Signal Bank 1 Sensor 2	(3) I	(3) —
(4) 4	(4) 0.5	(4) VT / BU	(4) 5293	(4) Powertrain Main Relay Fused Supply Voltage 4	(4) I	(4) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(5) 5	(5) 0.5	(5) GN	(5) 6935	(5) HO2S Pump Current Trim Signal	(5) I	(5) —
(6) 6	(6) 0.5	(6) YE / GY	(6) 6936	(6) HO2S Signal	(6) I	(6) —

B52B Heated Oxygen Sensor 2



4036496

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 10021265
- Service Connector: 19330904
- Description: 4-Way F 1.2 Multilock Series, Sealed(BK)

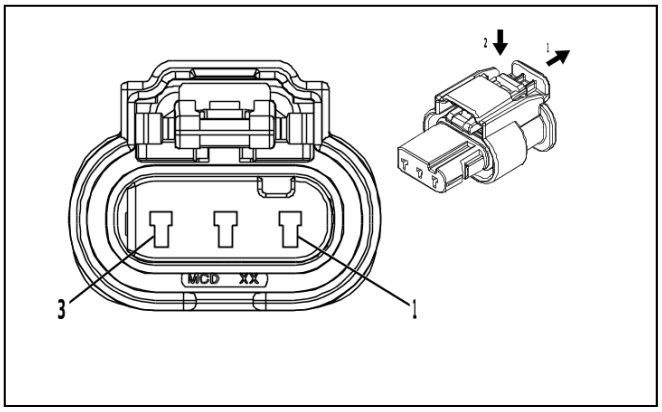
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

B52B Heated Oxygen Sensor 2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / WH	(1) 3122	(1) HO2S Heater Low Control Bank 1 Sensor 2	(1) I	(1) —
(2) 2	(2) 0.5	(2) VT / BU	(2) 5294	(2) Powertrain Main Relay Fused Supply Voltage 5	(2) I	(2) —
(3) 3	(3) 0.5	(3) WH / YE	(3) 3121	(3) HO2S Low Signal Bank 1 Sensor 2	(3) I	(3) —
(4) 4	(4) 0.5	(4) BN	(4) 3120	(4) HO2S High Signal Bank 1 Sensor 2	(4) I	(4) —

B55 Engine Compartment Cover Switch



4421568

Connector Part Information
- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 34900-3120
- Service Connector: 19368220
- Description: 3-Way F 1.2 MCON-LL Series, Sealed(BK)

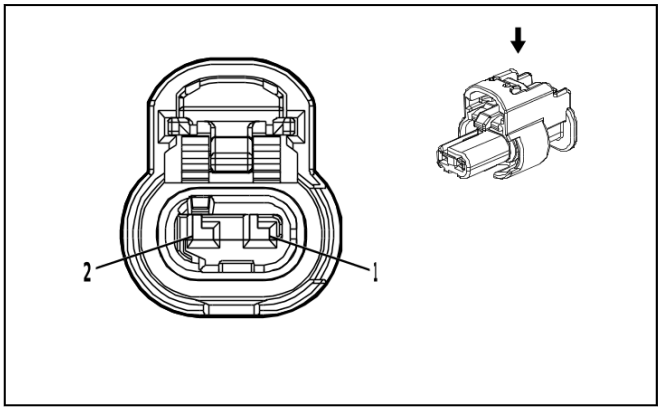
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B55 Engine Compartment Cover Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) YE	(1) 4063	(1) Hood Status A Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BN / GN	(2) 4064	(2) Hood Status B Signal	(2) I	(2) —
(3) 3	(3) 0.75	(3) BK	(3) 2250	(3) Ground	(3) I	(3) —

B58L Airbag Front End Discriminating Sensor - Left



4690744

Connector Part Information
- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 1-2296694-3
- Service Connector: 19366871
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

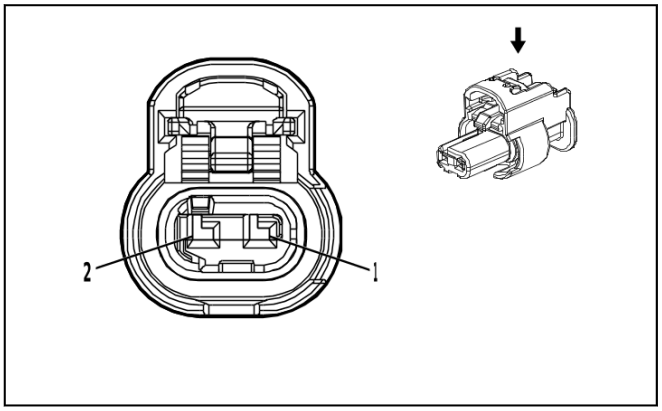
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

B58L Airbag Front End Discriminating Sensor - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / YE	(1) 354	(1) Left Front Impact Discriminating Sensor Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / OG	(2) 5045	(2) Left Front Impact Discriminating Sensor Low Reference	(2) I	(2) —

B58R Airbag Front End Discriminating Sensor - Right



4690744

Connector Part Information

- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 1-2296694-3
- Service Connector: 19366871
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

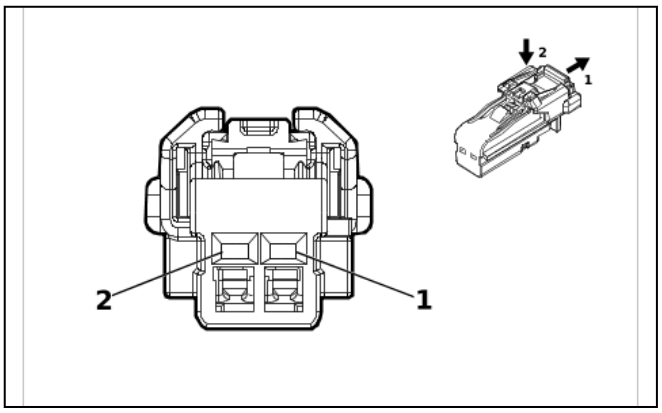
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

B58R Airbag Front End Discriminating Sensor - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / GN	(1) 1409	(1) Right Front Impact Discriminating Sensor Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / OG	(2) 5600	(2) Right Front Impact Discriminating Sensor Low Reference	(2) I	(2) —

B61P Seat Belt Tension Sensor - Passenger



4115691

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 6098-8988
- Service Connector: 87816612
- Description: 2-Way F 1.2 MCON Series(BK)

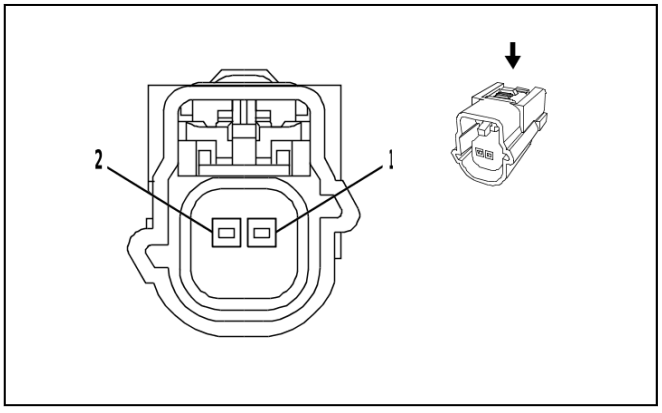
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B61P Seat Belt Tension Sensor - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / OG	(1) 3946	(1) Passenger Automatic Locking Retractor Switch Low Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) OG / BN	(2) 3947	(2) Passenger Automatic Locking Retractor Switch Signal	(2) I	(2) —

B63LF Airbag Side Impact Sensor - Left Front Door



2179777

Connector Part Information
- Harness Type: Front Side Door Door Wiring Harness - Driver
- OEM Connector: 54390242
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 0.64 Series, Sealed(GY)

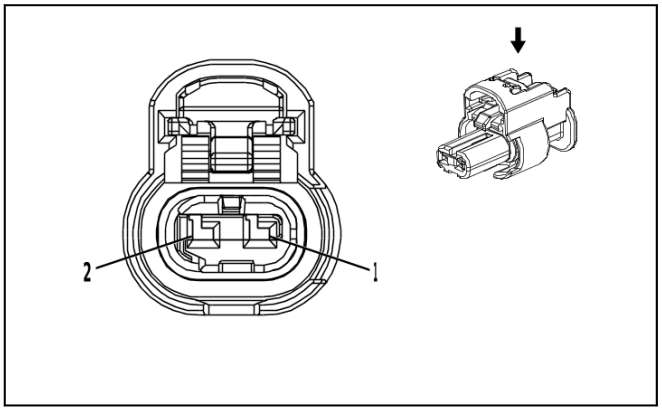
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

B63LF Airbag Side Impact Sensor - Left Front Door

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / GN	(1) 2132	(1) Left Front Side Impact Sensor Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / OG	(2) 6628	(2) Left Front Side Impact Sensor Low Reference	(2) I	(2) —

B63LRG Airbag Side Impact Rear Sensor - Left



4335931

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 1-2296694-2
- Service Connector: 19366843
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

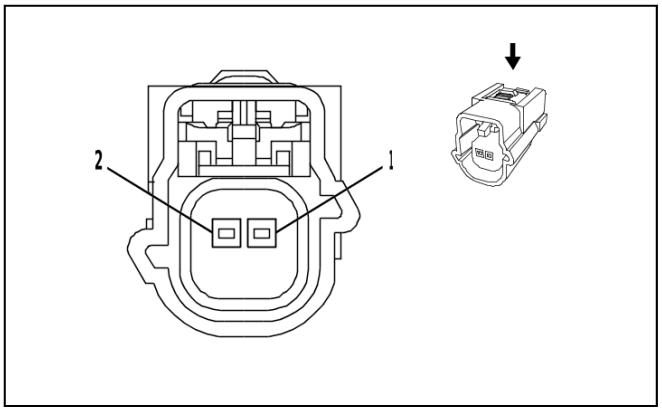
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

B63LRG Airbag Side Impact Rear Sensor - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / BU	(1) 6622	(1) Left Rear Side Impact Sensor Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / OG	(2) 6623	(2) Left Rear Side Impact Sensor Low Reference	(2) I	(2) —

B63RF Airbag Side Impact Sensor - Right Front Door



2179777

Connector Part Information
- Harness Type: Front Side Door Door Wiring Harness - Passenger
- OEM Connector: 54390242
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 0.64 Series, Sealed(GY)

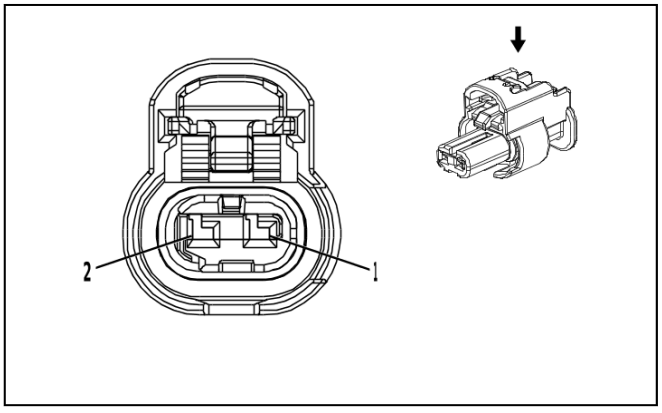
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

B63RF Airbag Side Impact Sensor - Right Front Door

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BN / OG	(1) 2134	(1) Right Front Side Impact Sensor Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / OG	(2) 6629	(2) Right Front Side Impact Sensor Low Reference	(2) I	(2) —

B63RRG Airbag Side Impact Rear Sensor - Right



4335931

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 1-2296694-2
- Service Connector: 19366843
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

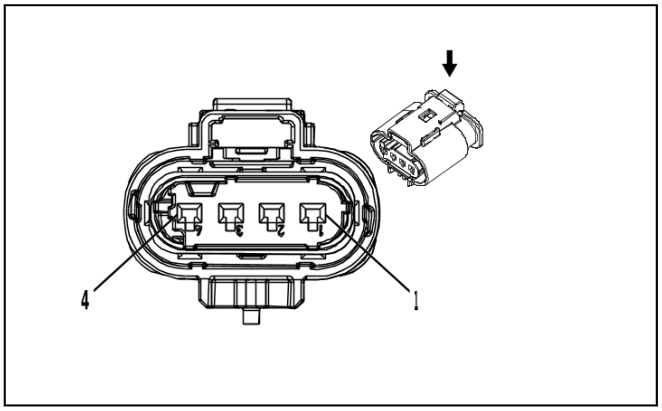
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

B63RRG Airbag Side Impact Rear Sensor - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / WH	(1) 6626	(1) Right Rear Side Impact Sensor Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / OG	(2) 6627	(2) Right Rear Side Impact Sensor Low Reference	(2) I	(2) —

B65 Manifold Absolute Pressure and Intake Air Temperature Sensor



2717079

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 10010346
- Service Connector: 13587299
- Description: 4-Way F 1.2 Multilock Series, Sealed(BK)

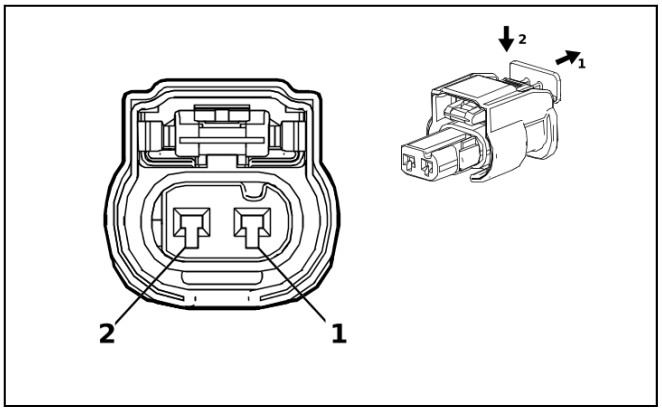
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B65 Manifold Absolute Pressure and Intake Air Temperature Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH / BU	(1) 7329	(1) Pre-Throttle Air Temperature Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) GY / RD	(2) 2704	(2) Manifold Absolute Pressure Sensor 5V Reference	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / GN	(3) 469	(3) Manifold Absolute Pressure Sensor Low Reference	(3) I	(3) —
(4) 4	(4) 0.5	(4) GN / WH	(4) 432	(4) Manifold Absolute Pressure Sensor Signal	(4) I	(4) —

B68A Knock Sensor 1



3960139

Connector Part Information
- Harness Type: Fuel Injector Wiring Harness
- OEM Connector: 34900-2120
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

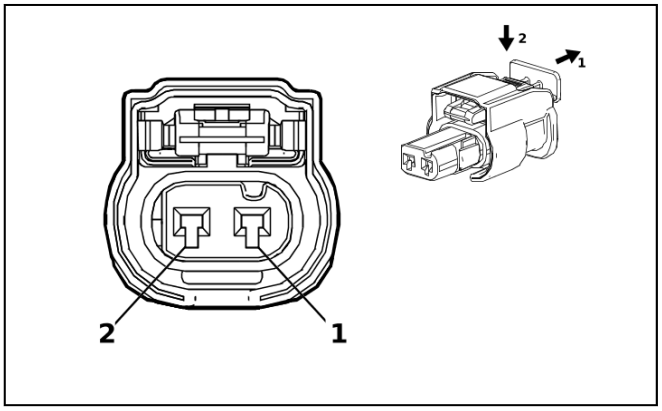
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

B68A Knock Sensor 1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / GY	(1) 496	(1) Knock Sensor 1 Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / WH	(2) 1716	(2) Knock Sensor Low Reference 1	(2) I	(2) —

B68B Knock Sensor 2



3960139

Connector Part Information
- Harness Type: Fuel Injector Wiring Harness
- OEM Connector: 34900-2120
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

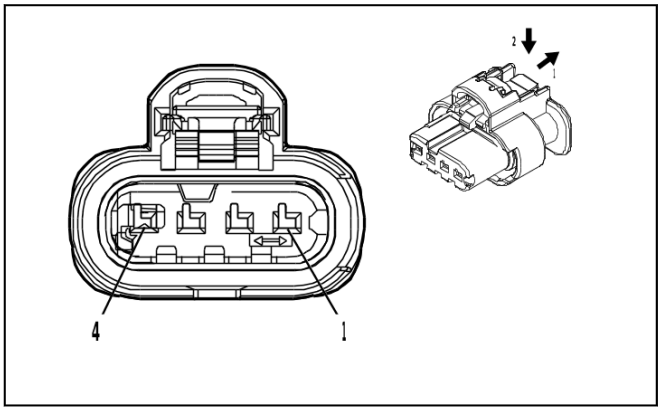
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

B68B Knock Sensor 2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH / GY	(1) 1876	(1) Knock Sensor 2 Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / GY	(2) 2303	(2) Knock Sensor Low Reference 2	(2) I	(2) —

B75 Mass Airflow Sensor



4934614

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296696-2
- Service Connector: 85519071
- Description: 4-Way F 1.2 MCON-CB Series, Sealed(BK)

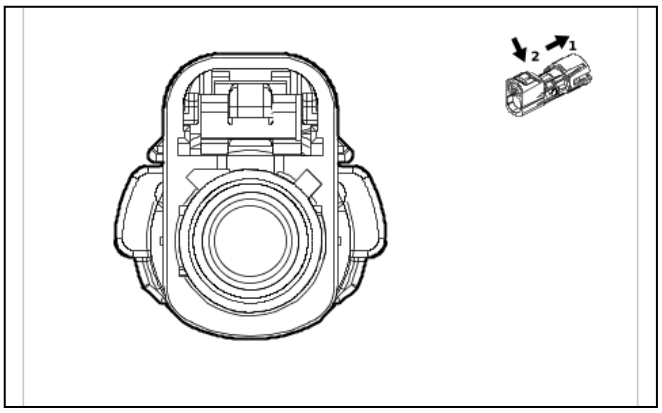
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B75 Mass Airflow Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / BU	(1) 5294	(1) Powertrain Main Relay Fused Supply Voltage 5	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU	(2) 492	(2) Mass Air Flow Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) GN / WH	(3) 4622	(3) Engine Control Module LIN Bus 2	(3) I	(3) —
(4) 4	(4) 0.75	(4) BK / WH	(4) 151	(4) Signal Ground	(4) I	(4) —

B87 Rearview Driver Information Camera (UV2)



5758030

Connector Part Information
- Harness Type: Liftgate Jumper Wiring Harness COAX
- OEM Connector: 13529782
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type(BK)

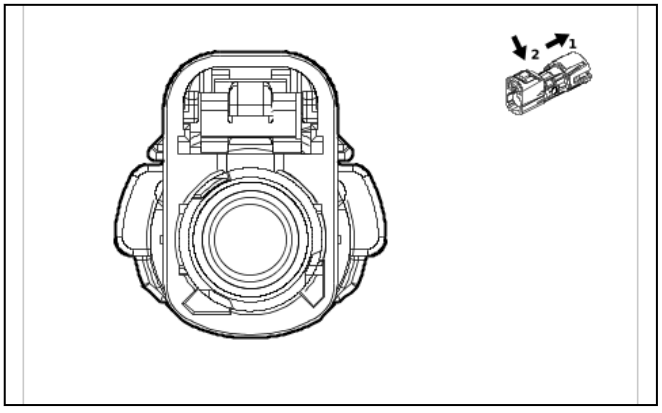
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

B87 Rearview Driver Information Camera (UV2)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	Coax Cable	—	Rear Vision Camera Coaxial Video Signal	I	—

B87 Rearview Driver Information Camera (UVB)



5757455

Connector Part Information
- Harness Type: Liftgate Jumper Wiring Harness COAX
- OEM Connector: 13529793
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type(OG)

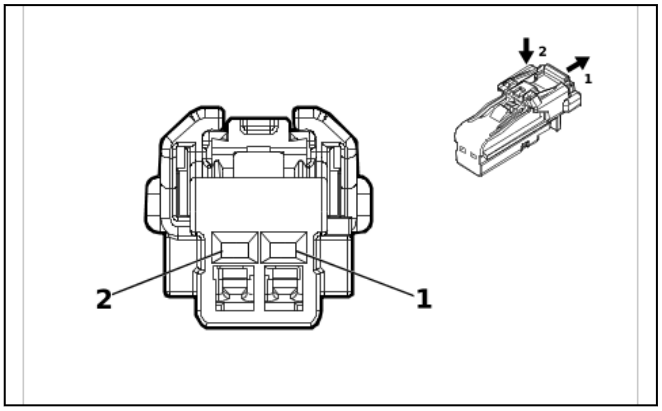
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

B87 Rearview Driver Information Camera (UVB)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	Coax Cable	—	Rear Vision Camera Coaxial Video Signal	I	—

B88D Seat Belt Switch - Driver



4115691

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 6098-8988
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.2 MCON Series(BK)

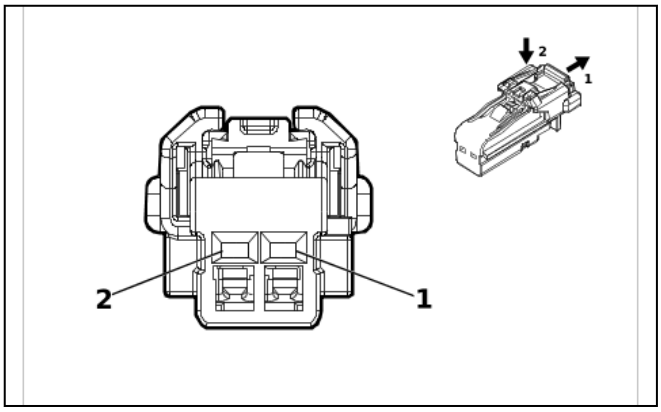
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B88D Seat Belt Switch - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BK / OG	(1) 1363	(1) Driver Seat Belt Switch Low Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) OG / BN	(2) 238	(2) Driver Seat Belt Switch Signal	(2) I	(2) —

B88P Seat Belt Switch - Passenger



4115691

Connector Part Information
- Harness Type: Front Seat Wiring Harness - Passenger
- OEM Connector: 6098-8988
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.2 MCON Series(BK)

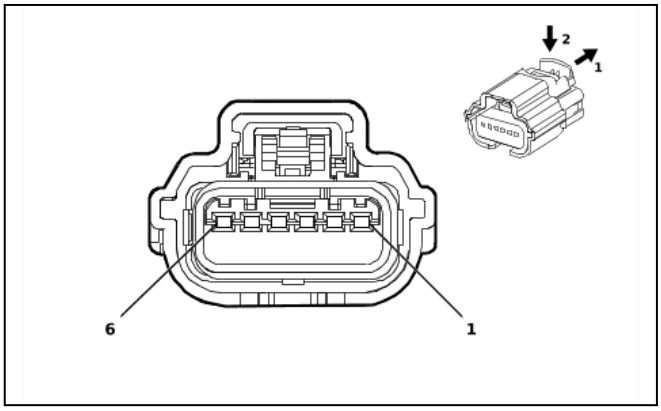
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B88P Seat Belt Switch - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BK / OG	(1) 1363	(1) Driver Seat Belt Switch Low Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) OG / VT	(2) 1362	(2) Passenger Seat Belt Switch Signal	(2) I	(2) —

B107 Accelerator Pedal Position Sensor



5157678

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 31404-7110
- Service Connector: 84773558
- Description: 6-Way F 64 Series, Sealed(BK)

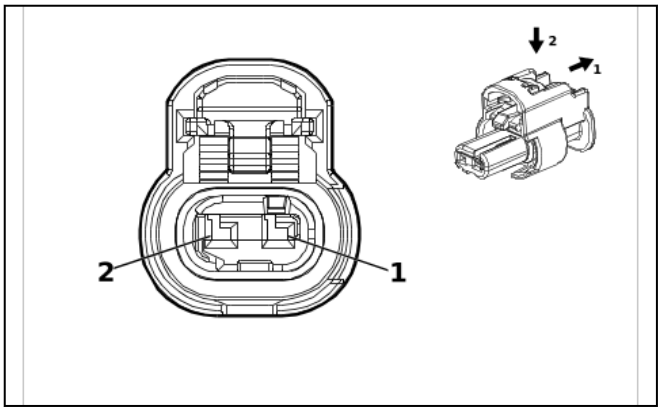
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

B107 Accelerator Pedal Position Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BN / RD	(1) 1274	(1) Accelerator Pedal Position 5V Reference 2	(1) I	(1) —
(2) 2	(2) 0.5	(2) GN / WH	(2) 1162	(2) Accelerator Pedal Position Signal 2	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / VT	(3) 1272	(3) Accelerator Pedal Position Low Reference 2	(3) I	(3) —
(4) 4	(4) 0.5	(4) BK / BU	(4) 1271	(4) Accelerator Pedal Position Low Reference 1	(4) I	(4) —
(5) 5	(5) 0.5	(5) YE / WH	(5) 1161	(5) Accelerator Pedal Position Signal 1	(5) I	(5) —
(6) 6	(6) 0.5	(6) WH / RD	(6) 1164	(6) Accelerator Pedal Position 5V Reference 1	(6) I	(6) —

B110 Battery Monitor Module X1



4649903

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 1-2296694-1
- Service Connector: 85761014
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

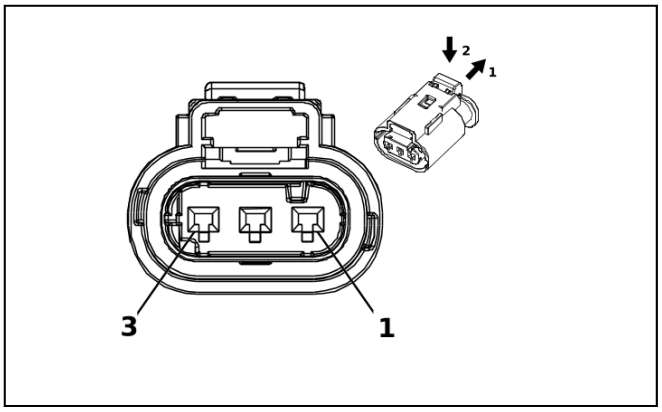
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

B110 Battery Monitor Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GN / YE	(1) 2855	(1) Body Control Module LIN Bus 9	(1) I	(1) —
(2) 2	(2) 0.75	(2) RD / YE	(2) 2340	(2) Battery Positive Voltage	(2) I	(2) —

B111 Turbocharger/Supercharger Boost Pressure Sensor



2717069

Connector Part Information

- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 10010341
- Service Connector: 84601390
- Description: 3-Way F 1.2 Multilock Series, Sealed(BK)

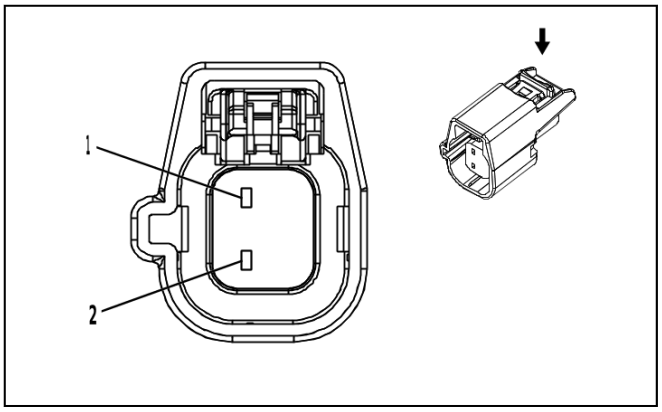
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B111 Turbocharger/Supercharger Boost Pressure Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BU / RD	(1) 460	(1) Engine Control Sensors 5 Volt Reference 1	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / YE	(2) 548	(2) Engine Control Sensors Low Reference 1	(2) I	(2) —
(3) 3	(3) 0.5	(3) YE / WH	(3) 3200	(3) Throttle Inlet Absolute Pressure Sensor Signal	(3) I	(3) —

B118 Windshield Washer Solvent Container Level Sensor



3958652

Connector Part Information
- Harness Type: Windshield Washer Pump Extension Wiring Harness
- OEM Connector: 7287-8378-40
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.5 Series, Sealed(L-GY)

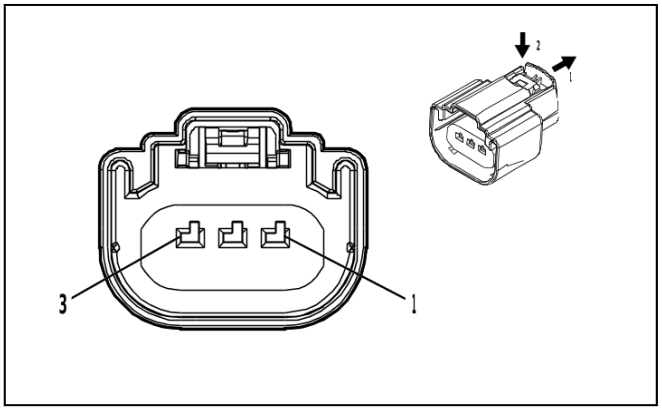
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

B118 Windshield Washer Solvent Container Level Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / BK	(1) 185	(1) Low Washer Fluid Indicator Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / WH	(2) 2250	(2) Ground	(2) I	(2) —

B139 Transfer Case Two/Four Wheel Drive Actuator Position Sensor (NP0 / NQH)



4569745

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 160073-3105
- Service Connector: 19179750
- Description: 3-Way F 1.5 MX Series, Sealed(BK)

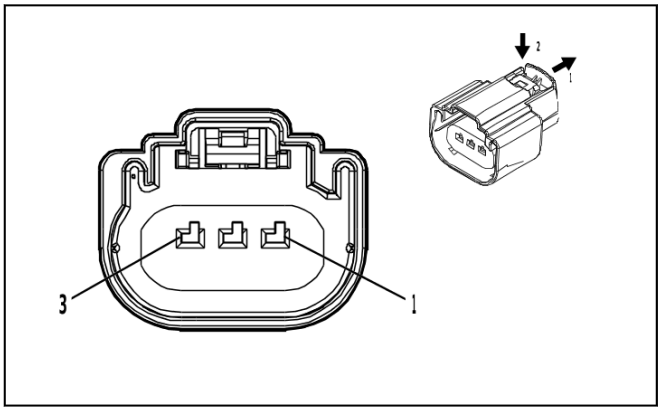
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

B139 Transfer Case Two/Four Wheel Drive Actuator Position Sensor (NP0 / NQH)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH / RD	(1) 7477	(1) Gear Position Sensor 5V Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) WH / GN	(2) 7479	(2) Rotary Position Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) YE / BK	(3) 7478	(3) Gear Position Sensor Low Reference	(3) I	(3) —

B150 Fuel Tank Pressure Sensor



4589538

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 160073-3106
- Service Connector: 84569854
- Description: 3-Way F 1.5 MX Series, Sealed(GY)

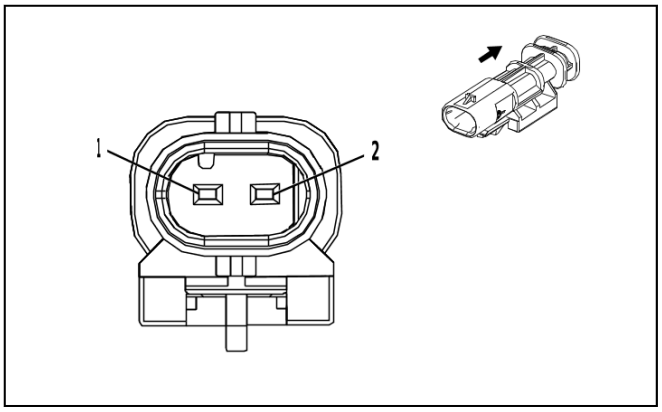
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

B150 Fuel Tank Pressure Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BU / WH	(1) 890	(1) Fuel Tank Pressure Sensor Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / BN	(2) 6284	(2) Fuel Tank Pressure Sensor Low Reference	(2) I	(2) —
(3) 3	(3) 0.5	(3) YE / RD	(3) 2709	(3) Fuel Tank Pressure Sensor 5V Reference	(3) I	(3) —

B153LR Rear Seat Belt Buckle - Left



2474755

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 2203314-1
- Service Connector: 85533165
- Description: 2-Way M 1.2 MCON Series, Sealed(BK)

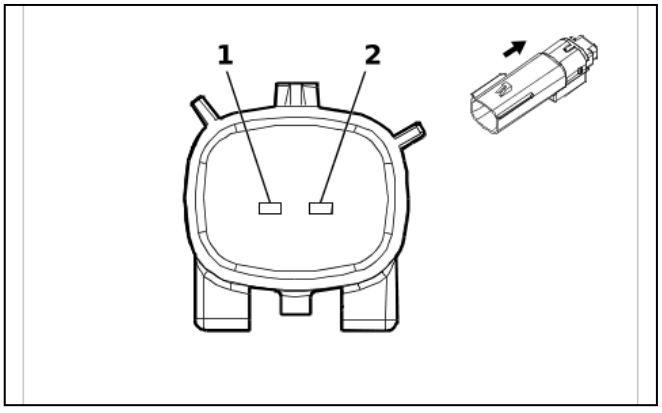
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-17 (L-GN)	No Tool Required

B153LR Rear Seat Belt Buckle - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BK / OG	(1) 1363	(1) Driver Seat Belt Switch Low Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) YE / OG	(2) 5161	(2) Left Rear Seat Belt Switch Signal	(2) I	(2) —

B153RM Rear Center Seat Belt Buckle



6366248

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 33481-2202
- Service Connector: 85043200
- Description: 2-Way M 1.5 MX Series, Sealed(GY)

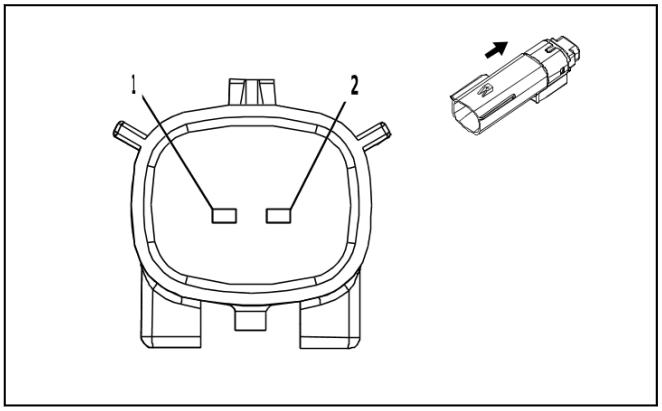
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-3 (GY)	No Tool Required

B153RM Rear Center Seat Belt Buckle

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BK / OG	(1) 1363	(1) Driver Seat Belt Switch Low Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU / OG	(2) 5163	(2) Rear Center Seat Belt Switch Signal	(2) I	(2) —

B153RR Rear Seat Belt Buckle - Right



3338703

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 33481-2201
- Service Connector: 84867146
- Description: 2-Way M 1.5 MX Series, Sealed(BK)

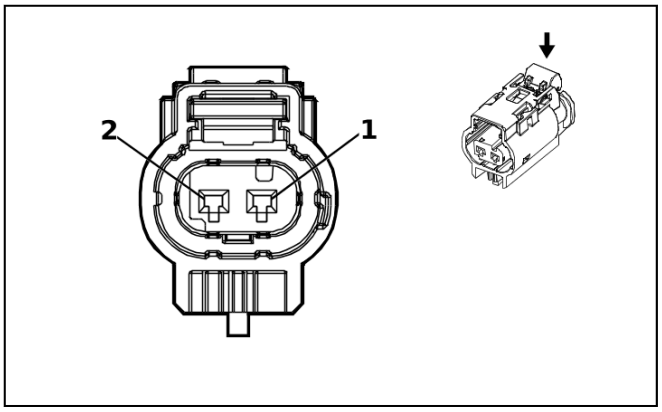
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-3 (GY)	No Tool Required

B153RR Rear Seat Belt Buckle - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BK / OG	(1) 1363	(1) Driver Seat Belt Switch Low Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) BN / OG	(2) 5162	(2) Right Rear Seat Belt Switch Signal	(2) I	(2) —

B172LF Front Disc Brake Pad Wear Sensor - Left



3747581

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 10094234
- Service Connector: 84727362
- Description: 2-Way F 1.2 Multilock Series, Sealed(BK)

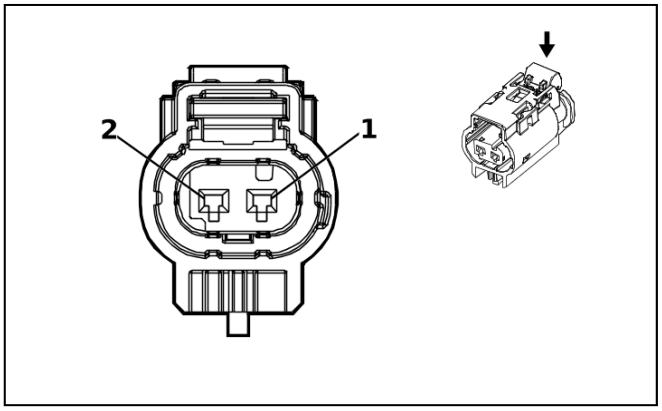
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B172LF Front Disc Brake Pad Wear Sensor - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BN / BU	(1) 1602	(1) Front Brake Pad Wear Sensor Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / WH	(2) 2051	(2) Signal Ground	(2) I	(2) —

B172LR Rear Disc Brake Pad Wear Sensor - Left



3747581

Connector Part Information
- Harness Type: Chassis Rear Wiring Harness Extension Harness
- OEM Connector: 10094234
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.2 Multilock Series, Sealed(BK)

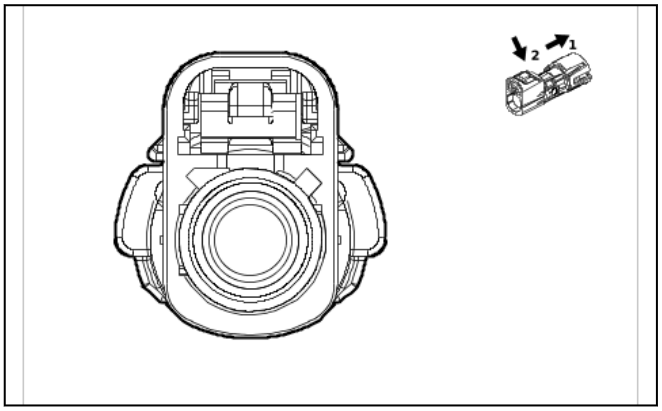
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B172LR Rear Disc Brake Pad Wear Sensor - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) GN / YE	(1) 1616	(1) Rear Brake Pad Wear Sensor Signal	(1) I	(1) —
(2) 2	(2) 0.75	(2) BK / WH	(2) 1751	(2) Signal Ground	(2) I	(2) —

B174G Front View Driver Information Camera - Grille (UV2 / UVB)



5758030

Connector Part Information

- Harness Type: Front Object Alarm Sensor Wiring Harness COAX
- OEM Connector: 13529782
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type(BK)

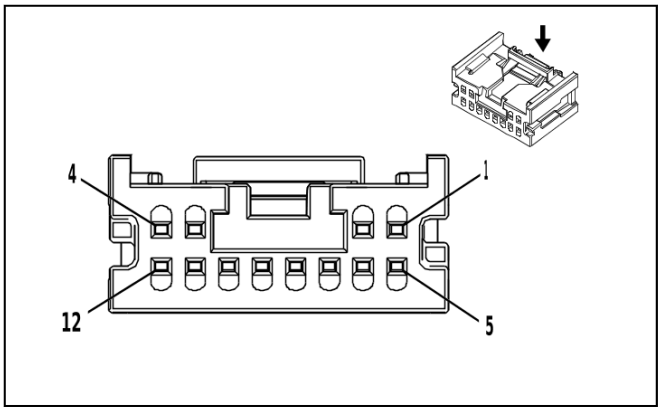
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

B174G Front View Driver Information Camera - Grille (UV2 / UVB)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	Coax Cable	—	Front Vision Camera 1 Coaxial Video Signal	I	—

B174W Front View Camera - Windshield



3824362

Connector Part Information

- Harness Type: Roof Wiring Harness
- OEM Connector: 34824-5124
- Service Connector: 13507121
- Description: 12-Way F Mini 50 Series(BK)

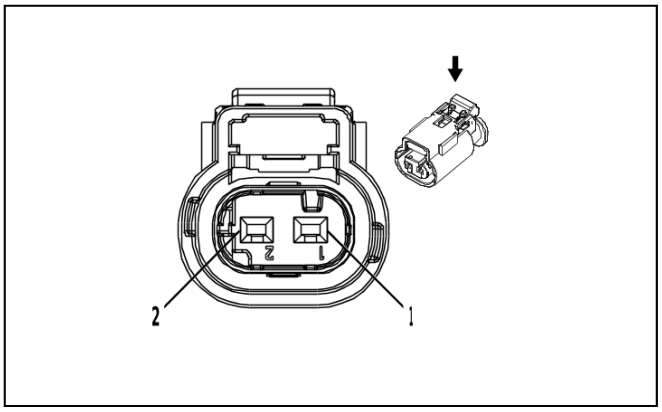
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19333221	EL-35616-58 (BK)	EL-38125-58

B174W Front View Camera - Windshield

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BK / WH	(1) 1851	(1) Signal Ground	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.35	(3) RD / YE	(3) 240	(3) Battery Positive Voltage	(3) I	(3) —
4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.35	(5) BU / YE	(5) 4979	(5) AUTOSAR CAN Bus [+] 2 Serial Data	(5) I	(5) —
(6) 6	(6) 0.35	(6) WH	(6) 4978	(6) AUTOSAR CAN Bus [-] 2 Serial Data	(6) I	(6) —
(7) 7	(7) 0.35	(7) BU / YE	(7) 4979	(7) AUTOSAR CAN Bus [+] 2 Serial Data	(7) I	(7) —
(8) 8	(8) 0.35	(8) WH	(8) 4978	(8) AUTOSAR CAN Bus [-] 2 Serial Data	(8) I	(8) —
9 - 12	—	—	—	Not Occupied	—	—

B203 Radiator Coolant Temperature Sensor



2717066

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 10010337
- Service Connector: 13587326
- Description: 2-Way F 1.2 Multilock Series, Sealed(BK)

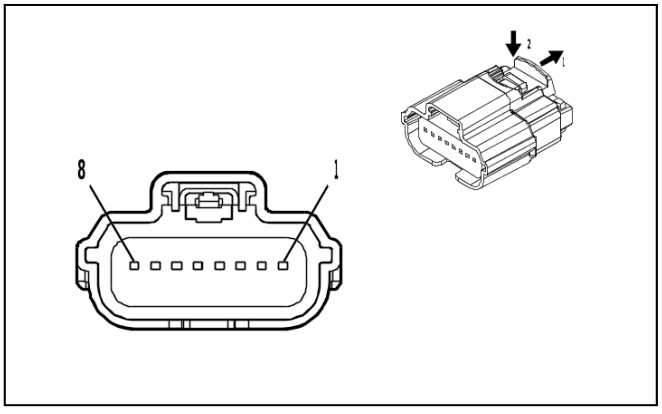
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B203 Radiator Coolant Temperature Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) YE / BK	(1) 3000	(1) Coolant Temperature Sensor 2 Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / GN	(2) 580	(2) Engine Control Sensors Low Reference 2	(2) I	(2) —

B218L Side Obstacle Detection Control Module - Left (UFB / UKI)



4708234

Connector Part Information
- Harness Type: Rear Object Alarm Sensor Wiring Harness
- OEM Connector: 31404-9110
- Service Connector: Service by Harness - See Part Catalog
- Description: 8-Way F 64 Series, Sealed(BK)

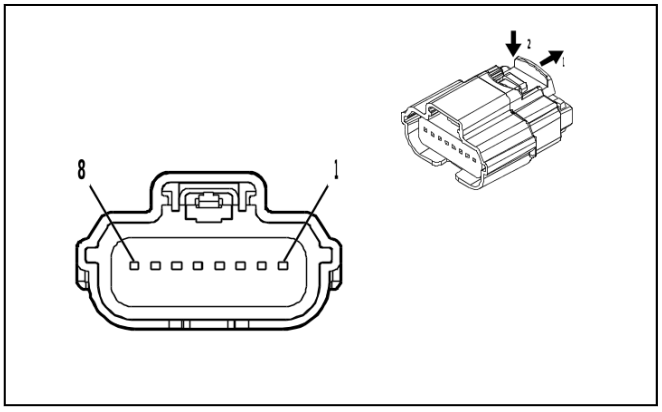
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

B218L Side Obstacle Detection Control Module - Left (UFB / UKI)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH	(1) 4087	(1) Private Serial Data Side Obstacle Detection CAN Bus [-] Serial Data	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU / VT	(2) 4088	(2) Private Serial Data Side Obstacle Detection CAN Bus [+] Serial Data	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / WH	(3) 751	(3) Signal Ground	(3) I	(3) —
(4) 4	(4) 0.5	(4) WH	(4) 4100	(4) AUTOSAR CAN Bus [-] 4 Serial Data	(4) I	(4) —
(5) 5	(5) 0.5	(5) WH	(5) 4100	(5) AUTOSAR CAN Bus [-] 4 Serial Data	(5) I	(5) —
(6) 6	(6) 0.5	(6) BU / VT	(6) 4101	(6) AUTOSAR CAN Bus [+] 4 Serial Data	(6) I	(6) —
(7) 7	(7) 0.5	(7) BU / VT	(7) 4101	(7) AUTOSAR CAN Bus [+] 4 Serial Data	(7) I	(7) —
(8) 8	(8) 0.5	(8) RD / BN	(8) 4940	(8) Battery Positive Voltage	(8) I	(8) —

B218R Side Obstacle Detection Control Module - Right



4708234

Connector Part Information

- Harness Type: Rear Object Alarm Sensor Wiring Harness
- OEM Connector: 31404-9532
- Service Connector: Service by Harness - See Part Catalog
- Description: 8-Way F 64 Series, Sealed(BK)

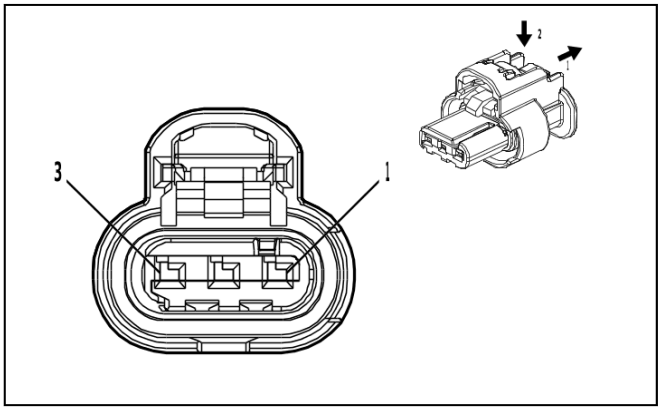
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

B218R Side Obstacle Detection Control Module - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH	(1) 4087	(1) Private Serial Data Side Obstacle Detection CAN Bus [-] Serial Data	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU / VT	(2) 4088	(2) Private Serial Data Side Obstacle Detection CAN Bus [+] Serial Data	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / WH	(3) 751	(3) Signal Ground	(3) I	(3) —
4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.5	(5) WH	(5) 4100	(5) AUTOSAR CAN Bus [-] 4 Serial Data	(5) I	(5) —
(6) 6	(6) 0.5	(6) BU / VT	(6) 4101	(6) AUTOSAR CAN Bus [+] 4 Serial Data	(6) I	(6) —
7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.5	(8) RD / BN	(8) 4940	(8) Battery Positive Voltage	(8) I	(8) —

B306E Parking Assist Alarm Sensor - Rear Left Outer (UD7)



4581126

Connector Part Information

- Harness Type: Rear Object Alarm Sensor Wiring Harness
- OEM Connector: 1-2296695-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

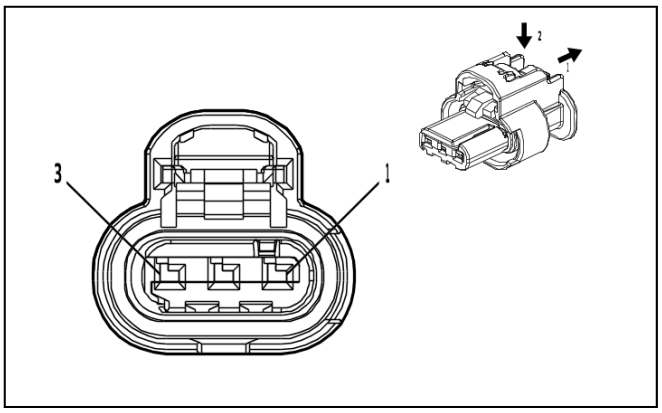
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B306E Parking Assist Alarm Sensor - Rear Left Outer (UD7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BN / WH	(1) 2374	(1) Object Sensor Voltage Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) YE	(2) 2375	(2) Left Rear Outer Parking Assist Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / GY	(3) 2379	(3) Object Sensor Low Reference	(3) I	(3) —

B306F Parking Assist Alarm Sensor - Rear Left Middle (UD7)



4581126

Connector Part Information

- Harness Type: Rear Object Alarm Sensor Wiring Harness
- OEM Connector: 1-2296695-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

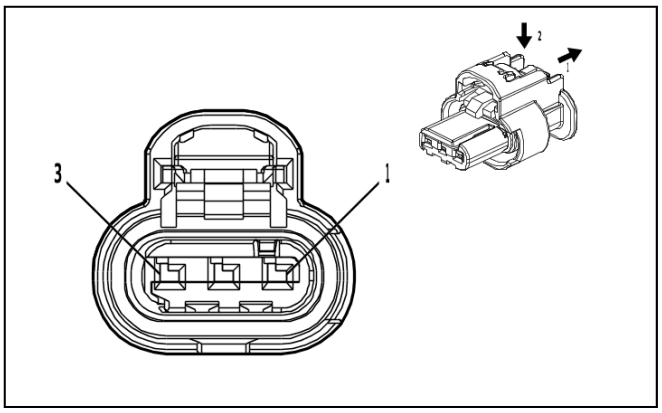
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B306F Parking Assist Alarm Sensor - Rear Left Middle (UD7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BN / WH	(1) 2374	(1) Object Sensor Voltage Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) YE / BU	(2) 2376	(2) Left Rear Middle Parking Assist Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / GY	(3) 2379	(3) Object Sensor Low Reference	(3) I	(3) —

B306G Parking Assist Alarm Sensor - Rear Right Middle (UD7)



4581126

Connector Part Information

- Harness Type: Rear Object Alarm Sensor Wiring Harness
- OEM Connector: 1-2296695-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

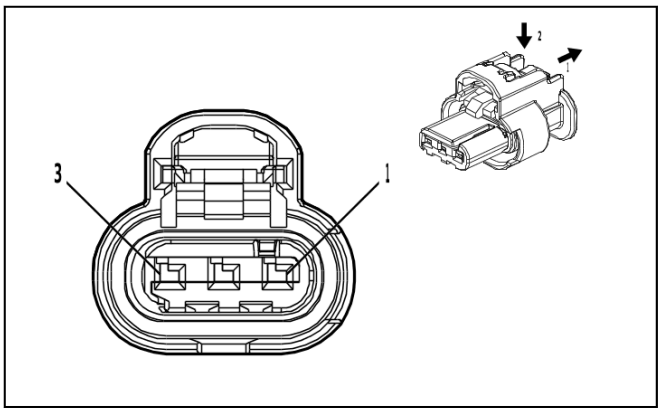
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B306G Parking Assist Alarm Sensor - Rear Right Middle (UD7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BN / WH	(1) 2374	(1) Object Sensor Voltage Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) YE / WH	(2) 2377	(2) Right Rear Middle Parking Assist Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / GY	(3) 2379	(3) Object Sensor Low Reference	(3) I	(3) —

B306H Parking Assist Alarm Sensor - Rear Right Outer (UD7)



4581126

Connector Part Information

- Harness Type: Rear Object Alarm Sensor Wiring Harness
- OEM Connector: 1-2296695-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

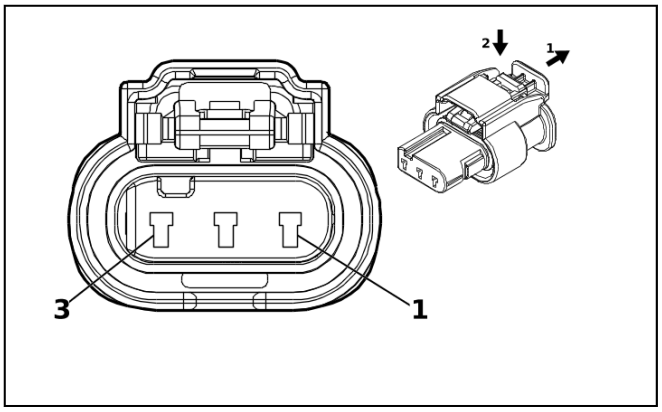
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B306H Parking Assist Alarm Sensor - Rear Right Outer (UD7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BN / WH	(1) 2374	(1) Object Sensor Voltage Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) YE / VT	(2) 2378	(2) Right Rear Outer Parking Assist Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / GY	(3) 2379	(3) Object Sensor Low Reference	(3) I	(3) —

B310 Fuel Pressure and Temperature Sensor



5420917

Connector Part Information

- Harness Type: Fuel Injector Wiring Harness
- OEM Connector: 34900-3127
- Service Connector: Service by Harness - See Part Catalog
- Description: 3-Way F 1.2 MCON-LL Series, Sealed(GY)

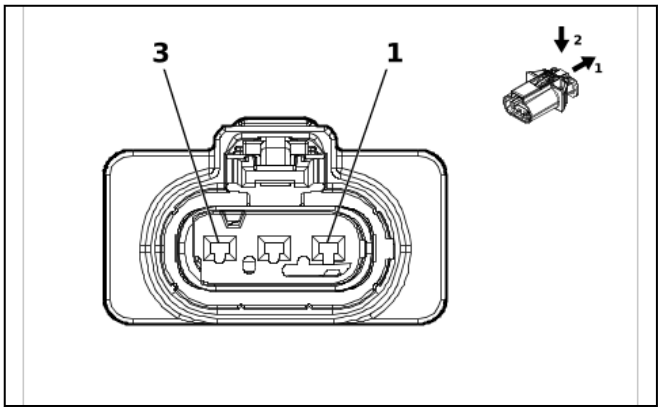
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

B310 Fuel Pressure and Temperature Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BK / GN	(1) 580	(1) Engine Control Sensors Low Reference 2	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU / WH	(2) 2918	(2) Fuel Rail Pressure Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) WH / RD	(3) 480	(3) Engine Control Vehicle Sensors 5 Volt Reference 1	(3) I	(3) —

B321 Crankcase Pressure Sensor



6530824

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 13560398
- Service Connector: 85736068
- Description: 3-Way F 1.2 MLK Series, Sealed(BK)

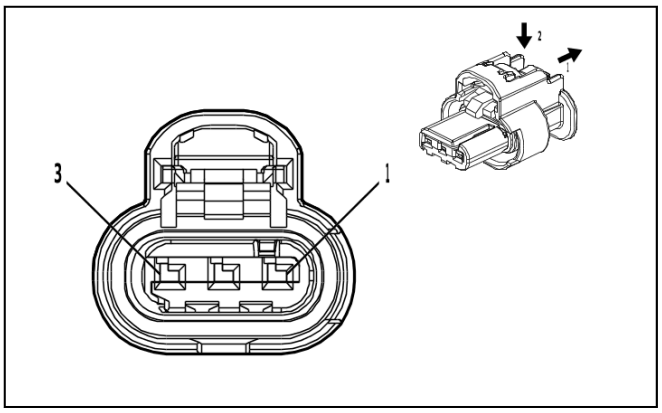
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B321 Crankcase Pressure Sensor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) YE / GY	(1) 3926	(1) Crankcase Differential Pressure Sensor Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / YE	(2) 548	(2) Engine Control Sensors Low Reference 1	(2) I	(2) —
(3) 3	(3) 0.5	(3) BU / RD	(3) 460	(3) Engine Control Sensors 5 Volt Reference 1	(3) I	(3) —

B338A Intake Camshaft Profile Sleeve Position Sensor 1



4581126

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296695-1
- Service Connector: 86792094
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

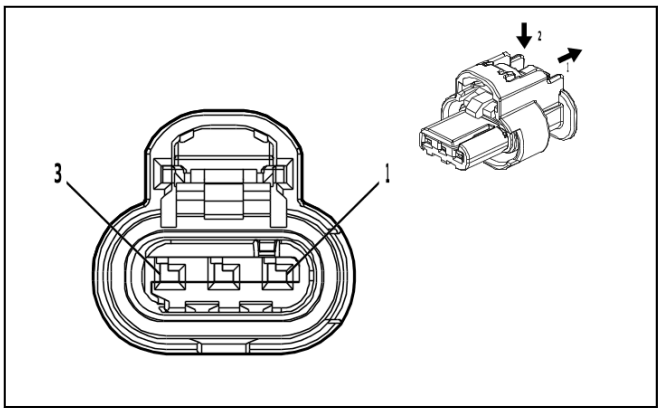
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B338A Intake Camshaft Profile Sleeve Position Sensor 1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH / RD	(1) 480	(1) Engine Control Vehicle Sensors 5 Volt Reference 1	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / GN	(2) 580	(2) Engine Control Sensors Low Reference 2	(2) I	(2) —
(3) 3	(3) 0.5	(3) VT / WH	(3) 3744	(3) Camshaft Intake Lobe Axial Position Signal 1	(3) I	(3) —

B338B Intake Camshaft Profile Sleeve Position Sensor 2



4581126

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296695-1
- Service Connector: 86792094
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

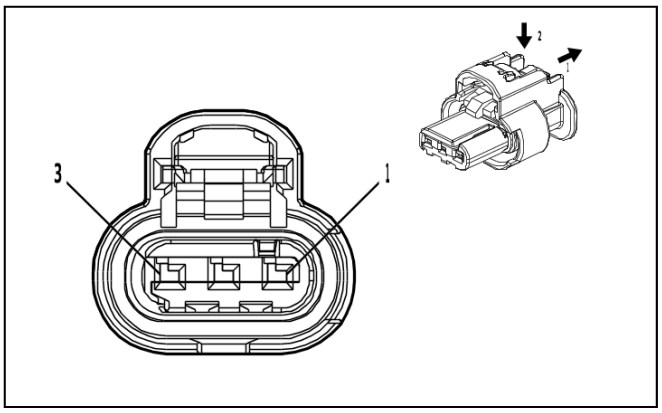
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B338B Intake Camshaft Profile Sleeve Position Sensor 2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH / RD	(1) 480	(1) Engine Control Vehicle Sensors 5 Volt Reference 1	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / GN	(2) 580	(2) Engine Control Sensors Low Reference 2	(2) I	(2) —
(3) 3	(3) 0.5	(3) VT / GN	(3) 3745	(3) Camshaft Intake Lobe Axial Position Signal 2	(3) I	(3) —

B339A Exhaust Camshaft Profile Sleeve Position Sensor 1



4581126

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296695-1
- Service Connector: 86792094
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

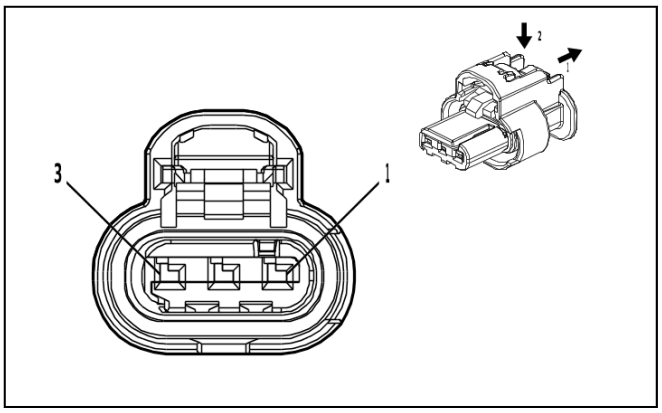
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B339A Exhaust Camshaft Profile Sleeve Position Sensor 1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH / RD	(1) 480	(1) Engine Control Vehicle Sensors 5 Volt Reference 1	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / GN	(2) 580	(2) Engine Control Sensors Low Reference 2	(2) I	(2) —
(3) 3	(3) 0.5	(3) YE / WH	(3) 3746	(3) Camshaft Exhaust Lobe Axial Position Signal 1	(3) I	(3) —

B339B Exhaust Camshaft Profile Sleeve Position Sensor 2



4581126

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296695-1
- Service Connector: 86792094
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

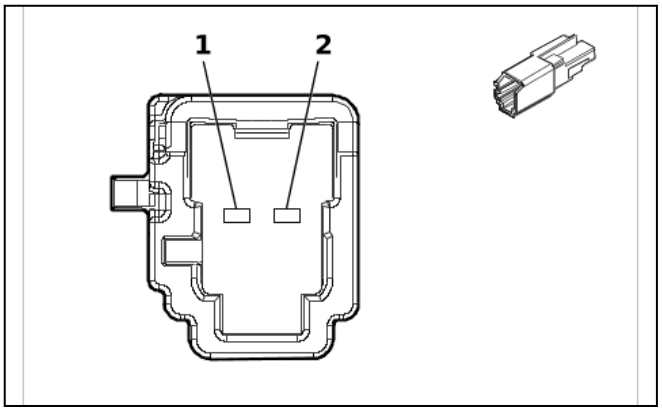
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

B339B Exhaust Camshaft Profile Sleeve Position Sensor 2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH / RD	(1) 480	(1) Engine Control Vehicle Sensors 5 Volt Reference 1	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / GN	(2) 580	(2) Engine Control Sensors Low Reference 2	(2) I	(2) —
(3) 3	(3) 0.5	(3) YE / GN	(3) 3747	(3) Camshaft Exhaust Lobe Axial Position Signal 2	(3) I	(3) —

B355 Communication Interface Module Microphone



6529127

Connector Part Information
- Harness Type: Roof Wiring Harness
- OEM Connector: 6099-0611
- Service Connector: 85725004
- Description: 2-Way M 1.2 MBS Series(GY)

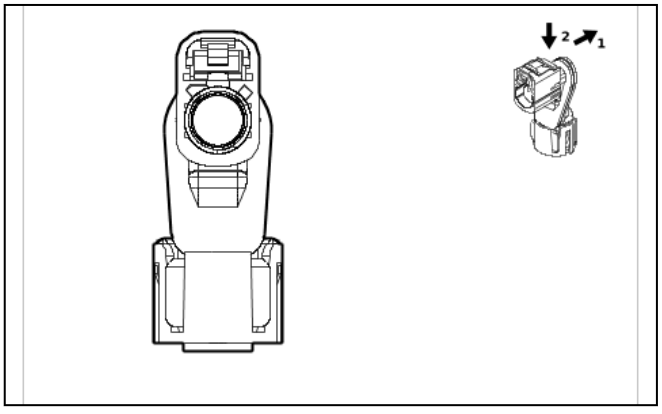
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-17 (L-GN)	No Tool Required

B355 Communication Interface Module Microphone

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BU / BK	(1) 7044	(1) Microphone [-] Signal	(1) I	(1) —
(2) 2	(2) 0.35	(2) VT / YE	(2) 7043	(2) Microphone [+] Signal	(2) I	(2) —

B384 Rearview Underbody Camera (UXA)



5920539

Connector Part Information
- Harness Type: Rearview Camera Wiring Harness
- OEM Connector: 13537644
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type(BK)

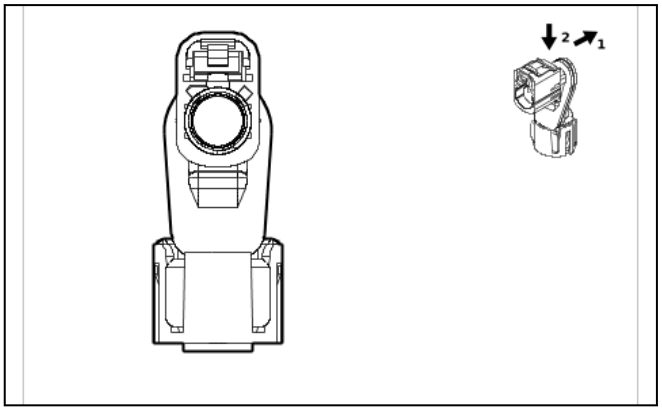
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

B384 Rearview Underbody Camera (UXA)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	LVDS	—	(PDR) Front Vision Camera #2	I	—

B385 Front View Underbody Camera (UXA)



5920539

Connector Part Information

- Harness Type: Rearview Camera Wiring Harness
- OEM Connector: 13537644
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type(BK)

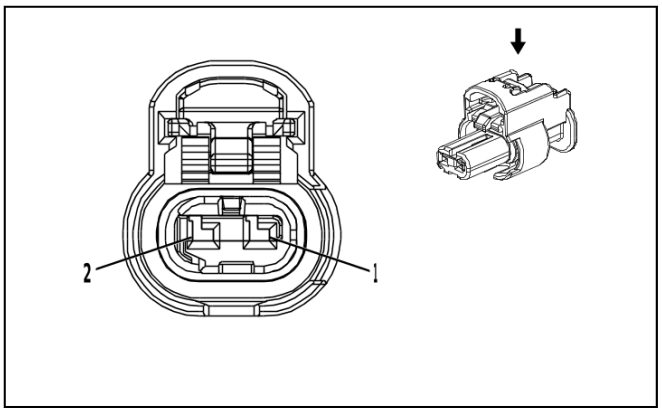
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

B385 Front View Underbody Camera (UXA)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	LVDS	—	(PDR) Front Vision Camera #2	I	—

E2LFW Front Side Marker Lamp - Left Wheel Opening Molding



4335931

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 1-2296694-2
- Service Connector: 19366843
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

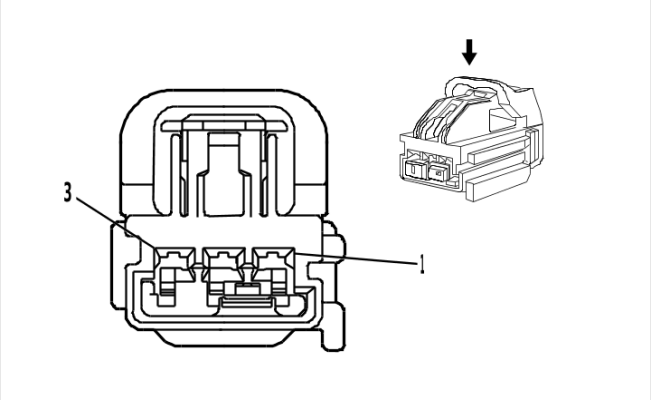
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

E2LFW Front Side Marker Lamp - Left Wheel Opening Molding

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BK	(1) 3750	(1) Ground	(1) I	(1) —
(2) 2	(2) 0.5	(2) BN / GN	(2) 4246	(2) Identification Lamp Control	(2) I	(2) —

E6 High Mount Stop Lamp



1787799

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 7283-3440-40
- Service Connector: 86825460
- Description: 3-Way F 1.5 Kaizen Series(L-GY)

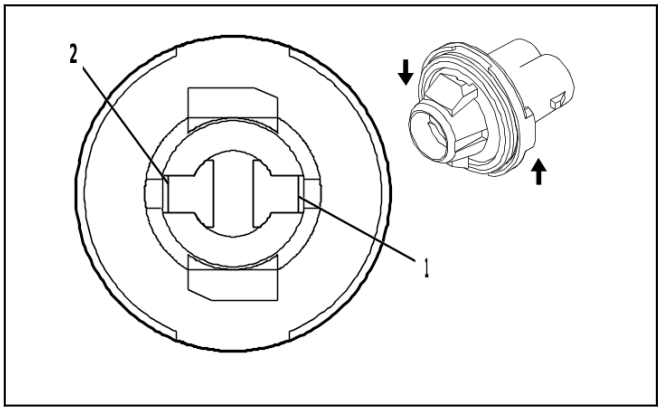
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-2A (GY)	No Tool Required

E6 High Mount Stop Lamp

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH / VT	(1) 1430	(1) Exterior Courtesy Lamp Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU / BK	(2) 1053	(2) Center High Mounted Stop Lamp Control 3	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK	(3) 550	(3) Ground	(3) I	(3) —

E7L Rear License Plate Lamp - Left



5153536

Connector Part Information

- Harness Type: Rear Object Alarm Sensor Wiring Harness
- OEM Connector: 15324946
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F Lamp Socket Wedge Base, Type W-2(D-GY)

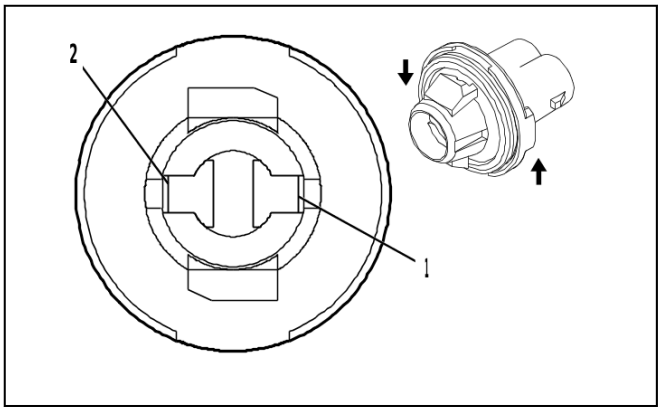
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

E7L Rear License Plate Lamp - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GN / YE	(1) 6846	(1) Rear License Plate Lamp Control	(1) I	(1) —
(2) 2	(2) 0.35	(2) BK	(2) 750	(2) Ground	(2) I	(2) —

E7R Rear License Plate Lamp - Right



5153536

Connector Part Information
- Harness Type: Rear Object Alarm Sensor Wiring Harness
- OEM Connector: 15324946
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F Lamp Socket Wedge Base, Type W-2(D-GY)

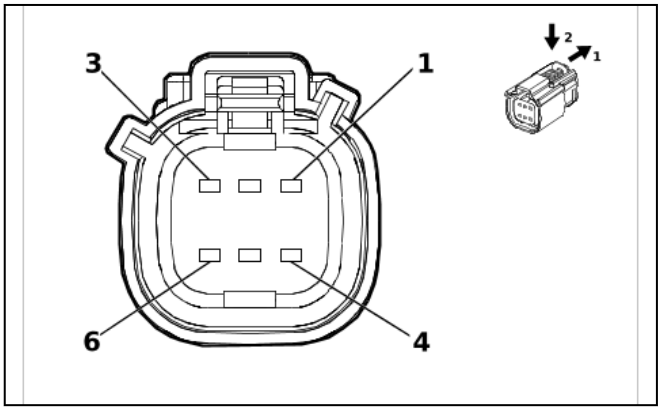
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

E7R Rear License Plate Lamp - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GN / YE	(1) 6846	(1) Rear License Plate Lamp Control	(1) I	(1) —
(2) 2	(2) 0.35	(2) BK	(2) 750	(2) Ground	(2) I	(2) —

E13LA Front Headlamp - Left X1



5926694

Connector Part Information
- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 33472-0607
- Service Connector: 19301527
- Description: 6-Way F 1.5 MX Series, Sealed(GY)

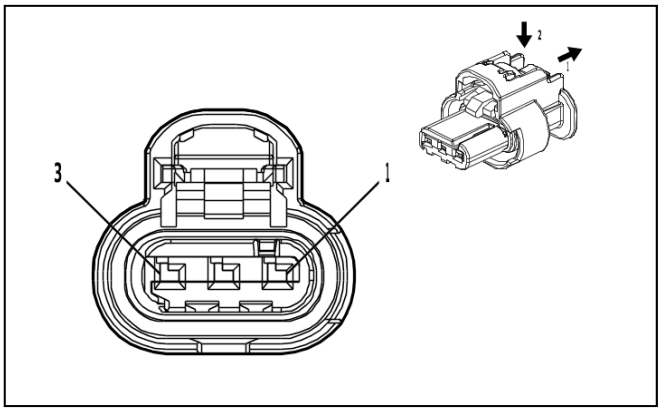
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-2A (GY)	No Tool Required

E13LA Front Headlamp - Left X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) BK	(1) 150	(1) Ground	(1) I	(1) —
(2) 2	(2) 0.75	(2) RD / WH	(2) 640	(2) Battery Positive Voltage	(2) II	(2) —
(3) 3	(3) 0.75	(3) YE	(3) 712	(3) Left Headlamp Low Beam Control	(3) II	(3) —
(4) 4	(4) 0.75	(4) WH	(4) 711	(4) Left Headlamp High Beam Control	(4) II	(4) —
(5) 5	(5) 0.5	(5) GY / BU	(5) 7538	(5) Left Front DRL Control	(5) I	(5) —
(6) 6	(6) 0.5	(6) WH / YE	(6) 1254	(6) Left Front Park Lamp Control	(6) I	(6) —

E13LA Front Headlamp - Left X2



4581126

Connector Part Information

- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 1-2296695-1
- Service Connector: 86792094
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

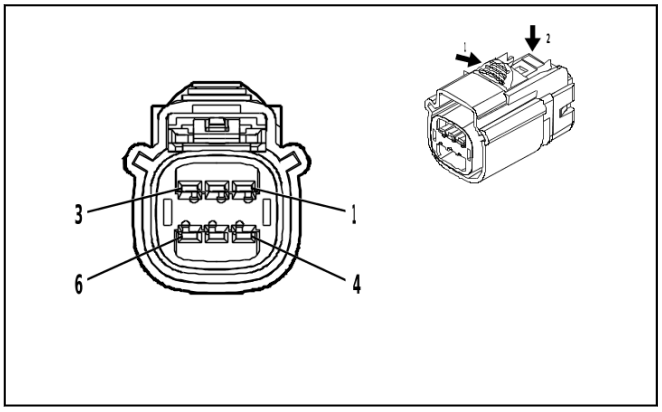
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

E13LA Front Headlamp - Left X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BU / WH	(1) 1314	(1) Left Front Turn Signal Lamp Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) WH / YE	(2) 1204	(2) Left Park Lamp Control 2	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK	(3) 150	(3) Ground	(3) I	(3) —

E13LA Front Headlamp - Left X3



5004419

Connector Part Information

- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 15513504
- Service Connector: 84999473
- Description: 6-Way F 1.5 OCS Series, Sealed(BK)

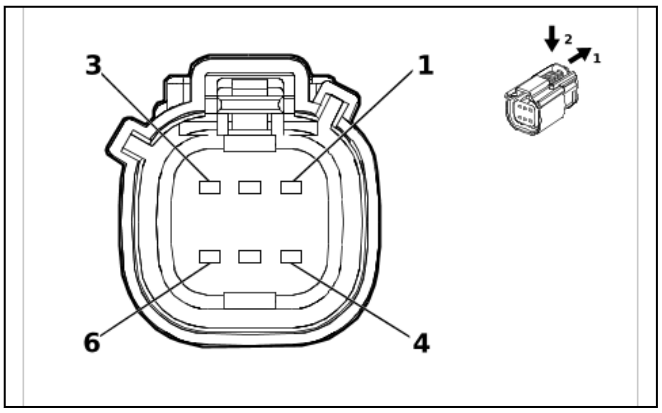
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-2A (GY)	No Tool Required

E13LA Front Headlamp - Left X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) BK	(1) 150	(1) Ground	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.75	(3) YE	(3) 712	(3) Left Headlamp Low Beam Control	(3) II	(3) —
(4) 4	(4) 0.75	(4) WH	(4) 711	(4) Left Headlamp High Beam Control	(4) II	(4) —
5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.5	(6) WH / YE	(6) 1254	(6) Left Front Park Lamp Control	(6) I	(6) —

E13RA Front Headlamp - Right X1



5926694

Connector Part Information

- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 33472-0607
- Service Connector: 19301527
- Description: 6-Way F 1.5 MX Series, Sealed(GY)

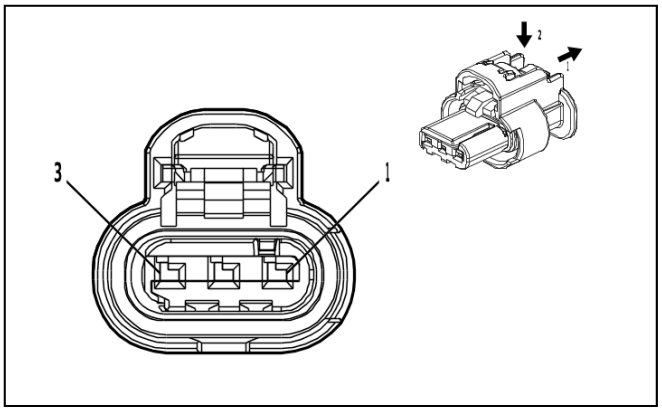
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-2A (GY)	No Tool Required

E13RA Front Headlamp - Right X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) BK	(1) 250	(1) Ground	(1) I	(1) —
(2) 2	(2) 0.75	(2) RD / YE	(2) 740	(2) Battery Positive Voltage	(2) II	(2) —
(3) 3	(3) 0.75	(3) YE	(3) 312	(3) Right Headlamp Low Beam Control	(3) II	(3) —
(4) 4	(4) 0.75	(4) WH	(4) 311	(4) Right Headlamp High Beam Control	(4) II	(4) —
(5) 5	(5) 0.5	(5) BU / BN	(5) 7539	(5) Right Front DRL Control	(5) I	(5) —
(6) 6	(6) 0.5	(6) BU / GN	(6) 1253	(6) Right Front Park Lamp Control	(6) I	(6) —

E13RA Front Headlamp - Right X2



4581126

Connector Part Information
- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 1-2296695-1
- Service Connector: 86792094
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

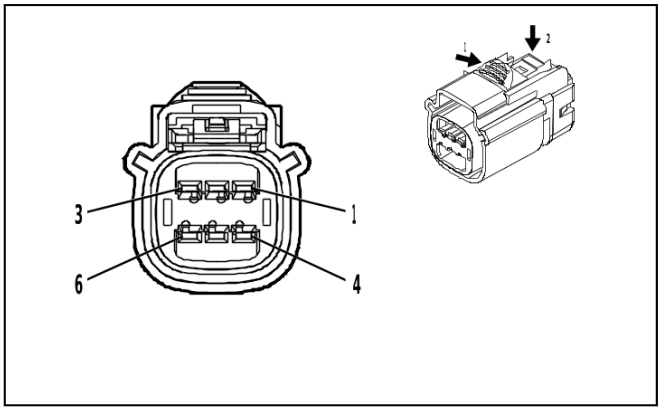
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

E13RA Front Headlamp - Right X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GN / VT	(1) 1315	(1) Right Front Turn Signal Lamp Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) VT	(2) 1203	(2) Right Park Lamp Control 2	(2) I	(2) —
(3) 3	(3) 0.75	(3) BK	(3) 250	(3) Ground	(3) I	(3) —

E13RA Front Headlamp - Right X3



5004419

Connector Part Information
- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 15513504
- Service Connector: 84999473
- Description: 6-Way F 1.5 OCS Series, Sealed(BK)

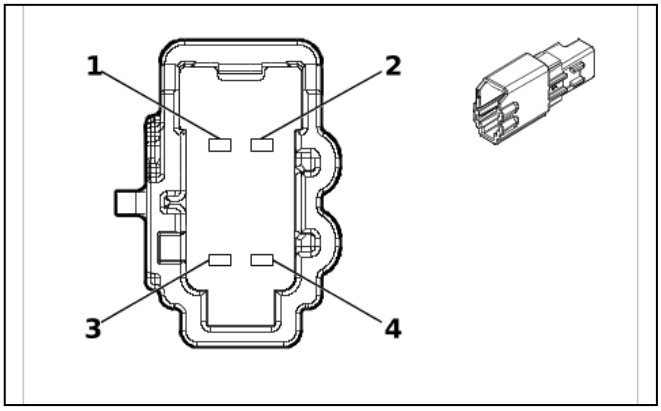
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-2A (GY)	No Tool Required

E13RA Front Headlamp - Right X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) BK	(1) 250	(1) Ground	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.75	(3) YE	(3) 312	(3) Right Headlamp Low Beam Control	(3) II	(3) —
(4) 4	(4) 0.75	(4) WH	(4) 311	(4) Right Headlamp High Beam Control	(4) II	(4) —
5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.5	(6) BU / GN	(6) 1253	(6) Right Front Park Lamp Control	(6) I	(6) —

E14A Front Seat Back Heater - Driver



5423974

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 6098-9049
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way M 1.2 MCON Series(GY)

Terminal Part Information

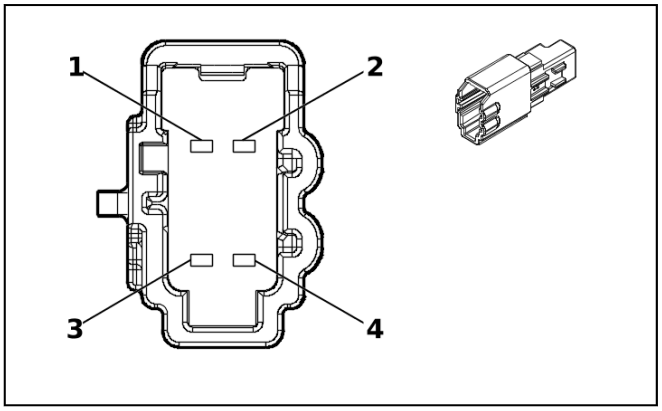
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-13 (BU)	No Tool Required
II	Not required	J-35616-17 (L-GN)	No Tool Required

E14A Front Seat Back Heater - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BN / VT	(1) 2077	(1) Driver Seat Heating Element Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU	(2) 2425	(2) Driver Seat Back Heating Temperature Sensor Signal	(2) II	(2) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(3) 3	(3) 0.5	(3) BK / YE	(3) 2080	(3) Driver Heated Seat Thermistor Low Reference	(3) II	(3) —
(4) 4	(4) 0.75	(4) BN / BK	(4) 2078	(4) Driver Seat Heating Element Low Reference	(4) I	(4) —

E14B Front Seat Cushion Heater - Driver



5360963

Connector Part Information
- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 6098-9046
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way M 1.2 MCON Series(BK)

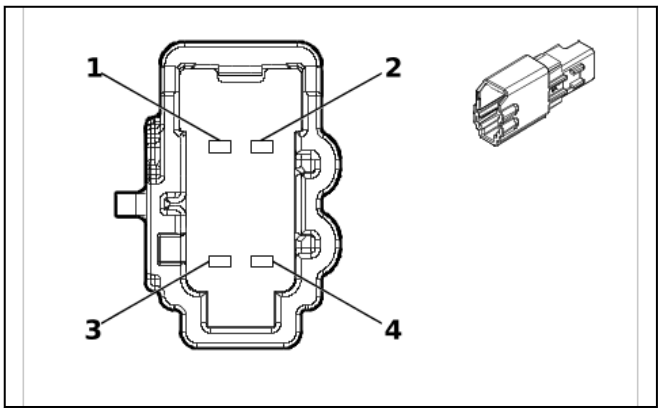
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-13 (BU)	No Tool Required
II	Not required	J-35616-17 (L-GN)	No Tool Required

E14B Front Seat Cushion Heater - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BN / VT	(1) 2077	(1) Driver Seat Heating Element Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) YE / GY	(2) 2079	(2) Driver Seat Heating Temperature Sensor Signal	(2) II	(2) —
(3) 3	(3) 0.5	(3) BK / YE	(3) 2080	(3) Driver Heated Seat Thermistor Low Reference	(3) II	(3) —
(4) 4	(4) 0.75	(4) BN / BK	(4) 2078	(4) Driver Seat Heating Element Low Reference	(4) I	(4) —

E14C Front Seat Back Heater - Passenger (KA1)



5423974

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Passenger
- OEM Connector: 6098-9049
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way M 1.2 MCON Series(GY)

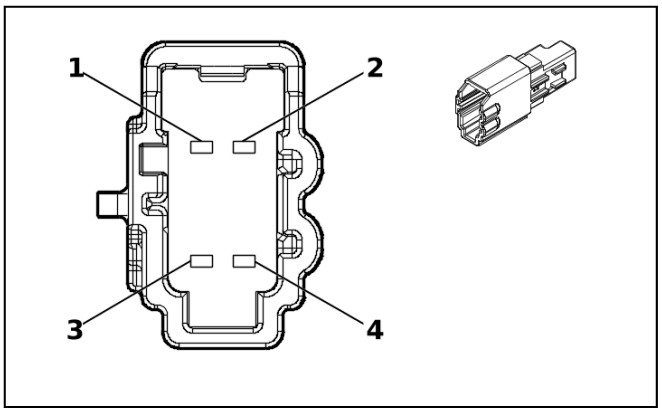
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-13 (BU)	No Tool Required
II	Not required	J-35616-17 (L-GN)	No Tool Required

E14C Front Seat Back Heater - Passenger (KA1)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BN / BU	(1) 2479	(1) Passenger Seat Heating Element Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) WH / BU	(2) 2436	(2) Passenger Seat Back Heating Temperature Sensor Signal	(2) II	(2) —
(3) 3	(3) 0.5	(3) BK / GN	(3) 2482	(3) Passenger Heated Back Thermistor Low Reference	(3) II	(3) —
(4) 4	(4) 0.75	(4) GY / BK	(4) 2480	(4) Passenger Seat Heating Element Low Reference	(4) I	(4) —

E14D Front Seat Cushion Heater - Passenger (KA1)



5360963

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Passenger
- OEM Connector: 6098-9046
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way M 1.2 MCON Series(BK)

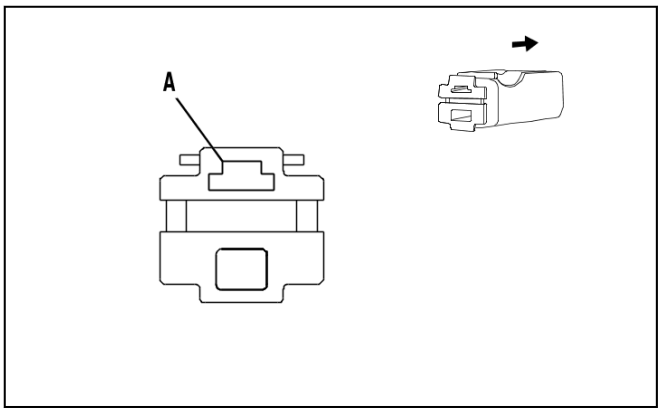
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-13 (BU)	No Tool Required
II	Not required	J-35616-17 (L-GN)	No Tool Required

E14D Front Seat Cushion Heater - Passenger (KA1)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BN / BU	(1) 2479	(1) Passenger Seat Heating Element Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) WH / GY	(2) 2434	(2) Passenger Seat Heating Temperature Sensor Signal	(2) II	(2) —
(3) 3	(3) 0.5	(3) BK / GY	(3) 2435	(3) Passenger Heated Seat Thermistor Low Reference	(3) II	(3) —
(4) 4	(4) 0.75	(4) GY / BK	(4) 2480	(4) Passenger Seat Heating Element Low Reference	(4) I	(4) —

E18 Rear Window Defogger Grid X1



4248834

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 7123-5014-30
- Service Connector: 19367647
- Description: 1-Way F 250 Series(BK)

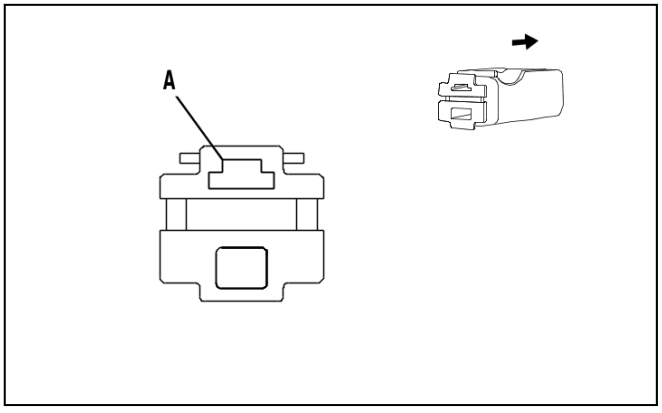
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-42 (RD)	No Tool Required

E18 Rear Window Defogger Grid X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	2.5	BN / VT	293	Rear Defogger Grid Control	I	—

E18 Rear Window Defogger Grid X2



4248834

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 7123-5014-30
- Service Connector: 19367647
- Description: 1-Way F 250 Series(BK)

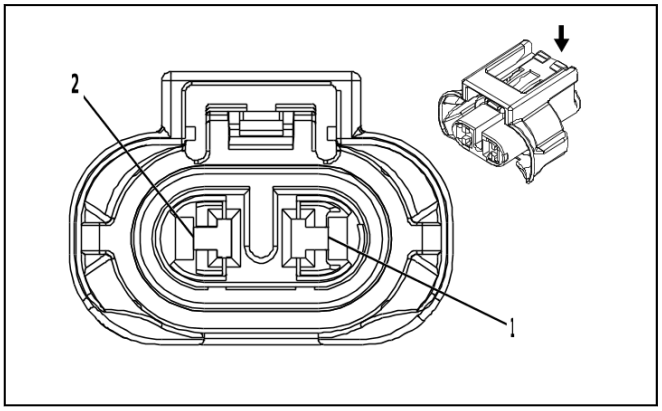
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-42 (RD)	No Tool Required

E18 Rear Window Defogger Grid X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	2.5	BK	550	Ground	I	—

E29LF Front Fog Lamp - Left (T40)



3404058

Connector Part Information

- Harness Type: Front Object Alarm Sensor Wiring Harness
- OEM Connector: F194300
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 2.8 APEX Series, Sealed(BK)

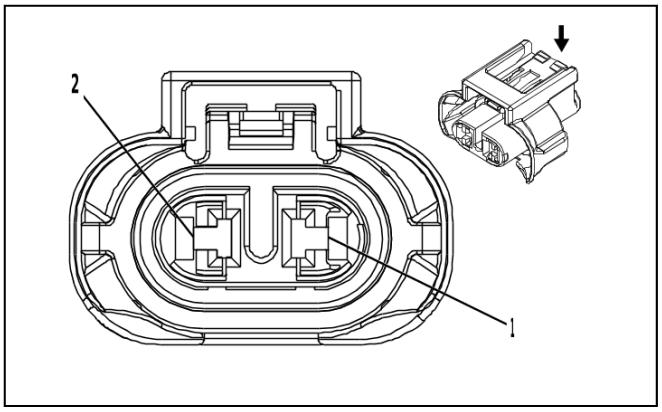
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-4A (PU)	No Tool Required

E29LF Front Fog Lamp - Left (T40)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) BN / GY	(1) 5061	(1) Left Front Fog Lamp Control	(1) I	(1) —
(2) 2	(2) 1.5	(2) BK	(2) 550	(2) Ground	(2) I	(2) —

E29RF Front Fog Lamp - Right (T40)



3404058

Connector Part Information
- Harness Type: Front Object Alarm Sensor Wiring Harness
- OEM Connector: F194300
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 2.8 APEX Series, Sealed(BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-4A (PU)	No Tool Required

E29RF Front Fog Lamp - Right (T40)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) BN / GY	(1) 5061	(1) Left Front Fog Lamp Control	(1) I	(1) —
(2) 2	(2) 1.5	(2) BK	(2) 550	(2) Ground	(2) I	(2) —

E33L Cargo Lamp - Left (S0Y)

—

Connector Part Information
- Harness Type: Cargo Lamp Wiring Harness
- OEM Connector: Not Available
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

E33L Cargo Lamp - Left (S0Y)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) —	(1) GY / BU	(1) 7762	(1) Cargo Lamp Control	(1) I	(1) —
(2) 2	(2) —	(2) BK	(2) 750	(2) Ground	(2) I	(2) —

E33R Cargo Lamp - Right (S0Y)

—

Connector Part Information
- Harness Type: Cargo Lamp Wiring Harness
- OEM Connector: Not Available
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way

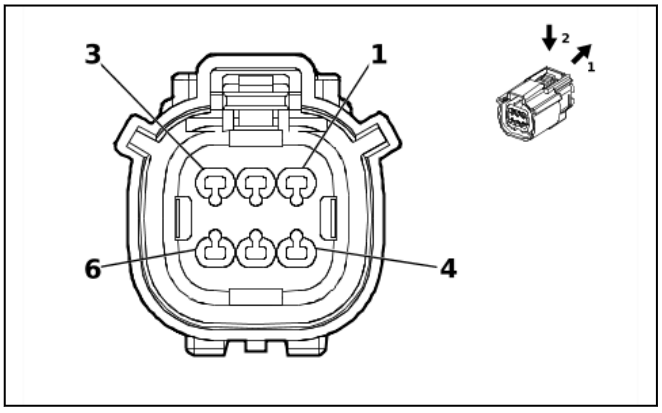
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

E33R Cargo Lamp - Right (S0Y)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) —	(1) GY / BU	(1) 7762	(1) Cargo Lamp Control	(1) I	(1) —
(2) 2	(2) —	(2) BK	(2) 750	(2) Ground	(2) I	(2) —

E42L Rear Body Structure Stop Lamp - Left



5666225

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 33472-0705
- Service Connector: 86526151
- Description: 6-Way F 1.5 MX Series, Sealed(BK)

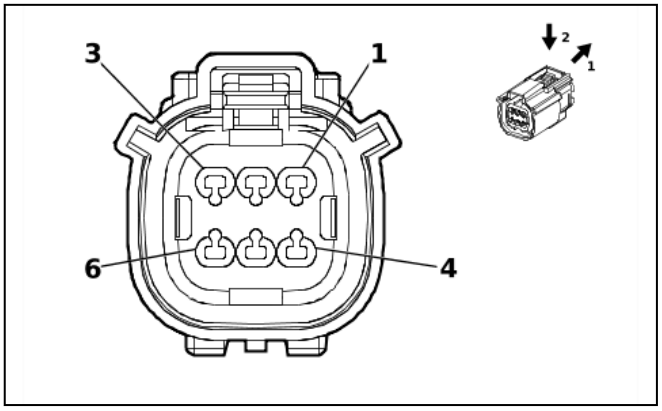
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

E42L Rear Body Structure Stop Lamp - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BK	(1) 750	(1) Ground	(1) I	(1) —
(2) 2	(2) 0.5 (2) 0.5	(2) GY / YE (2) BU / WH	(2) 7542 (2) 1334	(2) Left Rear Stop Lamp Control (2) Left Rear Turn Signal Lamp Control 2	(2) I (2) I	(2) T93 (2) - T93
(3) 3	(3) 0.5	(3) BN / BU	(3) 6993	(3) Left Rear Park Lamp Control	(3) I	(3) —
(4) 4	(4) 0.5 (4) 0.5	(4) BU / WH (4) GN / WH	(4) 1334 (4) 24	(4) Left Rear Turn Signal Lamp Control 2 (4) Backup Lamp Control	(4) I (4) I	(4) T93 (4) - T93
(5) 5	(5) 0.5	(5) GN / WH	(5) 24	(5) Backup Lamp Control	(5) I	(5) —
6	—	—	—	Not Occupied	—	—

E42R Rear Body Structure Stop Lamp - Right



5666225

Connector Part Information

- Harness Type: Chassis Wiring Harness
- OEM Connector: 33472-0705
- Service Connector: 86526151
- Description: 6-Way F 1.5 MX Series, Sealed(BK)

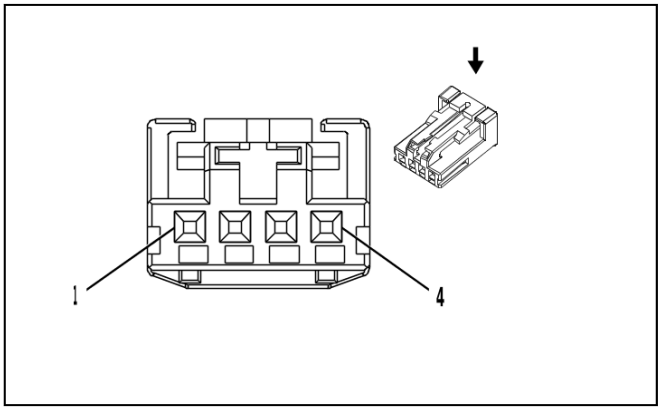
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-2A (GY)	No Tool Required

E42R Rear Body Structure Stop Lamp - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5 (1) 0.75	(1) BK (1) BK	(1) 850 (1) 850	(1) Ground (1) Ground	(1) I (1) II	(1) T93 (1) - T93
(2) 2	(2) 0.5 (2) 0.75	(2) WH / YE (2) BU / VT	(2) 7541 (2) 1335	(2) Right Rear Stop Lamp Control (2) Right Rear Turn Signal Lamp Control 2	(2) I (2) II	(2) T93 (2) - T93
(3) 3	(3) 0.5	(3) BN / GY	(3) 6995	(3) Right Rear Park Lamp Control	(3) I	(3) —
(4) 4	(4) 0.75 (4) 0.5	(4) BU / VT (4) GN / WH	(4) 1335 (4) 24	(4) Right Rear Turn Signal Lamp Control 2 (4) Backup Lamp Control	(4) II (4) I	(4) T93 (4) - T93
(5) 5	(5) 0.5	(5) GN / WH	(5) 24	(5) Backup Lamp Control	(5) I	(5) —
6	—	—	—	Not Occupied	—	—

E97 Rear Seat Position Center Courtesy Lamp



2717162

Connector Part Information

- Harness Type: Roof Wiring Harness
- OEM Connector: 936119-1
- Service Connector: 19367524
- Description: 4-Way F 0.64 Micro-Quadlock Series(BK)

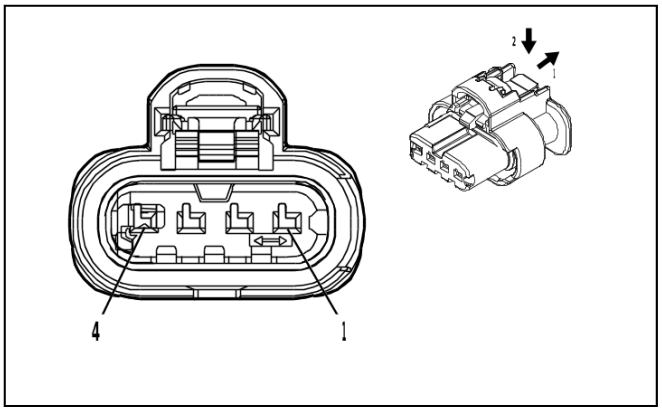
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

E97 Rear Seat Position Center Courtesy Lamp

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) WH / BN	(1) 6815	(1) Inadvertent Load Control	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.35	(3) BK	(3) 4250	(3) Ground	(3) I	(3) —
(4) 4	(4) 0.35	(4) GY	(4) 157	(4) Interior Lamp Control	(4) I	(4) —

F101 Instrument Panel Airbag



4280383

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 2296700-6
- Service Connector: 19368563
- Description: 4-Way F 1.2 MCON-CB Series, Sealed(YE)

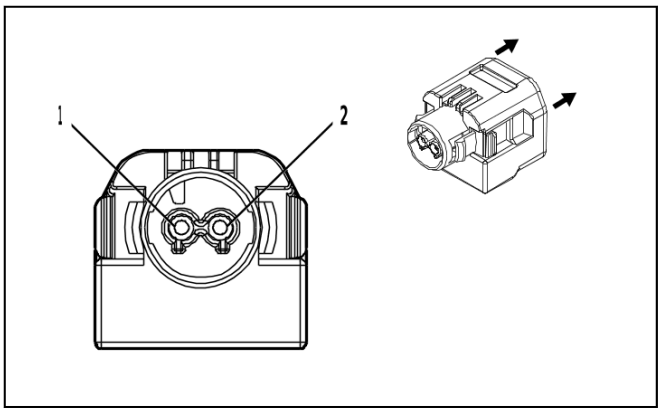
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

F101 Instrument Panel Airbag

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / WH	(1) 3024	(1) Passenger Instrument Panel Air Bag Stage 1 Low Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) YE / OG	(2) 3025	(2) Passenger Instrument Panel Air Bag Stage 1 High Control	(2) I	(2) —
(3) 3	(3) 0.5	(3) OG / VT	(3) 3026	(3) Passenger Instrument Panel Air Bag Stage 2 Low Control	(3) I	(3) —
(4) 4	(4) 0.5	(4) GY / OG	(4) 3027	(4) Passenger Instrument Panel Air Bag Stage 2 High Control	(4) I	(4) —

F105L Front and Rear Row Roof Rail Airbag - Left



4676225

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 1-1802367-3
- Service Connector: 13529172
- Description: 2-Way F ABX-5 Series(GY with YE Cover)

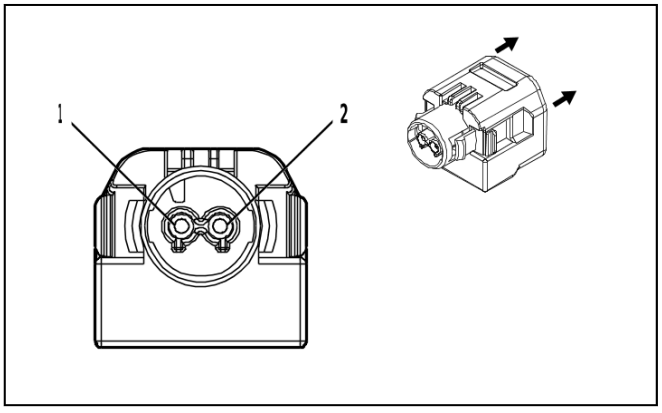
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-10 (GN)	No Tool Required

F105L Front and Rear Row Roof Rail Airbag - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / GN	(1) 5019	(1) Left Front Roof Rail Air Bag High Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) VT / OG	(2) 5020	(2) Left Front Roof Rail Air Bag Low Control	(2) I	(2) —

F105R Front and Rear Row Roof Rail Airbag - Right



4676225

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 1-1802367-3
- Service Connector: 13529172
- Description: 2-Way F ABX-5 Series(GY with YE Cover)

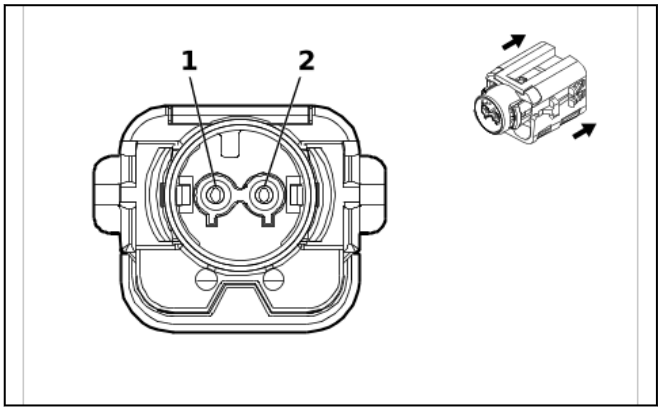
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-10 (GN)	No Tool Required

F105R Front and Rear Row Roof Rail Airbag - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / GY	(1) 5021	(1) Right Front Roof Rail Air Bag High Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) WH / OG	(2) 5022	(2) Right Front Roof Rail Air Bag Low Control	(2) I	(2) —

F106D Front Seat Outboard Seat Back Airbag - Driver



5499727

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 13535270
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F ABX-5 Series(PK with YE Cover)

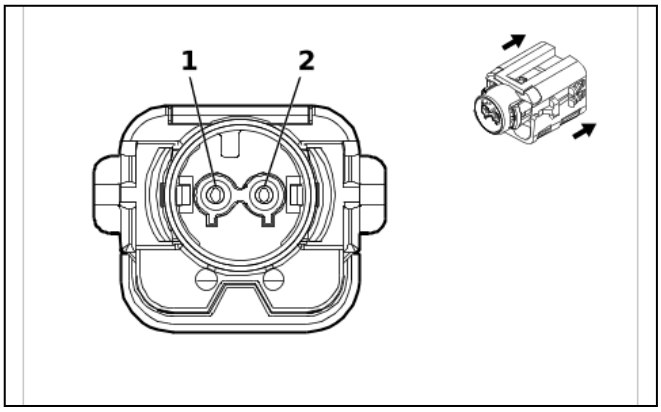
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-10 (GN)	No Tool Required

F106D Front Seat Outboard Seat Back Airbag - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / BU	(1) 4962	(1) Driver Seat Back Air Bag High Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / OG	(2) 4963	(2) Driver Seat Back Air Bag Low Control	(2) I	(2) —

F106P Front Seat Outboard Seat Back Airbag - Passenger



5499727

Connector Part Information
- Harness Type: Front Seat Wiring Harness - Passenger
- OEM Connector: 13535270
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F ABX-5 Series(PK with YE Cover)

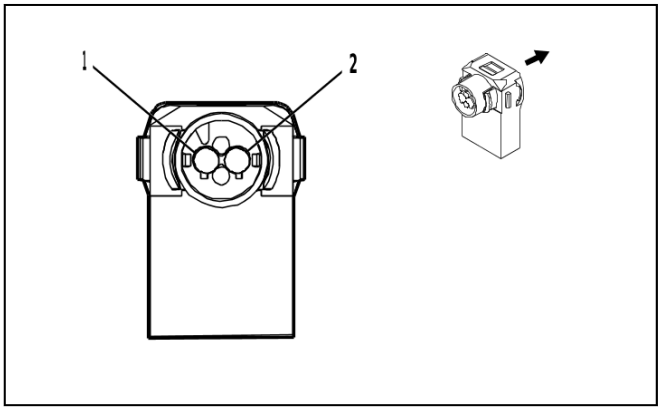
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-10 (GN)	No Tool Required

F106P Front Seat Outboard Seat Back Airbag - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / GY	(1) 4956	(1) Passenger Seat Back Air Bag High Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU / OG	(2) 4957	(2) Passenger Seat Back Air Bag Low Control	(2) I	(2) —

F107 Steering Wheel Airbag



4679778

Connector Part Information
- Harness Type: Steering Wheel Horn Switch Wiring Harness
- OEM Connector: 33345783
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F ABX-5 Series(GY with YE Cover)

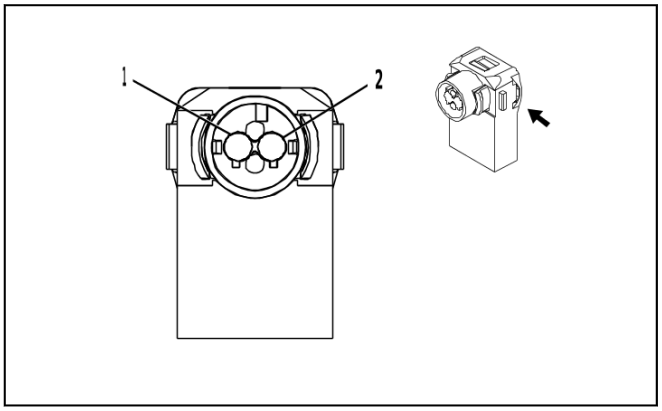
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

F107 Steering Wheel Airbag

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / VT	(1) 3021	(1) Steering Wheel Air Bag Stage 1 High Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) BN / OG	(2) 3020	(2) Steering Wheel Air Bag Stage 1 Low Control	(2) I	(2) —

F112D Front Seat Belt Retractor - Driver



4241364

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 13545487
- Service Connector: 85666123
- Description: 2-Way F ABX-5 Series(PU with YE Cover)

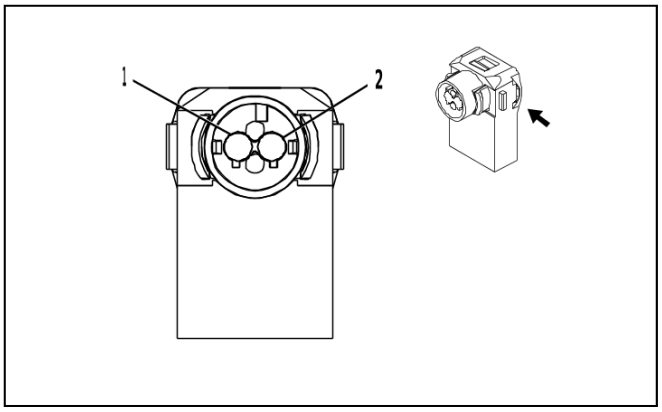
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-10 (GN)	No Tool Required

F112D Front Seat Belt Retractor - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / WH	(1) 3477	(1) Driver Seat Belt Retractor Pretensioner High Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) VT / OG	(2) 3478	(2) Driver Seat Belt Retractor Pretensioner Low Control	(2) I	(2) —

F112LR Rear Seat Belt Retractor - Left



4241364

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 35504153
- Service Connector: 85666123
- Description: 2-Way F ABX-5 Series(PU with YE Cover)

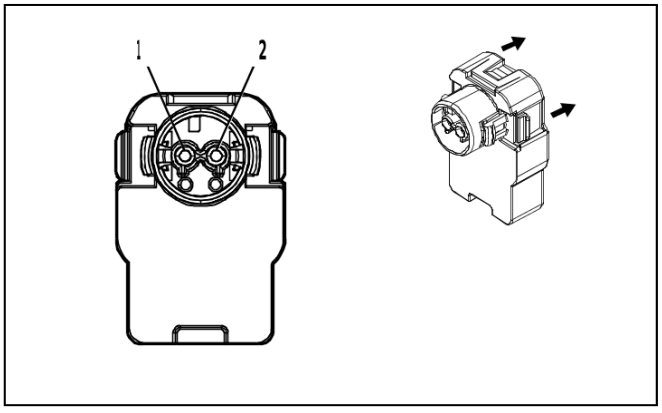
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-10 (GN)	No Tool Required

F112LR Rear Seat Belt Retractor - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / VT	(1) 5155	(1) Left Rear Seat Belt Pretensioner Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / OG	(2) 5156	(2) Left Rear Seat Belt Pretensioner Low Control	(2) I	(2) —

F112P Front Seat Belt Retractor - Passenger



4823732

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 1-1802365-1
- Service Connector: 13530531
- Description: 2-Way F ABX-5 Series(PK with YE Cover)

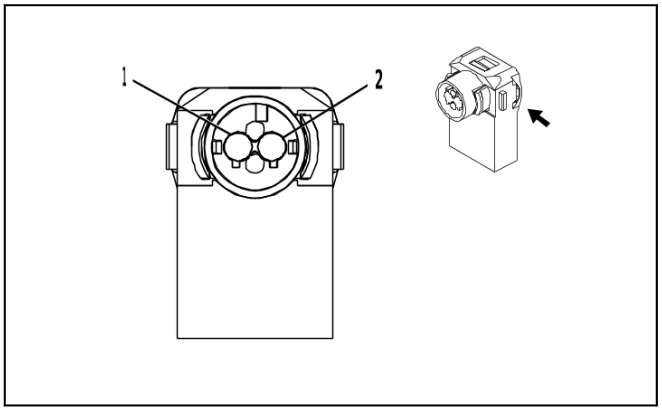
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-10 (GN)	No Tool Required

F112P Front Seat Belt Retractor - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / GN	(1) 3475	(1) Passenger Seat Belt Retractor Pretensioner High Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) WH / OG	(2) 3476	(2) Passenger Seat Belt Retractor Pretensioner Low Control	(2) I	(2) —

F112RR Rear Seat Belt Retractor - Right



4241364

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 35504153
- Service Connector: 85666123
- Description: 2-Way F ABX-5 Series(PU with YE Cover)

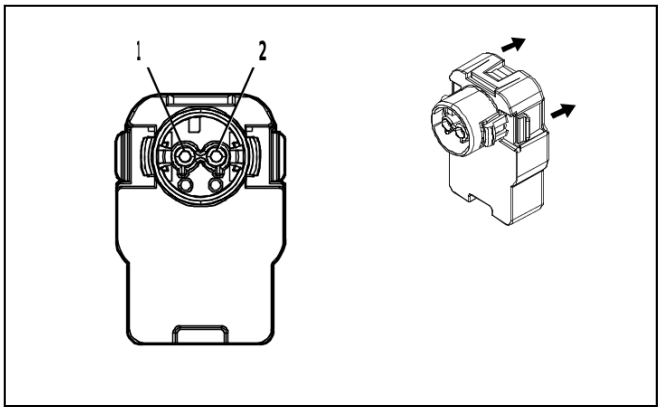
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-10 (GN)	No Tool Required

F112RR Rear Seat Belt Retractor - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / WH	(1) 5157	(1) Right Rear Seat Belt Pretensioner Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / OG	(2) 5158	(2) Right Rear Seat Belt Pretensioner Low Control	(2) I	(2) —

F113D Front Seat Belt Anchor Plate Tensioner - Driver



4823732

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 1-1802365-1
- Service Connector: 13530531
- Description: 2-Way F ABX-5 Series(PK with YE Cover)

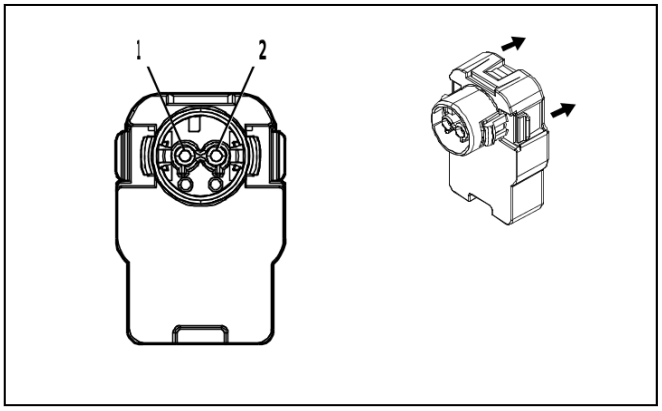
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-10 (GN)	No Tool Required

F113D Front Seat Belt Anchor Plate Tensioner - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / YE	(1) 3481	(1) Driver Seat Belt Anchor Pretensioner High Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) VT / OG	(2) 3482	(2) Driver Seat Belt Anchor Pretensioner Low Control	(2) I	(2) —

F113P Front Seat Belt Anchor Plate Tensioner - Passenger



4823732

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 1-1802365-1
- Service Connector: 13530531
- Description: 2-Way F ABX-5 Series(PK with YE Cover)

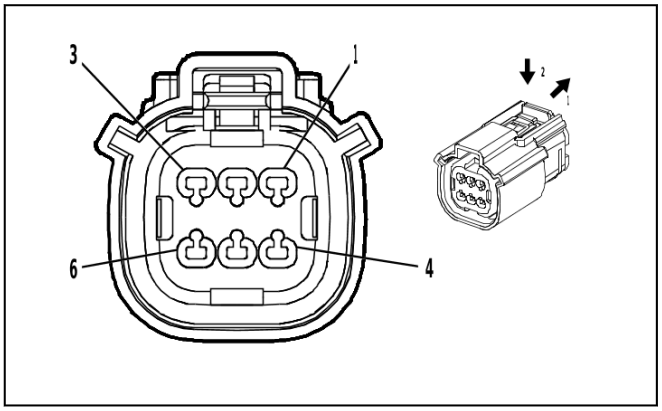
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-10 (GN)	No Tool Required

F113P Front Seat Belt Anchor Plate Tensioner - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / BN	(1) 3479	(1) Passenger Seat Belt Anchor Pretensioner High Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) GY / OG	(2) 3480	(2) Passenger Seat Belt Anchor Pretensioner Low Control	(2) I	(2) —

G5 Automatic Transmission Auxiliary Fluid Pump



4574736

Connector Part Information

- Harness Type: Automatic Transmission Wiring Harness
- OEM Connector: 160038-3009
- Service Connector: Service by Harness - See Part Catalog
- Description: 6-Way F 1.5 MX Series, Sealed(WH)

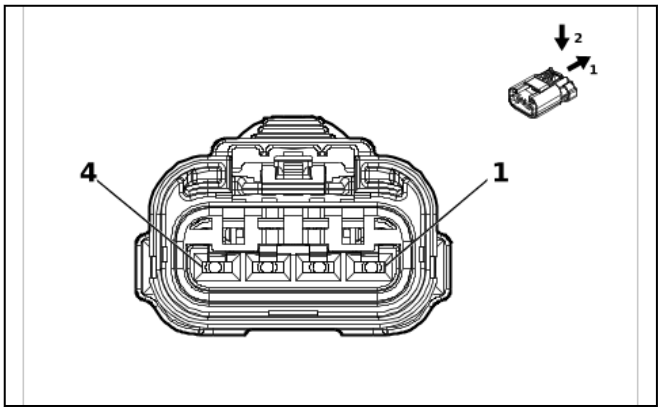
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-2A (GY)	No Tool Required

G5 Automatic Transmission Auxiliary Fluid Pump

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) RD / BU	(1) 840	(1) Battery Positive Voltage	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.5	(3) GN / GY	(3) 6387	(3) Transmission High Side Driver 1 Control	(3) I	(3) —
(4) 4	(4) 0.5	(4) GN / WH	(4) 2968	(4) Transmission Auxiliary Fluid Pump Control	(4) I	(4) —
5	—	—	—	Not Occupied	—	—
(6) 6	(6) 1.5	(6) BK	(6) 6250	(6) Transmission Ground	(6) I	(6) —

G10L Cooling Fan Motor - Left



5838592

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 35243535
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 2.8 APEX Series, Sealed(BK)

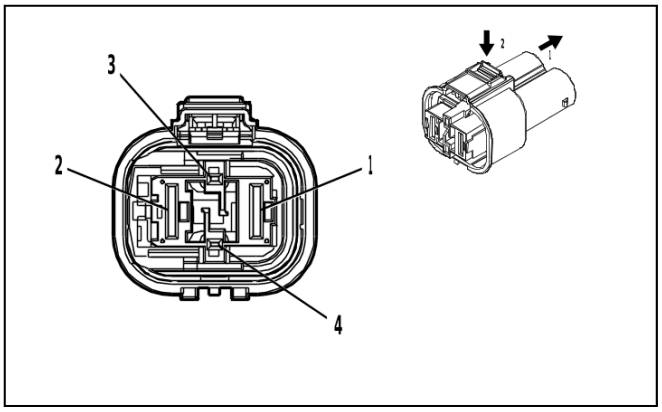
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-35 (VT)	No Tool Required

G10L Cooling Fan Motor - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 5	(1) BK	(1) 150	(1) Ground	(1) I	(1) —
(2) 2	(2) 5	(2) RD / BU	(2) 1542	(2) Battery Positive Voltage	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.75	(4) GN / VT	(4) 4621	(4) Engine Control Module LIN Bus 1	(4) I	(4) —

G10LW Cooling Fan Motor - Lower (Z82)



4847569

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 4-2286732-1
- Service Connector: 84766431
- Description: 4-Way F 1.2, 9.5 MCON Series, Sealed(BK)

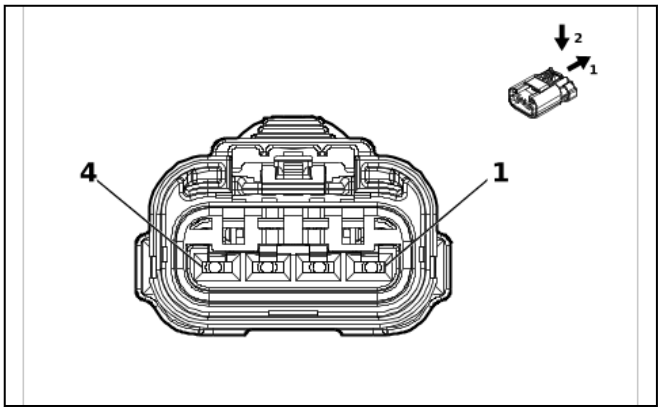
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required
II	Not required	J-35616-22 (RD)	No Tool Required

G10LW Cooling Fan Motor - Lower (Z82)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 5	(1) RD / GY	(1) 1342	(1) Battery Positive Voltage	(1) II	(1) —
(2) 2	(2) 5	(2) BK	(2) 150	(2) Ground	(2) II	(2) —
(3) 3	(3) 0.5	(3) GN / YE	(3) 4623	(3) Engine Control Module LIN Bus 3	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

G10R Cooling Fan Motor - Right



5838592

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 35243535
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 2.8 APEX Series, Sealed(BK)

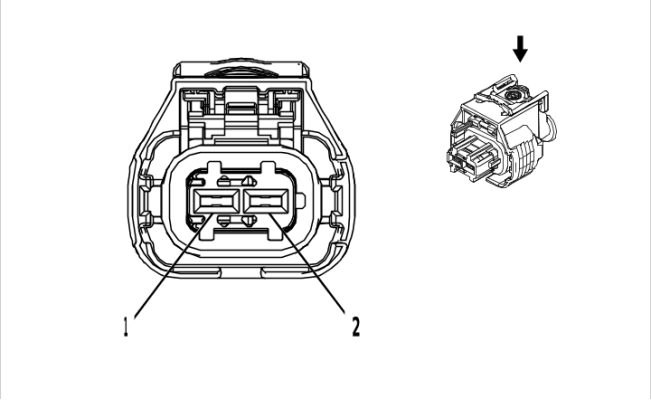
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-35 (VT)	No Tool Required

G10R Cooling Fan Motor - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 5	(1) BK	(1) 150	(1) Ground	(1) I	(1) —
(2) 2	(2) 5	(2) RD / YE	(2) 1442	(2) Battery Positive Voltage	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.75	(4) GN / VT	(4) 4621	(4) Engine Control Module LIN Bus 1	(4) I	(4) —

G13 Generator X1



2577394

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 1-928-405-714
- Service Connector: 13384371
- Description: 2-Way F 2.8 Series, Sealed(BK)

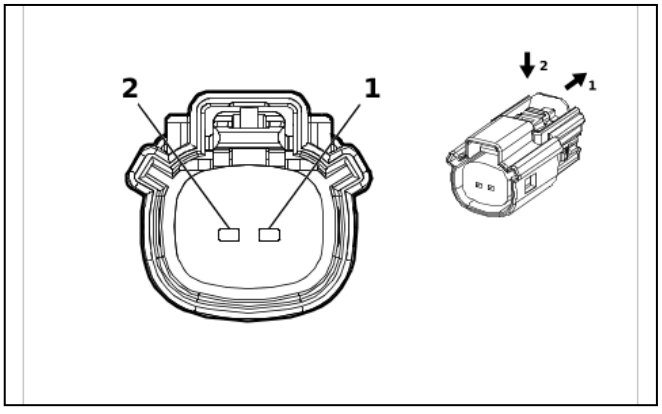
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-35 (VT)	No Tool Required

G13 Generator X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BN	(1) 25	(1) Charge Indicator Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) GY	(2) 23	(2) Generator Field Duty Cycle Signal	(2) I	(2) —

G18 Fuel Pump - High Pressure



2474713

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 33471-0206
- Service Connector: 13577534
- Description: 2-Way F 1.5 Series, Sealed(BK)

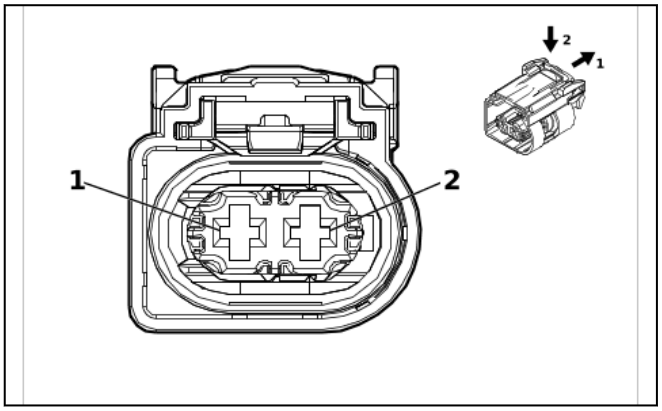
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

G18 Fuel Pump - High Pressure

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) VT / BK	(1) 7300	(1) High Pressure Fuel Pump Low Control	(1) I	(1) —
(2) 2	(2) 0.75	(2) YE	(2) 7301	(2) High Pressure Fuel Pump High Control	(2) I	(2) —

G24 Windshield Washer Pump



5580410

Connector Part Information

- Harness Type: Windshield Washer Pump Extension Wiring Harness
- OEM Connector: 2425741-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 2.8 MCP Series, Sealed(BK)

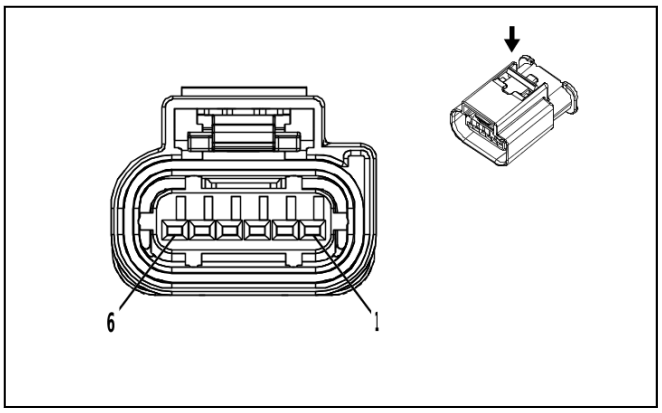
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-35 (VT)	No Tool Required

G24 Windshield Washer Pump

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) BU / VT	(1) 392	(1) Rear Window Washer Pump Control	(1) I	(1) —
(2) 2	(2) 1.5	(2) BU / VT	(2) 392	(2) Rear Window Washer Pump Control	(2) I	(2) —

G58 Evaporative Emission Canister Purge Pump



3747579

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 2272975-1
- Service Connector: 19354437
- Description: 6-Way F 1.2 MCON Series, Sealed(BK)

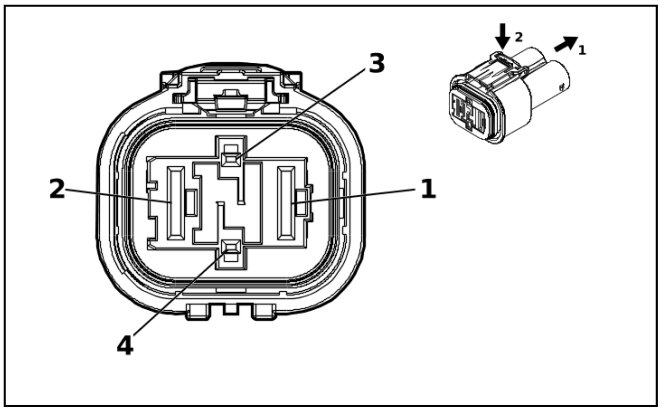
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

G58 Evaporative Emission Canister Purge Pump

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BN / BU	(1) 2447	(1) Evaporative Purge Pump Pressure Signal	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / YE	(2) 548	(2) Engine Control Sensors Low Reference 1	(2) I	(2) —
(3) 3	(3) 0.5	(3) BU / RD	(3) 460	(3) Engine Control Sensors 5 Volt Reference 1	(3) I	(3) —
(4) 4	(4) 0.5	(4) GN / BN	(4) 2732	(4) Engine Control Module LIN Bus 4	(4) I	(4) —
(5) 5	(5) 0.5	(5) BK	(5) 550	(5) Ground	(5) I	(5) —
(6) 6	(6) 0.5	(6) VT / BU	(6) 5294	(6) Powertrain Main Relay Fused Supply Voltage 5	(6) I	(6) —

G59 Engine Coolant Pump



5389785

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2332470-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 1.2, 9.5 MCON Series(BK)

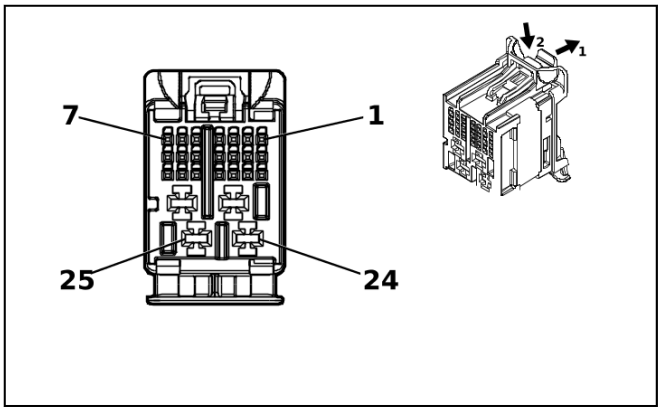
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required
II	Not required	J-35616-22 (RD)	No Tool Required

G59 Engine Coolant Pump

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 10	(1) RD / YE	(1) 442	(1) Battery Positive Voltage	(1) II	(1) —
(2) 2	(2) 10	(2) BK	(2) 6550	(2) Ground	(2) II	(2) —
(3) 3	(3) 0.5	(3) GN / BN	(3) 2732	(3) Engine Control Module LIN Bus 4	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

K9 Body Control Module X1



5203995

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 160027-0013
- Service Connector: 13534967
- Description: 25-Way F 0.5 MQS, 2.8 MCP Series(BK with GY Inner Connector)

Terminal Part Information

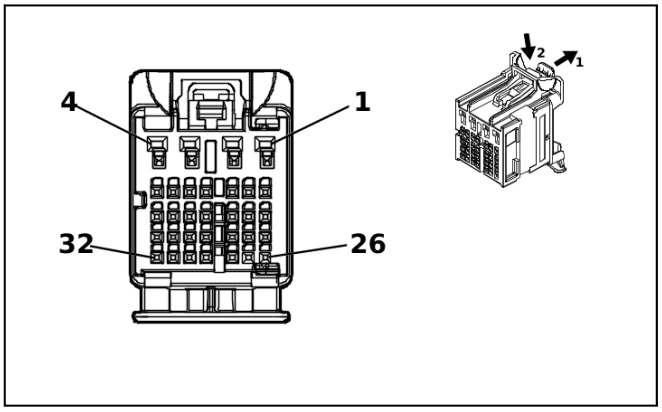
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58
II	87814662	J-35616-35 (VT)	J-38125-557

K9 Body Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.35	(5) BU / GY	(5) 754	(5) Blower Motor Speed Control	(5) I	(5) —
(6) 6	(6) 0.35	(6) WH / YE	(6) 4634	(6) HVAC Remote Enable Signal	(6) I	(6) —
7 - 10	—	—	—	Not Occupied	—	—
(11) 11	(11) 0.35	(11) GY / GN	(11) 4636	(11) HVAC System Enable Signal	(11) I	(11) —
(12) 12	(12) 0.35	(12) GY	(12) 728	(12) Security Indicator Control	(12) I	(12) —
13	—	—	—	Not Occupied	—	—
(14) 14	(14) 0.35	(14) GN / VT	(14) 4759	(14) Transmission Shift Lever Position Indicator 2 Control	(14) I	(14) —
(15) 15	(15) 0.35	(15) GY	(15) 590	(15) Driver Solar Sensor Signal	(15) I	(15) —
(16) 16	(16) 0.35	(16) GY	(16) 6137	(16) Air Conditioning Evaporator Temperature Sensor Signal	(16) I	(16) —
(17) 17	(17) 0.35	(17) WH / BU	(17) 278	(17) Ambient Light Sensor Signal	(17) I	(17) —
(18) 18	(18) 0.35	(18) BU / WH	(18) 734	(18) Inside Air Temperature Sensor Signal	(18) I	(18) —
19	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(20) 20	(20) 0.35	(20) GN / VT	(20) 2852	(20) Body Control Module LIN Bus 6	(20) I	(20) —
21 - 22	—	—	—	Not Occupied	—	—
(23) 23	(23) 1	(23) RD / GY	(23) 2840	(23) Battery Positive Voltage	(23) II	(23) —
24	—	—	—	Not Occupied	—	—
(25) 25	(25) 1	(25) RD / GY	(25) 2140	(25) Battery Positive Voltage	(25) II	(25) —

K9 Body Control Module X2



5204222

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 160028-0015
- Service Connector: 13534980
- Description: 32-Way F 0.5 NANO, 1.2 MCON, stAK50h Series(PK with GY Inner Connector)

Terminal Part Information

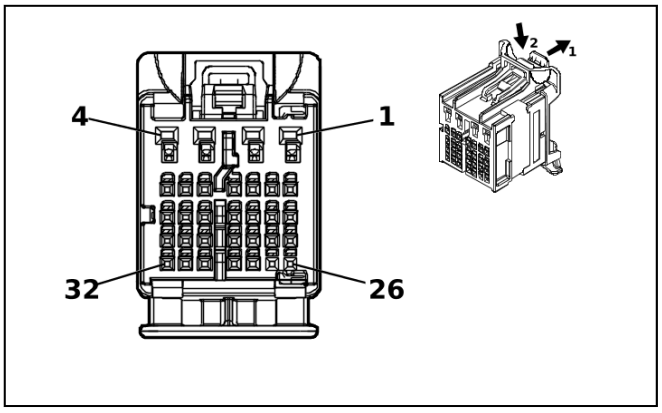
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58
II	84729890	J-35616-12 (BU)	J-38125-215A

K9 Body Control Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY	(1) 157	(1) Interior Lamp Control	(1) II	(1) —
2 - 4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.35	(5) BU / GN	(5) 5723	(5) Ignition Mode Switch Mode Voltage	(5) I	(5) —
6 - 8	—	—	—	Not Occupied	—	—
(9) 9	(9) 0.35	(9) GN / BU	(9) 3738	(9) Tap Up/Tap Down Switch Signal 2	(9) I	(9) —
(10) 10	(10) 0.35	(10) WH / BN	(10) 2203	(10) Enhanced Driver Mode 2 Switch Signal	(10) I	(10) —
11	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(12) 12	(12) 0.35	(12) YE / BU	(12) 1714	(12) Windshield Wiper Switch Low Signal	(12) I	(12) —
(13) 13	(13) 0.35	(13) BN / GN	(13) 11875	(13) Cruise Control Bank 2 Switch Signal	(13) I	(13) —
(14) 14	(14) 0.35	(14) GY / GN	(14) 11874	(14) Cruise Control Bank 1 Switch Signal	(14) I	(14) —
15	—	—	—	Not Occupied	—	—
(16) 16	(16) 0.35	(16) BN / BK	(16) 5720	(16) Ignition Mode Switch Accessory LED Signal	(16) I	(16) —
17 - 22	—	—	—	Not Occupied	—	—
(23) 23	(23) 0.35	(23) VT / BU	(23) 2916	(23) Right Turn Signal Switch Signal	(23) I	(23) —
24	—	—	—	Not Occupied	—	—
(25) 25	(25) 0.35	(25) BK / GY	(25) 6009	(25) Windshield Wiper Switch Low Reference	(25) I	(25) —
(26) 26	(26) 0.35	(26) WH / BK	(26) 94	(26) Windshield Washer Switch Signal	(26) I	(26) —
(27) 27	(27) 0.35	(27) YE / BN	(27) 307	(27) Headlamp Switch Flash Signal	(27) I	(27) —
(28) 28	(28) 0.35	(28) GN / WH	(28) 3287	(28) Horn Switch Signal	(28) I	(28) —
(29) 29	(29) 0.35	(29) WH / GN	(29) 2915	(29) Left Turn Signal Switch Signal	(29) I	(29) —
(30) 30	(30) 0.35	(30) BK / YE	(30) 407	(30) Sensor Low Reference	(30) I	(30) —
(31) 31	(31) 0.35	(31) GN / WH	(31) 111	(31) Hazard Warning Switch Signal	(31) I	(31) —
(32) 32	(32) 0.35	(32) WH	(32) 524	(32) High Beam Select Switch High Beam Signal	(32) I	(32) —

K9 Body Control Module X3



5203925

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 160028-0012
- Service Connector: 13534977
- Description: 32-Way F 0.5 NANO, 1.2 MCON, stAK50h Series(BU with GY Inner Connector)

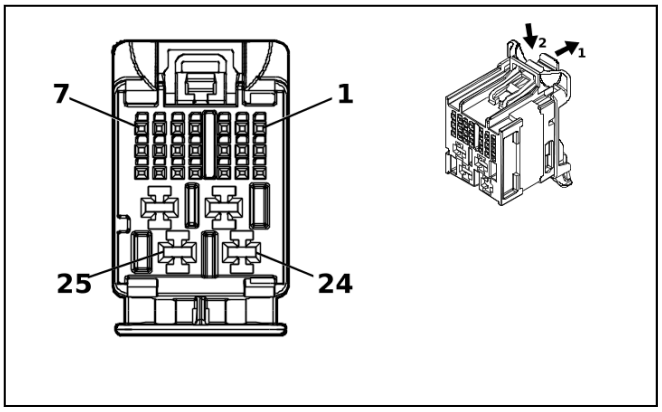
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58
II	84729890	J-35616-12 (BU)	J-38125-215A

K9 Body Control Module X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.5	(3) WH / BN	(3) 6815	(3) Inadvertent Load Control	(3) II	(3) —
4 - 8	—	—	—	Not Occupied	—	—
(9) 9	(9) 0.35	(9) YE / GY	(9) 44	(9) Instrument Panel Lamp Dimmer Switch Signal	(9) I	(9) —
(10) 10	(10) 0.35	(10) GN / BK	(10) 2858	(10) Body Control Module LIN Bus 12	(10) I	(10) —
11	—	—	—	Not Occupied	—	—
(12) 12	(12) 0.35	(12) VT / BK	(12) 7553	(12) Park Lock Solenoid Actuator Control	(12) I	(12) —
(13) 13	(13) 0.35	(13) WH	(13) 3152	(13) Lane Departure Warning Indicator Control	(13) I	(13) —
14	—	—	—	Not Occupied	—	—
(15) 15	(15) 0.35	(15) GN	(15) 1110	(15) Stop/Start Indicator Control	(15) I	(15) —
(16) 16	(16) 0.35	(16) GN / BU	(16) 761	(16) Blower Speed Feedback Signal	(16) I	(16) —
(17) 17	(17) 0.35	(17) WH / VT	(17) 5905	(17) Key Capture/Column Lock Shift Position Signal	(17) I	(17) —
(18) 18	(18) 0.35	(18) BK / YE	(18) 5005	(18) Instrument Panel Lamp Dimmer Switch Low Reference	(18) I	(18) —
(19) 19	(19) 0.35	(19) BU / BK	(19) 5719	(19) Ignition Mode Switch Start LED Signal	(19) I	(19) —
20 - 22	—	—	—	Not Occupied	—	—
(23) 23	(23) 0.35	(23) BU	(23) 1111	(23) Stop/Start Switch Signal	(23) I	(23) —
(24) 24	(24) 0.35	(24) WH / BU	(24) 3691	(24) Trailer Brake Apply Signal	(24) I	(24) —
(25) 25	(25) 0.35	(25) GY	(25) 4989	(25) Driver Mode 2 Switch Signal	(25) I	(25) —
26	—	—	—	Not Occupied	—	—
(27) 27	(27) 0.35	(27) GY / WH	(27) 3153	(27) Lane Departure Warning Disable Switch Signal	(27) I	(27) —
28 - 32	—	—	—	Not Occupied	—	—

K9 Body Control Module X4



5203893

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 160027-0018
- Service Connector: 13534970
- Description: 25-Way F 0.5 MQS, 2.8 MCP Series(GY)

Terminal Part Information

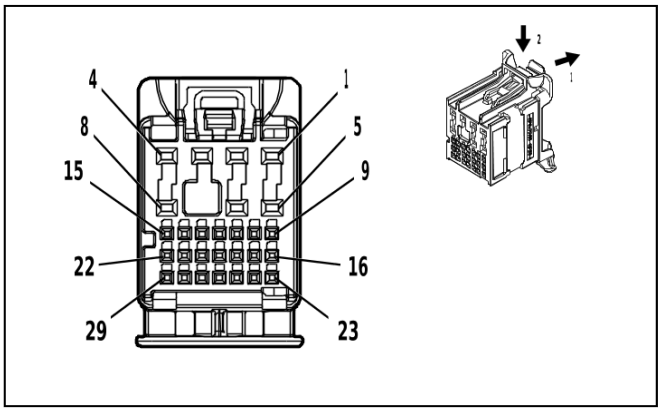
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58
II	87814662	J-35616-35 (VT)	J-38125-557

K9 Body Control Module X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BN / BK	(1) 3552	(1) Interior Passive Entry Antenna 1 High Signal	(1) I	(1) —
(2) 2	(2) 0.35	(2) WH	(2) 3553	(2) Interior Passive Entry Antenna 1 Low Signal	(2) I	(2) —
(3) 3	(3) 0.35	(3) BK / VT	(3) 1449	(3) Steering Wheel Resistor Ladder Low Reference	(3) I	(3) —
4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.35	(5) GN / VT	(5) 5199	(5) Run/Crank Relay Coil Control	(5) I	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.35	(7) BN / BK	(7) 4996	(7) Immobilizer Antenna Signal [+]	(7) I	(7) —
8 - 9	—	—	—	Not Occupied	—	—
(10) 10	(10) 0.35	(10) GY / GN	(10) 4083	(10) Retained Accessory Power Relay 2 Coil Control	(10) I	(10) —
(11) 11	(11) 0.35	(11) GY / GN	(11) 328	(11) Interior Lamp Defeat Switch Signal	(11) I	(11) —
12	—	—	—	Not Occupied	—	—
(13) 13	(13) 0.35	(13) GY	(13) 156	(13) Courtesy Lamp Switch Signal	(13) I	(13) —
(14) 14	(14) 0.35	(14) WH / GY	(14) 4997	(14) Immobilizer Antenna Low Signal	(14) I	(14) —
15	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(16) 16	(16) 0.35	(16) GN / WH	(16) 4115	(16) Body Control Module LIN Bus 5	(16) I	(16) —
17 - 18	—	—	—	Not Occupied	—	—
(19) 19	(19) 0.35	(19) BU / GN	(19) 4103	(19) AUTOSAR CAN Bus [+] 9 Serial Data	(19) I	(19) —
(20) 20	(20) 0.35	(20) WH / GN	(20) 4102	(20) AUTOSAR CAN Bus [-] 9 Serial Data	(20) I	(20) —
(21) 21	(21) 0.35	(21) WH	(21) 6816	(21) Indicator Dimming Control	(21) I	(21) —
(22) 22	(22) 0.75	(22) RD / WH	(22) 2740	(22) Battery Positive Voltage	(22) II	(22) —
(23) 23	(23) 2	(23) RD / BU	(23) 2540	(23) Battery Positive Voltage	(23) II	(23) —
(24) 24	(24) 2	(24) BK	(24) 2050	(24) Ground	(24) II	(24) —
(25) 25	(25) 2	(25) BK	(25) 2050	(25) Ground	(25) II	(25) —

K9 Body Control Module X5



4584346

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 160014-0012
- Service Connector: 13534972
- Description: 29-Way F 0.5 NANO, 1.2 MCON Series(GN)

Terminal Part Information

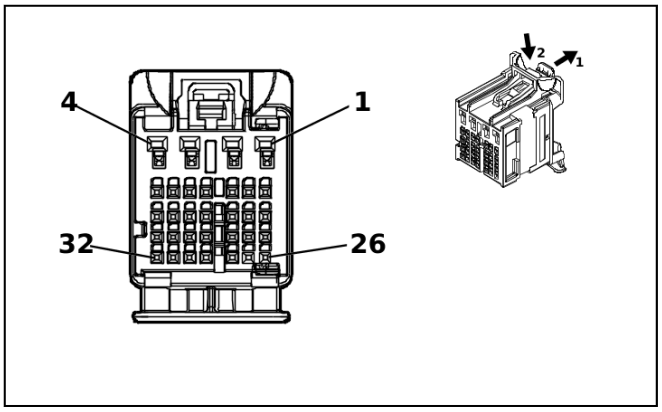
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58
II	84729890	J-35616-12 (BU)	J-38125-215A

K9 Body Control Module X5

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	—
(2) 2	(2) 0.5	(2) BU / BN	(2) 7573	(2) Air Conditioning Compressor Solenoid Valve Control	(2) II	(2) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(3) 3	(3) 0.5	(3) BU / YE	(3) 7574	(3) Air Conditioning Compressor Solenoid Valve Control	(3) II	(3) —
(4) 4	(4) 0.75	(4) WH	(4) 2679	(4) Lock Actuators Unlock Control 1	(4) II	(4) —
5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.5	(6) YE	(6) 6817	(6) LED Backlight Dimming Control 1	(6) II	(6) —
7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.75	(8) GY	(8) 2681	(8) Left Front Door Lock Actuator Lock Control	(8) II	(8) —
9 - 10	—	—	—	Not Occupied	—	—
(11) 11	(11) 0.35	(11) BN / WH	(11) 28	(11) Horn Relay Control	(11) I	(11) —
(12) 12	(12) 0.35	(12) WH / GN	(12) 4102	(12) AUTOSAR CAN Bus [-] 9 Serial Data	(12) I	(12) —
(13) 13	(13) 0.35	(13) BU / GN	(13) 4103	(13) AUTOSAR CAN Bus [+] 9 Serial Data	(13) I	(13) —
14 - 15	—	—	—	Not Occupied	—	—
(16) 16	(16) 0.35	(16) VT	(16) 4301	(16) Passive Entry Left Antenna Signal High	(16) I	(16) —
(17) 17	(17) 0.35	(17) GN / YE	(17) 2855	(17) Body Control Module LIN Bus 9	(17) I	(17) —
(18) 18	(18) 0.35	(18) VT / GY	(18) 126	(18) Left Front Door Open Switch Signal	(18) I	(18) —
(19) 19	(19) 0.35	(19) GN / YE	(19) 6134	(19) Body Control Module LIN Bus 3	(19) I	(19) —
20	—	—	—	Not Occupied	—	—
(21) 21	(21) 0.35	(21) WH / BU	(21) 6311	(21) Cruise/ETC/TCC Brake Signal	(21) I	(21) —
(22) 22	(22) 0.35	(22) BN / VT	(22) 193	(22) Rear Defogger Relay Control	(22) I	(22) —
(23) 23	(23) 0.35	(23) VT / GY	(23) 4302	(23) Passive Entry Left Antenna Signal Low	(23) I	(23) —
(24) 24	(24) 0.35	(24) WH	(24) 5359	(24) Brake Apply Sensor Control	(24) I	(24) —
(25) 25	(25) 0.35	(25) BU / YE	(25) 5361	(25) Brake Apply Sensor Signal	(25) I	(25) —
(26) 26	(26) 0.35	(26) BK / BN	(26) 5360	(26) Brake Apply Sensor Low Reference	(26) I	(26) —
27 - 29	—	—	—	Not Occupied	—	—

K9 Body Control Module X6



5202291

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 160028-0017
- Service Connector: 13534981
- Description: 32-Way F 0.5 MQS, 1.2 OCS Series(BN with GY Inner Connector)

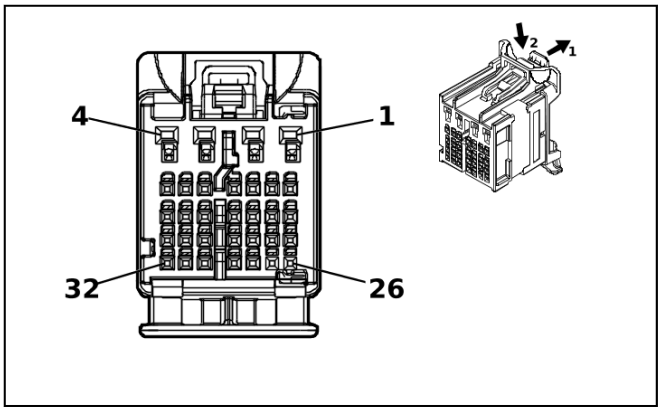
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58
II	84729890	J-35616-12 (BU)	J-38125-215A

K9 Body Control Module X6

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	—
(2) 2	(2) 0.75	(2) VT / WH	(2) 1094	(2) Right Rear Door Lock Actuator Lock Control	(2) II	(2) —
(3) 3	(3) 0.75	(3) GY / BK	(3) 2680	(3) Lock Actuators Unlock Control 2	(3) II	(3) —
4 - 10	—	—	—	Not Occupied	—	—
(11) 11	(11) 0.35	(11) GN / BU	(11) 6133	(11) Body Control Module LIN Bus 2	(11) I	(11) —
12 - 21	—	—	—	Not Occupied	—	—
(22) 22	(22) 0.35	(22) BN / GN	(22) 4064	(22) Hood Status B Signal	(22) I	(22) —
23 - 27	—	—	—	Not Occupied	—	—
(28) 28	(28) 0.35	(28) BU	(28) 2675	(28) Left Front Exterior Door Handle Switch Unlock Signal	(28) I	(28) —
29 - 32	—	—	—	Not Occupied	—	—

K9 Body Control Module X7



5202294

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 160028-0014
- Service Connector: 13534979
- Description: 32-Way F 0.5 MQS, 1.2 OCS Series(PU with GY Inner Connector)

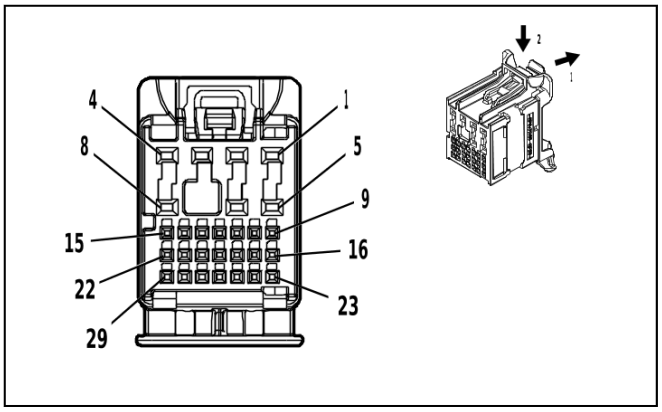
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58

K9 Body Control Module X7

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 18	—	—	—	Not Occupied	—	—
(19) 19	(19) 0.35	(19) GN / VT	(19) 2857	(19) Body Control Module LIN Bus 11	(19) I	(19) —
20 - 29	—	—	—	Not Occupied	—	—
(30) 30	(30) 0.35	(30) BU / YE	(30) 7176	(30) All Windows Open Switch Signal	(30) I	(30) —
31 - 32	—	—	—	Not Occupied	—	—

K9 Body Control Module X8



4578560

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 160014-0011
- Service Connector: 13534971
- Description: 29-Way F 0.5 NANO, 1.2 MCON, stAK50h Series(DK GY with GY Inner Connector)

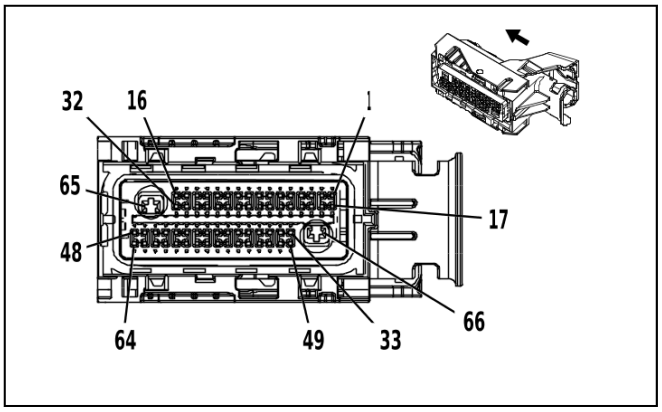
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58
II	84729890	J-35616-12 (BU)	J-38125-215A

K9 Body Control Module X8

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / VT	(1) 2691	(1) Rear Closure Actuator Lock Control	(1) II	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.75	(3) BU / YE	(3) 1091	(3) Left Rear Door Lock Actuator Lock Control	(3) II	(3) —
(4) 4	(4) 0.75	(4) YE / GN	(4) 2682	(4) Right Front Door Lock Actuator Lock Control	(4) II	(4) —
5 - 8	—	—	—	Not Occupied	—	—
(9) 9	(9) 0.35	(9) GN / BK	(9) 4304	(9) Passive Entry Right Antenna Signal Low	(9) I	(9) —
(10) 10	(10) 0.35	(10) GN / YE	(10) 4303	(10) Passive Entry Right Antenna Signal High	(10) I	(10) —
11 - 16	—	—	—	Not Occupied	—	—
(17) 17	(17) 0.35	(17) GN / YE	(17) 2862	(17) Body Control Module LIN Bus 16	(17) I	(17) —
(18) 18	(18) 0.35	(18) GN / WH	(18) 2854	(18) Body Control Module LIN Bus 8	(18) I	(18) —
19 - 27	—	—	—	Not Occupied	—	—
(28) 28	(28) 0.35	(28) GY / VT	(28) 2676	(28) Right Front Door Exterior Switch Unlock Signal	(28) I	(28) —
(29) 29	(29) 0.35	(29) GN / GY	(29) 6135	(29) Body Control Module LIN Bus 4	(29) I	(29) —

K20 Engine Control Module X1



4504420

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 34822-0953
- Service Connector: 85786016
- Description: 66-Way F 0.64, 2.8 Series, Sealed(BK with BU Terminal Position Assurance)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13587518	J-35616-35 (VT)	J-38125-11A
II	19351723	J-35616-64B (L-BU)	J-38125-213

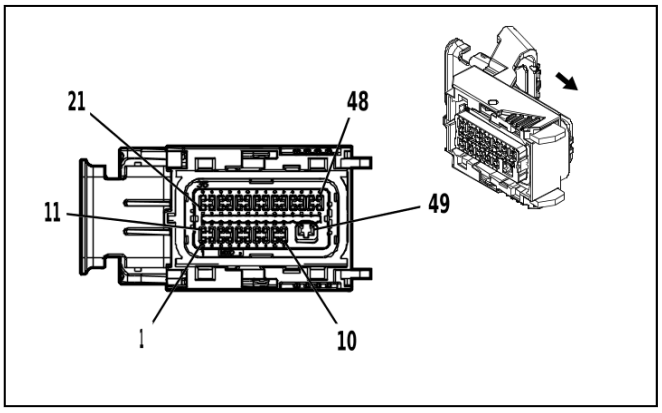
K20 Engine Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) YE	(1) 5991	(1) Powertrain Relay Coil Control	(1) II	(1) —
(2) 2	(2) 0.5	(2) YE / BK	(2) 625	(2) Starter Enable Relay Control	(2) II	(2) —
(3) 3	(3) 0.5	(3) YE / VT	(3) 4325	(3) Starter Pinion Solenoid Actuator Relay Control	(3) II	(3) —
4 - 5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.5	(6) VT / GY	(6) 3615	(6) Intake Camshaft Profile Actuator 1 Control A	(6) II	(6) —
(7) 7	(7) 0.5	(7) GN / BK	(7) 3616	(7) Intake Camshaft Profile Actuator 1 Control B	(7) II	(7) —
(8) 8	(8) 0.5	(8) GN	(8) 3585	(8) Intake Camshaft Profile Actuator 2 Control A	(8) II	(8) —
(9) 9	(9) 0.5	(9) BU	(9) 3584	(9) Intake Camshaft Profile Actuator 2 Control B	(9) II	(9) —
(10) 10	(10) 0.5	(10) YE / BU	(10) 3587	(10) Intake Camshaft Profile Actuator 3 Control A	(10) II	(10) —
(11) 11	(11) 0.5	(11) GY	(11) 3586	(11) Intake Camshaft Profile Actuator 3 Control B	(11) II	(11) —
(12) 12	(12) 0.5	(12) BU / WH	(12) 3589	(12) Intake Camshaft Profile Actuator 1 Position Sensor Signal	(12) II	(12) —
(13) 13	(13) 0.5	(13) GN / WH	(13) 3592	(13) Intake Camshaft Profile Actuator 2 Position Sensor Signal	(13) II	(13) —
(14) 14	(14) 0.5	(14) BK / GN	(14) 3593	(14) Intake Camshaft Profile Actuator 3 Position Sensor Signal	(14) II	(14) —
15	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(16) 16	(16) 0.75	(16) VT / BU	(16) 5291	(16) Powertrain Main Relay Fused Supply Voltage 2	(16) II	(16) —
(17) 17	(17) 0.5	(17) GN / GY	(17) 465	(17) Fuel Pump Primary Relay Control	(17) II	(17) —
(18) 18	(18) 0.5	(18) WH / GY	(18) 459	(18) Air Conditioning Compressor Clutch Relay Control	(18) II	(18) —
19 - 21	—	—	—	Not Occupied	—	—
(22) 22	(22) 0.5	(22) GN / YE	(22) 1402	(22) Intake Camshaft Profile Actuator 4 Control A	(22) II	(22) —
(23) 23	(23) 0.5	(23) GY / YE	(23) 1502	(23) Intake Camshaft Profile Actuator 4 Control B	(23) II	(23) —
(24) 24	(24) 0.5	(24) YE / VT	(24) 6265	(24) Exhaust Camshaft Profile Actuator 2 Control B	(24) II	(24) —
(25) 25	(25) 0.5	(25) VT / BK	(25) 6264	(25) Exhaust Camshaft Profile Actuator 2 Control A	(25) II	(25) —
(26) 26	(26) 0.5	(26) GY / BN	(26) 6262	(26) Exhaust Camshaft Profile Actuator 3 Control B	(26) II	(26) —
(27) 27	(27) 0.5	(27) GN / BN	(27) 6261	(27) Exhaust Camshaft Profile Actuator 3 Control A	(27) II	(27) —
(28) 28	(28) 0.5	(28) YE / BN	(28) 1702	(28) Intake Camshaft Profile Actuator 4 Position Sensor Signal	(28) II	(28) —
(29) 29	(29) 0.5	(29) GN / BK	(29) 6266	(29) Exhaust Camshaft Profile Actuator 2 Position Sensor Signal	(29) II	(29) —
(30) 30	(30) 0.5	(30) YE	(30) 6263	(30) Exhaust Camshaft Profile Actuator 3 Position Sensor Signal	(30) II	(30) —
31	—	—	—	Not Occupied	—	—
(32) 32	(32) 0.5	(32) VT / GY	(32) 139	(32) Run/Crank Ignition 1 Voltage	(32) II	(32) —
(33) 33	(33) 0.5	(33) BK / BU	(33) 1271	(33) Accelerator Pedal Position Low Reference 1	(33) II	(33) —
(34) 34	(34) 0.5	(34) YE / WH	(34) 3746	(34) Camshaft Exhaust Lobe Axial Position Signal 1	(34) II	(34) —
(35) 35	(35) 0.5	(35) BK / VT	(35) 1272	(35) Accelerator Pedal Position Low Reference 2	(35) II	(35) —
(36) 36	(36) 0.5	(36) YE / GN	(36) 3747	(36) Camshaft Exhaust Lobe Axial Position Signal 2	(36) II	(36) —
37	—	—	—	Not Occupied	—	—
(38) 38	(38) 0.5	(38) YE	(38) 4063	(38) Hood Status A Signal	(38) II	(38) —
(39) 39	(39) 0.5	(39) YE / WH	(39) 1161	(39) Accelerator Pedal Position Signal 1	(39) II	(39) —
40 - 41	—	—	—	Not Occupied	—	—
(42) 42	(42) 0.5	(42) GN / BN	(42) 2732	(42) Engine Control Module LIN Bus 4	(42) II	(42) —
43 - 44	—	—	—	Not Occupied	—	—
(45) 45	(45) 0.5	(45) BU / GY	(45) 4054	(45) Private Serial Data Powertrain CAN Bus [-] Serial Data	(45) II	(45) —
(46) 46	(46) 0.5	(46) WH	(46) 4055	(46) Private Serial Data Powertrain CAN Bus [+] Serial Data	(46) II	(46) —
(47) 47	(47) 0.5	(47) BU	(47) 492	(47) Mass Air Flow Sensor Signal	(47) II	(47) —
(48) 48	(48) 0.5	(48) RD / WH	(48) 140	(48) Battery Positive Voltage	(48) II	(48) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(49) 49	(49) 0.5	(49) WH / RD	(49) 1164	(49) Accelerator Pedal Position 5V Reference 1	(49) II	(49) —
(50) 50	(50) 0.5	(50) VT / WH	(50) 3744	(50) Camshaft Intake Lobe Axial Position Signal 1	(50) II	(50) —
(51) 51	(51) 0.5	(51) BN / RD	(51) 1274	(51) Accelerator Pedal Position 5V Reference 2	(51) II	(51) —
(52) 52	(52) 0.5	(52) VT / GN	(52) 3745	(52) Camshaft Intake Lobe Axial Position Signal 2	(52) II	(52) —
(53) 53	(53) 0.5	(53) BU / GY	(53) 636	(53) Ambient Air Temperature Sensor Signal	(53) II	(53) —
54	—	—	—	Not Occupied	—	—
(55) 55	(55) 0.5	(55) GN	(55) 380	(55) Air Conditioning Refrigerant Pressure Sensor Signal	(55) II	(55) —
(56) 56	(56) 0.5	(56) WH / GN	(56) 5380	(56) Brake Position Sensor Signal	(56) II	(56) —
(57) 57	(57) 0.5	(57) GN / WH	(57) 1162	(57) Accelerator Pedal Position Signal 2	(57) II	(57) —
58	—	—	—	Not Occupied	—	—
(59) 59	(59) 0.5	(59) WH	(59) 4978	(59) AUTOSAR CAN Bus [-] 2 Serial Data	(59) II	(59) —
(60) 60	(60) 0.5	(60) BU / YE	(60) 4979	(60) AUTOSAR CAN Bus [+] 2 Serial Data	(60) II	(60) —
61 - 62	—	—	—	Not Occupied	—	—
(63) 63	(63) 0.5	(63) WH	(63) 4976	(63) AUTOSAR CAN Bus [-] 3 Serial Data	(63) II	(63) —
(64) 64	(64) 0.5	(64) BU / BK	(64) 4977	(64) AUTOSAR CAN Bus [+] 3 Serial Data	(64) II	(64) —
(65) 65	(65) 2.5	(65) BK / WH	(65) 151	(65) Signal Ground	(65) I	(65) —
(66) 66	(66) 2	(66) VT / BU	(66) 5290	(66) Powertrain Main Relay Fused Supply Voltage 1	(66) I	(66) —

K20 Engine Control Module X2



4596458

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 34576-9493
- Service Connector: 85786015
- Description: 49-Way F 0.64, 2.8 Series, Sealed(BK with BK Terminal Position Assurance)

Terminal Part Information

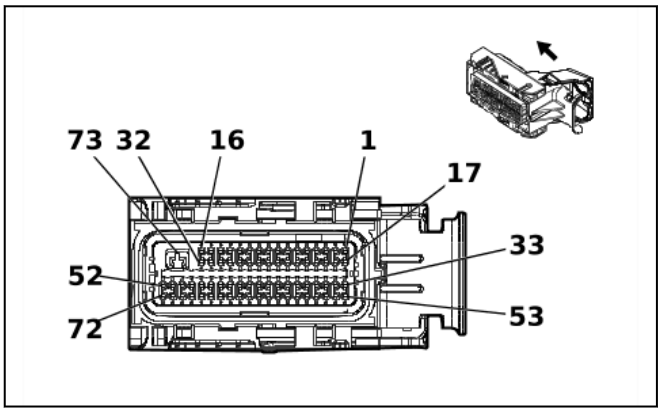
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13587518	J-35616-35 (VT)	J-38125-11A
II	19351723	J-35616-64B (L-BU)	J-38125-213

K20 Engine Control Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / GN	(1) 4320	(1) Powertrain Sensor Bus Enable	(1) II	(1) —
(2) 2	(2) 0.5	(2) BU / RD	(2) 460	(2) Engine Control Sensors 5 Volt Reference 1	(2) II	(2) —
3 - 4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.5	(5) BN / BU	(5) 2447	(5) Evaporative Purge Pump Pressure Signal	(5) II	(5) —
6 - 8	—	—	—	Not Occupied	—	—
(9) 9	(9) 0.5	(9) VT / BU	(9) 5294	(9) Powertrain Main Relay Fused Supply Voltage 5	(9) II	(9) —
(10) 10	(10) 0.5	(10) BU / GY	(10) 2978	(10) Coolant Diverter Valve Position Signal	(10) II	(10) —
11	—	—	—	Not Occupied	—	—
(12) 12	(12) 0.5	(12) BK / GN	(12) 580	(12) Engine Control Sensors Low Reference 2	(12) II	(12) —
13 - 14	—	—	—	Not Occupied	—	—
(15) 15	(15) 0.5	(15) GN / BK	(15) 3337	(15) Transmission Internal Mode Switch Mode Control Y	(15) II	(15) —
(16) 16	(16) 0.5	(16) YE / BN	(16) 331	(16) Oil Pressure Sensor Signal	(16) II	(16) —
17 - 18	—	—	—	Not Occupied	—	—
(19) 19	(19) 0.5	(19) BU / WH	(19) 2918	(19) Fuel Rail Pressure Sensor Signal	(19) II	(19) —
(20) 20	(20) 0.5	(20) WH	(20) 2590	(20) Turbocharger Wastegate Motor Feedback Signal	(20) II	(20) —
21	—	—	—	Not Occupied	—	—
(22) 22	(22) 0.5	(22) BK / GY	(22) 626	(22) Engine Control Vehicle Sensors Low Reference 1	(22) II	(22) —
(23) 23	(23) 0.5	(23) VT	(23) 7485	(23) Engine Oil Temperature Sensor 2 Signal	(23) II	(23) —
(24) 24	(24) 0.5	(24) BN / BU	(24) 357	(24) Oil Temperature Sensor Signal	(24) II	(24) —
(25) 25	(25) 0.5	(25) YE / WH	(25) 3200	(25) Throttle Inlet Absolute Pressure Sensor Signal	(25) II	(25) —
26 - 28	—	—	—	Not Occupied	—	—
(29) 29	(29) 0.5	(29) YE / GY	(29) 3926	(29) Crankcase Differential Pressure Sensor Signal	(29) II	(29) —
30	—	—	—	Not Occupied	—	—
(31) 31	(31) 0.5	(31) YE / GY	(31) 6936	(31) HO2S Signal	(31) II	(31) —
(32) 32	(32) 0.5	(32) BN	(32) 6934	(32) HO2S Ground	(32) II	(32) —
(33) 33	(33) 0.5	(33) GN / YE	(33) 4623	(33) Engine Control Module LIN Bus 3	(33) II	(33) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(34) 34	(34) 0.5	(34) GY / WH	(34) 3113	(34) HO2S Heater Low Control Bank 1 Sensor 1	(34) II	(34) —
35	—	—	—	Not Occupied	—	—
(36) 36	(36) 0.5	(36) WH / RD	(36) 480	(36) Engine Control Vehicle Sensors 5 Volt Reference 1	(36) II	(36) —
(37) 37	(37) 0.5	(37) YE / BK	(37) 3000	(37) Coolant Temperature Sensor 2 Signal	(37) II	(37) —
38 - 39	—	—	—	Not Occupied	—	—
(40) 40	(40) 0.5	(40) GY / VT	(40) 2404	(40) Engine Block Coolant Temperature Signal	(40) II	(40) —
41 - 44	—	—	—	Not Occupied	—	—
(45) 45	(45) 0.5	(45) GN	(45) 6935	(45) HO2S Pump Current Trim Signal	(45) II	(45) —
(46) 46	(46) 0.5	(46) BN / WH	(46) 6933	(46) HO2S Pump Current Signal	(46) II	(46) —
(47) 47	(47) 0.75	(47) GN / VT	(47) 4621	(47) Engine Control Module LIN Bus 1	(47) II	(47) —
(48) 48	(48) 0.5	(48) GN / WH	(48) 4622	(48) Engine Control Module LIN Bus 2	(48) II	(48) —
(49) 49	(49) 2.5	(49) BK / WH	(49) 151	(49) Signal Ground	(49) I	(49) —

K20 Engine Control Module X3



1650395

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 34566-9393
- Service Connector: 19333091
- Description: 73-Way F 0.64, 2.8 Series, Sealed(BK with GY Terminal Position Assurance)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13587518	J-35616-35 (VT)	J-38125-11A
II	19354746	J-35616-64B (L-BU)	J-38125-213

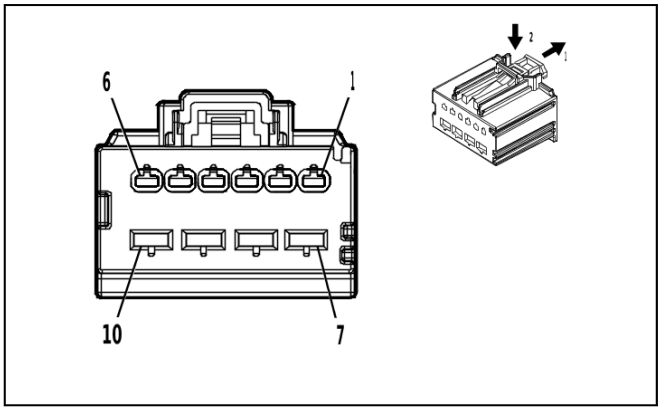
K20 Engine Control Module X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	—
(2) 2	(2) 0.5	(2) GN	(2) 3060	(2) Turbocharger Bypass Solenoid Valve Control Bank 1	(2) II	(2) —
(3) 3	(3) 0.5	(3) BN	(3) 25	(3) Charge Indicator Control	(3) II	(3) —
4 - 5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.5	(6) VT / BU	(6) 6270	(6) Crankshaft Position Sensor Voltage	(6) II	(6) —
(7) 7	(7) 0.5	(7) BN / RD	(7) 2701	(7) Throttle Position Sensor 5V Reference	(7) II	(7) —
8	—	—	—	Not Occupied	—	—
(9) 9	(9) 0.5	(9) GN / WH	(9) 432	(9) Manifold Absolute Pressure Sensor Signal	(9) II	(9) —
(10) 10	(10) 0.5	(10) BN	(10) 3120	(10) HO2S High Signal Bank 1 Sensor 2	(10) II	(10) —
(11) 11	(11) 0.5	(11) WH / YE	(11) 3121	(11) HO2S Low Signal Bank 1 Sensor 2	(11) II	(11) —
(12) 12	(12) 0.5	(12) VT / BN	(12) 5284	(12) Intake Camshaft Position Actuator Solenoid Valve 1	(12) II	(12) —
(13) 13	(13) 0.5	(13) GY / BU	(13) 5282	(13) Exhaust Camshaft Position Actuator Solenoid Valve 1	(13) II	(13) —
(14) 14	(14) 0.5	(14) BU	(14) 2976	(14) Coolant Diverter Valve Actuator Control Open	(14) II	(14) —
(15) 15	(15) 0.75	(15) WH / BN	(15) 2591	(15) Turbocharger Wastegate Motor Open Control	(15) II	(15) —
(16) 16	(16) 0.75	(16) WH / BU	(16) 2592	(16) Turbocharger Wastegate Motor Close Control	(16) II	(16) —
17 - 20	—	—	—	Not Occupied	—	—
(21) 21	(21) 0.5	(21) BK / YE	(21) 548	(21) Engine Control Sensors Low Reference 1	(21) II	(21) —
(22) 22	(22) 0.5	(22) BK / VT	(22) 6272	(22) Crankshaft Position Sensor Low Reference	(22) II	(22) —
(23) 23	(23) 0.5	(23) BK / BN	(23) 2752	(23) Throttle Position Sensor Low Reference	(23) II	(23) —
(24) 24	(24) 0.5	(24) YE / BU	(24) 2408	(24) Engine Inlet Coolant Temperature Signal	(24) II	(24) —
(25) 25	(25) 0.5	(25) VT	(25) 2988	(25) Engine Outlet Coolant Temperature Signal	(25) II	(25) —
(26) 26	(26) 0.5	(26) WH / BU	(26) 7329	(26) Pre-Throttle Air Temperature Signal	(26) II	(26) —
(27) 27	(27) 0.5	(27) BU / YE	(27) 8938	(27) Engine Integrated Exhaust Manifold Temperature Signal	(27) II	(27) —
(28) 28	(28) 0.5	(28) BK / BN	(28) 6753	(28) Camshaft Position Actuator Solenoid Valve 1 Low Reference	(28) II	(28) —
(29) 29	(29) 0.5	(29) BK / VT	(29) 6754	(29) Camshaft Position Actuator Solenoid Valve 1 Low Reference	(29) II	(29) —
(30) 30	(30) 0.5	(30) YE	(30) 581	(30) Throttle Actuator Open Control	(30) II	(30) —
(31) 31	(31) 0.5	(31) BN / WH	(31) 582	(31) Throttle Actuator Close Control	(31) II	(31) —
(32) 32	(32) 0.5	(32) BU / BN	(32) 2977	(32) Coolant Diverter Valve Actuator Control Close	(32) II	(32) —
(33) 33	(33) 0.5	(33) VT / GY	(33) 496	(33) Knock Sensor 1 Signal	(33) II	(33) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(34) 34	(34) 0.5	(34) WH / GY	(34) 1876	(34) Knock Sensor 2 Signal	(34) II	(34) —
(35) 35	(35) 0.5	(35) BK / GN	(35) 469	(35) Manifold Absolute Pressure Sensor Low Reference	(35) II	(35) —
(36) 36	(36) 0.5	(36) GN / BU	(36) 428	(36) EVAP Canister Purge Solenoid Control	(36) II	(36) —
37 - 38	—	—	—	Not Occupied	—	—
(39) 39	(39) 0.5	(39) BK / GN	(39) 5301	(39) Intake Camshaft Position Sensor Low Reference 1	(39) II	(39) —
(40) 40	(40) 0.5	(40) BK / GY	(40) 5296	(40) Exhaust Camshaft Position Sensor Low Reference 1	(40) II	(40) —
41	—	—	—	Not Occupied	—	—
(42) 42	(42) 0.5	(42) VT / BK	(42) 5273	(42) Exhaust Camshaft Position Sensor 1	(42) II	(42) —
(43) 43	(43) 0.5	(43) GN	(43) 6271	(43) Crankshaft Position Sensor Signal	(43) II	(43) —
(44) 44	(44) 0.75	(44) YE / BU	(44) 2124	(44) Ignition Control 4	(44) II	(44) —
(45) 45	(45) 0.75	(45) BU / WH	(45) 2122	(45) Ignition Control 2	(45) II	(45) —
(46) 46	(46) 0.75	(46) BK / BU	(46) 2129	(46) Ignition Control Low Reference Bank 1	(46) II	(46) —
(47) 47	(47) 0.5	(47) GY / WH	(47) 3122	(47) HO2S Heater Low Control Bank 1 Sensor 2	(47) II	(47) —
(48) 48	(48) 0.5	(48) BU / WH	(48) 3630	(48) Throttle Position Sensor SENT 1 Signal	(48) II	(48) —
(49) 49	(49) 0.75	(49) BU / WH	(49) 4904	(49) Direct Fuel Injector High Voltage Supply Cylinder 4	(49) II	(49) —
(50) 50	(50) 0.75	(50) GY / BU	(50) 4804	(50) Direct Fuel Injector High Voltage Control Cylinder 4	(50) II	(50) —
(51) 51	(51) 0.75	(51) BU / GY	(51) 4902	(51) Direct Fuel Injector High Voltage Supply Cylinder 2	(51) II	(51) —
(52) 52	(52) 0.75	(52) BU	(52) 4802	(52) Direct Fuel Injector High Voltage Control Cylinder 2	(52) II	(52) —
(53) 53	(53) 0.5	(53) BK / YE	(53) 1716	(53) Knock Sensor Low Reference 1	(53) II	(53) —
(54) 54	(54) 0.5	(54) BK / GY	(54) 2303	(54) Knock Sensor Low Reference 2	(54) II	(54) —
(55) 55	(55) 0.5	(55) GY / RD	(55) 2704	(55) Manifold Absolute Pressure Sensor 5V Reference	(55) II	(55) —
(56) 56	(56) 0.5	(56) YE / BN	(56) 106	(56) Oil Pump Motor Control	(56) II	(56) —
(57) 57	(57) 0.5	(57) BU	(57) 179	(57) Engine Oil Pump Control	(57) II	(57) —
58	—	—	—	Not Occupied	—	—
(59) 59	(59) 0.5	(59) GY / BU	(59) 5300	(59) Intake Camshaft Position Sensor 1 Voltage Reference	(59) II	(59) —
(60) 60	(60) 0.5	(60) GY / YE	(60) 5297	(60) Exhaust Camshaft Position Sensor 1 Voltage Reference	(60) II	(60) —
(61) 61	(61) 0.5	(61) GY	(61) 23	(61) Generator Field Duty Cycle Signal	(61) II	(61) —
62	—	—	—	Not Occupied	—	—
(63) 63	(63) 0.5	(63) YE / VT	(63) 5275	(63) Intake Camshaft Position Sensor 1	(63) II	(63) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(64) 64	(64) 0.75	(64) BU / VT	(64) 2121	(64) Ignition Control 1	(64) II	(64) —
(65) 65	(65) 0.75	(65) GN / BU	(65) 2123	(65) Ignition Control 3	(65) II	(65) —
66	—	—	—	Not Occupied	—	—
(67) 67	(67) 0.75	(67) VT / BK	(67) 7300	(67) High Pressure Fuel Pump Low Control	(67) II	(67) —
(68) 68	(68) 0.75	(68) YE	(68) 7301	(68) High Pressure Fuel Pump High Control	(68) II	(68) —
(69) 69	(69) 0.75	(69) BN / WH	(69) 4901	(69) Direct Fuel Injector High Voltage Supply Cylinder 1	(69) II	(69) —
(70) 70	(70) 0.75	(70) BN	(70) 4801	(70) Direct Fuel Injector High Voltage Control Cylinder 1	(70) II	(70) —
(71) 71	(71) 0.75	(71) GN / GY	(71) 4903	(71) Direct Fuel Injector High Voltage Supply Cylinder 3	(71) II	(71) —
(72) 72	(72) 0.75	(72) GN	(72) 4803	(72) Direct Fuel Injector High Voltage Control Cylinder 3	(72) II	(72) —
(73) 73	(73) 2	(73) VT / BU	(73) 5290	(73) Powertrain Main Relay Fused Supply Voltage 1	(73) I	(73) —

K29FV Front Seat Heater Vent Control Module X1 (KA1)



5035058

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Passenger
- OEM Connector: 31372-1600
- Service Connector: Service by Harness - See Part Catalog
- Description: 10-Way F 1.5, 2.8 MX Series(BK)

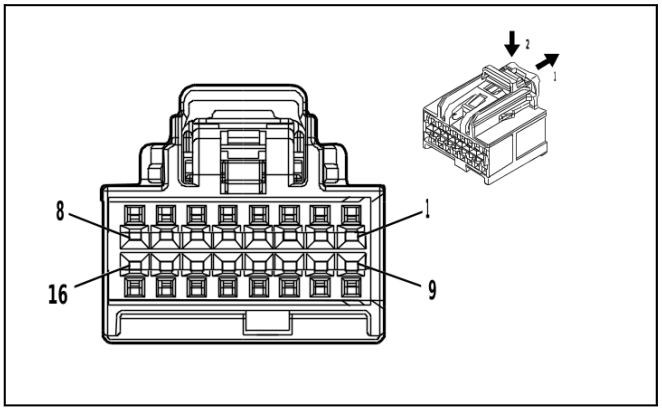
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-2A (GY)	No Tool Required
II	Not required	J-35616-4A (PU)	No Tool Required

K29FV Front Seat Heater Vent Control Module X1 (KA1)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	—
(2) 2	(2) 0.75	(2) BN / BU	(2) 2479	(2) Passenger Seat Heating Element Control	(2) I	(2) —
(3) 3	(3) 0.75	(3) GY / BK	(3) 2480	(3) Passenger Seat Heating Element Low Reference	(3) I	(3) —
(4) 4	(4) 0.75	(4) BN / BK	(4) 2078	(4) Driver Seat Heating Element Low Reference	(4) I	(4) —
5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.75	(6) BN / VT	(6) 2077	(6) Driver Seat Heating Element Control	(6) I	(6) —
(7) 7	(7) 0.75	(7) RD / VT	(7) 4640	(7) Battery Positive Voltage	(7) II	(7) —
(8) 8	(8) 1.5	(8) BK	(8) 4250	(8) Ground	(8) II	(8) —
9	—	—	—	Not Occupied	—	—
(10) 10	(10) 0.75	(10) RD / BU	(10) 4540	(10) Battery Positive Voltage	(10) II	(10) —

K29FV Front Seat Heater Vent Control Module X2 (KA1)



4873243

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Passenger
- OEM Connector: 35016343
- Service Connector: Service by Harness - See Part Catalog
- Description: 16-Way F 0.64 OCS Series(BK)

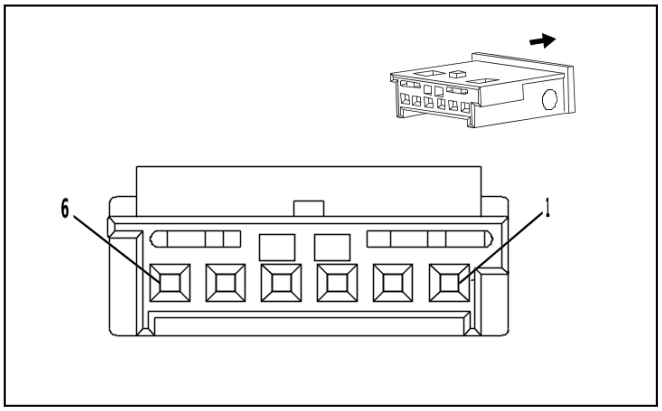
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

K29FV Front Seat Heater Vent Control Module X2 (KA1)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BK / YE	(1) 2080	(1) Driver Heated Seat Thermistor Low Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / GY	(2) 2435	(2) Passenger Heated Seat Thermistor Low Reference	(2) I	(2) —
(3) 3	(3) 0.5	(3) BU	(3) 2425	(3) Driver Seat Back Heating Temperature Sensor Signal	(3) I	(3) —
(4) 4	(4) 0.5	(4) WH / BU	(4) 2436	(4) Passenger Seat Back Heating Temperature Sensor Signal	(4) I	(4) —
(5) 5	(5) 0.5	(5) WH / GY	(5) 2434	(5) Passenger Seat Heating Temperature Sensor Signal	(5) I	(5) —
(6) 6	(6) 0.5	(6) YE / GY	(6) 2079	(6) Driver Seat Heating Temperature Sensor Signal	(6) I	(6) —
7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.5	(8) GN / VT	(8) 2857	(8) Body Control Module LIN Bus 11	(8) I	(8) —
(9) 9	(9) 0.5	(9) GN / VT	(9) 5906	(9) Driver Seat Blower Motor Control 1	(9) I	(9) —
(10) 10	(10) 0.5	(10) VT / WH	(10) 5908	(10) Passenger Seat Blower Motor Control 1	(10) I	(10) —
11	—	—	—	Not Occupied	—	—
(12) 12	(12) 0.5	(12) BK / GN	(12) 2482	(12) Passenger Heated Back Thermistor Low Reference	(12) I	(12) —
13 - 16	—	—	—	Not Occupied	—	—

K32 Heated Steering Wheel Module X1 (KI3)



1862024

Connector Part Information

- Harness Type: Steering Wheel Horn Switch Wiring Harness
- OEM Connector: 1-1241370-3
- Service Connector: Service by Harness - See Part Catalog
- Description: 6-Way F 0.64 Micro-Quadlock Series(BK)

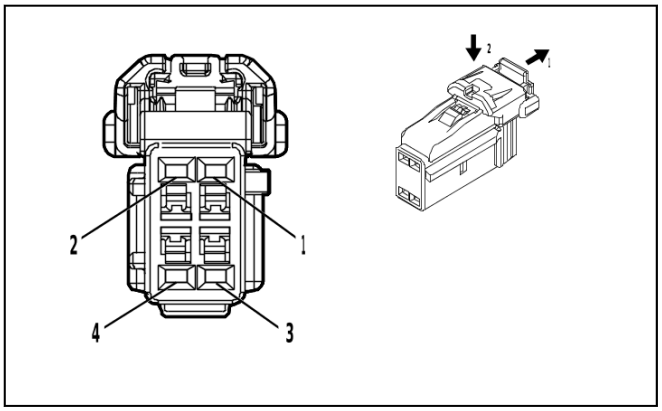
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

K32 Heated Steering Wheel Module X1 (KI3)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) YE / GY	(1) 5883	(1) Steering Wheel Heating Switch Signal	(1) I	(1) —
(2) 2	(2) 0.35	(2) BN / WH	(2) 5884	(2) Steering Wheel Heating Switch LED Control	(2) I	(2) —
(3) 3	(3) 0.5	(3) RD / BN	(3) 10040	(3) Battery Positive Voltage	(3) I	(3) —
(4) 4	(4) 0.5	(4) BK	(4) 6050	(4) Steering Wheel Ground	(4) I	(4) —
(5) 5	(5) 0.35	(5) BK / WH	(5) 6051	(5) Steering Wheel Ground	(5) I	(5) —
(6) 6	(6) 0.35	(6) GN / BK	(6) 2858	(6) Body Control Module LIN Bus 12	(6) I	(6) —

K32 Heated Steering Wheel Module X2 (KI3)



4872683

Connector Part Information

- Harness Type: Steering Wheel Horn Switch Wiring Harness
- OEM Connector: 13533335
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 1.2 Series(BK)

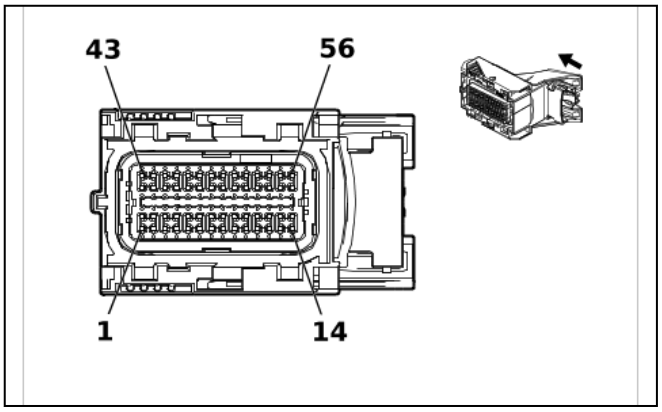
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

K32 Heated Steering Wheel Module X2 (KI3)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) —	(1) WH / YE	(1) 5888	(1) Steering Wheel Heating High Control	(1) I	(1) —
(2) 2	(2) —	(2) GY / YE	(2) 5887	(2) Steering Wheel Heating Low Control	(2) I	(2) —
(3) 3	(3) —	(3) VT / BU	(3) 5886	(3) Steering Wheel Heating Temperature Sensor Signal	(3) I	(3) —
(4) 4	(4) —	(4) YE / RD	(4) 5885	(4) Steering Wheel Heating Voltage Reference	(4) I	(4) —

K36 Restraints Control Module X1



5581812

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 160099-0035
- Service Connector: 85090371
- Description: 56-Way F 0.64 Series, Sealed(BK with BU Terminal Position Assurance)

Terminal Part Information

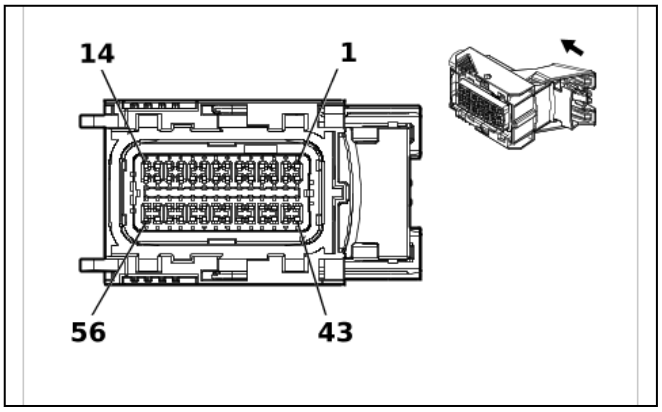
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19354746	J-35616-64B (L-BU)	J-38125-213

K36 Restraints Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.5	(7) BK / OG	(7) 5045	(7) Left Front Impact Discriminating Sensor Low Reference	(7) I	(7) —
(8) 8	(8) 0.5	(8) OG / YE	(8) 354	(8) Left Front Impact Discriminating Sensor Signal	(8) I	(8) —
(9) 9	(9) 0.5	(9) OG / GN	(9) 1409	(9) Right Front Impact Discriminating Sensor Signal	(9) I	(9) —
(10) 10	(10) 0.5	(10) BK / OG	(10) 5600	(10) Right Front Impact Discriminating Sensor Low Reference	(10) I	(10) —
(11) 11	(11) 0.5	(11) WH / OG	(11) 3476	(11) Passenger Seat Belt Retractor Pretensioner Low Control	(11) I	(11) —
(12) 12	(12) 0.5	(12) OG / GN	(12) 3475	(12) Passenger Seat Belt Retractor Pretensioner High Control	(12) I	(12) —
(13) 13	(13) 0.5	(13) YE / OG	(13) 3025	(13) Passenger Instrument Panel Air Bag Stage 1 High Control	(13) I	(13) —
(14) 14	(14) 0.5	(14) OG / WH	(14) 3024	(14) Passenger Instrument Panel Air Bag Stage 1 Low Control	(14) I	(14) —
15 - 24	—	—	—	Not Occupied	—	—
(25) 25	(25) 0.5	(25) VT / OG	(25) 3478	(25) Driver Seat Belt Retractor Pretensioner Low Control	(25) I	(25) —
(26) 26	(26) 0.5	(26) OG / WH	(26) 3477	(26) Driver Seat Belt Retractor Pretensioner High Control	(26) I	(26) —
(27) 27	(27) 0.5	(27) OG / VT	(27) 3021	(27) Steering Wheel Air Bag Stage 1 High Control	(27) I	(27) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(28) 28	(28) 0.5	(28) BN / OG	(28) 3020	(28) Steering Wheel Air Bag Stage 1 Low Control	(28) I	(28) —
(29) 29	(29) 0.35	(29) BU / GN	(29) 4103	(29) AUTOSAR CAN Bus [+] 9 Serial Data	(29) I	(29) —
(30) 30	(30) 0.35	(30) WH / GN	(30) 4102	(30) AUTOSAR CAN Bus [-] 9 Serial Data	(30) I	(30) —
31	—	—	—	Not Occupied	—	—
(32) 32	(32) 0.5	(32) OG / BN	(32) 3479	(32) Passenger Seat Belt Anchor Pretensioner High Control	(32) I	(32) —
(33) 33	(33) 0.5	(33) GY / OG	(33) 3480	(33) Passenger Seat Belt Anchor Pretensioner Low Control	(33) I	(33) —
34 - 36	—	—	—	Not Occupied	—	—
(37) 37	(37) 0.35	(37) GN	(37) 2308	(37) Passenger Air Bag Off Indicator Control	(37) I	(37) —
(38) 38	(38) 0.5	(38) OG / VT	(38) 3026	(38) Passenger Instrument Panel Air Bag Stage 2 Low Control	(38) I	(38) —
(39) 39	(39) 0.5	(39) GY / OG	(39) 3027	(39) Passenger Instrument Panel Air Bag Stage 2 High Control	(39) I	(39) —
(40) 40	(40) 0.35 (40) 0.35	(40) GN (40) VT / WH	(40) 3118 (40) 5234	(40) Roof Rail Air Bag Disable Indicator Control (40) Passenger Seat Belt Indicator Control	(40) I (40) I	(40) AL0 & C9I (40) - C91
41	—	—	—	Not Occupied	—	—
(42) 42	(42) 0.5	(42) BK / WH	(42) 1351	(42) Signal Ground	(42) I	(42) —
(43) 43	(43) 0.35	(43) BU / GN	(43) 4103	(43) AUTOSAR CAN Bus [+] 9 Serial Data	(43) I	(43) —
(44) 44	(44) 0.35	(44) WH / GN	(44) 4102	(44) AUTOSAR CAN Bus [-] 9 Serial Data	(44) I	(44) —
45	—	—	—	Not Occupied	—	—
(46) 46	(46) 0.5	(46) VT / OG	(46) 3482	(46) Driver Seat Belt Anchor Pretensioner Low Control	(46) I	(46) —
(47) 47	(47) 0.5	(47) OG / YE	(47) 3481	(47) Driver Seat Belt Anchor Pretensioner High Control	(47) I	(47) —
48 - 49	—	—	—	Not Occupied	—	—
(50) 50	(50) 0.35	(50) BN / WH	(50) 3895	(50) Roof Rail Air Bag Disable Switch Low Reference	(50) I	(50) —
(51) 51	(51) 0.35	(51) BU / WH	(51) 3119	(51) Roof Rail Air Bag Disable Switch Signal	(51) I	(51) —
(52) 52	(52) 0.35	(52) BU	(52) 2307	(52) Passenger Air Bag On Indicator Control	(52) I	(52) —
53 - 54	—	—	—	Not Occupied	—	—
(55) 55	(55) 0.5	(55) VT / WH	(55) 1139	(55) Run/Crank Ignition 1 Voltage	(55) I	(55) —
(56) 56	(56) 0.5	(56) RD / GN	(56) 4440	(56) Battery Positive Voltage	(56) I	(56) —

K36 Restraints Control Module X2



5377124

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 160099-0009
- Service Connector: 85004498
- Description: 56-Way F 0.64 Series, Sealed(BK)

Terminal Part Information

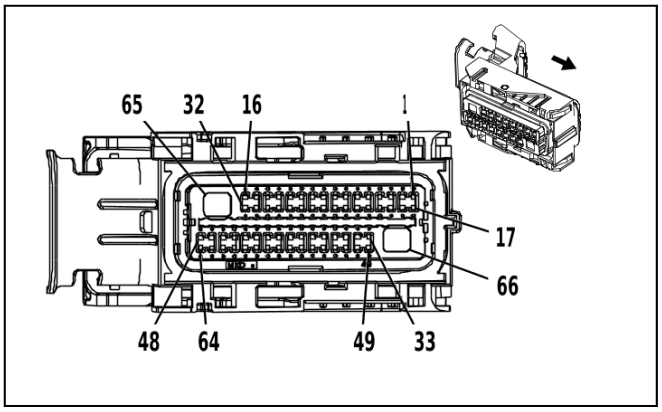
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19354746	J-35616-64B (L-BU)	J-38125-213

K36 Restraints Control Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) OG / WH	(1) 5157	(1) Right Rear Seat Belt Pretensioner Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / OG	(2) 5158	(2) Right Rear Seat Belt Pretensioner Low Control	(2) I	(2) —
3 - 9	—	—	—	Not Occupied	—	—
(10) 10	(10) 0.5	(10) BU / OG	(10) 5163	(10) Rear Center Seat Belt Switch Signal	(10) I	(10) —
(11) 11	(11) 0.5	(11) YE / OG	(11) 5161	(11) Left Rear Seat Belt Switch Signal	(11) I	(11) —
(12) 12	(12) 0.5	(12) OG / BN	(12) 238	(12) Driver Seat Belt Switch Signal	(12) I	(12) —
(13) 13	(13) 0.5	(13) BK / OG	(13) 6627	(13) Right Rear Side Impact Sensor Low Reference	(13) I	(13) —
(14) 14	(14) 0.5	(14) OG / WH	(14) 6626	(14) Right Rear Side Impact Sensor Signal	(14) I	(14) —
15 - 16	—	—	—	Not Occupied	—	—
(17) 17	(17) 0.5	(17) BK / OG	(17) 5156	(17) Left Rear Seat Belt Pretensioner Low Control	(17) I	(17) —
(18) 18	(18) 0.5	(18) OG / VT	(18) 5155	(18) Left Rear Seat Belt Pretensioner Control	(18) I	(18) —
19 - 22	—	—	—	Not Occupied	—	—
(23) 23	(23) 0.5	(23) BK / OG	(23) 1363	(23) Driver Seat Belt Switch Low Reference	(23) I	(23) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(24) 24	(24) 0.5	(24) BN / OG	(24) 5162	(24) Right Rear Seat Belt Switch Signal	(24) I	(24) —
(25) 25	(25) 0.5	(25) OG / VT	(25) 1362	(25) Passenger Seat Belt Switch Signal	(25) I	(25) —
26	—	—	—	Not Occupied	—	—
(27) 27	(27) 0.5	(27) BK / OG	(27) 6628	(27) Left Front Side Impact Sensor Low Reference	(27) I	(27) —
(28) 28	(28) 0.5	(28) OG / GN	(28) 2132	(28) Left Front Side Impact Sensor Signal	(28) I	(28) —
29 - 36	—	—	—	Not Occupied	—	—
(37) 37	(37) 0.5	(37) OG / GY	(37) 5021	(37) Right Front Roof Rail Air Bag High Control	(37) I	(37) —
(38) 38	(38) 0.5	(38) WH / OG	(38) 5022	(38) Right Front Roof Rail Air Bag Low Control	(38) I	(38) —
(39) 39	(39) 0.5	(39) BU / OG	(39) 4957	(39) Passenger Seat Back Air Bag Low Control	(39) I	(39) —
(40) 40	(40) 0.5	(40) OG / GY	(40) 4956	(40) Passenger Seat Back Air Bag High Control	(40) I	(40) —
(41) 41	(41) 0.5	(41) BK / OG	(41) 6629	(41) Right Front Side Impact Sensor Low Reference	(41) I	(41) —
(42) 42	(42) 0.5	(42) BN / OG	(42) 2134	(42) Right Front Side Impact Sensor Signal	(42) I	(42) —
43 - 50	—	—	—	Not Occupied	—	—
(51) 51	(51) 0.5	(51) OG / GN	(51) 5019	(51) Left Front Roof Rail Air Bag High Control	(51) I	(51) —
(52) 52	(52) 0.5	(52) VT / OG	(52) 5020	(52) Left Front Roof Rail Air Bag Low Control	(52) I	(52) —
(53) 53	(53) 0.5	(53) BK / OG	(53) 4963	(53) Driver Seat Back Air Bag Low Control	(53) I	(53) —
(54) 54	(54) 0.5	(54) OG / BU	(54) 4962	(54) Driver Seat Back Air Bag High Control	(54) I	(54) —
(55) 55	(55) 0.5	(55) BK / OG	(55) 6623	(55) Left Rear Side Impact Sensor Low Reference	(55) I	(55) —
(56) 56	(56) 0.5	(56) OG / BU	(56) 6622	(56) Left Rear Side Impact Sensor Signal	(56) I	(56) —

K38 Chassis Control Module



4024881

Connector Part Information

- Harness Type: Chassis Wiring Harness
- OEM Connector: 34822-0853
- Service Connector: 85786014
- Description: 66-Way F 0.64, 2.8 Series, Sealed(BK with BK Terminal Position Assurance)

Terminal Part Information

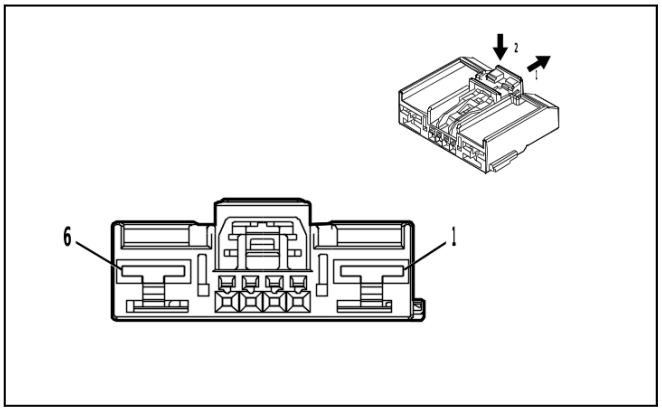
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13587518	J-35616-35 (VT)	J-38125-11A
II	19351723	J-35616-64B (L-BU)	J-38125-213

K38 Chassis Control Module

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.5	(6) VT / BK	(6) 739	(6) Run/Crank Ignition 1 Voltage	(6) II	(6) —
7 - 12	—	—	—	Not Occupied	—	—
(13) 13	(13) 0.5	(13) YE / GN	(13) 7122	(13) Axle Differential Lock Switch Signal	(13) II	(13) —
14 - 31	—	—	—	Not Occupied	—	—
(32) 32	(32) 0.5	(32) VT / GY	(32) 7117	(32) Front Axle Differential Lock Indicator Control	(32) II	(32) —
(33) 33	(33) 0.75	(33) VT / WH	(33) 7256	(33) Front Differential Lock Actuator Control	(33) II	(33) —
(34) 34	(34) 0.5	(34) BU / BK	(34) 4977	(34) AUTOSAR CAN Bus [+] 3 Serial Data	(34) II	(34) —
(35) 35	(35) 0.5	(35) BU / BK	(35) 4977	(35) AUTOSAR CAN Bus [+] 3 Serial Data	(35) II	(35) —
(36) 36	(36) 0.5	(36) WH	(36) 4976	(36) AUTOSAR CAN Bus [-] 3 Serial Data	(36) II	(36) —
(37) 37	(37) 0.5	(37) WH	(37) 4976	(37) AUTOSAR CAN Bus [-] 3 Serial Data	(37) II	(37) —
(38) 38	(38) 0.5	(38) YE	(38) 7115	(38) Rear Axle Differential Lock Indicator Control	(38) II	(38) —
39 - 43	—	—	—	Not Occupied	—	—
(44) 44	(44) 0.75	(44) GY / BK	(44) 7253	(44) Rear Differential Lock Actuator Low Control	(44) II	(44) —
45 - 49	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(50) 50	(50) 0.75	(50) VT / BN	(50) 7258	(50) Rear Differential Lock Actuator Control	(50) II	(50) —
51 - 59	—	—	—	Not Occupied	—	—
(60) 60	(60) 0.75	(60) WH / BK	(60) 7254	(60) Front Differential Lock Actuator Low Control	(60) II	(60) —
61 - 64	—	—	—	Not Occupied	—	—
(65) 65	(65) 1	(65) BK	(65) 5550	(65) Ground	(65) I	(65) —
(66) 66	(66) 1	(66) RD / WH	(66) 2140	(66) Battery Positive Voltage	(66) I	(66) —

K40D Driver Seat Adjuster Memory Module X1 (A45)



4650258

Connector Part Information
- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 7289-7139-30
- Service Connector: Service by Harness - See Part Catalog
- Description: 6-Way F 0.64, 6.3 Series(BK)

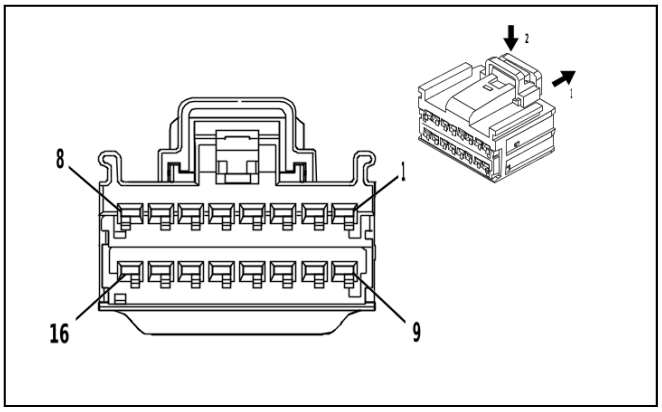
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-42 (RD)	No Tool Required
II	Not required	J-35616-64B (L-BU)	No Tool Required

K40D Driver Seat Adjuster Memory Module X1 (A45)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) BK	(1) 3750	(1) Ground	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.5	(3) RD / VT	(3) 3340	(3) Battery Positive Voltage	(3) II	(3) —
4 - 5	—	—	—	Not Occupied	—	—
(6) 6	(6) 2.5	(6) RD / BN	(6) 3640	(6) Battery Positive Voltage	(6) I	(6) —

K40D Driver Seat Adjuster Memory Module X2 (A45)



4332214

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 15512506
- Service Connector: Service by Harness - See Part Catalog
- Description: 16-Way F 1.5 OCS Series(BK)

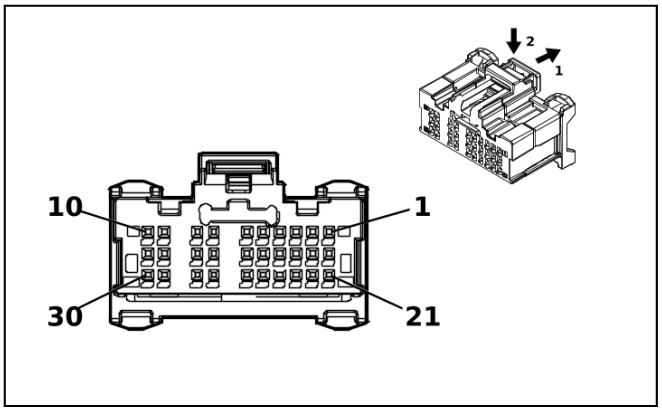
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

K40D Driver Seat Adjuster Memory Module X2 (A45)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) YE / BU	(1) 285	(1) Driver Seat Horizontal Motor Forward Control	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 1.5	(3) GN / YE	(3) 276	(3) Driver Seat Recline Motor Forward Control	(3) I	(3) —
4 - 5	—	—	—	Not Occupied	—	—
(6) 6	(6) 1.5	(6) BU / VT	(6) 287	(6) Driver Seat Front Vertical Motor Down Control	(6) I	(6) —
(7) 7	(7) 1.5	(7) YE	(7) 282	(7) Driver Seat Rear Vertical Motor Up Control	(7) I	(7) —
8	—	—	—	Not Occupied	—	—
(9) 9	(9) 1.5	(9) BU / YE	(9) 277	(9) Driver Seat Recline Motor Rearward Control	(9) I	(9) —
10	—	—	—	Not Occupied	—	—
(11) 11	(11) 1.5	(11) GY / GN	(11) 284	(11) Driver Seat Horizontal Motor Rearward Control	(11) I	(11) —
12	—	—	—	Not Occupied	—	—
(13) 13	(13) 1.5	(13) GY / BU	(13) 283	(13) Driver Seat Rear Vertical Motor Down Control	(13) I	(13) —
14 - 15	—	—	—	Not Occupied	—	—
(16) 16	(16) 1.5	(16) GN / BN	(16) 286	(16) Driver Seat Front Vertical Motor Up Control	(16) I	(16) —

K40D Driver Seat Adjuster Memory Module X3 (A45)



5202284

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 2309644-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 30-Way F 0.5 MQS Series(BK)

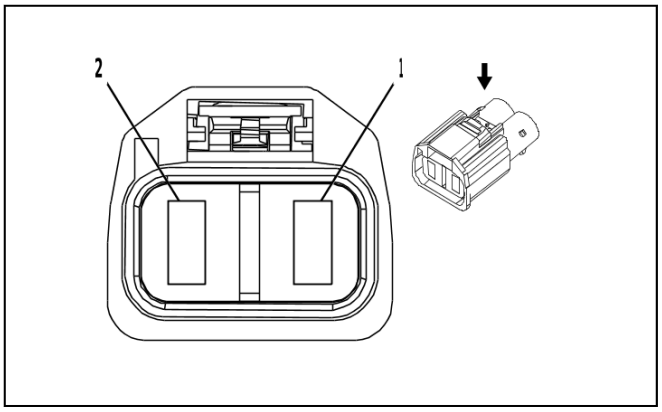
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	EL-35616-58 (BK)	No Tool Required

K40D Driver Seat Adjuster Memory Module X3 (A45)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	—
(2) 2	(2) 0.35	(2) BU / GN	(2) 614	(2) Seat Memory Switch Set Signal	(2) I	(2) —
3 - 8	—	—	—	Not Occupied	—	—
(9) 9	(9) 0.35	(9) WH	(9) 4100	(9) AUTOSAR CAN Bus [-] 4 Serial Data	(9) I	(9) —
(10) 10	(10) 0.35	(10) BU / VT	(10) 4101	(10) AUTOSAR CAN Bus [+] 4 Serial Data	(10) I	(10) —
11 - 15	—	—	—	Not Occupied	—	—
(16) 16	(16) 0.35	(16) WH	(16) 615	(16) Seat Memory Switch Signal 1	(16) I	(16) —
17	—	—	—	Not Occupied	—	—
(18) 18	(18) 0.35	(18) GN / GY	(18) 3758	(18) Driver Seat Adjuster Memory Module LIN Bus 2	(18) I	(18) —
(19) 19	(19) 0.35	(19) WH	(19) 4100	(19) AUTOSAR CAN Bus [-] 4 Serial Data	(19) I	(19) —
(20) 20	(20) 0.35	(20) BU / VT	(20) 4101	(20) AUTOSAR CAN Bus [+] 4 Serial Data	(20) I	(20) —
21 - 30	—	—	—	Not Occupied	—	—

K43 Power Steering Control Module X1



2748050

Connector Part Information
- Harness Type: Power Steering Wiring Harness
- OEM Connector: 7287-1990-30
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 9.5 Series, Sealed(BK)

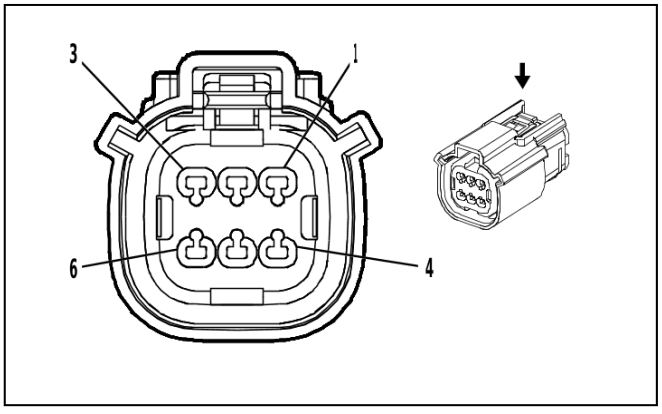
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-22 (RD)	No Tool Required

K43 Power Steering Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 16	(1) BK	(1) 250	(1) Ground	(1) I	(1) —
(2) 2	(2) 16	(2) RD / VT	(2) 542	(2) Battery Positive Voltage	(2) I	(2) —

K43 Power Steering Control Module X2



1986157

Connector Part Information
- Harness Type: Power Steering Wiring Harness
- OEM Connector: 33472-0674
- Service Connector: Service by Harness - See Part Catalog
- Description: 6-Way F 1.5 MX Series, Sealed(BK)

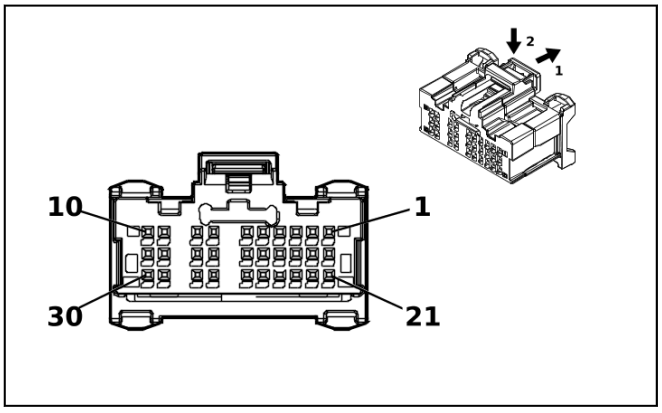
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

K43 Power Steering Control Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH	(1) 4978	(1) AUTOSAR CAN Bus [-] 2 Serial Data	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU / YE	(2) 4979	(2) AUTOSAR CAN Bus [+] 2 Serial Data	(2) I	(2) —
(3) 3	(3) 0.5	(3) BU / YE	(3) 4979	(3) AUTOSAR CAN Bus [+] 2 Serial Data	(3) I	(3) —
(4) 4	(4) 0.5	(4) WH	(4) 4978	(4) AUTOSAR CAN Bus [-] 2 Serial Data	(4) I	(4) —
5 - 6	—	—	—	Not Occupied	—	—

K56 Serial Data Gateway Module X1



5202284

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 2309644-1
- Service Connector: 84766507
- Description: 30-Way F 0.5 MQS Series(BK)

Terminal Part Information

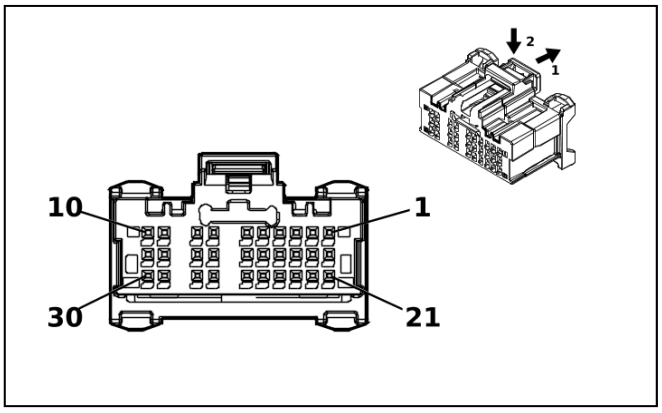
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58

K56 Serial Data Gateway Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) RD / WH	(1) 6440	(1) Battery Positive Voltage	(1) I	(1) —
2 - 3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.35	(4) BK / WH	(4) 2151	(4) Signal Ground	(4) I	(4) —
(5) 5	(5) 0.35	(5) BU	(5) 4987	(5) AUTOSAR CAN Bus [+] 1 Serial Data	(5) I	(5) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(6) 6	(6) 0.35	(6) WH	(6) 4986	(6) AUTOSAR CAN Bus [-] 1 Serial Data	(6) I	(6) —
(7) 7	(7) 0.35	(7) WH	(7) 4100	(7) AUTOSAR CAN Bus [-] 4 Serial Data	(7) I	(7) —
(8) 8	(8) 0.35	(8) BU / VT	(8) 4101	(8) AUTOSAR CAN Bus [+] 4 Serial Data	(8) I	(8) —
9 - 14	—	—	—	Not Occupied	—	—
(15) 15	(15) 0.35	(15) BU	(15) 4987	(15) AUTOSAR CAN Bus [+] 1 Serial Data	(15) I	(15) —
(16) 16	(16) 0.35	(16) WH	(16) 4986	(16) AUTOSAR CAN Bus [-] 1 Serial Data	(16) I	(16) —
(17) 17	(17) 0.35	(17) WH	(17) 4978	(17) AUTOSAR CAN Bus [-] 2 Serial Data	(17) I	(17) —
(18) 18	(18) 0.35	(18) BU / YE	(18) 4979	(18) AUTOSAR CAN Bus [+] 2 Serial Data	(18) I	(18) —
(19) 19	(19) 0.35	(19) BU / YE	(19) 4984	(19) AUTOSAR CAN Bus [-] 5 Serial Data	(19) I	(19) —
(20) 20	(20) 0.35	(20) BU / WH	(20) 4985	(20) AUTOSAR CAN Bus [+] 5 Serial Data	(20) I	(20) —
21 - 24	—	—	—	Not Occupied	—	—
(25) 25	(25) 0.35	(25) BU	(25) 4987	(25) AUTOSAR CAN Bus [+] 1 Serial Data	(25) I	(25) —
(26) 26	(26) 0.35	(26) WH	(26) 4986	(26) AUTOSAR CAN Bus [-] 1 Serial Data	(26) I	(26) —
(27) 27	(27) 0.35	(27) WH	(27) 4978	(27) AUTOSAR CAN Bus [-] 2 Serial Data	(27) I	(27) —
(28) 28	(28) 0.35	(28) BU / YE	(28) 4979	(28) AUTOSAR CAN Bus [+] 2 Serial Data	(28) I	(28) —
(29) 29	(29) 0.35	(29) BU / YE	(29) 4984	(29) AUTOSAR CAN Bus [-] 5 Serial Data	(29) I	(29) —
(30) 30	(30) 0.35	(30) BU / WH	(30) 4985	(30) AUTOSAR CAN Bus [+] 5 Serial Data	(30) I	(30) —

K56 Serial Data Gateway Module X2



5203942

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 2309644-2
- Service Connector: 84766509
- Description: 30-Way F 0.5 MQS Series(BK with L-GY Front Housing)

Terminal Part Information

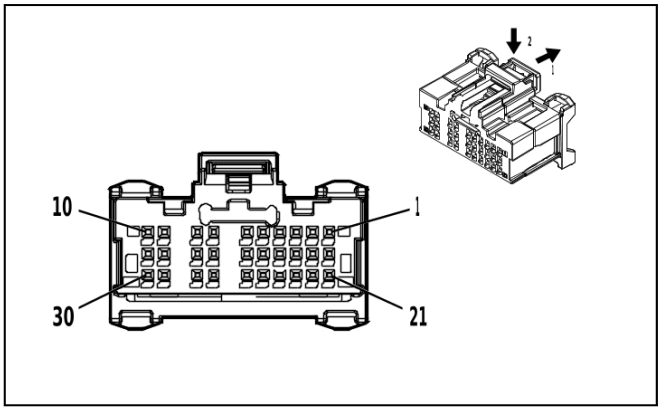
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58
II	Service by Cable	EL-35616-58 (BK)	EL-38125-58

K56 Serial Data Gateway Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.35	(3) BU / BK	(3) 4977	(3) AUTOSAR CAN Bus [+] 3 Serial Data	(3) I	(3) —
(4) 4	(4) 0.35	(4) WH	(4) 4976	(4) AUTOSAR CAN Bus [-] 3 Serial Data	(4) I	(4) —
(5) 5	(5) 0.35	(5) BK / GY	(5) 3559	(5) Passive Start Switch 2 Low Reference	(5) I	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.35	(7) GN / VT	(7) 5199	(7) Run/Crank Relay Coil Control	(7) I	(7) —
8	—	—	—	Not Occupied	—	—
(9) 9	(9) 0.35	(9) YE / WH	(9) 4973	(9) Ethernet Bus 1R [+]	(9) II	(9) —
(10) 10	(10) 0.35	(10) YE	(10) 4972	(10) Ethernet Bus 1R [-]	(10) II	(10) —
11 - 12	—	—	—	Not Occupied	—	—
(13) 13	(13) 0.35	(13) BU / BN	(13) 4983	(13) AUTOSAR CAN Bus [+] 7 Serial Data	(13) I	(13) —
(14) 14	(14) 0.35	(14) WH	(14) 4982	(14) AUTOSAR CAN Bus [-] 7 Serial Data	(14) I	(14) —
(15) 15	(15) 0.35	(15) GN / BK	(15) 3558	(15) Passive Start Switch Signal 2	(15) I	(15) —
(16) 16	(16) 0.35	(16) WH	(16) 4980	(16) AUTOSAR CAN Bus [-] 6 Serial Data	(16) I	(16) —
(17) 17	(17) 0.35	(17) GN	(17) 2578	(17) Private Serial Data Presentation CAN Bus [+] 1 Serial Data	(17) I	(17) —
(18) 18	(18) 0.35	(18) BN	(18) 2577	(18) Private Serial Data Presentation CAN Bus [-] 1 Serial Data	(18) I	(18) —
(19) 19	(19) 0.35	(19) WH	(19) 7207	(19) Ethernet Bus 1 Enable Signal	(19) I	(19) —
20 - 22	—	—	—	Not Occupied	—	—
(23) 23	(23) 0.35	(23) BU / WH	(23) 4985	(23) AUTOSAR CAN Bus [+] 5 Serial Data	(23) I	(23) —
(24) 24	(24) 0.35	(24) BU / YE	(24) 4984	(24) AUTOSAR CAN Bus [-] 5 Serial Data	(24) I	(24) —
25	—	—	—	Not Occupied	—	—
(26) 26	(26) 0.35	(26) YE	(26) 4981	(26) AUTOSAR CAN Bus [+] 6 Serial Data	(26) I	(26) —
(27) 27	(27) 0.35	(27) VT	(27) 2580	(27) Private Serial Data Presentation CAN Bus [+] 2 Serial Data	(27) I	(27) —
(28) 28	(28) 0.35	(28) GY	(28) 2579	(28) Private Serial Data Presentation CAN Bus [-] 2 Serial Data	(28) I	(28) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(29) 29	(29) 0.35	(29) GN / WH	(29) 4975	(29) Ethernet Bus 1T [+]	(29) II	(29) —
(30) 30	(30) 0.35	(30) GN	(30) 4974	(30) Ethernet Bus 1T [-]	(30) II	(30) —

K56 Serial Data Gateway Module X3



4900333

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 2309644-3
- Service Connector: 13519319
- Description: 30-Way F 0.5 MQS Series(BK with D-GY Front Housing)

Terminal Part Information

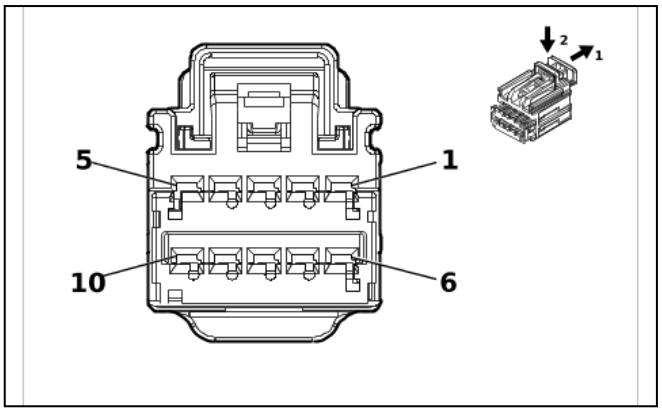
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58
II	Not required	No Tool Required	No Tool Required
III	Service by Cable	EL-35616-58 (BK)	EL-38125-58

K56 Serial Data Gateway Module X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BU / GN	(1) 4103	(1) AUTOSAR CAN Bus [+] 9 Serial Data	(1) I	(1) —
(2) 2	(2) 0.35	(2) WH / GN	(2) 4102	(2) AUTOSAR CAN Bus [-] 9 Serial Data	(2) I	(2) —
3 - 4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.35	(5) BU / YE	(5) 4979	(5) AUTOSAR CAN Bus [+] 2 Serial Data	(5) I	(5) —
(6) 6	(6) 0.35	(6) WH	(6) 4978	(6) AUTOSAR CAN Bus [-] 2 Serial Data	(6) I	(6) —
(7) 7	(7) 0	(7) BU / WH	(7) 4758	(7) Ethernet Bus 2 [+]	(7) III	(7) —
(8) 8	(8) 0	(8) BU	(8) 4757	(8) Ethernet Bus 2 [-]	(8) III	(8) —
9 - 24	—	—	—	Not Occupied	—	—
(25) 25	(25) 0.35	(25) BU	(25) 4987	(25) AUTOSAR CAN Bus [+] 1 Serial Data	(25) II	(25) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(26) 26	(26) 0.35	(26) WH	(26) 4986	(26) AUTOSAR CAN Bus [-] 1 Serial Data	(26) II	(26) —
27 - 30	—	—	—	Not Occupied	—	—

K61 Sunroof Control Module (CAC)



6153939

Connector Part Information

- Harness Type: Sunroof Wiring Harness
- OEM Connector: 15512475
- Service Connector: Service by Harness - See Part Catalog
- Description: 10-Way F 1.5 OCS Series(BK)

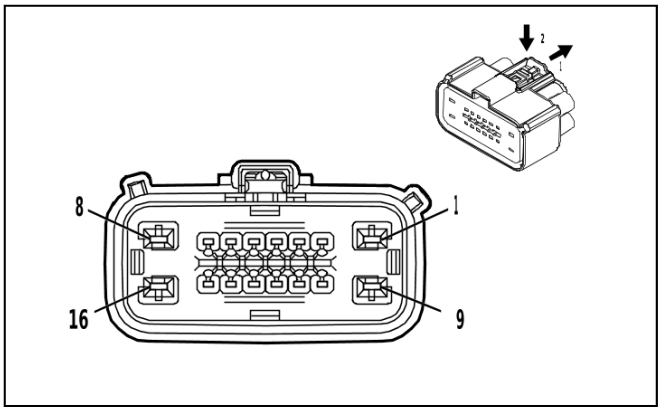
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-2A (GY)	No Tool Required

K61 Sunroof Control Module (CAC)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	—
(2) 2	(2) 0.35	(2) BU / VT	(2) 5027	(2) Sunroof Switch Serial Data 1 Signal	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.35	(4) WH / GN	(4) 3031	(4) Sunroof Vent Switch Signal	(4) I	(4) —
5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.35	(6) GN / WH	(6) 2854	(6) Body Control Module LIN Bus 8	(6) I	(6) —
7	—	—	—	Not Occupied	—	—
(8) 8	(8) 1.5	(8) RD / YE	(8) 2340	(8) Battery Positive Voltage	(8) I	(8) —
9	—	—	—	Not Occupied	—	—
(10) 10	(10) 1.5	(10) BK	(10) 1850	(10) Ground	(10) I	(10) —

K67 Trailer Brake Control Module



4624589

Connector Part Information

- Harness Type: Chassis Wiring Harness
- OEM Connector: 34985-4016
- Service Connector: 13599889
- Description: 16-Way F 1.5, 2.8 MX Series, Sealed(GY)

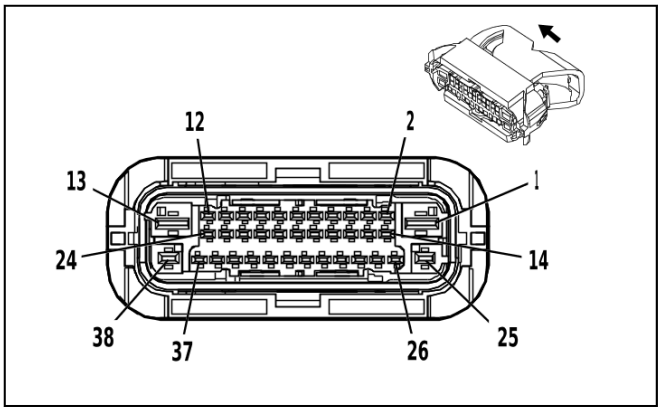
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13576377	J-35616-35 (VT)	J-38125-12A
II	85528055	J-35616-2A (GY)	J-38125-217

K67 Trailer Brake Control Module

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) RD / VT	(1) 1242	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 0.5	(2) WH / BK	(2) 2223	(2) Trailer Brake Apply Signal	(2) II	(2) —
3 - 4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.5	(5) YE / BK	(5) 2224	(5) Trailer Brake Enable Signal	(5) II	(5) —
6 - 7	—	—	—	Not Occupied	—	—
(8) 8	(8) 2.5	(8) BU	(8) 47	(8) Trailer Auxiliary Control	(8) I	(8) —
(9) 9	(9) 2.5	(9) BK	(9) 5550	(9) Ground	(9) I	(9) —
10 - 11	—	—	—	Not Occupied	—	—
(12) 12	(12) 0.5	(12) GN / BU	(12) 2733	(12) Brake System Control Module LIN Bus 2	(12) II	(12) —
13 - 16	—	—	—	Not Occupied	—	—

K68 Trailer Lamp Control Module



5141918

Connector Part Information

- Harness Type: Chassis Wiring Harness
- OEM Connector: 35740705
- Service Connector: 86825459
- Description: 38-Way F 1.5, 2.8, 4.8 MCP Series, Sealed(BK with BN Inner Connector)

Terminal Part Information

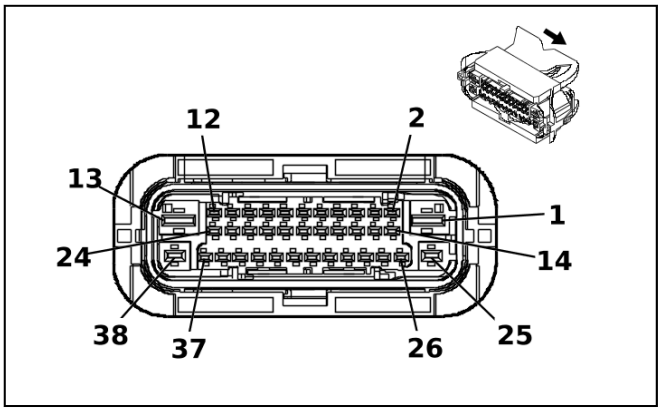
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19368624	J-35616-35 (VT)	J-38125-557
II	19369235	J-35616-14 (GN)	EL-38125-560A
III	85158596	J-35616-40 (BU)	J-38125-556
IV	Not required	No Tool Required	No Tool Required

K68 Trailer Lamp Control Module

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) RD / YE	(1) 5840	(1) Battery Positive Voltage	(1) III	(1) —
(2) 2	(2) 0.75	(2) YE / GY	(2) 1618	(2) Left Rear Trailer Stop/Turn Lamp Control	(2) II	(2) —
(3) 3	(3) 0.75	(3) GN / VT	(3) 1619	(3) Right Rear Trailer Stop/Turn Lamp Control	(3) II	(3) —
4 - 6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.75	(7) GN / WH	(7) 5189	(7) Trailer Backup Lamp Control	(7) II	(7) —
8 - 9	—	—	—	Not Occupied	—	—
(10) 10	(10) 0.5	(10) VT / BK	(10) 739	(10) Run/Crank Ignition 1 Voltage	(10) II	(10) —
(11) 11	(11) 0.5	(11) BN / YE	(11) 820	(11) Center High Mounted Stop Lamp Supply Voltage	(11) II	(11) —
12	—	—	—	Not Occupied	—	—
(13) 13	(13) 2.5	(13) BK	(13) 5550	(13) Ground	(13) III	(13) —
14 - 24	—	—	—	Not Occupied	—	—
(25) 25	(25) 1.5	(25) GY / BN	(25) 2109	(25) Trailer Park Lamp Control	(25) I	(25) —
26	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(27) 27	(27) 0.5	(27) BU / VT	(27) 4101	(27) AUTOSAR CAN Bus [+] 4 Serial Data	(27) II	(27) —
(28) 28	(28) 0.5	(28) WH	(28) 4100	(28) AUTOSAR CAN Bus [-] 4 Serial Data	(28) II	(28) —
(29) 29	(29) 0.5	(29) BU / VT	(29) 4101	(29) AUTOSAR CAN Bus [+] 4 Serial Data	(29) II	(29) —
(30) 30	(30) 0.5	(30) WH	(30) 4100	(30) AUTOSAR CAN Bus [-] 4 Serial Data	(30) II	(30) —
(31) 31	(31) 0.5	(31) BU / VT	(31) 4101	(31) AUTOSAR CAN Bus [+] 4 Serial Data	(31) IV	(31) —
(32) 32	(32) 0.5	(32) WH	(32) 4100	(32) AUTOSAR CAN Bus [-] 4 Serial Data	(32) IV	(32) —
33 - 37	—	—	—	Not Occupied	—	—
(38) 38	(38) 2.5	(38) RD / VT	(38) 5640	(38) Battery Positive Voltage	(38) I	(38) —

K69 Transfer Case Control Module



5199340

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 35740703
- Service Connector: 86825458
- Description: 38-Way F 1.5, 2.8, 4.8 MCP Series, Sealed(BK with BN Inner Connector)

Terminal Part Information

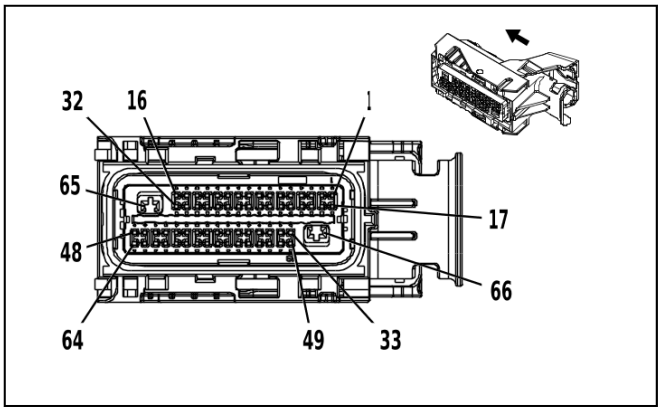
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19368624	J-35616-35 (VT)	J-38125-557
II	19369235	J-35616-14 (GN)	EL-38125-560A
III	85158596	J-35616-40 (BU)	J-38125-556

K69 Transfer Case Control Module

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 4	(1) RD / WH	(1) 2242	(1) Battery Positive Voltage	(1) III	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.5	(3) BU / YE	(3) 4979	(3) AUTOSAR CAN Bus [+] 2 Serial Data	(3) II	(3) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(4) 4	(4) 0.5	(4) WH	(4) 4978	(4) AUTOSAR CAN Bus [-] 2 Serial Data	(4) II	(4) —
(5) 5	(5) 0.5	(5) WH / GN	(5) 7479	(5) Rotary Position Sensor Signal	(5) II	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.5	(7) YE	(7) 7474	(7) Incremental Encoder Direction Signal	(7) II	(7) —
8	—	—	—	Not Occupied	—	—
(9) 9	(9) 0.5	(9) YE / WH	(9) 1695	(9) 4WD Locked Range Indicator Control	(9) II	(9) —
10	—	—	—	Not Occupied	—	—
(11) 11	(11) 0.5	(11) VT / GY	(11) 8017	(11) Secondary Axle Motor Relay Control	(11) II	(11) —
(12) 12	(12) 0.5	(12) GY / BK	(12) 1570	(12) Front Axle Actuator Control	(12) II	(12) —
(13) 13	(13) 2.5	(13) YE / VT	(13) 1553	(13) Transfer Case Motor Counter Clockwise Control	(13) III	(13) —
14	—	—	—	Not Occupied	—	—
(15) 15	(15) 0.5	(15) BU / YE	(15) 4979	(15) AUTOSAR CAN Bus [+] 2 Serial Data	(15) II	(15) —
(16) 16	(16) 0.5	(16) WH	(16) 4978	(16) AUTOSAR CAN Bus [-] 2 Serial Data	(16) II	(16) —
17	—	—	—	Not Occupied	—	—
(18) 18	(18) 0.5	(18) VT / BK	(18) 2139	(18) Run/Crank Ignition 1 Voltage	(18) II	(18) —
(19) 19	(19) 0.5	(19) BU / GY	(19) 7473	(19) Incremental Encoder Impulse Signal	(19) II	(19) —
(20) 20	(20) 0.5	(20) WH / RD	(20) 7477	(20) Gear Position Sensor 5V Reference	(20) II	(20) —
21 - 23	—	—	—	Not Occupied	—	—
(24) 24	(24) 0.5	(24) BK	(24) 8015	(24) Transfer Case Motor Low Reference	(24) II	(24) —
(25) 25	(25) 2.5	(25) BK	(25) 450	(25) Ground	(25) I	(25) —
26	—	—	—	Not Occupied	—	—
(27) 27	(27) 0.5	(27) BK	(27) 8014	(27) Transfer Case Lock Solenoid Low Reference	(27) II	(27) —
28 - 29	—	—	—	Not Occupied	—	—
(30) 30	(30) 0.5	(30) YE / BK	(30) 7478	(30) Gear Position Sensor Low Reference	(30) II	(30) —
(31) 31	(31) 0.5	(31) WH / GN	(31) 7475	(31) Incremental Encoder Sensor Voltage Reference	(31) II	(31) —
32	—	—	—	Not Occupied	—	—
(33) 33	(33) 0.75	(33) BU	(33) 8013	(33) Transfer Case Lock Solenoid Control 2	(33) II	(33) —
(34) 34	(34) 0.75	(34) YE / BN	(34) 1569	(34) Transfer Case Lock Solenoid Valve Control	(34) II	(34) —
35	—	—	—	Not Occupied	—	—
(36) 36	(36) 0.5	(36) VT	(36) 7476	(36) Incremental Encoder Sensor Low Reference	(36) II	(36) —
37	—	—	—	Not Occupied	—	—
(38) 38	(38) 2.5	(38) YE / GY	(38) 1552	(38) Transfer Case Motor Clockwise Control	(38) I	(38) —

K71 Transmission Control Module



3621452

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 34822-0943
- Service Connector: 19329822
- Description: 66-Way F 0.64, 2.8 Series, Sealed(BK with BK Terminal Position Assurance)

Terminal Part Information

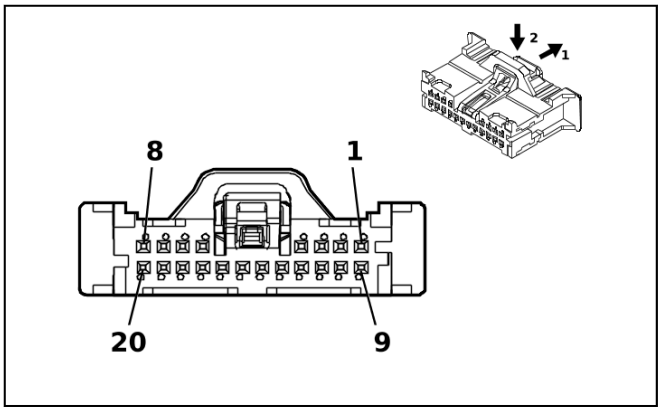
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13587518	J-35616-35 (VT)	J-38125-11A
II	19351723	J-35616-64B (L-BU)	J-38125-213

K71 Transmission Control Module

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH / BU	(1) 4507	(1) Transmission Clutch H Control	(1) II	(1) —
(2) 2	(2) 0.5	(2) BU	(2) 6401	(2) Clutch Solenoid Valve B Control	(2) II	(2) —
(3) 3	(3) 0.5	(3) GN / BU	(3) 1530	(3) Transmission Line Pressure Control Solenoid Valve Control	(3) II	(3) —
4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.5	(5) GY / RD	(5) 10817	(5) Lubricant Circuit Pressure Sensor 5 Volt Reference	(5) II	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.5	(7) YE / GN	(7) 4170	(7) Transmission Output Shaft Speed Sensor Circuit 9V Reference	(7) II	(7) —
(8) 8	(8) 0.5	(8) YE / BU	(8) 4171	(8) Transmission Input Shaft Speed Sensor Circuit 9V Reference	(8) II	(8) —
9 - 10	—	—	—	Not Occupied	—	—
(11) 11	(11) 0.5	(11) BU / BK	(11) 10819	(11) Lubricant Circuit Pressure Sensor Low Reference	(11) II	(11) —
12	—	—	—	Not Occupied	—	—
(13) 13	(13) 0.5	(13) GN / VT	(13) 4510	(13) Transmission Intermediate Speed Signal	(13) II	(13) —
(14) 14	(14) 0.5	(14) GY / BU	(14) 6358	(14) Output Speed Signal	(14) II	(14) —
(15) 15	(15) 0.5	(15) GN / RD	(15) 6353	(15) Input Speed Signal	(15) II	(15) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
16	—	—	—	Not Occupied	—	—
(17) 17	(17) 0.5	(17) WH	(17) 4508	(17) Transmission Clutch G Control	(17) II	(17) —
(18) 18	(18) 0.5	(18) BN	(18) 6400	(18) Clutch Solenoid Valve A Control	(18) II	(18) —
(19) 19	(19) 0.5	(19) GY	(19) 6402	(19) Clutch Solenoid Valve C Control	(19) II	(19) —
(20) 20	(20) 0.5	(20) VT / WH	(20) 422	(20) Torque Converter Clutch Solenoid Valve Control	(20) II	(20) —
(21) 21	(21) 0.5	(21) GN / BN	(21) 6380	(21) Torque Converter Clutch Enable Solenoid Valve A Control	(21) II	(21) —
(22) 22	(22) 0.5	(22) YE / BN	(22) 6210	(22) Torque Converter Clutch Enable Solenoid Valve B Control	(22) II	(22) —
23	—	—	—	Not Occupied	—	—
(24) 24	(24) 0.5	(24) GN / WH	(24) 2968	(24) Transmission Auxiliary Fluid Pump Control	(24) II	(24) —
25 - 27	—	—	—	Not Occupied	—	—
(28) 28	(28) 0.5	(28) BK / BN	(28) 586	(28) Transmission Fluid Temperature Sensor Low Reference	(28) II	(28) —
29 - 32	—	—	—	Not Occupied	—	—
(33) 33	(33) 0.75	(33) GN / GY	(33) 6387	(33) Transmission High Side Driver 1 Control	(33) II	(33) —
34	—	—	—	Not Occupied	—	—
(35) 35	(35) 0.5	(35) VT / BK	(35) 2139	(35) Run/Crank Ignition 1 Voltage	(35) II	(35) —
36	—	—	—	Not Occupied	—	—
(37) 37	(37) 0.5	(37) BU / YE	(37) 4979	(37) AUTOSAR CAN Bus [+] 2 Serial Data	(37) II	(37) —
(38) 38	(38) 0.5	(38) WH	(38) 4978	(38) AUTOSAR CAN Bus [-] 2 Serial Data	(38) II	(38) —
39 - 44	—	—	—	Not Occupied	—	—
(45) 45	(45) 0.5	(45) GN / YE	(45) 10816	(45) Lubricant Circuit Pressure Sensor Signal	(45) II	(45) —
46 - 48	—	—	—	Not Occupied	—	—
(49) 49	(49) 0.75	(49) GY / BN	(49) 6388	(49) Transmission High Side Driver 2 Control	(49) II	(49) —
50 - 52	—	—	—	Not Occupied	—	—
(53) 53	(53) 0.5	(53) BU / YE	(53) 4979	(53) AUTOSAR CAN Bus [+] 2 Serial Data	(53) II	(53) —
(54) 54	(54) 0.5	(54) WH	(54) 4978	(54) AUTOSAR CAN Bus [-] 2 Serial Data	(54) II	(54) —
55 - 62	—	—	—	Not Occupied	—	—
(63) 63	(63) 0.5	(63) BN / WH	(63) 585	(63) Transmission Fluid Temperature Sensor Signal	(63) II	(63) —
(64) 64	(64) 0.5	(64) BU / WH	(64) 3338	(64) Transmission Internal Mode Switch Mode Control X	(64) II	(64) —
(65) 65	(65) 1.5	(65) BK / WH	(65) 6251	(65) Transmission Control Module Ground	(65) I	(65) —
(66) 66	(66) 0.75	(66) RD / GN	(66) 1840	(66) Battery Positive Voltage	(66) I	(66) —

K73 Telematic Control Module X1



5200955

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 35068196
- Service Connector: 84769280
- Description: 20-Way F Mini 50 Series(BK)

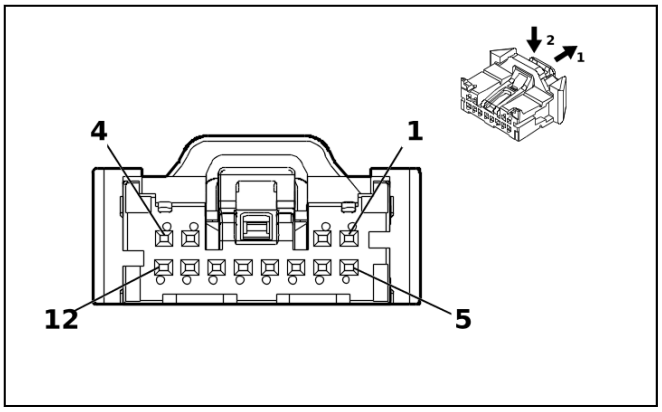
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	84944580	EL-35616-58 (BK)	EL-38125-58

K73 Telematic Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) RD / BU	(1) 3240	(1) Battery Positive Voltage	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.35	(3) GN / BK	(3) 2515	(3) Telematics Switch Supply Voltage	(3) I	(3) —
(4) 4	(4) 0.35	(4) GN / WH	(4) 2514	(4) Telematics Switch Signal	(4) I	(4) —
(5) 5	(5) 0.35	(5) YE / VT	(5) 2516	(5) Telematics Switch Green LED Indicator Control	(5) I	(5) —
(6) 6	(6) 0.35	(6) BN / WH	(6) 2517	(6) Telematics Switch Red LED Indicator Control	(6) I	(6) —
(7) 7	(7) 0.35	(7) BU / WH	(7) 4985	(7) AUTOSAR CAN Bus [+] 5 Serial Data	(7) I	(7) —
(8) 8	(8) 0.35	(8) BU / YE	(8) 4984	(8) AUTOSAR CAN Bus [-] 5 Serial Data	(8) I	(8) —
(9) 9	(9) 0.35	(9) BK / WH	(9) 451	(9) Signal Ground	(9) I	(9) —
10 - 18	—	—	—	Not Occupied	—	—
(19) 19	(19) 0.35	(19) BU / WH	(19) 4985	(19) AUTOSAR CAN Bus [+] 5 Serial Data	(19) I	(19) —
(20) 20	(20) 0.35	(20) BU / YE	(20) 4984	(20) AUTOSAR CAN Bus [-] 5 Serial Data	(20) I	(20) —

K73 Telematic Control Module X2



5360826

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 35068239
- Service Connector: 13529935
- Description: 12-Way F 050 CTS Series(BK)

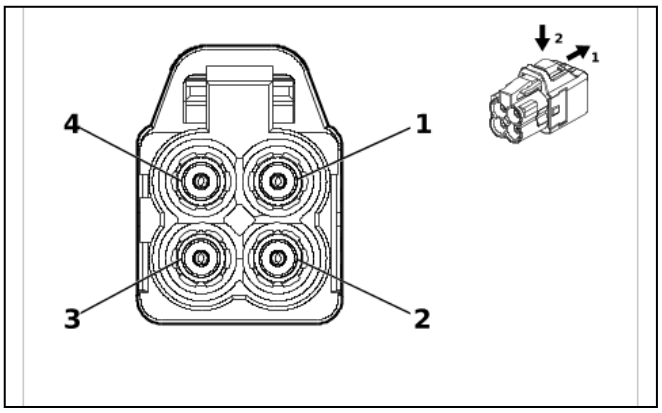
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	84944580	EL-35616-58 (BK)	EL-38125-58

K73 Telematic Control Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.35	(6) GY / YE	(6) 5149	(6) Voice Recognition Audio Signal	(6) I	(6) —
(7) 7	(7) 0.35	(7) BK / GY	(7) 5152	(7) Voice Recognition Audio [-] Control	(7) I	(7) —
(8) 8	(8) 0.35	(8) BU	(8) 655	(8) Cellular Telephone Microphone Signal	(8) I	(8) —
(9) 9	(9) 0.35	(9) BK / BN	(9) 654	(9) Cellular Telephone Microphone Low Reference	(9) I	(9) —
(10) 10	(10) 0.35	(10) BARE	(10) 1792	(10) Low Reference	(10) I	(10) —
11 - 12	—	—	—	Not Occupied	—	—

K73 Telematic Control Module X3



5835118

Connector Part Information
- Harness Type: Body Wiring Harness COAX
- OEM Connector: 13544819
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 4-Way F Mini Coax Type(BK)

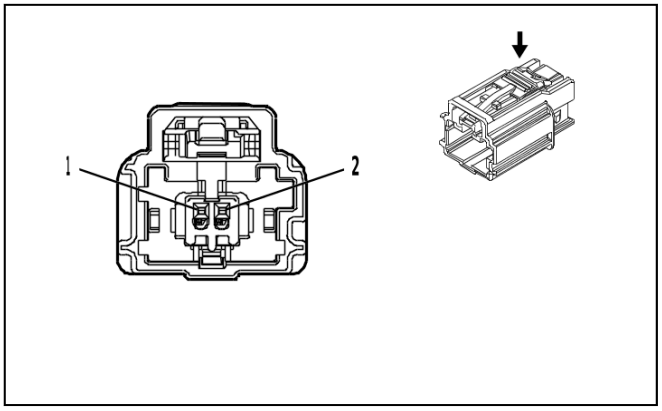
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

K73 Telematic Control Module X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	Coax Cable	—	(GPS/Cell) Coaxial Antenna Cell/GPS combined Signal	I	—

K73 Telematic Control Module X7



4942391

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 35122188
- Service Connector: 13532867
- Description: 2-Way F 050 CTS Ethernet Series, Sealed(BK)

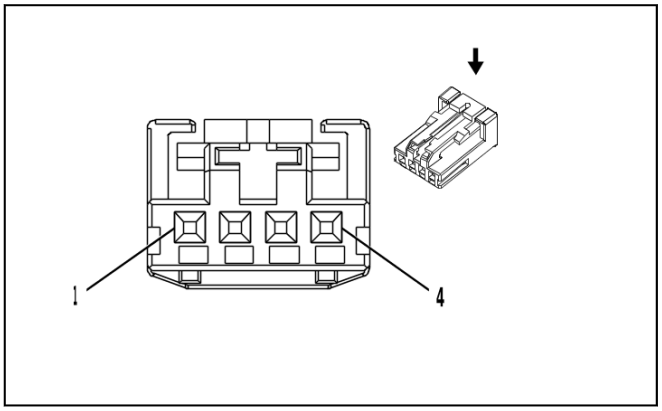
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Service by Cable	EL-35616-58 (BK)	EL-38125-58

K73 Telematic Control Module X7

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.1	(1) WH	(1) 7211	(1) Ethernet Bus 4 [+]	(1) I	(1) —
(2) 2	(2) 0.1	(2) GN	(2) 7210	(2) Ethernet Bus 4 [-]	(2) I	(2) —

K77 Remote Function Actuator Module



2717162

Connector Part Information
- Harness Type: Roof Wiring Harness
- OEM Connector: 1-936119-1
- Service Connector: 19367524
- Description: 4-Way F 0.64 Micro-Quadlock Series(BK)

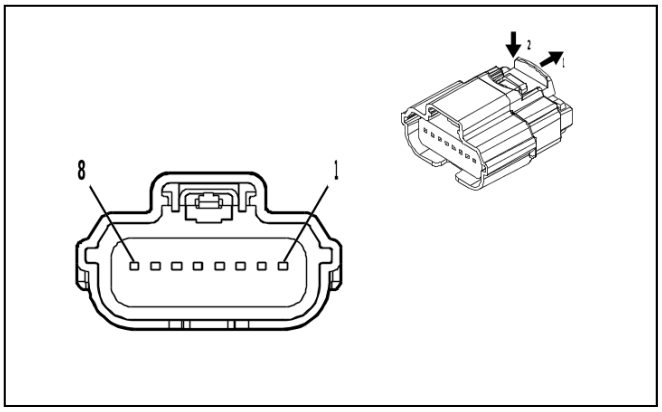
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

K77 Remote Function Actuator Module

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) RD / VT	(1) 1640	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 0.35	(2) GN / YE	(2) 2862	(2) Body Control Module LIN Bus 16	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.35	(4) BK / WH	(4) 451	(4) Signal Ground	(4) I	(4) —

K85P Restraints Occupant Classification System Module - Passenger



4708234

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Passenger
- OEM Connector: 31404-9110
- Service Connector: Service by Harness - See Part Catalog
- Description: 8-Way F 64 Series, Sealed(BK)

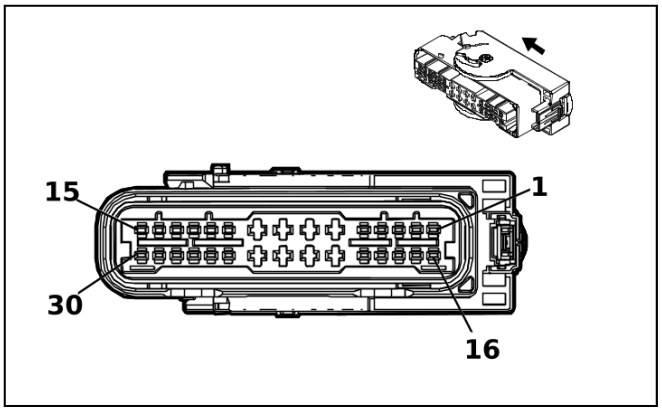
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

K85P Restraints Occupant Classification System Module - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) RD / GN	(1) 4440	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU	(2) 4987	(2) AUTOSAR CAN Bus [+] 1 Serial Data	(2) I	(2) —
(3) 3	(3) 0.5	(3) BU	(3) 4987	(3) AUTOSAR CAN Bus [+] 1 Serial Data	(3) I	(3) —
(4) 4	(4) 0.5	(4) WH	(4) 4986	(4) AUTOSAR CAN Bus [-] 1 Serial Data	(4) I	(4) —
(5) 5	(5) 0.5	(5) WH	(5) 4986	(5) AUTOSAR CAN Bus [-] 1 Serial Data	(5) I	(5) —
(6) 6	(6) 0.5	(6) BK / WH	(6) 1351	(6) Signal Ground	(6) I	(6) —
(7) 7	(7) 0.5	(7) OG / BN	(7) 3947	(7) Passenger Automatic Locking Retractor Switch Signal	(7) I	(7) —
(8) 8	(8) 0.5	(8) GY / OG	(8) 3946	(8) Passenger Automatic Locking Retractor Switch Low Reference	(8) I	(8) —

K111 Fuel Pump Power Control Module



3240109

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 5-2109446-2
- Service Connector: 86545828
- Description: 30-Way F 1.5, 2.8 MCP Series, Sealed(BK)

Terminal Part Information

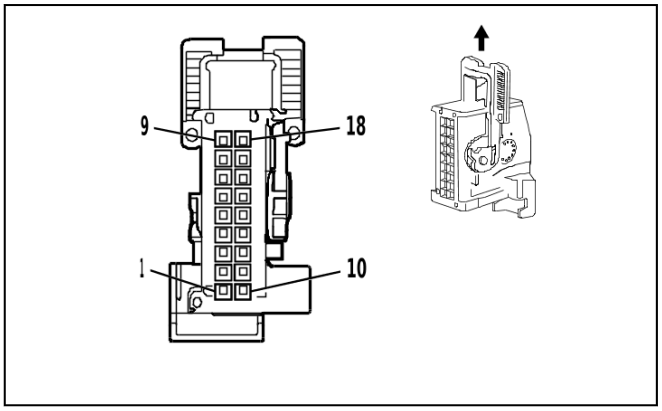
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19329958	J-35616-2A (GY)	J-38125-217
II	19371214	J-35616-35 (VT)	J-38125-556

K111 Fuel Pump Power Control Module

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 6	—	—	—	Not Occupied	—	—
(7) 7	(7) 2.5	(7) RD / VT	(7) 1940	(7) Battery Positive Voltage	(7) II	(7) —
(8) 8	(8) 2.5	(8) GY	(8) 120	(8) Fuel Pump Control	(8) II	(8) —
(9) 9	(9) 2.5	(9) YE / GY	(9) 4137	(9) Fuel Pump Supply Voltage Phase 2	(9) II	(9) —
(10) 10	(10) 0.5	(10) YE / RD	(10) 2709	(10) Fuel Tank Pressure Sensor 5V Reference	(10) I	(10) —
(11) 11	(11) 0.5	(11) BU / WH	(11) 890	(11) Fuel Tank Pressure Sensor Signal	(11) I	(11) —
(12) 12	(12) 0.5	(12) BN / RD	(12) 7445	(12) Fuel Line Pressure Sensor 5V Reference	(12) I	(12) —
(13) 13	(13) 0.5	(13) BU / GN	(13) 1936	(13) Primary Fuel Level Sensor Signal	(13) I	(13) —
14	—	—	—	Not Occupied	—	—
(15) 15	(15) 0.5	(15) BU / GY	(15) 4054	(15) Private Serial Data Powertrain CAN Bus [-] Serial Data	(15) I	(15) —
(16) 16	(16) 0.5	(16) VT / GN	(16) 4320	(16) Powertrain Sensor Bus Enable	(16) I	(16) —
17	—	—	—	Not Occupied	—	—
(18) 18	(18) 0.5	(18) GN / GY	(18) 465	(18) Fuel Pump Primary Relay Control	(18) I	(18) —
19 - 20	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(21) 21	(21) 0.5	(21) WH	(21) 1310	(21) EVAP Vent Solenoid Valve Control	(21) II	(21) —
(22) 22	(22) 2.5	(22) BK	(22) 750	(22) Ground	(22) II	(22) —
(23) 23	(23) 0.5	(23) BU	(23) 7444	(23) Fuel Pump Assembly Shield Ground	(23) II	(23) —
(24) 24	(24) 2.5	(24) WH / BN	(24) 4138	(24) Fuel Pump Supply Voltage Phase 3	(24) II	(24) —
(25) 25	(25) 0.5	(25) BK / BN	(25) 6284	(25) Fuel Tank Pressure Sensor Low Reference	(25) I	(25) —
(26) 26	(26) 0.5	(26) BU / WH	(26) 7446	(26) Fuel Pressure Sensor Signal	(26) I	(26) —
(27) 27	(27) 0.5	(27) BK / YE	(27) 7447	(27) Fuel Pressure Sensor Low Reference	(27) I	(27) —
(28) 28	(28) 0.5	(28) BK / GN	(28) 6281	(28) Fuel Level Sensor Low Reference	(28) I	(28) —
29	—	—	—	Not Occupied	—	—
(30) 30	(30) 0.5	(30) WH	(30) 4055	(30) Private Serial Data Powertrain CAN Bus [+] Serial Data	(30) I	(30) —

K157 Video Processing Module X1 ((UV2 / UXA) - UVB)



1567082

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 1379102-1
- Service Connector: 84976200
- Description: 18-Way F Micro-Quadlock Series(BK)

Terminal Part Information

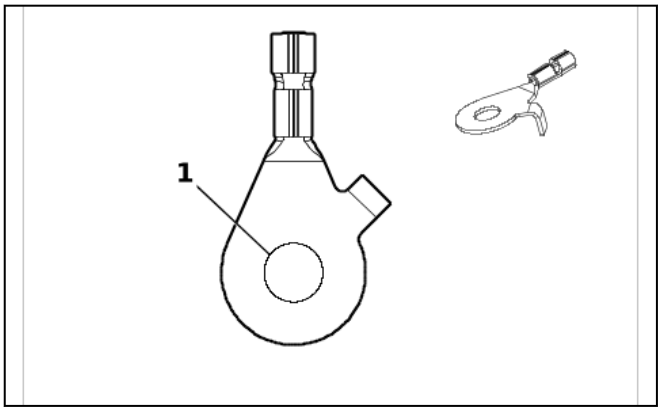
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19300632	J-35616-64B (L-BU)	J-38125-215A

K157 Video Processing Module X1 ((UV2 / UXA) - UVB)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.5	(3) BK / WH	(3) 451	(3) Signal Ground	(3) I	(3) —
4 - 9	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(10) 10	(10) 0.5	(10) RD / VT	(10) 1640	(10) Battery Positive Voltage	(10) I	(10) —
11 - 12	—	—	—	Not Occupied	—	—
(13) 13	(13) 0.35	(13) WH	(13) 4986	(13) AUTOSAR CAN Bus [-] 1 Serial Data	(13) I	(13) —
(14) 14	(14) 0.35	(14) WH	(14) 4986	(14) AUTOSAR CAN Bus [-] 1 Serial Data	(14) I	(14) —
(15) 15	(15) 0.35	(15) BU	(15) 4987	(15) AUTOSAR CAN Bus [+] 1 Serial Data	(15) I	(15) —
(16) 16	(16) 0.35	(16) BU	(16) 4987	(16) AUTOSAR CAN Bus [+] 1 Serial Data	(16) I	(16) —
17 - 18	—	—	—	Not Occupied	—	—

K157 Video Processing Module X2 ((UV2 / UXA) - UVB)



6154799

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 84172962
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way Ring Terminal

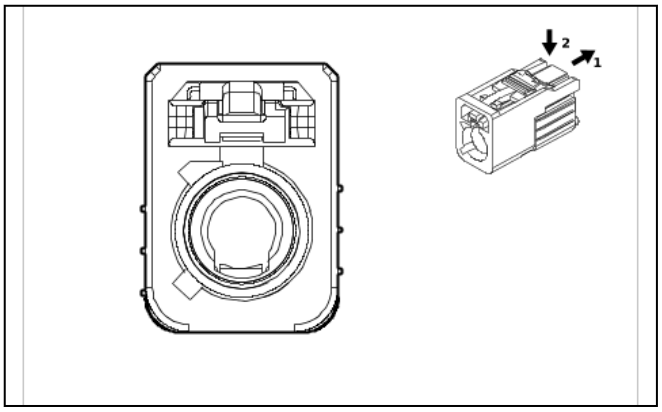
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

K157 Video Processing Module X2 ((UV2 / UXA) - UVB)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) BK	(1) 1350	(1) Ground	(1) I	(1) —

K157 Video Processing Module X3 (UXA)



5630785

Connector Part Information
- Harness Type: Body Wiring Harness COAX
- OEM Connector: 13516049
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type(BN)

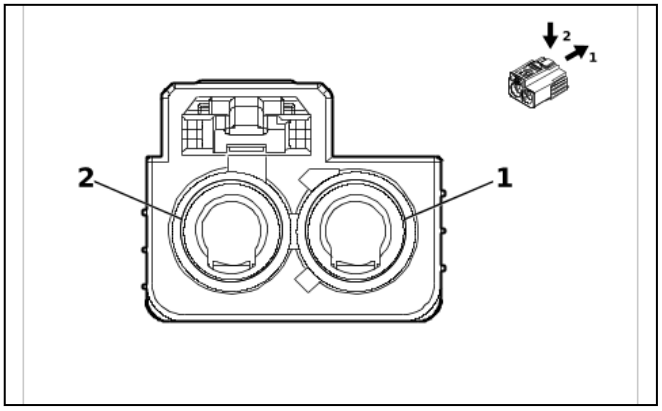
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

K157 Video Processing Module X3 (UXA)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	Coax Cable	—	Video Processing Module Coaxial Video Signal	I	—

K157 Video Processing Module X4 (UV2 - (UVB & UXA))



5810832

Connector Part Information
- Harness Type: Body Wiring Harness COAX
- OEM Connector: 13516079
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 2-Way F Coax Type(BN)

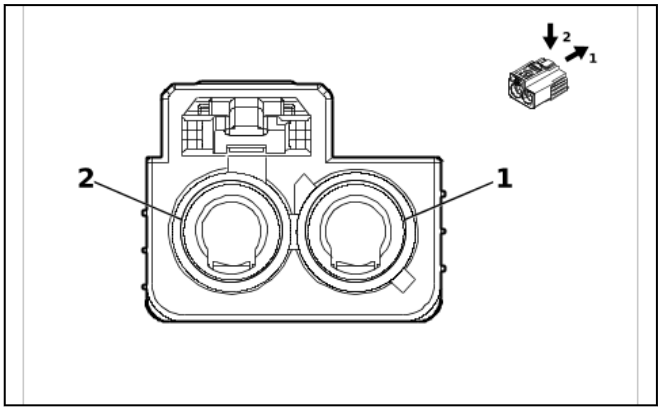
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

K157 Video Processing Module X4 (UV2 - (UVB & UXA))

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	Coax Cable	—	Driver Monitoring System Camera Coaxial Signal	I	—

K157 Video Processing Module X4 (UXA)



5810836

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 13516082
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 2-Way F Coax Type(BG)

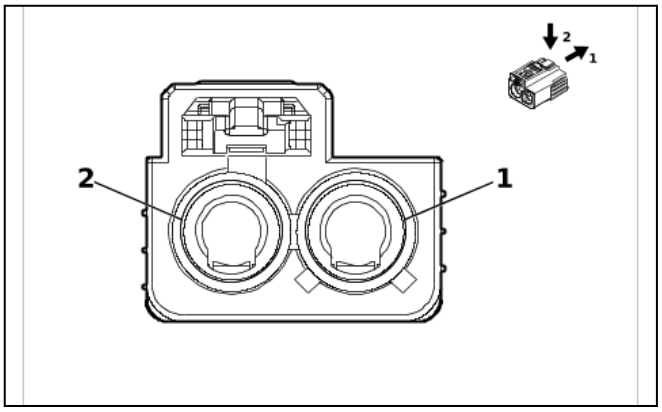
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

K157 Video Processing Module X4 (UXA)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.1	(1) WH	(1) 11352	(1) Underbody Camera 2 LVDS (Low Voltage DIfferential Signaling) Coaxial Signal	(1) I	(1) —
2	—	—	—	Not Occupied	—	—

K157 Video Processing Module X5 (UV2 - (UVB & UXA))



5810835

Connector Part Information
- Harness Type: Body Wiring Harness COAX
- OEM Connector: 13516083
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 2-Way F Coax Type(CU)

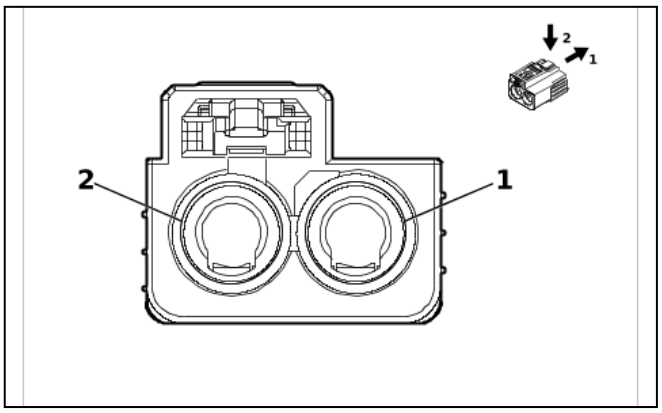
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

K157 Video Processing Module X5 (UV2 - (UVB & UXA))

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	Coax Cable	—	Driver Monitoring System Camera Coaxial Signal	I	—

K157 Video Processing Module X5 (UXA)



5810827

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 13516078
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 2-Way F Coax Type(GN)

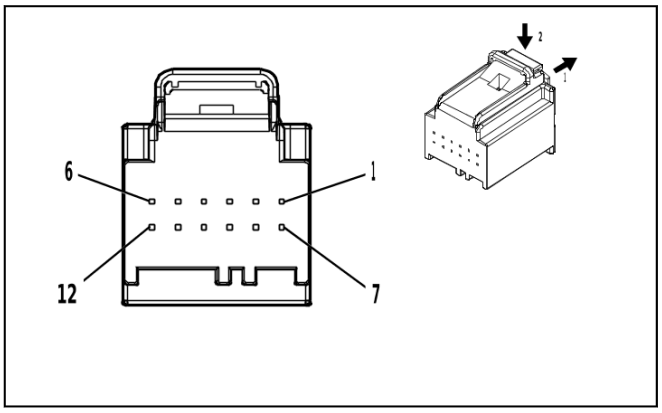
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

K157 Video Processing Module X5 (UXA)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.1	(1) WH	(1) 11348	(1) Underbody Camera LVDS (Low Voltage DIfferential Signaling) Coaxial Signal	(1) I	(1) —
2	—	—	—	Not Occupied	—	—

K182 Parking Assist Control Module X1 (UD7)



5095565

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 31410-0125
- Service Connector: 13525987
- Description: 12-Way F 0.64 Series(BK)

Terminal Part Information

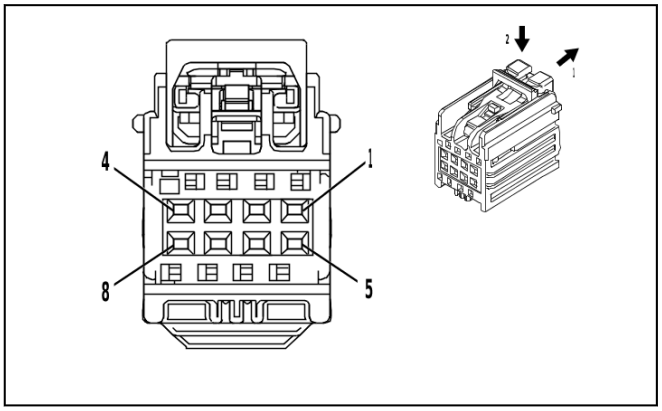
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13584547	J-35616-64B (L-BU)	J-38125-215A

K182 Parking Assist Control Module X1 (UD7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) RD / WH	(1) 4740	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 0.35	(2) WH	(2) 4986	(2) AUTOSAR CAN Bus [-] 1 Serial Data	(2) I	(2) —
(3) 3	(3) 0.35	(3) BU	(3) 4987	(3) AUTOSAR CAN Bus [+] 1 Serial Data	(3) I	(3) —
(4) 4	(4) 0.35	(4) BU	(4) 4987	(4) AUTOSAR CAN Bus [+] 1 Serial Data	(4) I	(4) —
5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.35	(6) BK / WH	(6) 2151	(6) Signal Ground	(6) I	(6) —
7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.35	(8) WH	(8) 4986	(8) AUTOSAR CAN Bus [-] 1 Serial Data	(8) I	(8) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(9) 9	(9) 0.35	(9) BU	(9) 4987	(9) AUTOSAR CAN Bus [+] 1 Serial Data	(9) I	(9) —
(10) 10	(10) 0.35	(10) WH	(10) 4986	(10) AUTOSAR CAN Bus [-] 1 Serial Data	(10) I	(10) —
11 - 12	—	—	—	Not Occupied	—	—

K182 Parking Assist Control Module X2 (UD7)



4280711

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 7289-2895-40
- Service Connector: 19355209
- Description: 8-Way F 0.64 Kaizen Series(GY)

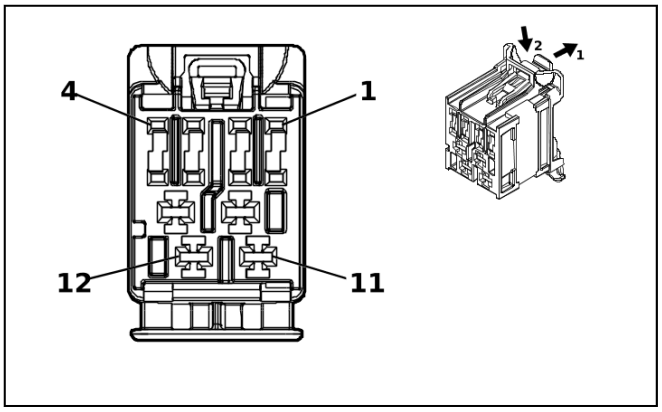
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

K182 Parking Assist Control Module X2 (UD7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	—
(2) 2	(2) 0.5	(2) YE / WH	(2) 2377	(2) Right Rear Middle Parking Assist Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) YE	(3) 2375	(3) Left Rear Outer Parking Assist Sensor Signal	(3) I	(3) —
(4) 4	(4) 0.75	(4) BN / WH	(4) 2374	(4) Object Sensor Voltage Reference	(4) I	(4) —
(5) 5	(5) 0.5	(5) YE / VT	(5) 2378	(5) Right Rear Outer Parking Assist Sensor Signal	(5) I	(5) —
(6) 6	(6) 0.5	(6) YE / BU	(6) 2376	(6) Left Rear Middle Parking Assist Sensor Signal	(6) I	(6) —
7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.75	(8) BK / GY	(8) 2379	(8) Object Sensor Low Reference	(8) I	(8) —

K219 Lighting Control Module X1



5203784

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 160026-0003
- Service Connector: 13509990
- Description: 12-Way F 1.2, 2.8 stAK50h Series(L-PU)

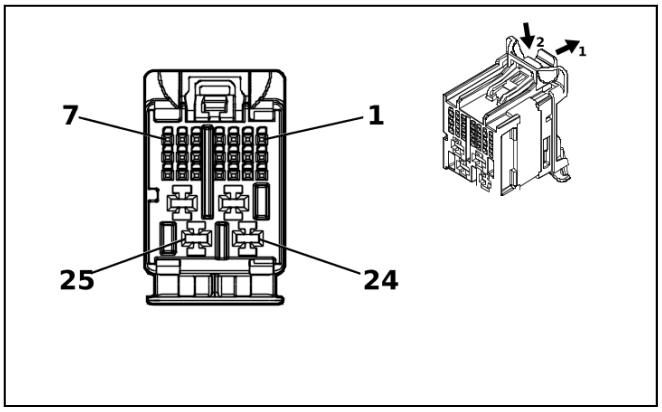
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	84729890	J-35616-12 (BU)	J-38125-215A
II	87814662	J-35616-35 (VT)	J-38125-557

K219 Lighting Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5 (1) 0.5	(1) WH / YE (1) GY / BU	(1) 1204 (1) 7538	(1) Left Park Lamp Control 2 (1) Left Front DRL Control	(1) I (1) I	(1) T4A (1) T7E
2 - 4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.5	(5) BU / WH	(5) 1314	(5) Left Front Turn Signal Lamp Control	(5) I	(5) —
(6) 6	(6) 0.5	(6) GN / WH	(6) 24	(6) Backup Lamp Control	(6) I	(6) —
7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.5	(8) WH / VT	(8) 1430	(8) Exterior Courtesy Lamp Control	(8) I	(8) —
(9) 9	(9) 1.5	(9) RD / GY	(9) 1740	(9) Battery Positive Voltage	(9) II	(9) —
(10) 10	(10) 0.75	(10) YE	(10) 712	(10) Left Headlamp Low Beam Control	(10) II	(10) —
11	—	—	—	Not Occupied	—	—
(12) 12	(12) 0.75	(12) WH	(12) 711	(12) Left Headlamp High Beam Control	(12) II	(12) —

K219 Lighting Control Module X2



5203807

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 160027-0012
- Service Connector: 13534966
- Description: 25-Way F 0.5 MQS, 2.8 MCP Series(GY with GY Inner Connector)

Terminal Part Information

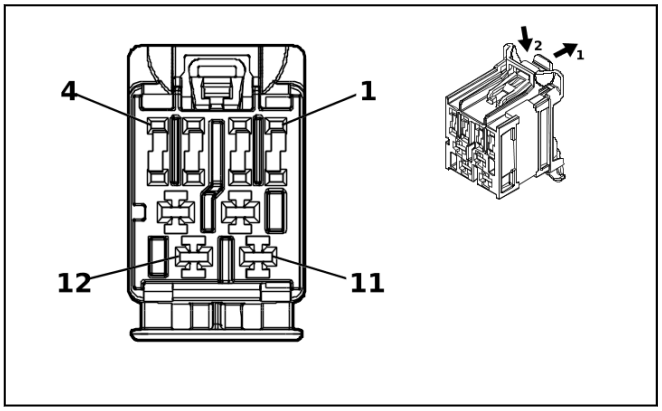
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58
II	87814662	J-35616-35 (VT)	J-38125-557

K219 Lighting Control Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) WH / YE	(1) 1254	(1) Left Front Park Lamp Control	(1) I	(1) —
(2) 2	(2) 0.35	(2) BU / GN	(2) 1253	(2) Right Front Park Lamp Control	(2) I	(2) —
(3) 3	(3) 0.35	(3) BN / GY	(3) 2268	(3) Windshield Washer Relay Control	(3) I	(3) —
(4) 4	(4) 0.35	(4) BU / BN	(4) 38	(4) Backup Lamp Relay Control	(4) I	(4) —
5 - 9	—	—	—	Not Occupied	—	—
(10) 10	(10) 0.35	(10) BN / GN	(10) 196	(10) Windshield Wiper Motor Park Switch Signal	(10) I	(10) —
(11) 11	(11) 0.35	(11) VT / BK	(11) 6568	(11) Front Turn Signal Lamp Feedback Signal	(11) I	(11) —
(12) 12	(12) 0.35	(12) GY	(12) 91	(12) Windshield Wiper Motor Relay Coil Control	(12) I	(12) —
13	—	—	—	Not Occupied	—	—
(14) 14	(14) 0.35	(14) VT	(14) 185	(14) Low Washer Fluid Indicator Control	(14) I	(14) —
15 - 18	—	—	—	Not Occupied	—	—
(19) 19	(19) 0.35	(19) WH / BN	(19) 7055	(19) Auxiliary Park Lamp Relay Control	(19) I	(19) —
(20) 20	(20) 0.35	(20) WH / YE	(20) 7545	(20) Right Front Turn Signal Lamp Feedback Signal	(20) I	(20) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(21) 21	(21) 0.35	(21) WH / VT	(21) 860	(21) Windshield Wiper Switch High Signal	(21) I	(21) —
(22) 22	(22) 1.5	(22) RD / GN	(22) 1540	(22) Battery Positive Voltage	(22) II	(22) —
(23) 23	(23) 1	(23) RD / VT	(23) 1640	(23) Battery Positive Voltage	(23) II	(23) —
24 - 25	—	—	—	Not Occupied	—	—

K219 Lighting Control Module X3



5203797

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 160026-0002
- Service Connector: 13509989
- Description: 12-Way F 1.2, 2.8 stAK50h Series(GN)

Terminal Part Information

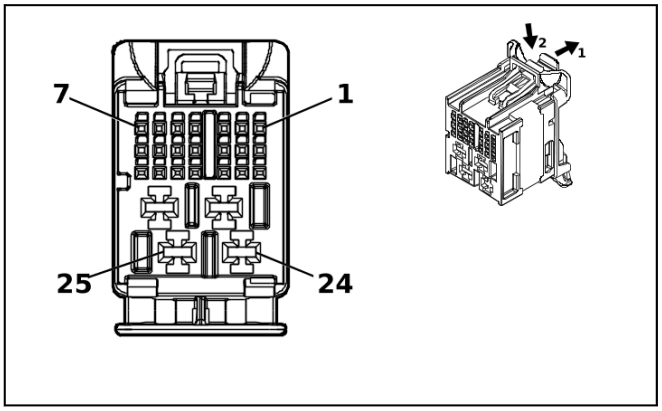
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	84729890	J-35616-12 (BU)	J-38125-215A
II	87814662	J-35616-35 (VT)	J-38125-557

K219 Lighting Control Module X3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.5 (4) 0.5	(4) VT (4) BU / BN	(4) 1203 (4) 7539	(4) Right Park Lamp Control 2 (4) Right Front DRL Control	(4) I (4) I	(4) T4A (4) T7E
5	—	—	—	Not Occupied	—	—
(6) 6	(6) 0.5	(6) GN / VT	(6) 1315	(6) Right Front Turn Signal Lamp Control	(6) I	(6) —
(7) 7	(7) 0.5	(7) BN / GY	(7) 5061	(7) Left Front Fog Lamp Control	(7) I	(7) —
8	—	—	—	Not Occupied	—	—
(9) 9	(9) 1.5	(9) RD / BN	(9) 1440	(9) Battery Positive Voltage	(9) II	(9) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(10) 10	(10) 1.5	(10) RD / WH	(10) 1340	(10) Battery Positive Voltage	(10) II	(10) —
(11) 11	(11) 0.75	(11) WH	(11) 311	(11) Right Headlamp High Beam Control	(11) II	(11) —
(12) 12	(12) 1	(12) YE	(12) 312	(12) Right Headlamp Low Beam Control	(12) II	(12) —

K219 Lighting Control Module X4



5203416

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 160027-0015
- Service Connector: 13534969
- Description: 25-Way F 0.5 MQS, 2.8 MCP Series(PU with GY Inner Connector)

Terminal Part Information

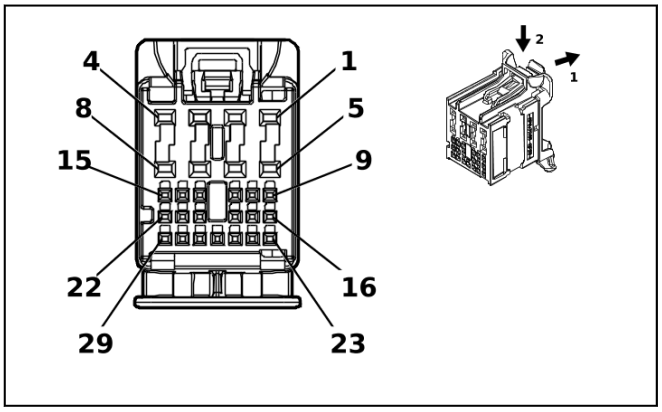
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58
II	87814662	J-35616-35 (VT)	J-38125-557

K219 Lighting Control Module X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.35	(3) BU / GN	(3) 4103	(3) AUTOSAR CAN Bus [+] 9 Serial Data	(3) I	(3) —
(4) 4	(4) 0.35	(4) WH / GN	(4) 4102	(4) AUTOSAR CAN Bus [-] 9 Serial Data	(4) I	(4) —
(5) 5	(5) 0.35	(5) BU / GN	(5) 4103	(5) AUTOSAR CAN Bus [+] 9 Serial Data	(5) I	(5) —
(6) 6	(6) 0.35	(6) WH / GN	(6) 4102	(6) AUTOSAR CAN Bus [-] 9 Serial Data	(6) I	(6) —
(7) 7	(7) 0.35	(7) WH / BU	(7) 6311	(7) Cruise/ETC/TCC Brake Signal	(7) I	(7) —
8 - 9	—	—	—	Not Occupied	—	—
(10) 10	(10) 0.35	(10) WH / GN	(10) 4102	(10) AUTOSAR CAN Bus [-] 9 Serial Data	(10) I	(10) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(11) 11	(11) 0.35	(11) BU / GN	(11) 4103	(11) AUTOSAR CAN Bus [+] 9 Serial Data	(11) I	(11) —
12 - 21	—	—	—	Not Occupied	—	—
(22) 22	(22) 1	(22) RD / BN	(22) 1140	(22) Battery Positive Voltage	(22) II	(22) —
(23) 23	(23) 1.5	(23) BK / WH	(23) 451	(23) Signal Ground	(23) II	(23) —
(24) 24	(24) 1	(24) RD / BU	(24) 1240	(24) Battery Positive Voltage	(24) II	(24) —
(25) 25	(25) 1.5	(25) BK / WH	(25) 451	(25) Signal Ground	(25) II	(25) —

K219 Lighting Control Module X5



5203373

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 160029-0013
- Service Connector: 13534975
- Description: 29-Way F 0.5 NANO, 1.2 MCON, stAK50h Series(BU with GY Inner Connector)

Terminal Part Information

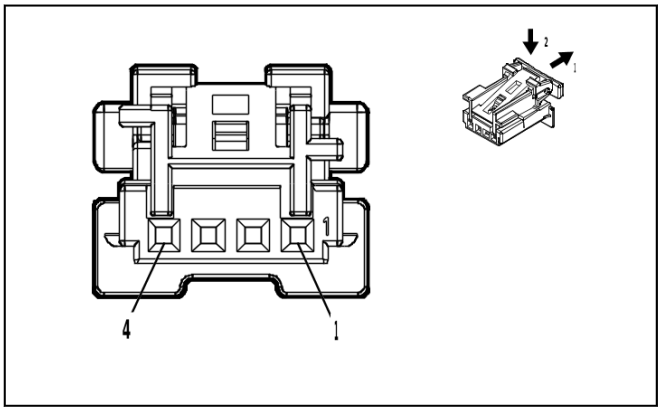
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370262	EL-35616-58 (BK)	EL-38125-58
II	84729890	J-35616-12 (BU)	J-38125-215A

K219 Lighting Control Module X5

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	—
(2) 2	(2) 0.5	(2) BN / GY	(2) 6995	(2) Right Rear Park Lamp Control	(2) II	(2) —
(3) 3	(3) 0.5	(3) GY / YE	(3) 7542	(3) Left Rear Stop Lamp Control	(3) II	(3) —
(4) 4	(4) 0.5	(4) BU / VT	(4) 1335	(4) Right Rear Turn Signal Lamp Control 2	(4) II	(4) —
5	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(6) 6	(6) 0.5	(6) BN / BU	(6) 6993	(6) Left Rear Park Lamp Control	(6) II	(6) —
(7) 7	(7) 0.5	(7) WH / YE	(7) 7541	(7) Right Rear Stop Lamp Control	(7) II	(7) —
(8) 8	(8) 0.5	(8) BU / WH	(8) 1334	(8) Left Rear Turn Signal Lamp Control 2	(8) II	(8) —
9	—	—	—	Not Occupied	—	—
(10) 10	(10) 0.35	(10) GN / WH	(10) 2270	(10) Rear Window Washer Relay Control	(10) I	(10) —
(11) 11	(11) 0.35	(11) GY	(11) 1715	(11) Windshield Wiper Switch High Signal	(11) I	(11) —
(13) 13	(13) 0.35	(13) GN / BN	(13) 319	(13) Right Rear Trailer Stop/Turn Lamp Control	(13) I	(13) —
14 - 17	—	—	—	Not Occupied	—	—
(18) 18	(18) 0.35	(18) VT / WH	(18) 1139	(18) Run/Crank Ignition 1 Voltage	(18) I	(18) —
20 - 24	—	—	—	Not Occupied	—	—
(25) 25	(25) 0.35	(25) BN / YE	(25) 820	(25) Center High Mounted Stop Lamp Supply Voltage	(25) I	(25) —
26 - 27	—	—	—	Not Occupied	—	—
(28) 28	(28) 0.35	(28) GN / YE	(28) 6846	(28) Rear License Plate Lamp Control	(28) I	(28) —
(29) 29	(29) 0.35	(29) YE / BU	(29) 318	(29) Left Rear Trailer Stop/Turn Lamp Control	(29) I	(29) —

M4P Programmable Air Inlet Valve Actuator



4997407

Connector Part Information

- Harness Type: Air Conditioning Wiring Harness
- OEM Connector: 2294218-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 0.64 Micro-Quadlock Series(BK)

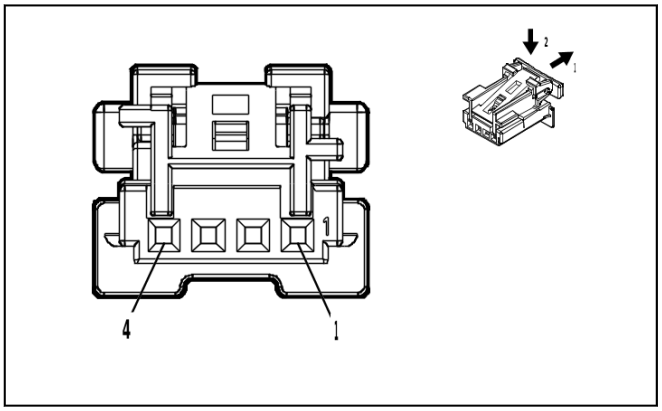
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

M4P Programmable Air Inlet Valve Actuator

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BK	(1) 2050	(1) Ground	(1) I	(1) SZ
(2) 2	(2) 0.35	(2) GN / VT	(2) 2852	(2) Body Control Module LIN Bus 6	(2) I	(2) SZ
(3) 3	(3) 0.35	(3) BK	(3) 2050	(3) Ground	(3) I	(3) SZ
(4) 4	(4) 0.35	(4) WH / YE	(4) 4634	(4) HVAC Remote Enable Signal	(4) I	(4) SZ

M6PL Programmable Temperature Valve Actuator - Left



4997407

Connector Part Information

- Harness Type: Air Conditioning Wiring Harness
- OEM Connector: 2294218-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 0.64 Micro-Quadlock Series(BK)

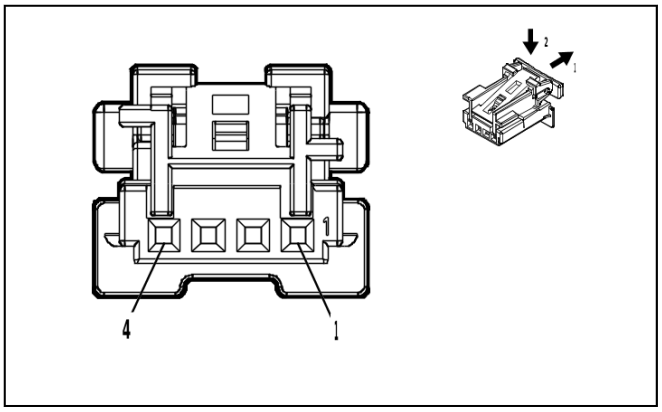
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

M6PL Programmable Temperature Valve Actuator - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BK	(1) 2050	(1) Ground	(1) I	(1) SZ
(2) 2	(2) 0.35	(2) GN / VT	(2) 2852	(2) Body Control Module LIN Bus 6	(2) I	(2) SZ
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.35	(4) WH / YE	(4) 4634	(4) HVAC Remote Enable Signal	(4) I	(4) SZ

M6PR Programmable Temperature Valve Actuator - Right



4997407

Connector Part Information
- Harness Type: Air Conditioning Wiring Harness
- OEM Connector: 2294218-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 0.64 Micro-Quadlock Series(BK)

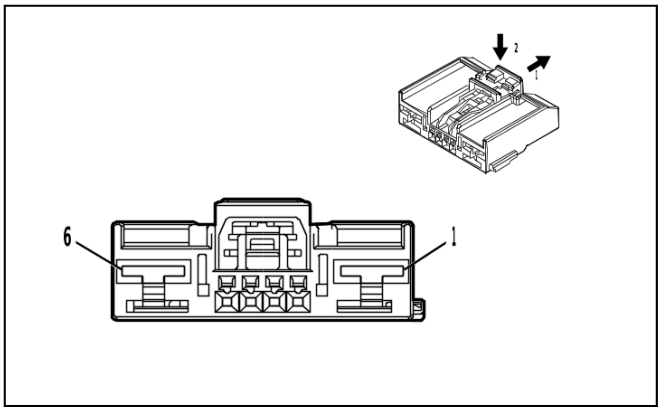
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

M6PR Programmable Temperature Valve Actuator - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BK	(1) 2050	(1) Ground	(1) I	(1) DZ
(2) 2	(2) 0.35	(2) GN / VT	(2) 2852	(2) Body Control Module LIN Bus 6	(2) I	(2) DZ
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.35	(4) WH / YE	(4) 4634	(4) HVAC Remote Enable Signal	(4) I	(4) DZ

M8 Blower Motor



4650258

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 7289-7139-30
- Service Connector: 19356432
- Description: 6-Way F 0.64, 6.3 Series(BK)

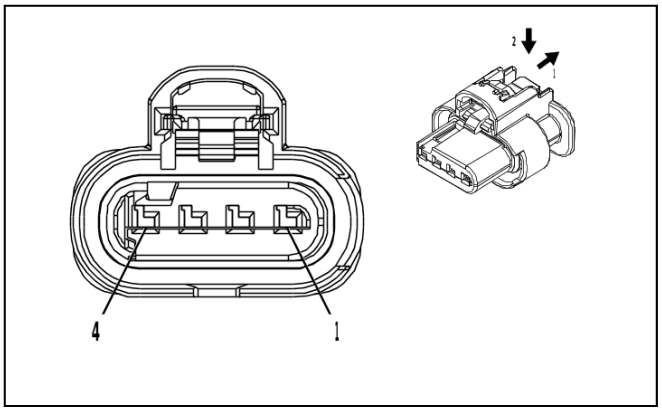
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-42 (RD)	No Tool Required
II	Not required	J-35616-64B (L-BU)	No Tool Required

M8 Blower Motor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 5	(1) RD / WH	(1) 2040	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 0.35	(2) BU / GY	(2) 754	(2) Blower Motor Speed Control	(2) II	(2) —
(3) 3	(3) 0.35	(3) GN / BU	(3) 761	(3) Blower Speed Feedback Signal	(3) II	(3) —
4 - 5	—	—	—	Not Occupied	—	—
(6) 6	(6) 2.5	(6) BK	(6) 4250	(6) Ground	(6) I	(6) —

M26 Front Drive Axle Actuator (NP0 / NQH)



4210809

Connector Part Information

- Harness Type: Power Steering Wiring Harness
- OEM Connector: 1-2296696-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 1.2 MCON-CB Series, Sealed(BK)

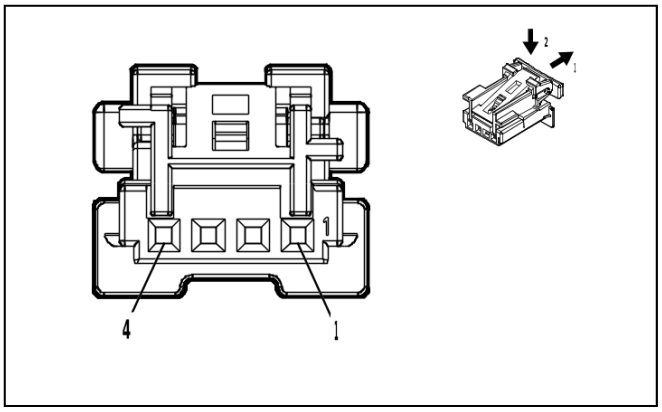
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

M26 Front Drive Axle Actuator (NP0 / NQH)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GN	(1) 8016	(1) Secondary Axle Motor Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) GY / BK	(2) 1570	(2) Front Axle Actuator Control	(2) I	(2) —
(3) 3	(3) 0.5	(3) YE / WH	(3) 1695	(3) 4WD Locked Range Indicator Control	(3) I	(3) —
(4) 4	(4) 0.5	(4) BK	(4) 2250	(4) Ground	(4) I	(4) —

M37P Programmable Mode Valve Actuator



4997407

Connector Part Information

- Harness Type: Air Conditioning Wiring Harness
- OEM Connector: 2294218-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 0.64 Micro-Quadlock Series(BK)

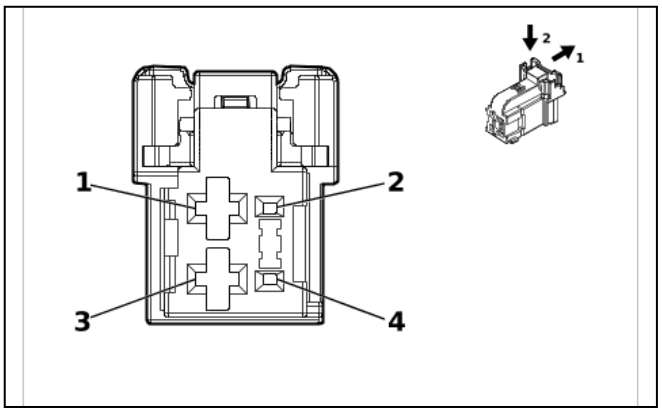
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

M37P Programmable Mode Valve Actuator

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BK	(1) 2050	(1) Ground	(1) I	(1) SZ
(2) 2	(2) 0.35	(2) GN / VT	(2) 2852	(2) Body Control Module LIN Bus 6	(2) I	(2) SZ
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.35	(4) WH / YE	(4) 4634	(4) HVAC Remote Enable Signal	(4) I	(4) SZ

M50D Front Seat Tilt Adjuster Actuator - Driver (A45 / A2X)



5410027

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 2316171-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 0.64, 2.8 Series(BK)

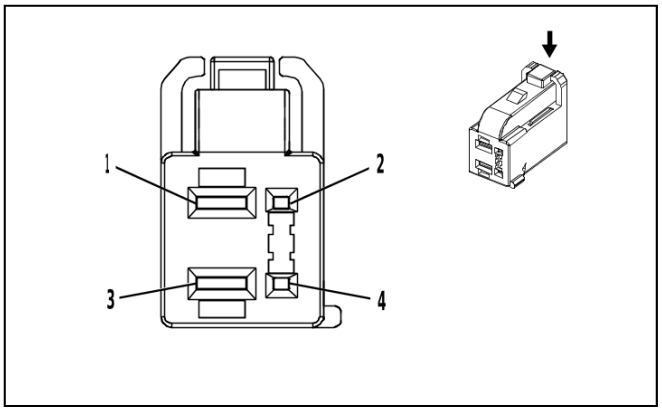
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-35 (VT)	No Tool Required

M50D Front Seat Tilt Adjuster Actuator - Driver (A45 / A2X)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) BU / VT	(1) 287	(1) Driver Seat Front Vertical Motor Down Control	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 1.5	(3) GN / BN	(3) 286	(3) Driver Seat Front Vertical Motor Up Control	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

M51D Front Seat Adjuster Actuator - Driver (A45 / A2X)



3683652

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 13583828
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 0.64, 2.8 Series(BK)

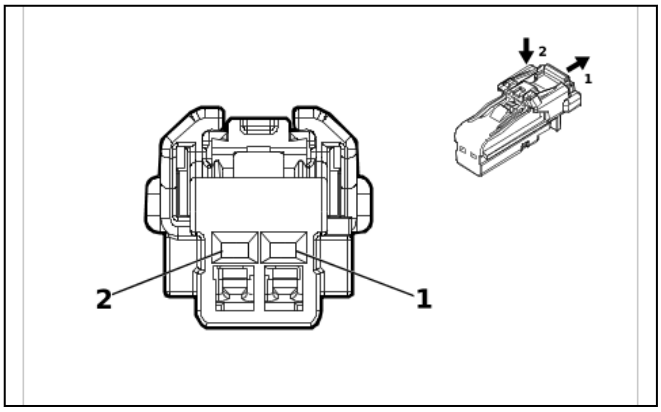
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-4A (PU)	No Tool Required

M51D Front Seat Adjuster Actuator - Driver (A45 / A2X)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) GY / GN	(1) 284	(1) Driver Seat Horizontal Motor Rearward Control	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 1.5	(3) YE / BU	(3) 285	(3) Driver Seat Horizontal Motor Forward Control	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

M53D Front Seat Back Lumbar Motor - Driver (AL9)



4115691

Connector Part Information
- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 6098-8988
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.2 MCON Series(BK)

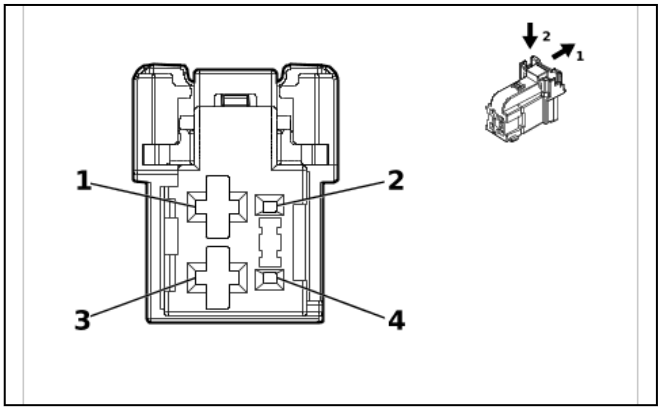
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

M53D Front Seat Back Lumbar Motor - Driver (AL9)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BU	(1) 611	(1) Driver Seat Lumbar Support Motor Forward Control	(1) I	(1) —
(2) 2	(2) 0.75	(2) VT	(2) 610	(2) Driver Seat Lumbar Support Motor Backward Control	(2) I	(2) —

M55D Front Seat Vertical Adjuster Actuator - Driver



5410027

Connector Part Information
- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 2316171-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 0.64, 2.8 Series(BK)

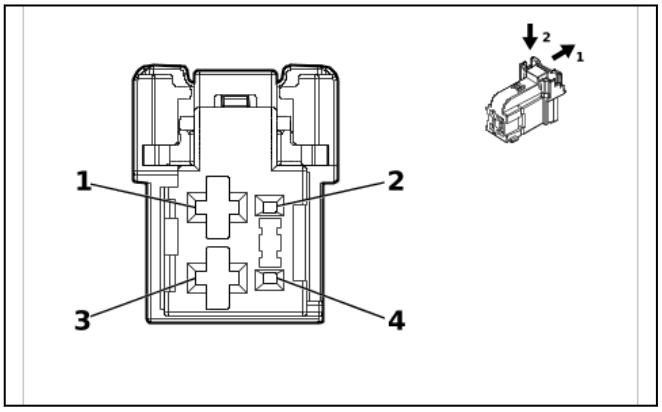
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-35 (VT)	No Tool Required

M55D Front Seat Vertical Adjuster Actuator - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) GY / BU	(1) 283	(1) Driver Seat Rear Vertical Motor Down Control	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 1.5	(3) YE	(3) 282	(3) Driver Seat Rear Vertical Motor Up Control	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

M56D Front Seat Recliner Actuator - Driver (A45 / A2X)



5410027

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 2316171-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 0.64, 2.8 Series(BK)

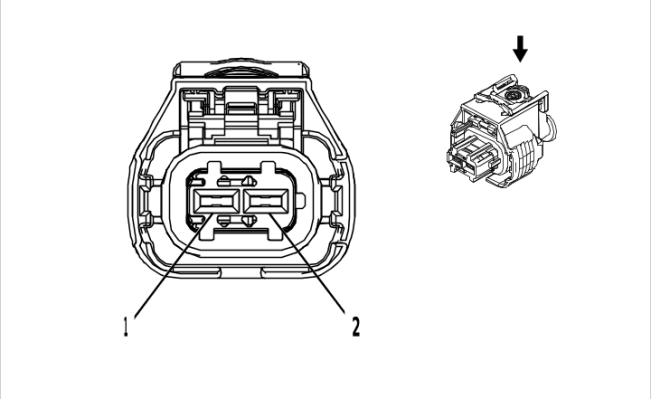
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-35 (VT)	No Tool Required

M56D Front Seat Recliner Actuator - Driver (A45 / A2X)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) GN / YE	(1) 276	(1) Driver Seat Recline Motor Forward Control	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 1.5	(3) BU / YE	(3) 277	(3) Driver Seat Recline Motor Rearward Control	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

M64 Starter



2577394

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 1-928-405-714
- Service Connector: 13384371
- Description: 2-Way F 2.8 Series, Sealed(BK)

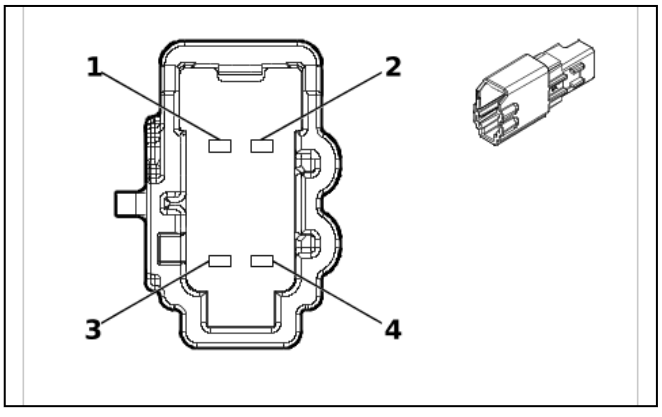
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-35 (VT)	No Tool Required

M64 Starter

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) YE	(1) 6	(1) Starter Solenoid Crank Ignition Voltage	(1) I	(1) —
(2) 2	(2) 2.5	(2) YE / GN	(2) 4358	(2) Starter Pinion Solenoid Voltage	(2) I	(2) —

M73A Front Seat Back Ventilation Blower - Driver (KU9)



5423974

Connector Part Information
- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 6098-9049
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way M 1.2 MCON Series(GY)

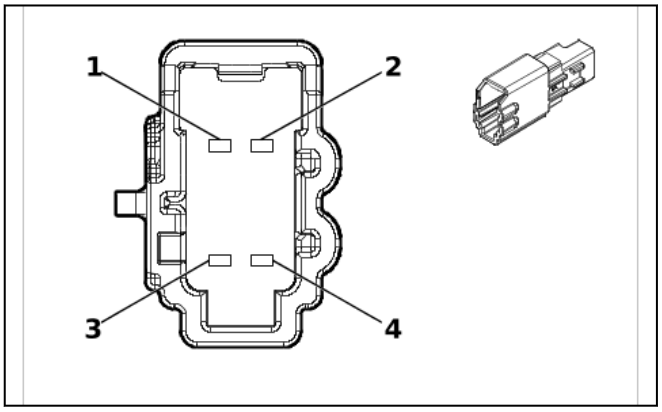
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-17 (L-GN)	No Tool Required

M73A Front Seat Back Ventilation Blower - Driver (KU9)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / GN	(1) 839	(1) Run/Crank Ignition 1 Voltage	(1) I	(1) —
(2) 2	(2) 0.5	(2) GN / VT	(2) 5906	(2) Driver Seat Blower Motor Control 1	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK	(3) 3750	(3) Ground	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

M73B Front Seat Back Ventilation Blower - Passenger (KU9)



5423974

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Passenger
- OEM Connector: 6098-9049
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way M 1.2 MCON Series(GY)

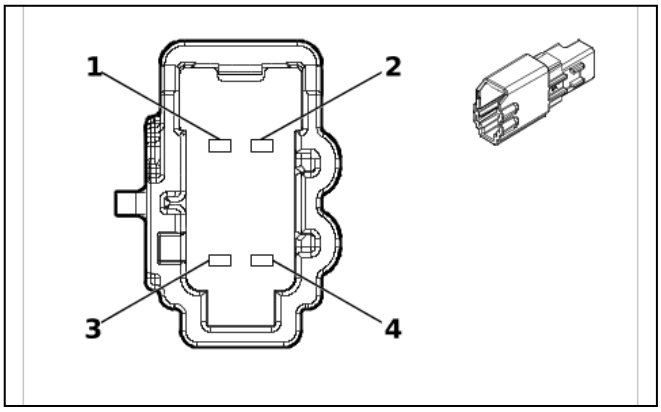
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-17 (L-GN)	No Tool Required

M73B Front Seat Back Ventilation Blower - Passenger (KU9)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / GN	(1) 839	(1) Run/Crank Ignition 1 Voltage	(1) I	(1) —
(2) 2	(2) 0.5	(2) VT / WH	(2) 5908	(2) Passenger Seat Blower Motor Control 1	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK	(3) 4250	(3) Ground	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

M73D Front Seat Cushion Ventilation Blower - Driver (KU9)



5423974

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 6098-9049
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way M 1.2 MCON Series(GY)

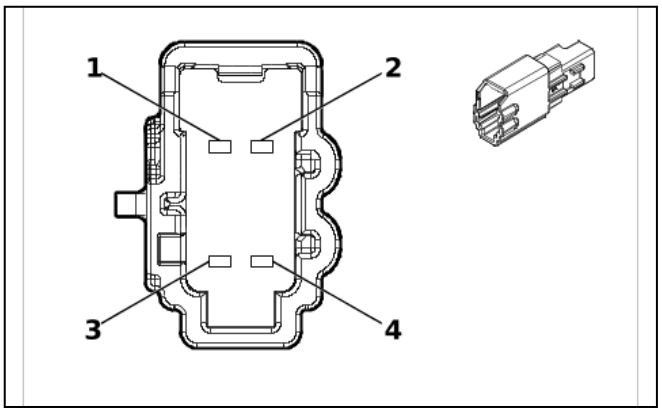
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-17 (L-GN)	No Tool Required

M73D Front Seat Cushion Ventilation Blower - Driver (KU9)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / GN	(1) 839	(1) Run/Crank Ignition 1 Voltage	(1) I	(1) —
(2) 2	(2) 0.5	(2) GN / VT	(2) 5906	(2) Driver Seat Blower Motor Control 1	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK	(3) 3750	(3) Ground	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

M73P Front Seat Cushion Ventilation Blower - Passenger (KU9)



5423974

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Passenger
- OEM Connector: 6098-9049
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way M 1.2 MCON Series(GY)

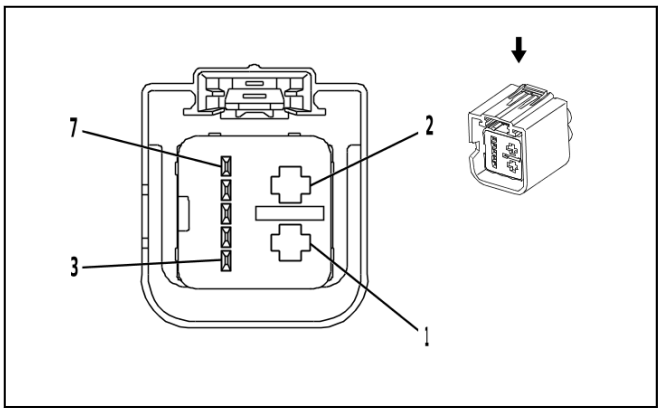
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-17 (L-GN)	No Tool Required

M73P Front Seat Cushion Ventilation Blower - Passenger (KU9)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / GN	(1) 839	(1) Run/Crank Ignition 1 Voltage	(1) I	(1) —
(2) 2	(2) 0.5	(2) VT / WH	(2) 5908	(2) Passenger Seat Blower Motor Control 1	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK	(3) 4250	(3) Ground	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

M74D Front Side Door Window Regulator Motor - Driver (AXG)



2282932

Connector Part Information

- Harness Type: Front Side Door Door Wiring Harness - Driver
- OEM Connector: 1-1732115-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 7-Way F 0.64, 2.8 Kaizen Timer Series, Sealed(GY)

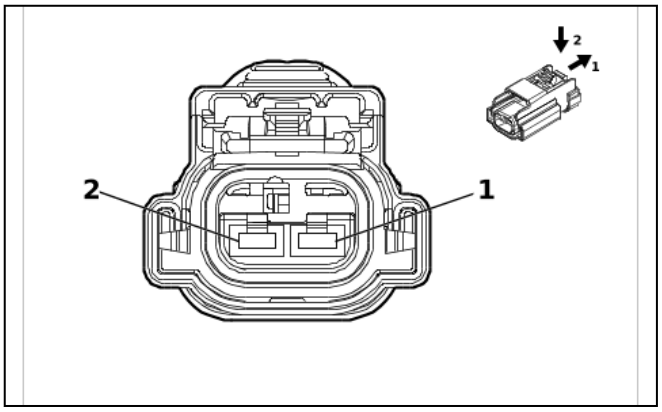
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-4A (PU)	No Tool Required
II	Not required	J-35616-64B (L-BU)	No Tool Required

M74D Front Side Door Window Regulator Motor - Driver (AXG)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) GN / GY	(1) 164	(1) Left Front Window Motor Up Control	(1) I	(1) —
(2) 2	(2) 2.5	(2) YE / VT	(2) 165	(2) Left Front Window Motor Down Control	(2) I	(2) —
(3) 3	(3) 0.35	(3) GY / GN	(3) 2763	(3) Window Switch Left Front Up Signal	(3) II	(3) —
(4) 4	(4) 0.35	(4) GN / YE	(4) 6134	(4) Body Control Module LIN Bus 3	(4) II	(4) —
(5) 5	(5) 0.35	(5) GN	(5) 2766	(5) Power Window Switch Left Front Express Signal	(5) II	(5) —
(6) 6	(6) 0.35	(6) GY	(6) 745	(6) Left Front Door Ajar Switch Signal	(6) II	(6) —
(7) 7	(7) 0.35	(7) WH / BN	(7) 2764	(7) Window Switch Left Front Down Signal	(7) II	(7) —

M74LR Rear Side Door Window Regulator Motor - Left



5795169

Connector Part Information
- Harness Type: Rear Side Door Door Wiring Harness - Left
- OEM Connector: 35286783
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 2.8 APEX Series, Sealed(BK)

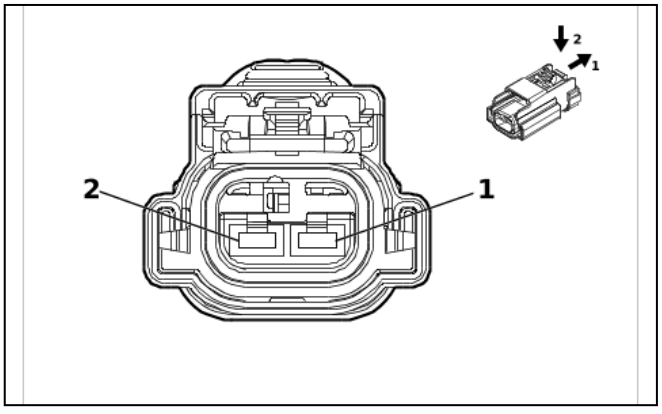
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-4A (PU)	No Tool Required

M74LR Rear Side Door Window Regulator Motor - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2	(1) BU / VT	(1) 668	(1) Left Rear Window Motor Up Control	(1) I	(1) —
(2) 2	(2) 2	(2) YE / BU	(2) 669	(2) Left Rear Window Motor Down Control	(2) I	(2) —

M74P Front Side Door Window Regulator Motor - Passenger



5795169

Connector Part Information
- Harness Type: Front Side Door Door Wiring Harness - Passenger
- OEM Connector: 35286783
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 2.8 APEX Series, Sealed(BK)

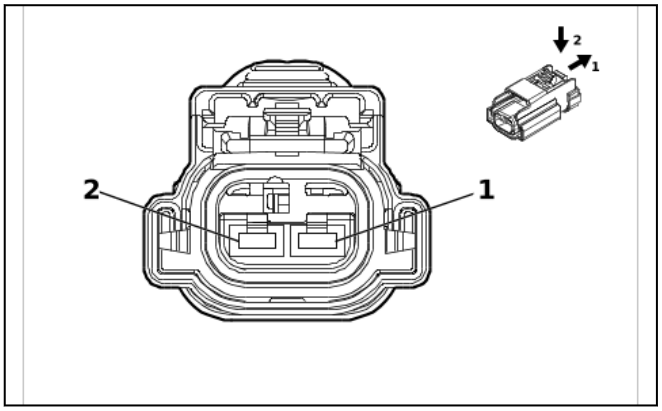
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-4A (PU)	No Tool Required

M74P Front Side Door Window Regulator Motor - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2	(1) GN / GY	(1) 666	(1) Right Front Window Motor Up Control	(1) I	(1) —
(2) 2	(2) 2	(2) YE / BU	(2) 667	(2) Right Front Window Motor Down Control	(2) I	(2) —

M74RR Rear Side Door Window Regulator Motor - Right



5795169

Connector Part Information

- Harness Type: Rear Side Door Door Wiring Harness - Right
- OEM Connector: 35286783
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 2.8 APEX Series, Sealed(BK)

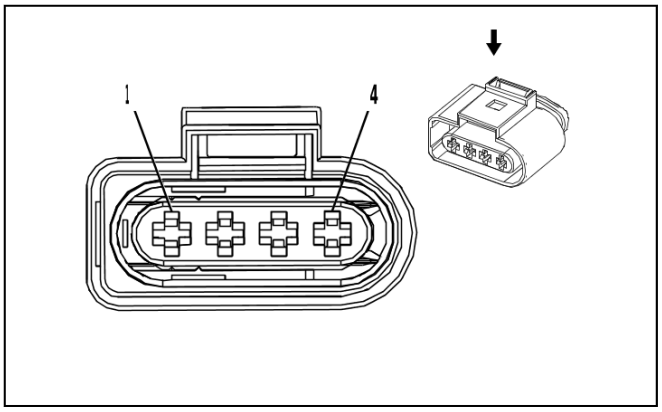
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-4A (PU)	No Tool Required

M74RR Rear Side Door Window Regulator Motor - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2	(1) BU / GY	(1) 670	(1) Right Rear Window Motor Up Control	(1) I	(1) —
(2) 2	(2) 2	(2) GN / BK	(2) 671	(2) Right Rear Window Motor Down Control	(2) I	(2) —

M75 Windshield Wiper Motor



2474722

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 638245-2
- Service Connector: 85596545
- Description: 4-Way F Junior Power Timer Series, Sealed(BK)

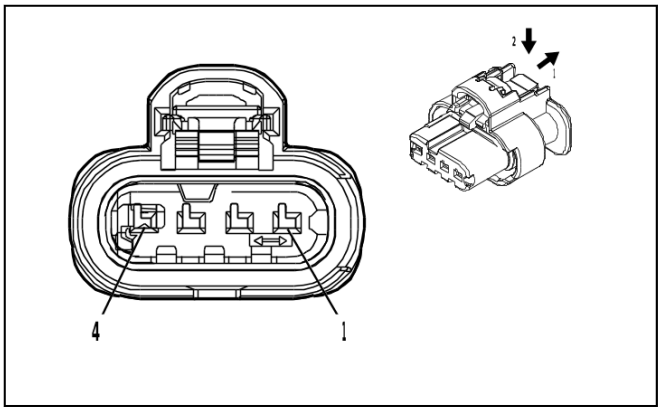
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-4A (PU)	No Tool Required

M75 Windshield Wiper Motor

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BN / GN	(1) 196	(1) Windshield Wiper Motor Park Switch Signal	(1) I	(1) —
(2) 2	(2) 2.5	(2) YE / BN	(2) 95	(2) Windshield Wiper Motor Low Speed Control	(2) I	(2) —
(3) 3	(3) 2.5	(3) BK	(3) 150	(3) Ground	(3) I	(3) —
(4) 4	(4) 2.5	(4) WH	(4) 92	(4) Windshield Wiper Motor High Speed Control	(4) I	(4) —

M96B Active Grille Air Shutter Actuator 2



4934614

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 1-2296696-2
- Service Connector: 85519071
- Description: 4-Way F 1.2 MCON-CB Series, Sealed(BK)

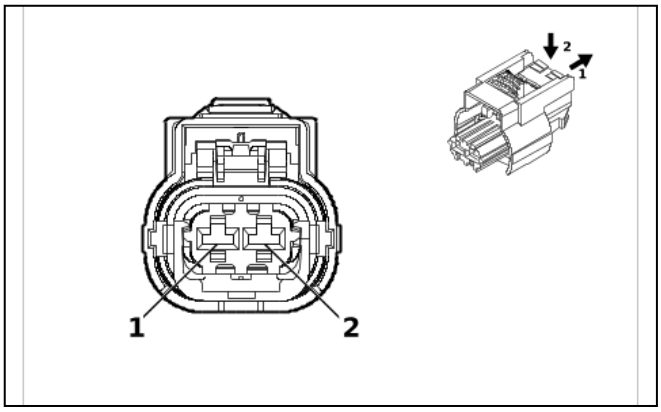
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

M96B Active Grille Air Shutter Actuator 2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / BU	(1) 5705	(1) Powertrain Main Relay Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) GN / VT	(2) 10806	(2) Engine Control Module LIN Bus 1	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK	(3) 150	(3) Ground	(3) I	(3) —
(4) 4	(4) 0.5	(4) BK	(4) 150	(4) Ground	(4) I	(4) —

M104L Parking Brake Actuator - Left



4992524

Connector Part Information
- Harness Type: Chassis Rear Wiring Harness Extension Harness
- OEM Connector: 35182447
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 2.8 MCP Series, Sealed(BK)

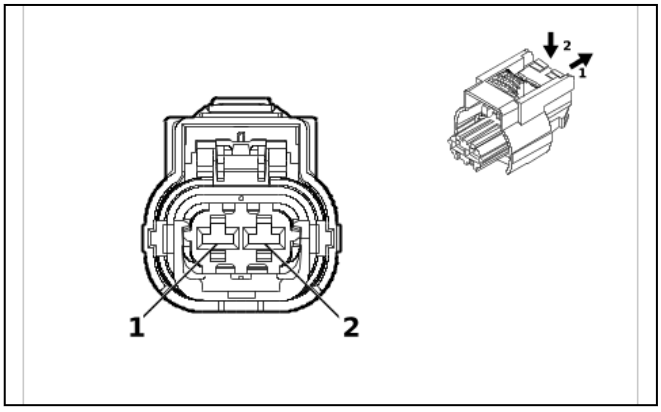
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-35 (VT)	No Tool Required

M104L Parking Brake Actuator - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) WH	(1) 2001	(1) Left Park Brake Motor Apply Control	(1) I	(1) —
(2) 2	(2) 2.5	(2) GY / BK	(2) 4369	(2) Left Park Brake Motor Low Reference	(2) I	(2) —

M104R Parking Brake Actuator - Right



4992524

Connector Part Information
- Harness Type: Chassis Rear Wiring Harness Extension Harness
- OEM Connector: 35182447
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 2.8 MCP Series, Sealed(BK)

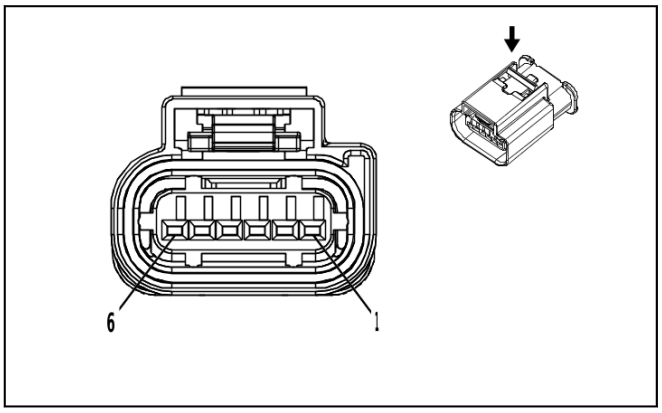
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-35 (VT)	No Tool Required

M104R Parking Brake Actuator - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) GN / VT	(1) 1988	(1) Right Park Brake Motor Apply Control	(1) I	(1) —
(2) 2	(2) 2.5	(2) GY	(2) 4368	(2) Right Park Brake Motor Low Reference	(2) I	(2) —

M128 Turbocharger Wastegate Actuator



3747579

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 2272975-5
- Service Connector: 19352911
- Description: 6-Way F 1.2 MCON Series, Sealed(BK)

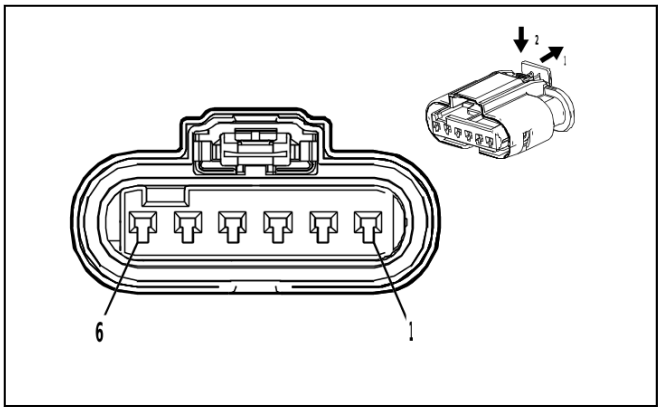
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

M128 Turbocharger Wastegate Actuator

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BK / YE	(1) 548	(1) Engine Control Sensors Low Reference 1	(1) I	(1) —
(2) 2	(2) 0.5	(2) WH	(2) 2590	(2) Turbocharger Wastegate Motor Feedback Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) BU / RD	(3) 460	(3) Engine Control Sensors 5 Volt Reference 1	(3) I	(3) —
(4) 4	(4) 0.75	(4) WH / BU	(4) 2592	(4) Turbocharger Wastegate Motor Close Control	(4) I	(4) —
(5) 5	(5) 0.75	(5) WH / BN	(5) 2591	(5) Turbocharger Wastegate Motor Open Control	(5) I	(5) —
6	—	—	—	Not Occupied	—	—

M129A Intake Camshaft Profile Actuator 1



3960142

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 34900-6219
- Service Connector: 85005020
- Description: 6-Way F 1.2 MCON-LL Series, Sealed(BK)

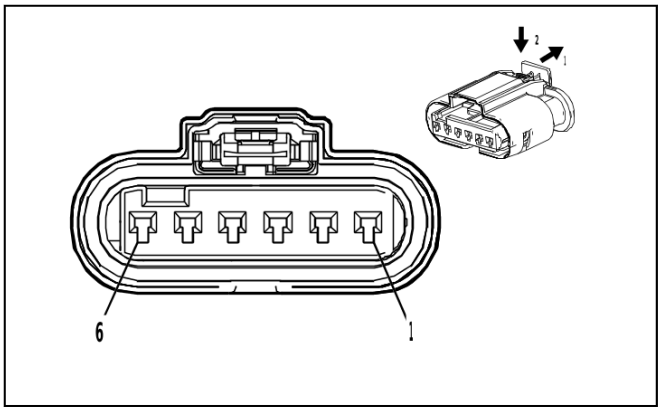
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

M129A Intake Camshaft Profile Actuator 1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / GY	(1) 3615	(1) Intake Camshaft Profile Actuator 1 Control A	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU / WH	(2) 3589	(2) Intake Camshaft Profile Actuator 1 Position Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / YE	(3) 548	(3) Engine Control Sensors Low Reference 1	(3) I	(3) —
(4) 4	(4) 0.5	(4) BU / RD	(4) 460	(4) Engine Control Sensors 5 Volt Reference 1	(4) I	(4) —
(5) 5	(5) 0.5	(5) VT / BU	(5) 5293	(5) Powertrain Main Relay Fused Supply Voltage 4	(5) I	(5) —
(6) 6	(6) 0.5	(6) GN / BK	(6) 3616	(6) Intake Camshaft Profile Actuator 1 Control B	(6) I	(6) —

M129B Intake Camshaft Profile Actuator 2



3960142

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 34900-6219
- Service Connector: 85005020
- Description: 6-Way F 1.2 MCON-LL Series, Sealed(BK)

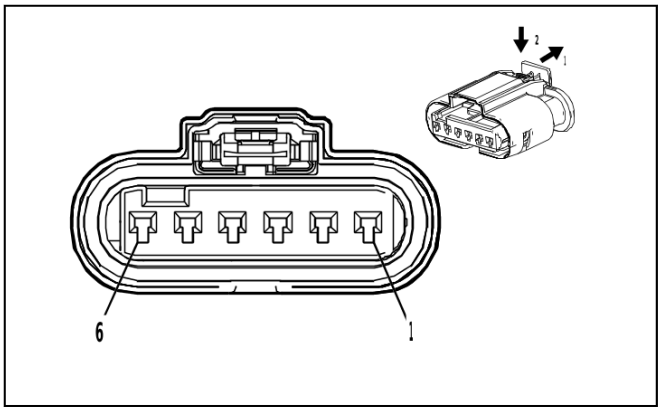
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

M129B Intake Camshaft Profile Actuator 2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GN	(1) 3585	(1) Intake Camshaft Profile Actuator 2 Control A	(1) I	(1) —
(2) 2	(2) 0.5	(2) GN / WH	(2) 3592	(2) Intake Camshaft Profile Actuator 2 Position Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / YE	(3) 548	(3) Engine Control Sensors Low Reference 1	(3) I	(3) —
(4) 4	(4) 0.5	(4) BU / RD	(4) 460	(4) Engine Control Sensors 5 Volt Reference 1	(4) I	(4) —
(5) 5	(5) 0.5	(5) VT / BU	(5) 5293	(5) Powertrain Main Relay Fused Supply Voltage 4	(5) I	(5) —
(6) 6	(6) 0.5	(6) BU	(6) 3584	(6) Intake Camshaft Profile Actuator 2 Control B	(6) I	(6) —

M129C Intake Camshaft Profile Actuator 3



3960142

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 34900-6219
- Service Connector: 85005020
- Description: 6-Way F 1.2 MCON-LL Series, Sealed(BK)

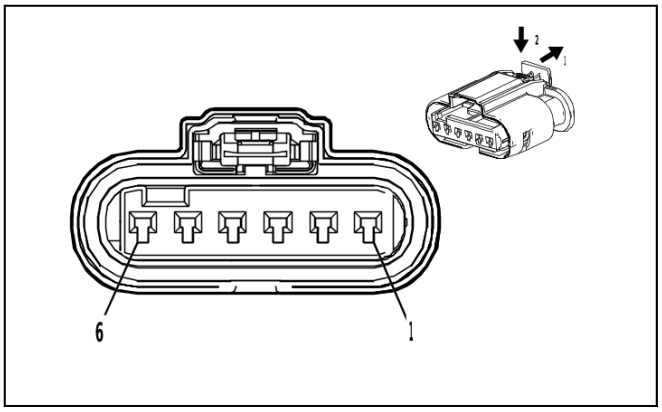
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

M129C Intake Camshaft Profile Actuator 3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) YE / BU	(1) 3587	(1) Intake Camshaft Profile Actuator 3 Control A	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / GN	(2) 3593	(2) Intake Camshaft Profile Actuator 3 Position Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / YE	(3) 548	(3) Engine Control Sensors Low Reference 1	(3) I	(3) —
(4) 4	(4) 0.5	(4) BU / RD	(4) 460	(4) Engine Control Sensors 5 Volt Reference 1	(4) I	(4) —
(5) 5	(5) 0.5	(5) VT / BU	(5) 5293	(5) Powertrain Main Relay Fused Supply Voltage 4	(5) I	(5) —
(6) 6	(6) 0.5	(6) GY	(6) 3586	(6) Intake Camshaft Profile Actuator 3 Control B	(6) I	(6) —

M129D Intake Camshaft Profile Actuator 4



3960142

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 34900-6219
- Service Connector: 85005020
- Description: 6-Way F 1.2 MCON-LL Series, Sealed(BK)

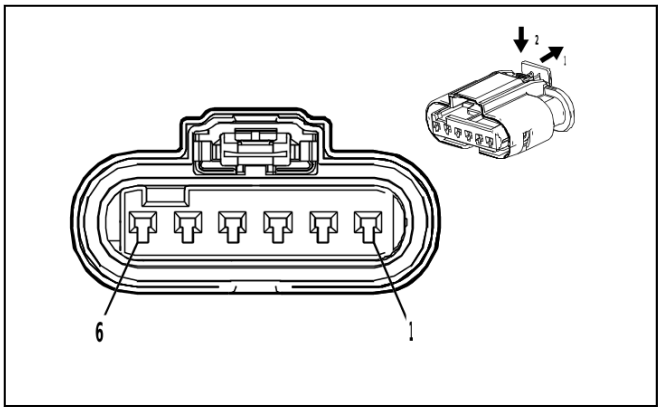
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

M129D Intake Camshaft Profile Actuator 4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GN / YE	(1) 1402	(1) Intake Camshaft Profile Actuator 4 Control A	(1) I	(1) —
(2) 2	(2) 0.5	(2) YE / BN	(2) 1702	(2) Intake Camshaft Profile Actuator 4 Position Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / YE	(3) 548	(3) Engine Control Sensors Low Reference 1	(3) I	(3) —
(4) 4	(4) 0.5	(4) BU / RD	(4) 460	(4) Engine Control Sensors 5 Volt Reference 1	(4) I	(4) —
(5) 5	(5) 0.5	(5) VT / BU	(5) 5293	(5) Powertrain Main Relay Fused Supply Voltage 4	(5) I	(5) —
(6) 6	(6) 0.5	(6) GY / YE	(6) 1502	(6) Intake Camshaft Profile Actuator 4 Control B	(6) I	(6) —

M130B Exhaust Camshaft Profile Actuator 2



3960142

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 34900-6219
- Service Connector: 85005020
- Description: 6-Way F 1.2 MCON-LL Series, Sealed(BK)

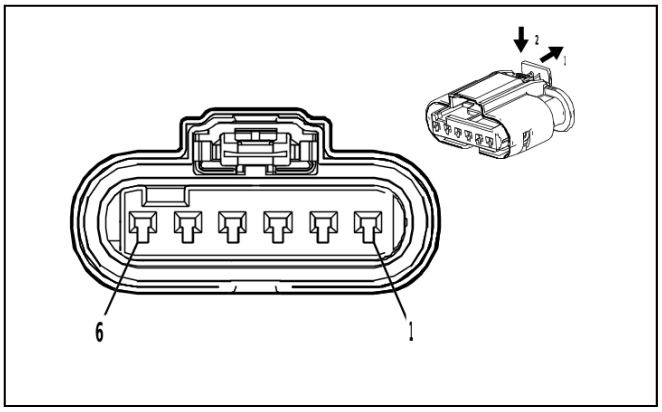
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

M130B Exhaust Camshaft Profile Actuator 2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) YE / VT	(1) 6265	(1) Exhaust Camshaft Profile Actuator 2 Control B	(1) I	(1) —
(2) 2	(2) 0.5	(2) GN / BK	(2) 6266	(2) Exhaust Camshaft Profile Actuator 2 Position Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / YE	(3) 548	(3) Engine Control Sensors Low Reference 1	(3) I	(3) —
(4) 4	(4) 0.5	(4) BU / RD	(4) 460	(4) Engine Control Sensors 5 Volt Reference 1	(4) I	(4) —
(5) 5	(5) 0.5	(5) VT / BU	(5) 5293	(5) Powertrain Main Relay Fused Supply Voltage 4	(5) I	(5) —
(6) 6	(6) 0.5	(6) VT / BK	(6) 6264	(6) Exhaust Camshaft Profile Actuator 2 Control A	(6) I	(6) —

M130C Exhaust Camshaft Profile Actuator 3



3960142

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 34900-6219
- Service Connector: 85005020
- Description: 6-Way F 1.2 MCON-LL Series, Sealed(BK)

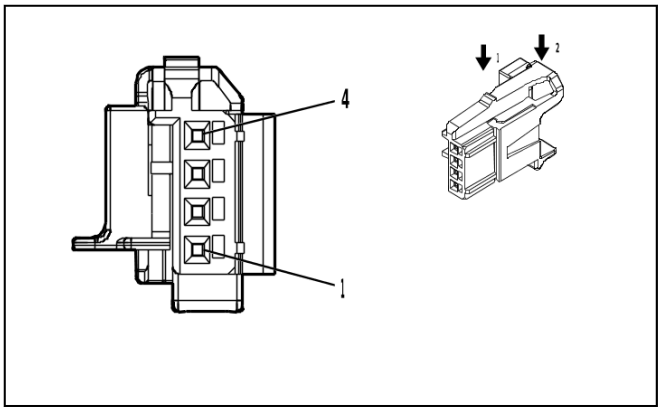
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

M130C Exhaust Camshaft Profile Actuator 3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / BN	(1) 6262	(1) Exhaust Camshaft Profile Actuator 3 Control B	(1) I	(1) —
(2) 2	(2) 0.5	(2) YE	(2) 6263	(2) Exhaust Camshaft Profile Actuator 3 Position Sensor Signal	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / YE	(3) 548	(3) Engine Control Sensors Low Reference 1	(3) I	(3) —
(4) 4	(4) 0.5	(4) BU / RD	(4) 460	(4) Engine Control Sensors 5 Volt Reference 1	(4) I	(4) —
(5) 5	(5) 0.5	(5) VT / BU	(5) 5293	(5) Powertrain Main Relay Fused Supply Voltage 4	(5) I	(5) —
(6) 6	(6) 0.5	(6) GN / BN	(6) 6261	(6) Exhaust Camshaft Profile Actuator 3 Control A	(6) I	(6) —

P2 Automatic Transmission Control Indicator



5092142

Connector Part Information

- Harness Type: Front Floor Console Wiring Harness Extension Harness
- OEM Connector: 2294399-5
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 0.64 MQS Series

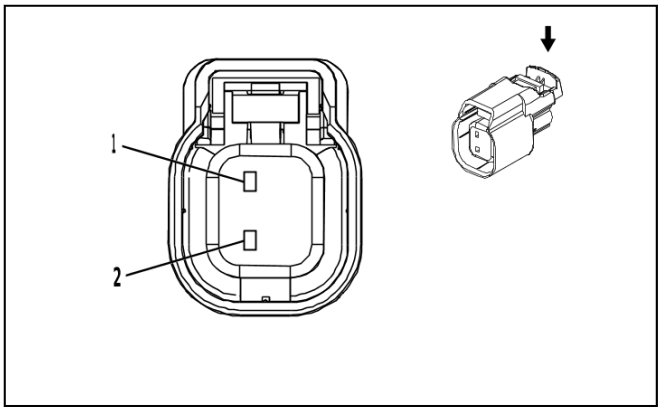
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

P2 Automatic Transmission Control Indicator

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GN / VT	(1) 4759	(1) Transmission Shift Lever Position Indicator 2 Control	(1) I	(1) —
(2) 2	(2) 0.35	(2) GN / BU	(2) 6133	(2) Body Control Module LIN Bus 2	(2) I	(2) —
(3) 3	(3) 0.35	(3) BK	(3) 2050	(3) Ground	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

P13 Horn



2792100

Connector Part Information
- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 34062-0027
- Service Connector: 87821959
- Description: 2-Way F 1.5 Series, Sealed(BK)

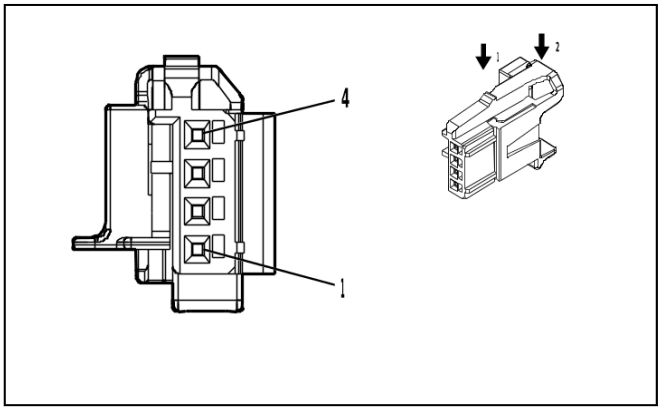
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-2A (GY)	No Tool Required

P13 Horn

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BK	(1) 250	(1) Ground	(1) I	(1) —
(2) 2	(2) 0.75	(2) BN / GY	(2) 29	(2) Horn Control	(2) I	(2) —

P14 Instrument Panel Airbag Arming Status Display



5092142

Connector Part Information
- Harness Type: Roof Wiring Harness
- OEM Connector: 2294399-5
- Service Connector: 84766302
- Description: 4-Way F 0.64 MQS Series

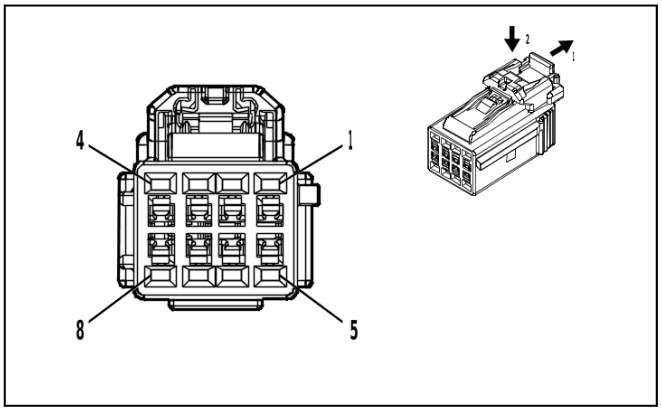
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

P14 Instrument Panel Airbag Arming Status Display

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) RD / VT	(1) 4040	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 0.35	(2) BU	(2) 2307	(2) Passenger Air Bag On Indicator Control	(2) I	(2) —
(3) 3	(3) 0.35	(3) GN	(3) 2308	(3) Passenger Air Bag Off Indicator Control	(3) I	(3) —
(4) 4	(4) 0.35 (4) 0.35	(4) GN (4) VT / WH	(4) 3118 (4) 5234	(4) Roof Rail Air Bag Disable Indicator Control (4) Passenger Seat Belt Indicator Control	(4) I (4) I	(4) AL0 & C9I (4) - C91

P16 Instrument Panel Cluster Control Module X1



5086387

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 6098-8443
- Service Connector: 84613126
- Description: 8-Way F 1.2 Series(BK)

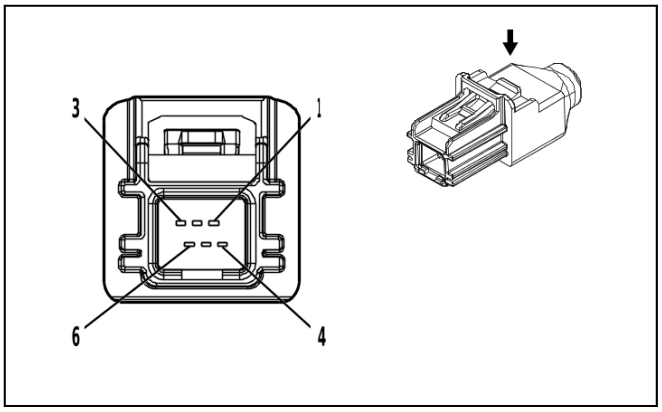
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

P16 Instrument Panel Cluster Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) RD / BN	(1) 1440	(1) Battery Positive Voltage	(1) I	(1) —
2 - 7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.35	(8) BK	(8) 2050	(8) Ground	(8) I	(8) —

P16 Instrument Panel Cluster Control Module X2



4806625

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 13551197
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 6-Way M HSAL-2 Series(BK)

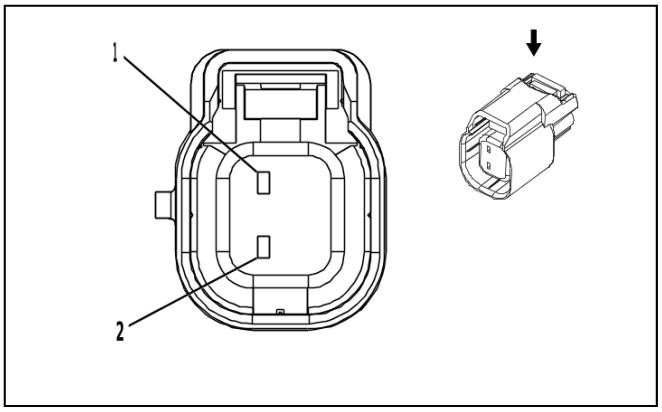
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

P16 Instrument Panel Cluster Control Module X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0	(1) BARE	(1) 10603	(1) Virtual Cockpit Unit Instrument Panel Display LVDS (Low Voltage Differential Signaling) Low Reference	(1) I	(1) —
(2) 2	(2) 0	(2) BU	(2) 10604	(2) Virtual Cockpit Unit Instrument Panel Display LVDS (Low Voltage Differential Signaling) Signal [+]	(2) I	(2) —
(3) 3	(3) 0	(3) WH	(3) 10605	(3) Virtual Cockpit Unit Instrument Panel Display LVDS (Low Voltage Differential Signaling) Signal [-]	(3) I	(3) —
4 - 6	—	—	—	Not Occupied	—	—

P19AG Radio Front Side Door Speaker - Left (UQ3)



4115616

Connector Part Information
- Harness Type: Front Side Door Door Wiring Harness - Driver
- OEM Connector: 34062-0046
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.5 Series, Sealed(BK)

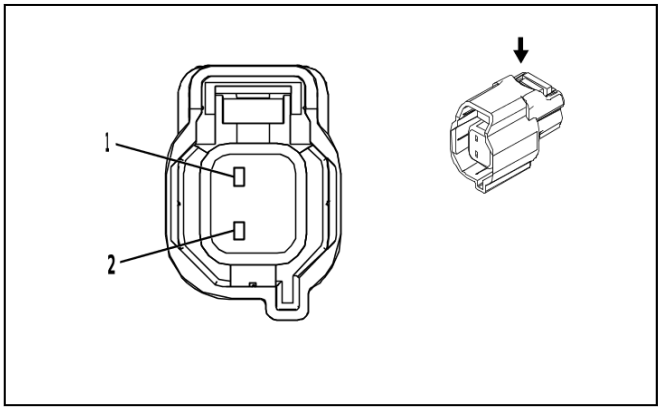
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-2A (GY)	No Tool Required

P19AG Radio Front Side Door Speaker - Left (UQ3)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1	(1) BN / BU	(1) 118	(1) Left Front Speaker [-] Control 1	(1) I	(1) —
(2) 2	(2) 1	(2) BU	(2) 201	(2) Left Front Speaker 1 [+] Control	(2) I	(2) —

P19AG Radio Front Side Door Speaker - Left (UQA)



2900396

Connector Part Information
- Harness Type: Front Side Door Door Wiring Harness - Driver
- OEM Connector: 34062-0026
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.5 Series, Sealed(L-GY)

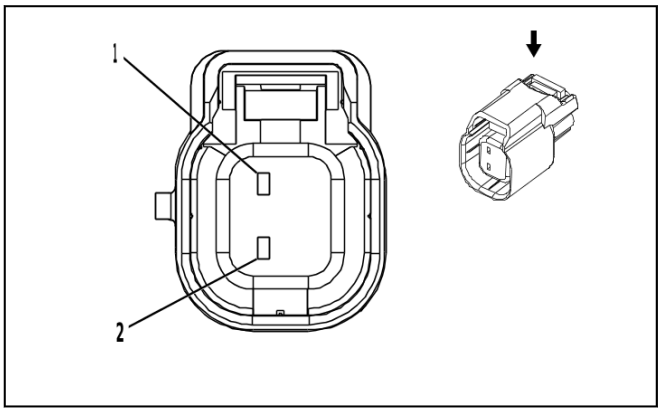
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-2A (GY)	No Tool Required

P19AG Radio Front Side Door Speaker - Left (UQA)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1	(1) BN / BU	(1) 118	(1) Left Front Speaker [-] Control 1	(1) I	(1) —
(2) 2	(2) 1	(2) BU	(2) 201	(2) Left Front Speaker 1 [+] Control	(2) I	(2) —

P19AH Radio Front Side Door Speaker - Right (UQ3)



4115616

Connector Part Information

- Harness Type: Front Side Door Door Wiring Harness - Passenger
- OEM Connector: 34062-0046
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.5 Series, Sealed(BK)

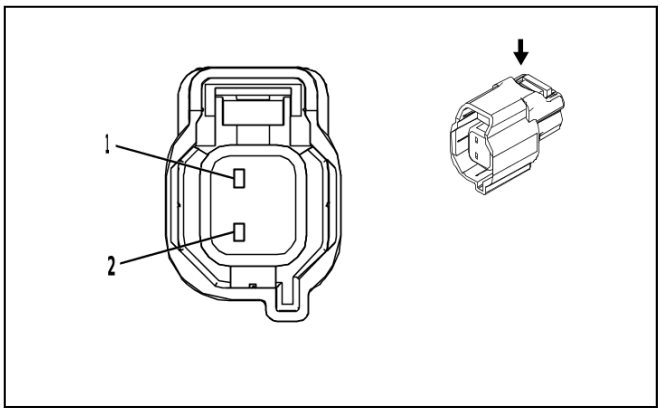
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-2A (GY)	No Tool Required

P19AH Radio Front Side Door Speaker - Right (UQ3)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1	(1) YE / BK	(1) 117	(1) Right Front Speaker [-] Control 1	(1) I	(1) —
(2) 2	(2) 1	(2) YE	(2) 200	(2) Right Front Speaker 1 [+] Control	(2) I	(2) —

P19AH Radio Front Side Door Speaker - Right (UQA)



2900396

Connector Part Information
- Harness Type: Front Side Door Door Wiring Harness - Passenger
- OEM Connector: 34062-0026
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.5 Series, Sealed(L-GY)

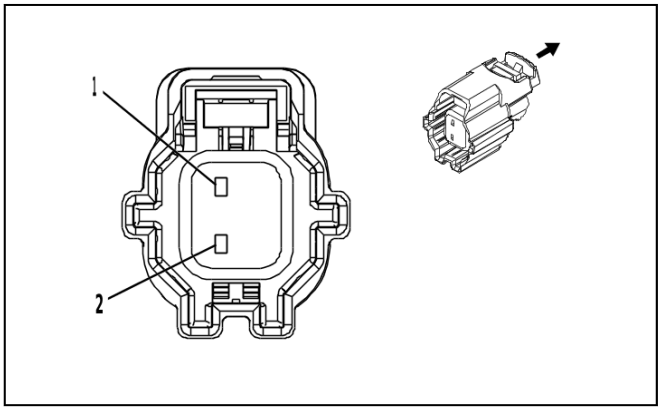
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-2A (GY)	No Tool Required

P19AH Radio Front Side Door Speaker - Right (UQA)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 1	(1) YE / BK	(1) 117	(1) Right Front Speaker [-] Control 1	(1) I	(1) —
(2) 2	(2) 1	(2) YE	(2) 200	(2) Right Front Speaker 1 [+] Control	(2) I	(2) —

P19AL Radio Rear Side Door Speaker - Left (UQ3)



4223204

Connector Part Information
- Harness Type: Rear Side Door Door Wiring Harness - Left
- OEM Connector: 34062-0044
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.5 MX Series, Sealed(BK)

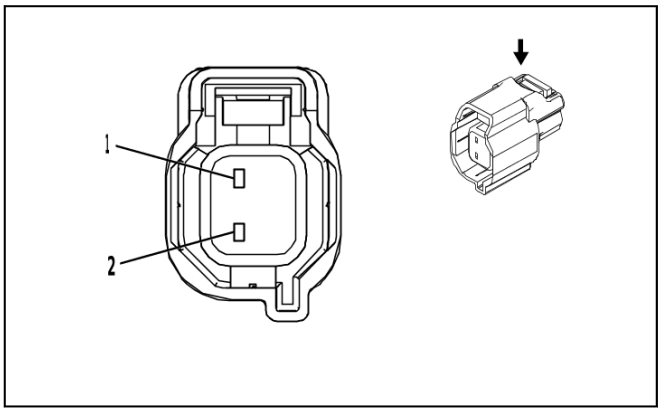
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-2A (GY)	No Tool Required

P19AL Radio Rear Side Door Speaker - Left (UQ3)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) GN / BK	(1) 116	(1) Left Rear Speaker [-] Control	(1) I	(1) —
(2) 2	(2) 0.75	(2) GN	(2) 199	(2) Left Rear Speaker [+] Control	(2) I	(2) —

P19AL Radio Rear Side Door Speaker - Left (UQA)



2900396

Connector Part Information

- Harness Type: Rear Side Door Door Wiring Harness - Left
- OEM Connector: 34062-0026
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.5 Series, Sealed(L-GY)

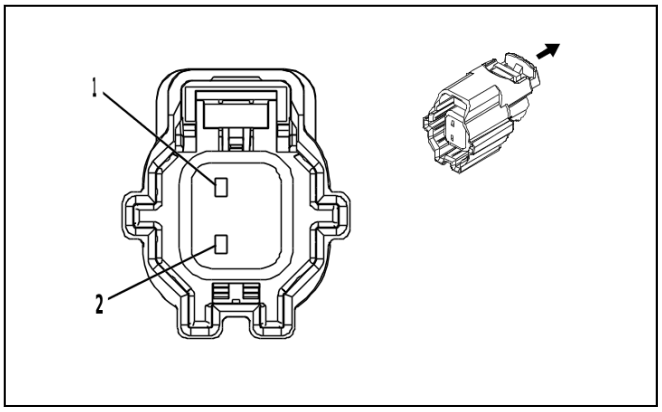
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

P19AL Radio Rear Side Door Speaker - Left (UQA)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GN / BK	(1) 116	(1) Left Rear Speaker [-] Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) GN	(2) 199	(2) Left Rear Speaker [+] Control	(2) I	(2) —

P19AM Radio Rear Side Door Speaker - Right (UQ3)



4223204

Connector Part Information
- Harness Type: Rear Side Door Door Wiring Harness - Right
- OEM Connector: 34062-0044
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.5 MX Series, Sealed(BK)

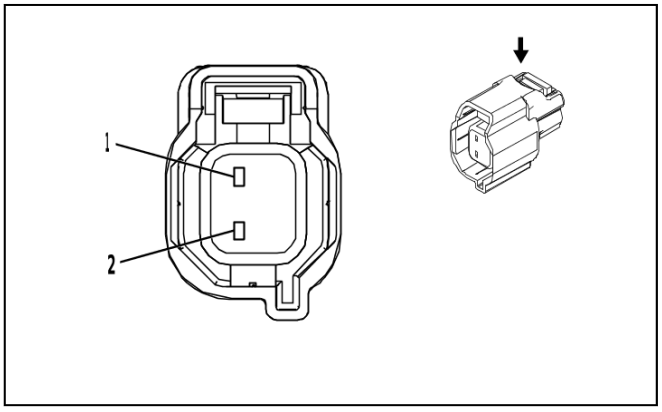
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-2A (GY)	No Tool Required

P19AM Radio Rear Side Door Speaker - Right (UQ3)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BU / BK	(1) 115	(1) Right Rear Speaker [-] Control	(1) I	(1) —
(2) 2	(2) 0.75	(2) WH	(2) 46	(2) Right Rear Speaker [+] Control	(2) I	(2) —

P19AM Radio Rear Side Door Speaker - Right (UQA)



2900396

Connector Part Information
- Harness Type: Rear Side Door Door Wiring Harness - Right
- OEM Connector: 34062-0026
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.5 Series, Sealed(L-GY)

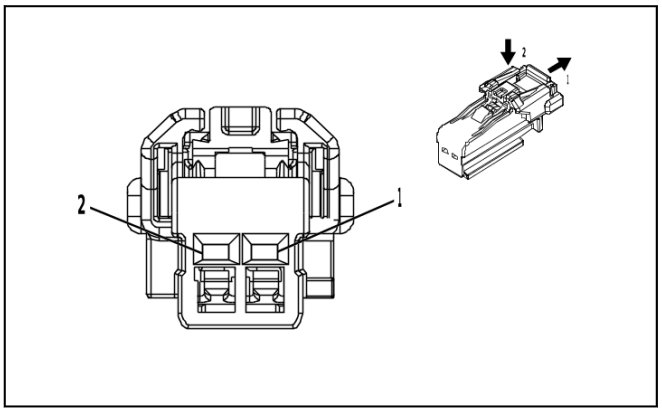
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

P19AM Radio Rear Side Door Speaker - Right (UQA)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BU / BK	(1) 115	(1) Right Rear Speaker [-] Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) WH	(2) 46	(2) Right Rear Speaker [+] Control	(2) I	(2) —

P19B Radio Front Center Speaker (UQA)



4373379

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 6098-8989
- Service Connector: 19369632
- Description: 2-Way F 1.2 MCON Series(GY)

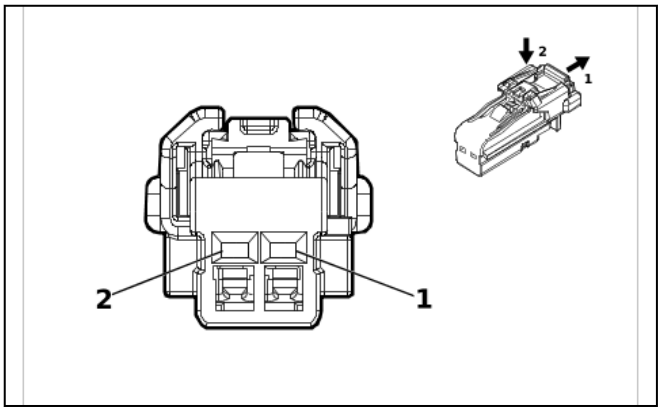
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

P19B Radio Front Center Speaker (UQA)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BU / YE	(1) 1960	(1) Front Center Speaker [-] Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) YE / WH	(2) 1860	(2) Front Center Speaker [+] Control	(2) I	(2) —

P19J Radio Front Speaker - Instrument Panel Left (UQ3)



4115691

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 6098-8988
- Service Connector: 87816612
- Description: 2-Way F 1.2 MCON Series(BK)

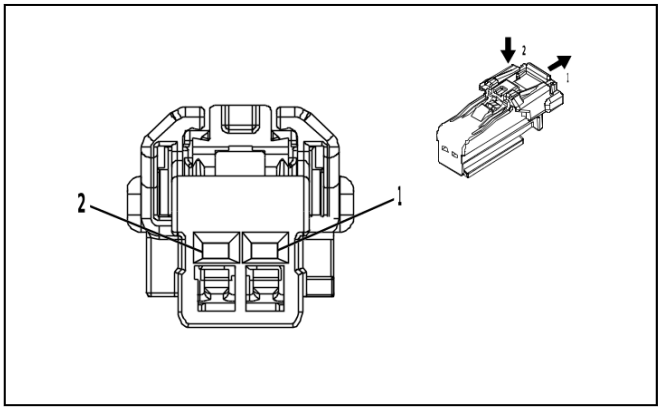
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

P19J Radio Front Speaker - Instrument Panel Left (UQ3)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BN / BU	(1) 118	(1) Left Front Speaker [-] Control 1	(1) I	(1) —
(2) 2	(2) 0.75	(2) BU	(2) 201	(2) Left Front Speaker 1 [+] Control	(2) I	(2) —

P19J Radio Front Speaker - Instrument Panel Left (UQA)



4373379

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 6098-8989
- Service Connector: 19369632
- Description: 2-Way F 1.2 MCON Series(GY)

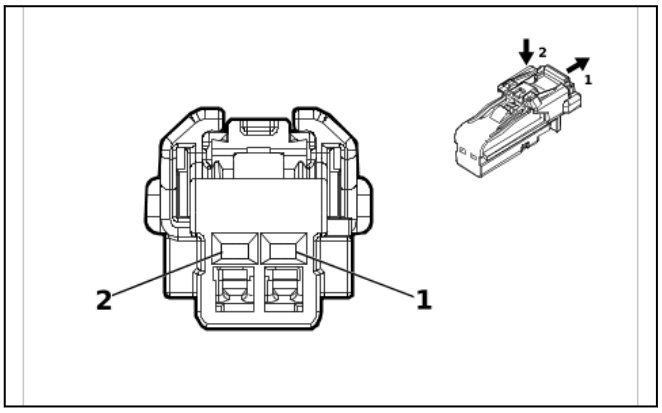
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

P19J Radio Front Speaker - Instrument Panel Left (UQA)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BU / BN	(1) 1957	(1) Left Front Midrange Speaker [-] Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU / VT	(2) 1857	(2) Left Front Midrange Speaker [+] Control	(2) I	(2) —

P19W Radio Front Speaker - Instrument Panel Right (UQ3)



4115691

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 6098-8988
- Service Connector: 87816612
- Description: 2-Way F 1.2 MCON Series(BK)

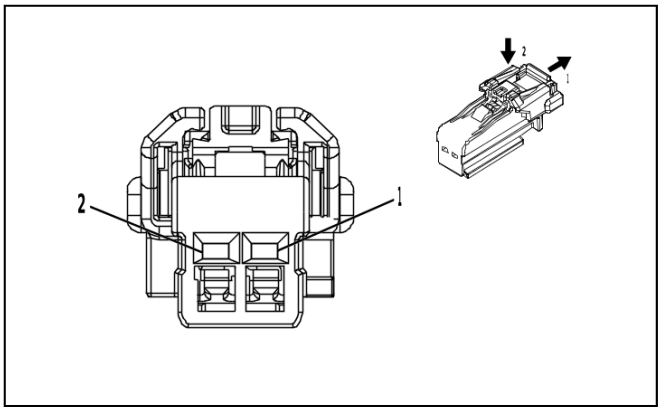
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

P19W Radio Front Speaker - Instrument Panel Right (UQ3)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) YE / BK	(1) 117	(1) Right Front Speaker [-] Control 1	(1) I	(1) —
(2) 2	(2) 0.75	(2) YE	(2) 200	(2) Right Front Speaker 1 [+] Control	(2) I	(2) —

P19W Radio Front Speaker - Instrument Panel Right (UQA)



4373379

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 6098-8989
- Service Connector: 19369632
- Description: 2-Way F 1.2 MCON Series(GY)

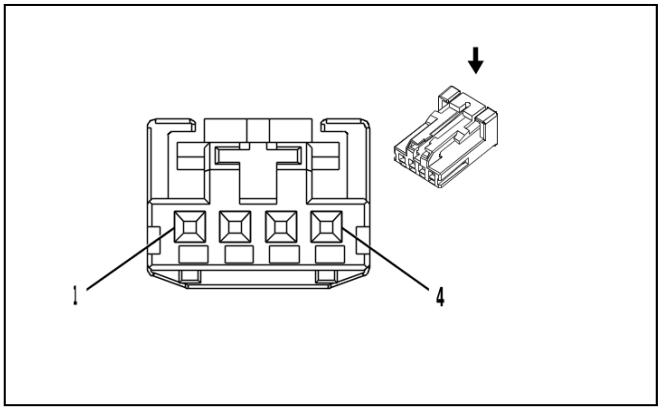
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

P19W Radio Front Speaker - Instrument Panel Right (UQA)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BN / BK	(1) 1953	(1) Right Front Midrange Speaker [-] Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) WH / YE	(2) 1853	(2) Right Front Midrange Speaker [+] Control	(2) I	(2) —

P43 Forward Collision Alert Display



2717162

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 1-936119-1
- Service Connector: 19367524
- Description: 4-Way F 0.64 Micro-Quadlock Series(BK)

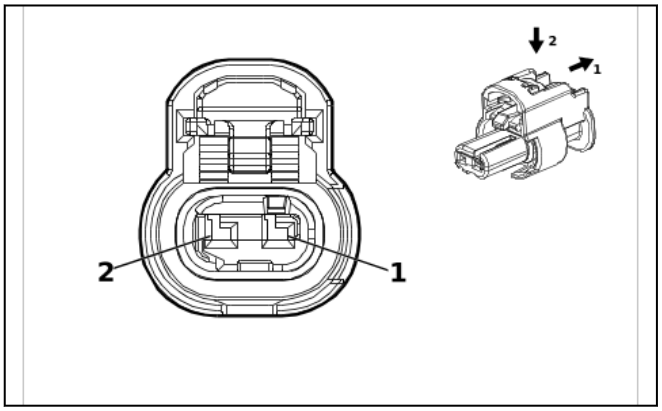
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

P43 Forward Collision Alert Display

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) VT / BK	(1) 1639	(1) Run/Crank Ignition 1 Voltage	(1) I	(1) —
(2) 2	(2) 0.35	(2) GY / YE	(2) 3885	(2) Forward Collision Alert LED Control	(2) I	(2) —
(3) 3	(3) 0.35	(3) GY / BK	(3) 4787	(3) Day Night LED Control	(3) I	(3) —
(4) 4	(4) 0.35	(4) BK / WH	(4) 2151	(4) Signal Ground	(4) I	(4) —

Q2 Air Conditioning Clutch



4649903

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296694-1
- Service Connector: 85761014
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

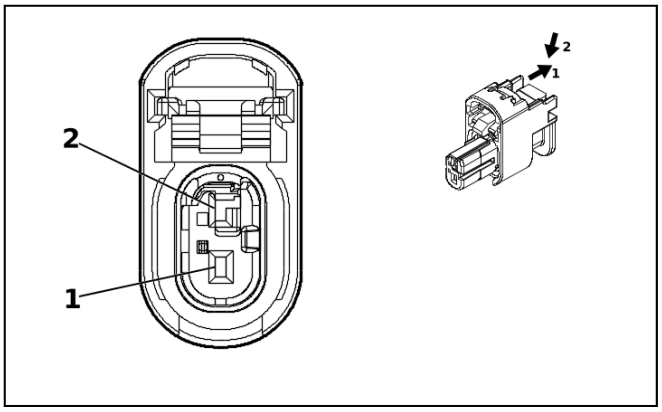
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

Q2 Air Conditioning Clutch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BK	(1) 450	(1) Ground	(1) I	(1) —
(2) 2	(2) 0.75	(2) BN / GN	(2) 59	(2) Air Conditioning Compressor Clutch Control	(2) I	(2) —

Q6E Camshaft Position Actuator Solenoid Valve - Exhaust



5340268

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296702-2
- Service Connector: 19371204
- Description: 2-Way F 1.2 MCON-CB Series, Sealed(BK)

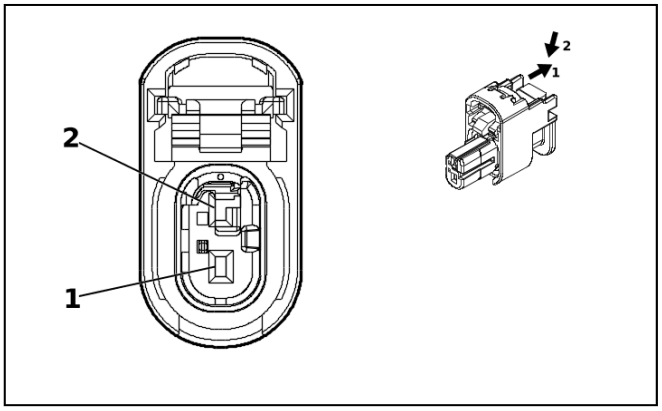
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

Q6E Camshaft Position Actuator Solenoid Valve - Exhaust

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / BU	(1) 5282	(1) Exhaust Camshaft Position Actuator Solenoid Valve 1	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / VT	(2) 6754	(2) Camshaft Position Actuator Solenoid Valve 1 Low Reference	(2) I	(2) —

Q6F Camshaft Position Actuator Solenoid Valve - Intake



5340268

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296702-2
- Service Connector: 19371204
- Description: 2-Way F 1.2 MCON-CB Series, Sealed(BK)

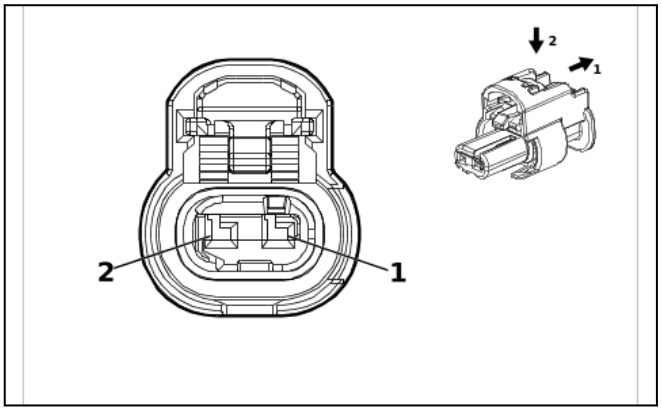
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

Q6F Camshaft Position Actuator Solenoid Valve - Intake

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / BN	(1) 5284	(1) Intake Camshaft Position Actuator Solenoid Valve 1	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK / BN	(2) 6753	(2) Camshaft Position Actuator Solenoid Valve 1 Low Reference	(2) I	(2) —

Q9F Differential Locking Actuator - Front (G93)



4649903

Connector Part Information

- Harness Type: Power Steering Wiring Harness
- OEM Connector: 1-2296694-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

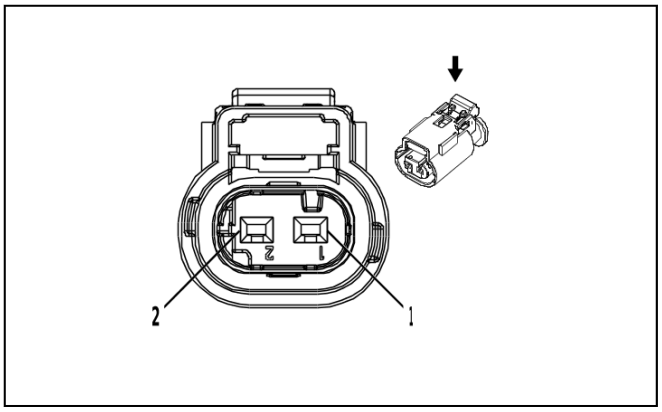
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

Q9F Differential Locking Actuator - Front (G93)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) VT / WH	(1) 7256	(1) Front Differential Lock Actuator Control	(1) I	(1) —
(2) 2	(2) 0.75	(2) WH / BK	(2) 7254	(2) Front Differential Lock Actuator Low Control	(2) I	(2) —

Q12 Evaporative Emission Canister Purge Solenoid Valve



2717066

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 10010337
- Service Connector: 13587326
- Description: 2-Way F 1.2 Multilock Series, Sealed(BK)

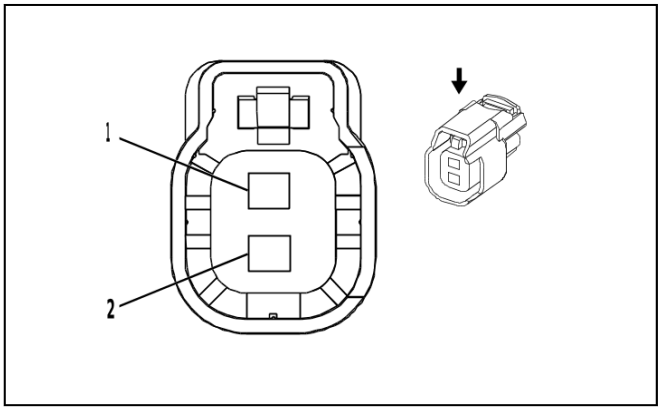
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

Q12 Evaporative Emission Canister Purge Solenoid Valve

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / BU	(1) 5293	(1) Powertrain Main Relay Fused Supply Voltage 4	(1) I	(1) —
(2) 2	(2) 0.5	(2) GN / BU	(2) 428	(2) EVAP Canister Purge Solenoid Control	(2) I	(2) —

Q13 Evaporative Emission Canister Vent Solenoid Valve



2422378

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 34062-0028
- Service Connector: 13579002
- Description: 2-Way F 1.5 Series, Sealed(BK)

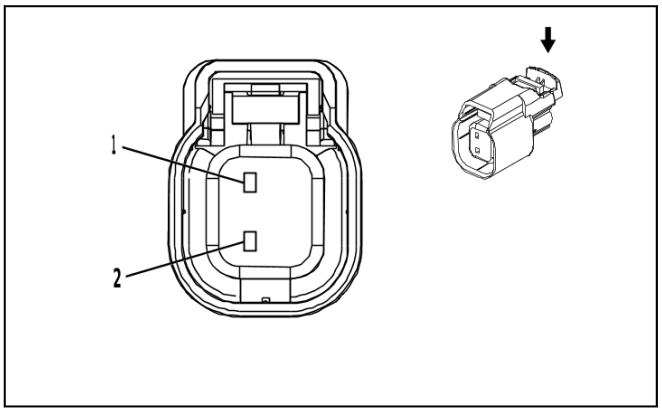
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

Q13 Evaporative Emission Canister Vent Solenoid Valve

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH	(1) 1310	(1) EVAP Vent Solenoid Valve Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) RD / WH	(2) 4140	(2) Battery Positive Voltage	(2) I	(2) —

Q17A Fuel Injector 1



2792100

Connector Part Information
- Harness Type: Fuel Injector Wiring Harness
- OEM Connector: 34062-4008
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.5 Series, Sealed(BK)

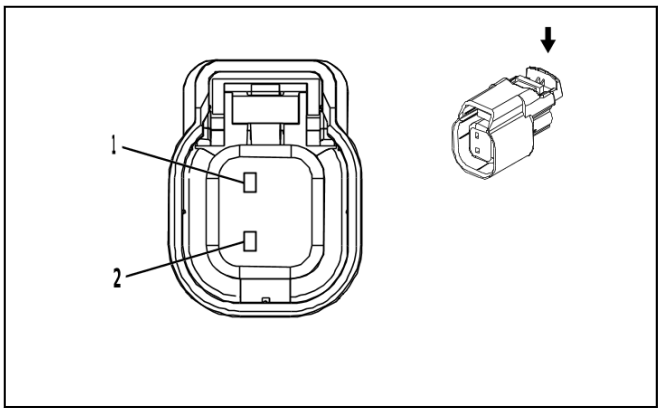
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

Q17A Fuel Injector 1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.8	(1) BN	(1) 4801	(1) Direct Fuel Injector High Voltage Control Cylinder 1	(1) I	(1) —
(2) 2	(2) 0.8	(2) BN / WH	(2) 4901	(2) Direct Fuel Injector High Voltage Supply Cylinder 1	(2) I	(2) —

Q17B Fuel Injector 2



2792100

Connector Part Information
- Harness Type: Fuel Injector Wiring Harness
- OEM Connector: 34062-4008
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.5 Series, Sealed(BK)

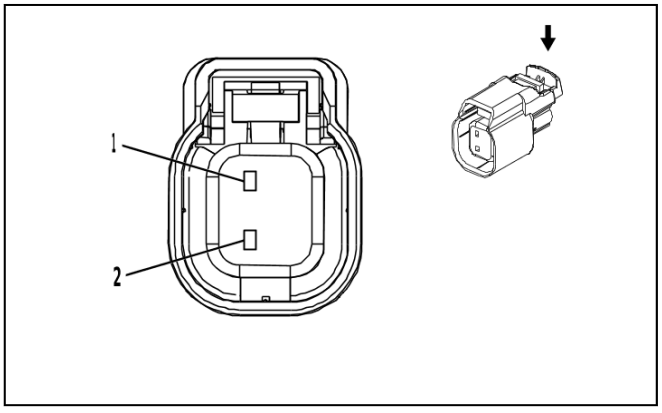
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

Q17B Fuel Injector 2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.8	(1) BU	(1) 4802	(1) Direct Fuel Injector High Voltage Control Cylinder 2	(1) I	(1) —
(2) 2	(2) 0.8	(2) BU / GY	(2) 4902	(2) Direct Fuel Injector High Voltage Supply Cylinder 2	(2) I	(2) —

Q17C Fuel Injector 3



2792100

Connector Part Information
- Harness Type: Fuel Injector Wiring Harness
- OEM Connector: 34062-4008
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.5 Series, Sealed(BK)

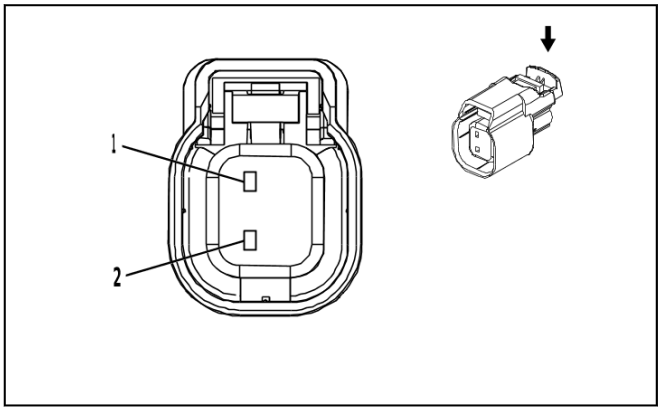
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

Q17C Fuel Injector 3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.8	(1) GN	(1) 4803	(1) Direct Fuel Injector High Voltage Control Cylinder 3	(1) I	(1) —
(2) 2	(2) 0.8	(2) GN / GY	(2) 4903	(2) Direct Fuel Injector High Voltage Supply Cylinder 3	(2) I	(2) —

Q17D Fuel Injector 4



2792100

Connector Part Information

- Harness Type: Fuel Injector Wiring Harness
- OEM Connector: 34062-4008
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.5 Series, Sealed(BK)

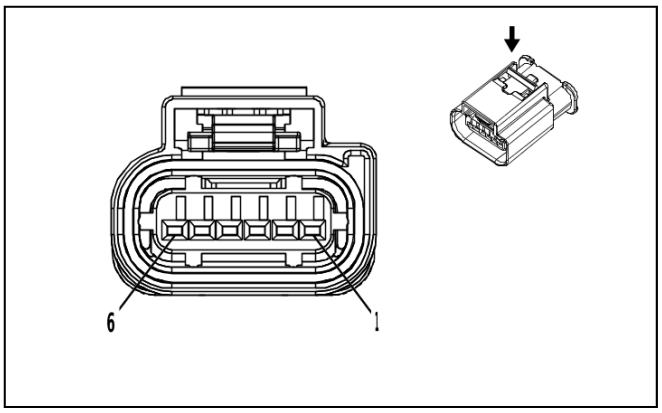
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required

Q17D Fuel Injector 4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.8	(1) GY / BU	(1) 4804	(1) Direct Fuel Injector High Voltage Control Cylinder 4	(1) I	(1) —
(2) 2	(2) 0.8	(2) BU / WH	(2) 4904	(2) Direct Fuel Injector High Voltage Supply Cylinder 4	(2) I	(2) —

Q38 Throttle Body



3747579

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 2272975-5
- Service Connector: 19352911
- Description: 6-Way F 1.2 MCON Series, Sealed(BK)

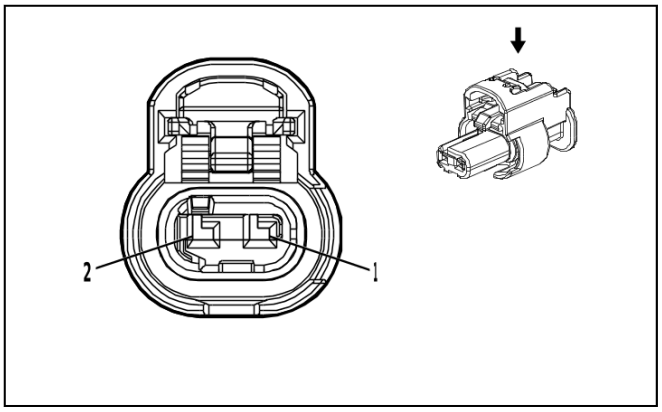
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

Q38 Throttle Body

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) YE	(1) 581	(1) Throttle Actuator Open Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) BN / WH	(2) 582	(2) Throttle Actuator Close Control	(2) I	(2) —
(3) 3	(3) 0.5	(3) BU / WH	(3) 3630	(3) Throttle Position Sensor SENT 1 Signal	(3) I	(3) —
(4) 4	(4) 0.5	(4) BK / BN	(4) 2752	(4) Throttle Position Sensor Low Reference	(4) I	(4) —
(5) 5	(5) 0.5	(5) BN / RD	(5) 2701	(5) Throttle Position Sensor 5V Reference	(5) I	(5) —
6	—	—	—	Not Occupied	—	—

Q40 Turbocharger Bypass Valve Solenoid



4690744

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296694-3
- Service Connector: 19366871
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

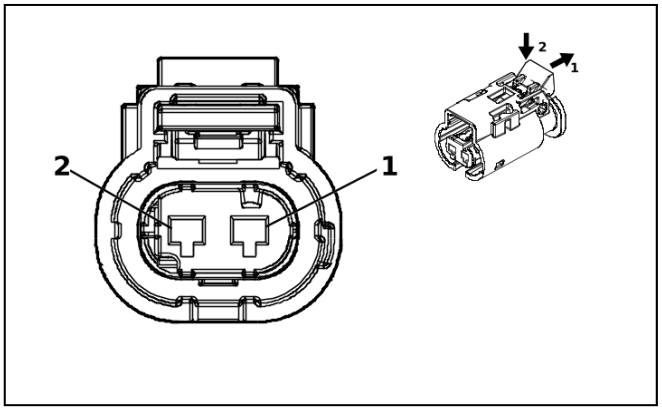
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

Q40 Turbocharger Bypass Valve Solenoid

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / BU	(1) 5293	(1) Powertrain Main Relay Fused Supply Voltage 4	(1) I	(1) —
(2) 2	(2) 0.5	(2) GN	(2) 3060	(2) Turbocharger Bypass Solenoid Valve Control Bank 1	(2) I	(2) —

Q44 Engine Oil Pressure Control Solenoid Valve



5245486

Connector Part Information
- Harness Type: Oil Pump Flow Control Solenoid Valve Harness
- OEM Connector: 10142540
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way M 1.2 MLK Series, Sealed(BK)

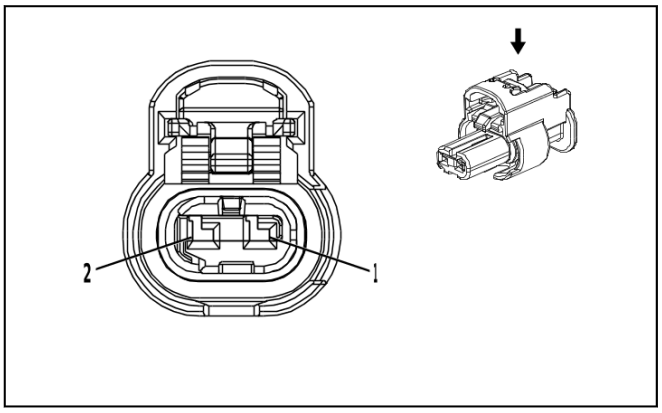
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-13 (BU)	No Tool Required

Q44 Engine Oil Pressure Control Solenoid Valve

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) YE / BN	(1) 106	(1) Oil Pump Motor Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU	(2) 179	(2) Engine Oil Pump Control	(2) I	(2) —

Q46 Air Conditioning Compressor Solenoid Valve



4335931

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296694-2
- Service Connector: 19366843
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

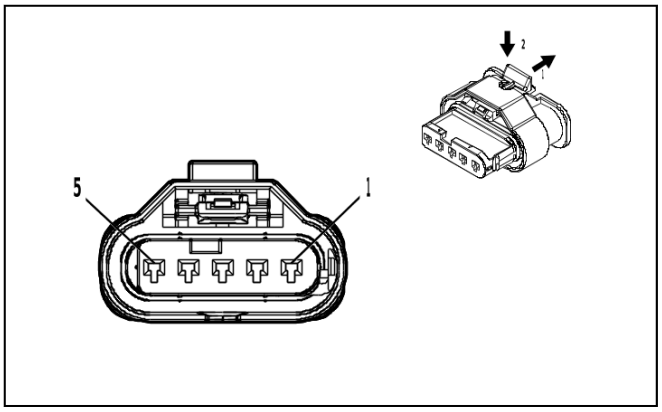
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

Q46 Air Conditioning Compressor Solenoid Valve

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BU / YE	(1) 7574	(1) Air Conditioning Compressor Solenoid Valve Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU / BN	(2) 7573	(2) Air Conditioning Compressor Solenoid Valve Control	(2) I	(2) —

Q74 Engine Coolant Bypass Valve



4994456

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 2-2236898-5
- Service Connector: 19371191
- Description: 5-Way F 1.2 MCON-LL Series, Sealed(NA)

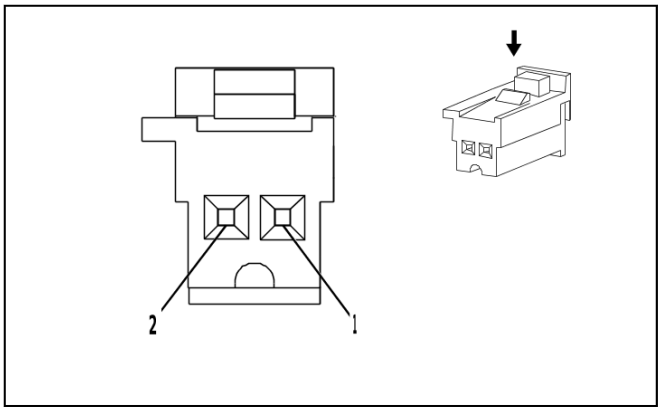
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

Q74 Engine Coolant Bypass Valve

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BU	(1) 2976	(1) Coolant Diverter Valve Actuator Control Open	(1) I	(1) —
(2) 2	(2) 0.5	(2) BU / BN	(2) 2977	(2) Coolant Diverter Valve Actuator Control Close	(2) I	(2) —
(3) 3	(3) 0.5	(3) WH / RD	(3) 480	(3) Engine Control Vehicle Sensors 5 Volt Reference 1	(3) I	(3) —
(4) 4	(4) 0.5	(4) BU / GY	(4) 2978	(4) Coolant Diverter Valve Position Signal	(4) I	(4) —
(5) 5	(5) 0.5	(5) BK / GN	(5) 580	(5) Engine Control Sensors Low Reference 2	(5) I	(5) —

Q77A Transmission Control Solenoid Valve 1



4051391

Connector Part Information
- Harness Type: Automatic Transmission Wiring Harness
- OEM Connector: 13956948
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 0.64 MTS Series(VT)

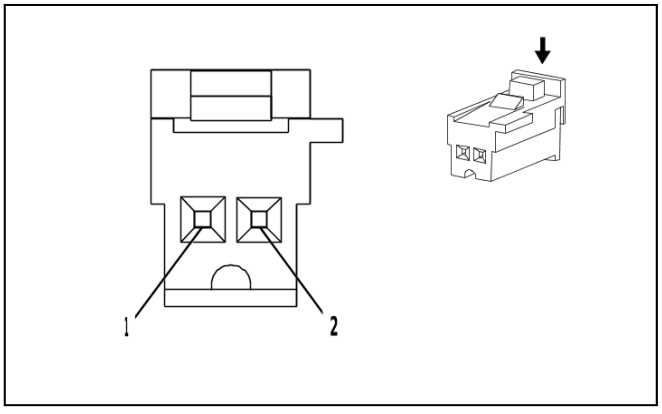
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

Q77A Transmission Control Solenoid Valve 1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BN	(1) 6400	(1) Clutch Solenoid Valve A Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) GY / BN	(2) 6388	(2) Transmission High Side Driver 2 Control	(2) I	(2) —

Q77B Transmission Control Solenoid Valve 2



4008644

Connector Part Information
- Harness Type: Automatic Transmission Wiring Harness
- OEM Connector: 13941672
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 0.64 MTS Series(GY)

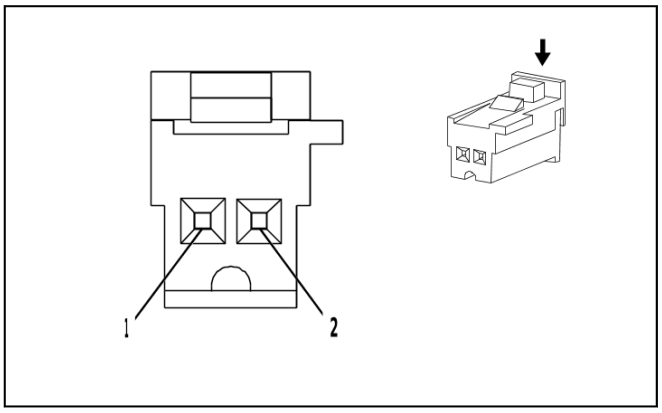
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

Q77B Transmission Control Solenoid Valve 2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BU	(1) 6401	(1) Clutch Solenoid Valve B Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) GY / BN	(2) 6388	(2) Transmission High Side Driver 2 Control	(2) I	(2) —

Q77C Transmission Control Solenoid Valve 3



4008644

Connector Part Information

- Harness Type: Automatic Transmission Wiring Harness
- OEM Connector: 13941672
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 0.64 MTS Series(GY)

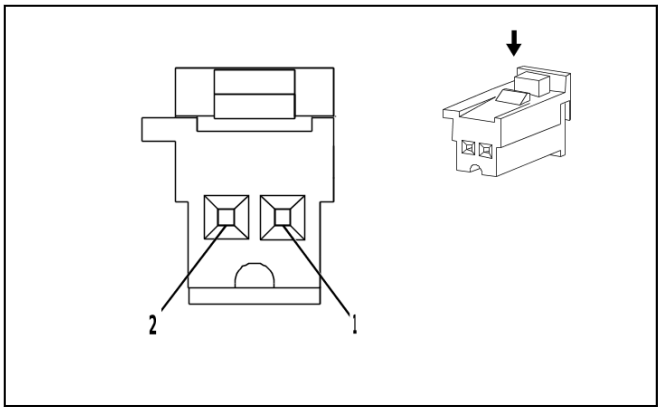
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

Q77C Transmission Control Solenoid Valve 3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY	(1) 6402	(1) Clutch Solenoid Valve C Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) GY / BN	(2) 6388	(2) Transmission High Side Driver 2 Control	(2) I	(2) —

Q77D Transmission Control Solenoid Valve 4



4051391

Connector Part Information
- Harness Type: Automatic Transmission Wiring Harness
- OEM Connector: 13956948
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 0.64 MTS Series(VT)

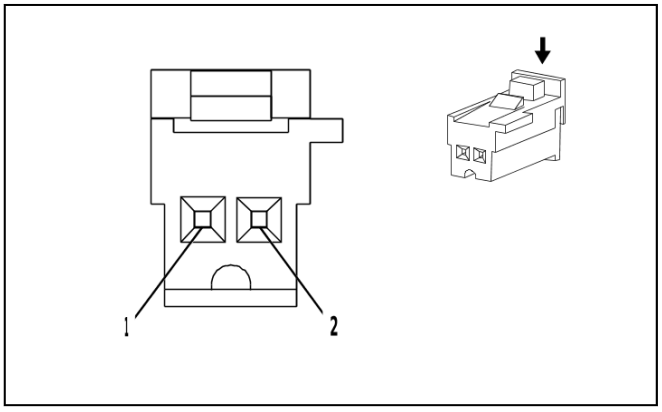
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

Q77D Transmission Control Solenoid Valve 4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) WH	(1) 4508	(1) Transmission Clutch G Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) GN / GY	(2) 6387	(2) Transmission High Side Driver 1 Control	(2) I	(2) —

Q77G Transmission Control Solenoid Valve 7



4008644

Connector Part Information
- Harness Type: Automatic Transmission Wiring Harness
- OEM Connector: 13941672
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 0.64 MTS Series(GY)

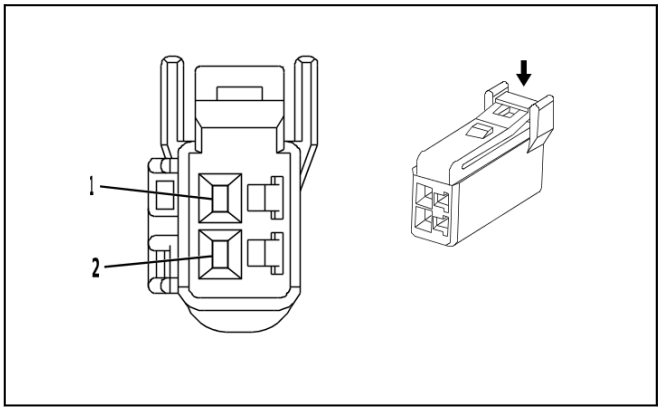
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

Q77G Transmission Control Solenoid Valve 7

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) YE / BN	(1) 6404	(1) Clutch Solenoid Valve E Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) GY / BN	(2) 6388	(2) Transmission High Side Driver 2 Control	(2) I	(2) —

Q77H Transmission Control Solenoid Valve 8



4051682

Connector Part Information

- Harness Type: Automatic Transmission Wiring Harness
- OEM Connector: 7287-0122
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 040 III Series(NA)

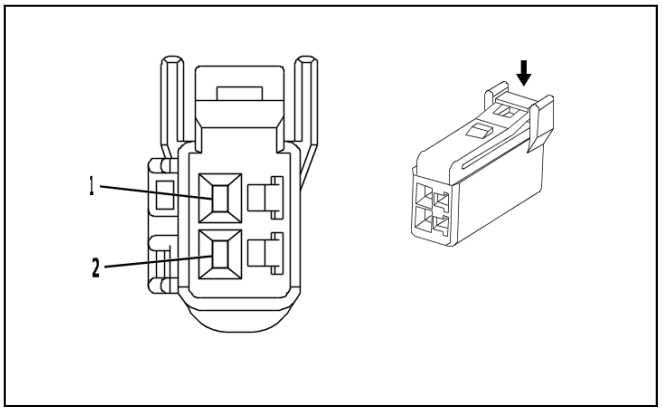
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

Q77H Transmission Control Solenoid Valve 8

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GN / GY	(1) 6387	(1) Transmission High Side Driver 1 Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) GN / WH	(2) 6380	(2) Torque Converter Clutch Enable Solenoid Valve A Control	(2) I	(2) —

Q77J Transmission Control Solenoid Valve 9



4051682

Connector Part Information
- Harness Type: Automatic Transmission Wiring Harness
- OEM Connector: 7287-0122
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 040 III Series(NA)

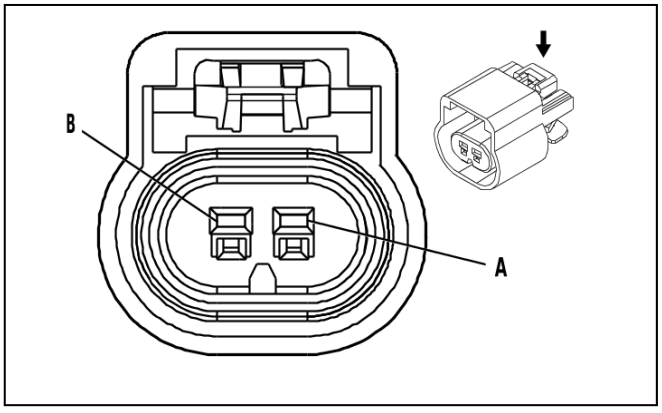
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

Q77J Transmission Control Solenoid Valve 9

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / BN	(1) 6388	(1) Transmission High Side Driver 2 Control	(1) I	(1) —
(2) 2	(2) 0.5	(2) YE / BN	(2) 6210	(2) Torque Converter Clutch Enable Solenoid Valve B Control	(2) I	(2) —

R6A Terminating Resistor - High Speed Bus (A45)



523630

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 19153731
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 150 GT Series, Sealed(BK)

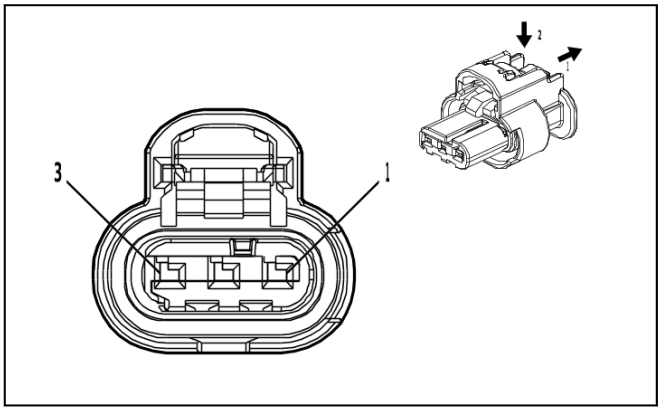
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-2A (GY)	No Tool Required

R6A Terminating Resistor - High Speed Bus (A45)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	—	BU / VT	4101	AUTOSAR CAN Bus [+] 4 Serial Data	I	—
B	—	WH	4100	AUTOSAR CAN Bus [-] 4 Serial Data	I	—

Q97B Engine Coolant Flow Control Valve - Block



4778903

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 1-2296695-2
- Service Connector: 86792095
- Description: 3-Way F 1.2 MCON-CB Series, Sealed(BK)

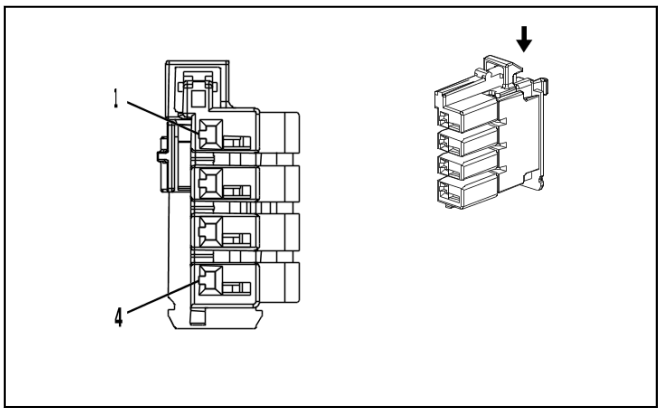
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

Q97B Engine Coolant Flow Control Valve - Block

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GN / BN	(1) 2732	(1) Engine Control Module LIN Bus 4	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK	(2) 550	(2) Ground	(2) I	(2) —
(3) 3	(3) 0.5	(3) VT / BU	(3) 5294	(3) Powertrain Main Relay Fused Supply Voltage 5	(3) I	(3) —

S2 Automatic Transmission Manual Shift Shaft Position Switch



4364148

Connector Part Information

- Harness Type: Automatic Transmission Wiring Harness
- OEM Connector: 2289524-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 1.2 MCON Series(BN)

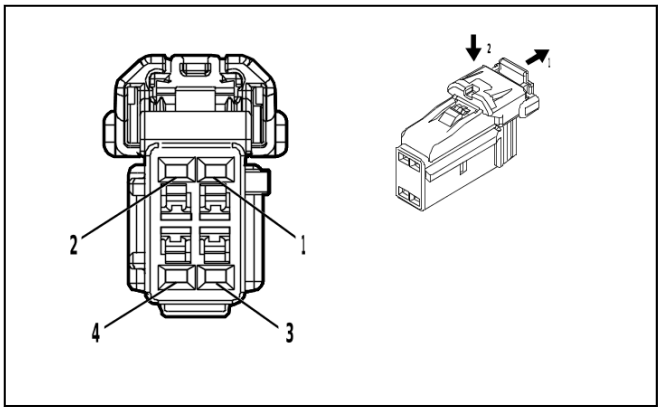
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

S2 Automatic Transmission Manual Shift Shaft Position Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GN / YE	(1) 3337	(1) Transmission Internal Mode Switch Mode Control Y	(1) I	(1) —
(2) 2	(2) 0.5	(2) WH / RD	(2) 596	(2) 5V Reference	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / GY	(3) 3927	(3) Transmission Internal Mode Switch Feedback Signal	(3) I	(3) —
(4) 4	(4) 0.5	(4) BU / WH	(4) 3338	(4) Transmission Internal Mode Switch Mode Control X	(4) I	(4) —

S3 Automatic Transmission Control



4872683

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 6098-8435
- Service Connector: 19369633
- Description: 4-Way F 1.2 Series(BK)

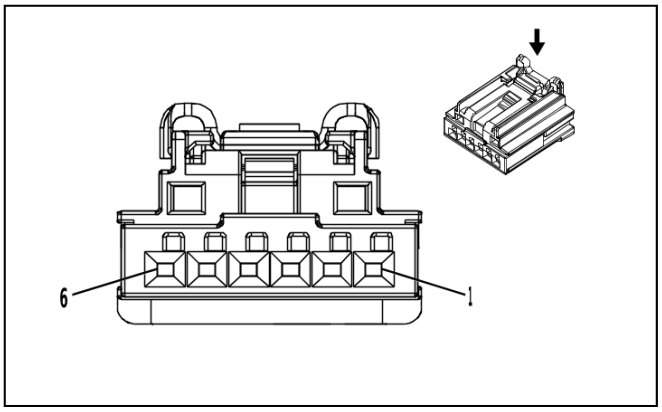
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

S3 Automatic Transmission Control

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) VT / BK	(1) 7553	(1) Park Lock Solenoid Actuator Control	(1) I	(1) —
(2) 2	(2) 0.35	(2) WH / VT	(2) 5905	(2) Key Capture/Column Lock Shift Position Signal	(2) I	(2) —
(3) 3	(3) 0.35	(3) GN / BU	(3) 3738	(3) Tap Up/Tap Down Switch Signal 2	(3) I	(3) —
(4) 4	(4) 0.5	(4) BK	(4) 2050	(4) Ground	(4) I	(4) —

S13D Door Lock Switch - Driver



4145138

Connector Part Information

- Harness Type: Front Side Door Door Wiring Harness - Driver
- OEM Connector: 2035363-2
- Service Connector: Service by Harness - See Part Catalog
- Description: 6-Way F 0.64 Generation Y Series(BK)

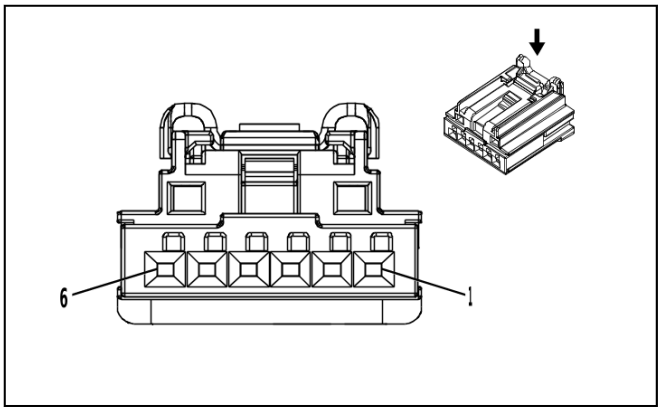
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

S13D Door Lock Switch - Driver

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BN / GY	(1) 4784	(1) Left Front Door LED Backlight Dimming Control	(1) I	(1) —
(2) 2	(2) 0.35	(2) VT / YE	(2) 4244	(2) Left Front Door Lock Indicator Control	(2) I	(2) —
(3) 3	(3) 0.35	(3) BN / YE	(3) 2771	(3) Left Front Door Lock Switch Lock Signal	(3) I	(3) —
(4) 4	(4) 0.35	(4) BN / WH	(4) 2772	(4) Left Front Door Lock Switch Unlock Signal	(4) I	(4) —
(5) 5	(5) 0.35	(5) BK	(5) 1150	(5) Ground	(5) I	(5) —
6	—	—	—	Not Occupied	—	—

S13P Door Lock Switch - Passenger



4145138

Connector Part Information

- Harness Type: Front Side Door Door Wiring Harness - Passenger
- OEM Connector: 2035363-2
- Service Connector: Service by Harness - See Part Catalog
- Description: 6-Way F 0.64 Generation Y Series(BK)

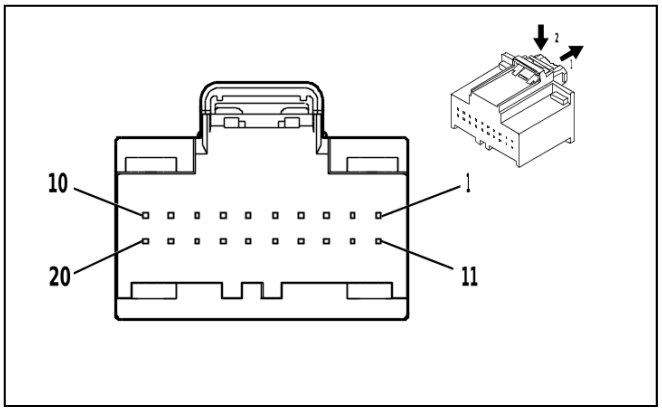
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

S13P Door Lock Switch - Passenger

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GY / VT	(1) 4638	(1) LED Backlight Dimming Control Right Front Door	(1) I	(1) —
(2) 2	(2) 0.35	(2) YE / BU	(2) 4245	(2) Right Front Door Lock Indicator Control	(2) I	(2) —
(3) 3	(3) 0.35	(3) YE / VT	(3) 2773	(3) Right Front Door Lock Switch Lock Control	(3) I	(3) —
(4) 4	(4) 0.35	(4) BN / VT	(4) 2774	(4) Right Front Door Lock Switch Unlock Control	(4) I	(4) —
(5) 5	(5) 0.35	(5) BK	(5) 3450	(5) Ground	(5) I	(5) —
6	—	—	—	Not Occupied	—	—

S26 Hazard Warning Switch



5109511

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 31410-0208
- Service Connector: 13525993
- Description: 20-Way F 0.64 Series(GN)

Terminal Part Information

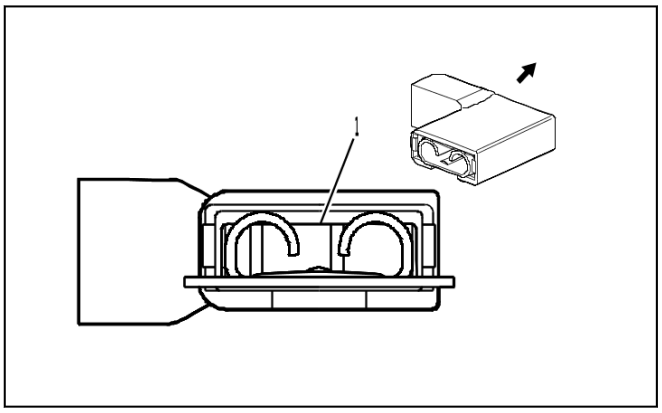
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13584547	J-35616-64B (L-BU)	J-38125-215A

S26 Hazard Warning Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BK / WH	(1) 2151	(1) Signal Ground	(1) I	(1) —
(2) 2	(2) 0.35	(2) YE	(2) 6817	(2) LED Backlight Dimming Control 1	(2) I	(2) —
(3) 3	(3) 0.35	(3) GN / WH	(3) 111	(3) Hazard Warning Switch Signal	(3) I	(3) —
(4) 4	(4) 0.35	(4) WH	(4) 6816	(4) Indicator Dimming Control	(4) I	(4) —
(5) 5	(5) 0.35	(5) GN	(5) 1110	(5) Stop/Start Indicator Control	(5) I	(5) —
(6) 6	(6) 0.35	(6) BU	(6) 1111	(6) Stop/Start Switch Signal	(6) I	(6) —
(7) 7	(7) 0.35	(7) WH	(7) 3152	(7) Lane Departure Warning Indicator Control	(7) I	(7) —
(8) 8	(8) 0.35	(8) GY / WH	(8) 3153	(8) Lane Departure Warning Disable Switch Signal	(8) I	(8) —
(9) 9	(9) 0.35	(9) BU / YE	(9) 7176	(9) All Windows Open Switch Signal	(9) I	(9) —
10	—	—	—	Not Occupied	—	—
(11) 11	(11) 0.5	(11) YE / GN	(11) 7122	(11) Axle Differential Lock Switch Signal	(11) I	(11) —
(12) 12	(12) 0.5	(12) YE	(12) 7115	(12) Rear Axle Differential Lock Indicator Control	(12) I	(12) —
(13) 13	(13) 0.5	(13) VT / GY	(13) 7117	(13) Front Axle Differential Lock Indicator Control	(13) I	(13) —
14	—	—	—	Not Occupied	—	—
(15) 15	(15) 0.35	(15) BU / WH	(15) 3119	(15) Roof Rail Air Bag Disable Switch Signal	(15) I	(15) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(16) 16	(16) 0.35	(16) BN / WH	(16) 3895	(16) Roof Rail Air Bag Disable Switch Low Reference	(16) I	(16) —
17	—	—	—	Not Occupied	—	—
(18) 18	(18) 0.5	(18) BU / WH	(18) 10716	(18) Upfitter Accessory Relay 1 Coil Control	(18) I	(18) —
(19) 19	(19) 0.35	(19) GY	(19) 4989	(19) Driver Mode 2 Switch Signal	(19) I	(19) —
20	—	—	—	Not Occupied	—	—

S33 Steering Wheel Horn Contact



1862161

Connector Part Information
- Harness Type: Steering Wheel Horn Switch Wiring Harness
- OEM Connector: 3-170823-8
- Service Connector: Service by Harness - See Part Catalog
- Description: 1-Way F 187 Faston(NA)

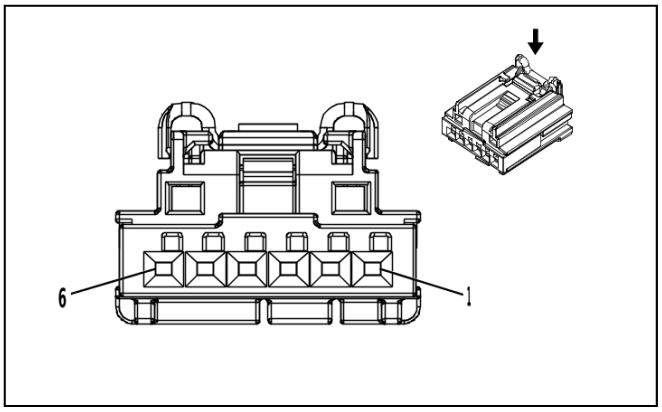
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-40 (BU)	No Tool Required
II	Not required	No Tool Required	No Tool Required

S33 Steering Wheel Horn Contact

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BK / WH	(1) 6051	(1) Steering Wheel Ground	(1) I	(1) —
(2) 2	(2) 0.35	(2) GN / WH	(2) 3287	(2) Horn Switch Signal	(2) II	(2) —

S36 Dimmer Switch



3960313

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 2035363-4
- Service Connector: 19332786
- Description: 6-Way F 0.64 Generation Y Series(BK)

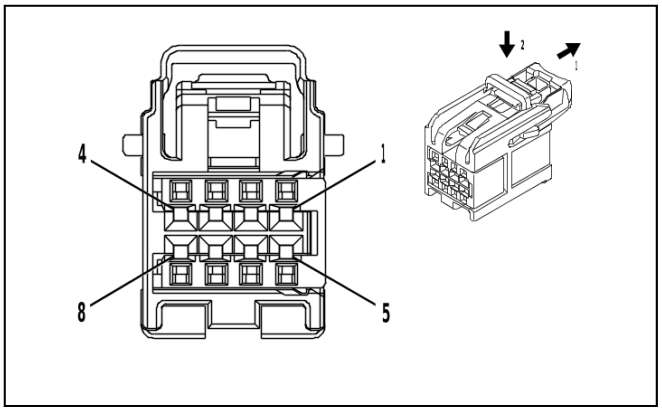
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

S36 Dimmer Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BK / YE	(1) 5005	(1) Instrument Panel Lamp Dimmer Switch Low Reference	(1) I	(1) —
(2) 2	(2) 0.35	(2) YE / GY	(2) 44	(2) Instrument Panel Lamp Dimmer Switch Signal	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.35	(4) BK	(4) 2050	(4) Ground	(4) I	(4) —
(5) 5	(5) 0.35	(5) YE	(5) 6817	(5) LED Backlight Dimming Control 1	(5) I	(5) —
6	—	—	—	Not Occupied	—	—

S38 On/Off Vehicle Switch



4232228

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 15526973
- Service Connector: 19353873
- Description: 8-Way F 0.64 OCS Series(GY)

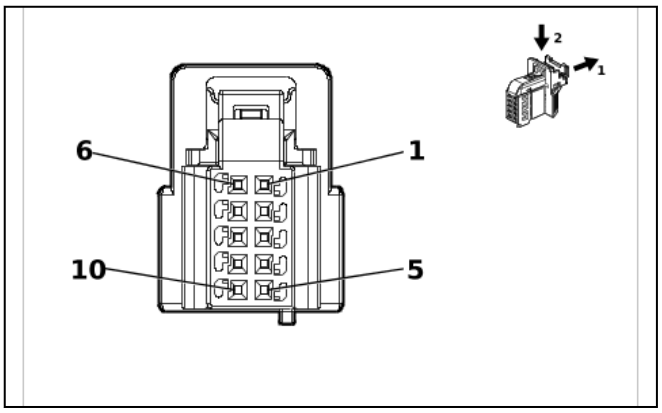
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

S38 On/Off Vehicle Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BU / BK	(1) 5719	(1) Ignition Mode Switch Start LED Signal	(1) I	(1) —
(2) 2	(2) 0.35	(2) BN / BK	(2) 5720	(2) Ignition Mode Switch Accessory LED Signal	(2) I	(2) —
(3) 3	(3) 0.75	(3) BK / WH	(3) 2151	(3) Signal Ground	(3) I	(3) —
(4) 4	(4) 0.35	(4) BU / GN	(4) 5723	(4) Ignition Mode Switch Mode Voltage	(4) I	(4) —
(5) 5	(5) 0.35	(5) YE	(5) 6817	(5) LED Backlight Dimming Control 1	(5) I	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.35	(7) BK / GY	(7) 3559	(7) Passive Start Switch 2 Low Reference	(7) I	(7) —
(8) 8	(8) 0.35	(8) GN / BK	(8) 3558	(8) Passive Start Switch Signal 2	(8) I	(8) —

S47D Front Seat Adjuster Memory Switch - Driver (A45)



5838155

Connector Part Information

- Harness Type: Front Side Door Door Wiring Harness - Driver
- OEM Connector: 2310000-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 10-Way F 0.64 MQS Series(BK)

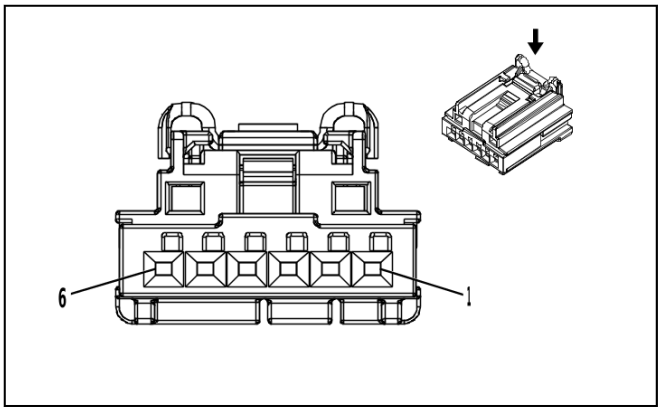
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

S47D Front Seat Adjuster Memory Switch - Driver (A45)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BN / GY	(1) 4784	(1) Left Front Door LED Backlight Dimming Control	(1) I	(1) —
(2) 2	(2) 0.35	(2) VT / YE	(2) 4244	(2) Left Front Door Lock Indicator Control	(2) I	(2) —
(3) 3	(3) 0.35	(3) BN / YE	(3) 2771	(3) Left Front Door Lock Switch Lock Signal	(3) I	(3) —
(4) 4	(4) 0.35	(4) BN / WH	(4) 2772	(4) Left Front Door Lock Switch Unlock Signal	(4) I	(4) —
(5) 5	(5) 0.35	(5) BK / WH	(5) 3051	(5) Signal Ground	(5) I	(5) —
(6) 6	(6) 0.35	(6) BU / GN	(6) 614	(6) Seat Memory Switch Set Signal	(6) I	(6) —
(7) 7	(7) 0.35	(7) WH	(7) 615	(7) Seat Memory Switch Signal 1	(7) I	(7) —
8 - 10	—	—	—	Not Occupied	—	—

S51 Communication Center Call Switch



3960313

Connector Part Information

- Harness Type: Roof Wiring Harness
- OEM Connector: 2035363-4
- Service Connector: 19332786
- Description: 6-Way F 0.64 Generation Y Series(BK)

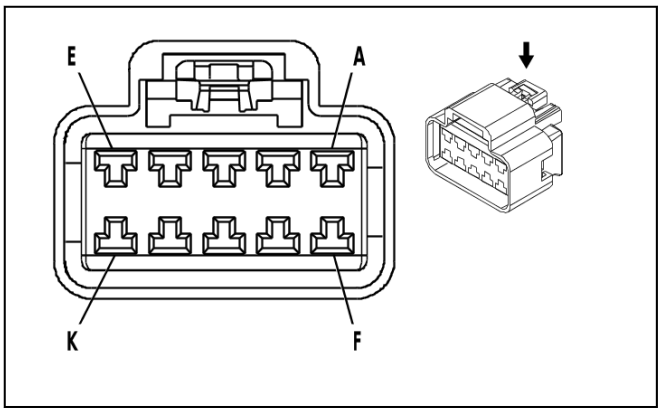
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

S51 Communication Center Call Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GN / BK	(1) 2515	(1) Telematics Switch Supply Voltage	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.35	(3) GN / WH	(3) 2514	(3) Telematics Switch Signal	(3) I	(3) —
(4) 4	(4) 0.35	(4) YE / VT	(4) 2516	(4) Telematics Switch Green LED Indicator Control	(4) I	(4) —
(5) 5	(5) 0.35	(5) BN / WH	(5) 2517	(5) Telematics Switch Red LED Indicator Control	(5) I	(5) —
(6) 6	(6) 0.35	(6) BK / WH	(6) 451	(6) Signal Ground	(6) I	(6) —

S64D Front Seat Adjuster Switch - Driver (A2X-A45)



623046

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 13523876
- Service Connector: Service by Harness - See Part Catalog
- Description: 10-Way F 280 GT Series(BK)

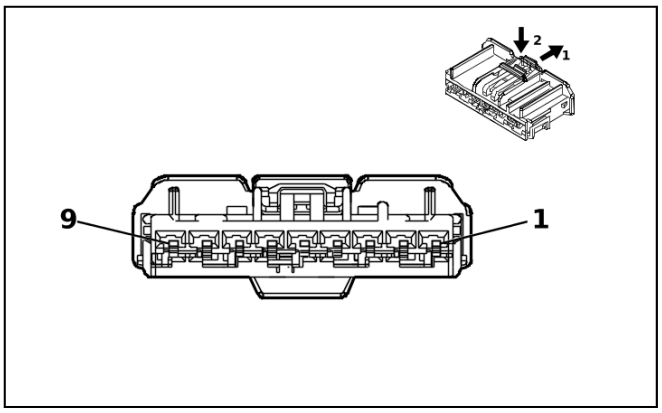
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

S64D Front Seat Adjuster Switch - Driver (A2X-A45)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	2.5	RD / GY	3540	Battery Positive Voltage	I	—
B	1.5	BU / YE	277	Driver Seat Recline Motor Rearward Control	I	—
C	1.5	YE / BU	285	Driver Seat Horizontal Motor Forward Control	I	—
D	1.5	GY / GN	284	Driver Seat Horizontal Motor Rearward Control	I	—
E	1.5	GY / BU	283	Driver Seat Rear Vertical Motor Down Control	I	—
F	1.5	GN / BN	286	Driver Seat Front Vertical Motor Up Control	I	—
G	1.5	YE	282	Driver Seat Rear Vertical Motor Up Control	I	—
H	1.5	GN / YE	276	Driver Seat Recline Motor Forward Control	I	—
J	2.5	BK	3750	Ground	I	—
K	1.5	BU / VT	287	Driver Seat Front Vertical Motor Down Control	I	—

S65D Front Seat Lumbar Switch - Driver (AL9)



5204289

Connector Part Information

- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 7289-6875-40
- Service Connector: Service by Harness - See Part Catalog
- Description: 9-Way F 2.8 YESC Series(GY)

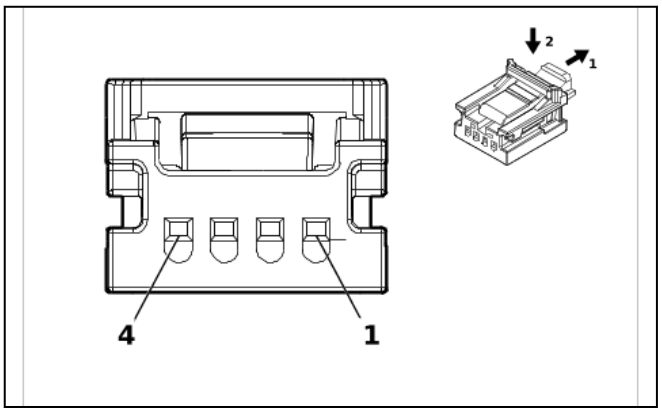
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-4A (PU)	No Tool Required

S65D Front Seat Lumbar Switch - Driver (AL9)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BK	(1) 3750	(1) Ground	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.75	(3) RD / WH	(3) 3440	(3) Battery Positive Voltage	(3) I	(3) —
4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.75	(5) BU	(5) 611	(5) Driver Seat Lumbar Support Motor Forward Control	(5) I	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.75	(7) VT	(7) 610	(7) Driver Seat Lumbar Support Motor Backward Control	(7) I	(7) —
8 - 9	—	—	—	Not Occupied	—	—

S70E Radio Favorites Switch - Steering Wheel



5493278

Connector Part Information

- Harness Type: Steering Wheel Horn Switch Wiring Harness
- OEM Connector: 34791-5140
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F Mini 50 Series(BK)

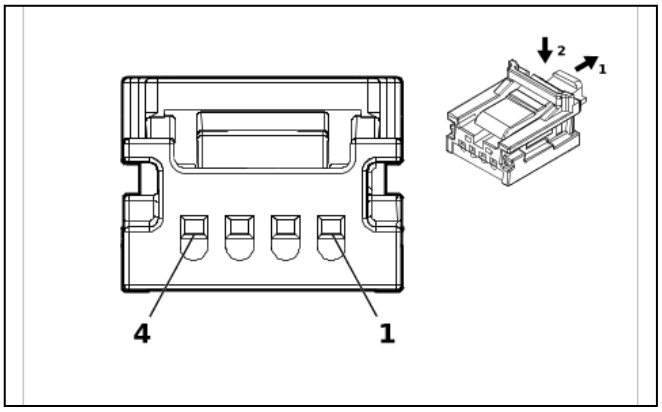
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	EL-35616-58 (BK)	No Tool Required

S70E Radio Favorites Switch - Steering Wheel

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BK / WH	(1) 6051	(1) Steering Wheel Ground	(1) I	(1) —
(2) 2	(2) 0.35	(2) WH / YE	(2) 4313	(2) Radio Favorite Forward Switch Signal	(2) I	(2) —
(3) 3	(3) 0.35	(3) YE / BU	(3) 4312	(3) Radio Favorite Back Switch Signal	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

S70F Radio Volume Switch - Steering Wheel



5493584

Connector Part Information

- Harness Type: Steering Wheel Horn Switch Wiring Harness
- OEM Connector: 34791-5141
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F Mini 50 Series(GY)

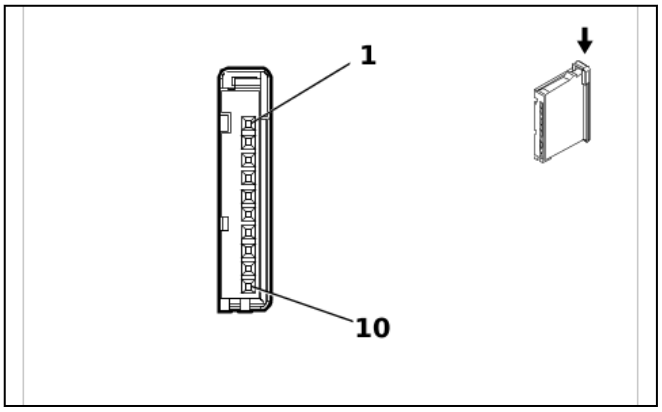
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	EL-35616-58 (BK)	No Tool Required

S70F Radio Volume Switch - Steering Wheel

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BK / WH	(1) 6051	(1) Steering Wheel Ground	(1) I	(1) —
(2) 2	(2) 0.35	(2) GY / BN	(2) 4314	(2) Radio Volume Down Switch Signal	(2) I	(2) —
(3) 3	(3) 0.35	(3) BU	(3) 4315	(3) Radio Volume Up Switch Signal	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

S70L Cruise Control Switch



6496613

Connector Part Information

- Harness Type: Steering Wheel Horn Switch Wiring Harness
- OEM Connector: 2282268-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 10-Way F 0.5 MQS Series(BK)

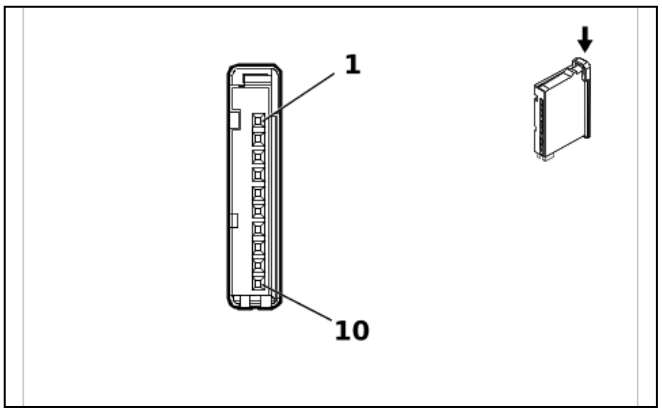
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	EL-35616-58 (BK)	No Tool Required

S70L Cruise Control Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.35	(3) GY / GN	(3) 5737	(3) Distance Sensing Cruise Control Gap Up/ Down Switch Signal	(3) I	(3) —
4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.35	(5) YE / BK	(5) 3893	(5) Steering Wheel LED Backlight Dimming Control	(5) I	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.35	(7) BN / GN	(7) 1884	(7) Cruise Control Set/Coast/Resume/Accelerate Switch Signal	(7) I	(7) —
(8) 8	(8) 0.35	(8) BK / VT	(8) 1449	(8) Steering Wheel Resistor Ladder Low Reference	(8) I	(8) —
9	—	—	—	Not Occupied	—	—
(10) 10	(10) 0.35	(10) BK / WH	(10) 6051	(10) Steering Wheel Ground	(10) I	(10) —

S70R Radio Control Switch - Steering Wheel



6496614

Connector Part Information

- Harness Type: Steering Wheel Horn Switch Wiring Harness
- OEM Connector: 2282268-2
- Service Connector: Service by Harness - See Part Catalog
- Description: 10-Way F 0.5 MQS Series(NA)

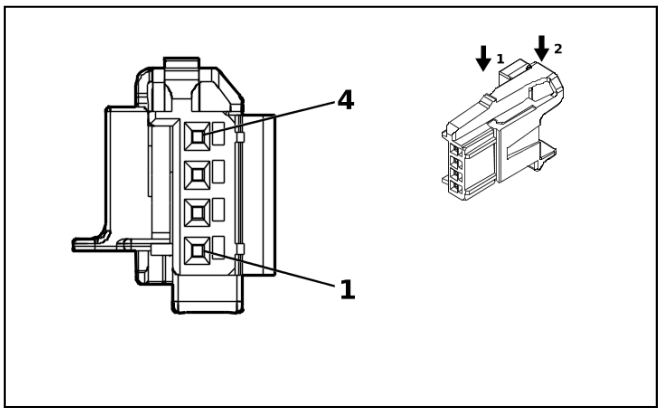
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	EL-35616-58 (BK)	No Tool Required

S70R Radio Control Switch - Steering Wheel

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) RD / GN	(1) 5140	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 0.35	(2) GY / BN	(2) 4314	(2) Radio Volume Down Switch Signal	(2) I	(2) —
(3) 3	(3) 0.35	(3) WH / YE	(3) 4313	(3) Radio Favorite Forward Switch Signal	(3) I	(3) —
(4) 4	(4) 0.35	(4) GN / BK	(4) 10652	(4) Radio LIN Bus 1	(4) I	(4) —
(5) 5	(5) 0.35	(5) YE / BK	(5) 3893	(5) Steering Wheel LED Backlight Dimming Control	(5) I	(5) —
(6) 6	(6) 0.35	(6) YE / GY	(6) 5883	(6) Steering Wheel Heating Switch Signal	(6) I	(6) —
(7) 7	(7) 0.35	(7) BN / WH	(7) 5884	(7) Steering Wheel Heating Switch LED Control	(7) I	(7) —
(8) 8	(8) 0.35	(8) BK / WH	(8) 6051	(8) Steering Wheel Ground	(8) I	(8) —
(9) 9	(9) 0.35	(9) BU	(9) 4315	(9) Radio Volume Up Switch Signal	(9) I	(9) —
(10) 10	(10) 0.35	(10) YE / BU	(10) 4312	(10) Radio Favorite Back Switch Signal	(10) I	(10) —

S72 Sunroof Switch (CAC)



5191926

Connector Part Information

- Harness Type: Roof Wiring Harness
- OEM Connector: 2294399-1
- Service Connector: 84724190
- Description: 4-Way F 0.64 Micro-Quadlock Series(BK)

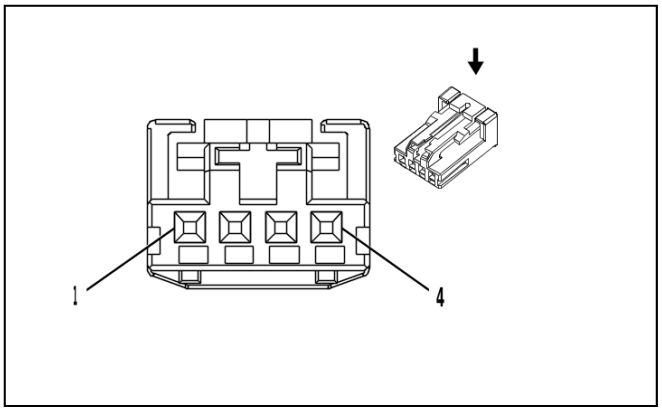
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

S72 Sunroof Switch (CAC)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BK	(1) 4250	(1) Ground	(1) I	(1) —
(2) 2	(2) 0.35	(2) YE	(2) 6817	(2) LED Backlight Dimming Control 1	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.35	(4) BU / VT	(4) 5027	(4) Sunroof Switch Serial Data 1 Signal	(4) I	(4) —

S76 Trailer Brake Control Switch (JL1 & Z82)



2717162

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 1-936119-1
- Service Connector: 19367524
- Description: 4-Way F 0.64 Micro-Quadlock Series(BK)

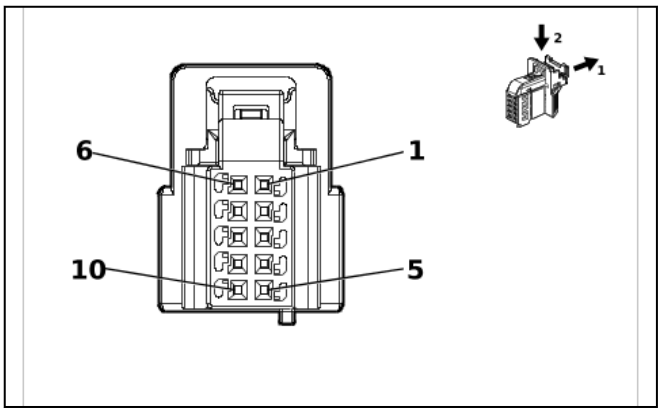
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

S76 Trailer Brake Control Switch (JL1 & Z82)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) RD / VT	(1) 4040	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 0.35	(2) GN / BU	(2) 2733	(2) Brake System Control Module LIN Bus 2	(2) I	(2) —
(3) 3	(3) 0.35	(3) BK	(3) 2050	(3) Ground	(3) I	(3) —
4	—	—	—	Not Occupied	—	—

S78 Turn Signal Switch



5838155

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 2310000-1
- Service Connector: 13518417
- Description: 10-Way F 0.64 MQS Series(BK)

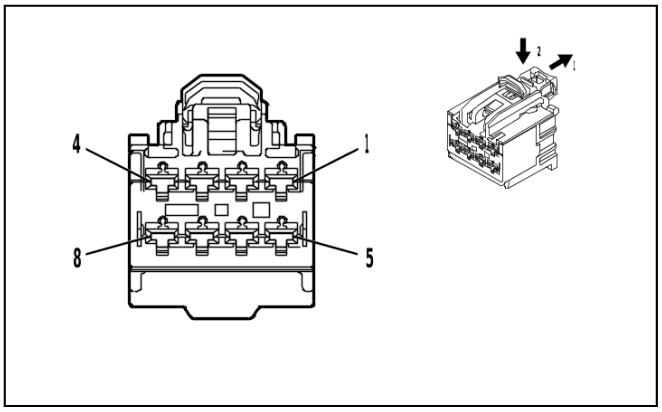
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19300632	J-35616-64B (L-BU)	J-38125-215A

S78 Turn Signal Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) WH / GN	(1) 2915	(1) Left Turn Signal Switch Signal	(1) I	(1) —
(2) 2	(2) 0.35	(2) VT / BU	(2) 2916	(2) Right Turn Signal Switch Signal	(2) I	(2) —
(3) 3	(3) 0.35	(3) BK	(3) 2050	(3) Ground	(3) I	(3) —
4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.35	(5) WH / BK	(5) 94	(5) Windshield Washer Switch Signal	(5) I	(5) —
(6) 6	(6) 0.35	(6) YE / BN	(6) 307	(6) Headlamp Switch Flash Signal	(6) I	(6) —
(7) 7	(7) 0.35	(7) WH	(7) 524	(7) High Beam Select Switch High Beam Signal	(7) I	(7) —
(8) 8	(8) 0.35	(8) BK / GY	(8) 6009	(8) Windshield Wiper Switch Low Reference	(8) I	(8) —
(9) 9	(9) 0.35	(9) GY	(9) 1715	(9) Windshield Wiper Switch High Signal	(9) I	(9) —
(10) 10	(10) 0.35	(10) YE / BU	(10) 1714	(10) Windshield Wiper Switch Low Signal	(10) I	(10) —

S79D Front Side Door Window Control Switch - Driver X1



4875738

Connector Part Information

- Harness Type: Front Side Door Door Lock Door Wiring Harness - Driver
- OEM Connector: 33223792
- Service Connector: Service by Harness - See Part Catalog
- Description: 8-Way F 2.8 OCS Series(BK)

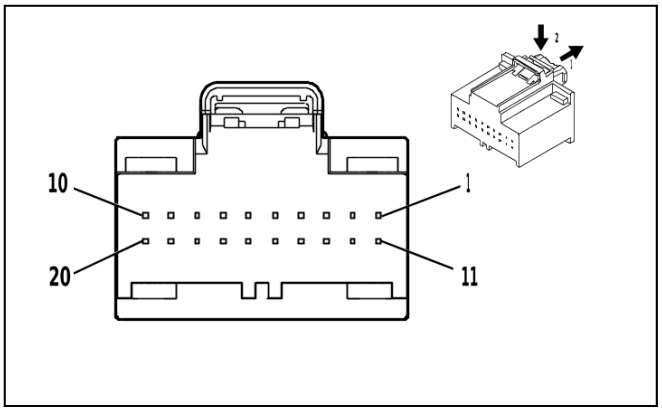
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-4A (PU)	No Tool Required

S79D Front Side Door Window Control Switch - Driver X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5 (1) 2.5	(1) BK (1) BK	(1) 1150 (1) 1150	(1) Ground (1) Ground	(1) I (1) I	(1) AEC (1) AXG
(2) 2	(2) 2 (2) 0.35	(2) YE / VT (2) WH / BN	(2) 165 (2) 2764	(2) Left Front Window Motor Down Control (2) Window Switch Left Front Down Signal	(2) I (2) I	(2) AEC (2) AXG
3 - 4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.5	(5) WH	(5) 606	(5) Left Outside Rearview Mirror Heater Control	(5) I	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 2 (7) 0.35	(7) GN / GY (7) GY / GN	(7) 164 (7) 2763	(7) Left Front Window Motor Up Control (7) Window Switch Left Front Up Signal	(7) I (7) I	(7) AEC (7) AXG
(8) 8	(8) 2.5 (8) 0.5	(8) RD / BU (8) RD / VT	(8) 1240 (8) 1940	(8) Battery Positive Voltage (8) Battery Positive Voltage	(8) I (8) I	(8) AEC (8) AXG

S79D Front Side Door Window Control Switch - Driver X2



5109537

Connector Part Information

- Harness Type: Front Side Door Door Lock Door Wiring Harness - Driver
- OEM Connector: 31410-0206
- Service Connector: Service by Harness - See Part Catalog
- Description: 20-Way F 0.64 Series(GY)

Terminal Part Information

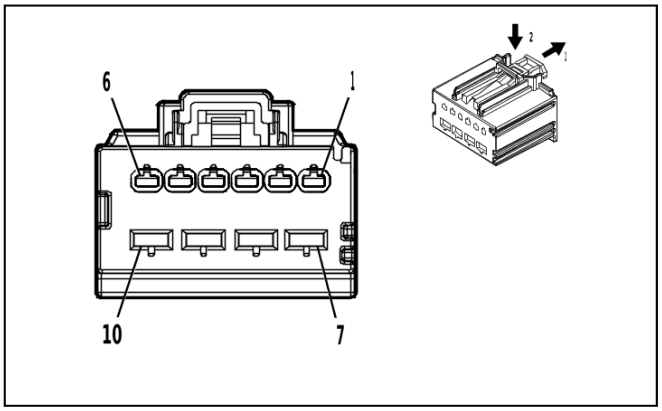
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

S79D Front Side Door Window Control Switch - Driver X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BN / YE	(1) 2771	(1) Left Front Door Lock Switch Lock Signal	(1) I	(1) —
(2) 2	(2) 0.35	(2) BN / WH	(2) 2772	(2) Left Front Door Lock Switch Unlock Signal	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.35	(4) VT / YE	(4) 4244	(4) Left Front Door Lock Indicator Control	(4) I	(4) —
(5) 5	(5) 0.35	(5) BN / GY	(5) 4784	(5) Left Front Door LED Backlight Dimming Control	(5) I	(5) —
(6) 6	(6) 0.35	(6) GY / YE	(6) 1760	(6) Left Side Object Detection LED Control	(6) I	(6) —
7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.35	(8) YE / BN	(8) 2789	(8) Left Front Mirror Motor Common Control	(8) I	(8) —
(9) 9	(9) 0.35	(9) GN	(9) 2766	(9) Power Window Switch Left Front Express Signal	(9) I	(9) —
10	—	—	—	Not Occupied	—	—
(11) 11	(11) 0.35	(11) WH / VT	(11) 4258	(11) Left Front Door Lock Status Signal	(11) I	(11) —
(12) 12	(12) 0.35	(12) VT / BU	(12) 2788	(12) Left Front Mirror Motor Up [+] Down [-] Control	(12) I	(12) —
(13) 13	(13) 0.35	(13) BN / BK	(13) 2790	(13) Left Front Mirror Motor Right [+] Left [-] Control	(13) I	(13) —
14	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(15) 15	(15) 0.35	(15) GN / YE	(15) 6134	(15) Body Control Module LIN Bus 3	(15) I	(15) —
(16) 16	(16) 0.35	(16) WH / YE	(16) 2792	(16) Left Front Mirror Position Sensor Left [-] Right [+] Signal	(16) I	(16) —
(17) 17	(17) 0.35	(17) GY / BN	(17) 2787	(17) Left Front Mirror Position Sensor Up [+] Down [-] Signal	(17) I	(17) —
(18) 18	(18) 0.35	(18) GY	(18) 745	(18) Left Front Door Ajar Switch Signal	(18) I	(18) —
(19) 19	(19) 0.35	(19) VT / RD	(19) 2791	(19) Left Front Mirror Position Sensor High Reference	(19) I	(19) —
(20) 20	(20) 0.35	(20) BK / BN	(20) 673	(20) Left Outside Rearview Mirror Position Sensor Low Reference	(20) I	(20) —

S79LR Rear Side Door Window Switch - Left



5035058

Connector Part Information
- Harness Type: Rear Side Door Door Wiring Harness - Left
- OEM Connector: 31372-1600
- Service Connector: Service by Harness - See Part Catalog
- Description: 10-Way F 1.5, 2.8 MX Series(BK)

Terminal Part Information

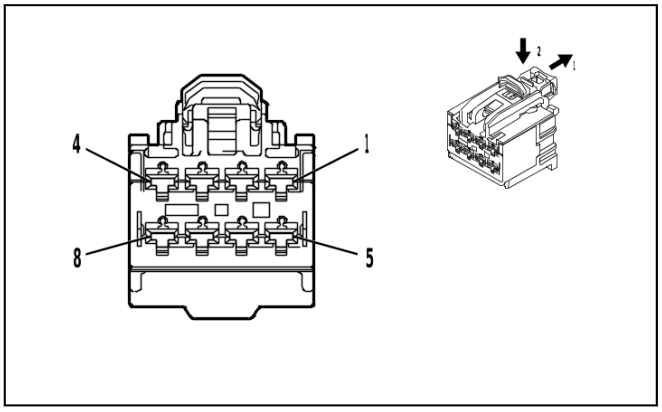
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-2A (GY)	No Tool Required
III	Not required	J-35616-4A (PU)	No Tool Required

S79LR Rear Side Door Window Switch - Left

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GN / GY	(1) 6135	(1) Body Control Module LIN Bus 4	(1) I	(1) —
(2) 2	(2) 0.35	(2) GY	(2) 747	(2) Left Rear Door Ajar Switch Signal	(2) I	(2) —
(3) 3	(3) 0.75	(3) BK	(3) 1150	(3) Ground	(3) II	(3) —
4 - 6	—	—	—	Not Occupied	—	—
(7) 7	(7) 2.5	(7) BK	(7) 1150	(7) Ground	(7) III	(7) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(8) 8	(8) 2.5	(8) RD / BU	(8) 1240	(8) Battery Positive Voltage	(8) III	(8) —
(9) 9	(9) 2	(9) BU / VT	(9) 668	(9) Left Rear Window Motor Up Control	(9) III	(9) —
(10) 10	(10) 2	(10) YE / BU	(10) 669	(10) Left Rear Window Motor Down Control	(10) III	(10) —

S79P Front Side Door Window Switch - Passenger X1



4875738

Connector Part Information

- Harness Type: Front Side Door Door Lock Door Wiring Harness - Passenger
- OEM Connector: 33223792
- Service Connector: Service by Harness - See Part Catalog
- Description: 8-Way F 2.8 OCS Series(BK)

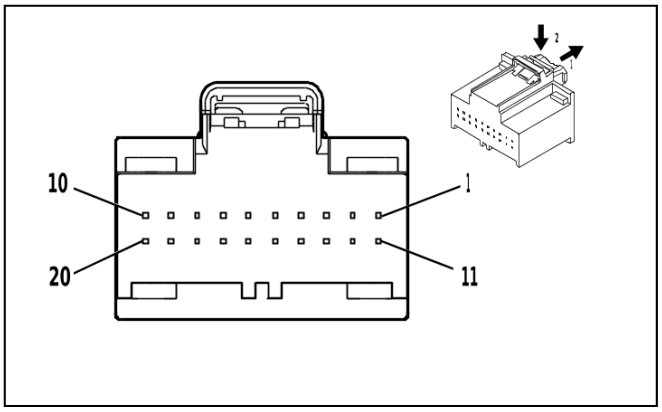
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-4A (PU)	No Tool Required

S79P Front Side Door Window Switch - Passenger X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) BK	(1) 1250	(1) Ground	(1) I	(1) —
(2) 2	(2) 2	(2) YE / BU	(2) 667	(2) Right Front Window Motor Down Control	(2) I	(2) —
3 - 4	—	—	—	Not Occupied	—	—
(5) 5	(5) 0.5	(5) BN / VT	(5) 607	(5) Right Outside Rearview Mirror Heater Control	(5) I	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 2	(7) GN / GY	(7) 666	(7) Right Front Window Motor Up Control	(7) I	(7) —
(8) 8	(8) 2.5	(8) RD / GY	(8) 3540	(8) Battery Positive Voltage	(8) I	(8) —

S79P Front Side Door Window Switch - Passenger X2



5109537

Connector Part Information

- Harness Type: Front Side Door Door Lock Door Wiring Harness - Passenger
- OEM Connector: 31410-0206
- Service Connector: Service by Harness - See Part Catalog
- Description: 20-Way F 0.64 Series(GY)

Terminal Part Information

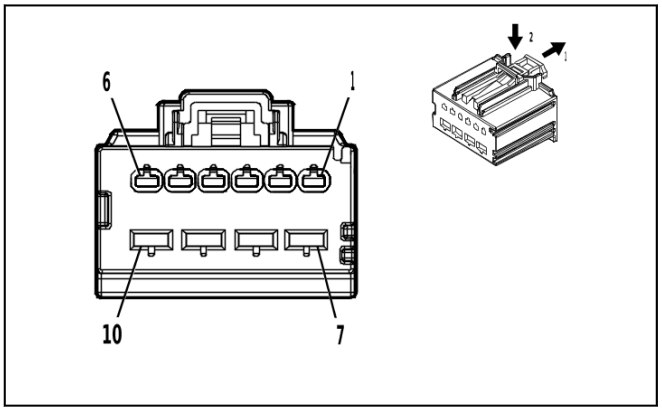
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

S79P Front Side Door Window Switch - Passenger X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) YE / RD	(1) 2799	(1) Right Front Mirror Position Sensor High Reference	(1) I	(1) —
(2) 2	(2) 0.35	(2) GN / BK	(2) 2798	(2) Right Front Mirror Motor Right [+] Left [-] Control	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.35	(4) YE / BU	(4) 4245	(4) Right Front Door Lock Indicator Control	(4) I	(4) —
(5) 5	(5) 0.35	(5) GY / VT	(5) 4638	(5) LED Backlight Dimming Control Right Front Door	(5) I	(5) —
(6) 6	(6) 0.35	(6) GY	(6) 1761	(6) Right Side Object Detection LED Control	(6) I	(6) —
7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.35	(8) GY	(8) 746	(8) Right Front Door Ajar Switch Signal	(8) I	(8) —
(9) 9	(9) 0.35	(9) GN / YE	(9) 6134	(9) Body Control Module LIN Bus 3	(9) I	(9) —
(10) 10	(10) 0.35	(10) VT / WH	(10) 2800	(10) Right Front Mirror Position Sensor Left [-] Right [+] Signal	(10) I	(10) —
(11) 11	(11) 0.35	(11) BU / YE	(11) 2795	(11) Right Front Mirror Position Sensor Up [+] Down [-] Signal	(11) I	(11) —
(12) 12	(12) 0.35	(12) YE / VT	(12) 2773	(12) Right Front Door Lock Switch Lock Control	(12) I	(12) —
(13) 13	(13) 0.35	(13) BN / VT	(13) 2774	(13) Right Front Door Lock Switch Unlock Control	(13) I	(13) —
14 - 15	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(16) 16	(16) 0.35	(16) VT	(16) 4259	(16) Right Front Door Lock Status Signal	(16) I	(16) —
(17) 17	(17) 0.35	(17) YE / VT	(17) 2796	(17) Right Front Mirror Motor Up [+] Down [-] Control	(17) I	(17) —
18	—	—	—	Not Occupied	—	—
(19) 19	(19) 0.35	(19) WH	(19) 2797	(19) Right Front Mirror Motor Common Control	(19) I	(19) —
(20) 20	(20) 0.35	(20) BK / GN	(20) 675	(20) Right Outside Rearview Mirror Position Sensor Low Reference	(20) I	(20) —

S79RR Rear Side Door Window Switch - Right



5035058

Connector Part Information

- Harness Type: Rear Side Door Door Wiring Harness - Right
- OEM Connector: 31372-1600
- Service Connector: Service by Harness - See Part Catalog
- Description: 10-Way F 1.5, 2.8 MX Series(BK)

Terminal Part Information

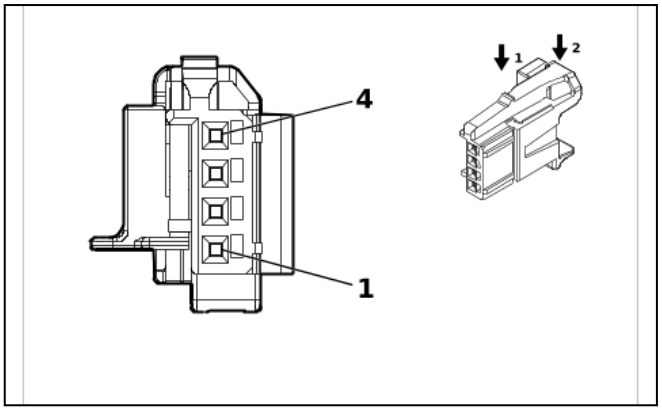
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-4A (PU)	No Tool Required

S79RR Rear Side Door Window Switch - Right

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GN / GY	(1) 6135	(1) Body Control Module LIN Bus 4	(1) I	(1) —
(2) 2	(2) 0.35	(2) GY	(2) 748	(2) Right Rear Door Ajar Switch Signal	(2) I	(2) —
3 - 6	—	—	—	Not Occupied	—	—
(7) 7	(7) 2.5	(7) BK	(7) 1250	(7) Ground	(7) II	(7) —
(8) 8	(8) 2.5	(8) RD / GY	(8) 3540	(8) Battery Positive Voltage	(8) II	(8) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(9) 9	(9) 2	(9) BU / GY	(9) 670	(9) Right Rear Window Motor Up Control	(9) II	(9) —
(10) 10	(10) 2	(10) GN / BK	(10) 671	(10) Right Rear Window Motor Down Control	(10) II	(10) —

S88 Sunroof Tilt Position Switch (CAC)



5417126

Connector Part Information
- Harness Type: Roof Wiring Harness
- OEM Connector: 2294399-2
- Service Connector: 84880893
- Description: 4-Way F 0.64 MQS Series(WH)

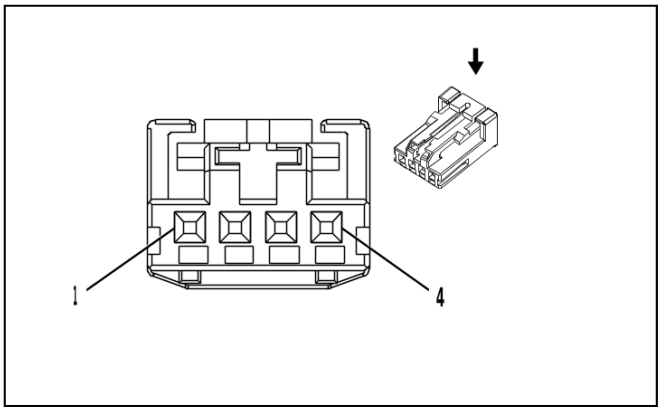
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

S88 Sunroof Tilt Position Switch (CAC)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BK	(1) 4250	(1) Ground	(1) I	(1) —
(2) 2	(2) 0.35	(2) YE	(2) 6817	(2) LED Backlight Dimming Control 1	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.35	(4) WH / GN	(4) 3031	(4) Sunroof Vent Switch Signal	(4) I	(4) —

S91 Parking Brake Control Switch



2717162

Connector Part Information

- Harness Type: Front Floor Console Wiring Harness Extension Harness
- OEM Connector: 1-936119-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 0.64 Micro-Quadlock Series(BK)

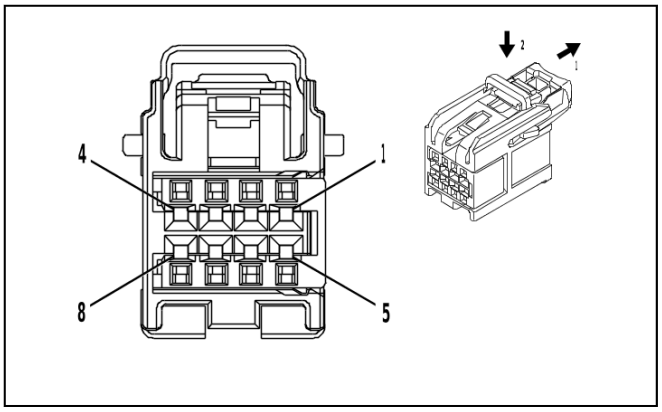
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

S91 Parking Brake Control Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) RD / GN	(1) 5140	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 0.35	(2) GN / YE	(2) 2731	(2) Brake System Control Module LIN Bus 1	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.35	(4) BK / WH	(4) 2151	(4) Signal Ground	(4) I	(4) —

S126 Ride Control Switch (NP0 / NQH)



4232228

Connector Part Information

- Harness Type: Front Floor Console Wiring Harness Extension Harness
- OEM Connector: 15526973
- Service Connector: Service by Harness - See Part Catalog
- Description: 8-Way F 0.64 OCS Series(GY)

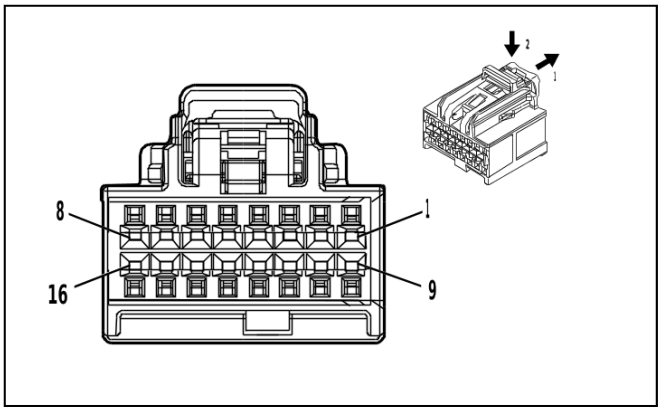
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

S126 Ride Control Switch (NP0 / NQH)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) WH / BN	(1) 2203	(1) Enhanced Driver Mode 2 Switch Signal	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.35	(3) BK / GY	(3) 2204	(3) Enhanced Driver Mode 1 Switch Low Reference	(3) I	(3) —
(4) 4	(4) 0.35	(4) YE	(4) 6817	(4) LED Backlight Dimming Control 1	(4) I	(4) —
(5) 5	(5) 0.35	(5) BK	(5) 2050	(5) Ground	(5) I	(5) —
6 - 7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.35	(8) VT / GN	(8) 39	(8) Run/Crank Ignition 1 Voltage	(8) I	(8) —

S172 Auxiliary Multifunction Switch



4873243

Connector Part Information

- Harness Type: Harness Asm-AUX M/FUNC SW WRG
- OEM Connector: 35016343
- Service Connector: Service by Harness - See Part Catalog
- Description: 16-Way F 0.64 OCS Series(BK)

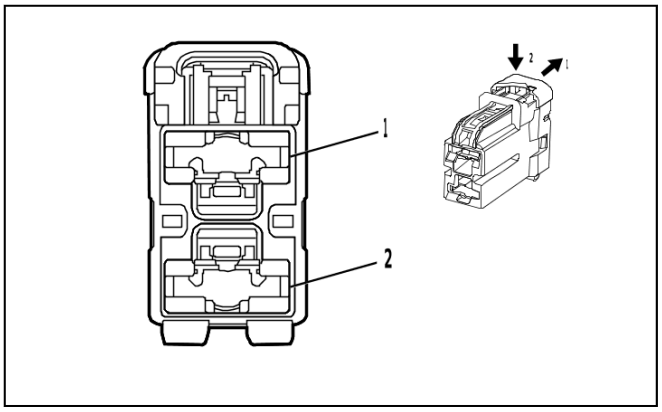
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required
I	Not required	No Tool Required	No Tool Required

S172 Auxiliary Multifunction Switch

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) —	(1) —	(1) —	(1) —	(1) I	(1) —
(2) 2	(2) 0.35	(2) YE	(2) 6817	(2) LED Backlight Dimming Control 1	(2) I	(2) —
(3) 3	(3) 0.35	(3) WH	(3) 6816	(3) Indicator Dimming Control	(3) I	(3) —
(4) 4	(4) —	(4) —	(4) —	(4) —	(4) I	(4) —
(5) 5	(5) —	(5) —	(5) —	(5) —	(5) I	(5) —
(6) 6	(6) 0.35	(6) BU / WH	(6) 10717	(6) Upfitter Accessory Relay 2 Coil Control	(6) I	(6) —
(7) 7	(7) 0.35	(7) VT / GY	(7) 10718	(7) Upfitter Accessory Relay 3 Coil Control	(7) I	(7) —
(8) 8	(8) 0.35	(8) GN / BN	(8) 10719	(8) Upfitter Accessory Relay 4 Coil Control	(8) I	(8) —
(9) 9	(9) —	(9) —	(9) —	(9) —	(9) I	(9) —
(10) 10	(10) —	(10) —	(10) —	(10) —	(10) I	(10) —
(11) 11	(11) —	(11) —	(11) —	(11) —	(11) I	(11) —
(12) 12	(12) 0.75	(12) BK / WH	(12) 2151	(12) Signal Ground	(12) I	(12) —
(13) 13	(13) —	(13) —	(13) —	(13) —	(13) I	(13) —
(14) 14	(14) —	(14) —	(14) —	(14) —	(14) I	(14) —
(15) 15	(15) —	(15) —	(15) —	(15) —	(15) I	(15) —
(16) 16	(16) —	(16) —	(16) —	(16) —	(16) I	(16) —

T1 DC/AC Converter Control Module X1



2453116

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 7283-0724-30
- Service Connector: 85011842
- Description: 2-Way F 9.5 Series(BK)

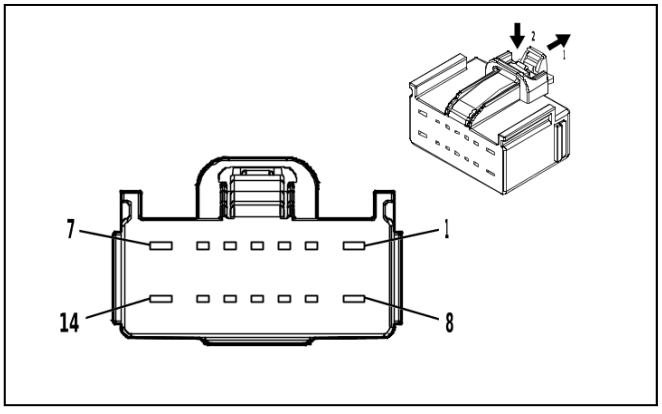
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-22 (RD)	No Tool Required

T1 DC/AC Converter Control Module X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 5	(1) BN / BK	(1) 4629	(1) DC/AC Inverter Control	(1) I	(1) —
(2) 2	(2) 5	(2) BK	(2) 550	(2) Ground	(2) I	(2) —

T1 DC/AC Converter Control Module X2 (KI6)



4934172

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 7289-7630-30
- Service Connector: 13513604
- Description: 14-Way F 1.5, 2.8 YESC Series(BK)

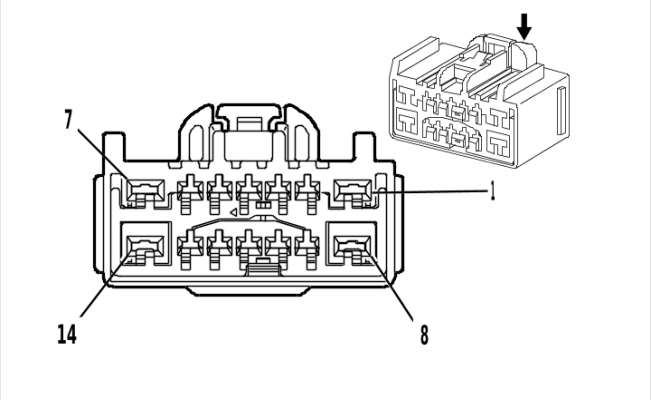
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13575850	J-35616-2A (GY)	J-38125-557
II	84962855	J-35616-4A (PU)	J-38125-11A

T1 DC/AC Converter Control Module X2 (KI6)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BK	(1) 10117	(1) AC Outlet Phase A Control	(1) II	(1) —
(2) 2	(2) 0.5	(2) VT / RD	(2) 4049	(2) AC Power Outlet Sensor High Reference	(2) I	(2) —
(3) 3	(3) 0.5	(3) VT / GY	(3) 539	(3) Run/Crank Ignition 1 Voltage	(3) I	(3) —
(4) 4	(4) 0.5	(4) WH / GN	(4) 4628	(4) DC/AC Inverter Relay Control	(4) I	(4) —
(5) 5	(5) 0.5	(5) BU / BN	(5) 6807	(5) DC/AC Inverter Control	(5) I	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.75	(7) BK / WH	(7) 10120	(7) AC Outlet 2 Phase A Control	(7) II	(7) —
(8) 8	(8) 0.75	(8) RD	(8) 10118	(8) AC Outlet Phase B Control	(8) II	(8) —
(9) 9	(9) 0.75	(9) BARE	(9) 10116	(9) AC Outlet Low Reference	(9) I	(9) —
(10) 10	(10) 0.35	(10) GN / BU	(10) 6133	(10) Body Control Module LIN Bus 2	(10) I	(10) —
11	—	—	—	Not Occupied	—	—
(12) 12	(12) 0.5	(12) GN / BN	(12) 2266	(12) DC/AC Inverter Control 2	(12) I	(12) —
(13) 13	(13) 0.75	(13) BARE	(13) 10119	(13) AC Outlet 2 Low Reference	(13) I	(13) —
(14) 14	(14) 0.75	(14) RD / WH	(14) 10121	(14) AC Outlet 2 Phase B Control	(14) II	(14) —

T1 DC/AC Converter Control Module X2 (KI7)



1540775

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 7289-7631-90
- Service Connector: 13513603
- Description: 14-Way F 1.5, 2.8 YESC Series(BU)

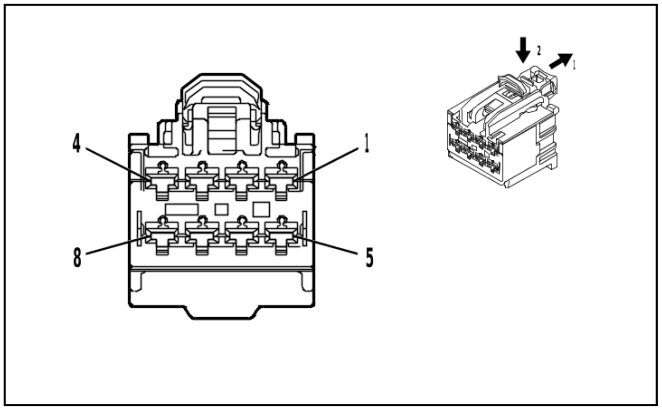
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13575850	J-35616-2A (GY)	J-38125-557
II	84962855	J-35616-4A (PU)	J-38125-11A

T1 DC/AC Converter Control Module X2 (KI7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BK	(1) 10117	(1) AC Outlet Phase A Control	(1) II	(1) —
(2) 2	(2) 0.5	(2) VT / RD	(2) 4049	(2) AC Power Outlet Sensor High Reference	(2) I	(2) —
(3) 3	(3) 0.5	(3) VT / GY	(3) 539	(3) Run/Crank Ignition 1 Voltage	(3) I	(3) —
(4) 4	(4) 0.5	(4) WH / GN	(4) 4628	(4) DC/AC Inverter Relay Control	(4) I	(4) —
(5) 5	(5) 0.5	(5) BU / BN	(5) 6807	(5) DC/AC Inverter Control	(5) I	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.75	(7) BK / WH	(7) 10120	(7) AC Outlet 2 Phase A Control	(7) II	(7) —
(8) 8	(8) 0.75	(8) RD	(8) 10118	(8) AC Outlet Phase B Control	(8) II	(8) —
(9) 9	(9) 0.75	(9) BARE	(9) 10116	(9) AC Outlet Low Reference	(9) I	(9) —
(10) 10	(10) 0.35	(10) GN / BU	(10) 6133	(10) Body Control Module LIN Bus 2	(10) I	(10) —
11	—	—	—	Not Occupied	—	—
(12) 12	(12) 0.5	(12) GN / BN	(12) 2266	(12) DC/AC Inverter Control 2	(12) I	(12) —
(13) 13	(13) 0.75	(13) BARE	(13) 10119	(13) AC Outlet 2 Low Reference	(13) I	(13) —
(14) 14	(14) 0.75	(14) RD / WH	(14) 10121	(14) AC Outlet 2 Phase B Control	(14) II	(14) —

T3 Audio Amplifier X1



4875738

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 33223792
- Service Connector: 19369366
- Description: 8-Way F 2.8 OCS Series(BK)

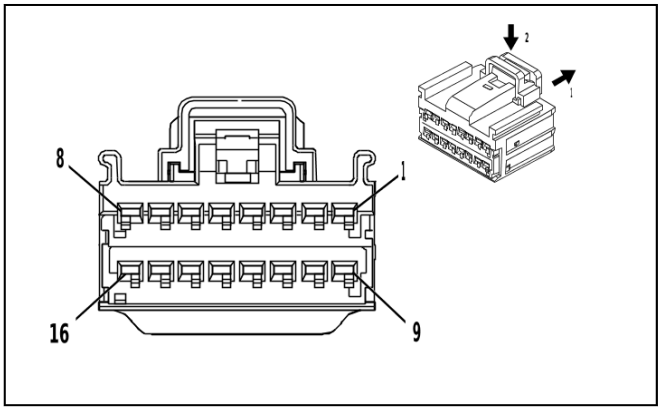
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-4A (PU)	No Tool Required

T3 Audio Amplifier X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) YE	(1) 200	(1) Right Front Speaker 1 [+] Control	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 2.5	(3) BU	(3) 201	(3) Left Front Speaker 1 [+] Control	(3) I	(3) —
(4) 4	(4) 3	(4) RD / YE	(4) 3740	(4) Battery Positive Voltage	(4) I	(4) —
(5) 5	(5) 2.5	(5) YE / BK	(5) 117	(5) Right Front Speaker [-] Control 1	(5) I	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 2.5	(7) BN / BU	(7) 118	(7) Left Front Speaker [-] Control 1	(7) I	(7) —
(8) 8	(8) 3	(8) BK / WH	(8) 651	(8) Signal Ground	(8) I	(8) —

T3 Audio Amplifier X2



4332214

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 15512506
- Service Connector: 13591061
- Description: 16-Way F 1.5 OCS Series(BK)

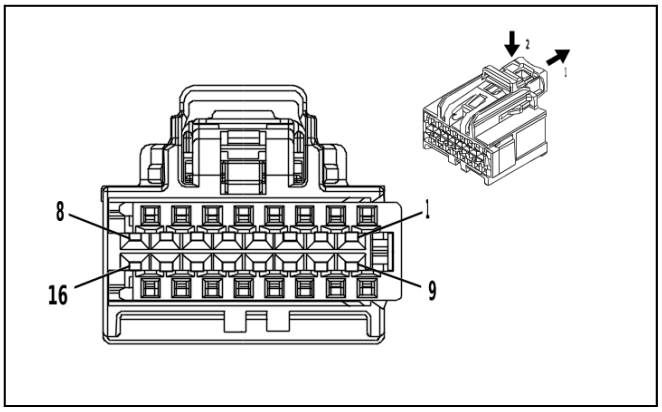
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	84757974	J-35616-2A (GY)	J-38125-215A

T3 Audio Amplifier X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	—	—	—	Not Occupied	—	—
(2) 2	(2) 0.5	(2) WH / YE	(2) 1853	(2) Right Front Midrange Speaker [+] Control	(2) I	(2) —
(3) 3	(3) 0.5	(3) BU / VT	(3) 1857	(3) Left Front Midrange Speaker [+] Control	(3) I	(3) —
(4) 4	(4) 0.5	(4) WH	(4) 46	(4) Right Rear Speaker [+] Control	(4) I	(4) —
(5) 5	(5) 0.5	(5) GN	(5) 199	(5) Left Rear Speaker [+] Control	(5) I	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.5	(7) YE / WH	(7) 1860	(7) Front Center Speaker [+] Control	(7) I	(7) —
8 - 9	—	—	—	Not Occupied	—	—
(10) 10	(10) 0.5	(10) BN / BK	(10) 1953	(10) Right Front Midrange Speaker [-] Control	(10) I	(10) —
(11) 11	(11) 0.5	(11) BU / BN	(11) 1957	(11) Left Front Midrange Speaker [-] Control	(11) I	(11) —
(12) 12	(12) 0.5	(12) BU / BK	(12) 115	(12) Right Rear Speaker [-] Control	(12) I	(12) —
(13) 13	(13) 0.5	(13) GN / BK	(13) 116	(13) Left Rear Speaker [-] Control	(13) I	(13) —
14	—	—	—	Not Occupied	—	—
(15) 15	(15) 0.5	(15) BU / YE	(15) 1960	(15) Front Center Speaker [-] Control	(15) I	(15) —
16	—	—	—	Not Occupied	—	—

T3 Audio Amplifier X4



4256181

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 35016345
- Service Connector: 13519740
- Description: 16-Way F 0.64 OCS Series(BN)

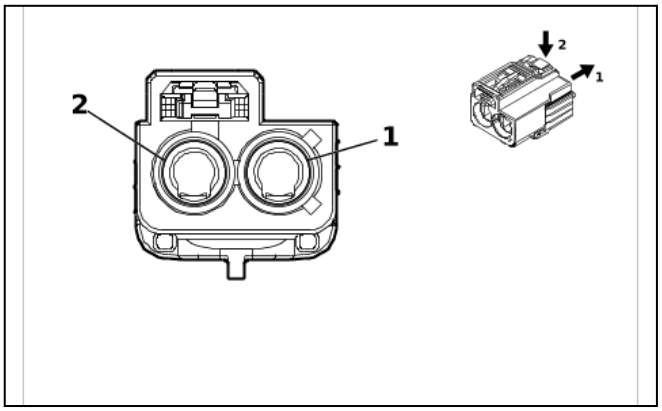
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	84619127	J-35616-64B (L-BU)	J-38125-215A

T3 Audio Amplifier X4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 7	—	—	—	Not Occupied	—	—
(8) 8	(8) 0.35	(8) BU / YE	(8) 4984	(8) AUTOSAR CAN Bus [-] 5 Serial Data	(8) I	(8) —
9	—	—	—	Not Occupied	—	—
(10) 10	(10) 0.35	(10) WH	(10) 8580	(10) Automotive Audio Bus A2B Serial Data 1 [+]	(10) I	(10) —
(11) 11	(11) 0.35	(11) GN	(11) 8579	(11) Automotive Audio Bus A2B Serial Data 1 [-]	(11) I	(11) —
12 - 15	—	—	—	Not Occupied	—	—
(16) 16	(16) 0.35	(16) BU / WH	(16) 4985	(16) AUTOSAR CAN Bus [+] 5 Serial Data	(16) I	(16) —

T4P High Frequency Antenna (- MAM)



5661671

Connector Part Information

- Harness Type: Body Wiring Harness COAX
- OEM Connector: 13516425
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 2-Way F Coax Type(VT)

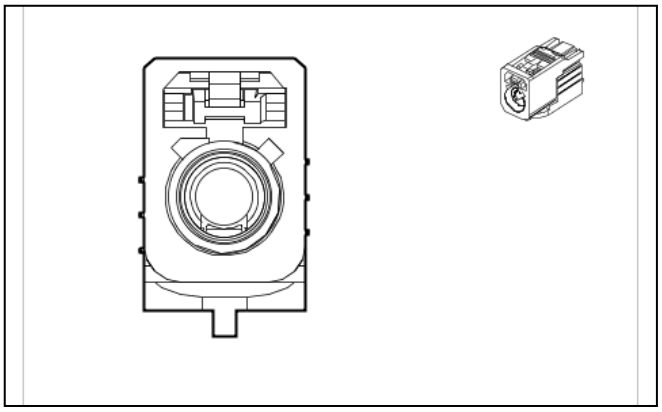
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

T4P High Frequency Antenna (- MAM)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	Coax Cable	—	(GPS only) Coaxial Antenna GPS Signal	I	—

T4P High Frequency Antenna (IVD - (U2Q / U2K / MCX))



5633209

Connector Part Information
- Harness Type: Body Wiring Harness COAX
- OEM Connector: 13516408
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type(BK)

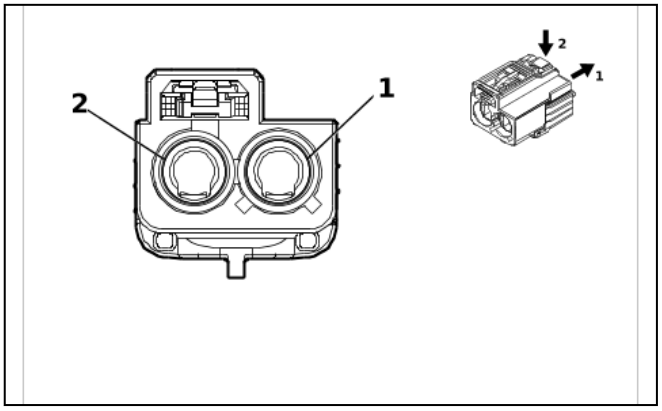
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

T4P High Frequency Antenna (IVD - (U2Q / U2K / MCX))

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	Coax Cable	—	(AM/FM) Antenna RF Signal	I	—

T4P High Frequency Antenna (U2K / (MCX - (U2K / U2Q)))



5907715

Connector Part Information
- Harness Type: Body Wiring Harness COAX
- OEM Connector: 13516431
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 2-Way F Coax Type(CU)

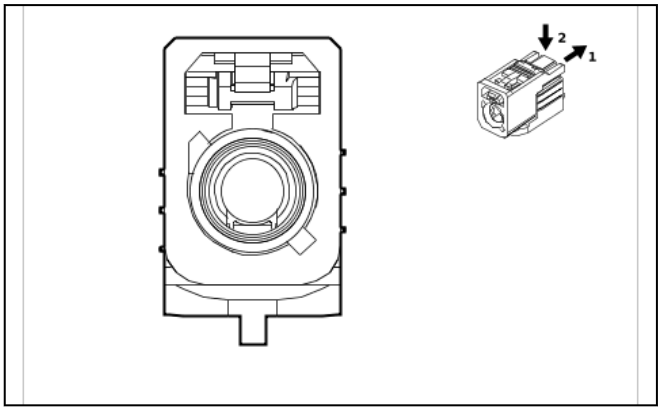
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

T4P High Frequency Antenna (U2K / (MCX - (U2K / U2Q)))

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	Coax Cable	—	(GPS/Cell) Coaxial Antenna Cell/GPS combined Signal	I	—

T4TA Auxiliary Wireless Communication Interface Antenna



5518436

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness COAX
- OEM Connector: 13516416
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type(BG)

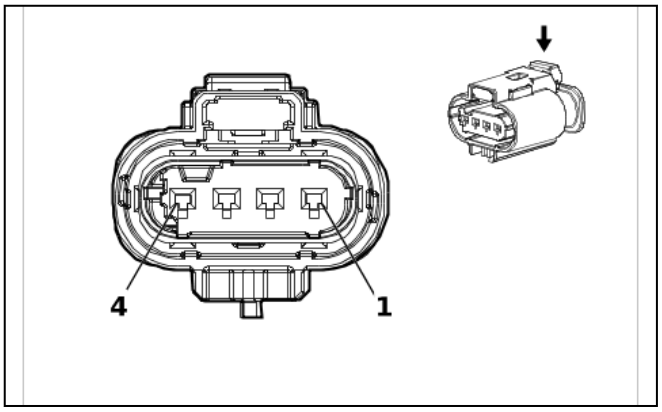
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

T4TA Auxiliary Wireless Communication Interface Antenna

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	Coax Cable	—	WiFi Antenna Coaxial Signal	I	—

T8A Ignition Coil 1



5402120

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 10092979
- Service Connector: 84889372
- Description: 4-Way F 1.2 Multilock Series, Sealed(BK)

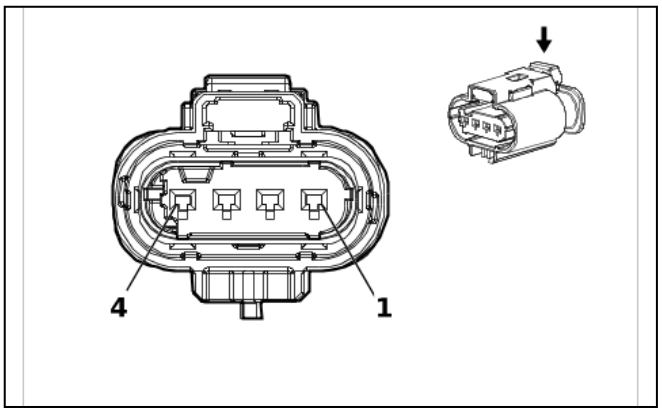
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

T8A Ignition Coil 1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BK	(1) 6450	(1) Engine Even Bank Ground	(1) I	(1) —
(2) 2	(2) 0.75	(2) BK / BU	(2) 2129	(2) Ignition Control Low Reference Bank 1	(2) I	(2) —
(3) 3	(3) 0.75	(3) BU / VT	(3) 2121	(3) Ignition Control 1	(3) I	(3) —
(4) 4	(4) 0.75	(4) VT / BU	(4) 5291	(4) Powertrain Main Relay Fused Supply Voltage 2	(4) I	(4) —

T8B Ignition Coil 2



5402120

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 10092979
- Service Connector: 84889372
- Description: 4-Way F 1.2 Multilock Series, Sealed(BK)

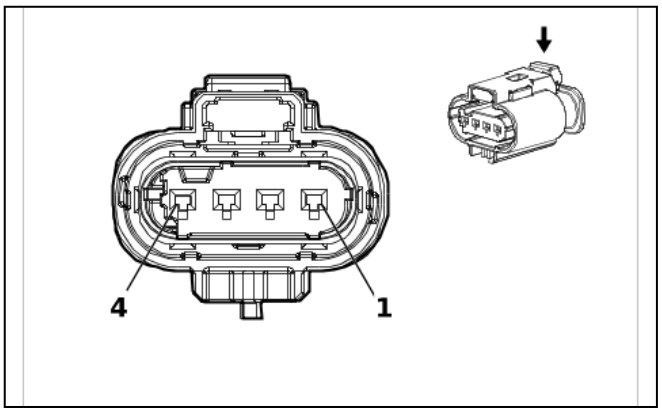
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

T8B Ignition Coil 2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BK	(1) 6450	(1) Engine Even Bank Ground	(1) I	(1) —
(2) 2	(2) 0.75	(2) BK / BU	(2) 2129	(2) Ignition Control Low Reference Bank 1	(2) I	(2) —
(3) 3	(3) 0.75	(3) BU / WH	(3) 2122	(3) Ignition Control 2	(3) I	(3) —
(4) 4	(4) 0.75	(4) VT / BU	(4) 5291	(4) Powertrain Main Relay Fused Supply Voltage 2	(4) I	(4) —

T8C Ignition Coil 3



5402120

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 10092979
- Service Connector: 84889372
- Description: 4-Way F 1.2 Multilock Series, Sealed(BK)

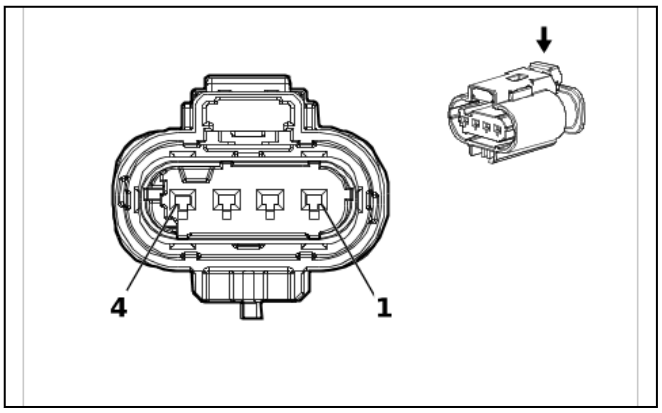
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

T8C Ignition Coil 3

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BK	(1) 6450	(1) Engine Even Bank Ground	(1) I	(1) —
(2) 2	(2) 0.75	(2) BK / BU	(2) 2129	(2) Ignition Control Low Reference Bank 1	(2) I	(2) —
(3) 3	(3) 0.75	(3) GN / BU	(3) 2123	(3) Ignition Control 3	(3) I	(3) —
(4) 4	(4) 0.75	(4) VT / BU	(4) 5291	(4) Powertrain Main Relay Fused Supply Voltage 2	(4) I	(4) —

T8D Ignition Coil 4



5402120

Connector Part Information

- Harness Type: Engine Wiring Harness
- OEM Connector: 10092979
- Service Connector: 84889372
- Description: 4-Way F 1.2 Multilock Series, Sealed(BK)

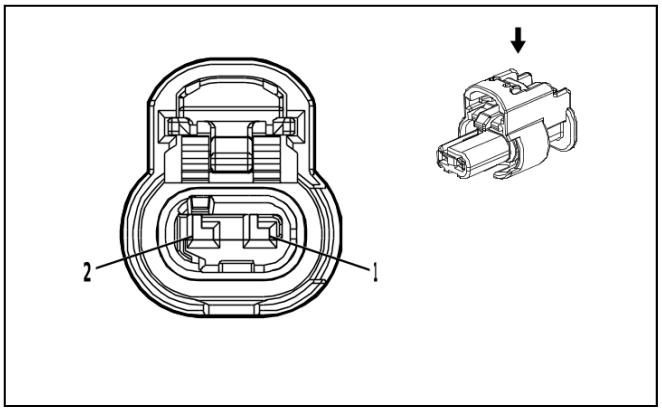
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

T8D Ignition Coil 4

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BK	(1) 6450	(1) Engine Even Bank Ground	(1) I	(1) —
(2) 2	(2) 0.75	(2) BK / BU	(2) 2129	(2) Ignition Control Low Reference Bank 1	(2) I	(2) —
(3) 3	(3) 0.75	(3) YE / BU	(3) 2124	(3) Ignition Control 4	(3) I	(3) —
(4) 4	(4) 0.75	(4) VT / BU	(4) 5291	(4) Powertrain Main Relay Fused Supply Voltage 2	(4) I	(4) —

T10KA Low Frequency Console Number 2 Antenna



4690744

Connector Part Information
- Harness Type: Front Floor Console Wiring Harness
- OEM Connector: 1-2296694-3
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

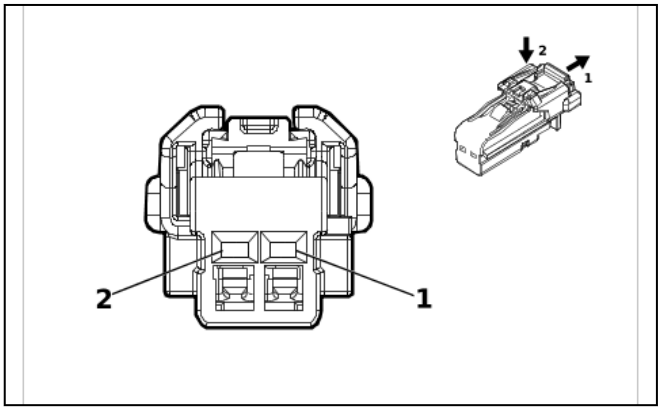
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required

T10KA Low Frequency Console Number 2 Antenna

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BN / BK	(1) 3552	(1) Interior Passive Entry Antenna 1 High Signal	(1) I	(1) —
(2) 2	(2) 0.35	(2) WH	(2) 3553	(2) Interior Passive Entry Antenna 1 Low Signal	(2) I	(2) —

T10UA Low Frequency Console Antenna



4115691

Connector Part Information
- Harness Type: Front Floor Console Wiring Harness
- OEM Connector: 6098-8988
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.2 MCON Series(BK)

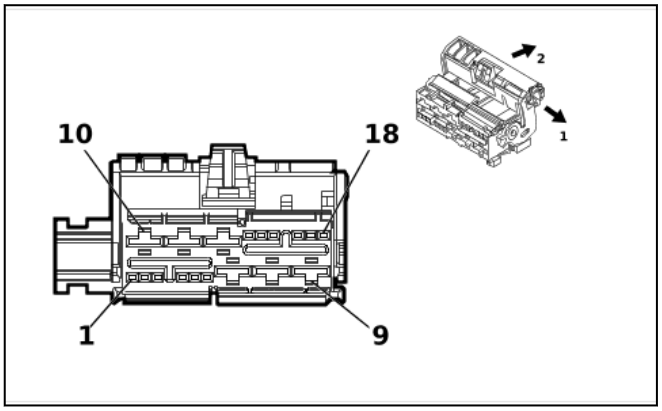
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

T10UA Low Frequency Console Antenna

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BN / BK	(1) 4996	(1) Immobilizer Antenna Signal [+]	(1) I	(1) —
(2) 2	(2) 0.35	(2) WH / GY	(2) 4997	(2) Immobilizer Antenna Low Signal	(2) I	(2) —

T19 Multifunction Power Supply Converter



3825662

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 35509388
- Service Connector: 13549243
- Description: 18-Way F 0.64 MTS, 6.3 MCP Series(BK)

Terminal Part Information

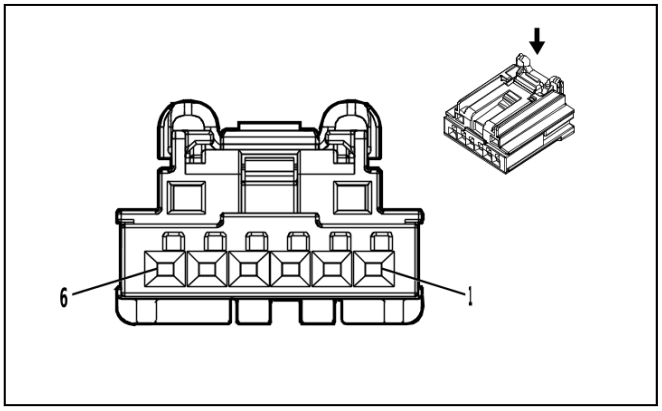
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19300632	J-35616-64B (L-BU)	J-38125-215A
II	19367600	J-35616-42 (RD)	J-38125-556

T19 Multifunction Power Supply Converter

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1 - 3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.5	(4) VT / GN	(4) 4320	(4) Powertrain Sensor Bus Enable	(4) I	(4) —
(5) 5	(5) 0.5	(5) YE / BK	(5) 625	(5) Starter Enable Relay Control	(5) I	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 2.5	(7) BK	(7) 3750	(7) Ground	(7) II	(7) —
(8) 8	(8) 2.5	(8) RD / VT	(8) 2640	(8) Battery Positive Voltage	(8) II	(8) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(9) 9	(9) 2.5	(9) RD / GN	(9) 2173	(9) 12V Regulated Supply Voltage 2	(9) II	(9) —
(10) 10	(10) 2.5	(10) RD / YE	(10) 2172	(10) 12V Regulated Supply Voltage 1	(10) II	(10) —
(11) 11	(11) 2.5	(11) RD / BU	(11) 2540	(11) Battery Positive Voltage	(11) II	(11) —
(12) 12	(12) 2.5	(12) BK	(12) 3750	(12) Ground	(12) II	(12) —
(13) 13	(13) 0.5	(13) BU / GY	(13) 4054	(13) Private Serial Data Powertrain CAN Bus [-] Serial Data	(13) I	(13) —
(14) 14	(14) 0.5	(14) BU / GY	(14) 4054	(14) Private Serial Data Powertrain CAN Bus [-] Serial Data	(14) I	(14) —
(15) 15	(15) 0.5	(15) WH	(15) 4055	(15) Private Serial Data Powertrain CAN Bus [+] Serial Data	(15) I	(15) —
(16) 16	(16) 0.5	(16) WH	(16) 4055	(16) Private Serial Data Powertrain CAN Bus [+] Serial Data	(16) I	(16) —
17 - 18	—	—	—	Not Occupied	—	—

T22 Wireless Accessory Charging Module



5020940

Connector Part Information

- Harness Type: Front Floor Console Wiring Harness Extension Harness
- OEM Connector: 2035363-6
- Service Connector: Service by Harness - See Part Catalog
- Description: 6-Way F 0.64 Generation Y Series(BK)

Terminal Part Information

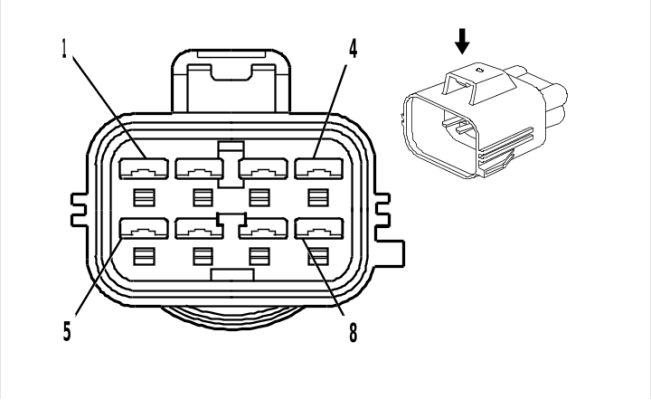
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

T22 Wireless Accessory Charging Module

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) RD / VT	(1) 6340	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 0.5	(2) BK	(2) 2050	(2) Ground	(2) I	(2) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(3) 3	(3) 0.35	(3) BU / YE	(3) 4984	(3) AUTOSAR CAN Bus [-] 5 Serial Data	(3) I	(3) —
(4) 4	(4) 0.35	(4) BU / WH	(4) 4985	(4) AUTOSAR CAN Bus [+] 5 Serial Data	(4) I	(4) —
(5) 5	(5) 0.35	(5) BU / YE	(5) 4984	(5) AUTOSAR CAN Bus [-] 5 Serial Data	(5) I	(5) —
(6) 6	(6) 0.35	(6) BU / WH	(6) 4985	(6) AUTOSAR CAN Bus [+] 5 Serial Data	(6) I	(6) —

X79A Configurable/Accessory Provision Supply Connector



1856785

Connector Part Information

- Harness Type: BLOCK ASM - WRG HARN AUX JUNC
- OEM Connector: 7282-5574-10
- Service Connector: Service by Harness - See Part Catalog
- Description: 8-Way M 2.8 YESC Series, Sealed(D-GY)

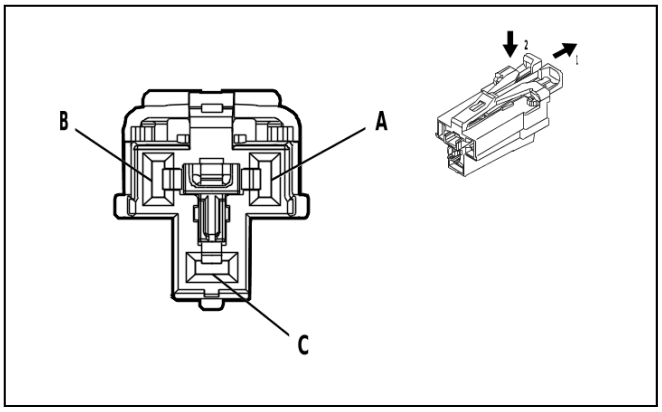
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required
I	Not required	No Tool Required	No Tool Required

X79A Configurable/Accessory Provision Supply Connector

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 2	(1) YE	(1) 10731	(1) Upfitter Accessory 1 Supply Voltage	(1) I	(1) —
(2) 2	(2) 2	(2) BU	(2) 10732	(2) Upfitter Accessory 2 Supply Voltage	(2) I	(2) —
(3) 3	(3) 2	(3) GY	(3) 10733	(3) Upfitter Accessory 3 Supply Voltage	(3) I	(3) —
(4) 4	(4) 2	(4) RD	(4) 10734	(4) Upfitter Accessory 4 Supply Voltage	(4) I	(4) —
(5) 5	(5) 2	(5) WH	(5) 10735	(5) Upfitter Accessory 5 Supply Voltage	(5) I	(5) —
(6) 6	(6) 2	(6) BN	(6) 10736	(6) Electronic Transmission Range Select Park Position Sensor 1 5 Volt Reference	(6) I	(6) —
(7) 7	(7) —	(7) —	(7) —	(7) —	(7) I	(7) —
(8) 8	(8) —	(8) —	(8) —	(8) —	(8) I	(8) —

X80L Front Floor Console Accessory Power Rear Receptacle (KCA)



4872413

Connector Part Information
- Harness Type: Front Floor Console Wiring Harness
- OEM Connector: 33386302
- Service Connector: Service by Harness - See Part Catalog
- Description: 3-Way F 2.8 APEX Series(GY)

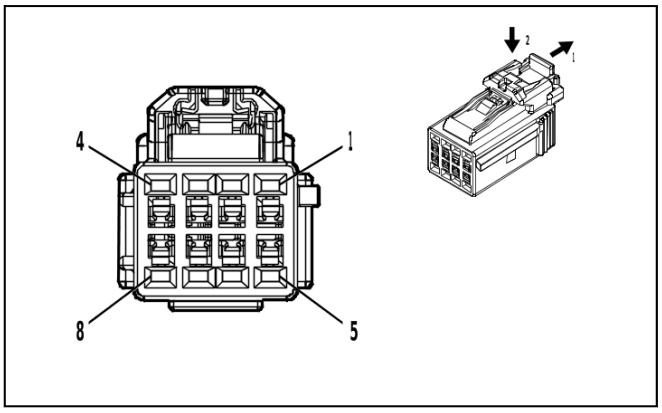
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-35 (VT)	No Tool Required

X80L Front Floor Console Accessory Power Rear Receptacle (KCA)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	1	VT	1001	Retained Accessory Power Ignition Voltage	I	—
B	—	—	—	Not Occupied	—	—
C	1	BK	2050	Ground	I	—

X81ACA Front Floor Console Accessory Power Rear Receptacle - 110V AC (KI6)



5086387

Connector Part Information
- Harness Type: Front Floor Console Wiring Harness
- OEM Connector: 6098-8443
- Service Connector: Service by Harness - See Part Catalog
- Description: 8-Way F 1.2 Series(BK)

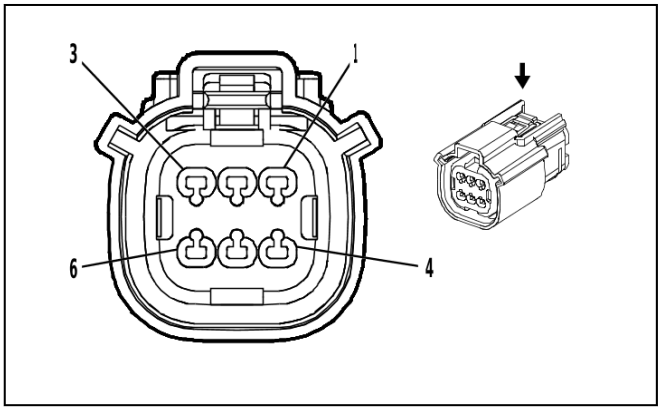
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

X81ACA Front Floor Console Accessory Power Rear Receptacle - 110V AC (KI6)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BK	(1) 10117	(1) AC Outlet Phase A Control	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.5	(3) VT / RD	(3) 4049	(3) AC Power Outlet Sensor High Reference	(3) I	(3) —
(4) 4	(4) 0.5	(4) BU / BN	(4) 6807	(4) DC/AC Inverter Control	(4) I	(4) —
(5) 5	(5) 0.75	(5) RD	(5) 10118	(5) AC Outlet Phase B Control	(5) I	(5) —
6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.5	(7) BK	(7) 2050	(7) Ground	(7) I	(7) —
8	—	—	—	Not Occupied	—	—

X81AP Pickup Box Accessory Power Receptacle - 110V AC (KC9)



1986157

Connector Part Information

- Harness Type: Body Rear Wiring Harness
- OEM Connector: 33472-0616
- Service Connector: Service by Harness - See Part Catalog
- Description: 6-Way F 1.5 MX Series, Sealed(BK)

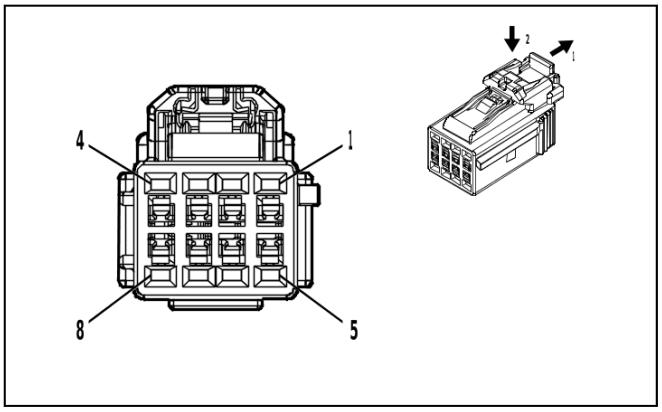
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-2A (GY)	No Tool Required

X81AP Pickup Box Accessory Power Receptacle - 110V AC (KC9)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / RD	(1) 4049	(1) AC Power Outlet Sensor High Reference	(1) I	(1) —
(2) 2	(2) 0.5	(2) GN / BN	(2) 2266	(2) DC/AC Inverter Control 2	(2) I	(2) —
3	—	—	—	Not Occupied	—	—
(4) 4	(4) 0.75	(4) BK / WH	(4) 10120	(4) AC Outlet 2 Phase A Control	(4) II	(4) —
(5) 5	(5) 0.5	(5) BK	(5) 850	(5) Ground	(5) I	(5) —
(6) 6	(6) 0.75	(6) RD / WH	(6) 10121	(6) AC Outlet 2 Phase B Control	(6) II	(6) —

X81BCA Front Floor Console Accessory Power Rear Receptacle - 220V AC (KI7)



5086387

Connector Part Information

- Harness Type: Front Floor Console Wiring Harness
- OEM Connector: 6098-8443
- Service Connector: Service by Harness - See Part Catalog
- Description: 8-Way F 1.2 Series(BK)

Terminal Part Information

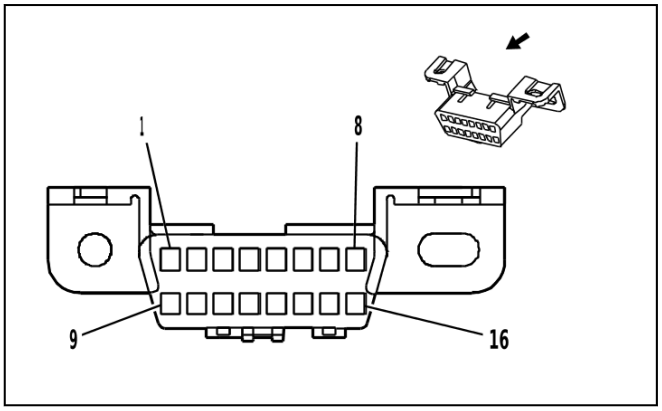
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required

X81BCA Front Floor Console Accessory Power Rear Receptacle - 220V AC (KI7)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BK	(1) 10117	(1) AC Outlet Phase A Control	(1) I	(1) —
2	—	—	—	Not Occupied	—	—
(3) 3	(3) 0.5	(3) VT / RD	(3) 4049	(3) AC Power Outlet Sensor High Reference	(3) I	(3) —
(4) 4	(4) 0.5	(4) BU / BN	(4) 6807	(4) DC/AC Inverter Control	(4) I	(4) —
(5) 5	(5) 0.75	(5) RD	(5) 10118	(5) AC Outlet Phase B Control	(5) I	(5) —
6	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(7) 7	(7) 0.5	(7) BK	(7) 2050	(7) Ground	(7) I	(7) —
8	—	—	—	Not Occupied	—	—

X84 Data Link Connector



68793

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 12110250
- Service Connector: 12110250
- Description: 16-Way F 150 Metri-Pack Series(BK)

Terminal Part Information

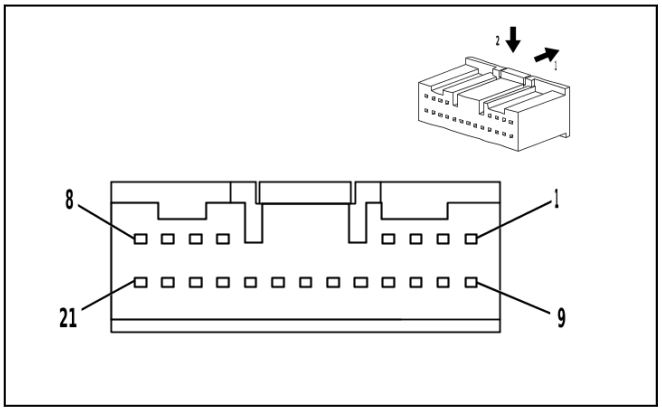
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13580059	J-35616-14 (GN)	J-38125-12A
II	Service by Cable	J-35616-2A (GY)	J-38125-11A

X84 Data Link Connector

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BU / BN	(1) 4983	(1) AUTOSAR CAN Bus [+] 7 Serial Data	(1) I	(1) —
(2) 2	(2) 0.35	(2) GN	(2) 2578	(2) Private Serial Data Presentation CAN Bus [+] 1 Serial Data	(2) I	(2) —
(3) 3	(3) 0.35	(3) YE / WH	(3) 4973	(3) Ethernet Bus 1R [+]	(3) II	(3) —
(4) 4	(4) 0.75	(4) BK	(4) 2050	(4) Ground	(4) I	(4) —
(5) 5	(5) 0.5	(5) BK / WH	(5) 2151	(5) Signal Ground	(5) I	(5) —
(6) 6	(6) 0.35	(6) YE	(6) 4981	(6) AUTOSAR CAN Bus [+] 6 Serial Data	(6) I	(6) —
(7) 7	(7) 0.35	(7) VT	(7) 2580	(7) Private Serial Data Presentation CAN Bus [+] 2 Serial Data	(7) I	(7) —
(8) 8	(8) 0.35	(8) WH	(8) 7207	(8) Ethernet Bus 1 Enable Signal	(8) I	(8) —
(9) 9	(9) 0.35	(9) WH	(9) 4982	(9) AUTOSAR CAN Bus [-] 7 Serial Data	(9) I	(9) —
(10) 10	(10) 0.35	(10) BN	(10) 2577	(10) Private Serial Data Presentation CAN Bus [-] 1 Serial Data	(10) I	(10) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(11) 11	(11) 0.35	(11) YE	(11) 4972	(11) Ethernet Bus 1R [-]	(11) II	(11) —
(12) 12	(12) 0.35	(12) GN / WH	(12) 4975	(12) Ethernet Bus 1T [+]	(12) II	(12) —
(13) 13	(13) 0.35	(13) GN	(13) 4974	(13) Ethernet Bus 1T [-]	(13) II	(13) —
(14) 14	(14) 0.35	(14) WH	(14) 4980	(14) AUTOSAR CAN Bus [-] 6 Serial Data	(14) I	(14) —
(15) 15	(15) 0.35	(15) GY	(15) 2579	(15) Private Serial Data Presentation CAN Bus [-] 2 Serial Data	(15) I	(15) —
(16) 16	(16) 0.5	(16) RD / BU	(16) 3240	(16) Battery Positive Voltage	(16) I	(16) —

X85 Steering Wheel Airbag Coil X1



3960237

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: ATLCPB-21B-2AY
- Service Connector: 13510218
- Description: 21-Way F 0.64 Series(YE)

Terminal Part Information

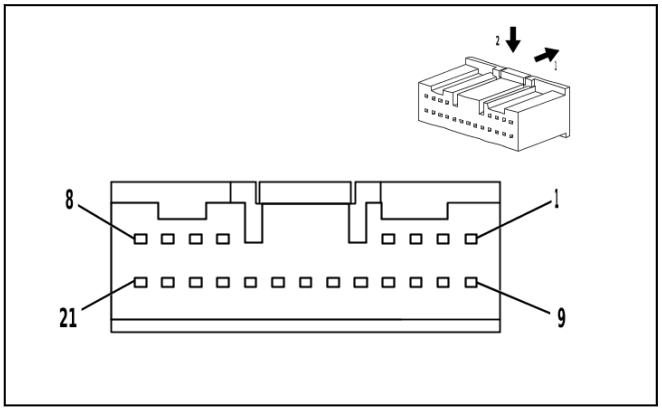
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13575742	J-35616-64B (L-BU)	J-38125-215A
II	13575865	J-35616-64B (L-BU)	J-38125-215A

X85 Steering Wheel Airbag Coil X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BK / WH	(1) 6051	(1) Steering Wheel Ground	(1) I	(1) —
(2) 2	(2) 0.35	(2) GN / WH	(2) 3287	(2) Horn Switch Signal	(2) I	(2) —
3 - 6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.5	(7) BN / OG	(7) 3020	(7) Steering Wheel Air Bag Stage 1 Low Control	(7) II	(7) —

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(8) 8	(8) 0.5	(8) OG / VT	(8) 3021	(8) Steering Wheel Air Bag Stage 1 High Control	(8) II	(8) —
(9) 9	(9) 0.35	(9) GN / GY	(9) 10652	(9) Radio LIN Bus 1	(9) I	(9) —
(10) 10	(10) 0.35	(10) GN / BK	(10) 2858	(10) Body Control Module LIN Bus 12	(10) I	(10) —
(11) 11	(11) 0.35	(11) GY / GN	(11) 11874	(11) Cruise Control Bank 1 Switch Signal	(11) I	(11) —
(12) 12	(12) 0.35	(12) BK / VT	(12) 1449	(12) Steering Wheel Resistor Ladder Low Reference	(12) I	(12) —
13	—	—	—	Not Occupied	—	—
(14) 14	(14) 0.35	(14) RD / GN	(14) 5140	(14) Battery Positive Voltage	(14) I	(14) —
(15) 15	(15) 0.35	(15) BN / GN	(15) 11875	(15) Cruise Control Bank 2 Switch Signal	(15) I	(15) —
16 - 19	—	—	—	Not Occupied	—	—
(20) 20	(20) 0.5	(20) BK	(20) 2050	(20) Ground	(20) I	(20) —
(21) 21	(21) 0.35	(21) RD / BN	(21) 10040	(21) Battery Positive Voltage	(21) I	(21) —

X85 Steering Wheel Airbag Coil X2



3960237

Connector Part Information

- Harness Type: Steering Wheel Horn Switch Wiring Harness
- OEM Connector: ATLCPB-21B-2AY
- Service Connector: Service by Harness - See Part Catalog
- Description: 21-Way F 0.64 Series(YE)

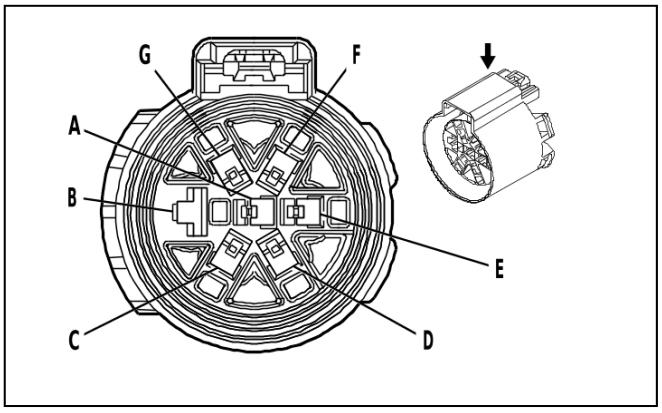
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

X85 Steering Wheel Airbag Coil X2

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BK / WH	(1) 6051	(1) Steering Wheel Ground	(1) I	(1) —
(2) 2	(2) 0.5	(2) GN / WH	(2) 3287	(2) Horn Switch Signal	(2) I	(2) —
3 - 6	—	—	—	Not Occupied	—	—
(7) 7	(7) 0.5	(7) BN / OG	(7) 3020	(7) Steering Wheel Air Bag Stage 1 Low Control	(7) I	(7) —
(8) 8	(8) 0.5	(8) OG / VT	(8) 3021	(8) Steering Wheel Air Bag Stage 1 High Control	(8) I	(8) —
(9) 9	(9) 0.35	(9) RD / BN	(9) 10040	(9) Battery Positive Voltage	(9) I	(9) —
(10) 10	(10) 0.5	(10) BK	(10) 6050	(10) Steering Wheel Ground	(10) I	(10) —
11 - 14	—	—	—	Not Occupied	—	—
(15) 15	(15) 0.35	(15) GY / GN	(15) 5737	(15) Distance Sensing Cruise Control Gap Up/ Down Switch Signal	(15) I	(15) —
(16) 16	(16) 0.35	(16) RD / GN	(16) 5140	(16) Battery Positive Voltage	(16) I	(16) —
17	—	—	—	Not Occupied	—	—
(18) 18	(18) 0.35	(18) BK / VT	(18) 1449	(18) Steering Wheel Resistor Ladder Low Reference	(18) I	(18) —
(19) 19	(19) 0.35	(19) BN / GN	(19) 1884	(19) Cruise Control Set/Coast/Resume/ Accelerate Switch Signal	(19) I	(19) —
(20) 20	(20) 0.35	(20) GN / BK	(20) 2858	(20) Body Control Module LIN Bus 12	(20) I	(20) —
(21) 21	(21) 0.35	(21) GN / BK	(21) 10652	(21) Radio LIN Bus 1	(21) I	(21) —

X88B Tow Vehicle Electrical Receptacle (U1D & Z82)



2056936

Connector Part Information

- Harness Type: Chassis Wiring Harness
- OEM Connector: 13857223
- Service Connector: 86816072
- Description: 7-Way F 280, 630 Metri-Pack Series, Sealed(BK)

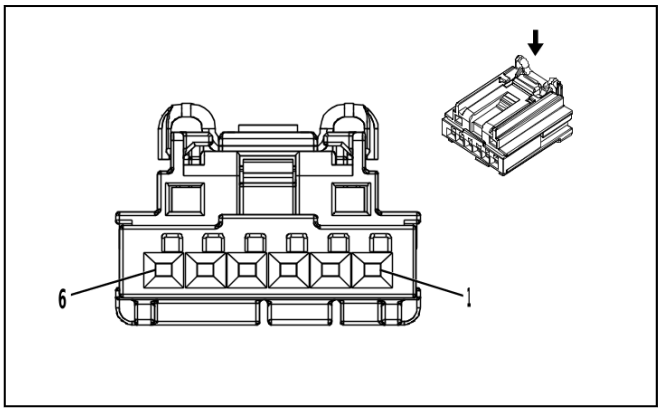
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-42 (RD)	No Tool Required
II	Not required	J-35616-4A (PU)	No Tool Required

X88B Tow Vehicle Electrical Receptacle (U1D & Z82)

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
A	0.75 0.75	GN / WH WH / GN	5189 1624	Trailer Backup Lamp Control Trailer Backup Lamp Control	II II	U1D+ Z82 Z82- U1D
B	5	WH	22	Trailer Ground	I	—
C	2.5	BU	47	Trailer Auxiliary Control	II	—
D	0.75	GN / VT	1619	Right Rear Trailer Stop/Turn Lamp Control	II	—
E	3	RD / GY	1042	Battery Positive Voltage	II	—
F	1.5	GY / BN	2109	Trailer Park Lamp Control	II	—
G	0.75	YE / GY	1618	Left Rear Trailer Stop/Turn Lamp Control	II	—

X92C Single Charge Only 2nd Row Receptacle - Floor Console Rear



3960313

Connector Part Information

- Harness Type: Front Floor Console Wiring Harness
- OEM Connector: 2035363-4
- Service Connector: Service by Harness - See Part Catalog
- Description: 6-Way F 0.64 Generation Y Series(BK)

Terminal Part Information

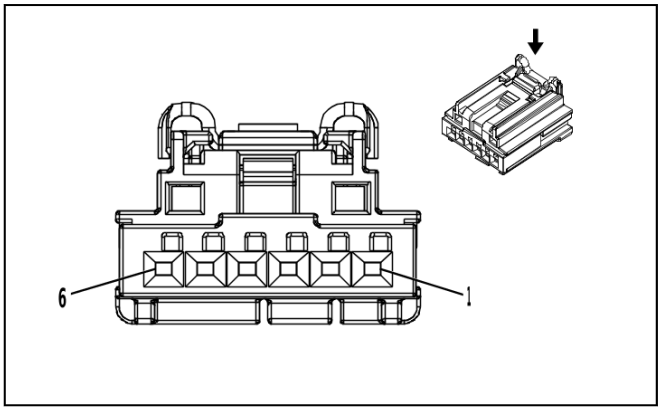
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

X92C Single Charge Only 2nd Row Receptacle - Floor Console Rear

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT	(1) 4701	(1) Retained Accessory Power Control	(1) I	(1) —
2	—	—	—	Not Occupied	—	—

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(3) 3	(3) 0.5	(3) BK	(3) 2050	(3) Ground	(3) I	(3) —
4 - 6	—	—	—	Not Occupied	—	—

X92G USB 2 Port Receptacle X1



3960313

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 2035363-4
- Service Connector: 19332786
- Description: 6-Way F 0.64 Generation Y Series(BK)

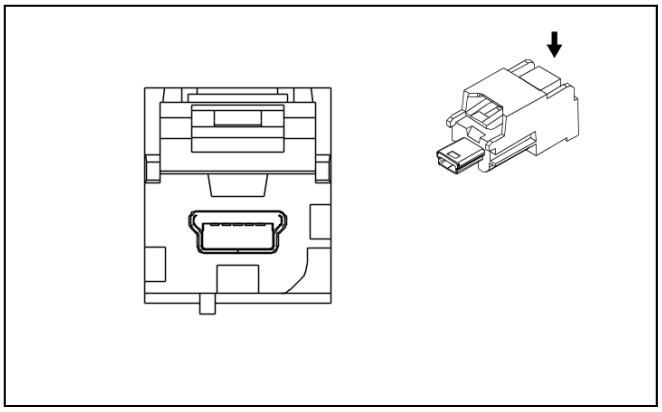
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-64B (L-BU)	No Tool Required

X92G USB 2 Port Receptacle X1

Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) RD / WH	(1) 7240	(1) Battery Positive Voltage	(1) I	(1) —
(2) 2	(2) 0.35	(2) YE	(2) 6817	(2) LED Backlight Dimming Control 1	(2) I	(2) —
(3) 3	(3) 0.5	(3) BK / WH	(3) 2151	(3) Signal Ground	(3) I	(3) —
4 - 6	—	—	—	Not Occupied	—	—

X92G USB 2 Port Receptacle X2



3028807

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness USB
- OEM Connector: 13585100
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 5-Way M 2.0 Mini-B USB Type(GY)

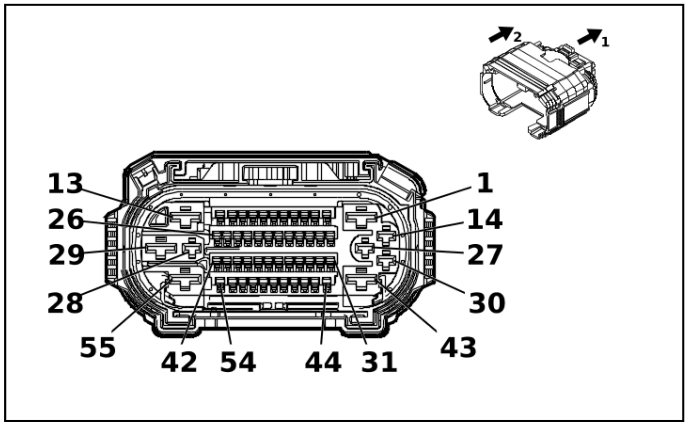
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X92G USB 2 Port Receptacle X2

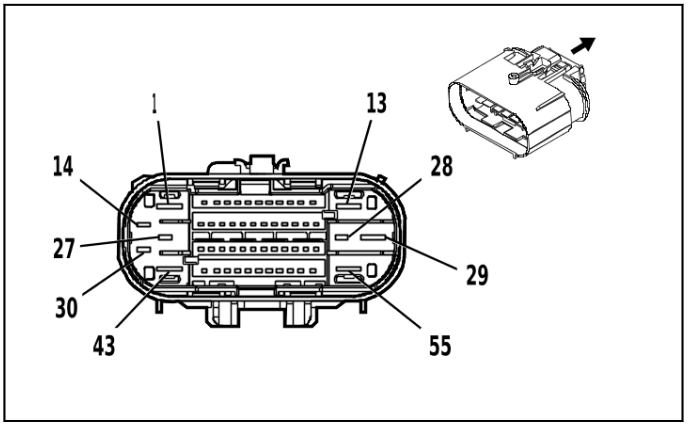
Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
—	—	USB	—	USB Serial Data	I	—

X100 Chassis Wiring Harness to Body Wiring Harness



5246872

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 35716591
- Service Connector: 19371184
- Description: 55-Way F 1.2 OCS, 2.8, 6.3 CTS Series, Sealed(GY)



4994369

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 35716588
- Service Connector: 84727363
- Description: 55-Way M 1.2 OCS, 2.8, 6.3 CTS Series, Sealed(GY)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370818	J-35616-12 (BU)	J-38125-215A
II	84634921	J-35616-42 (RD)	J-38125-212
III	84847992	J-35616-32 (OG)	J-38125-36
IV	84867140	J-35616-13 (BU)	J-38125-215A
V	84992391	J-35616-5 (PU)	J-38125-36

X100 Chassis Wiring Harness to Body Wiring Harness

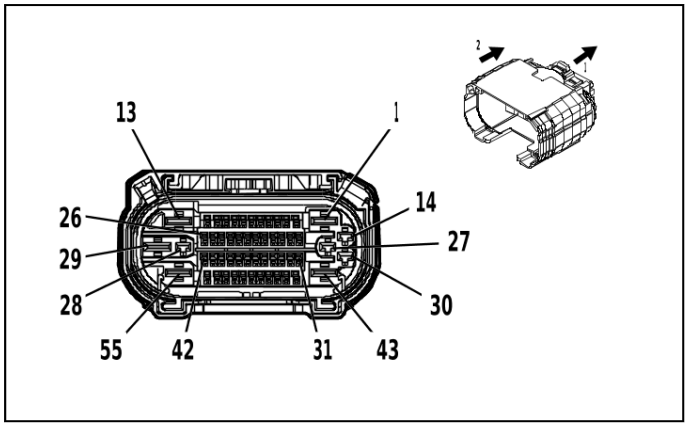
Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 6	(1) GY	(1) 4368	(1) II	(1) —	(1) Right Park Brake Motor Low Reference	(1) 1	(1) 2.5	(1) GY	(1) 4368	(1) III	(1) —
(2) 2	(2) 0.5	(2) VT / BU	(2) 5705	(2) I	(2) —	(2) Powertrain Main Relay Control	(2) 2	(2) 0.5	(2) VT / BU	(2) 5705	(2) IV	(2) —
(3) 3	(3) 0.5	(3) BK	(3) 150	(3) I	(3) —	(3) Ground	(3) 3	(3) 0.5	(3) BK	(3) 150	(3) IV	(3) —
4	—	—	—	—	—	Not Occupied	4	—	—	—	—	—
(5) 5	(5) 0.5	(5) BU / YE	(5) 4979	(5) I	(5) —	(5) AUTOSAR CAN Bus [+] 2 Serial Data	(5) 5	(5) 0.5	(5) BU / YE	(5) 4979	(5) IV	(5) —
(6) 6	(6) 0.5	(6) WH	(6) 4978	(6) I	(6) —	(6) AUTOSAR CAN Bus [-] 2 Serial Data	(6) 6	(6) 0.5	(6) WH	(6) 4978	(6) IV	(6) —
7	—	—	—	—	—	Not Occupied	7	—	—	—	—	—
(8) 8	(8) 0.5	(8) BU / WH	(8) 1334	(8) I	(8) —	(8) Left Rear Turn Signal Lamp Control 2	(8) 8	(8) 0.5	(8) BU / WH	(8) 1334	(8) IV	(8) —
(9) 9	(9) 0.75	(9) BU / VT	(9) 1335	(9) I	(9) —	(9) Right Rear Turn Signal Lamp Control 2	(9) 9	(9) 0.5	(9) BU / VT	(9) 1335	(9) IV	(9) —
10	—	—	—	—	—	Not Occupied	10	—	—	—	—	—
(11) 11	(11) 0.5	(11) BN / BU	(11) 6993	(11) I	(11) —	(11) Left Rear Park Lamp Control	(11) 11	(11) 0.5	(11) BN / BU	(11) 6993	(11) IV	(11) —
(12) 12	(12) 0.5	(12) BN / GY	(12) 6995	(12) I	(12) —	(12) Right Rear Park Lamp Control	(12) 12	(12) 0.5	(12) BN / GY	(12) 6995	(12) IV	(12) —
(13) 13	(13) 6	(13) RD / BN	(13) 440	(13) II	(13) —	(13) Battery Positive Voltage	(13) 13	(13) 6	(13) RD / BN	(13) 440	(13) III	(13) —
14	—	—	—	—	—	Not Occupied	14	—	—	—	—	—
(15) 15	(15) 0.75	(15) BU / WH	(15) BARE	(15) I	(15) —	(15) Uninsulated Wire	(15) 15	(15) 0.75	(15) BK	(15) BARE	(15) IV	(15) —
(16) 16	(16) 0.75	(16) BK / WH	(16) 10120	(16) I	(16) —	(16) AC Outlet 2 Phase A Control	(16) 16	(16) 0.75	(16) BK / WH	(16) 10120	(16) IV	(16) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(17) 17	(17) 0.75	(17) R D / WH	(17) 10 121	(17) I	(17) —	(17) AC Outlet 2 Phase B Control	(17) 17	(17) 0.75	(17) R D / WH	(17) 10 121	(17) IV	(17) —
18 - 19	—	—	—	—	—	Not Occupied	18 - 19	—	—	—	—	—
(20) 20	(20) 0.5	(20) G Y / VT	(20) 26 91	(20) I	(20) —	(20) Rear Closure Actuator Lock Control	(20) 20	(20) 0.5	(20) G Y / VT	(20) 26 91	(20) IV	(20) —
(21) 21	(21) 0.5	(21) G Y / BK	(21) 26 80	(21) I	(21) —	(21) Lock Actuators Unlock Control 2	(21) 21	(21) 0.5	(21) G Y / BK	(21) 26 80	(21) IV	(21) —
22 - 23	—	—	—	—	—	Not Occupied	22 - 23	—	—	—	—	—
(24) 24	(24) 0.75	(24) R D / BU	(24) 84 0	(24) I	(24) —	(24) Battery Positive Voltage	(24) 24	(24) 0.75	(24) R D / BU	(24) 84 0	(24) IV	(24) —
(25) 25	(25) 0.5	(25) G N / YE	(25) 68 46	(25) I	(25) —	(25) Rear License Plate Lamp Control	(25) 25	(25) 0.35	(25) G N / YE	(25) 68 46	(25) IV	(25) —
26 - 27	—	—	—	—	—	Not Occupied	26 - 27	—	—	—	—	—
(28) 28	(28) —	(28) —	(28) —	(28) —	(28) —	(28) Ground	(28) 28	(28) 2.5	(28) B K	(28) 15 0	(28) V	(28) —
(29) 29	(29) 6	(29) G Y / BK	(29) 43 69	(29) II	(29) —	(29) Left Park Brake Motor Low Reference	(29) 29	(29) 2.5	(29) G Y / BK	(29) 43 69	(29) III	(29) —
30	—	—	—	—	—	Not Occupied	30	—	—	—	—	—
(31) 31	(31) 0.5	(31) B N / BU	(31) 16 02	(31) I	(31) —	(31) Front Brake Pad Wear Sensor Signal	(31) 31	(31) 0.5	(31) B N / BU	(31) 16 02	(31) IV	(31) —
(32) 32	(32) 0.5	(32) B K / WH	(32) 20 51	(32) I	(32) —	(32) Signal Ground	(32) 32	(32) 0.5	(32) B K / WH	(32) 20 51	(32) IV	(32) —
(33) 33	(33) 0.5	(33) Y E	(33) 87 2	(33) I	(33) —	(33) Right Front Wheel Speed Sensor Signal	(33) 33	(33) 0.5	(33) Y E	(33) 87 2	(33) IV	(33) —
(34) 34	(34) 0.5	(34) G Y / BN	(34) 70 65	(34) I	(34) —	(34) Right Front Wheel Speed Sensor Control	(34) 34	(34) 0.5	(34) G Y / BN	(34) 70 65	(34) IV	(34) —
(35) 35	(35) 0.5	(35) G Y	(35) 83 0	(35) I	(35) —	(35) Left Front Wheel Speed Sensor Signal	(35) 35	(35) 0.5	(35) G Y	(35) 83 0	(35) IV	(35) —
(36) 36	(36) 0.5	(36) G Y / WH	(36) 70 64	(36) I	(36) —	(36) Left Front Wheel Speed Sensor Control	(36) 36	(36) 0.5	(36) G Y / WH	(36) 70 64	(36) IV	(36) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(37) 37	(37) 0.5	(37) V T	(37) 88 2	(37) I	(37) —	(37) Right Rear Wheel Speed Sensor Signal	(37) 37	(37) 0.5	(37) V T	(37) 88 2	(37) IV	(37) —
(38) 38	(38) 0.5	(38) G Y / YE	(38) 71 28	(38) I	(38) —	(38) Right Rear Wheel Speed Sensor Control	(38) 38	(38) 0.5	(38) G Y / YE	(38) 71 28	(38) IV	(38) —
(39) 39	(39) 0.5	(39) B U	(39) 88 4	(39) I	(39) —	(39) Left Rear Wheel Speed Sensor Signal	(39) 39	(39) 0.5	(39) B U	(39) 88 4	(39) IV	(39) —
(40) 40	(40) 0.5	(40) G Y / BK	(40) 71 27	(40) I	(40) —	(40) Left Rear Wheel Speed Sensor Control	(40) 40	(40) 0.5	(40) G Y / BK	(40) 71 27	(40) IV	(40) —
41 - 42	—	—	—	—	—	Not Occupied	41 - 42	—	—	—	—	—
(43) 43	(43) 6	(43) G N / VT	(43) 19 88	(43) II	(43) —	(43) Right Park Brake Motor Apply Control	(43) 43	(43) 2.5	(43) G N / VT	(43) 19 88	(43) III	(43) —
44	—	—	—	—	—	Not Occupied	44	—	—	—	—	—
(45) 45	(45) 0.5	(45) G N / YE	(45) 16 16	(45) I	(45) —	(45) Rear Brake Pad Wear Sensor Signal	(45) 45	(45) 0.5	(45) G N / YE	(45) 16 16	(45) IV	(45) —
(46) 46	(46) 0.5	(46) Y E	(46) 23 75	(46) I	(46) —	(46) Left Rear Outer Parking Assist Sensor Signal	(46) 46	(46) 0.5	(46) Y E	(46) 23 75	(46) IV	(46) —
(47) 47	(47) 0.75	(47) B N / WH	(47) 23 74	(47) I	(47) —	(47) Object Sensor Volt-age Reference	(47) 47	(47) 0.75	(47) B N / WH	(47) 23 74	(47) IV	(47) —
(48) 48	(48) 0.5	(48) Y E / BU	(48) 23 76	(48) I	(48) —	(48) Left Rear Middle Parking Assist Sensor Signal	(48) 48	(48) 0.5	(48) Y E / BU	(48) 23 76	(48) IV	(48) —
(49) 49	(49) 0.5	(49) Y E / VT	(49) 23 78	(49) I	(49) —	(49) Right Rear Outer Parking Assist Sensor Signal	(49) 49	(49) 0.5	(49) Y E / VT	(49) 23 78	(49) IV	(49) —
(50) 50	(50) 0.75	(50) B K / GY	(50) 23 79	(50) I	(50) —	(50) Object Sensor Low Reference	(50) 50	(50) 0.75	(50) B K / GY	(50) 23 79	(50) IV	(50) —
(51) 51	(51) 0.5	(51) Y E / WH	(51) 23 77	(51) I	(51) —	(51) Right Rear Middle Parking Assist Sensor Signal	(51) 51	(51) 0.5	(51) Y E / WH	(51) 23 77	(51) IV	(51) —
52 - 53	—	—	—	—	—	Not Occupied	52 - 53	—	—	—	—	—

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(54) 54	(54) 0.75	(54) BK	(54) 2203	(54) I	(54) —	(54) Enhanced Driver Mode 2 Switch Signal	(54) 54	(54) 0.75	(54) BK	(54) 2203	(54) IV	(54) —
(55) 55	(55) 6	(55) WH	(55) 2001	(55) II	(55) —	(55) Left Park Brake Motor Apply Control	(55) 55	(55) 2.5	(55) WH	(55) 2001	(55) III	(55) —

X101 Body Wiring Harness to Chassis Wiring Harness



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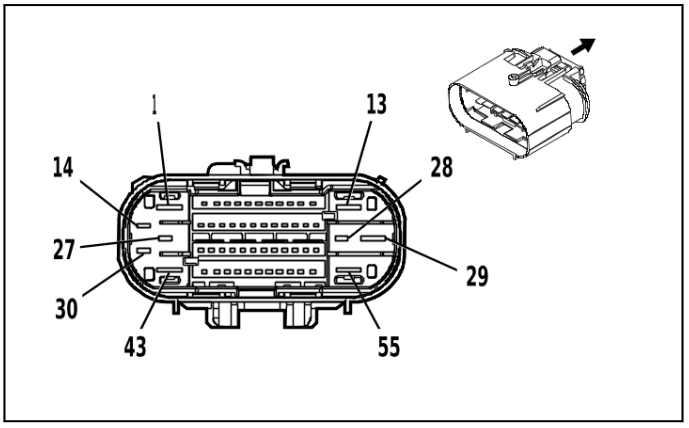


4993301

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 35016652
- Service Connector: 19371185
- Description: 55-Way F 1.2 OCS, 2.8, 6.3 CTS Series, Sealed(BK)

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 35205173
- Service Connector: 84727364
- Description: 55-Way M 1.2 OCS, 2.8, 6.3 CTS Series, Sealed(BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19332901	J-35616-35 (VT)	J-38125-212
II	19370818	J-35616-12 (BU)	J-38125-215A
III	Not required	No Tool Required	No Tool Required
IV	84867140	J-35616-13 (BU)	J-38125-215A
V	84992391	J-35616-5 (PU)	J-38125-36
VI	Not required	No Tool Required	No Tool Required

X101 Body Wiring Harness to Chassis Wiring Harness

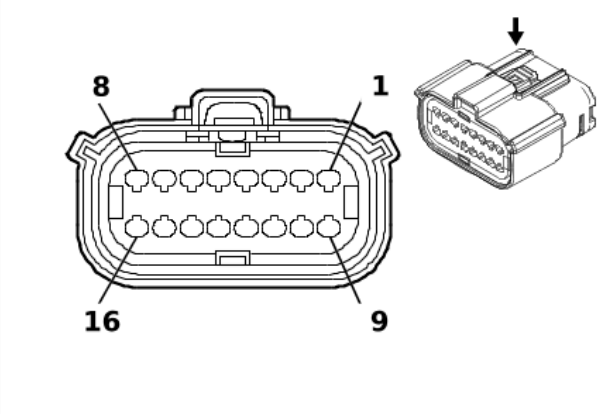
Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1 - 2	—	—	—	—	—	Not Occupied	1 - 2	—	—	—	—	—
(3) 3	(3) 0.5	(3) YE / GN	(3) 7122	(3) II	(3) —	(3) Axle Differential Lock Switch Signal	(3) 3	(3) 0.5	(3) YE / GN	(3) 7122	(3) IV	(3) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(4) 4	(4) 0.5	(4) YE	(4) 7115	(4) II	(4) —	(4) Rear Axle Differential Lock Indicator Control	(4) 4	(4) 0.5	(4) YE	(4) 7115	(4) IV	(4) —
(5) 5	(5) 0.5	(5) VT / GY	(5) 7117	(5) II	(5) —	(5) Front Axle Differential Lock Indicator Control	(5) 5	(5) 0.5	(5) VT / GY	(5) 7117	(5) IV	(5) —
6 - 8	—	—	—	—	—	Not Occupied	6 - 8	—	—	—	—	—
(9) 9	(9) 0.5	(9) GY / YE	(9) 7542	(9) II	(9) —	(9) Left Rear Stop Lamp Control	(9) 9	(9) 0.5	(9) GY / YE	(9) 7542	(9) IV	(9) —
(10) 10	(10) 0.5 (10) 0.5	(10) WH / BK (10) WH / YE	(10) 2223 (10) 7541	(10) III (10) II	(10) JL1 (10) - T93	(10) Trailer Brake Apply Signal (10) Right Rear Stop Lamp Control	(10) 10	(10) 0.5 (10) 0.5	(10) WH / BK (10) WH / YE	(10) 2223 (10) 7541	(10) VI (10) IV	(10) JL1 (10) - T93
(11) 11	(11) 0.5 (11) 0.5	(11) YE / BK (11) BK	(11) 2224 (11) 2250	(11) III (11) II	(11) JL1 (11) - T93	(11) Trailer Brake Enable Signal (11) Ground	(11) 11	(11) 0.5 (11) 0.5	(11) YE / BK (11) BK	(11) 2224 (11) 2250	(11) VI (11) IV	(11) JL1 (11) - T93
(12) 12	(12) 0.5	(12) VT / BK	(12) 739	(12) III	(12) —	(12) Run/ Crank Ignition 1 Voltage	(12) 12	(12) 0.5	(12) VT / BK	(12) 739	(12) VI	(12) —
13	—	—	—	—	—	Not Occupied	13	—	—	—	—	—
(14) 14	(14) 0.5 (14) 2.5	(14) BN / YE (14) BU	(14) 820 (14) 47	(14) III (14) I	(14) — (14) —	(14) Center High Mounted Stop Lamp Supply Voltage (14) Trailer Auxiliary Control	(14) 14	(14) 0.5 (14) 2.5	(14) BN / YE (14) BU	(14) 820 (14) 47	(14) VI (14) V	(14) — (14) —
(15) 15	(15) 0.5 (15) 0.5	(15) GN / BN (15) GN / BU	(15) 2266 (15) 2733	(15) II (15) III	(15) — (15) —	(15) DC/AC Inverter Control 2 (15) Brake System Control Module LIN Bus 2	(15) 15	(15) 0.5 (15) 0.5	(15) GN / BN (15) GN / BU	(15) 2266 (15) 2733	(15) IV (15) VI	(15) — (15) —
(16) 16	(16) 0.5	(16) VT / RD	(16) 4049	(16) II	(16) —	(16) AC Power Outlet Sensor High Reference	(16) 16	(16) 0.5	(16) VT / RD	(16) 4049	(16) IV	(16) —
17 - 19	—	—	—	—	—	Not Occupied	17 - 19	—	—	—	—	—
(20) 20	(20) 0.5	(20) GN / BU	(20) 2733	(20) II	(20) —	(20) Brake System Control Module LIN Bus 2	(20) 20	(20) 0.5	(20) GN / BU	(20) 2733	(20) IV	(20) —
(21) 21	(21) 0.35	(21) BN / YE	(21) 820	(21) II	(21) —	(21) Center High Mounted Stop Lamp Supply Voltage	(21) 21	(21) 0.5	(21) BN / YE	(21) 820	(21) IV	(21) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(22) 22	(22) 0.5	(22) YE / GN	(22) 71 22	(22) III	(22) —	(22) Axle Differential Lock Switch Signal	(22) 22	(22) 0.5	(22) YE / GN	(22) 71 22	(22) VI	(22) —
(23) 23	(23) 0.5 (23) 0.5	(23) YE (23) VT / BK	(23) 71 15 (23) 73 9	(23) III (23) II	(23) — (23) —	(23) Rear Axle Differential Lock Indicator Control (23) Run/ Crank Ignition 1 Voltage	(23) 23	(23) 0.5 (23) 0.5	(23) YE (23) VT / BK	(23) 71 15 (23) 73 9	(23) VI (23) IV	(23) — (23) —
(24) 24	(24) 0.5 (24) 0.5	(24) YE / BK (24) VT / GY	(24) 22 24 (24) 71 17	(24) II (24) III	(24) — (24) —	(24) Trailer Brake Enable Signal (24) Front Axle Differential Lock Indicator Control	(24) 24	(24) 0.5 (24) 0.5	(24) YE / BK (24) VT / GY	(24) 22 24 (24) 71 17	(24) IV (24) VI	(24) — (24) —
(25) 25	(25) 0.5	(25) WH / BK	(25) 22 23	(25) II	(25) —	(25) Trailer Brake Apply Signal	(25) 25	(25) 0.5	(25) WH / BK	(25) 22 23	(25) IV	(25) —
(26) 26	(26) 0.5	(26) GN / WH	(26) 24	(26) II	(26) —	(26) Backup Lamp Control	(26) 26	(26) 0.75	(26) GN / WH	(26) 24	(26) IV	(26) —
27 - 32	—	—	—	—	—	Not Occupied	27 - 32	—	—	—	—	—
(33) 33	(33) 0.5	(33) BU / YE	(33) 49 79	(33) II	(33) —	(33) AUTOSAR CAN Bus [+] 2 Serial Data	(33) 33	(33) 0.5	(33) BU / YE	(33) 49 79	(33) IV	(33) —
(34) 34	(34) 0.5	(34) WH	(34) 49 78	(34) II	(34) —	(34) AUTOSAR CAN Bus [-] 2 Serial Data	(34) 34	(34) 0.5	(34) WH	(34) 49 78	(34) IV	(34) —
35	—	—	—	—	—	Not Occupied	35	—	—	—	—	—
(36) 36	(36) 0.5	(36) BU / YE	(36) 49 79	(36) II	(36) —	(36) AUTOSAR CAN Bus [+] 2 Serial Data	(36) 36	(36) 0.5	(36) BU / YE	(36) 49 79	(36) IV	(36) —
(37) 37	(37) 0.5	(37) WH	(37) 49 78	(37) II	(37) —	(37) AUTOSAR CAN Bus [-] 2 Serial Data	(37) 37	(37) 0.5	(37) WH	(37) 49 78	(37) IV	(37) —
38	—	—	—	—	—	Not Occupied	38	—	—	—	—	—
(39) 39	(39) 0.5	(39) BU / VT	(39) 41 01	(39) II	(39) —	(39) AUTOSAR CAN Bus [+] 4 Serial Data	(39) 39	(39) 0.5	(39) BU / VT	(39) 41 01	(39) IV	(39) —
(40) 40	(40) 0.5	(40) WH	(40) 41 00	(40) II	(40) —	(40) AUTOSAR CAN Bus [-] 4 Serial Data	(40) 40	(40) 0.5	(40) WH	(40) 41 00	(40) IV	(40) —
41 - 48	—	—	—	—	—	Not Occupied	41 - 48	—	—	—	—	—
(49) 49	(49) 0.5	(49) WH	(49) 40 55	(49) II	(49) —	(49) Private Serial Data Powertrain CAN Bus [+] Serial Data	(49) 49	(49) 0.5	(49) WH	(49) 40 55	(49) IV	(49) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(50) 50	(50) 0.5	(50) BU / GY	(50) 40 54	(50) II	(50) —	(50) Private Serial Data Powertrain CAN Bus [-] Serial Data	(50) 50	(50) 0.5	(50) BU / GY	(50) 40 54	(50) IV	(50) —
51	—	—	—	—	—	Not Occupied	51	—	—	—	—	—
(52) 52	(52) 0.5	(52) BU / BK	(52) 49 77	(52) II	(52) —	(52) AUTOSAR CAN Bus [+] 3 Serial Data	(52) 52	(52) 0.5	(52) BU / BK	(52) 49 77	(52) IV	(52) —
(53) 53	(53) 0.5	(53) WH	(53) 49 76	(53) II	(53) —	(53) AUTOSAR CAN Bus [-] 3 Serial Data	(53) 53	(53) 0.5	(53) WH	(53) 49 76	(53) IV	(53) —
54 - 55	—	—	—	—	—	Not Occupied	54 - 55	—	—	—	—	—

X107 Chassis Wiring Harness to Power Steering Wiring Harness



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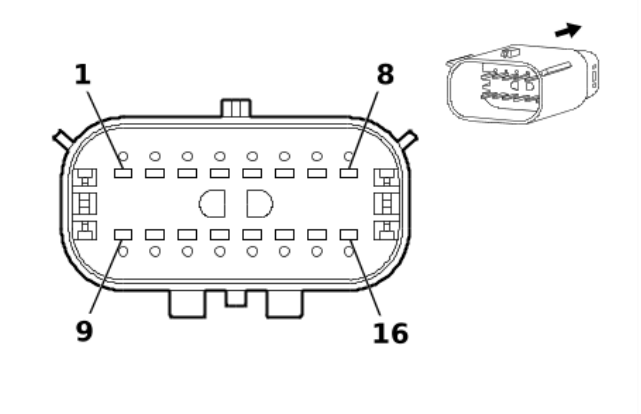


2548390

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 33472-1606
- Service Connector: 13584788
- Description: 16-Way F 1.5 MX Series, Sealed(BK)

Connector Part Information
- Harness Type: Power Steering Wiring Harness
- OEM Connector: 33482-8601
- Service Connector: Service by Harness - See Part Catalog
- Description: 16-Way M 1.5 MX Series, Sealed(BK)

Terminal Part Information

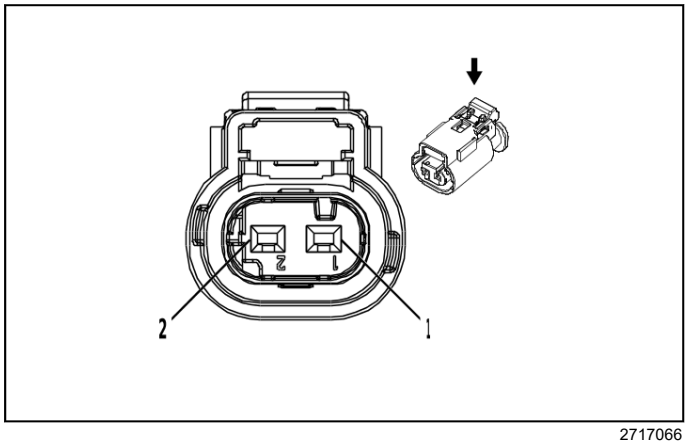
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19368973	J-35616-2A (GY)	J-38125-217
II	Not required	J-35616-3 (GY)	No Tool Required

X107 Chassis Wiring Harness to Power Steering Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BU / YE	(1) 497 9	(1) I	(1) —	(1) AUTOSAR CAN Bus [+] 2 Serial Data	(1) 1	(1) 0.5	(1) BU / YE	(1) 497 9	(1) II	(1) —
(2) 2	(2) 0.5	(2) WH	(2) 497 8	(2) I	(2) —	(2) AUTOSAR CAN Bus [-] 2 Serial Data	(2) 2	(2) 0.5	(2) WH	(2) 497 8	(2) II	(2) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
3 - 4	—	—	—	—	—	Not Occupied	3 - 4	—	—	—	—	—
(5) 5	(5) 0.5	(5) BU / YE	(5) 4979	(5) I	(5) —	(5) AUTOSAR CAN Bus [+] 2 Serial Data	(5) 5	(5) 0.5	(5) BU / YE	(5) 4979	(5) II	(5) —
(6) 6	(6) 0.5	(6) WH	(6) 4978	(6) I	(6) —	(6) AUTOSAR CAN Bus [-] 2 Serial Data	(6) 6	(6) 0.5	(6) WH	(6) 4978	(6) II	(6) —
7 - 8	—	—	—	—	—	Not Occupied	7 - 8	—	—	—	—	—
(9) 9	(9) 0.75	(9) VT / WH	(9) 7256	(9) I	(9) —	(9) Front Differential Lock Actuator Control	(9) 9	(9) 0.75	(9) VT / WH	(9) 7256	(9) II	(9) —
(10) 10	(10) 0.75	(10) WH / BK	(10) 7254	(10) I	(10) —	(10) Front Differential Lock Actuator Low Control	(10) 10	(10) 0.75	(10) WH / BK	(10) 7254	(10) II	(10) —
11 - 12	—	—	—	—	—	Not Occupied	11 - 12	—	—	—	—	—
(13) 13	(13) 0.5	(13) YE / WH	(13) 1695	(13) I	(13) —	(13) 4WD Locked Range Indicator Control	(13) 13	(13) 0.5	(13) YE / WH	(13) 1695	(13) II	(13) —
(14) 14	(14) 0.5	(14) GY / BK	(14) 1570	(14) I	(14) —	(14) Front Axle Actuator Control	(14) 14	(14) 0.5	(14) GY / BK	(14) 1570	(14) II	(14) —
(15) 15	(15) 0.5	(15) BK	(15) 2250	(15) I	(15) —	(15) Ground	(15) 15	(15) 0.5	(15) BK	(15) 2250	(15) II	(15) —
(16) 16	(16) 0.5	(16) GN	(16) 8016	(16) I	(16) —	(16) Secondary Axle Motor Control	(16) 16	(16) 0.5	(16) GN	(16) 8016	(16) II	(16) —

X144 Engine Wiring Harness to Oil Pump Flow Control Solenoid Valve Harness



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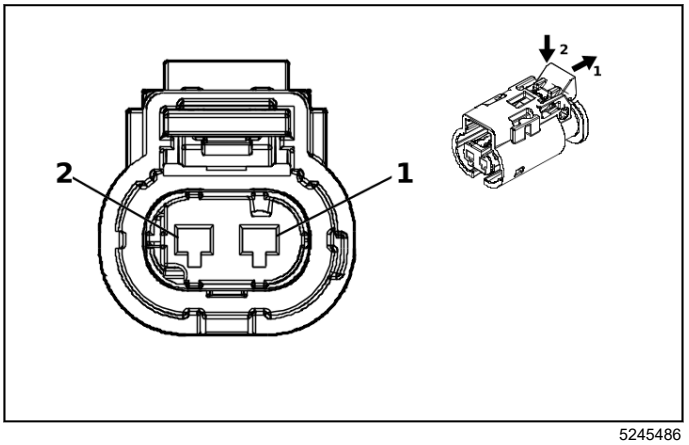


5245486

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 10010337
- Service Connector: 13587326
- Description: 2-Way F 1.2 Multilock Series, Sealed(BK)

Connector Part Information
- Harness Type: Oil Pump Flow Control Solenoid Valve Harness
- OEM Connector: 13522570
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way M 1.2 MLK Series, Sealed(BK)

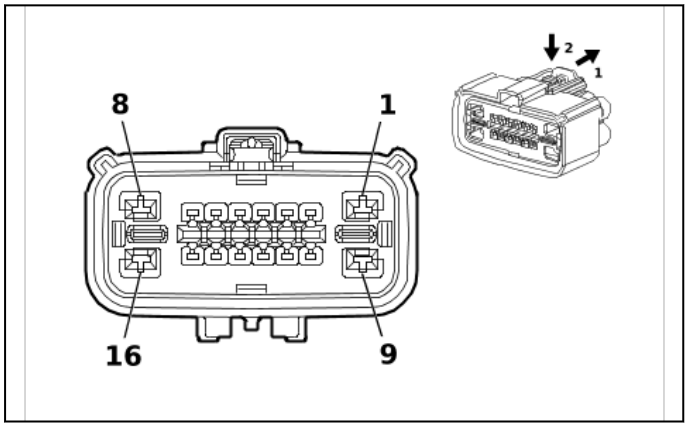
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required
II	Not required	J-35616-13 (BU)	No Tool Required

X144 Engine Wiring Harness to Oil Pump Flow Control Solenoid Valve Harness

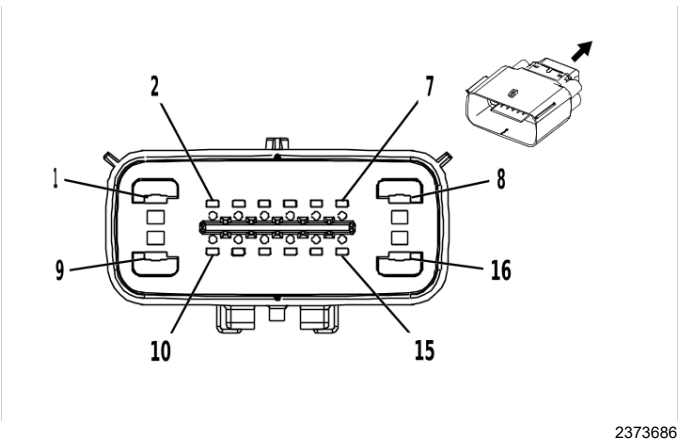
Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) YE / BN	(1) 106	(1) I	(1) —	(1) Oil Pump Motor Control	(1) 1	(1) 0.5	(1) YE / BN	(1) 106	(1) II	(1) —
(2) 2	(2) 0.5	(2) BU	(2) 179	(2) I	(2) —	(2) Engine Oil Pump Control	(2) 2	(2) 0.5	(2) BU	(2) 179	(2) II	(2) —

X150 Body Wiring Harness to Forward Lamp Wiring Harness



5971740

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 34985-8270
- Service Connector: 19352906
- Description: 16-Way F 1.5, 2.8 MX Series, Sealed(BK)



2373686

Connector Part Information
- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 34986-1601
- Service Connector: 19331031
- Description: 16-Way M 1.5, 2.8 MX Series, Sealed(BK)

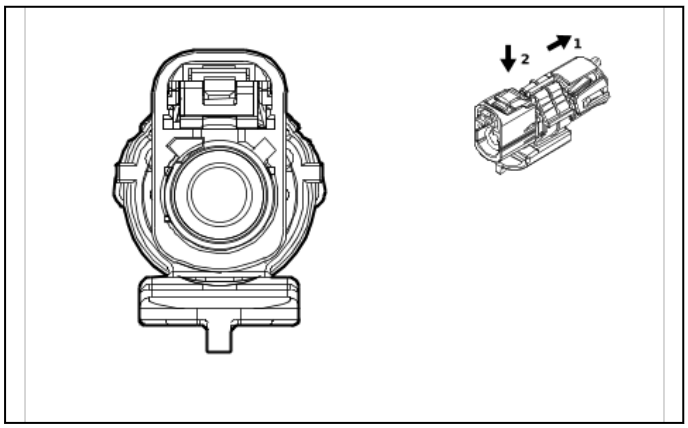
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13576377	J-35616-35 (VT)	J-38125-12A
II	85528055	J-35616-2A (GY)	J-38125-217
III	19366658	J-35616-5 (PU)	J-38125-12A
IV	86800300	J-35616-3 (GY)	J-38125-217

X150 Body Wiring Harness to Forward Lamp Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) RD / WH	(1) 640	(1) I	(1) —	(1) Battery Positive Voltage	(1) 1	(1) 0.75	(1) RD / WH	(1) 640	(1) III	(1) —
(2) 2	(2) 0.75	(2) YE	(2) 712	(2) II	(2) —	(2) Left Headlamp Low Beam Control	(2) 2	(2) 0.75	(2) YE	(2) 712	(2) IV	(2) —
(3) 3	(3) 0.75	(3) WH	(3) 711	(3) II	(3) —	(3) Left Headlamp High Beam Control	(3) 3	(3) 0.75	(3) WH	(3) 711	(3) IV	(3) —
(4) 4	(4) 0.35	(4) WH / YE	(4) 1254	(4) II	(4) —	(4) Left Front Park Lamp Control	(4) 4	(4) 0.5	(4) WH / YE	(4) 1254	(4) IV	(4) —
(5) 5	(5) 0.5	(5) WH / YE	(5) 1204	(5) II	(5) —	(5) Left Park Lamp Control 2	(5) 5	(5) 0.5	(5) WH / YE	(5) 1204	(5) IV	(5) —
6 - 8	—	—	—	—	—	Not Occupied	6 - 8	—	—	—	—	—
(9) 9	(9) 2.5	(9) BK	(9) 150	(9) I	(9) —	(9) Ground	(9) 9	(9) 2.5	(9) BK	(9) 150	(9) III	(9) —
(10) 10	(10) 0.5	(10) GY / BU	(10) 7538	(10) II	(10) —	(10) Left Front DRL Control	(10) 10	(10) 0.5	(10) GY / BU	(10) 7538	(10) IV	(10) —
(11) 11	(11) 0.5	(11) BU / WH	(11) 1314	(11) II	(11) —	(11) Left Front Turn Signal Lamp Control	(11) 11	(11) 0.5	(11) BU / WH	(11) 1314	(11) IV	(11) —
12 - 13	—	—	—	—	—	Not Occupied	12 - 13	—	—	—	—	—
(14) 14	(14) 0.5	(14) OG / YE	(14) 354	(14) II	(14) —	(14) Left Front Impact Discriminating Sensor Signal	(14) 14	(14) 0.5	(14) OG / YE	(14) 354	(14) IV	(14) —
(15) 15	(15) 0.5	(15) BK / OG	(15) 5045	(15) II	(15) —	(15) Left Front Impact Discriminating Sensor Low Reference	(15) 15	(15) 0.5	(15) BK / OG	(15) 5045	(15) IV	(15) —
16	—	—	—	—	—	Not Occupied	16	—	—	—	—	—

X156 Body Wiring Harness to Forward Lamp Wiring Harness (UV2 / UXA)



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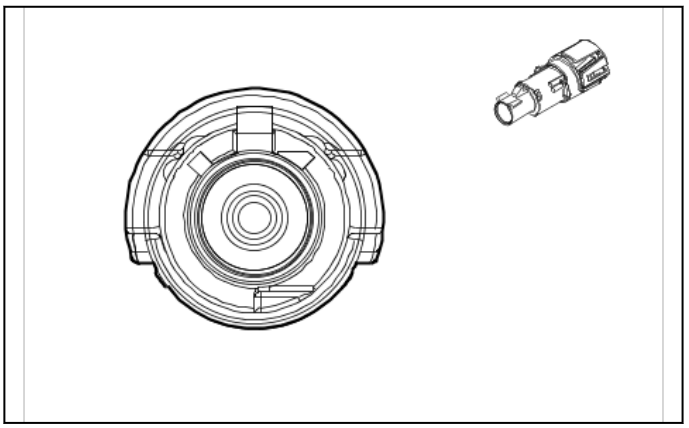


5518522

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 13529796
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type, Sealed(BK)

Connector Part Information
- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 13516806
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way M Coax Type, Sealed(BK)

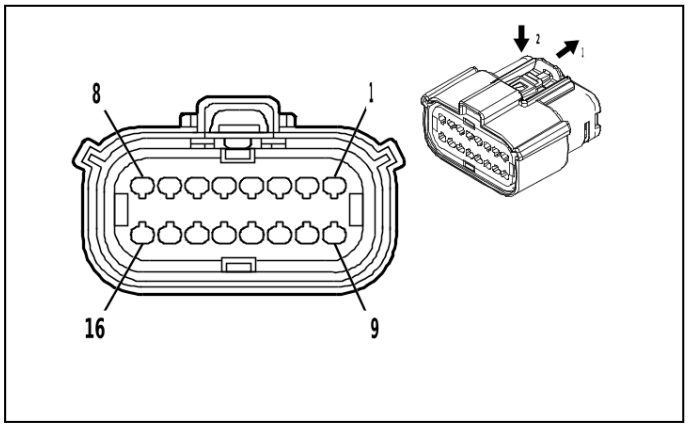
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X156 Body Wiring Harness to Forward Lamp Wiring Harness (UV2 / UXA)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
—	—	LVDS	—	I	—	(PDR) Front Vision Camera #2	—	—	LVDS	—	I	—

X160 Engine Wiring Harness to Fuel Injector Wiring Harness



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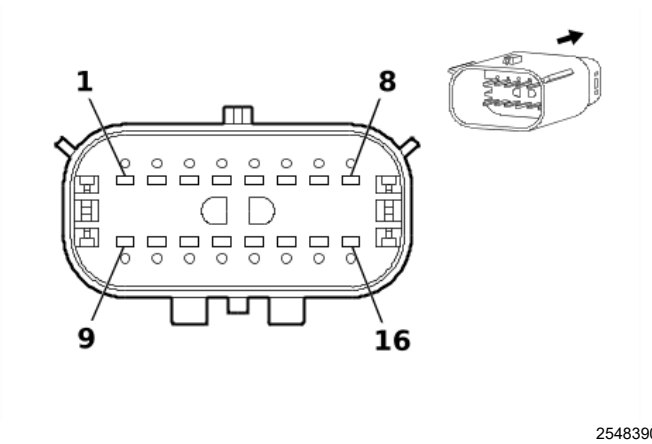


2548390

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 33472-1866
- Service Connector: 13584788
- Description: 16-Way F 1.5 MX Series, Sealed(BK)

Connector Part Information
- Harness Type: Fuel Injector Wiring Harness
- OEM Connector: 33482-8641
- Service Connector: Service by Harness - See Part Catalog
- Description: 16-Way M 1.5 MX Series, Sealed(BK)

Terminal Part Information

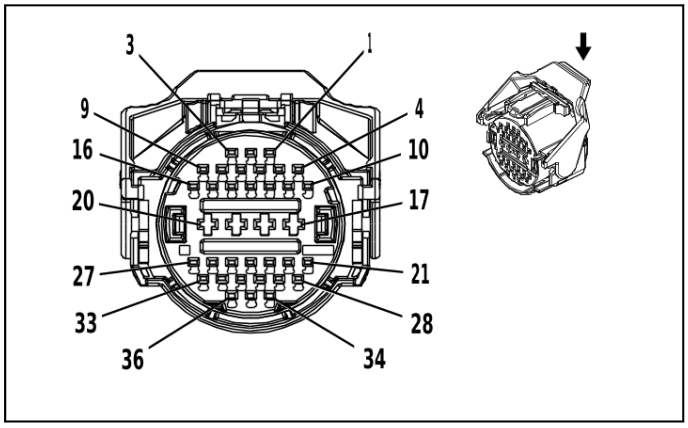
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19368973	J-35616-2A (GY)	J-38125-217
II	Not required	J-35616-3 (GY)	No Tool Required

X160 Engine Wiring Harness to Fuel Injector Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) VT / GY	(1) 496	(1) I	(1) —	(1) Knock Sensor 1 Signal	(1) 1	(1) 0.5	(1) VT / GY	(1) 496	(1) II	(1) —
(2) 2	(2) 0.75	(2) BN	(2) 480 1	(2) I	(2) —	(2) Direct Fuel Injector High Voltage Control Cylinder 1	(2) 2	(2) 0.8	(2) BN	(2) 480 1	(2) II	(2) —
(3) 3	(3) 0.5	(3) WH / RD	(3) 480	(3) I	(3) —	(3) Engine Control Vehicle Sensors 5 Volt Reference 1	(3) 3	(3) 0.5	(3) WH / RD	(3) 480	(3) II	(3) —
(4) 4	(4) 0.75	(4) GY / BU	(4) 480 4	(4) I	(4) —	(4) Direct Fuel Injector High Voltage Control Cylinder 4	(4) 4	(4) 0.8	(4) GY / BU	(4) 480 4	(4) II	(4) —
5	—	—	—	—	—	Not Occupied	5	—	—	—	—	—
(6) 6	(6) 0.75	(6) GN	(6) 480 3	(6) I	(6) —	(6) Direct Fuel Injector High Voltage Control Cylinder 3	(6) 6	(6) 0.8	(6) GN	(6) 480 3	(6) II	(6) —
(7) 7	(7) 0.75	(7) BU	(7) 480 2	(7) I	(7) —	(7) Direct Fuel Injector High Voltage Control Cylinder 2	(7) 7	(7) 0.8	(7) BU	(7) 480 2	(7) II	(7) —
(8) 8	(8) 0.5	(8) WH / GY	(8) 187 6	(8) I	(8) —	(8) Knock Sensor 2 Signal	(8) 8	(8) 0.5	(8) WH / GY	(8) 187 6	(8) II	(8) —
(9) 9	(9) 0.5	(9) BK / YE	(9) 171 6	(9) I	(9) —	(9) Knock Sensor Low Reference 1	(9) 9	(9) 0.5	(9) BK / YE	(9) 171 6	(9) II	(9) —
(10) 10	(10) 0.75	(10) BN / WH	(10) 49 01	(10) I	(10) —	(10) Direct Fuel Injector High Voltage Supply Cylinder 1	(10) 10	(10) 0.8	(10) BN / WH	(10) 49 01	(10) II	(10) —
(11) 11	(11) 0.5	(11) BU / WH	(11) 29 18	(11) I	(11) —	(11) Fuel Rail Pressure Sensor Signal	(11) 11	(11) 0.5	(11) BU / WH	(11) 29 18	(11) II	(11) —
(12) 12	(12) 0.5	(12) BK / GN	(12) 58 0	(12) I	(12) —	(12) Engine Control Sensors Low Reference 2	(12) 12	(12) 0.5	(12) BK / GN	(12) 58 0	(12) II	(12) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(13) 13	(13) 0.75	(13) B U / WH	(13) 49 04	(13) I	(13) —	(13) Direct Fuel Injector High Voltage Supply Cylinder 4	(13) 13	(13) 0.8	(13) B U / WH	(13) 49 04	(13) II	(13) —
(14) 14	(14) 0.75	(14) G N / GY	(14) 49 03	(14) I	(14) —	(14) Direct Fuel Injector High Voltage Supply Cylinder 3	(14) 14	(14) 0.8	(14) G N / GY	(14) 49 03	(14) II	(14) —
(15) 15	(15) 0.75	(15) B U / GY	(15) 49 02	(15) I	(15) —	(15) Direct Fuel Injector High Voltage Supply Cylinder 2	(15) 15	(15) 0.8	(15) B U / GY	(15) 49 02	(15) II	(15) —
(16) 16	(16) 0.5	(16) B K / GY	(16) 23 03	(16) I	(16) —	(16) Knock Sensor Low Reference 2	(16) 16	(16) 0.5	(16) B K / GY	(16) 23 03	(16) II	(16) —

X175 Engine Wiring Harness to Automatic Transmission Wiring Harness



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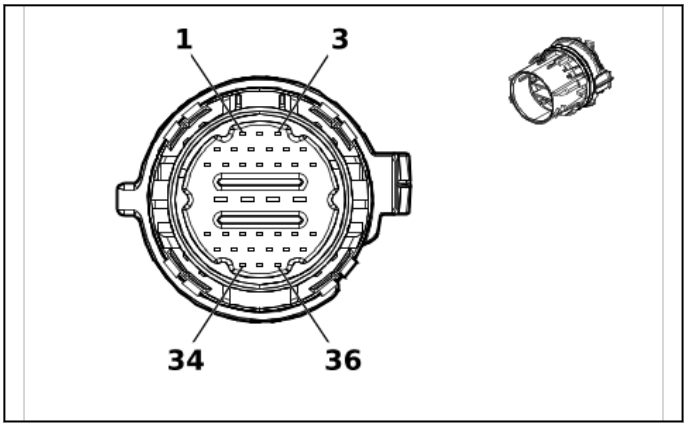


6493751

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 2138314-9
- Service Connector: 19329922
- Description: 36-Way F 1.2 MCON-CB, 2.8 MCP Series, Sealed(BK)

Connector Part Information
- Harness Type: Automatic Transmission Wiring Harness
- OEM Connector: 2356151-9
- Service Connector: Service by Harness - See Part Catalog
- Description: 36-Way M 1.2 MCON-CB, 2.8 MCP Series, Sealed(NA)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13575368	J-35616-35 (VT)	J-38125-36
II	19300445	J-35616-12 (BU)	J-38125-11A
III	Not required	J-35616-17 (L-GN)	No Tool Required

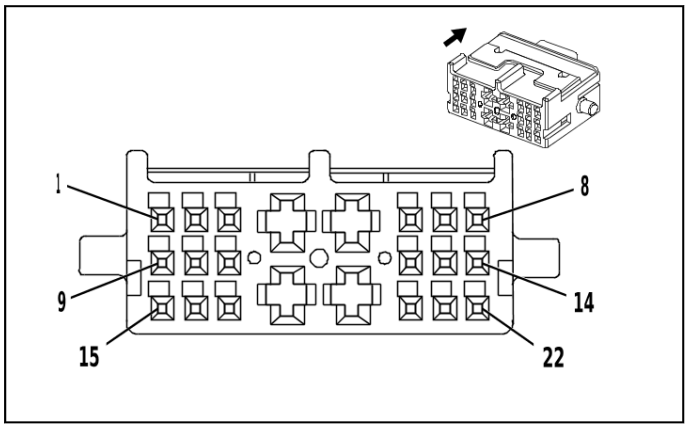
X175 Engine Wiring Harness to Automatic Transmission Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GN / BN	(1) 6380	(1) II	(1) —	(1) Torque Converter Clutch Enable Solenoid Valve A Control	(1) 1	(1) 0.5	(1) GN / WH	(1) 6380	(1) III	(1) —
2	—	—	—	—	—	Not Occupied	2	—	—	—	—	—
(3) 3	(3) 0.5	(3) VT / WH	(3) 422	(3) II	(3) —	(3) Torque Converter Clutch Solenoid Valve Control	(3) 3	(3) 0.5	(3) YE / BN	(3) 6404	(3) III	(3) —
(4) 4	(4) 0.5	(4) GN / BU	(4) 1530	(4) II	(4) —	(4) Transmission Line Pressure Control Solenoid Valve Control	(4) 4	(4) 0.5	(4) GY / GN	(4) 6403	(4) III	(4) —
(5) 5	(5) 0.5	(5) BN	(5) 6400	(5) II	(5) —	(5) Clutch Solenoid Valve A Control	(5) 5	(5) 0.5	(5) BN	(5) 6400	(5) III	(5) —
(6) 6	(6) 0.5	(6) BU	(6) 6401	(6) II	(6) —	(6) Clutch Solenoid Valve B Control	(6) 6	(6) 0.5	(6) BU	(6) 6401	(6) III	(6) —
(7) 7	(7) 0.5	(7) YE / BN	(7) 6210	(7) II	(7) —	(7) Torque Converter Clutch Enable Solenoid Valve B Control	(7) 7	(7) 0.5	(7) YE / BN	(7) 6210	(7) III	(7) —
(8) 8	(8) 0.5	(8) GN / WH	(8) 2968	(8) II	(8) —	(8) Transmission Auxiliary Fluid Pump Control	(8) 8	(8) 0.5	(8) GN / WH	(8) 2968	(8) III	(8) —
9	—	—	—	—	—	Not Occupied	9	—	—	—	—	—
(10) 10	(10) 0.5	(10) GY	(10) 6402	(10) II	(10) —	(10) Clutch Solenoid Valve C Control	(10) 10	(10) 0.5	(10) GY	(10) 6402	(10) III	(10) —
(11) 11	(11) 0.5	(11) BK / BN	(11) 586	(11) II	(11) —	(11) Transmission Fluid Temperature Sensor Low Reference	(11) 11	(11) 0.5	(11) BK / BN	(11) 586	(11) III	(11) —
(12) 12	(12) 0.5	(12) BN / WH	(12) 585	(12) II	(12) —	(12) Transmission Fluid Temperature Sensor Signal	(12) 12	(12) 0.5	(12) BN / WH	(12) 585	(12) III	(12) —
(13) 13	(13) 0.5	(13) WH	(13) 4508	(13) II	(13) —	(13) Transmission Clutch G Control	(13) 13	(13) 0.5	(13) WH	(13) 4508	(13) III	(13) —
(14) 14	(14) 0.5	(14) WH / BU	(14) 4507	(14) II	(14) —	(14) Transmission Clutch H Control	(14) 14	(14) 0.5	(14) WH / BU	(14) 4507	(14) III	(14) —
15 - 16	—	—	—	—	—	Not Occupied	15 - 16	—	—	—	—	—

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(17) 17	(17) 1.5	(17) RD / BU	(17) 840	(17) I	(17) —	(17) Battery Positive Voltage	(17) 17	(17) 1.5	(17) RD / BU	(17) 840	(17) III	(17) —
(18) 18	(18) 0.75	(18) GN / GY	(18) 6387	(18) I	(18) —	(18) Transmission High Side Driver 1 Control	(18) 18	(18) 2.5	(18) GN / GY	(18) 6387	(18) III	(18) —
(19) 19	(19) 0.75	(19) GY / BN	(19) 6388	(19) I	(19) —	(19) Transmission High Side Driver 2 Control	(19) 19	(19) 2.5	(19) GY / BN	(19) 6388	(19) III	(19) —
(20) 20	(20) 1.5	(20) BK	(20) 450	(20) I	(20) —	(20) Ground	(20) 20	(20) 1.5	(20) BK	(20) 6250	(20) III	(20) —
(21) 21	(21) 0.5	(21) GN / BK	(21) 3337	(21) II	(21) —	(21) Transmission Internal Mode Switch Mode Control Y	(21) 21	(21) 0.5	(21) GN / YE	(21) 3337	(21) III	(21) —
(22) 22	(22) 0.5	(22) BU / WH	(22) 3338	(22) II	(22) —	(22) Transmission Internal Mode Switch Mode Control X	(22) 22	(22) 0.5	(22) BU / WH	(22) 3338	(22) III	(22) —
23	—	—	—	—	—	Not Occupied	23	—	—	—	—	—
(24) 24	(24) 0.5	(24) GY / BU	(24) 6358	(24) II	(24) —	(24) Output Speed Signal	(24) 24	(24) 0.5	(24) GY / BU	(24) 6358	(24) III	(24) —
(25) 25	(25) 0.5	(25) YE / GN	(25) 4170	(25) II	(25) —	(25) Transmission Output Shaft Speed Sensor Circuit 9V Reference	(25) 25	(25) 0.5	(25) YE / GN	(25) 4170	(25) III	(25) —
(26) 26	(26) 0.5	(26) GN / RD	(26) 6353	(26) II	(26) —	(26) Input Speed Signal	(26) 26	(26) 0.5	(26) GN / YE	(26) 6353	(26) III	(26) —
(27) 27	(27) 0.5	(27) YE / BU	(27) 4171	(27) II	(27) —	(27) Transmission Input Shaft Speed Sensor Circuit 9V Reference	(27) 27	(27) 0.5	(27) WH / RD	(27) 596	(27) III	(27) —
28	—	—	—	—	—	Not Occupied	28	—	—	—	—	—
(29) 29	(29) 0.5	(29) WH / RD	(29) 480	(29) II	(29) —	(29) Engine Control Vehicle Sensors 5 Volt Reference 1	(29) 29	(29) 0.5	(29) WH / RD	(29) 596	(29) III	(29) —
(30) 30	(30) 0.5	(30) BK / GY	(30) 626	(30) II	(30) —	(30) Engine Control Vehicle Sensors Low Reference 1	(30) 30	(30) 0.5	(30) BK / GY	(30) 3927	(30) III	(30) —
31	—	—	—	—	—	Not Occupied	31	—	—	—	—	—
(32) 32	(32) 0.5	(32) GN / VT	(32) 4510	(32) II	(32) —	(32) Transmission Intermediate Speed Signal	(32) 32	(32) 0.5	(32) GN / VT	(32) 4510	(32) III	(32) —
33	—	—	—	—	—	Not Occupied	33	—	—	—	—	—

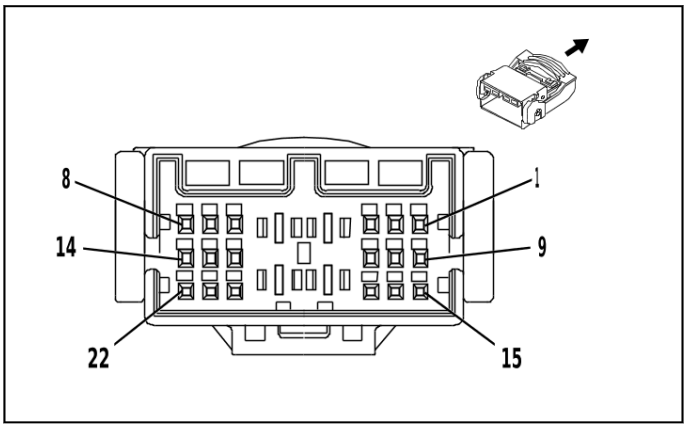
Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(34) 34	(34) 0.5	(34) G Y / RD	(34) 10 817	(34) II	(34) —	(34) Lubricant Circuit Pressure Sensor 5 Volt Reference	(34) 34	(34) 0.5	(34) G N	(34) 91 6	(34) III	(34) —
(35) 35	(35) 0.5	(35) B U / BK	(35) 10 819	(35) II	(35) —	(35) Lubricant Circuit Pressure Sensor Low Reference	(35) 35	(35) 0.5	(35) G N / BK	(35) 91 7	(35) III	(35) —
(36) 36	(36) 0.5	(36) G N / YE	(36) 10 816	(36) II	(36) —	(36) Lubricant Circuit Pressure Sensor Signal	(36) 36	(36) 0.5	(36) B U / YE	(36) 91 5	(36) III	(36) —

X176 Automatic Transmission Wiring Harness to Automatic Transmission Wiring Harness



3977748

Connector Part Information
- Harness Type: Automatic Transmission Wiring Harness
- OEM Connector: 1897543-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 22-Way F 0.64 Micro-Quadlock, 2.8 Micro-Power Series(NA)



3977770

Connector Part Information
- Harness Type: Automatic Transmission Wiring Harness
- OEM Connector: 1897540-1
- Service Connector: Service by Harness - See Part Catalog
- Description: 22-Way M 0.64 Micro-Quadlock, 2.8 Micro-Power Series(NA)

Terminal Part Information

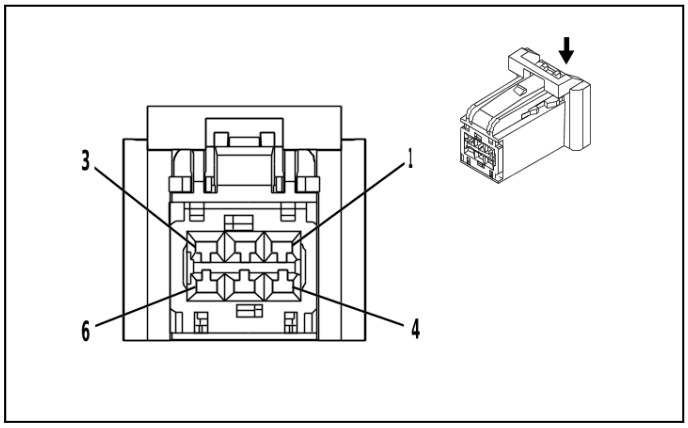
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-35 (VT)	No Tool Required
II	Not required	J-35616-64B (L-BU)	No Tool Required
III	Not required	J-35616-5 (PU)	No Tool Required
IV	Not required	J-35616-65B (L-BU)	No Tool Required

X176 Automatic Transmission Wiring Harness to Automatic Transmission Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GN / WH	(1) 6380	(1) II	(1) —	(1) Torque Converter Clutch Enable Solenoid Valve A Control	(1) 1	(1) 0.5	(1) GN / WH	(1) 6380	(1) IV	(1) —
(2) 2	(2) 0.5	(2) BU / WH	(2) 3338	(2) II	(2) —	(2) Transmission Internal Mode Switch Mode Control X	(2) 2	(2) 0.5	(2) BU / WH	(2) 3338	(2) IV	(2) —
(3) 3	(3) 0.5	(3) GN	(3) 916	(3) II	(3) —	(3) Ground	(3) 3	(3) 0.5	(3) GY / RD	(3) 10817	(3) IV	(3) —
(4) 4	(4) 2.5	(4) GN / GY	(4) 6387	(4) I	(4) —	(4) Transmission High Side Driver 1 Control	(4) 4	(4) 2.5	(4) GN / GY	(4) 6387	(4) III	(4) —
(5) 5	(5) 1.5	(5) RD / GN	(5) 840	(5) I	(5) —	(5) Battery Positive Voltage	(5) 5	(5) 0.5	(5) RD / GN	(5) 840	(5) III	(5) —
(6) 6	(6) 0.5	(6) WH / RD	(6) 596	(6) II	(6) —	(6) 5V Reference	(6) 6	(6) 0.5	(6) WH / RD	(6) 596	(6) IV	(6) —
(7) 7	(7) 0.5	(7) WH / BU	(7) 4507	(7) II	(7) —	(7) Transmission Clutch H Control	(7) 7	(7) 0.5	(7) WH / BU	(7) 4507	(7) IV	(7) —
(8) 8	(8) 0.5	(8) GY / GN	(8) 6403	(8) II	(8) —	(8) Clutch Solenoid Valve D Control	(8) 8	(8) 0.5	(8) GY / GN	(8) 6403	(8) IV	(8) —
(9) 9	(9) 0.5	(9) WH	(9) 4508	(9) II	(9) —	(9) Transmission Clutch G Control	(9) 9	(9) 0.5	(9) WH	(9) 4508	(9) IV	(9) —
(10) 10	(10) 0.5	(10) YE / BN	(10) 6210	(10) II	(10) —	(10) Torque Converter Clutch Enable Solenoid Valve B Control	(10) 10	(10) 0.5	(10) YE / BN	(10) 6210	(10) IV	(10) —
(11) 11	(11) 0.5	(11) GN / YE	(11) 3337	(11) II	(11) —	(11) Transmission Internal Mode Switch Mode Control Y	(11) 11	(11) 0.5	(11) GN / YE	(11) 3337	(11) IV	(11) —
(12) 12	(12) 0.5	(12) BU / BK	(12) 917	(12) II	(12) —	(12) Ground	(12) 12	(12) 0.5	(12) GN / BK	(12) 917	(12) IV	(12) —
(13) 13	(13) 0.5	(13) GY	(13) 6402	(13) II	(13) —	(13) Clutch Solenoid Valve C Control	(13) 13	(13) 0.5	(13) GY	(13) 6402	(13) IV	(13) —
(14) 14	(14) 0.5	(14) GY / GN	(14) 6404	(14) II	(14) —	(14) Clutch Solenoid Valve E Control	(14) 14	(14) 0.5	(14) YE / BN	(14) 6404	(14) IV	(14) —
(15) 15	(15) 0.5	(15) BN / WH	(15) 585	(15) II	(15) —	(15) Transmission Fluid Temperature Sensor Signal	(15) 15	(15) 0.5	(15) BK / BN	(15) 585	(15) IV	(15) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(16) 16	(16) 0.5	(16) B K / BN	(16) 58 6	(16) II	(16) —	(16) Transmission Fluid Temperature Sensor Low Reference	(16) 16	(16) 0.5	(16) B K / BN	(16) 58 6	(16) IV	(16) —
(17) 17	(17) 0.5	(17) B U / YE	(17) 91 5	(17) II	(17) —	(17) Ground	(17) 17	(17) 0.5	(17) B U / YE	(17) 91 5	(17) IV	(17) —
(18) 18	(18) 2.5	(18) G Y / BN	(18) 63 88	(18) I	(18) —	(18) Transmission High Side Driver 2 Control	(18) 18	(18) 2.5	(18) G Y / BN	(18) 63 88	(18) III	(18) —
(19) 19	(19) 1.5	(19) B K	(19) 62 50	(19) I	(19) —	(19) Transmission Ground	(19) 19	(19) 1.5	(19) B K	(19) 62 50	(19) III	(19) —
(20) 20	(20) 0.5	(20) B K / GY	(20) 39 27	(20) II	(20) —	(20) Transmission Internal Mode Switch Feedback Signal	(20) 20	(20) 0.5	(20) B K / GY	(20) 39 27	(20) IV	(20) —
(21) 21	(21) 0.5	(21) B N	(21) 64 00	(21) II	(21) —	(21) Clutch Solenoid Valve A Control	(21) 21	(21) 0.5	(21) B N	(21) 64 00	(21) IV	(21) —
(22) 22	(22) 0.5	(22) B U	(22) 64 01	(22) II	(22) —	(22) Clutch Solenoid Valve B Control	(22) 22	(22) 0.5	(22) B U	(22) 64 01	(22) IV	(22) —

X177 Automatic Transmission Wiring Harness to Automatic Transmission Wiring Harness



3977938

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Connector Part Information
- Harness Type: A
- OEM Connector: 33134940
- Service Connector: Service by Harness - See Part Catalog
- Description: 6-Way F 1.2 OCS Series(NA)

Connector Part Information
- Harness Type: Automatic Transmission Wiring Harness
- OEM Connector: Not Available
- Service Connector: Service by Harness - See Part Catalog
- Description: 6-Way M (NA)

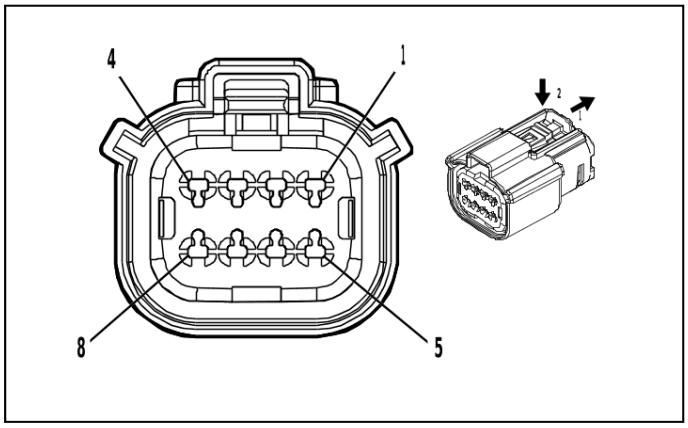
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required
II	Not required	Pending	No Tool Required

X177 Automatic Transmission Wiring Harness to Automatic Transmission Wiring Harness

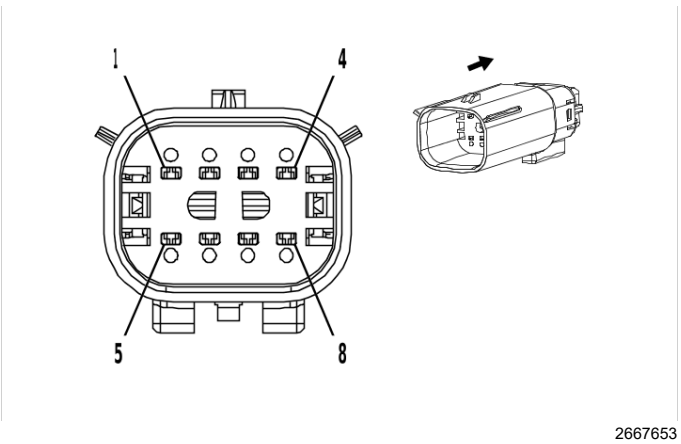
Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / BU	(1) 6358	(1) I	(1) —	(1) Output Speed Signal	(1) 1	(1) 0.5	(1) GY / BU	(1) 6358	(1) II	(1) —
(2) 2	(2) 0.5	(2) YE / GN	(2) 4170	(2) I	(2) —	(2) Transmission Output Shaft Speed Sensor Circuit 9V Reference	(2) 2	(2) 0.5	(2) YE / GN	(2) 4170	(2) II	(2) —
(3) 3	(3) 0.5	(3) YE / GN	(3) 4170	(3) I	(3) —	(3) Transmission Output Shaft Speed Sensor Circuit 9V Reference	(3) 3	(3) 0.5	(3) YE / GN	(3) 4170	(3) II	(3) —
(4) 4	(4) 0.5	(4) WH / RD	(4) 596	(4) I	(4) —	(4) 5V Reference	(4) 4	(4) 0.5	(4) WH / RD	(4) 596	(4) II	(4) —
(5) 5	(5) 0.5	(5) GN / YE	(5) 6353	(5) I	(5) —	(5) Input Speed Signal	(5) 5	(5) 0.5	(5) GN / YE	(5) 6353	(5) II	(5) —
(6) 6	(6) 0.5	(6) GN / VT	(6) 4510	(6) I	(6) —	(6) Transmission Intermediate Speed Signal	(6) 6	(6) 0.5	(6) GN / VT	(6) 4510	(6) II	(6) —

X190 Wiring Harness Auxiliary Junction Block to Body Wiring Harness



4846407

Connector Part Information
- Harness Type: Wiring Harness Auxiliary Junction Block
- OEM Connector: 33472-4877
- Service Connector: Service by Harness - See Part Catalog
- Description: 8-Way F 1.5 MX Series, Sealed(BK)



2667653

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 13520589
- Service Connector: Service by Harness - See Part Catalog
- Description: 8-Way M 1.5 MX Series, Sealed(BK)

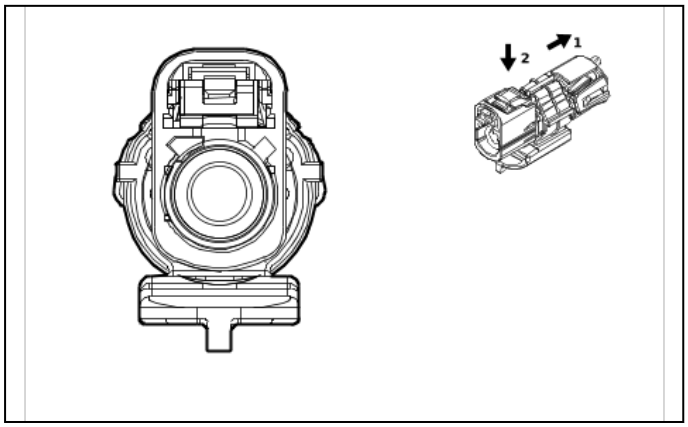
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required
I	Not required	No Tool Required	No Tool Required
II	Not required	No Tool Required	No Tool Required
II	Not required	No Tool Required	No Tool Required

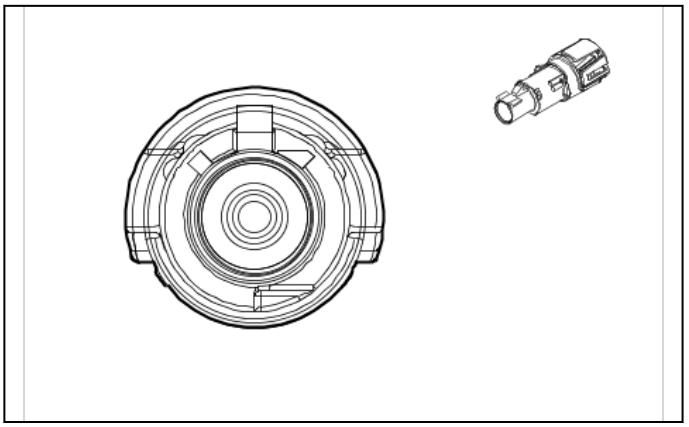
X190 Wiring Harness Auxiliary Junction Block to Body Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) YE	(1) 10716	(1) I	(1) —	(1) Upfitter Accessory Relay 1 Coil Control	(1) 1	(1) 0.5	(1) BU / WH	(1) 10716	(1) II	(1) —
(2) 2	(2) 0.5	(2) GN	(2) 10717	(2) I	(2) —	(2) Upfitter Accessory Relay 2 Coil Control	(2) 2	(2) 0.5	(2) GN	(2) 10717	(2) II	(2) —
(3) 3	(3) 0.5	(3) TN	(3) 10718	(3) I	(3) —	(3) Upfitter Accessory Relay 3 Coil Control	(3) 3	(3) 0.5	(3) TN	(3) 10718	(3) II	(3) —
(4) 4	(4) 0.5	(4) BU	(4) 10719	(4) I	(4) —	(4) Upfitter Accessory Relay 4 Coil Control	(4) 4	(4) 0.5	(4) BU	(4) 10719	(4) II	(4) —
5 - 6	—	—	—	—	—	Not Occupied	5 - 6	—	—	—	—	—
(7) 7	(7) 0.75	(7) VT	(7) 2601	(7) I	(7) —	(7) Retained Accessory Power Control	(7) 7	(7) 0.75	(7) VT	(7) 2601	(7) II	(7) —
(8) 8	(8) —	(8) —	(8) —	(8) I	(8) —	(8) —	(8) 8	(8) —	(8) —	(8) —	(8) II	(8) —

X195 Forward Lamp Wiring Harness to Front View Camera Switch Wiring Harness



5519150



5518522

Connector Part Information

- Harness Type: Forward Lamp Wiring Harness COAX
- OEM Connector: 13529796
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type, Sealed(BK)

Connector Part Information

- Harness Type: Front View Camera Switch Wiring Harness COAX
- OEM Connector: 13516806
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way M Coax Type, Sealed(BK)

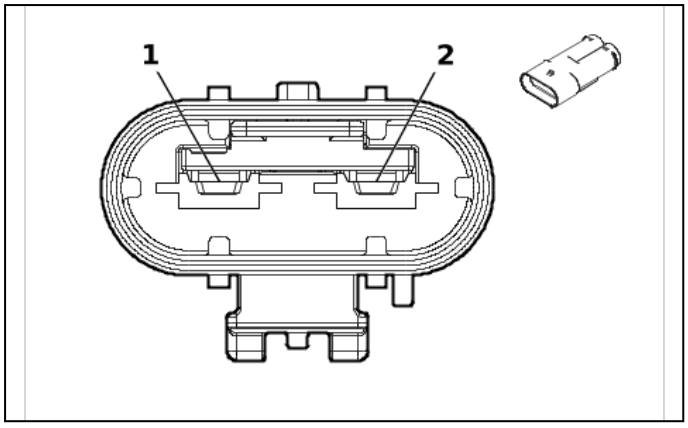
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

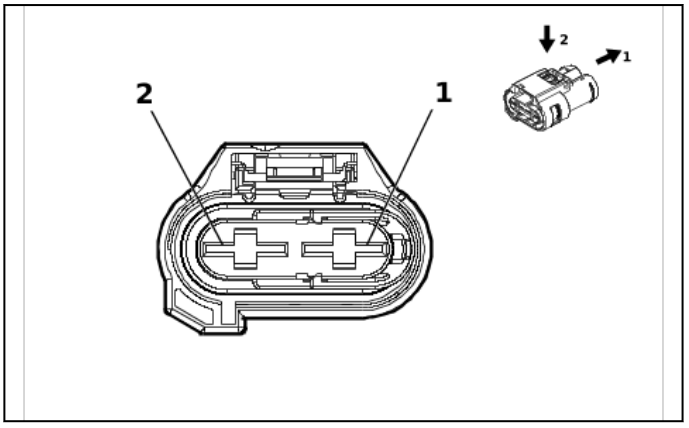
X195 Forward Lamp Wiring Harness to Front View Camera Switch Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
—	—	Coax Cable	—	I	—	Front Vision Camera 1 Coaxial Video Signal	—	—	Coax Cable	—	I	—

X198 Power Steering Wiring Harness to Battery Wiring Harness



6154529



3608474

Connector Part Information
- Harness Type: Power Steering Wiring Harness
- OEM Connector: 13544729
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 12 MAS Series(BK)

Connector Part Information
- Harness Type: Battery Wiring Harness
- OEM Connector: Not Available
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way M (BK)

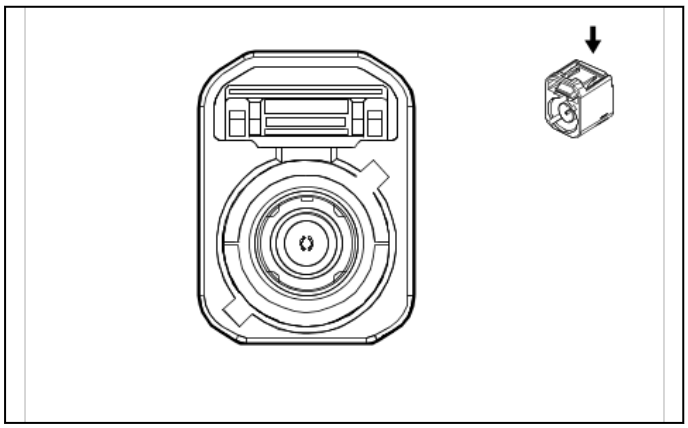
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required
II	Not required	No Tool Required	No Tool Required

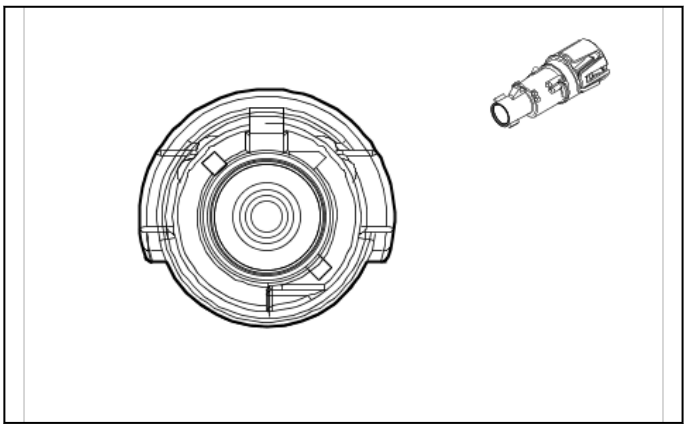
X198 Power Steering Wiring Harness to Battery Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 16	(1) RD / VT	(1) 542	(1) I	(1) —	(1) Battery Positive Voltage	(1) 1	(1) 16	(1) RD / VT	(1) 542	(1) II	(1) —
(2) 2	(2) 16	(2) BK	(2) 250	(2) I	(2) —	(2) Ground	(2) 2	(2) 16	(2) BK	(2) 250	(2) II	(2) —

X199 Chassis Wiring Harness to Body Wiring Harness



6691660



5633901

Connector Part Information
- Harness Type: Chassis Wiring Harness COAX
- OEM Connector: 2-2330270-3
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type(BU)

Connector Part Information
- Harness Type: Body Wiring Harness COAX
- OEM Connector: Not Available
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way M (BU)

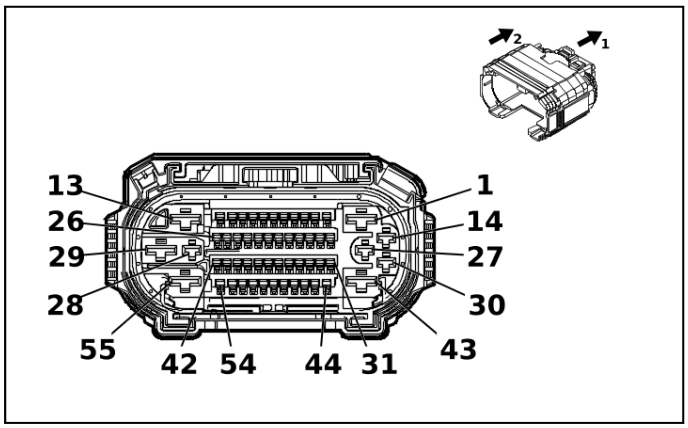
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

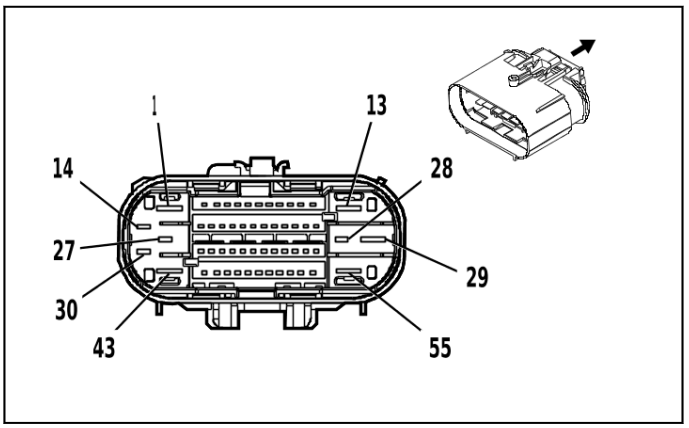
X199 Chassis Wiring Harness to Body Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
—	—	Coax Cable	—	I	—	Rear Vision Camera Coaxial Video Signal	—	—	Coax Cable	—	I	—

X201 Engine Wiring Harness to Body Wiring Harness



5246872



4994369

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 35716589
- Service Connector: 19371184
- Description: 55-Way F 1.2 OCS, 2.8, 6.3 CTS Series, Sealed(GY)

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 35716583
- Service Connector: 84727363
- Description: 55-Way M 1.2 OCS, 2.8, 6.3 CTS Series, Sealed(GY)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19332901	J-35616-35 (VT)	J-38125-212
II	19370818	J-35616-12 (BU)	J-38125-215A
III	84867140	J-35616-13 (BU)	J-38125-215A
IV	84992391	J-35616-5 (PU)	J-38125-36

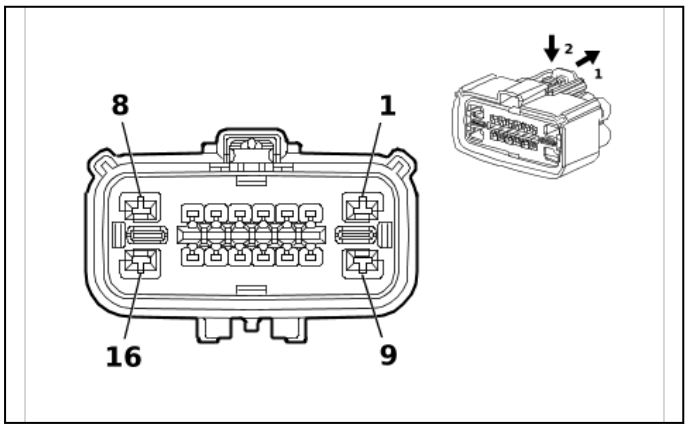
X201 Engine Wiring Harness to Body Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1 - 3	—	—	—	—	—	Not Occupied	1 - 3	—	—	—	—	—
(4) 4	(4) 0.5	(4) GN / VT	(4) 4621	(4) II	(4) —	(4) Engine Control Module LIN Bus 1	(4) 4	(4) 0.5	(4) GN / VT	(4) 10806	(4) III	(4) —
(5) 5	(5) 0.5	(5) WH	(5) 4055	(5) II	(5) —	(5) Private Serial Data Powertrain CAN Bus [+] Serial Data	(5) 5	(5) 0.5	(5) WH	(5) 4055	(5) III	(5) —
(6) 6	(6) 0.5	(6) BU / GY	(6) 4054	(6) II	(6) —	(6) Private Serial Data Powertrain CAN Bus [-] Serial Data	(6) 6	(6) 0.5	(6) BU / GY	(6) 4054	(6) III	(6) —
(7) 7	(7) 0.5	(7) BU / BK	(7) 4977	(7) II	(7) —	(7) AUTOSAR CAN Bus [+] 3 Serial Data	(7) 7	(7) 0.5	(7) BU / BK	(7) 4977	(7) III	(7) —
(8) 8	(8) 0.5	(8) WH	(8) 4976	(8) II	(8) —	(8) AUTOSAR CAN Bus [-] 3 Serial Data	(8) 8	(8) 0.5	(8) WH	(8) 4976	(8) III	(8) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
9 - 14	—	—	—	—	—	Not Occupied	9 - 14	—	—	—	—	—
(15) 15	(15) 0.5	(15) WH / RD	(15) 48 0	(15) II	(15) —	(15) Engine Control Vehicle Sensors 5 Volt Reference 1	(15) 15	(15) 0.5	(15) WH / RD	(15) 48 0	(15) III	(15) —
(16) 16	(16) 0.5	(16) WH / GN	(16) 53 80	(16) II	(16) —	(16) Brake Position Sensor Signal	(16) 16	(16) 0.5	(16) WH / GN	(16) 53 80	(16) III	(16) —
(17) 17	(17) 0.5	(17) B K / GY	(17) 62 6	(17) II	(17) —	(17) Engine Control Vehicle Sensors Low Reference 1	(17) 17	(17) 0.5	(17) B K / GY	(17) 62 6	(17) III	(17) —
(18) 18	(18) 0.5	(18) B K / GY	(18) 62 6	(18) II	(18) —	(18) Engine Control Vehicle Sensors Low Reference 1	(18) 18	(18) 0.5	(18) B K / GY	(18) 62 6	(18) III	(18) —
(19) 19	(19) 0.5	(19) B U / GY	(19) 63 6	(19) II	(19) —	(19) Ambient Air Temperature Sensor Signal	(19) 19	(19) 0.5	(19) B U / GY	(19) 63 6	(19) III	(19) —
(20) 20	(20) 0.5	(20) Y E / BK	(20) 62 5	(20) II	(20) —	(20) Starter Enable Relay Control	(20) 20	(20) 0.5	(20) Y E / BK	(20) 62 5	(20) III	(20) —
(21) 21	(21) 0.5	(21) V T / GN	(21) 43 20	(21) II	(21) —	(21) Powertra in Sensor Bus Enable	(21) 21	(21) 0.5	(21) V T / GN	(21) 43 20	(21) III	(21) —
(22) 22	(22) 0.5	(22) V T / BK	(22) 21 39	(22) II	(22) —	(22) Run/ Crank Ignition 1 Voltage	(22) 22	(22) 0.5	(22) V T / BK	(22) 21 39	(22) III	(22) —
23	—	—	—	—	—	Not Occupied	23	—	—	—	—	—
(24) 24	(24) 0.5	(24) WH / RD	(24) 11 64	(24) II	(24) —	(24) Accelerat or Pedal Position 5V Reference 1	(24) 24	(24) 0.5	(24) WH / RD	(24) 11 64	(24) III	(24) —
(25) 25	(25) 0.5	(25) Y E / WH	(25) 11 61	(25) II	(25) —	(25) Accelerat or Pedal Position Signal 1	(25) 25	(25) 0.5	(25) Y E / WH	(25) 11 61	(25) III	(25) —
(26) 26	(26) 0.5	(26) B K / BU	(26) 12 71	(26) II	(26) —	(26) Accelerat or Pedal Position Low Reference 1	(26) 26	(26) 0.5	(26) B K / BU	(26) 12 71	(26) III	(26) —
27	—	—	—	—	—	Not Occupied	27	—	—	—	—	—
(28) 28	(28) 0.75	(28) R D / GN	(28) 18 40	(28) I	(28) —	(28) Battery Positive Volt- age	(28) 28	(28) 1.5	(28) R D / GN	(28) 18 40	(28) IV	(28) —
29 - 31	—	—	—	—	—	Not Occupied	29 - 31	—	—	—	—	—
(32) 32	(32) 0.5	(32) B U / BN	(32) 75 73	(32) II	(32) —	(32) Air Conditioning Compressor Solenoid Valve Control	(32) 32	(32) 0.5	(32) B U / BN	(32) 75 73	(32) III	(32) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(33) 33	(33) 0.5	(33) B U / YE	(33) 75 74	(33) II	(33) —	(33) Air Conditioning Compressor Solenoid Valve Control	(33) 33	(33) 0.5	(33) B U / YE	(33) 75 74	(33) III	(33) —
34	—	—	—	—	—	Not Occupied	34	—	—	—	—	—
(35) 35	(35) 0.5	(35) Y E	(35) 40 63	(35) II	(35) —	(35) Hood Status A Signal	(35) 35	(35) 0.5	(35) Y E	(35) 40 63	(35) III	(35) —
36	—	—	—	—	—	Not Occupied	36	—	—	—	—	—
(37) 37	(37) 0.5	(37) V T / GY	(37) 13 9	(37) II	(37) —	(37) Run/ Crank Ignition 1 Voltage	(37) 37	(37) 0.5	(37) V T / BK	(37) 73 9	(37) III	(37) —
38 - 39	—	—	—	—	—	Not Occupied	38 - 39	—	—	—	—	—
(40) 40	(40) 0.5	(40) B N / RD	(40) 12 74	(40) II	(40) —	(40) Accelerat or Pedal Position 5V Reference 2	(40) 40	(40) 0.5	(40) B N / RD	(40) 12 74	(40) III	(40) —
(41) 41	(41) 0.5	(41) G N / WH	(41) 11 62	(41) II	(41) —	(41) Accelerat or Pedal Position Signal 2	(41) 41	(41) 0.5	(41) G N / WH	(41) 11 62	(41) III	(41) —
(42) 42	(42) 0.5	(42) B K / VT	(42) 12 72	(42) II	(42) —	(42) Accelerat or Pedal Position Low Reference 2	(42) 42	(42) 0.5	(42) B K / VT	(42) 12 72	(42) III	(42) —
43	—	—	—	—	—	Not Occupied	43	—	—	—	—	—
(44) 44	(44) 0.75	(44) B K	(44) 51 33	(44) II	(44) —	(44) Left Rear Door Dead Lock Lock Signal	(44) 44	(44) 0.75	(44) B K	(44) 22 04	(44) III	(44) —
45 - 46	—	—	—	—	—	Not Occupied	45 - 46	—	—	—	—	—
(47) 47	(47) 0.5	(47) B U / RD	(47) 46 0	(47) II	(47) —	(47) Engine Control Sensors 5 Volt Reference 1	(47) 47	(47) 0.5	(47) G Y / RD	(47) 10 667	(47) III	(47) —
(48) 48	(48) 0.5	(48) B K / YE	(48) 54 8	(48) II	(48) —	(48) Engine Control Sensors Low Reference 1	(48) 48	(48) 0.5	(48) B K / GN	(48) 58 0	(48) III	(48) —
(49) 49	(49) 0.5	(49) Y E / WH	(49) 32 00	(49) II	(49) —	(49) Throttle Inlet Absolute Pressure Sensor Signal	(49) 49	(49) 0.5	(49) Y E / WH	(49) 32 00	(49) III	(49) —
50 - 53	—	—	—	—	—	Not Occupied	50 - 53	—	—	—	—	—
(54) 54	(54) 0.75	(54) B K	(54) 51 33	(54) II	(54) —	(54) Left Rear Door Dead Lock Lock Signal	(54) 54	(54) 0.75	(54) B K	(54) 22 04	(54) III	(54) —
55	—	—	—	—	—	Not Occupied	55	—	—	—	—	—

X204 Engine Wiring Harness to Chassis Wiring Harness



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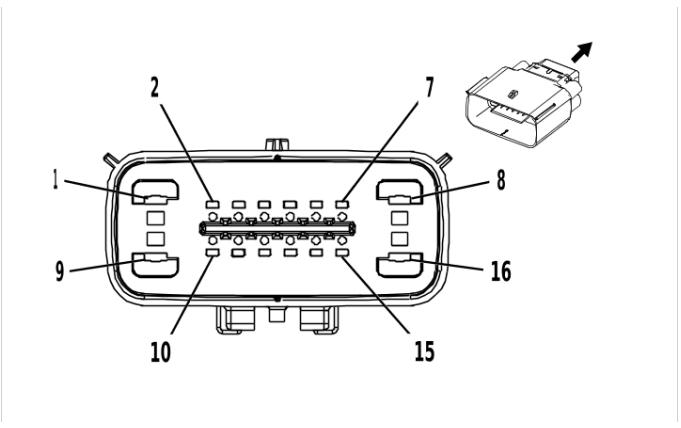


2373686

Connector Part Information
- Harness Type: Engine Wiring Harness
- OEM Connector: 34985-8270
- Service Connector: 19352906
- Description: 16-Way F 1.5, 2.8 MX Series, Sealed(BK)

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 34986-8254
- Service Connector: 19331031
- Description: 16-Way M 1.5, 2.8 MX Series, Sealed(BK)

Terminal Part Information

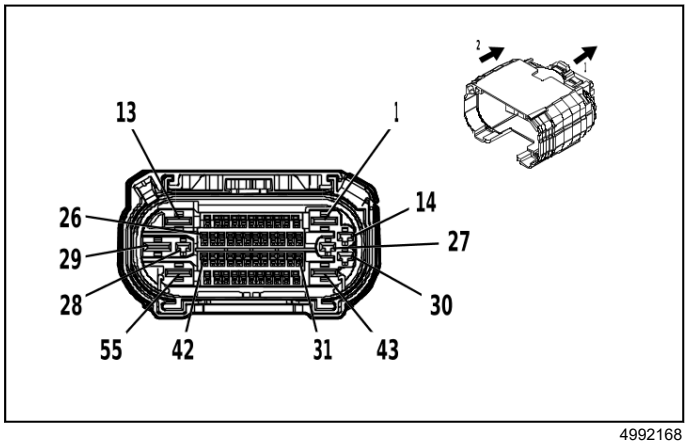
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13576377	J-35616-35 (VT)	J-38125-12A
II	85528055	J-35616-2A (GY)	J-38125-217
III	19366658	J-35616-5 (PU)	J-38125-12A
IV	86800300	J-35616-3 (GY)	J-38125-217

X204 Engine Wiring Harness to Chassis Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 3	(1) RD / WH	(1) 2242	(1) I	(1) —	(1) Battery Positive Voltage	(1) 1	(1) 3	(1) RD / WH	(1) 2242	(1) III	(1) —
2	—	—	—	—	—	Not Occupied	2	—	—	—	—	—
(3) 3	(3) 0.5	(3) GY / BK	(3) 1570	(3) II	(3) —	(3) Front Axle Actuator Control	(3) 3	(3) 0.5	(3) GY / BK	(3) 1570	(3) IV	(3) —
(4) 4	(4) 0.5	(4) YE / WH	(4) 1695	(4) II	(4) —	(4) 4WD Locked Range Indicator Control	(4) 4	(4) 0.5	(4) YE / WH	(4) 1695	(4) IV	(4) —
5	—	—	—	—	—	Not Occupied	5	—	—	—	—	—
(6) 6	(6) 0.5	(6) VT / GN	(6) 4320	(6) II	(6) —	(6) Powertrain Sensor Bus Enable	(6) 6	(6) 0.5	(6) VT / GN	(6) 4320	(6) IV	(6) —
(7) 7	(7) 0.5	(7) GN / GY	(7) 465	(7) II	(7) —	(7) Fuel Pump Primary Relay Control	(7) 7	(7) 0.5	(7) GN / GY	(7) 465	(7) IV	(7) —
8 - 10	—	—	—	—	—	Not Occupied	8 - 10	—	—	—	—	—

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(11) 11	(11) 0.5	(11) GN / VT	(11) 46 21	(11) II	(11) —	(11) Engine Control Module LIN Bus 1	(11) 11	(11) 0.5	(11) GN / VT	(11) 10 806	(11) IV	(11) —
(12) 12	(12) 0.5	(12) BU / YE	(12) 49 79	(12) II	(12) —	(12) AUTOSAR CAN Bus [+] 2 Serial Data	(12) 12	(12) 0.5	(12) BU / YE	(12) 49 79	(12) IV	(12) —
(13) 13	(13) 0.5	(13) WH	(13) 49 78	(13) II	(13) —	(13) AUTOSAR CAN Bus [-] 2 Serial Data	(13) 13	(13) 0.5	(13) WH	(13) 49 78	(13) IV	(13) —
(14) 14	(14) 0.5	(14) BU / BK	(14) 49 77	(14) II	(14) —	(14) AUTOSAR CAN Bus [+] 3 Serial Data	(14) 14	(14) 0.5	(14) BU / BK	(14) 49 77	(14) IV	(14) —
(15) 15	(15) 0.5	(15) WH	(15) 49 76	(15) II	(15) —	(15) AUTOSAR CAN Bus [-] 3 Serial Data	(15) 15	(15) 0.5	(15) WH	(15) 49 76	(15) IV	(15) —
16	—	—	—	—	—	Not Occupied	16	—	—	—	—	—

X205R Body Wiring Harness to Forward Lamp Wiring Harness



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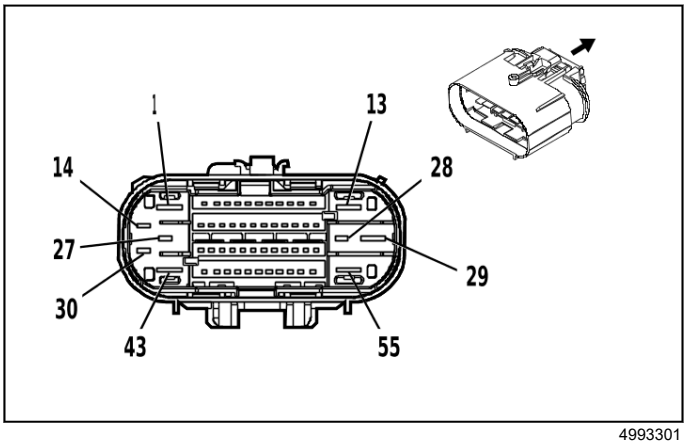


4993301

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 13522700
- Service Connector: 19371185
- Description: 55-Way F 1.2 OCS, 2.8, 6.3 CTS Series, Sealed(BK)

Connector Part Information
- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 35205173
- Service Connector: 84727364
- Description: 55-Way M 1.2 OCS, 2.8, 6.3 CTS Series, Sealed(BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19370818	J-35616-12 (BU)	J-38125-215A
II	19371217	J-35616-12 (BU)	J-38125-215A
III	84867140	J-35616-13 (BU)	J-38125-215A

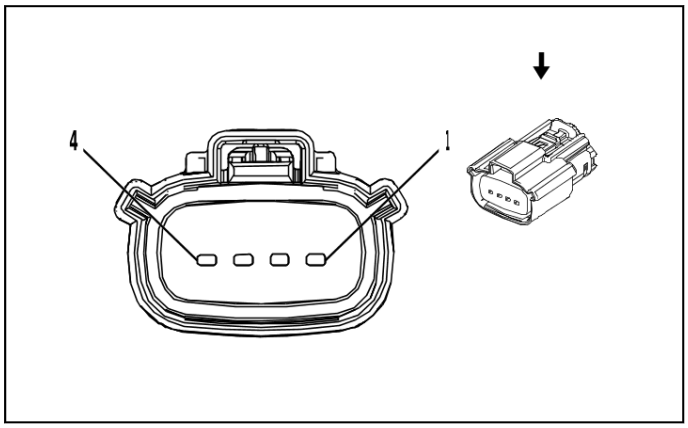
X205R Body Wiring Harness to Forward Lamp Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	—	—	—	—	—	Not Occupied	1	—	—	—	—	—
(2) 2	(2) 1	(2) YE	(2) 312	(2) II	(2) —	(2) Right Headlamp Low Beam Control	(2) 2	(2) 0.75	(2) YE	(2) 312	(2) III	(2) —
(3) 3	(3) 0.75	(3) WH	(3) 311	(3) I	(3) —	(3) Right Headlamp High Beam Control	(3) 3	(3) 0.75	(3) WH	(3) 311	(3) III	(3) —
4	—	—	—	—	—	Not Occupied	4	—	—	—	—	—
(5) 5	(5) 0.75	(5) GY/VT	(5) 228	(5) I	(5) —	(5) Windshield Washer Pump Control	(5) 5	(5) 0.75	(5) GY/VT	(5) 228	(5) III	(5) —
(6) 6	(6) 0.75	(6) BU/VT	(6) 392	(6) I	(6) —	(6) Rear Window Washer Pump Control	(6) 6	(6) 0.75	(6) BU/VT	(6) 392	(6) III	(6) —
(7) 7	(7) 0.75	(7) RD/YE	(7) 740	(7) I	(7) —	(7) Battery Positive Voltage	(7) 7	(7) 0.75	(7) RD/YE	(7) 740	(7) III	(7) —
8	—	—	—	—	—	Not Occupied	8	—	—	—	—	—
(9) 9	(9) 0.5	(9) GY/RD	(9) 10667	(9) I	(9) —	(9) Engine Control Sensors 5 Volt Reference	(9) 9	(9) 0.5	(9) GY/RD	(9) 10667	(9) III	(9) —
(10) 10	(10) 0.5	(10) BK/GN	(10) 580	(10) I	(10) —	(10) Engine Control Sensors Low Reference 2	(10) 10	(10) 0.5	(10) BK/GN	(10) 580	(10) III	(10) —
(11) 11	(11) 0.5	(11) YE/WH	(11) 3200	(11) I	(11) —	(11) Throttle Inlet Absolute Pressure Sensor Signal	(11) 11	(11) 0.5	(11) YE/WH	(11) 3200	(11) III	(11) —
(12) 12	(12) 1	(12) BK	(12) 3	(12) II	(12) —	(12) Run/Crank Ignition 1 Voltage	(12) 12	(12) 0.75	(12) BK	(12) 1	(12) III	(12) —
13 - 14	—	—	—	—	—	Not Occupied	13 - 14	—	—	—	—	—
(15) 15	(15) 0.5	(15) BU/GY	(15) 636	(15) I	(15) —	(15) Ambient Air Temperature Sensor Signal	(15) 15	(15) 0.5	(15) BU/GY	(15) 636	(15) III	(15) —
(16) 16	(16) 0.5	(16) BK/GY	(16) 626	(16) I	(16) —	(16) Engine Control Vehicle Sensors Low Reference 1	(16) 16	(16) 0.5	(16) BK/GY	(16) 626	(16) III	(16) —
(17) 17	(17) 0.35	(17) BN/GN	(17) 4064	(17) I	(17) —	(17) Hood Status B Signal	(17) 17	(17) 0.5	(17) BN/GN	(17) 4064	(17) III	(17) —
(18) 18	(18) 0.5	(18) YE	(18) 4063	(18) I	(18) —	(18) Hood Status A Signal	(18) 18	(18) 0.5	(18) YE	(18) 4063	(18) III	(18) —
19 - 20	—	—	—	—	—	Not Occupied	19 - 20	—	—	—	—	—

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(21) 21	(21) 0.35	(21) BU / GN	(21) 12 53	(21) I	(21) —	(21) Right Front Park Lamp Control	(21) 21	(21) 0.5	(21) BU / GN	(21) 12 53	(21) III	(21) —
(22) 22	(22) 0.5	(22) GN / VT	(22) 13 15	(22) I	(22) —	(22) Right Front Turn Signal Lamp Control	(22) 22	(22) 0.5	(22) GN / VT	(22) 13 15	(22) III	(22) —
23	—	—	—	—	—	Not Occupied	23	—	—	—	—	—
(24) 24	(24) 0.75	(24) BN / GY	(24) 29	(24) I	(24) —	(24) Horn Control	(24) 24	(24) 0.75	(24) BN / GY	(24) 29	(24) III	(24) —
25	—	—	—	—	—	Not Occupied	25	—	—	—	—	—
(26) 26	(26) 0.35	(26) VT	(26) 18 5	(26) I	(26) —	(26) Low Washer Fluid Indicator Control	(26) 26	(26) 0.5	(26) VT	(26) 18 5	(26) III	(26) —
27 - 31	—	—	—	—	—	Not Occupied	27 - 31	—	—	—	—	—
(32) 32	(32) 0.5	(32) BN / GN	(32) 42 46	(32) I	(32) —	(32) Identification Lamp Control	(32) 32	(32) —	(32) —	(32) —	(32) —	(32) —
33	—	—	—	—	—	Not Occupied	33	—	—	—	—	—
(34) 34	(34) 0.5	(34) GN / VT	(34) 10 806	(34) I	(34) —	(34) Engine Control Module LIN Bus 1	(34) 34	(34) 0.5	(34) GN / VT	(34) 10 806	(34) III	(34) —
(35) 35	(35) 0.5	(35) VT / BU	(35) 57 05	(35) I	(35) —	(35) Powertrain Main Relay Control	(35) 35	(35) 0.5	(35) VT / BU	(35) 57 05	(35) III	(35) —
36 - 37	—	—	—	—	—	Not Occupied	36 - 37	—	—	—	—	—
(38) 38	(38) 0.5	(38) VT	(38) 12 03	(38) I	(38) —	(38) Right Park Lamp Control 2	(38) 38	(38) 0.5	(38) VT	(38) 12 03	(38) III	(38) —
(39) 39	(39) 0.5	(39) BU / BN	(39) 75 39	(39) I	(39) —	(39) Right Front DRL Control	(39) 39	(39) 0.5	(39) BU / BN	(39) 75 39	(39) III	(39) —
(40) 40	(40) 0.35	(40) WH / YE	(40) 75 45	(40) I	(40) —	(40) Right Front Turn Signal Lamp Feedback Signal	(40) 40	(40) —	(40) —	(40) —	(40) —	(40) —
41 - 43	—	—	—	—	—	Not Occupied	41 - 43	—	—	—	—	—
(44) 44	(44) 1	(44) BK	(44) 4	(44) II	(44) —	(44) Accessory Ignition Voltage	(44) 44	(44) 0.75	(44) BK	(44) 2	(44) III	(44) —
(45) 45	(45) 0.5	(45) BN / GY	(45) 50 61	(45) I	(45) —	(45) Left Front Fog Lamp Control	(45) 45	(45) 0.5	(45) BN / GY	(45) 50 61	(45) III	(45) —
46 - 51	—	—	—	—	—	Not Occupied	46 - 51	—	—	—	—	—
(52) 52	(52) 0.5	(52) OG / GN	(52) 14 09	(52) I	(52) —	(52) Right Front Impact Discriminating Sensor Signal	(52) 52	(52) 0.5	(52) OG / GN	(52) 14 09	(52) III	(52) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(53) 53	(53) 0.5	(53) BK / OG	(53) 5600	(53) I	(53) —	(53) Right Front Impact Discriminating Sensor Low Reference	(53) 53	(53) 0.5	(53) BK / OG	(53) 5600	(53) III	(53) —
(54) 54	(54) 1	(54) BK	(54) 4	(54) II	(54) —	(54) Accessory Ignition Voltage	(54) 54	(54) 0.75	(54) BK	(54) 3	(54) III	(54) —
55	—	—	—	—	—	Not Occupied	55	—	—	—	—	—

X250J Windshield Washer Pump Extension Wiring Harness to Forward Lamp Wiring Harness



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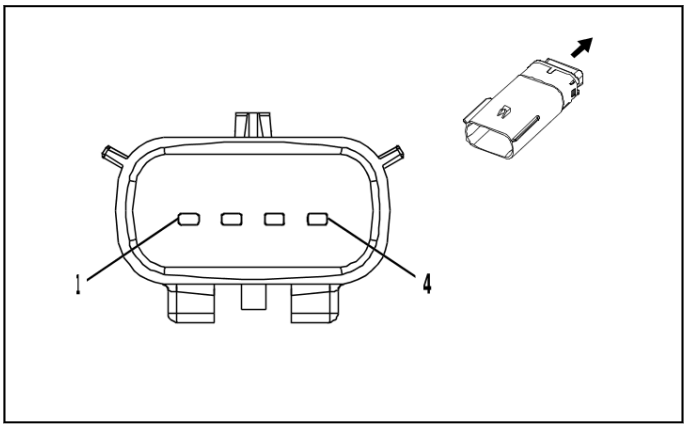


2917338

Connector Part Information
- Harness Type: Windshield Washer Pump Extension Wiring Harness
- OEM Connector: 33471-0406
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 1.5 Series, Sealed(BK)

Connector Part Information
- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 33481-4401
- Service Connector: 19330690
- Description: 4-Way M 1.5 Series, Sealed(BK)

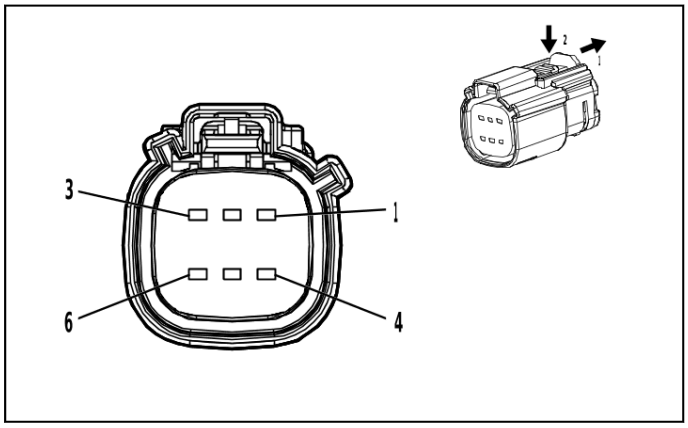
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-2A (GY)	No Tool Required
III	Not required	J-35616-3 (GY)	No Tool Required

X250J Windshield Washer Pump Extension Wiring Harness to Forward Lamp Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) RD / WH	(1) 2	(1) I	(1) —	(1) Windshield Washer Pump Control (1) Battery Positive Voltage	(1) 1	(1) 0.75 (1) 0.75	(1) GY / VT (1) BK	(1) 228 (1) 2250	(1) III (1) III	(1) UXA (1) - UXA
(2) 2	(2) 1.5	(2) RD / BK	(2) 1	(2) I	(2) —	(2) Windshield Washer Pump Control (2) Unfused Battery Positive Voltage	(2) 2	(2) 0.75 (2) 0.75	(2) GY / VT (2) BU / VT	(2) 228 (2) 392	(2) III (2) III	(2) - UXA (2) UXA
(3) 3	(3) 0.75	(3) RD / YE	(3) 4	(3) II	(3) —	(3) Accessory Ignition Voltage	(3) 3	(3) 0.5	(3) VT	(3) 185	(3) III	(3) —
(4) 4	(4) 0.75	(4) RD / BK	(4) 3	(4) II	(4) —	(4) Run/ Crank Ignition 1 Voltage	(4) 4	(4) 0.5	(4) BK	(4) 2250	(4) III	(4) —

X260 Front Object Alarm Sensor Wiring Harness to Forward Lamp Wiring Harness



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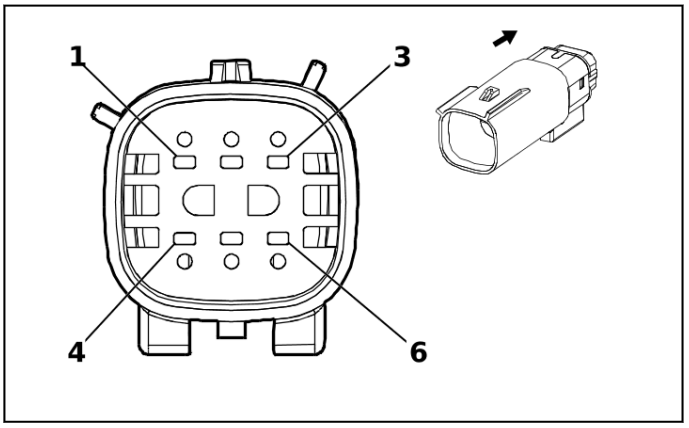


5318944

Connector Part Information
- Harness Type: Front Object Alarm Sensor Wiring Harness
- OEM Connector: 33472-0670
- Service Connector: Service by Harness - See Part Catalog
- Description: 6-Way F 1.5 MX Series, Sealed(GY)

Connector Part Information
- Harness Type: Forward Lamp Wiring Harness
- OEM Connector: 33482-3628
- Service Connector: 84856300
- Description: 6-Way M 1.5 MX Series, Sealed(GY)

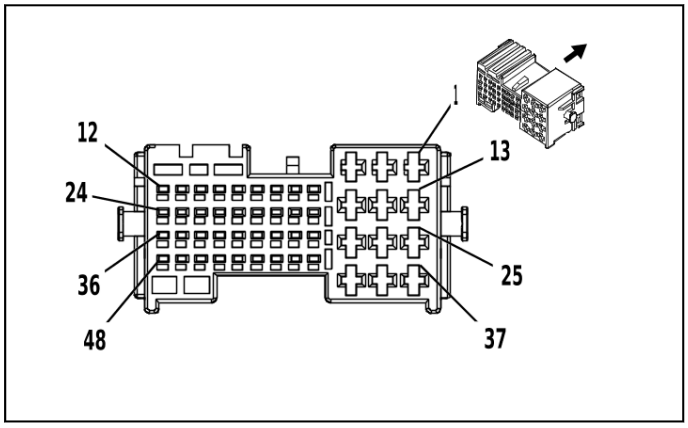
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-3 (GY)	No Tool Required

X260 Front Object Alarm Sensor Wiring Harness to Forward Lamp Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BN / GY	(1) 5061	(1) I	(1) —	(1) Left Front Fog Lamp Control	(1) 1	(1) 0.5	(1) BN / GY	(1) 5061	(1) II	(1) —
(2) 2	(2) 0.5	(2) BK	(2) 550	(2) I	(2) —	(2) Ground	(2) 2	(2) 0.75	(2) BK	(2) 550	(2) II	(2) —
3 - 6	—	—	—	—	—	Not Occupied	3 - 6	—	—	—	—	—

X300 Body Wiring Harness to Instrument Panel Wiring Harness



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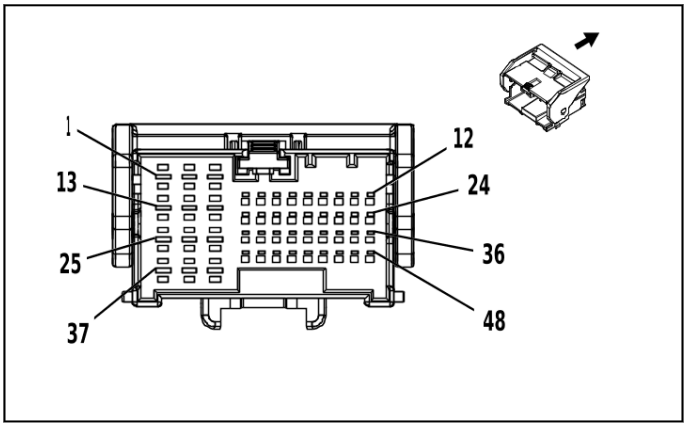


3277901

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 2109452-2
- Service Connector: 19329739
- Description: 48-Way F 1.2 MCON, 2.8 MCP Series(BK)

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 5-2109455-2
- Service Connector: 19329740
- Description: 48-Way M 1.2 MCON, 2.8 MCP Series(BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19329758	J-35616-12 (BU)	J-38125-215A
II	87814662	J-35616-35 (VT)	J-38125-557
III	13575574	J-35616-5 (PU)	J-38125-215A
IV	86509266	J-35616-13 (BU)	J-38125-215A

X300 Body Wiring Harness to Instrument Panel Wiring Harness

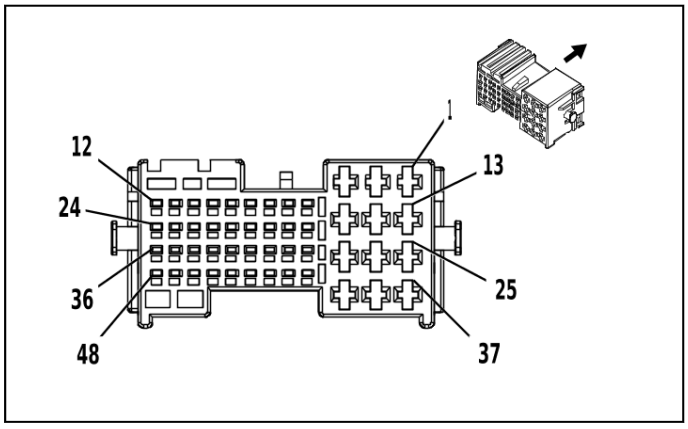
Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 1	(1) RD / BN	(1) 1140	(1) II	(1) —	(1) Battery Positive Voltage	(1) 1	(1) 1	(1) RD / BN	(1) 1140	(1) III	(1) —
(2) 2	(2) 1	(2) RD / BU	(2) 1240	(2) II	(2) —	(2) Battery Positive Voltage	(2) 2	(2) 1	(2) RD / BU	(2) 1240	(2) III	(2) —
(3) 3	(3) 0.35	(3) RD / VT	(3) 3340	(3) II	(3) —	(3) Battery Positive Voltage	(3) 3	(3) 0.35	(3) RD / VT	(3) 3340	(3) IV	(3) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(4) 4	(4) 0.35	(4) GN / BU	(4) 6133	(4) I	(4) —	(4) Body Control Module LIN Bus 2	(4) 4	(4) 0.35	(4) GN / BU	(4) 6133	(4) IV	(4) —
(5) 5	(5) 0.35	(5) BU / WH	(5) 4985	(5) I	(5) —	(5) AUTOSAR CAN Bus [+] 5 Serial Data	(5) 5	(5) 0.35	(5) BU / WH	(5) 4985	(5) IV	(5) —
(6) 6	(6) 0.35	(6) BU / YE	(6) 4984	(6) I	(6) —	(6) AUTOSAR CAN Bus [-] 5 Serial Data	(6) 6	(6) 0.35	(6) BU / YE	(6) 4984	(6) IV	(6) —
(7) 7	(7) 0.35	(7) BU / WH	(7) 4985	(7) I	(7) —	(7) AUTOSAR CAN Bus [+] 5 Serial Data	(7) 7	(7) 0.35	(7) BU / WH	(7) 4985	(7) IV	(7) —
(8) 8	(8) 0.35	(8) BU / YE	(8) 4984	(8) I	(8) —	(8) AUTOSAR CAN Bus [-] 5 Serial Data	(8) 8	(8) 0.35	(8) BU / YE	(8) 4984	(8) IV	(8) —
(9) 9	(9) 0.35	(9) GN / YE	(9) 2731	(9) I	(9) —	(9) Brake System Control Module LIN Bus 1	(9) 9	(9) 0.35	(9) GN / YE	(9) 2731	(9) IV	(9) —
(10) 10	(10) 0.5	(10) GN / BU	(10) 2733	(10) I	(10) —	(10) Brake System Control Module LIN Bus 2	(10) 10	(10) 0.35	(10) GN / BU	(10) 2733	(10) IV	(10) —
(11) 11	(11) 0.5 (11) 0.35	(11) BU / VT (11) BU / VT	(11) 4101 (11) 4101	(11) I (11) I	(11) (UFB/ UKI) - (U1D) (11) A45	(11) AUTOSAR CAN Bus [+] 4 Serial Data (11) AUTOSAR CAN Bus [+] 4 Serial Data	(11) 11	(11) 0.35	(11) BU / VT	(11) 4101	(11) IV	(11) —
(12) 12	(12) 0.5 (12) 0.35	(12) WH (12) WH	(12) 4100 (12) 4100	(12) I (12) I	(12) (UFB/ UKI) - (U1D) (12) A45	(12) AUTOSAR CAN Bus [-] 4 Serial Data (12) AUTOSAR CAN Bus [-] 4 Serial Data	(12) 12	(12) 0.35	(12) WH	(12) 4100	(12) IV	(12) —
(13) 13	(13) 1.5	(13) RD / WH	(13) 1340	(13) II	(13) —	(13) Battery Positive Voltage	(13) 13	(13) 1.5	(13) RD / WH	(13) 1340	(13) III	(13) —
(14) 14	(14) 1.5	(14) RD / GN	(14) 1540	(14) II	(14) —	(14) Battery Positive Voltage	(14) 14	(14) 1.5	(14) RD / GN	(14) 1540	(14) III	(14) —
(15) 15	(15) 0.75	(15) RD / WH	(15) 3440	(15) II	(15) —	(15) Battery Positive Voltage	(15) 15	(15) 0.75	(15) RD / WH	(15) 3440	(15) III	(15) —
16 - 17	—	—	—	—	—	Not Occupied	16 - 17	—	—	—	—	—
(18) 18	(18) 0.35	(18) BU	(18) 4987	(18) I	(18) —	(18) AUTOSAR CAN Bus [+] 1 Serial Data	(18) 18	(18) 0.35	(18) BU	(18) 4987	(18) IV	(18) —
(19) 19	(19) 0.35	(19) WH	(19) 4986	(19) I	(19) —	(19) AUTOSAR CAN Bus [-] 1 Serial Data	(19) 19	(19) 0.35	(19) WH	(19) 4986	(19) IV	(19) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(20) 20	(20) 0.35	(20) G Y	(20) 17 15	(20) I	(20) —	(20) Windshield Wiper Switch High Signal	(20) 20	(20) 0.35	(20) G Y	(20) 17 15	(20) IV	(20) —
(21) 21	(21) 0.5	(21) V T / OG	(21) 34 82	(21) I	(21) —	(21) Driver Seat Belt Anchor Pretensioner Low Control	(21) 21	(21) 0.5	(21) V T / OG	(21) 34 82	(21) IV	(21) —
(22) 22	(22) 0.5	(22) O G / YE	(22) 34 81	(22) I	(22) —	(22) Driver Seat Belt Anchor Pretensioner High Control	(22) 22	(22) 0.5	(22) O G / YE	(22) 34 81	(22) IV	(22) —
(23) 23	(23) 0.5	(23) G Y / OG	(23) 34 80	(23) I	(23) —	(23) Passenger Seat Belt Anchor Pretensioner Low Control	(23) 23	(23) 0.5	(23) G Y / OG	(23) 34 80	(23) IV	(23) —
(24) 24	(24) 0.5	(24) O G / BN	(24) 34 79	(24) I	(24) —	(24) Passenger Seat Belt Anchor Pretensioner High Control	(24) 24	(24) 0.5	(24) O G / BN	(24) 34 79	(24) IV	(24) —
(25) 25	(25) 0.75	(25) G N / BK	(25) 11 6	(25) II	(25) —	(25) Left Rear Speaker [-] Control	(25) 25	(25) 0.75	(25) G N / BK	(25) 11 6	(25) III	(25) —
(26) 26	(26) 0.75	(26) G N	(26) 19 9	(26) II	(26) —	(26) Left Rear Speaker [+] Control	(26) 26	(26) 0.75	(26) G N	(26) 19 9	(26) III	(26) —
27 - 28	—	—	—	—	—	Not Occupied	27 - 28	—	—	—	—	—
(29) 29	(29) 0.5	(29) O G / YE	(29) 35 4	(29) I	(29) —	(29) Left Front Impact Discriminating Sensor Signal	(29) 29	(29) 0.5	(29) O G / YE	(29) 35 4	(29) IV	(29) —
(30) 30	(30) 0.5	(30) B K / OG	(30) 50 45	(30) I	(30) —	(30) Left Front Impact Discriminating Sensor Low Reference	(30) 30	(30) 0.5	(30) B K / OG	(30) 50 45	(30) IV	(30) —
(31) 31	(31) 0.5	(31) O G / GN	(31) 14 09	(31) I	(31) —	(31) Right Front Impact Discriminating Sensor Signal	(31) 31	(31) 0.5	(31) O G / GN	(31) 14 09	(31) IV	(31) —
(32) 32	(32) 0.5	(32) B K / OG	(32) 56 00	(32) I	(32) —	(32) Right Front Impact Discriminating Sensor Low Reference	(32) 32	(32) 0.5	(32) B K / OG	(32) 56 00	(32) IV	(32) —
(33) 33	(33) 0.5	(33) V T / OG	(33) 34 78	(33) I	(33) —	(33) Driver Seat Belt Retractor Pretensioner Low Control	(33) 33	(33) 0.5	(33) V T / OG	(33) 34 78	(33) IV	(33) —
(34) 34	(34) 0.5	(34) O G / WH	(34) 34 77	(34) I	(34) —	(34) Driver Seat Belt Retractor Pretensioner High Control	(34) 34	(34) 0.5	(34) O G / WH	(34) 34 77	(34) IV	(34) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(35) 35	(35) 0.5	(35) WH / OG	(35) 34 76	(35) I	(35) —	(35) Passenger Seat Belt Retractor Pretensioner Low Control	(35) 35	(35) 0.5	(35) WH / OG	(35) 34 76	(35) IV	(35) —
(36) 36	(36) 0.5	(36) OG / GN	(36) 34 75	(36) I	(36) —	(36) Passenger Seat Belt Retractor Pretensioner High Control	(36) 36	(36) 0.5	(36) OG / GN	(36) 34 75	(36) IV	(36) —
37 - 44	—	—	—	—	—	Not Occupied	37 - 44	—	—	—	—	—
(45) 45	(45) 0.35	(45) GY / GN	(45) 32 8	(45) I	(45) —	(45) Interior Lamp Defeat Switch Signal	(45) 45	(45) 0.35	(45) GY / GN	(45) 32 8	(45) IV	(45) —
(46) 46	(46) 0.35	(46) GY	(46) 15 7	(46) I	(46) —	(46) Interior Lamp Control	(46) 46	(46) 0.35	(46) GY	(46) 15 6	(46) IV	(46) —
(47) 47	(47) 0.5	(47) GY	(47) 15 7	(47) I	(47) —	(47) Interior Lamp Control	(47) 47	(47) 0.5	(47) GY	(47) 15 7	(47) IV	(47) —
(48) 48	(48) 0.5	(48) WH / BN	(48) 68 15	(48) I	(48) —	(48) Inadvertent Load Control	(48) 48	(48) 0.5	(48) WH / BN	(48) 68 15	(48) IV	(48) —

X301 Body Wiring Harness to Instrument Panel Wiring Harness



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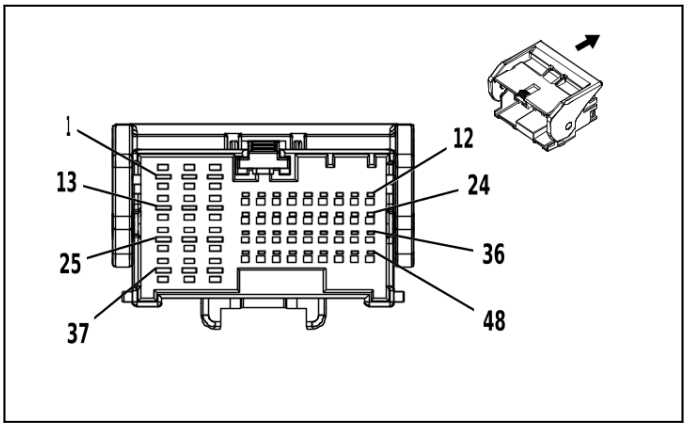

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Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 1-2109452-3
- Service Connector: 19329737
- Description: 48-Way F 1.2 MCON, 2.8 MCP Series(GY)

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 1-2109455-3
- Service Connector: 19329738
- Description: 48-Way M 1.2 MCON, 2.8 MCP Series(GY)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19300446	J-35616-12 (BU)	J-38125-12A
II	87814662	J-35616-35 (VT)	J-38125-557
III	13575574	J-35616-5 (PU)	J-38125-215A
IV	86509266	J-35616-13 (BU)	J-38125-215A

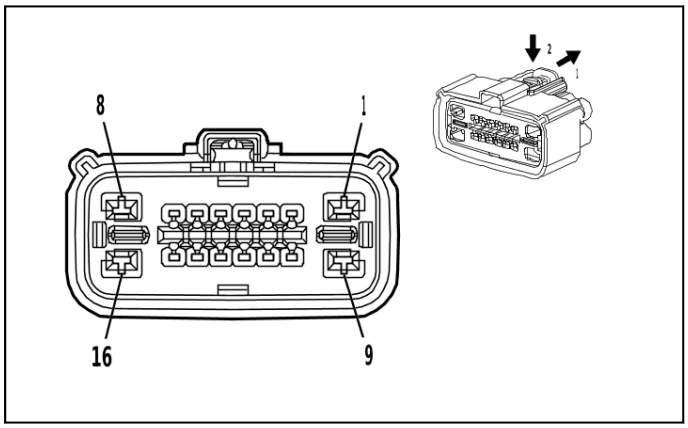
X301 Body Wiring Harness to Instrument Panel Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) BU	(1) 47	(1) II	(1) —	(1) Trailer Auxiliary Control	(1) 1	(1) 2.5	(1) BU	(1) 47	(1) III	(1) —
(2) 2	(2) 2.5	(2) RD / BN	(2) 4142	(2) II	(2) —	(2) Primary Fused Battery Positive Voltage	(2) 2	(2) 2.5	(2) RD / BN	(2) 4142	(2) III	(2) —
(3) 3	(3) 0.5	(3) RD / VT	(3) 1940	(3) II	(3) —	(3) Battery Positive Voltage	(3) 3	(3) 0.5	(3) RD / VT	(3) 1940	(3) III	(3) —
(4) 4	(4) 0.5	(4) YE	(4) 6817	(4) I	(4) —	(4) LED Backlight Dimming Control 1	(4) 4	(4) 0.5	(4) YE	(4) 6817	(4) IV	(4) —
(5) 5	(5) 0.5	(5) VT / GY	(5) 7117	(5) I	(5) —	(5) Front Axle Differential Lock Indicator Control	(5) 5	(5) 0.5	(5) VT / GY	(5) 7117	(5) IV	(5) —
(6) 6	(6) 0.5	(6) YE	(6) 7115	(6) I	(6) —	(6) Rear Axle Differential Lock Indicator Control	(6) 6	(6) 0.5	(6) YE	(6) 7115	(6) IV	(6) —
(7) 7	(7) 0.5	(7) YE / GN	(7) 7122	(7) I	(7) —	(7) Axle Differential Lock Switch Signal	(7) 7	(7) 0.5	(7) YE / GN	(7) 7122	(7) IV	(7) —
8	—	—	—	—	—	Not Occupied	8	—	—	—	—	—
(9) 9	(9) 0.5	(9) YE	(9) 2375	(9) I	(9) —	(9) Left Rear Outer Parking Assist Sensor Signal	(9) 9	(9) 0.5	(9) YE	(9) 2375	(9) IV	(9) —
(10) 10	(10) 0.75	(10) BN / WH	(10) 2374	(10) I	(10) —	(10) Object Sensor Voltage Reference	(10) 10	(10) 0.75	(10) BN / WH	(10) 2374	(10) IV	(10) —
(11) 11	(11) 0.5	(11) YE / BU	(11) 2376	(11) I	(11) —	(11) Left Rear Middle Parking Assist Sensor Signal	(11) 11	(11) 0.5	(11) YE / BU	(11) 2376	(11) IV	(11) —
(12) 12	(12) 0.5	(12) YE / VT	(12) 2378	(12) I	(12) —	(12) Right Rear Outer Parking Assist Sensor Signal	(12) 12	(12) 0.5	(12) YE / VT	(12) 2378	(12) IV	(12) —
13 - 20	—	—	—	—	—	Not Occupied	13 - 20	—	—	—	—	—
(21) 21	(21) 0.35	(21) BU / YE	(21) 7176	(21) I	(21) —	(21) All Windows Open Switch Signal	(21) 21	(21) 0.35	(21) BU / YE	(21) 7176	(21) IV	(21) —
(22) 22	(22) 0.35	(22) GN / WH	(22) 24	(22) I	(22) —	(22) Backup Lamp Control	(22) 22	(22) 0.35	(22) GN / WH	(22) 24	(22) IV	(22) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(23) 23	(23) 0.5	(23) YE / WH	(23) 2377	(23) I	(23) —	(23) Right Rear Middle Parking Assist Sensor Signal	(23) 23	(23) 0.5	(23) YE / WH	(23) 2377	(23) IV	(23) —
(24) 24	(24) 0.75	(24) BK / GY	(24) 2379	(24) I	(24) —	(24) Object Sensor Low Reference	(24) 24	(24) 0.75	(24) BK / GY	(24) 2379	(24) IV	(24) —
(25) 25	(25) 0.75 (25) 0.5	(25) BN / BU (25) BU / BN	(25) 118 (25) 1957	(25) II (25) II	(25) UQ3 (25) UQA	(25) Left Front Speaker [-] Control 1 (25) Left Front Midrange Speaker [-] Control	(25) 25	(25) 0.75 (25) 0.5	(25) BN / BU (25) BU / BN	(25) 118 (25) 1957	(25) III (25) III	(25) UQ3 (25) UQA
(26) 26	(26) 0.75 (26) 0.5	(26) BU (26) BU / VT	(26) 201 (26) 1857	(26) II (26) II	(26) UQ3 (26) UQA	(26) Left Front Speaker 1 [+] Control (26) Left Front Midrange Speaker [+] Control	(26) 26	(26) 0.75 (26) 0.5	(26) BU (26) BU / VT	(26) 201 (26) 1857	(26) III (26) III	(26) UQ3 (26) UQA
27	—	—	—	—	—	Not Occupied	27	—	—	—	—	—
(28) 28	(28) 0.5	(28) VT / BK	(28) 739	(28) I	(28) —	(28) Run/ Crank Ignition 1 Voltage	(28) 28	(28) 0.5	(28) VT / BK	(28) 739	(28) IV	(28) —
(29) 29	(29) 0.5	(29) VT / WH	(29) 1139	(29) I	(29) —	(29) Run/ Crank Ignition 1 Voltage	(29) 29	(29) 0.5	(29) VT / WH	(29) 1139	(29) IV	(29) —
30 - 34	—	—	—	—	—	Not Occupied	30 - 34	—	—	—	—	—
(35) 35	(35) 0.5	(35) VT / RD	(35) 4049	(35) I	(35) —	(35) AC Power Outlet Sensor High Reference	(35) 35	(35) 0.5	(35) VT / RD	(35) 4049	(35) IV	(35) —
(36) 36	(36) 0.5	(36) BU / BN	(36) 6807	(36) I	(36) —	(36) DC/AC Inverter Control	(36) 36	(36) 0.5	(36) BU / BN	(36) 6807	(36) IV	(36) —
37 - 40	—	—	—	—	—	Not Occupied	37 - 40	—	—	—	—	—
(41) 41	(41) 0.35	(41) RD / BU	(41) 3240	(41) I	(41) —	(41) Battery Positive Voltage	(41) 41	(41) 0.5	(41) RD / BU	(41) 3240	(41) IV	(41) —
(42) 42	(42) 0.35	(42) RD / GN	(42) 5140	(42) I	(42) —	(42) Battery Positive Voltage	(42) 42	(42) 0.35	(42) RD / VT	(42) 4040	(42) IV	(42) —
(43) 43	(43) 0.35	(43) BU	(43) 2307	(43) I	(43) —	(43) Passenger Air Bag On Indicator Control	(43) 43	(43) 0.35	(43) BU	(43) 2307	(43) IV	(43) —
(44) 44	(44) 0.35	(44) GN	(44) 2308	(44) I	(44) —	(44) Passenger Air Bag Off Indicator Control	(44) 44	(44) 0.35	(44) GN	(44) 2308	(44) IV	(44) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(45) 45	(45) 0.35 (45) 0.35	(45) GN (45) VT / WH	(45) 3118 (45) 5234	(45) I (45) I	(45) AL0 & C9I (45) - C91	(45) Roof Rail Air Bag Disable Indicator Control (45) Passenger Seat Belt Indicator Control	(45) 45	(45) 0.35 (45) 0.35	(45) GN (45) VT / WH	(45) 3118 (45) 5234	(45) IV (45) IV	(45) AL0 & C9I (45) - C91
(46) 46	(46) 0.75	(46) BARE	(46) 10116	(46) I	(46) —	(46) AC Outlet Low Reference	(46) 46	(46) 0.75	(46) BARE	(46) 10116	(46) IV	(46) —
(47) 47	(47) 0.75	(47) BK	(47) 10117	(47) I	(47) —	(47) AC Outlet Phase A Control	(47) 47	(47) 0.75	(47) BK	(47) 10117	(47) IV	(47) —
(48) 48	(48) 0.75	(48) RD	(48) 10118	(48) I	(48) —	(48) AC Outlet Phase B Control	(48) 48	(48) 0.75	(48) RD	(48) 10118	(48) IV	(48) —

X302A Front Seat Wiring Harness - Driver to Body Wiring Harness



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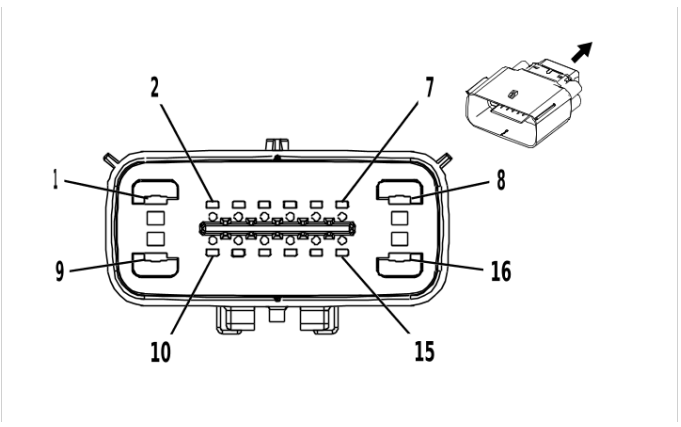

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Connector Part Information
- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 34985-2161
- Service Connector: Service by Harness - See Part Catalog
- Description: 16-Way F 1.5, 2.8 MX Series, Sealed(YE)

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 34986-1605
- Service Connector: 19331031
- Description: 16-Way M 1.5, 2.8 MX Series, Sealed(YE)

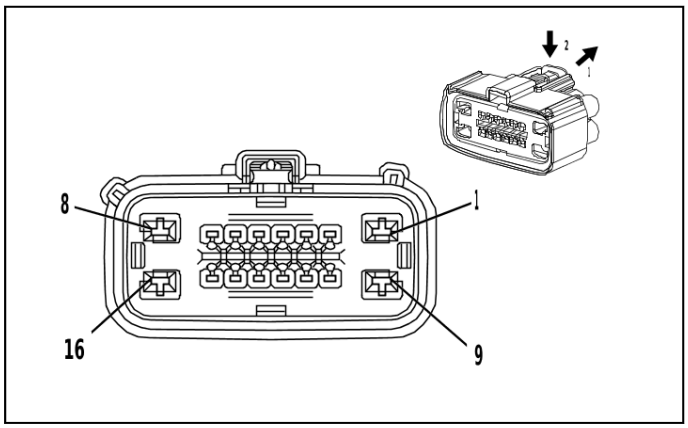
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-2A (GY)	No Tool Required
III	Not required	J-35616-35 (VT)	No Tool Required
IV	19366658	J-35616-5 (PU)	J-38125-12A
V	86800300	J-35616-3 (GY)	J-38125-217

X302A Front Seat Wiring Harness - Driver to Body Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) BK	(1) 3750	(1) III	(1) —	(1) Ground	(1) 1	(1) 2.5	(1) BK	(1) 3750	(1) IV	(1) —
(2) 2	(2) 0.5	(2) OG / BU	(2) 4962	(2) II	(2) —	(2) Driver Seat Back Air Bag High Control	(2) 2	(2) 0.5	(2) OG / BU	(2) 4962	(2) V	(2) —
(3) 3	(3) 0.5	(3) BK / OG	(3) 4963	(3) II	(3) —	(3) Driver Seat Back Air Bag Low Control	(3) 3	(3) 0.5	(3) BK / OG	(3) 4963	(3) V	(3) —
(4) 4	(4) 0.5	(4) BK / OG	(4) 1363	(4) I	(4) —	(4) Driver Seat Belt Switch Low Reference	(4) 4	(4) 0.5	(4) BK / OG	(4) 1363	(4) V	(4) —
(5) 5	(5) 0.5	(5) OG / BN	(5) 238	(5) I	(5) —	(5) Driver Seat Belt Switch Signal	(5) 5	(5) 0.5	(5) OG / BN	(5) 238	(5) V	(5) —
6 - 7	—	—	—	—	—	Not Occupied	6 - 7	—	—	—	—	—
(8) 8	(8) 2.5 (8) 2.5	(8) RD / GY (8) RD / BN	(8) 3540 (8) 3640	(8) III (8) III	(8) A2X (8) A45	(8) Battery Positive Voltage (8) Battery Positive Voltage	(8) 8	(8) 2.5	(8) RD / GY	(8) 3540	(8) IV	(8) —
(9) 9	(9) 0.5	(9) RD / VT	(9) 3340	(9) III	(9) —	(9) Battery Positive Voltage	(9) 9	(9) 0.35	(9) RD / VT	(9) 3340	(9) IV	(9) —
10	—	—	—	—	—	Not Occupied	10	—	—	—	—	—
(11) 11	(11) 0.5	(11) BU	(11) 2425	(11) I	(11) —	(11) Driver Seat Back Heating Temperature Sensor Signal	(11) 11	(11) 0.5	(11) BU	(11) 2425	(11) V	(11) —
(12) 12	(12) 0.5	(12) BK / YE	(12) 2080	(12) I	(12) —	(12) Driver Heated Seat Thermistor Low Reference	(12) 12	(12) 0.5	(12) BK / YE	(12) 2080	(12) V	(12) —
(13) 13	(13) 0.5	(13) YE / GY	(13) 2079	(13) I	(13) —	(13) Driver Seat Heating Temperature Sensor Signal	(13) 13	(13) 0.5	(13) YE / GY	(13) 2079	(13) V	(13) —
(14) 14	(14) 0.75	(14) BN / BK	(14) 2078	(14) II	(14) —	(14) Driver Seat Heating Element Low Reference	(14) 14	(14) 0.75	(14) BN / BK	(14) 2078	(14) V	(14) —
(15) 15	(15) 0.75	(15) BN / VT	(15) 2077	(15) II	(15) —	(15) Driver Seat Heating Element Control	(15) 15	(15) 0.75	(15) BN / VT	(15) 2077	(15) V	(15) —
(16) 16	(16) 0.75	(16) RD / WH	(16) 3440	(16) III	(16) —	(16) Battery Positive Voltage	(16) 16	(16) 0.75	(16) RD / WH	(16) 3440	(16) IV	(16) —

X302B Front Seat Wiring Harness - Driver to Body Wiring Harness



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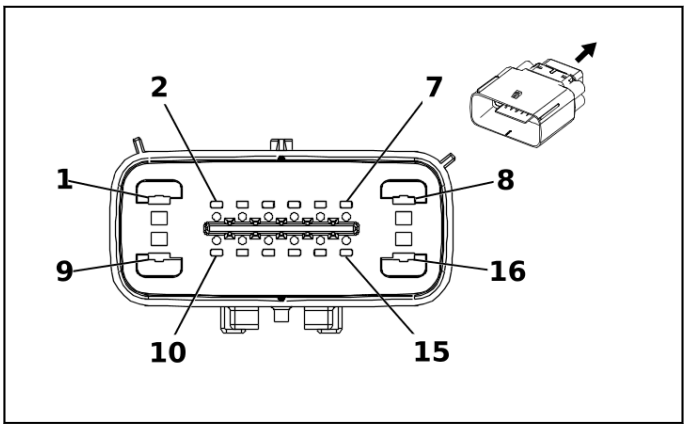


4209017

Connector Part Information
- Harness Type: Front Seat Wiring Harness - Driver
- OEM Connector: 34985-1607
- Service Connector: Service by Harness - See Part Catalog
- Description: 16-Way F 1.5, 2.8 MX Series, Sealed(GY)

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 34986-8006
- Service Connector: 19352214
- Description: 16-Way M 1.5, 2.8 MX Series, Sealed(L-GY)

Terminal Part Information

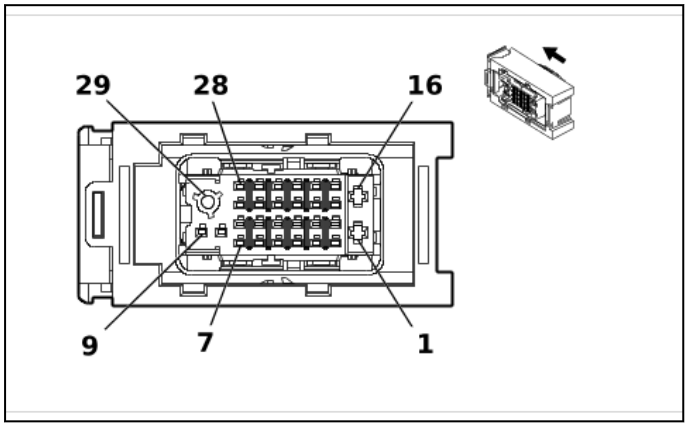
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	86800300	J-35616-3 (GY)	J-38125-217

X302B Front Seat Wiring Harness - Driver to Body Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	—	—	—	—	—	Not Occupied	1	—	—	—	—	—
(2) 2	(2) 0.35	(2) BU / GN	(2) 614	(2) I	(2) —	(2) Seat Memory Switch Set Signal	(2) 2	(2) 0.35	(2) BU / GN	(2) 614	(2) II	(2) —
(3) 3	(3) 0.35	(3) WH	(3) 615	(3) I	(3) —	(3) Seat Memory Switch Signal 1	(3) 3	(3) 0.35	(3) WH	(3) 615	(3) II	(3) —
4 - 9	—	—	—	—	—	Not Occupied	4 - 9	—	—	—	—	—
(10) 10	(10) 0.5	(10) VT / GN	(10) 839	(10) I	(10) —	(10) Run/ Crank Ignition 1 Voltage	(10) 10	(10) 0.5	(10) VT / GN	(10) 839	(10) II	(10) —
(11) 11	(11) 0.5	(11) GN / VT	(11) 5906	(11) I	(11) —	(11) Driver Seat Blower Motor Control 1	(11) 11	(11) 0.5	(11) GN / VT	(11) 5906	(11) II	(11) —
(12) 12	(12) 0.35	(12) WH	(12) 4100	(12) I	(12) —	(12) AUTOSAR CAN Bus [-] 4 Serial Data	(12) 12	(12) 0.35	(12) WH	(12) 4100	(12) II	(12) —
(13) 13	(13) 0.35	(13) BU / VT	(13) 4101	(13) I	(13) —	(13) AUTOSAR CAN Bus [+] 4 Serial Data	(13) 13	(13) 0.35	(13) BU / VT	(13) 4101	(13) II	(13) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(14) 14	(14) 0.35	(14) WH	(14) 41 00	(14) I	(14) —	(14) AUTOSAR CAN Bus [-] 4 Serial Data	(14) 14	(14) 0.5	(14) WH	(14) 41 00	(14) II	(14) —
(15) 15	(15) 0.35	(15) BU / VT	(15) 41 01	(15) I	(15) —	(15) AUTOSAR CAN Bus [+] 4 Serial Data	(15) 15	(15) 0.5	(15) BU / VT	(15) 41 01	(15) II	(15) —
16	—	—	—	—	—	Not Occupied	16	—	—	—	—	—

X303 Body Wiring Harness to Front Side Door Door Wiring Harness - Driver



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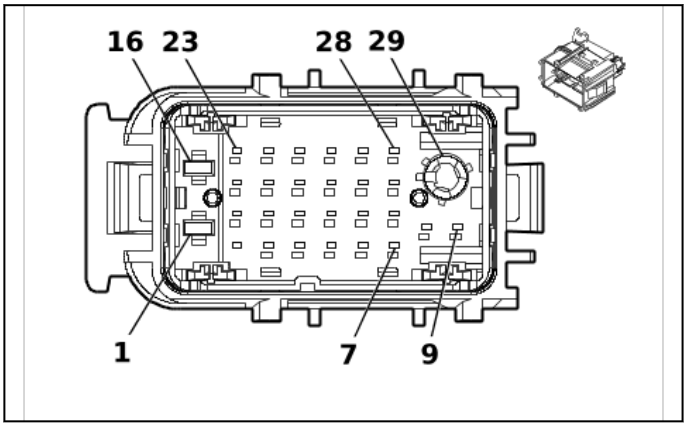


6154847

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 35383762
- Service Connector: 85741556
- Description: 29-Way F 1.2, 2.8 CTS Coaxial Series, Sealed(YE)

Connector Part Information
- Harness Type: Front Side Door Door Wiring Harness - Driver
- OEM Connector: 35383764
- Service Connector: Service by Harness - See Part Catalog
- Description: 29-Way M 1.2 CTS, 2.8 DCS-2, Coaxial Series, Sealed(YE)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19368624	J-35616-35 (VT)	J-38125-557
II	85741557	J-35616-12 (BU)	J-38125-215A
III	Service by Cable	No Tool Required	No Tool Required
IV	Not required	J-35616-13 (BU)	No Tool Required
V	Not required	J-35616-17 (L-GN)	No Tool Required
VI	Not required	J-35616-5 (PU)	No Tool Required
VII	Service by Cable	No Tool Required	No Tool Required

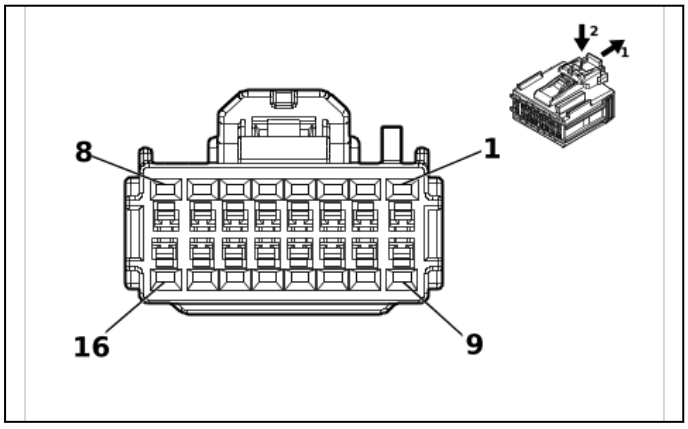
X303 Body Wiring Harness to Front Side Door Door Wiring Harness - Driver

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) BK	(1) 1150	(1) I	(1) —	(1) Ground	(1) 1	(1) 2.5	(1) BK	(1) 1150	(1) VI	(1) —
2	—	—	—	—	—	Not Occupied	2	—	—	—	—	—

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(3) 3	(3) 0.5	(3) BK / WH	(3) 451	(3) II	(3) —	(3) Signal Ground	(3) 3	(3) 0.35	(3) BK / WH	(3) 3051	(3) V	(3) —
(4) 4	(4) 0.35	(4) BU / GN	(4) 614	(4) II	(4) —	(4) Seat Memory Switch Set Signal	(4) 4	(4) 0.35	(4) BU / GN	(4) 614	(4) V	(4) —
(5) 5	(5) 0.35	(5) WH	(5) 615	(5) II	(5) —	(5) Seat Memory Switch Signal 1	(5) 5	(5) 0.35	(5) WH	(5) 615	(5) V	(5) —
6	—	—	—	—	—	Not Occupied	6	—	—	—	—	—
(7) 7	(7) 0.35	(7) GN / YE	(7) 6134	(7) II	(7) —	(7) Body Control Module LIN Bus 3	(7) 7	(7) 0.35	(7) GN / YE	(7) 6134	(7) V	(7) —
8 - 10	—	—	—	—	—	Not Occupied	8 - 10	—	—	—	—	—
(11) 11	(11) 0.5	(11) OG / GN	(11) 2132	(11) II	(11) —	(11) Left Front Side Impact Sensor Signal	(11) 11	(11) 0.5	(11) OG / GN	(11) 2132	(11) V	(11) —
(12) 12	(12) 0.5	(12) BK / OG	(12) 6628	(12) II	(12) —	(12) Left Front Side Impact Sensor Low Reference	(12) 12	(12) 0.5	(12) BK / OG	(12) 6628	(12) V	(12) —
13	—	—	—	—	—	Not Occupied	13	—	—	—	—	—
(14) 14	(14) 0.35	(14) VT / GY	(14) 4302	(14) II	(14) —	(14) Passive Entry Left Antenna Signal Low	(14) 14	(14) 0.5	(14) VT / GY	(14) 4302	(14) V	(14) —
(15) 15	(15) 0.35	(15) VT	(15) 4301	(15) II	(15) —	(15) Passive Entry Left Antenna Signal High	(15) 15	(15) 0.5	(15) VT	(15) 4301	(15) V	(15) —
(16) 16	(16) 2.5	(16) RD / BU	(16) 1240	(16) I	(16) —	(16) Battery Positive Voltage	(16) 16	(16) 2.5	(16) RD / GY	(16) 3540	(16) VI	(16) —
(17) 17	(17) 0.5	(17) RD / VT	(17) 1940	(17) II	(17) —	(17) Battery Positive Voltage	(17) 17	(17) 0.5	(17) RD / VT	(17) 1940	(17) V	(17) —
18	—	—	—	—	—	Not Occupied	18	—	—	—	—	—
(19) 19	(19) 0.35	(19) VT / GY	(19) 126	(19) II	(19) —	(19) Left Front Door Open Switch Signal	(19) 19	(19) 0.35	(19) VT / GY	(19) 126	(19) V	(19) —
(20) 20	(20) 0.35	(20) BU	(20) 2675	(20) II	(20) —	(20) Left Front Exterior Door Handle Switch Unlock Signal	(20) 20	(20) 0.35	(20) BU	(20) 2675	(20) V	(20) —
21 - 22	—	—	—	—	—	Not Occupied	21 - 22	—	—	—	—	—
(23) 23	(23) 0.75	(23) WH	(23) 2679	(23) II	(23) —	(23) Lock Actuators Unlock Control 1	(23) 23	(23) 0.75	(23) WH	(23) 2679	(23) V	(23) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(24) 24	(24) 0.75	(24) G Y	(24) 26 81	(24) II	(24) —	(24) Left Front Door Lock Actuator Lock Control	(24) 24	(24) 0.75	(24) G Y	(24) 26 81	(24) V	(24) —
25 - 26	—	—	—	—	—	Not Occupied	25 - 26	—	—	—	—	—
(27) 27	(27) 0.75 (27) 1	(27) B U (27) B U	(27) 20 1 (27) 20 1	(27) II (27) II	(27) UQ3 (27) UQA	(27) Left Front Speaker 1 [+] Control (27) Left Front Speaker 1 [+] Control	(27) 27	(27) 1	(27) B U	(27) 20 1	(27) IV	(27) —
(28) 28	(28) 0.75 (28) 1	(28) B N / BU (28) B N / BU	(28) 11 8 (28) 11 8	(28) II (28) II	(28) UQ3 (28) UQA	(28) Left Front Speaker [-] Control 1 (28) Left Front Speaker [-] Control 1	(28) 28	(28) 1	(28) B N / BU	(28) 11 8	(28) IV	(28) —
(29) 29	(29) 0	(29) WH	(29) Co ax Cable	(29) III	(29) —	(29) Coax Cable	(29) 29	(29) 0 (29) 0	(29) B ARE (29) WH	(29) Co ax Cable (29) Co ax Cable	(29) VII (29) VII	(29) — (29) —

X304 Instrument Panel Wiring Harness to Front Floor Console Wiring Harness Extension Harness



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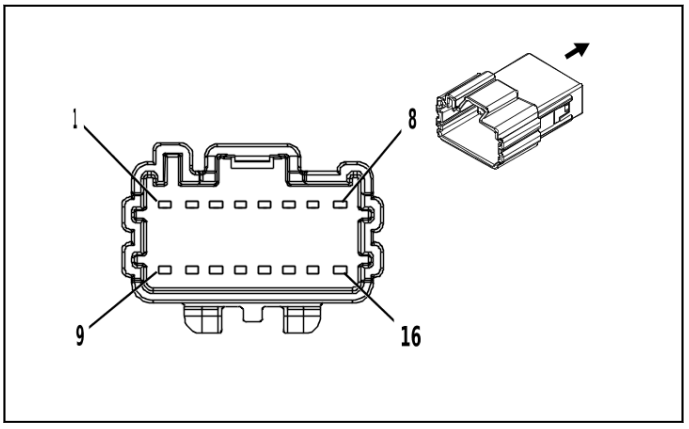


4223086

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 6098-9012
- Service Connector: 13541574
- Description: 16-Way F 1.2 MCON Series(BK)

Connector Part Information
- Harness Type: Front Floor Console Wiring Harness Extension Harness
- OEM Connector: 6098-8828
- Service Connector: Service by Harness - See Part Catalog
- Description: 16-Way M 1.2 Series(BK)

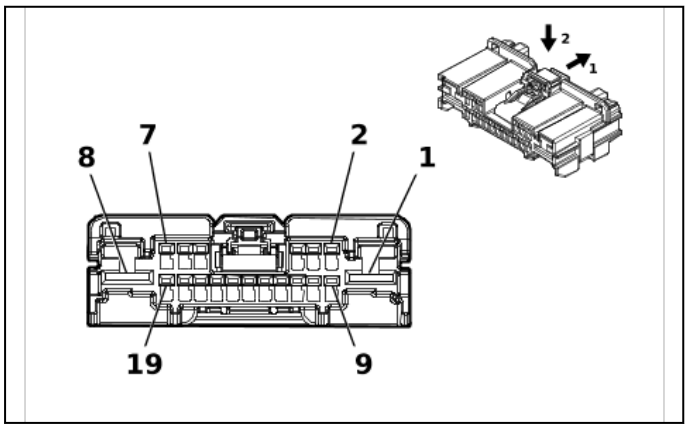
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	84962854	J-35616-12 (BU)	J-38125-215A
II	Not required	J-35616-17 (L-GN)	No Tool Required

X304 Instrument Panel Wiring Harness to Front Floor Console Wiring Harness Extension Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) WH / BN	(1) 2203	(1) I	(1) —	(1) Enhanced Driver Mode 2 Switch Signal	(1) 1	(1) 0.35	(1) WH / BN	(1) 2203	(1) II	(1) —
(2) 2	(2) 0.35	(2) BK / GY	(2) 2204	(2) I	(2) —	(2) Enhanced Driver Mode 1 Switch Low Reference	(2) 2	(2) 0.35	(2) BK / GY	(2) 2204	(2) II	(2) —
(3) 3	(3) 0.35	(3) GN / BU	(3) 6133	(3) I	(3) —	(3) Body Control Module LIN Bus 2	(3) 3	(3) 0.35	(3) GN / BU	(3) 6133	(3) II	(3) —
(4) 4	(4) 0.35	(4) GN / YE	(4) 2731	(4) I	(4) —	(4) Brake System Control Module LIN Bus 1	(4) 4	(4) 0.35	(4) GN / YE	(4) 2731	(4) II	(4) —
5	—	—	—	—	—	Not Occupied	5	—	—	—	—	—
(6) 6	(6) 0.35	(6) VT / GN	(6) 39	(6) I	(6) —	(6) Run/ Crank Ignition 1 Voltage	(6) 6	(6) 0.35	(6) VT / GN	(6) 39	(6) II	(6) —
(7) 7	(7) 0.5	(7) RD / VT	(7) 6340	(7) I	(7) —	(7) Battery Positive Voltage	(7) 7	(7) 0.5	(7) RD / VT	(7) 6340	(7) II	(7) —
(8) 8	(8) 0.35	(8) RD / GN	(8) 5140	(8) I	(8) —	(8) Battery Positive Voltage	(8) 8	(8) 0.35	(8) RD / GN	(8) 5140	(8) II	(8) —
(9) 9	(9) 0.35	(9) BU / WH	(9) 4985	(9) I	(9) —	(9) AUTOSAR CAN Bus [+] 5 Serial Data	(9) 9	(9) 0.35	(9) BU / WH	(9) 4985	(9) II	(9) —
(10) 10	(10) 0.35	(10) BU / YE	(10) 4984	(10) I	(10) —	(10) AUTOSAR CAN Bus [-] 5 Serial Data	(10) 10	(10) 0.35	(10) BU / YE	(10) 4984	(10) II	(10) —
(11) 11	(11) 0.35	(11) BU / WH	(11) 4985	(11) I	(11) —	(11) AUTOSAR CAN Bus [+] 5 Serial Data	(11) 11	(11) 0.35	(11) BU / WH	(11) 4985	(11) II	(11) —
(12) 12	(12) 0.35	(12) BU / YE	(12) 4984	(12) I	(12) —	(12) AUTOSAR CAN Bus [-] 5 Serial Data	(12) 12	(12) 0.35	(12) BU / YE	(12) 4984	(12) II	(12) —
(13) 13	(13) 0.35	(13) YE	(13) 6817	(13) I	(13) —	(13) LED Backlight Dimming Control 1	(13) 13	(13) 0.35	(13) YE	(13) 6817	(13) II	(13) —
(14) 14	(14) 0.35	(14) GN / VT	(14) 4759	(14) I	(14) —	(14) Transmission Shift Lever Position Indicator 2 Control	(14) 14	(14) 0.35	(14) GN / VT	(14) 4759	(14) II	(14) —
(15) 15	(15) 0.35	(15) BK / WH	(15) 2151	(15) I	(15) —	(15) Signal Ground	(15) 15	(15) 0.35	(15) BK / WH	(15) 2151	(15) II	(15) —
(16) 16	(16) 0.5	(16) BK	(16) 2050	(16) I	(16) —	(16) Ground (16) Ground	(16) 16	(16) 0.35 (16) 0.5	(16) BK (16) BK	(16) 2050 (16) 2050	(16) II (16) II	(16) - (NP0/ NQH/ K4C) (16) (NP0/ NQH/ K4C)

X305 Instrument Panel Wiring Harness to Front Floor Console Wiring Harness



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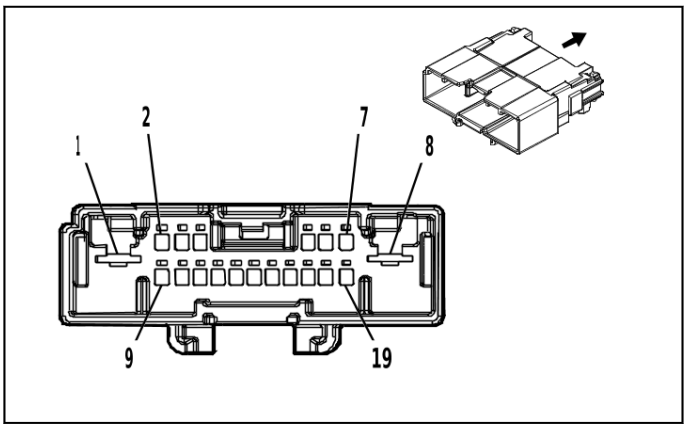


4879946

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 6098-8756
- Service Connector: 13526847
- Description: 19-Way F 1.2, 6.3 Series(BK)

Connector Part Information
- Harness Type: Front Floor Console Wiring Harness
- OEM Connector: 6098-8086
- Service Connector: Service by Harness - See Part Catalog
- Description: 19-Way M 1.2 MCON, 6.3 YESC Series(BK)

Terminal Part Information

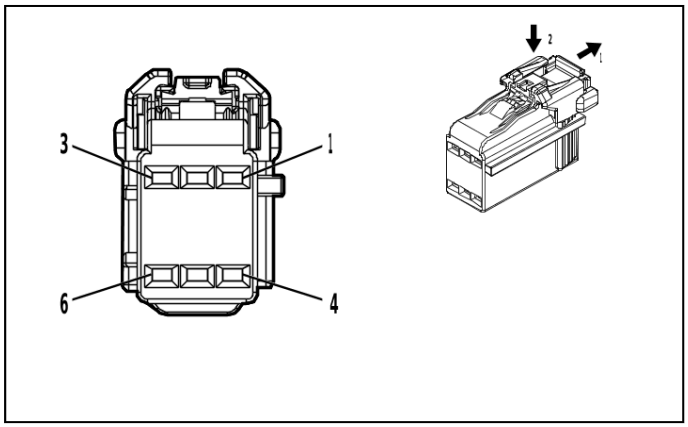
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	13578928	J-35616-42 (RD)	J-38125-11A
II	19371240	J-35616-12 (BU)	J-38125-215A
III	84962854	J-35616-12 (BU)	J-38125-215A
IV	Not required	J-35616-13 (BU)	No Tool Required
V	Not required	J-35616-17 (L-GN)	No Tool Required
VI	Not required	J-35616-43 (RD)	No Tool Required

X305 Instrument Panel Wiring Harness to Front Floor Console Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) BK	(1) 2050	(1) I	(1) —	(1) Ground (1) Ground	(1) 1	(1) 1 (1) 2.5	(1) BK (1) BK	(1) 2050 (1) 2050	(1) VI (1) VI	(1) - (KI6/ KI7/ UBI/ UBP) (1) KI6/ KI7/ UBI/ UBP
(2) 2	(2) 0.5	(2) VT	(2) 4701	(2) III	(2) —	(2) Retained Accessory Power Control	(2) 2	(2) 0.5	(2) VT	(2) 4701	(2) V	(2) —
3 - 4	—	—	—	—	—	Not Occupied	3 - 4	—	—	—	—	—
(5) 5	(5) 0.75	(5) BARE	(5) 10116	(5) III	(5) —	(5) AC Outlet Low Reference	(5) 5	(5) 0.75	(5) BARE	(5) 10116	(5) IV	(5) —
(6) 6	(6) 0.75	(6) BK	(6) 10117	(6) III	(6) —	(6) AC Outlet Phase A Control	(6) 6	(6) 0.75	(6) BK	(6) 10117	(6) IV	(6) —
(7) 7	(7) 0.75	(7) RD	(7) 10118	(7) III	(7) —	(7) AC Outlet Phase B Control	(7) 7	(7) 0.75	(7) RD	(7) 10118	(7) IV	(7) —
8	—	—	—	—	—	Not Occupied	8	—	—	—	—	—

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(9) 9	(9) 1	(9) VT	(9) 100 1	(9) II	(9) —	(9) Retained Accessory Power Ignition Voltage	(9) 9	(9) 1	(9) VT	(9) 100 1	(9) IV	(9) —
10 - 11	—	—	—	—	—	Not Occupied	10 - 11	—	—	—	—	—
(12) 12	(12) 0.35	(12) WH / GY	(12) 49 97	(12) III	(12) —	(12) Immobilizer Antenna Low Signal	(12) 12	(12) 0.35	(12) WH / GY	(12) 49 97	(12) V	(12) —
(13) 13	(13) 0.35	(13) B N / BK	(13) 49 96	(13) III	(13) —	(13) Immobilizer Antenna Signal [+]	(13) 13	(13) 0.35	(13) B N / BK	(13) 49 96	(13) V	(13) —
(14) 14	(14) 0.35	(14) B N / BK	(14) 35 52	(14) III	(14) —	(14) Interior Passive Entry Antenna 1 High Signal	(14) 14	(14) 0.35	(14) B N / BK	(14) 35 52	(14) V	(14) —
(15) 15	(15) 0.35	(15) WH	(15) 35 53	(15) III	(15) —	(15) Interior Passive Entry Antenna 1 Low Signal	(15) 15	(15) 0.35	(15) WH	(15) 35 53	(15) V	(15) —
16 - 17	—	—	—	—	—	Not Occupied	16 - 17	—	—	—	—	—
(18) 18	(18) 0.5	(18) V T / RD	(18) 40 49	(18) III	(18) —	(18) AC Power Outlet Sensor High Reference	(18) 18	(18) 0.5	(18) V T / RD	(18) 40 49	(18) V	(18) —
(19) 19	(19) 0.5	(19) B U / BN	(19) 68 07	(19) III	(19) —	(19) DC/AC Inverter Control	(19) 19	(19) 0.5	(19) B U / BN	(19) 68 07	(19) V	(19) —

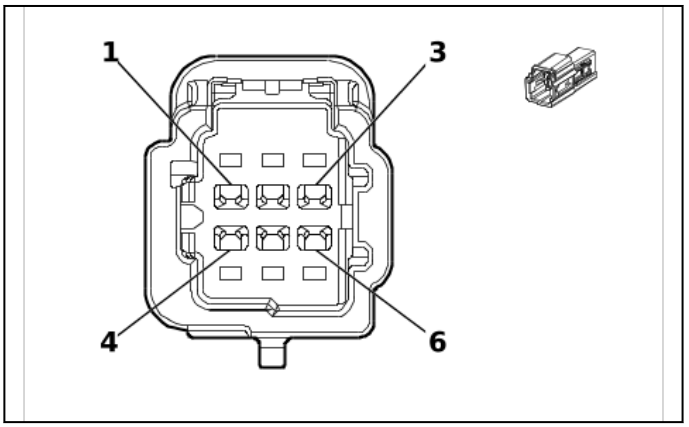
X315 Instrument Panel Wiring Harness to Air Conditioning Wiring Harness



4862126

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 6098-8996
- Service Connector: 84613129
- Description: 6-Way F 1.2 Series(BK)



5714613

Connector Part Information

- Harness Type: Air Conditioning Wiring Harness
- OEM Connector: 6098-9120
- Service Connector: Service by Harness - See Part Catalog
- Description: 6-Way M 1.2 MBS Series(BK)

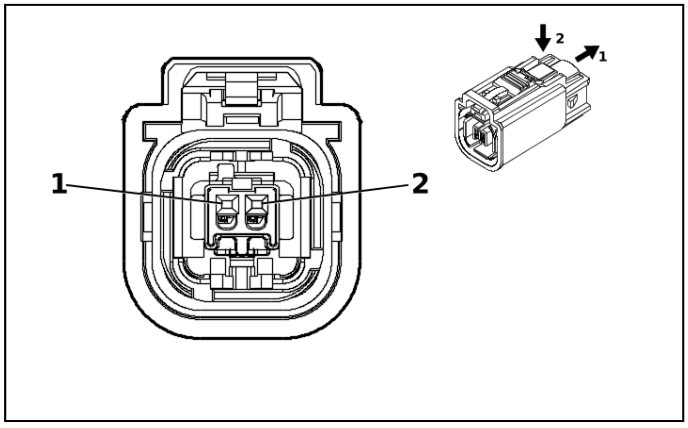
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required
II	Not required	J-35616-17 (L-GN)	No Tool Required

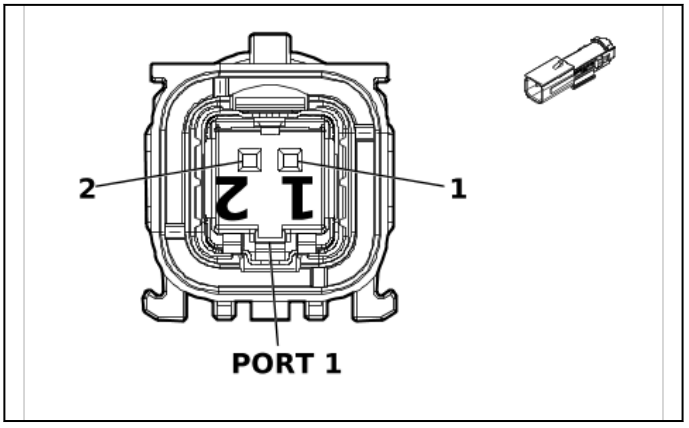
X315 Instrument Panel Wiring Harness to Air Conditioning Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GY	(1) 6137	(1) I	(1) —	(1) Air Conditioning Evaporator Temperature Sensor Signal	(1) 1	(1) 0.35	(1) GY	(1) 1	(1) II	(1) SZ/ DZ
(2) 2	(2) 0.35	(2) GN / VT	(2) 2852	(2) I	(2) —	(2) Body Control Module LIN Bus 6	(2) 2	(2) 0.35	(2) GN / VT	(2) 2	(2) II	(2) SZ
(3) 3	(3) 0.35	(3) BK / YE	(3) 407	(3) I	(3) —	(3) Sensor Low Reference	(3) 3	(3) 0.35	(3) BK / YE	(3) 3	(3) II	(3) SZ/ DZ
(4) 4	(4) 0.35	(4) WH / YE	(4) 4634	(4) I	(4) —	(4) HVAC Remote Enable Signal	(4) 4	(4) 0.35	(4) WH / YE	(4) 4	(4) II	(4) SZ
(5) 5	(5) 0.5	(5) BK	(5) 2050	(5) I	(5) —	(5) Ground	(5) 5	(5) 0.35	(5) BK	(5) 5	(5) II	(5) SZ
6	—	—	—	—	—	Not Occupied	6	—	—	—	—	—

X367 Instrument Panel Wiring Harness to Body Wiring Harness



5358341



5909921

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 35212796
- Service Connector: 85090373
- Description: 2-Way F 050 CTS Ethernet Series, Sealed(BK)

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 35185531
- Service Connector: Service by Cable Assembly - See Part Catalog
- Description: 2-Way M 050 CTS Ethernet Series, Sealed(BK)

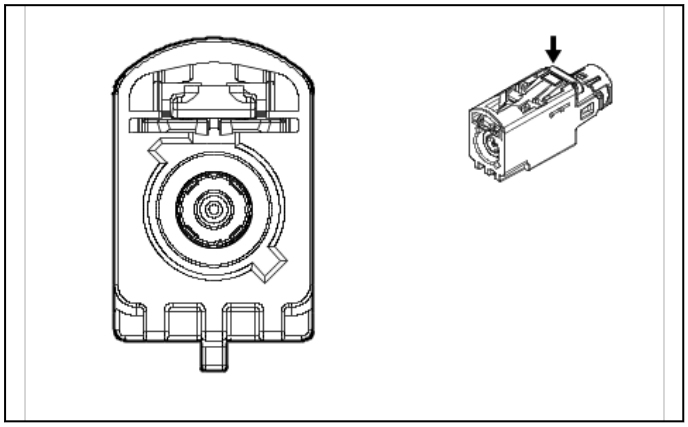
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Service by Cable	EL-35616-58 (BK)	EL-38125-58
II	Service by Cable	EL-35616-58 (BK)	EL-38125-58

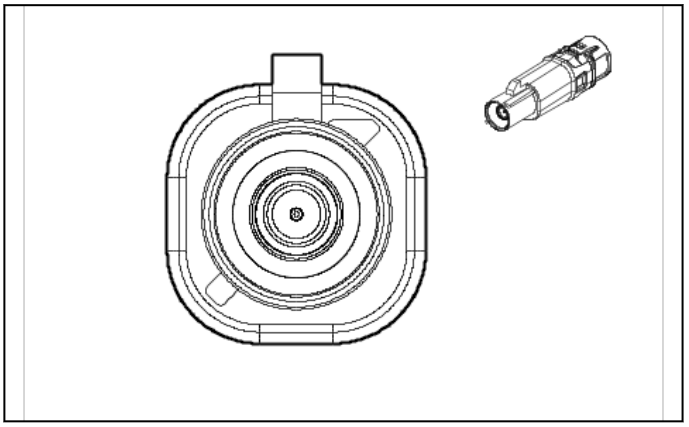
X367 Instrument Panel Wiring Harness to Body Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.1	(1) WH	(1) 7211	(1) I	(1) —	(1) Ethernet Bus 4 [+]	(1) 1	(1) 0.1	(1) WH	(1) 7211	(1) II	(1) —
(2) 2	(2) 0.1	(2) GN	(2) 7210	(2) I	(2) —	(2) Ethernet Bus 4 [-]	(2) 2	(2) 0.1	(2) GN	(2) 7210	(2) II	(2) —

X371 Rearview Underbody Camera Jumper Wiring Harness to Rearview Camera Wiring Harness (UXA)



6420730



6154842

Connector Part Information
- Harness Type: Rearview Underbody Camera Jumper Wiring Harness
- OEM Connector: Not Available
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F

Connector Part Information
- Harness Type: Rearview Camera Wiring Harness
- OEM Connector: 13517385
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way M Coax Type(GY)

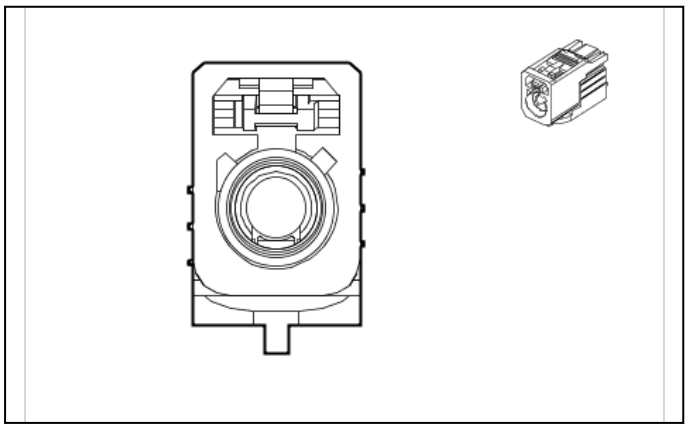
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

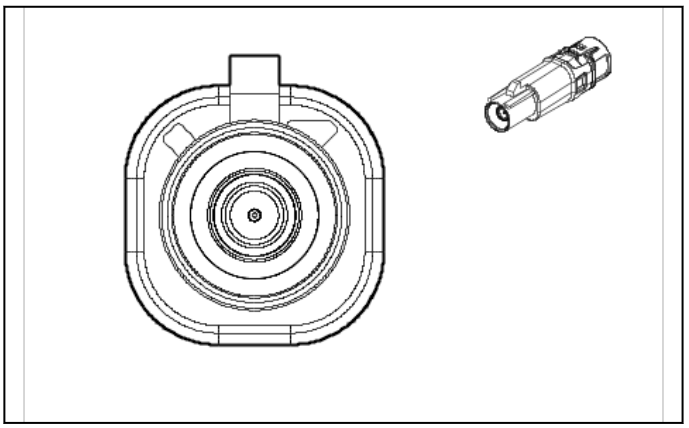
X371 Rearview Underbody Camera Jumper Wiring Harness to Rearview Camera Wiring Harness (UXA)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
—	—	LVDS	—	I	—	(Infotainment) Infotainment Display Signal	—	—	LVDS	—	I	—

X372 Front View Underbody Camera Jumper Wiring Harness to Rearview Camera Wiring Harness (UXA)



5633890



5295025

Connector Part Information
- Harness Type: Front View Underbody Camera Jumper Wiring Harness COAX
- OEM Connector: Not Available
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F

Connector Part Information
- Harness Type: Rearview Camera Wiring Harness COAX
- OEM Connector: 13517379
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way M Coax Type(BK)

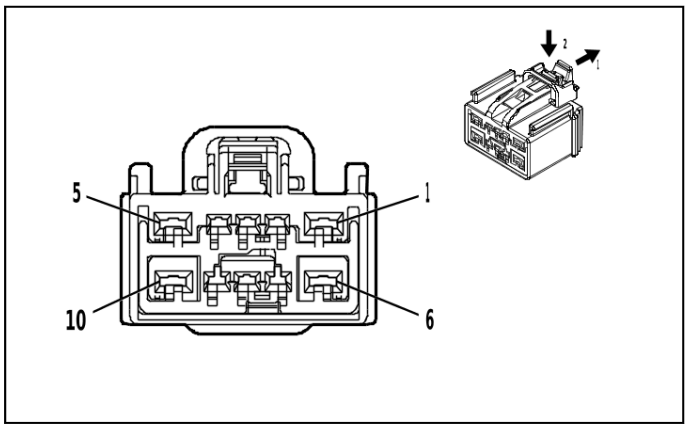
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

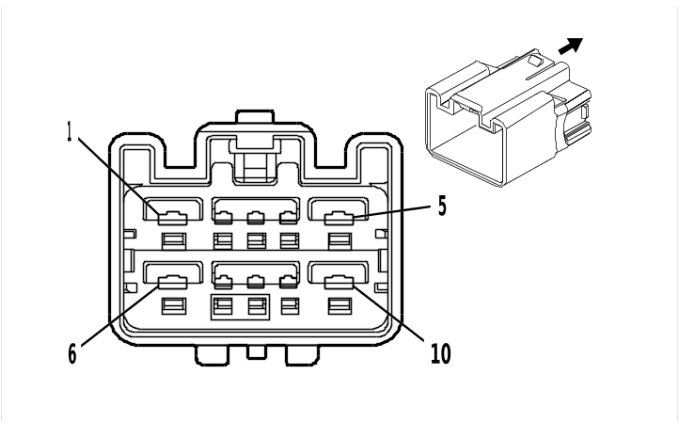
X372 Front View Underbody Camera Jumper Wiring Harness to Rearview Camera Wiring Harness (UXA)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
—	—	Coax Cable	—	I	—	Combined Camera Video Signal 2 [+]	—	—	Coax Cable	—	I	—

X375 Roof Wiring Harness to Sunroof Wiring Harness



5020939



1851890

Connector Part Information
- Harness Type: Roof Wiring Harness
- OEM Connector: 7289-9153-40
- Service Connector: 13518747
- Description: 10-Way F 1.5, 2.8 Kaizen Series(L-GY)

Connector Part Information
- Harness Type: Sunroof Wiring Harness
- OEM Connector: 7282-6459-40
- Service Connector: Service by Harness - See Part Catalog
- Description: 10-Way M 1.5, 2.8 Kaizen Series(L-GY)

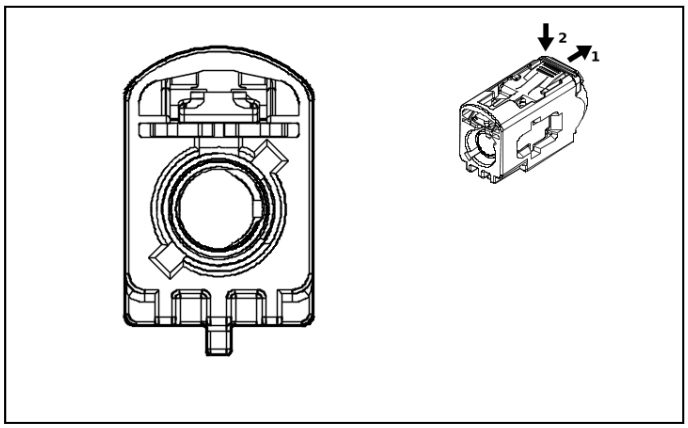
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19332534	J-35616-2A (GY)	J-38125-557
II	85544080	J-35616-4A (PU)	J-38125-11A
III	Not required	J-35616-3 (GY)	No Tool Required
IV	Not required	J-35616-5 (PU)	No Tool Required

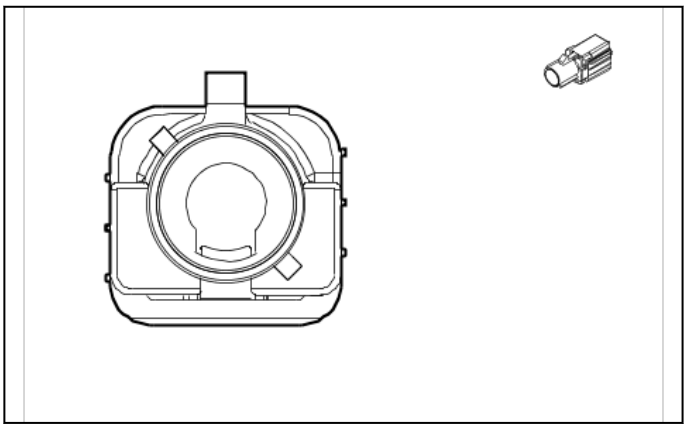
X375 Roof Wiring Harness to Sunroof Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1 - 3	—	—	—	—	—	Not Occupied	1 - 3	—	—	—	—	—
(4) 4	(4) 0.35	(4) GN / WH	(4) 2854	(4) I	(4) —	(4) Body Control Module LIN Bus 8	(4) 4	(4) 0.35	(4) BARE / WH	(4) 2854	(4) III	(4) —
(5) 5	(5) 1.5	(5) BK	(5) 1850	(5) II	(5) —	(5) Ground	(5) 5	(5) 1.5	(5) BK	(5) 1850	(5) IV	(5) —
(6) 6	(6) 1.5	(6) RD / YE	(6) 2340	(6) II	(6) —	(6) Battery Positive Voltage	(6) 6	(6) 1.5	(6) RD / YE	(6) 2340	(6) IV	(6) —
(7) 7	(7) 0.35	(7) BU / VT	(7) 5027	(7) I	(7) —	(7) Sunroof Switch Serial Data 1 Signal	(7) 7	(7) 0.35	(7) BARE / VT	(7) 5027	(7) III	(7) —
8	—	—	—	—	—	Not Occupied	8	—	—	—	—	—
(9) 9	(9) 0.35	(9) WH / GN	(9) 3031	(9) I	(9) —	(9) Sunroof Vent Switch Signal	(9) 9	(9) 0.35	(9) BARE / GN	(9) 3031	(9) III	(9) —
10	—	—	—	—	—	Not Occupied	10	—	—	—	—	—

X380 Instrument Panel Wiring Harness to Body Wiring Harness ((UV2 / UXA) - UVB)



5215274



5873701

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness COAX
- OEM Connector: 13516215
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type(BU)

Connector Part Information
- Harness Type: Body Wiring Harness COAX
- OEM Connector: 13516061
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way M Coax Type(BU)

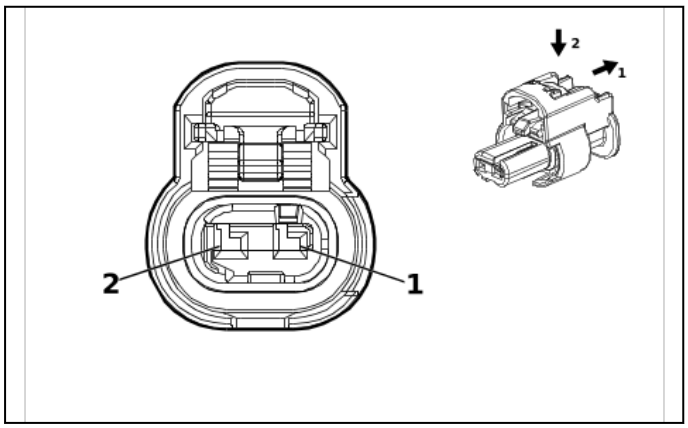
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

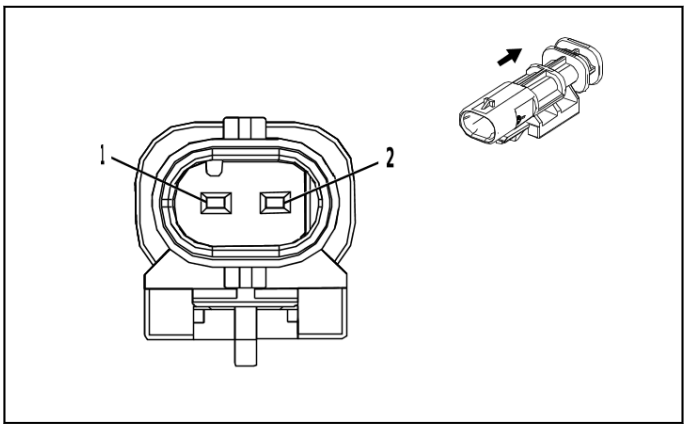
X380 Instrument Panel Wiring Harness to Body Wiring Harness ((UV2 / UXA) - UVB)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
—	—	Coax Cable	—	I	—	Video Processing Module Coaxial Video Signal	—	—	Coax Cable	—	I	—

X382 Chassis Wiring Harness to Chassis Wiring Harness



4649903



2474755

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 1-2296694-1
- Service Connector: 85761014
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 13591337
- Service Connector: 85533165
- Description: 2-Way M 1.2 MCON Series, Sealed(BK)

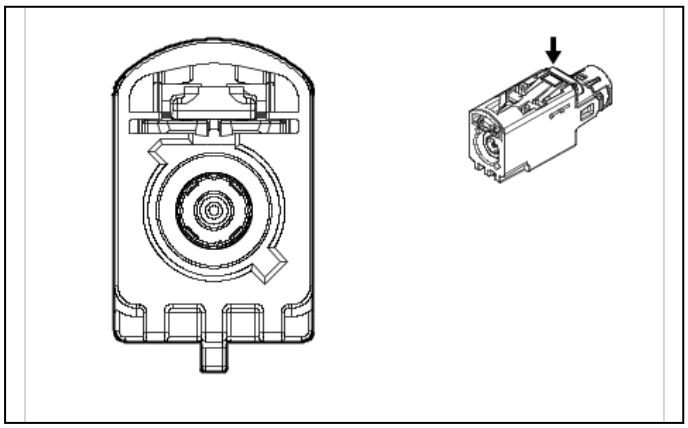
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required
II	Not required	J-35616-17 (L-GN)	No Tool Required

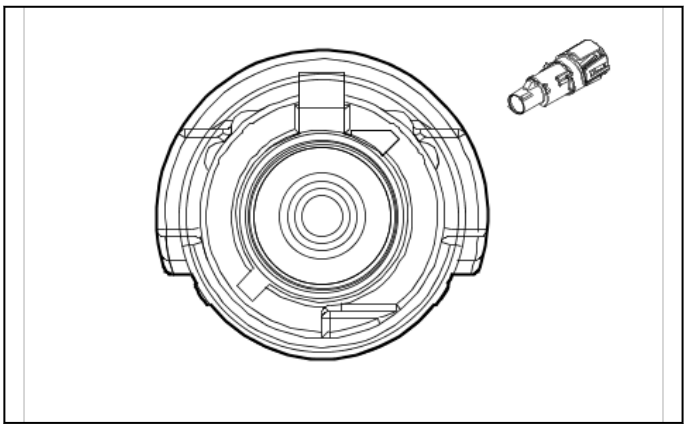
X382 Chassis Wiring Harness to Chassis Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) RD / BU	(1) 840	(1) I	(1) —	(1) Battery Positive Voltage	(1) 1	(1) 0.75	(1) RD / BU	(1) 840	(1) II	(1) —
(2) 2	(2) 0.5	(2) BK	(2) 750	(2) I	(2) —	(2) Ground	(2) 2	(2) 0.75	(2) BK	(2) 750	(2) II	(2) —

X383 Rearview Camera Wiring Hanress Jumper to Body Wiring Harness



6420730



6154828

Connector Part Information
- Harness Type: Body Wiring Harness COAX
- OEM Connector: 13517370
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type(GY)

Connector Part Information
- Harness Type: Jumoer COAX
- OEM Connector: 13516812
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way M Coax Type, Sealed(GY)

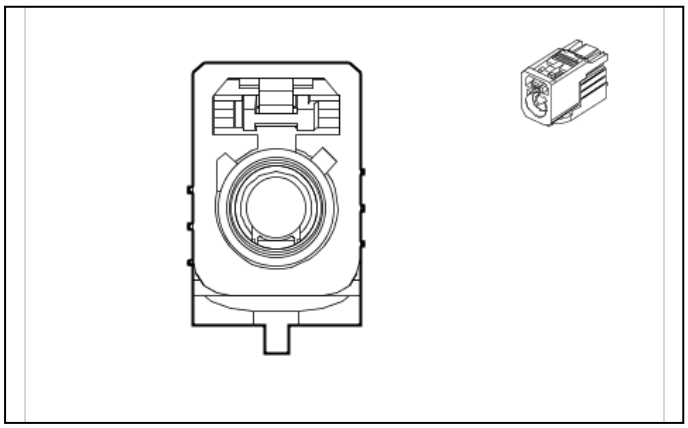
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X383 Rearview Camera Wiring Hanress Jumper to Body Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
—	—	Coax Cable	—	I	—	Rear Vision Camera Coaxial Video Signal	—	—	Coax Cable	—	I	—

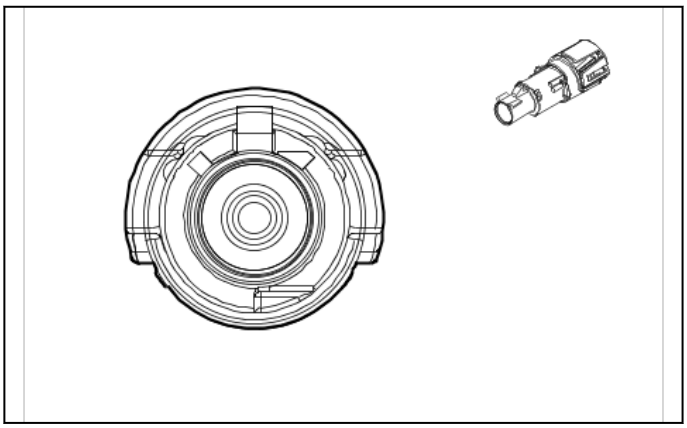
X384 Rearview Camera Wiring Harness Jumper to Body Wiring Harness (UXA)



5633890

Connector Part Information

- Harness Type: Rearview Camera Wiring Harness Jumper
- OEM Connector: Not Available
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F



5518522

Connector Part Information

- Harness Type: Body Wiring Harness
- OEM Connector: 13516806
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way M Coax Type, Sealed(BK)

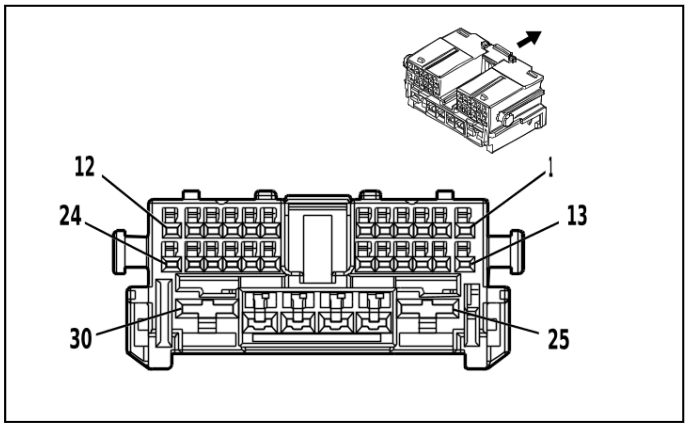
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

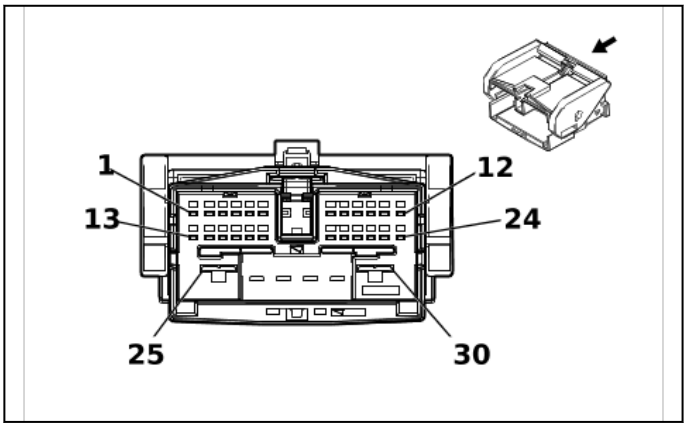
X384 Rearview Camera Wiring Harness Jumper to Body Wiring Harness (UXA)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
—	—	LVDS	—	I	—	(PDR) Front Vision Camera #2	—	—	LVDS	—	I	—

X393 Front Side Door Door Wiring Harness - Driver to Front Side Door Door Lock Door Wiring Harness - Driver



4253192



4249201

Connector Part Information

- Harness Type: Front Side Door Door Wiring Harness - Driver
- OEM Connector: 7298-4329-30
- Service Connector: Service by Harness - See Part Catalog
- Description: 30-Way F 1.2 MCON, 2.8, 6.3 YESC Series(BK)

Connector Part Information

- Harness Type: Front Side Door Door Lock Door Wiring Harness - Driver
- OEM Connector: 7297-4331-30
- Service Connector: Service by Harness - See Part Catalog
- Description: 30-Way M 1.2 MCON, 2.8, 6.3 YESC Series(BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required
II	Not required	J-35616-35 (VT)	No Tool Required
III	Not required	J-35616-42 (RD)	No Tool Required
IV	Not required	J-35616-4A (PU)	No Tool Required
V	Not required	J-35616-17 (L-GN)	No Tool Required
VI	Not required	J-35616-43 (RD)	No Tool Required
VII	Not required	J-35616-5 (PU)	No Tool Required

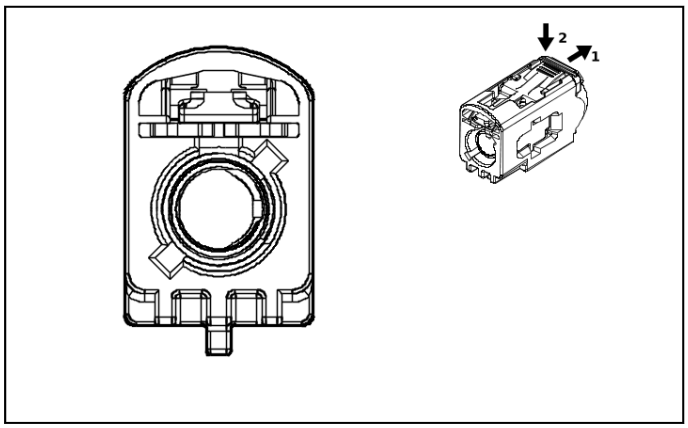
X393 Front Side Door Door Wiring Harness - Driver to Front Side Door Door Lock Door Wiring Harness - Driver

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) BN / GY	(1) 4784	(1) I	(1) —	(1) Left Front Door LED Backlight Dimming Control	(1) 1	(1) 0.35	(1) BN / GY	(1) 4784	(1) V	(1) —
(2) 2	(2) 0.35	(2) VT / YE	(2) 4244	(2) I	(2) —	(2) Left Front Door Lock Indicator Control	(2) 2	(2) 0.35	(2) VT / YE	(2) 4244	(2) V	(2) —
(3) 3	(3) 0.35	(3) WH / VT	(3) 4258	(3) I	(3) —	(3) Left Front Door Lock Status Signal	(3) 3	(3) 0.35	(3) WH / VT	(3) 4258	(3) V	(3) —
(4) 4	(4) 0.35	(4) BN / YE	(4) 2771	(4) I	(4) —	(4) Left Front Door Lock Switch Lock Signal	(4) 4	(4) 0.35	(4) BN / YE	(4) 2771	(4) V	(4) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(5) 5	(5) 0.35	(5) BN / WH	(5) 2772	(5) I	(5) —	(5) Left Front Door Lock Switch Unlock Signal	(5) 5	(5) 0.35	(5) BN / WH	(5) 2772	(5) V	(5) —
(6) 6	(6) 0.35	(6) GY / YE	(6) 1760	(6) I	(6) —	(6) Left Side Object Detection LED Control	(6) 6	(6) 0.35	(6) GY / YE	(6) 1760	(6) V	(6) —
(7) 7	(7) 0.35	(7) G N / YE	(7) 6134	(7) I	(7) —	(7) Body Control Module LIN Bus 3	(7) 7	(7) 0.35	(7) G N / YE	(7) 6134	(7) V	(7) —
(8) 8	(8) 0.35	(8) GY	(8) 745	(8) I	(8) —	(8) Left Front Door Ajar Switch Signal	(8) 8	(8) 0.35	(8) GY	(8) 745	(8) V	(8) —
(9) 9	(9) 0.35	(9) GY / GN	(9) 2763	(9) I	(9) —	(9) Window Switch Left Front Up Signal	(9) 9	(9) 0.35	(9) GY / GN	(9) 2763	(9) V	(9) —
(10) 10	(10) 0.35	(10) WH / BN	(10) 2764	(10) I	(10) —	(10) Window Switch Left Front Down Signal	(10) 10	(10) 0.35	(10) WH / BN	(10) 2764	(10) V	(10) —
(11) 11	(11) 0.35	(11) G N	(11) 2766	(11) I	(11) —	(11) Power Window Switch Left Front Express Signal	(11) 11	(11) 0.35	(11) G N	(11) 2766	(11) V	(11) —
12	—	—	—	—	—	Not Occupied	12	—	—	—	—	—
(13) 13	(13) 0.5	(13) WH	(13) 606	(13) I	(13) —	(13) Left Outside Rearview Mirror Heater Control	(13) 13	(13) 0.5	(13) WH	(13) 606	(13) V	(13) —
14 - 15	—	—	—	—	—	Not Occupied	14 - 15	—	—	—	—	—
(16) 16	(16) 0.35	(16) V T / BU	(16) 2788	(16) I	(16) —	(16) Left Front Mirror Motor Up [+] Down [-] Control	(16) 16	(16) 0.35	(16) V T / BU	(16) 2788	(16) V	(16) —
(17) 17	(17) 0.35	(17) Y E / BN	(17) 2789	(17) I	(17) —	(17) Left Front Mirror Motor Common Control	(17) 17	(17) 0.35	(17) Y E / BN	(17) 2789	(17) V	(17) —
(18) 18	(18) 0.35	(18) B N / BK	(18) 2790	(18) I	(18) —	(18) Left Front Mirror Motor Right [+] Left [-] Control	(18) 18	(18) 0.35	(18) B N / BK	(18) 2790	(18) V	(18) —
(19) 19	(19) 0.35	(19) G Y / BN	(19) 2787	(19) I	(19) —	(19) Left Front Mirror Position Sensor Up [+] Down [-] Signal	(19) 19	(19) 0.35	(19) G Y / BN	(19) 2787	(19) V	(19) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(20) 20	(20) 0.35	(20) VT / RD	(20) 2791	(20) I	(20) —	(20) Left Front Mirror Position Sensor High Reference	(20) 20	(20) 0.35	(20) VT / RD	(20) 2791	(20) V	(20) —
(21) 21	(21) 0.35	(21) WH / YE	(21) 2792	(21) I	(21) —	(21) Left Front Mirror Position Sensor Left [-] Right [+] Signal	(21) 21	(21) 0.35	(21) WH / YE	(21) 2792	(21) V	(21) —
(22) 22	(22) 0.35	(22) BK / BN	(22) 673	(22) I	(22) —	(22) Left Outside Rearview Mirror Position Sensor Low Reference	(22) 22	(22) 0.35	(22) BK / BN	(22) 673	(22) V	(22) —
23 - 24	—	—	—	—	—	Not Occupied	23 - 24	—	—	—	—	—
(25) 25	(25) 2.5 (25) 0.5	(25) RD / BU (25) RD / VT	(25) 1240 (25) 1940	(25) III (25) III	(25) AEC (25) AXG	(25) Battery Positive Voltage (25) Battery Positive Voltage	(25) 25	(25) 2.5 (25) 0.5	(25) RD / BU (25) RD / VT	(25) 1240 (25) 1940	(25) VI (25) VI	(25) AEC (25) AXG
(26) 26	(26) 2.5 (26) 0.5	(26) BK (26) BK	(26) 1150 (26) 1150	(26) IV (26) II	(26) AEC (26) AXG	(26) Ground (26) Ground	(26) 26	(26) 2.5 (26) 0.5	(26) BK (26) BK	(26) 1150 (26) 1150	(26) VII (26) VII	(26) AEC (26) AXG
(27) 27	(27) 2	(27) YE / VT	(27) 165	(27) IV	(27) —	(27) Left Front Window Motor Down Control	(27) 27	(27) 2	(27) YE / VT	(27) 165	(27) VII	(27) —
(28) 28	(28) 2	(28) GN / GY	(28) 164	(28) IV	(28) —	(28) Left Front Window Motor Up Control	(28) 28	(28) 2	(28) GN / GY	(28) 164	(28) VII	(28) —
29 - 30	—	—	—	—	—	Not Occupied	29 - 30	—	—	—	—	—

X399 Instrument Panel Wiring Harness to Body Wiring Harness (UVB - UV2)



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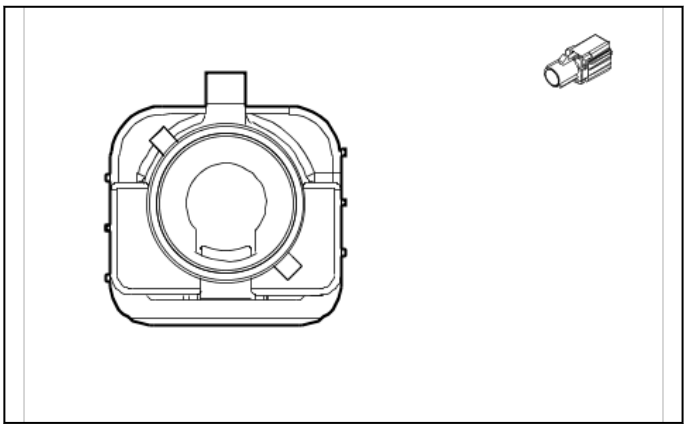


5873701

Connector Part Information

- Harness Type: Instrument Panel Wiring Harness COAX
- OEM Connector: 13516215
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type(BU)

Connector Part Information

- Harness Type: Body Wiring Harness COAX
- OEM Connector: 13516061
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way M Coax Type(BU)

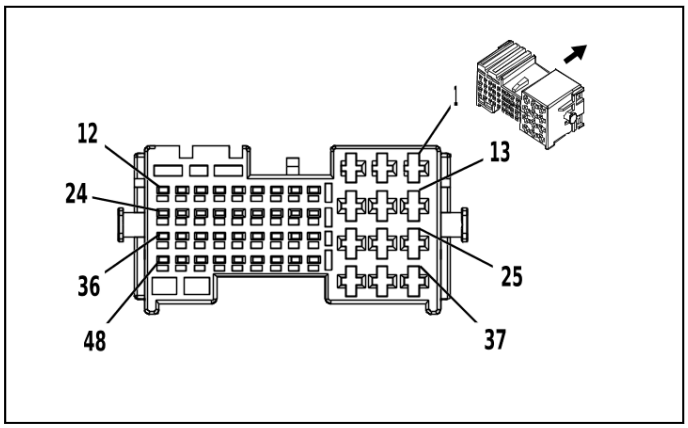
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X399 Instrument Panel Wiring Harness to Body Wiring Harness (UVB - UV2)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
—	—	Coax Cable	—	I	—	Rear Vision Camera Coaxial Video Signal	—	—	Coax Cable	—	I	—

X400 Instrument Panel Wiring Harness to Body Wiring Harness



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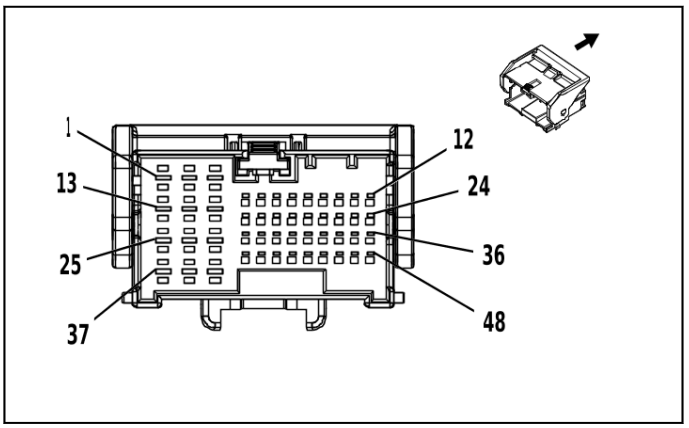


3277901

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness
- OEM Connector: 2109452-2
- Service Connector: 19329739
- Description: 48-Way F 1.2 MCON, 2.8 MCP Series(BK)

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 5-2109455-2
- Service Connector: 19329740
- Description: 48-Way M 1.2 MCON, 2.8 MCP Series(BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19329758	J-35616-12 (BU)	J-38125-215A
II	87814662	J-35616-35 (VT)	J-38125-557
III	Service by Cable	J-35616-12 (BU)	J-38125-215A
IV	13575574	J-35616-5 (PU)	J-38125-215A
V	86509266	J-35616-13 (BU)	J-38125-215A
VI	Service by Cable	J-35616-13 (BU)	J-38125-215A

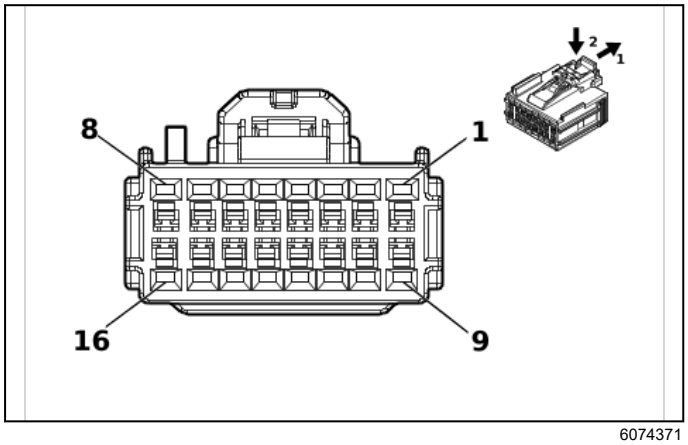
X400 Instrument Panel Wiring Harness to Body Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.75 (1) 0.5	(1) YE / BK (1) BN / BK	(1) 117 (1) 1953	(1) II (1) II	(1) UQ3 (1) UQA	(1) Right Front Speaker [-] Control 1 (1) Right Front Midrange Speaker [-] Control	(1) 1	(1) 0.75 (1) 0.5	(1) YE / BK (1) BN / BK	(1) 117 (1) 1953	(1) IV (1) IV	(1) UQ3 (1) UQA
(2) 2	(2) 0.75 (2) 0.5	(2) YE (2) WH / YE	(2) 200 (2) 1853	(2) II (2) II	(2) UQ3 (2) UQA	(2) Right Front Speaker 1 [+] Control (2) Right Front Midrange Speaker [+] Control	(2) 2	(2) 0.75 (2) 0.5	(2) YE (2) WH / YE	(2) 200 (2) 1853	(2) IV (2) IV	(2) UQ3 (2) UQA
(3) 3	(3) 0.5	(3) YE / WH	(3) 1860	(3) II	(3) —	(3) Front Center Speaker [+] Control	(3) 3	(3) 0.5	(3) YE / WH	(3) 1860	(3) IV	(3) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(4) 4	(4) 0.5	(4) RD / GN	(4) 4440	(4) I	(4) —	(4) Battery Positive Voltage	(4) 4	(4) 0.5	(4) RD / GN	(4) 4440	(4) V	(4) —
(5) 5	(5) 0.5	(5) BK / WH	(5) 1351	(5) I	(5) —	(5) Signal Ground	(5) 5	(5) 0.5	(5) BK / WH	(5) 1351	(5) V	(5) —
(6) 6	(6) 0.35	(6) GN / WH	(6) 4115	(6) I	(6) —	(6) Body Control Module LIN Bus 5	(6) 6	(6) 0.35	(6) GN / WH	(6) 4115	(6) VI	(6) —
(7) 7	(7) 0.35	(7) BU	(7) 4987	(7) I	(7) —	(7) AUTOSAR CAN Bus [+] 1 Serial Data	(7) 7	(7) 0.35	(7) BU	(7) 4987	(7) VI	(7) —
(8) 8	(8) 0.35	(8) WH	(8) 4986	(8) I	(8) —	(8) AUTOSAR CAN Bus [-] 1 Serial Data	(8) 8	(8) 0.35	(8) WH	(8) 4986	(8) VI	(8) —
(9) 9	(9) 0.35	(9) BU	(9) 4987	(9) I	(9) —	(9) AUTOSAR CAN Bus [+] 1 Serial Data	(9) 9	(9) 0.35	(9) BU	(9) 4987	(9) VI	(9) —
(10) 10	(10) 0.35	(10) WH	(10) 4986	(10) I	(10) —	(10) AUTOSAR CAN Bus [-] 1 Serial Data	(10) 10	(10) 0.35	(10) WH	(10) 4986	(10) VI	(10) —
(11) 11	(11) 0.35	(11) BU / YE	(11) 4979	(11) I	(11) —	(11) AUTOSAR CAN Bus [+] 2 Serial Data	(11) 11	(11) 0.35	(11) BU / YE	(11) 4979	(11) VI	(11) —
(12) 12	(12) 0.35	(12) WH	(12) 4978	(12) I	(12) —	(12) AUTOSAR CAN Bus [-] 2 Serial Data	(12) 12	(12) 0.35	(12) WH	(12) 4978	(12) VI	(12) —
(13) 13	(13) 0.75	(13) BU / BK	(13) 115	(13) II	(13) —	(13) Right Rear Speaker [-] Control	(13) 13	(13) 0.75	(13) BU / BK	(13) 115	(13) IV	(13) —
(14) 14	(14) 0.75	(14) WH	(14) 46	(14) II	(14) —	(14) Right Rear Speaker [+] Control	(14) 14	(14) 0.75	(14) WH	(14) 46	(14) IV	(14) —
(15) 15	(15) 0.5	(15) BU / YE	(15) 1960	(15) II	(15) —	(15) Front Center Speaker [-] Control	(15) 15	(15) 0.5	(15) BU / YE	(15) 1960	(15) IV	(15) —
(16) 16	(16) 0.35	(16) BK / GY	(16) 5152	(16) I	(16) —	(16) Voice Recognition Audio [-] Control	(16) 16	(16) 0.35	(16) BK / GY	(16) 5152	(16) VI	(16) —
(17) 17	(17) 0.35	(17) GY / YE	(17) 5149	(17) I	(17) —	(17) Voice Recognition Audio Signal	(17) 17	(17) 0.35	(17) GY / YE	(17) 5149	(17) VI	(17) —
(18) 18	(18) 0.35	(18) BARE	(18) 1792	(18) I	(18) —	(18) Low Reference	(18) 18	(18) 0.35	(18) BARE	(18) 1792	(18) VI	(18) —
19 - 22	—	—	—	—	—	Not Occupied	19 - 22	—	—	—	—	—
(23) 23	(23) 0.35	(23) BU / BK	(23) 4977	(23) I	(23) —	(23) AUTOSAR CAN Bus [+] 3 Serial Data	(23) 23	(23) 0.5	(23) BU / BK	(23) 4977	(23) V	(23) —
(24) 24	(24) 0.35	(24) WH	(24) 4976	(24) I	(24) —	(24) AUTOSAR CAN Bus [-] 3 Serial Data	(24) 24	(24) 0.5	(24) WH	(24) 4976	(24) V	(24) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
25 - 27	—	—	—	—	—	Not Occupied	25 - 27	—	—	—	—	—
(28) 28	(28) 0.35	(28) B U / BK	(28) 70 44	(28) I	(28) —	(28) Microphone [-] Signal	(28) 28	(28) 0.35	(28) B U / BK	(28) 70 44	(28) VI	(28) —
(29) 29	(29) 0.35	(29) V T / YE	(29) 70 43	(29) I	(29) —	(29) Microphone [+] Signal	(29) 29	(29) 0.35	(29) V T / YE	(29) 70 43	(29) VI	(29) —
30 - 32	—	—	—	—	—	Not Occupied	30 - 32	—	—	—	—	—
(33) 33	(33) 0.1	(33) WH	(33) 85 80	(33) III	(33) —	(33) Automotive Audio Bus A2B Serial Data 1 [+]	(33) 33	(33) 0.35	(33) WH	(33) 85 80	(33) VI	(33) —
(34) 34	(34) 0.1	(34) G N	(34) 85 79	(34) III	(34) —	(34) Automotive Audio Bus A2B Serial Data 1 [-]	(34) 34	(34) 0.35	(34) G N	(34) 85 79	(34) VI	(34) —
35 - 36	—	—	—	—	—	Not Occupied	35 - 36	—	—	—	—	—
(37) 37	(37) 2.5	(37) B K	(37) 42 50	(37) II	(37) —	(37) Ground	(37) 37	(37) 2.5	(37) B K	(37) 42 50	(37) IV	(37) —
38	—	—	—	—	—	Not Occupied	38	—	—	—	—	—
(39) 39	(39) 0.75	(39) R D / GN	(39) 18 40	(39) II	(39) —	(39) Battery Positive Voltage	(39) 39	(39) 1.5	(39) R D / GN	(39) 18 40	(39) IV	(39) —
40 - 48	—	—	—	—	—	Not Occupied	40 - 48	—	—	—	—	—

X401 Roof Wiring Harness to Body Wiring Harness



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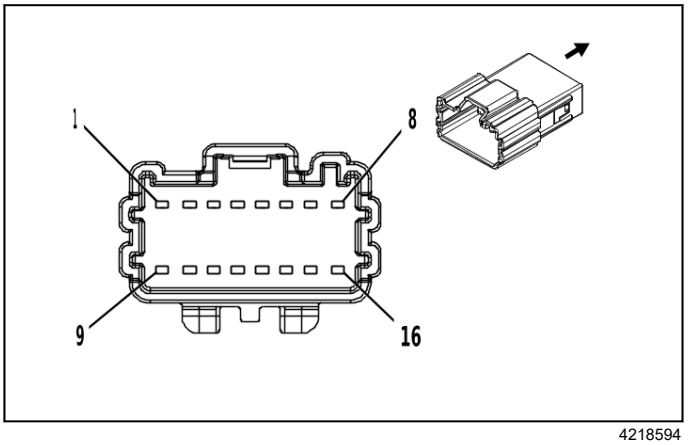


4218594

Connector Part Information
- Harness Type: Roof Wiring Harness
- OEM Connector: 6098-9013
- Service Connector: 13541573
- Description: 16-Way F 1.2 MCON Series(GY)

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 6098-8829
- Service Connector: 13527235
- Description: 16-Way M 1.2 Series(GY)

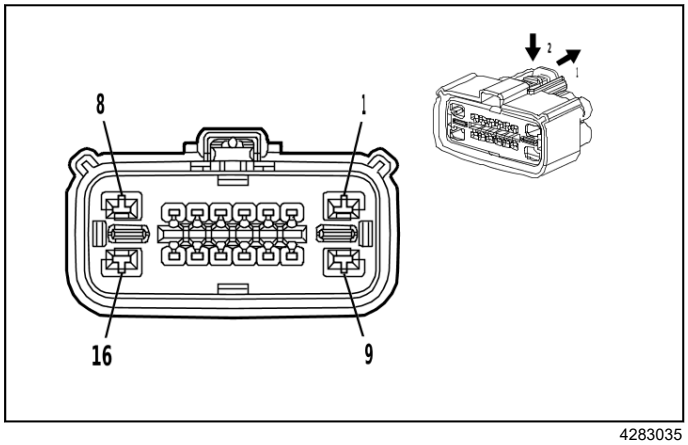
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	84962854	J-35616-12 (BU)	J-38125-215A
II	84616651	J-35616-13 (BU)	J-38125-215A

X401 Roof Wiring Harness to Body Wiring Harness

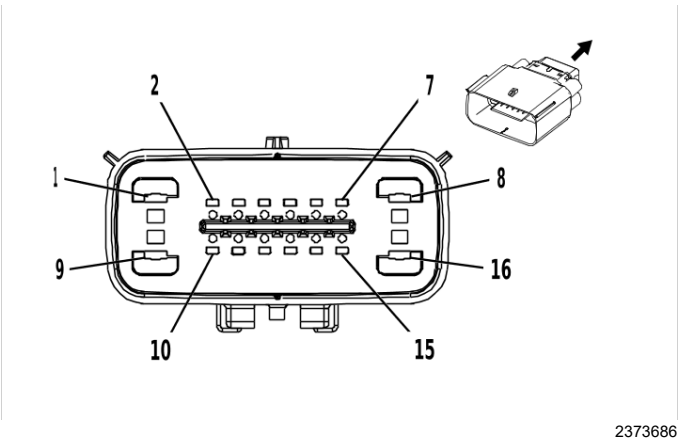
Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) BK	(1) 4250	(1) I	(1) —	(1) Ground	(1) 1	(1) 0.75	(1) BK	(1) 4250	(1) II	(1) —
(2) 2	(2) 0.5 (2) 0.35	(2) WH / BN (2) WH / BN	(2) 6815 (2) 6815	(2) I (2) I	(2) C75/ DEG+ C75 (2) C75-DEG	(2) Inadvertent Load Control (2) Inadvertent Load Control	(2) 2	(2) 0.5	(2) WH / BN	(2) 6815	(2) II	(2) —
(3) 3	(3) 0.5	(3) GY	(3) 157	(3) I	(3) —	(3) Interior Lamp Control	(3) 3	(3) 0.5	(3) GY	(3) 157	(3) II	(3) —
(4) 4	(4) 0.35	(4) GY	(4) 156	(4) I	(4) —	(4) Courtesy Lamp Switch Signal	(4) 4	(4) 0.35	(4) GY	(4) 156	(4) II	(4) —
(5) 5	(5) 0.35	(5) GY / GN	(5) 328	(5) I	(5) —	(5) Interior Lamp Defeat Switch Signal	(5) 5	(5) 0.35	(5) GY / GN	(5) 328	(5) II	(5) —
6 - 10	—	—	—	—	—	Not Occupied	6 - 10	—	—	—	—	—
(11) 11	(11) 0.35	(11) YE	(11) 6817	(11) I	(11) —	(11) LED Backlight Dimming Control 1	(11) 11	(11) 0.35	(11) YE	(11) 6817	(11) II	(11) —
(12) 12	(12) 0.35	(12) GN / WH	(12) 2854	(12) I	(12) —	(12) Body Control Module LIN Bus 8	(12) 12	(12) 0.35	(12) GN / WH	(12) 2854	(12) II	(12) —
(13) 13	(13) 0.35	(13) GN / YE	(13) 2862	(13) I	(13) —	(13) Body Control Module LIN Bus 16	(13) 13	(13) 0.35	(13) GN / YE	(13) 2862	(13) II	(13) —
14 - 16	—	—	—	—	—	Not Occupied	14 - 16	—	—	—	—	—

X402A Front Seat Wiring Harness - Passenger to Body Wiring Harness



4283035

Connector Part Information
- Harness Type: Front Seat Wiring Harness - Passenger
- OEM Connector: 34985-2161
- Service Connector: Service by Harness - See Part Catalog
- Description: 16-Way F 1.5, 2.8 MX Series, Sealed(YE)



2373686

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 34986-1605
- Service Connector: 19331031
- Description: 16-Way M 1.5, 2.8 MX Series, Sealed(YE)

Terminal Part Information

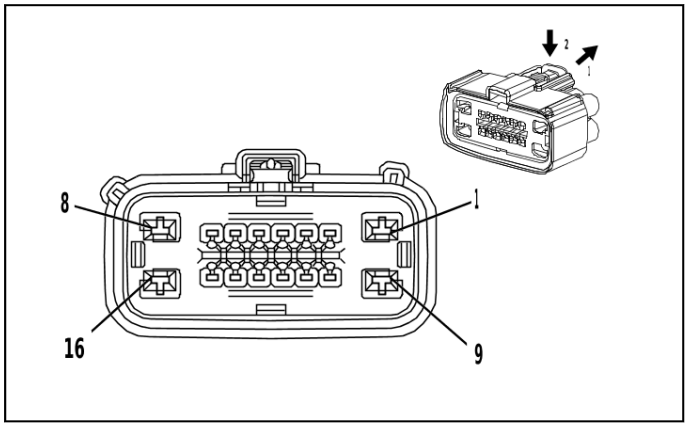
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-2A (GY)	No Tool Required
III	Not required	J-35616-35 (VT)	No Tool Required
IV	19366658	J-35616-5 (PU)	J-38125-12A
V	86800300	J-35616-3 (GY)	J-38125-217

X402A Front Seat Wiring Harness - Passenger to Body Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 2.5 (1) 1.5	(1) BK (1) BK	(1) 4250 (1) 4250	(1) III (1) III	(1) (KA1+ KU9) (1) KA1-KU9	(1) Ground (1) Ground	(1) 1	(1) 2.5	(1) BK	(1) 4250	(1) IV	(1) —
(2) 2	(2) 0.5	(2) OG / GY	(2) 4956	(2) II	(2) —	(2) Passenger Seat Back Air Bag High Control	(2) 2	(2) 0.5	(2) OG / GY	(2) 4956	(2) V	(2) —
(3) 3	(3) 0.5	(3) BU / OG	(3) 4957	(3) II	(3) —	(3) Passenger Seat Back Air Bag Low Control	(3) 3	(3) 0.5	(3) BU / OG	(3) 4957	(3) V	(3) —
(4) 4	(4) 0.5	(4) BK / WH	(4) 1351	(4) I	(4) —	(4) Signal Ground	(4) 4	(4) 0.5	(4) BK / WH	(4) 1351	(4) V	(4) —
(5) 5	(5) 0.5	(5) GY / OG	(5) 3946	(5) I	(5) —	(5) Passenger Automatic Locking Retractor Switch Low Reference	(5) 5	(5) 0.5	(5) GY / OG	(5) 3946	(5) V	(5) —
(6) 6	(6) 0.5	(6) OG / BN	(6) 3947	(6) I	(6) —	(6) Passenger Automatic Locking Retractor Switch Signal	(6) 6	(6) 0.5	(6) OG / BN	(6) 3947	(6) V	(6) —
(7) 7	(7) 0.5	(7) RD / GN	(7) 4440	(7) I	(7) —	(7) Battery Positive Voltage	(7) 7	(7) 0.5	(7) RD / GN	(7) 4440	(7) V	(7) —
(8) 8	(8) —	(8) —	(8) —	(8) —	(8) —	(8) Battery Positive Voltage	(8) 8	(8) 2.5	(8) RD / YE	(8) 4340	(8) IV	(8) —
9	—	—	—	—	—	Not Occupied	9	—	—	—	—	—
(10) 10	(10) 0.5	(10) OG / VT	(10) 1362	(10) I	(10) —	(10) Passenger Seat Belt Switch Signal	(10) 10	(10) 0.5	(10) OG / VT	(10) 1362	(10) V	(10) —
(11) 11	(11) 0.5	(11) BK / OG	(11) 1363	(11) I	(11) —	(11) Driver Seat Belt Switch Low Reference	(11) 11	(11) 0.5	(11) BK / OG	(11) 1363	(11) V	(11) —
(12) 12	(12) 0.5	(12) WH	(12) 4986	(12) I	(12) —	(12) AUTOSAR CAN Bus [-] 1 Serial Data	(12) 12	(12) 0.35	(12) WH	(12) 4986	(12) V	(12) —
(13) 13	(13) 0.5	(13) BU	(13) 4987	(13) I	(13) —	(13) AUTOSAR CAN Bus [+] 1 Serial Data	(13) 13	(13) 0.35	(13) BU	(13) 4987	(13) V	(13) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(14) 14	(14) 0.5	(14) WH	(14) 49 86	(14) I	(14) —	(14) AUTOSAR CAN Bus [-] 1 Serial Data	(14) 14	(14) 0.35	(14) WH	(14) 49 86	(14) V	(14) —
(15) 15	(15) 0.5	(15) BU	(15) 49 87	(15) I	(15) —	(15) AUTOSAR CAN Bus [+] 1 Serial Data	(15) 15	(15) 0.35	(15) BU	(15) 49 87	(15) V	(15) —
(16) 16	(16) —	(16) —	(16) —	(16) —	(16) —	(16) Battery Positive Voltage	(16) 16	(16) 0.75	(16) RD / BN	(16) 42 40	(16) IV	(16) —

X402B Front Seat Wiring Harness - Passenger to Body Wiring Harness



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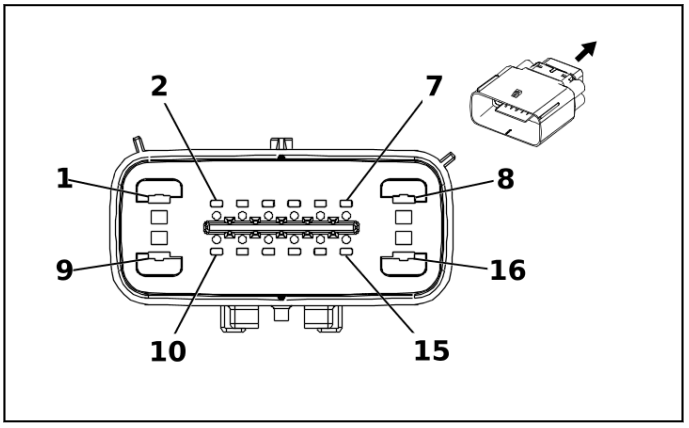


4209017

Connector Part Information
- Harness Type: Front Seat Wiring Harness - Passenger
- OEM Connector: 34985-1607
- Service Connector: Service by Harness - See Part Catalog
- Description: 16-Way F 1.5, 2.8 MX Series, Sealed(GY)

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 34986-8006
- Service Connector: 19352214
- Description: 16-Way M 1.5, 2.8 MX Series, Sealed(L-GY)

Terminal Part Information

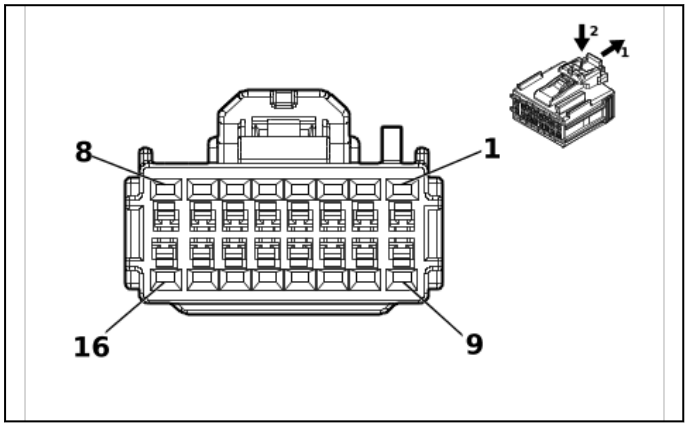
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-2A (GY)	No Tool Required
III	86800300	J-35616-3 (GY)	J-38125-217

X402B Front Seat Wiring Harness - Passenger to Body Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
1	—	—	—	—	—	Not Occupied	1	—	—	—	—	—
(2) 2	(2) 0.75	(2) BN / VT	(2) 207 7	(2) II	(2) —	(2) Driver Seat Heating Element Control	(2) 2	(2) 0.75	(2) BN / VT	(2) 207 7	(2) III	(2) —
(3) 3	(3) 0.75	(3) BN / BK	(3) 207 8	(3) II	(3) —	(3) Driver Seat Heating Element Low Reference	(3) 3	(3) 0.75	(3) BN / BK	(3) 207 8	(3) III	(3) —

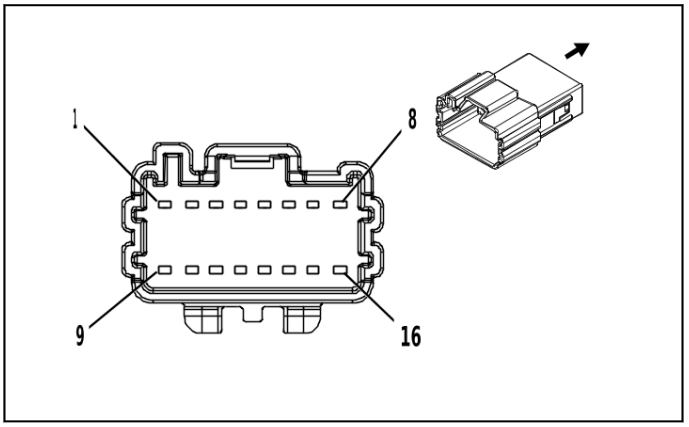
Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(4) 4	(4) 0.5	(4) YE / GY	(4) 2079	(4) I	(4) —	(4) Driver Seat Heating Temperature Sensor Signal	(4) 4	(4) 0.5	(4) YE / GY	(4) 2079	(4) III	(4) —
(5) 5	(5) 0.5	(5) BK / YE	(5) 2080	(5) I	(5) —	(5) Driver Heated Seat Thermistor Low Reference	(5) 5	(5) 0.5	(5) BK / YE	(5) 2080	(5) III	(5) —
(6) 6	(6) 0.5	(6) BU	(6) 2425	(6) I	(6) —	(6) Driver Seat Back Heating Temperature Sensor Signal	(6) 6	(6) 0.5	(6) BU	(6) 2425	(6) III	(6) —
7 - 9	—	—	—	—	—	Not Occupied	7 - 9	—	—	—	—	—
(10) 10	(10) 0.5	(10) GN / VT	(10) 2857	(10) I	(10) —	(10) Body Control Module LIN Bus 11	(10) 10	(10) 0.35	(10) GN / VT	(10) 2857	(10) III	(10) —
(11) 11	(11) 0.75	(11) RD / BU	(11) 4540	(11) II	(11) —	(11) Battery Positive Voltage	(11) 11	(11) 0.75	(11) RD / BU	(11) 4540	(11) III	(11) —
(12) 12	(12) 0.75	(12) RD / VT	(12) 4640	(12) II	(12) —	(12) Battery Positive Voltage	(12) 12	(12) 0.75	(12) RD / VT	(12) 4640	(12) III	(12) —
13	—	—	—	—	—	Not Occupied	13	—	—	—	—	—
(14) 14	(14) 0.5	(14) GN / VT	(14) 5906	(14) I	(14) —	(14) Driver Seat Blower Motor Control 1	(14) 14	(14) 0.5	(14) GN / VT	(14) 5906	(14) III	(14) —
(15) 15	(15) 0.5	(15) VT / GN	(15) 839	(15) I	(15) —	(15) Run/ Crank Ignition 1 Voltage	(15) 15	(15) 0.5	(15) VT / GN	(15) 839	(15) III	(15) —
16	—	—	—	—	—	Not Occupied	16	—	—	—	—	—

X402C Roof Wiring Harness to Body Wiring Harness



6074391

Connector Part Information
- Harness Type: Roof Wiring Harness
- OEM Connector: 6098-9012
- Service Connector: 13541574
- Description: 16-Way F 1.2 MCON Series(BK)



4223086

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 6098-8828
- Service Connector: 13526848
- Description: 16-Way M 1.2 Series(BK)

Terminal Part Information

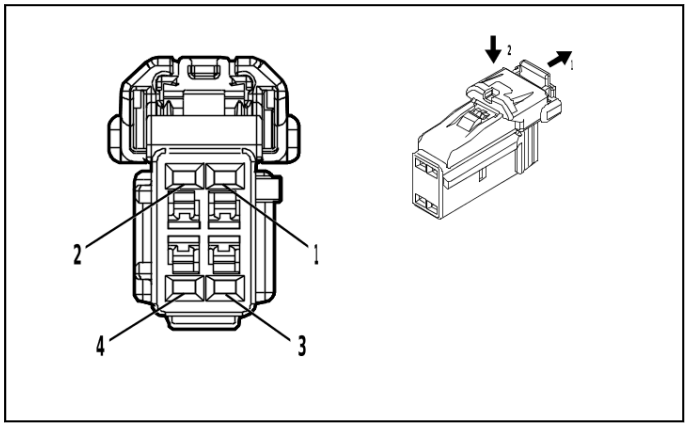
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	84962854	J-35616-12 (BU)	J-38125-215A
II	84616651	J-35616-13 (BU)	J-38125-215A

X402C Roof Wiring Harness to Body Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.35 (1) 0.5	(1) BK / WH (1) BK / WH	(1) 1851 (1) 1851	(1) I (1) I	(1) (- (DD8/ CJ2)) (1) DD8/ CJ2	(1) Signal Ground (1) Signal Ground	(1) 1	(1) 0.5	(1) BK / WH	(1) 451	(1) II	(1) —
(2) 2	(2) 0.35	(2) RD / YE	(2) 240	(2) I	(2) —	(2) Battery Positive Voltage	(2) 2	(2) 0.35	(2) RD / YE	(2) 240	(2) II	(2) —
(3) 3	(3) 0.35	(3) RD / VT	(3) 4040	(3) I	(3) —	(3) Battery Positive Voltage	(3) 3	(3) 0.35	(3) RD / VT	(3) 4040	(3) II	(3) —
(4) 4	(4) 0.35	(4) BU	(4) 2307	(4) I	(4) —	(4) Passenger Air Bag On Indicator Control	(4) 4	(4) 0.35	(4) BU	(4) 2307	(4) II	(4) —
(5) 5	(5) 0.35	(5) GN	(5) 2308	(5) I	(5) —	(5) Passenger Air Bag Off Indicator Control	(5) 5	(5) 0.35	(5) GN	(5) 2308	(5) II	(5) —
(6) 6	(6) 0.35 (6) 0.35	(6) GN (6) VT / WH	(6) 3118 (6) 5234	(6) I (6) I	(6) C91 (6) - C91	(6) Roof Rail Air Bag Disable Indicator Control (6) Passenger Seat Belt Indicator Control	(6) 6	(6) 0.35 (6) 0.35	(6) GN (6) VT / WH	(6) 3118 (6) 5234	(6) II (6) II	(6) C91 (6) - C91
(7) 7	(7) 0.35	(7) GN / WH	(7) 4115	(7) I	(7) —	(7) Body Control Module LIN Bus 5	(7) 7	(7) 0.35	(7) GN / WH	(7) 4115	(7) II	(7) —
(8) 8	(8) 0.35	(8) GN / WH	(8) 24	(8) I	(8) —	(8) Backup Lamp Control	(8) 8	(8) 0.35	(8) GN / WH	(8) 24	(8) II	(8) —
(9) 9	(9) 0.35 (9) 0.35	(9) VT / GN (9) VT / GN	(9) 39 (9) 39	(9) I (9) I	(9) (CJ2/ DD8) (9) - DD8	(9) Run/ Crank Ignition 1 Voltage (9) Run/ Crank Ignition 1 Voltage	(9) 9	(9) 0.5	(9) VT / WH	(9) 1139	(9) II	(9) —
(10) 10	(10) 0.35	(10) BU / BK	(10) 7044	(10) I	(10) —	(10) Microphone [-] Signal	(10) 10	(10) 0.35	(10) BU / BK	(10) 7044	(10) II	(10) —
(11) 11	(11) 0.35	(11) VT / YE	(11) 7043	(11) I	(11) —	(11) Microphone [+] Signal	(11) 11	(11) 0.35	(11) VT / YE	(11) 7043	(11) II	(11) —
12	—	—	—	—	—	Not Occupied	12	—	—	—	—	—
(13) 13	(13) 0.35	(13) BU / YE	(13) 4979	(13) I	(13) —	(13) AUTOSAR CAN Bus [+] 2 Serial Data	(13) 13	(13) 0.5	(13) BU / YE	(13) 4979	(13) II	(13) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(14) 14	(14) 0.35	(14) WH	(14) 49 78	(14) I	(14) —	(14) AUTOSAR CAN Bus [-] 2 Serial Data	(14) 14	(14) 0.5	(14) WH	(14) 49 78	(14) II	(14) —
(15) 15	(15) 0.35	(15) BU / YE	(15) 49 79	(15) I	(15) —	(15) AUTOSAR CAN Bus [+] 2 Serial Data	(15) 15	(15) 0.35	(15) BU / YE	(15) 49 79	(15) II	(15) —
(16) 16	(16) 0.35	(16) WH	(16) 49 78	(16) I	(16) —	(16) AUTOSAR CAN Bus [-] 2 Serial Data	(16) 16	(16) 0.35	(16) WH	(16) 49 78	(16) II	(16) —

X402D Inside Air Moisture and Windshield Temperature Sensor Jumper Wiring Harness to Roof Wiring Harness (CJ2)



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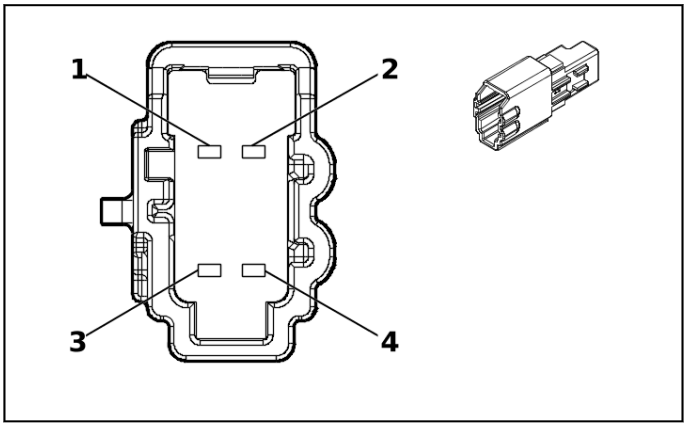


5360963

Connector Part Information
- Harness Type: Inside Air Moisture and Windshield Temperature Sensor Jumper Wiring Harness
- OEM Connector: Not Available
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F

Connector Part Information
- Harness Type: Roof Wiring Harness
- OEM Connector: 6098-9046
- Service Connector: 84847258
- Description: 4-Way M 1.2 MCON Series(BK)

Terminal Part Information

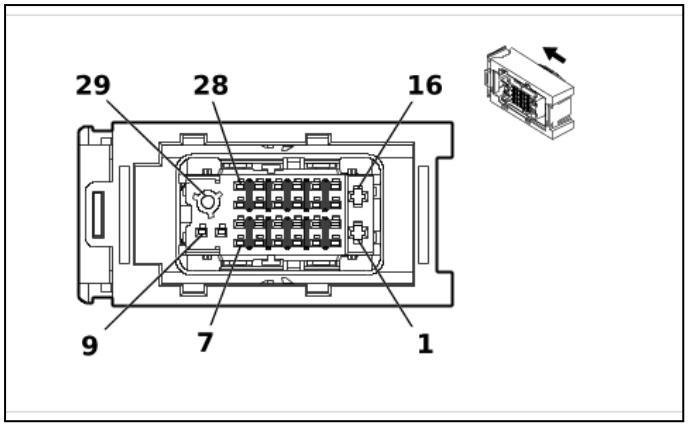
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required
II	Not required	J-35616-17 (L-GN)	No Tool Required

X402D Inside Air Moisture and Windshield Temperature Sensor Jumper Wiring Harness to Roof Wiring Harness (CJ2)

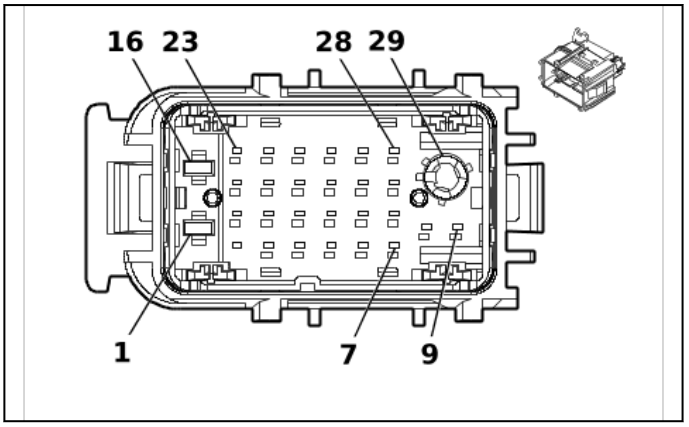
Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) VT / GN	(1) 39	(1) I	(1) —	(1) Run/ Crank Ignition 1 Voltage	(1) 1	(1) 0.35	(1) VT / GN	(1) 39	(1) II	(1) —
(2) 2	(2) 0.35	(2) BK / WH	(2) 185 1	(2) I	(2) —	(2) Signal Ground	(2) 2	(2) 0.35	(2) BK / WH	(2) 185 1	(2) II	(2) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(3) 3	(3) 0.35	(3) GN / WH	(3) 4115	(3) I	(3) —	(3) Body Control Module LIN Bus 5	(3) 3	(3) 0.35	(3) GN / WH	(3) 4115	(3) II	(3) —
4	—	—	—	—	—	Not Occupied	4	—	—	—	—	—

X404 Body Wiring Harness to Front Side Door Door Wiring Harness - Passenger



6174956



6154847

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 35383762
- Service Connector: 85741556
- Description: 29-Way F 1.2, 2.8 CTS Coaxial Series, Sealed(YE)

Connector Part Information
- Harness Type: Front Side Door Door Wiring Harness - Passenger
- OEM Connector: 35383764
- Service Connector: Service by Harness - See Part Catalog
- Description: 29-Way M 1.2 CTS, 2.8 DCS-2, Coaxial Series, Sealed(YE)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19368624	J-35616-35 (VT)	J-38125-557
II	85741557	J-35616-12 (BU)	J-38125-215A
III	Service by Cable	No Tool Required	No Tool Required
IV	Not required	J-35616-13 (BU)	No Tool Required
V	Not required	J-35616-17 (L-GN)	No Tool Required
VI	Not required	J-35616-5 (PU)	No Tool Required
VII	Service by Cable	No Tool Required	No Tool Required

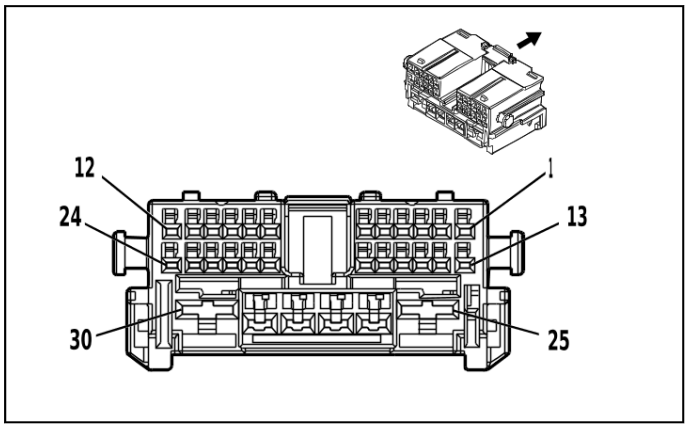
X404 Body Wiring Harness to Front Side Door Door Wiring Harness - Passenger

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) BK	(1) 4250	(1) I	(1) —	(1) Ground	(1) 1	(1) 2.5	(1) BK	(1) 1250	(1) VI	(1) —
2 - 6	—	—	—	—	—	Not Occupied	2 - 6	—	—	—	—	—
(7) 7	(7) 0.35	(7) GN / YE	(7) 6134	(7) II	(7) —	(7) Body Control Module LIN Bus 3	(7) 7	(7) 0.35	(7) GN / YE	(7) 6134	(7) V	(7) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
8 - 10	—	—	—	—	—	Not Occupied	8 - 10	—	—	—	—	—
(11) 11	(11) 0.5	(11) BN / OG	(11) 21 34	(11) II	(11) —	(11) Right Front Side Impact Sensor Signal	(11) 11	(11) 0.5	(11) BN / OG	(11) 21 34	(11) V	(11) —
(12) 12	(12) 0.5	(12) BK / OG	(12) 66 29	(12) II	(12) —	(12) Right Front Side Impact Sensor Low Reference	(12) 12	(12) 0.5	(12) BK / OG	(12) 66 29	(12) V	(12) —
13	—	—	—	—	—	Not Occupied	13	—	—	—	—	—
(14) 14	(14) 0.35	(14) GN / BK	(14) 43 04	(14) II	(14) —	(14) Passive Entry Right Antenna Signal Low	(14) 14	(14) 0.5	(14) GN / BK	(14) 43 04	(14) V	(14) —
(15) 15	(15) 0.35	(15) GN / YE	(15) 43 03	(15) II	(15) —	(15) Passive Entry Right Antenna Signal High	(15) 15	(15) 0.5	(15) GN / YE	(15) 43 03	(15) V	(15) —
(16) 16	(16) 2.5	(16) RD / GY	(16) 35 40	(16) I	(16) —	(16) Battery Positive Voltage	(16) 16	(16) 2.5	(16) RD / GY	(16) 35 40	(16) VI	(16) —
17 - 19	—	—	—	—	—	Not Occupied	17 - 19	—	—	—	—	—
(20) 20	(20) 0.35	(20) GY / VT	(20) 26 76	(20) II	(20) —	(20) Right Front Door Exterior Switch Unlock Signal	(20) 20	(20) 0.35	(20) GY / VT	(20) 26 76	(20) V	(20) —
21 - 22	—	—	—	—	—	Not Occupied	21 - 22	—	—	—	—	—
(23) 23	(23) 0.75	(23) GY / BK	(23) 26 80	(23) II	(23) —	(23) Lock Actuators Unlock Control 2	(23) 23	(23) 0.75	(23) GY / BK	(23) 26 80	(23) V	(23) —
(24) 24	(24) 0.75	(24) YE / GN	(24) 26 82	(24) II	(24) —	(24) Right Front Door Lock Actuator Lock Control	(24) 24	(24) 0.75	(24) YE / GN	(24) 26 82	(24) V	(24) —
25 - 26	—	—	—	—	—	Not Occupied	25 - 26	—	—	—	—	—
(27) 27	(27) 0.75 (27) 1	(27) YE (27) YE	(27) 20 0 (27) 20 0	(27) II (27) II	(27) UQ3 (27) UQA	(27) Right Front Speaker 1 [+] Control (27) Right Front Speaker 1 [+] Control	(27) 27	(27) 1	(27) YE	(27) 20 0	(27) IV	(27) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(28) 28	(28) 0.75 (28) 1	(28) YE / BK (28) YE / BK	(28) 117 (28) 117	(28) II (28) II	(28) UQ3 (28) UQA	(28) Right Front Speaker [-] Control 1 (28) Right Front Speaker [-] Control 1	(28) 28	(28) 1	(28) YE / BK	(28) 117	(28) IV	(28) —
(29) 29	(29) 0	(29) WH	(29) Coax Cable	(29) III	(29) —	(29) Coax Cable	(29) 29	(29) 0	(29) WH	(29) Coax Cable	(29) VII	(29) —

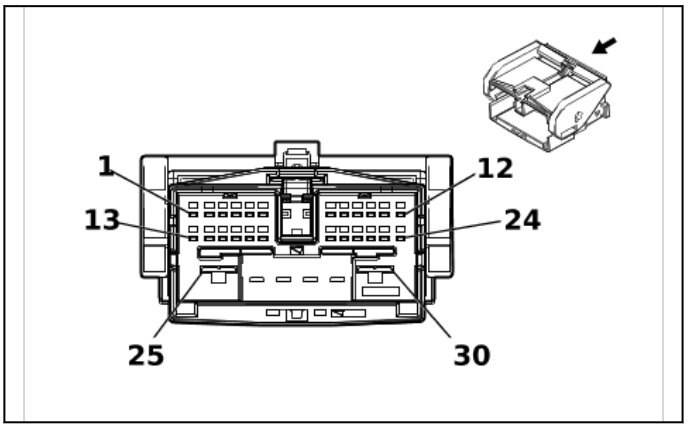
X494 Front Side Door Door Wiring Harness - Passenger to Front Side Door Door Lock Door Wiring Harness - Passenger



4253192

Connector Part Information

- Harness Type: Front Side Door Door Wiring Harness - Passenger
- OEM Connector: 7298-4329-30
- Service Connector: Service by Harness - See Part Catalog
- Description: 30-Way F 1.2 MCON, 2.8, 6.3 YESC Series(BK)



4249201

Connector Part Information

- Harness Type: Front Side Door Door Lock Door Wiring Harness - Passenger
- OEM Connector: 7297-4331-30
- Service Connector: Service by Harness - See Part Catalog
- Description: 30-Way M 1.2 MCON, 2.8, 6.3 YESC Series(BK)

Terminal Part Information

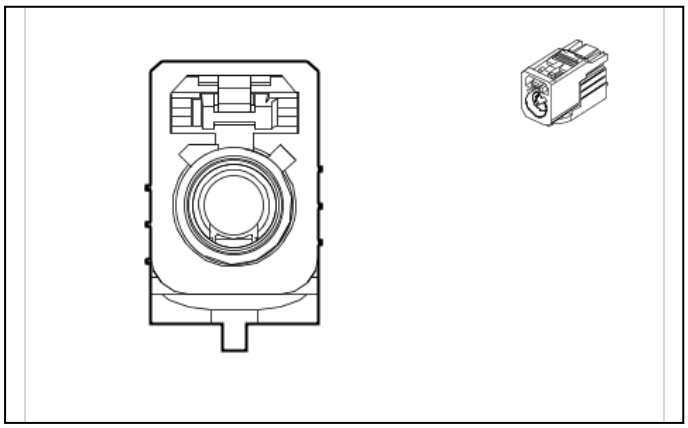
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required
II	Not required	J-35616-42 (RD)	No Tool Required
III	Not required	J-35616-4A (PU)	No Tool Required
IV	Not required	J-35616-17 (L-GN)	No Tool Required
V	Not required	J-35616-43 (RD)	No Tool Required
VI	Not required	J-35616-5 (PU)	No Tool Required

X494 Front Side Door Door Wiring Harness - Passenger to Front Side Door Door Lock Door Wiring Harness - Passenger

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.35	(1) GY / VT	(1) 4638	(1) I	(1) —	(1) LED Backlight Dimming Control Right Front Door	(1) 1	(1) 0.35	(1) GY / VT	(1) 4638	(1) IV	(1) —
(2) 2	(2) 0.35	(2) YE / BU	(2) 4245	(2) I	(2) —	(2) Right Front Door Lock Indicator Control	(2) 2	(2) 0.35	(2) YE / BU	(2) 4245	(2) IV	(2) —
(3) 3	(3) 0.35	(3) VT	(3) 4259	(3) I	(3) —	(3) Right Front Door Lock Status Signal	(3) 3	(3) 0.35	(3) VT	(3) 4259	(3) IV	(3) —
(4) 4	(4) 0.35	(4) YE / VT	(4) 2773	(4) I	(4) —	(4) Right Front Door Lock Switch Lock Control	(4) 4	(4) 0.35	(4) YE / VT	(4) 2773	(4) IV	(4) —
(5) 5	(5) 0.35	(5) BN / VT	(5) 2774	(5) I	(5) —	(5) Right Front Door Lock Switch Unlock Control	(5) 5	(5) 0.35	(5) BN / VT	(5) 2774	(5) IV	(5) —
(6) 6	(6) 0.35	(6) GY	(6) 1761	(6) I	(6) —	(6) Right Side Object Detection LED Control	(6) 6	(6) 0.35	(6) GY	(6) 1761	(6) IV	(6) —
(7) 7	(7) 0.35	(7) GN / YE	(7) 6134	(7) I	(7) —	(7) Body Control Module LIN Bus 3	(7) 7	(7) 0.35	(7) GN / YE	(7) 6134	(7) IV	(7) —
(8) 8	(8) 0.35	(8) GY	(8) 746	(8) I	(8) —	(8) Right Front Door Ajar Switch Signal	(8) 8	(8) 0.35	(8) GY	(8) 746	(8) IV	(8) —
9 - 12	—	—	—	—	—	Not Occupied	9 - 12	—	—	—	—	—
(13) 13	(13) 0.5	(13) BN / VT	(13) 607	(13) I	(13) —	(13) Right Outside Rearview Mirror Heater Control	(13) 13	(13) 0.5	(13) BN / VT	(13) 607	(13) IV	(13) —
14 - 15	—	—	—	—	—	Not Occupied	14 - 15	—	—	—	—	—
(16) 16	(16) 0.35	(16) YE / VT	(16) 2796	(16) I	(16) —	(16) Right Front Mirror Motor Up [+] Down [-] Control	(16) 16	(16) 0.35	(16) YE / VT	(16) 2796	(16) IV	(16) —
(17) 17	(17) 0.35	(17) WH	(17) 2797	(17) I	(17) —	(17) Right Front Mirror Motor Common Control	(17) 17	(17) 0.35	(17) WH	(17) 2797	(17) IV	(17) —
(18) 18	(18) 0.35	(18) GN / BK	(18) 2798	(18) I	(18) —	(18) Right Front Mirror Motor Right [+] Left [-] Control	(18) 18	(18) 0.35	(18) GN / BK	(18) 2798	(18) IV	(18) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(19) 19	(19) 0.35	(19) BU / YE	(19) 2795	(19) I	(19) —	(19) Right Front Mirror Position Sensor Up [+] Down [-] Signal	(19) 19	(19) 0.35	(19) BU / YE	(19) 2795	(19) IV	(19) —
(20) 20	(20) 0.35	(20) YE / RD	(20) 2799	(20) I	(20) —	(20) Right Front Mirror Position Sensor High Reference	(20) 20	(20) 0.35	(20) YE / RD	(20) 2799	(20) IV	(20) —
(21) 21	(21) 0.35	(21) VT / WH	(21) 2800	(21) I	(21) —	(21) Right Front Mirror Position Sensor Left [-] Right [+] Signal	(21) 21	(21) 0.35	(21) VT / WH	(21) 2800	(21) IV	(21) —
(22) 22	(22) 0.35	(22) BK / GN	(22) 675	(22) I	(22) —	(22) Right Outside Rearview Mirror Position Sensor Low Reference	(22) 22	(22) 0.35	(22) BK / GN	(22) 675	(22) IV	(22) —
23 - 24	—	—	—	—	—	Not Occupied	23 - 24	—	—	—	—	—
(25) 25	(25) 2.5	(25) RD / GY	(25) 3540	(25) II	(25) —	(25) Battery Positive Voltage	(25) 25	(25) 2.5	(25) RD / GY	(25) 3540	(25) V	(25) —
(26) 26	(26) 2.5	(26) BK	(26) 1250	(26) III	(26) —	(26) Ground	(26) 26	(26) 2.5	(26) BK	(26) 1250	(26) VI	(26) —
(27) 27	(27) 2	(27) YE / BU	(27) 667	(27) III	(27) —	(27) Right Front Window Motor Down Control	(27) 27	(27) 2	(27) YE / BU	(27) 667	(27) VI	(27) —
(28) 28	(28) 2	(28) GN / GY	(28) 666	(28) III	(28) —	(28) Right Front Window Motor Up Control	(28) 28	(28) 2	(28) GN / GY	(28) 666	(28) VI	(28) —
29 - 30	—	—	—	—	—	Not Occupied	29 - 30	—	—	—	—	—

X499A Body Wiring Harness to Instrument Panel Wiring Harness



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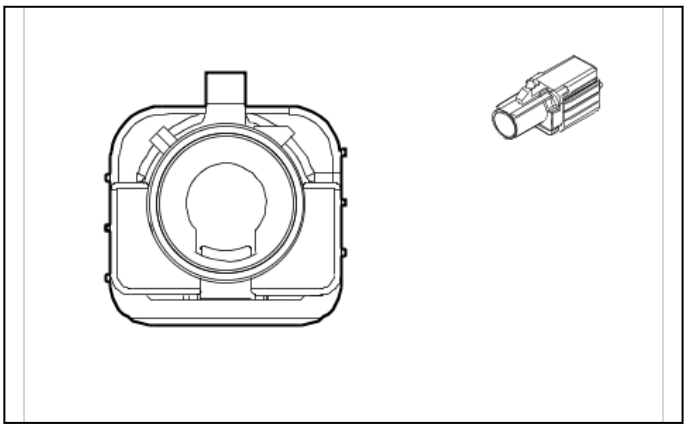


5660998

Connector Part Information
- Harness Type: Body Wiring Harness COAX
- OEM Connector: 13516408
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type(BK)

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness COAX
- OEM Connector: 13516059
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way M Coax Type(BK)

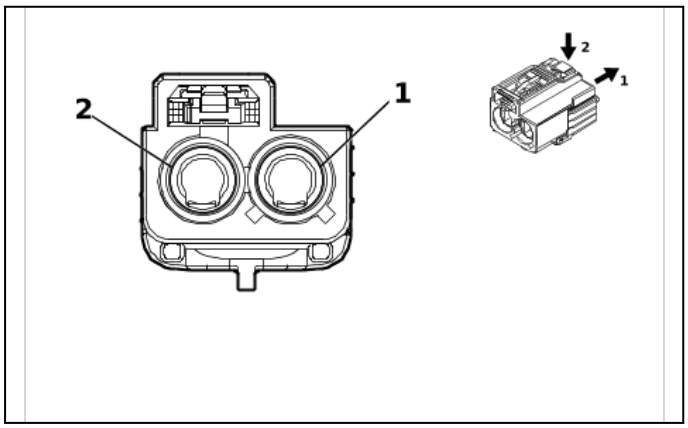
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X499A Body Wiring Harness to Instrument Panel Wiring Harness

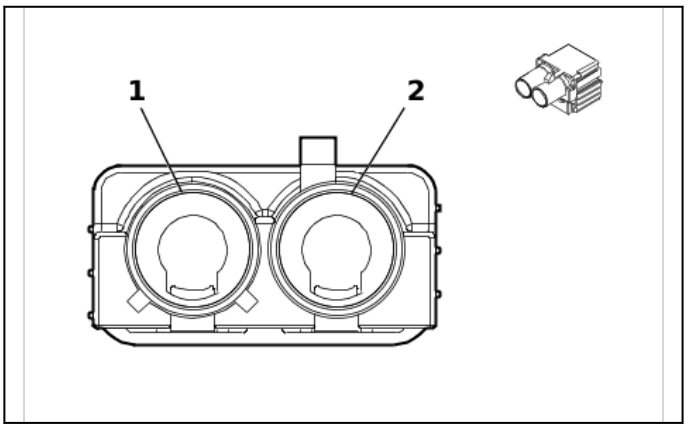
Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
—	—	Coax Cable	—	I	—	(AM/FM) Antenna RF Signal	—	—	Coax Cable	—	I	—

X499C Body Wiring Harness to Instrument Panel Wiring Harness



5907715

Connector Part Information
- Harness Type: Body Wiring Harness COAX
- OEM Connector: 13516431
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 2-Way F Coax Type(CU)



5987873

Connector Part Information
- Harness Type: Instrument Panel Wiring Harness COAX
- OEM Connector: 13516098
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 2-Way M Coax Type(CU)

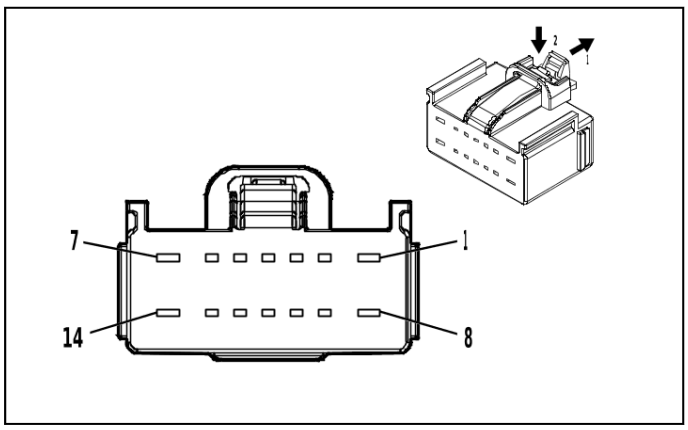
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X499C Body Wiring Harness to Instrument Panel Wiring Harness

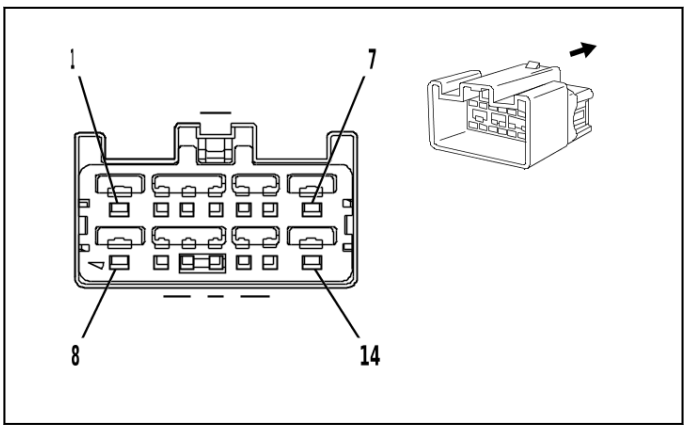
Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
—	—	Coax Cable	—	I	—	(FM2) Antenna RF Signal (2)	—	—	Coax Cable	—	I	—

X500 Roof Wiring Harness to Body Wiring Harness



4934172

Connector Part Information
- Harness Type: Roof Wiring Harness
- OEM Connector: 7289-7630-40
- Service Connector: 13513605
- Description: 14-Way F 1.5, 2.8 YESC Series(GY)



1283905

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 7282-6447-40
- Service Connector: 88956523
- Description: 14-Way M 1.5, 2.8 YESC Series(L-GY)

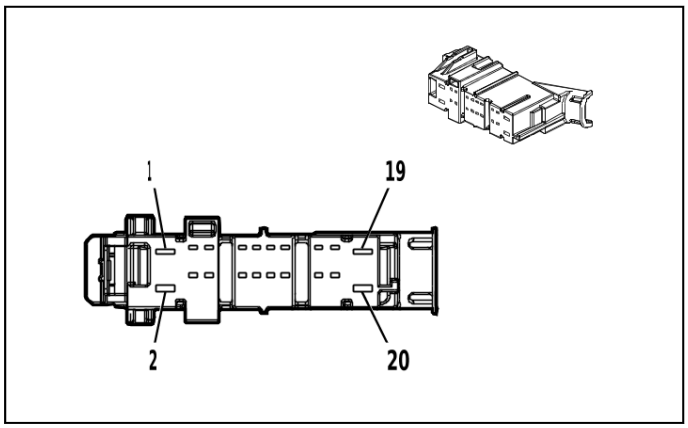
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	19332534	J-35616-2A (GY)	J-38125-557
II	85544080	J-35616-4A (PU)	J-38125-11A
III	13578907	J-35616-3 (GY)	J-38125-215A
IV	13578908	J-35616-5 (PU)	J-38125-11A

X500 Roof Wiring Harness to Body Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 1.5	(1) RD / YE	(1) 2340	(1) II	(1) —	(1) Battery Positive Voltage	(1) 1	(1) 1.5	(1) RD / YE	(1) 2340	(1) IV	(1) —
2	—	—	—	—	—	Not Occupied	2	—	—	—	—	—
(3) 3	(3) 0.35	(3) GN / BK	(3) 2515	(3) I	(3) —	(3) Telematics Switch Supply Voltage	(3) 3	(3) 0.35	(3) GN / BK	(3) 2515	(3) III	(3) —
(4) 4	(4) 0.35	(4) GN / WH	(4) 2514	(4) I	(4) —	(4) Telematics Switch Signal	(4) 4	(4) 0.35	(4) GN / WH	(4) 2514	(4) III	(4) —
(5) 5	(5) 0.35	(5) YE / VT	(5) 2516	(5) I	(5) —	(5) Telematics Switch Green LED Indicator Control	(5) 5	(5) 0.35	(5) YE / VT	(5) 2516	(5) III	(5) —
(6) 6	(6) 0.35	(6) BN / WH	(6) 2517	(6) I	(6) —	(6) Telematics Switch Red LED Indicator Control	(6) 6	(6) 0.35	(6) BN / WH	(6) 2517	(6) III	(6) —
7	—	—	—	—	—	Not Occupied	7	—	—	—	—	—
(8) 8	(8) 1.5	(8) BK	(8) 1850	(8) II	(8) —	(8) Ground	(8) 8	(8) 1.5	(8) BK	(8) 4250	(8) IV	(8) —
(9) 9	(9) 0.5 (9) 0.35	(9) BK / WH (9) BK / WH	(9) 451 (9) 451	(9) I (9) I	(9) UE1 (9) - UE1	(9) Signal Ground (9) Signal Ground	(9) 9	(9) 0.5	(9) BK / WH	(9) 451	(9) III	(9) —
(10) 10	(10) 0.35	(10) RD / VT	(10) 1640	(10) I	(10) —	(10) Battery Positive Voltage	(10) 10	(10) 0.35	(10) RD / VT	(10) 1640	(10) III	(10) —
11	—	—	—	—	—	Not Occupied	11	—	—	—	—	—
(12) 12	(12) 0.35	(12) BK / BN	(12) 654	(12) I	(12) —	(12) Cellular Telephone Microphone Low Reference	(12) 12	(12) 0.35	(12) BK / BN	(12) 654	(12) III	(12) —
(13) 13	(13) 0.35	(13) BU	(13) 655	(13) I	(13) —	(13) Cellular Telephone Microphone Signal	(13) 13	(13) 0.35	(13) BU	(13) 655	(13) III	(13) —
14	—	—	—	—	—	Not Occupied	14	—	—	—	—	—

X503 Rear Side Door Door Wiring Harness - Left to Body Wiring Harness



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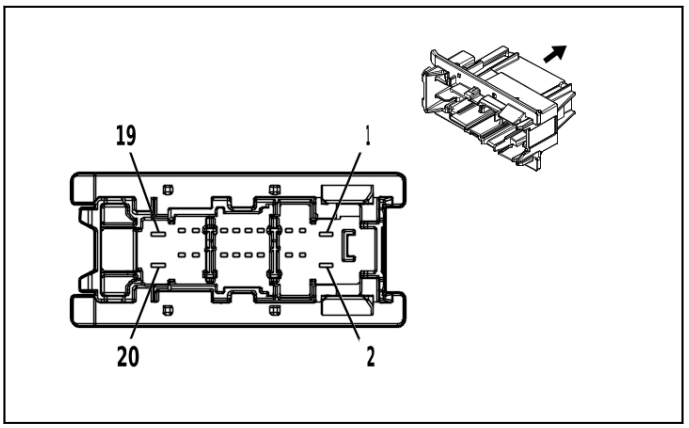


4663657

Connector Part Information
- Harness Type: Rear Side Door Door Wiring Harness - Left
- OEM Connector: 6098-8196
- Service Connector: Service by Harness - See Part Catalog
- Description: 20-Way F 1.2 MCON, 2.8 MCP Series(BK)

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 6098-8887
- Service Connector: 13527239
- Description: 20-Way M 1.2 MCON, 2.8 MCP Series(BK)

Terminal Part Information

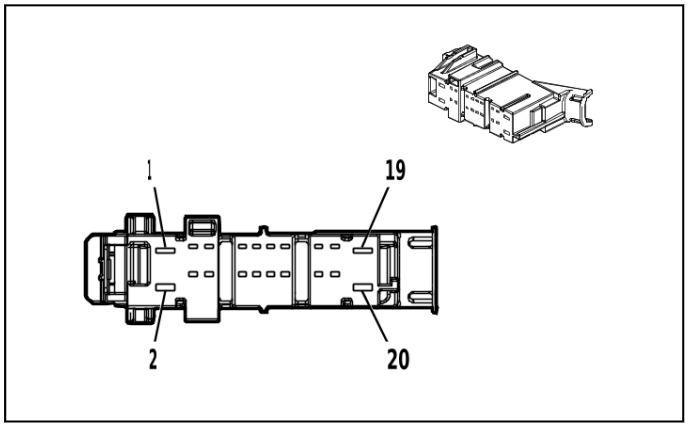
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required
II	Not required	J-35616-35 (VT)	No Tool Required
III	13586064	J-35616-5 (PU)	J-38125-212
IV	84616651	J-35616-13 (BU)	J-38125-215A

X503 Rear Side Door Door Wiring Harness - Left to Body Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) RD / BU	(1) 1240	(1) II	(1) —	(1) Battery Positive Voltage	(1) 1	(1) 2.5	(1) RD / BU	(1) 1240	(1) III	(1) —
(2) 2	(2) 2.5	(2) BK	(2) 1150	(2) II	(2) —	(2) Ground	(2) 2	(2) 2.5	(2) BK	(2) 3750	(2) III	(2) —
(3) 3	(3) 0.75	(3) BU / YE	(3) 1091	(3) I	(3) —	(3) Left Rear Door Lock Actuator Lock Control	(3) 3	(3) 0.75	(3) BU / YE	(3) 1091	(3) IV	(3) —
(4) 4	(4) 0.75	(4) WH	(4) 2679	(4) I	(4) —	(4) Lock Actuators Unlock Control 1	(4) 4	(4) 0.75	(4) WH	(4) 2679	(4) IV	(4) —
5 - 6	—	—	—	—	—	Not Occupied	5 - 6	—	—	—	—	—
(7) 7	(7) 0.35	(7) GN / GY	(7) 6135	(7) I	(7) —	(7) Body Control Module LIN Bus 4	(7) 7	(7) 0.35	(7) GN / GY	(7) 6135	(7) IV	(7) —
8 - 11	—	—	—	—	—	Not Occupied	8 - 11	—	—	—	—	—

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(12) 12	(12) 0.75 (12) 0.5	(12) GN / BK (12) GN / BK	(12) 116 (12) 116	(12) I (12) I	(12) UQ3 (12) UQA	(12) Left Rear Speaker [-] Control (12) Left Rear Speaker [-] Control	(12) 12	(12) 0.75 (12) 0.5	(12) GN / BK (12) GN / BK	(12) 116 (12) 116	(12) IV (12) IV	(12) UQ3 (12) UQA
(13) 13	(13) 0.75 (13) 0.5	(13) GN (13) GN	(13) 199 (13) 199	(13) I (13) I	(13) UQ3 (13) UQA	(13) Left Rear Speaker [+] Control (13) Left Rear Speaker [+] Control	(13) 13	(13) 0.75 (13) 0.5	(13) GN (13) GN	(13) 199 (13) 199	(13) IV (13) IV	(13) UQ3 (13) UQA
14 - 20	—	—	—	—	—	Not Occupied	14 - 20	—	—	—	—	—

X604 Rear Side Door Door Wiring Harness - Right to Body Wiring Harness



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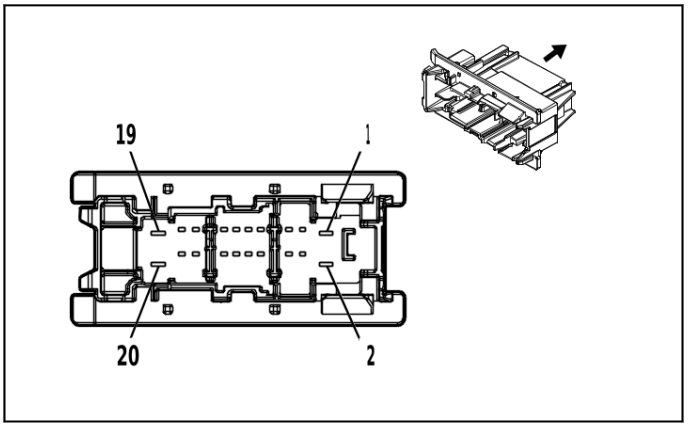


4663657

Connector Part Information
- Harness Type: Rear Side Door Door Wiring Harness - Right
- OEM Connector: 6098-8196
- Service Connector: Service by Harness - See Part Catalog
- Description: 20-Way F 1.2 MCON, 2.8 MCP Series(BK)

Connector Part Information
- Harness Type: Body Wiring Harness
- OEM Connector: 6098-8887
- Service Connector: 13527239
- Description: 20-Way M 1.2 MCON, 2.8 MCP Series(BK)

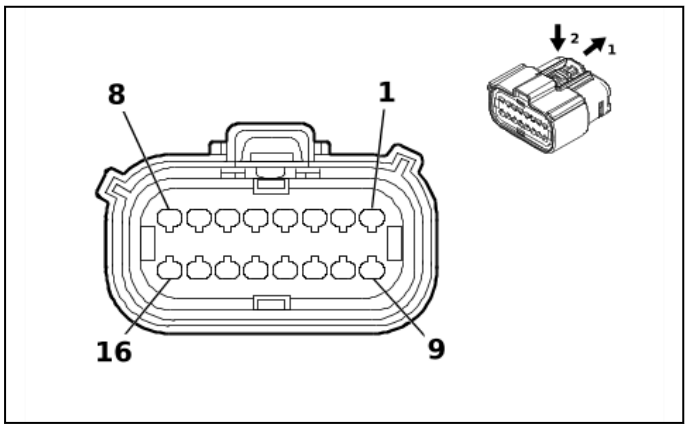
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required
II	Not required	J-35616-35 (VT)	No Tool Required
III	13586064	J-35616-5 (PU)	J-38125-212
IV	84616651	J-35616-13 (BU)	J-38125-215A

X604 Rear Side Door Door Wiring Harness - Right to Body Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) RD / GY	(1) 3540	(1) II	(1) —	(1) Battery Positive Voltage	(1) 1	(1) 2.5	(1) RD / GY	(1) 3540	(1) III	(1) —
(2) 2	(2) 2.5	(2) BK	(2) 1250	(2) II	(2) —	(2) Ground	(2) 2	(2) 2.5	(2) BK	(2) 4250	(2) III	(2) —
(3) 3	(3) 0.75	(3) VT / WH	(3) 1094	(3) I	(3) —	(3) Right Rear Door Lock Actuator Lock Control	(3) 3	(3) 0.75	(3) VT / WH	(3) 1094	(3) IV	(3) —
(4) 4	(4) 0.75	(4) GY / BK	(4) 2680	(4) I	(4) —	(4) Lock Actuators Unlock Control 2	(4) 4	(4) 0.75	(4) GY / BK	(4) 2680	(4) IV	(4) —
5 - 6	—	—	—	—	—	Not Occupied	5 - 6	—	—	—	—	—
(7) 7	(7) 0.35	(7) GN / GY	(7) 6135	(7) I	(7) —	(7) Body Control Module LIN Bus 4	(7) 7	(7) 0.35	(7) GN / GY	(7) 6135	(7) IV	(7) —
8 - 11	—	—	—	—	—	Not Occupied	8 - 11	—	—	—	—	—
(12) 12	(12) 0.75 (12) 0.5	(12) BU / BK (12) BU / BK	(12) 115 (12) 115	(12) I (12) I	(12) UQ3 (12) UQA	(12) Right Rear Speaker [-] Control (12) Right Rear Speaker [-] Control	(12) 12	(12) 0.75 (12) 0.5	(12) BU / BK (12) BU / BK	(12) 115 (12) 115	(12) IV (12) IV	(12) UQ3 (12) UQA
(13) 13	(13) 0.75 (13) 0.5	(13) WH (13) WH	(13) 46 (13) 46	(13) I (13) I	(13) UQ3 (13) UQA	(13) Right Rear Speaker [+] Control (13) Right Rear Speaker [+] Control	(13) 13	(13) 0.75 (13) 0.5	(13) WH (13) WH	(13) 46 (13) 46	(13) IV (13) IV	(13) UQ3 (13) UQA
14 - 20	—	—	—	—	—	Not Occupied	14 - 20	—	—	—	—	—

X700 Rear Object Alarm Sensor Wiring Harness to Chassis Wiring Harness



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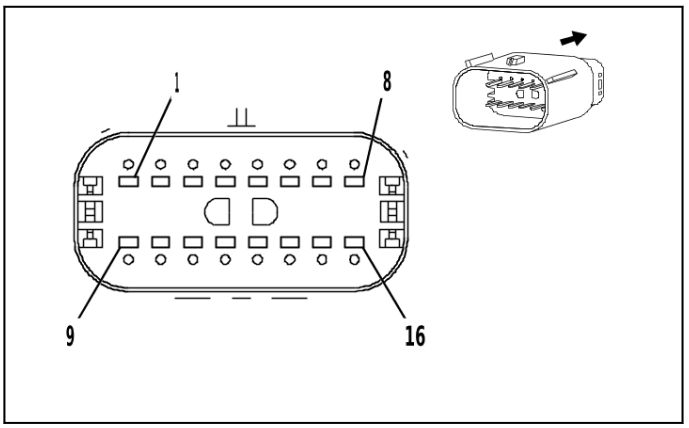


4223713

Connector Part Information
- Harness Type: Rear Object Alarm Sensor Wiring Harness
- OEM Connector: 33472-1607
- Service Connector: Service by Harness - See Part Catalog
- Description: 16-Way F 1.5 MX Series, Sealed(L-GY)

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 33482-8602
- Service Connector: 84625100
- Description: 16-Way M 1.5 MX Series, Sealed(GY)

Terminal Part Information

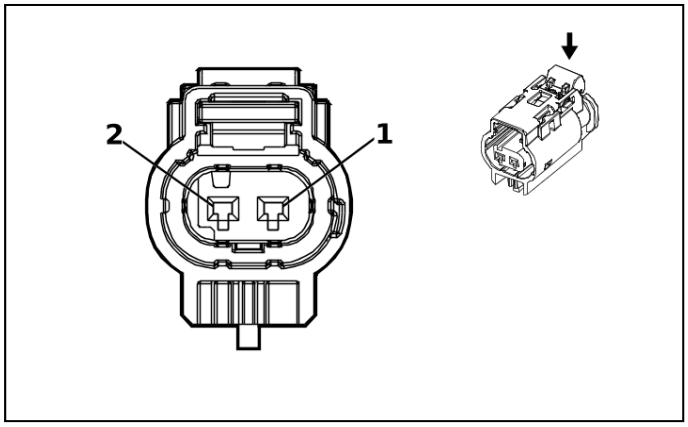
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-2A (GY)	No Tool Required
III	19119395	J-35616-3 (GY)	J-38125-217

X700 Rear Object Alarm Sensor Wiring Harness to Chassis Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BU / VT	(1) 4101	(1) I	(1) —	(1) AUTOSAR CAN Bus [+] 4 Serial Data	(1) 1	(1) 0.5	(1) BU / VT	(1) 4101	(1) III	(1) —
(2) 2	(2) 0.5	(2) WH	(2) 4100	(2) I	(2) —	(2) AUTOSAR CAN Bus [-] 4 Serial Data	(2) 2	(2) 0.5	(2) WH	(2) 4100	(2) III	(2) —
3	—	—	—	—	—	Not Occupied	3	—	—	—	—	—
(4) 4	(4) 0.5	(4) GY / BK	(4) 2680	(4) I	(4) —	(4) Lock Actuators Unlock Control 2	(4) 4	(4) 0.5	(4) GY / BK	(4) 2680	(4) III	(4) —
(5) 5	(5) 0.5	(5) GY / VT	(5) 2691	(5) I	(5) —	(5) Rear Closure Actuator Lock Control	(5) 5	(5) 0.5	(5) GY / VT	(5) 2691	(5) III	(5) —
(6) 6	(6) 0.5	(6) YE	(6) 2375	(6) I	(6) —	(6) Left Rear Outer Parking Assist Sensor Signal	(6) 6	(6) 0.5	(6) YE	(6) 2375	(6) III	(6) —
(7) 7	(7) 0.75	(7) BK / GY	(7) 2379	(7) II	(7) —	(7) Object Sensor Low Reference	(7) 7	(7) 0.75	(7) BK / GY	(7) 2379	(7) III	(7) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(8) 8	(8) 0.75	(8) BN / WH	(8) 2374	(8) II	(8) —	(8) Object Sensor Voltage Reference	(8) 8	(8) 0.75	(8) BN / WH	(8) 2374	(8) III	(8) —
(9) 9	(9) 0.5	(9) RD / BN	(9) 4940	(9) I	(9) —	(9) Battery Positive Voltage	(9) 9	(9) 0.5	(9) RD / BN	(9) 4940	(9) III	(9) —
(10) 10	(10) 0.5	(10) BK / WH	(10) 751	(10) I	(10) —	(10) Signal Ground	(10) 10	(10) 0.5	(10) BK / WH	(10) 751	(10) III	(10) —
(11) 11	(11) 0.5	(11) GN / YE	(11) 6846	(11) I	(11) —	(11) Rear License Plate Lamp Control	(11) 11	(11) 0.5	(11) GN / YE	(11) 6846	(11) III	(11) —
(12) 12	(12) 0.5	(12) BK	(12) 750	(12) I	(12) —	(12) Ground	(12) 12	(12) 0.5	(12) BK	(12) 750	(12) III	(12) —
13	—	—	—	—	—	Not Occupied	13	—	—	—	—	—
(14) 14	(14) 0.5	(14) YE / BU	(14) 2376	(14) I	(14) —	(14) Left Rear Middle Parking Assist Sensor Signal	(14) 14	(14) 0.5	(14) YE / BU	(14) 2376	(14) III	(14) —
(15) 15	(15) 0.5	(15) YE / WH	(15) 2377	(15) I	(15) —	(15) Right Rear Middle Parking Assist Sensor Signal	(15) 15	(15) 0.5	(15) YE / WH	(15) 2377	(15) III	(15) —
(16) 16	(16) 0.5	(16) YE / VT	(16) 2378	(16) I	(16) —	(16) Right Rear Outer Parking Assist Sensor Signal	(16) 16	(16) 0.5	(16) YE / VT	(16) 2378	(16) III	(16) —

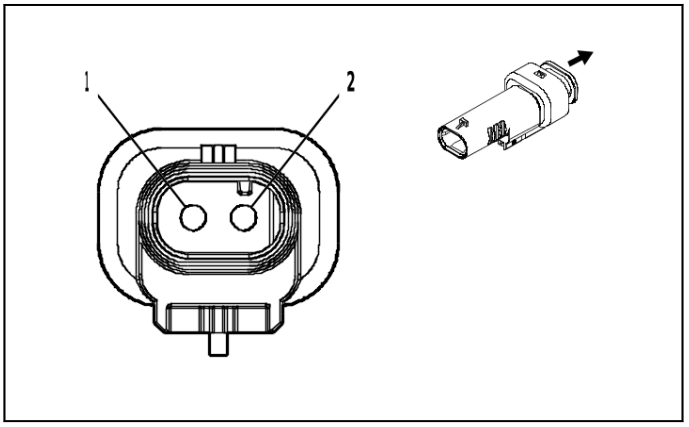
X777 Chassis Rear Wiring Harness Extension Harness to Chassis Wiring Harness (- G94)



5207726

Connector Part Information

- Harness Type: Chassis Rear Wiring Harness Extension Harness
- OEM Connector: 10094237
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.2 Multilock Series, Sealed(GY)



4992757

Connector Part Information

- Harness Type: Chassis Wiring Harness
- OEM Connector: 10094251
- Service Connector: 19371200
- Description: 2-Way M 1.2 MLK Series, Sealed(GY)

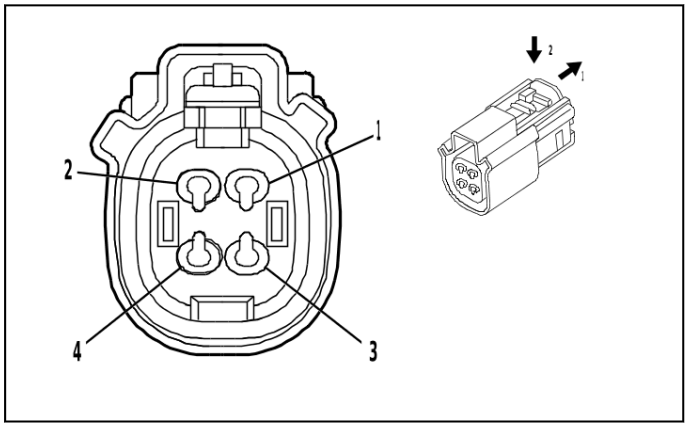
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required
II	Not required	J-35616-13 (BU)	No Tool Required

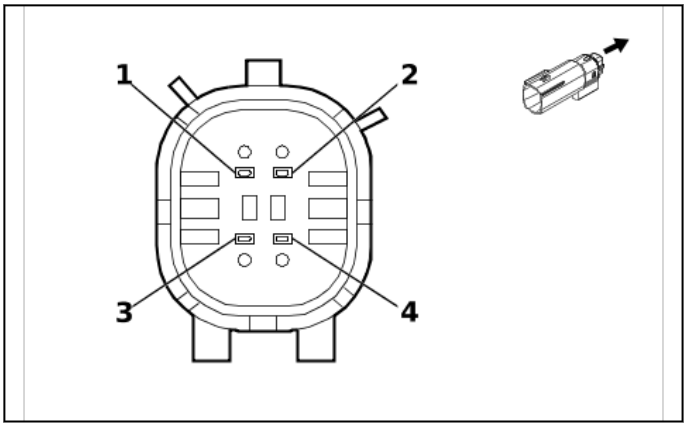
X777 Chassis Rear Wiring Harness Extension Harness to Chassis Wiring Harness (- G94)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) GN / YE	(1) 1616	(1) I	(1) —	(1) Rear Brake Pad Wear Sensor Signal	(1) 1	(1) 0.5	(1) GN / YE	(1) 1616	(1) II	(1) —
(2) 2	(2) 0.75	(2) BK / WH	(2) 1751	(2) I	(2) —	(2) Signal Ground	(2) 2	(2) 0.5	(2) BK / WH	(2) 2051	(2) II	(2) —

X788 Chassis Wiring Harness to Chassis Rear Wiring Harness Extension Harness (G94)



3960090



5604894

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 33472-4007
- Service Connector: 19368970
- Description: 4-Way F 1.5 MX Series, Sealed(GY)

Connector Part Information
- Harness Type: Chassis Rear Wiring Harness Extension Harness
- OEM Connector: Not Available
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way M (GY)

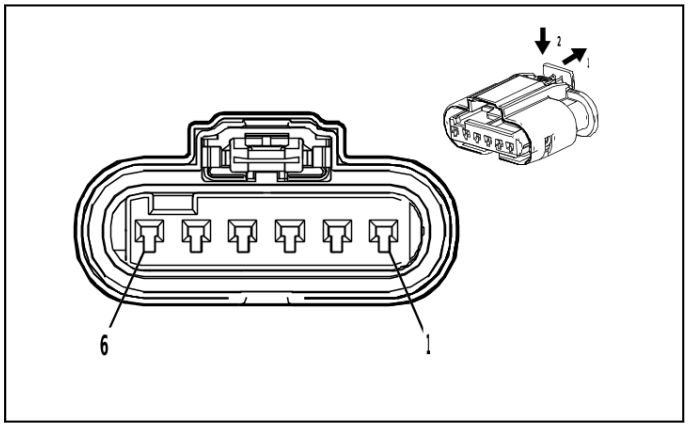
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-14 (GN)	No Tool Required
II	Not required	J-35616-2A (GY)	No Tool Required
III	Not required	No Tool Required	No Tool Required

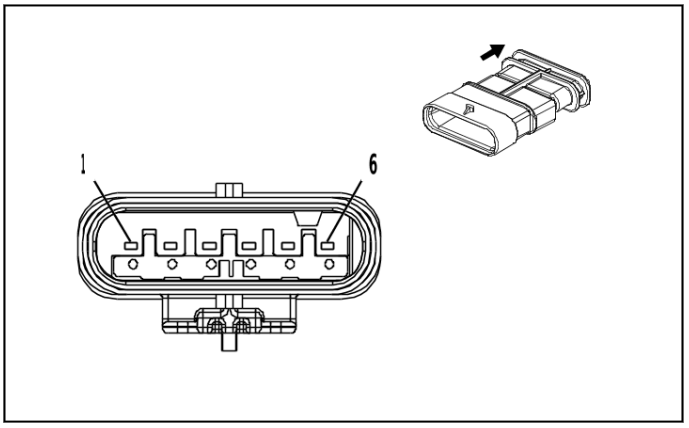
X788 Chassis Wiring Harness to Chassis Rear Wiring Harness Extension Harness (G94)

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.75	(1) VT / BN	(1) 7258	(1) II	(1) —	(1) Rear Differential Lock Actuator Control	(1) 1	(1) 0.75	(1) VT / BN	(1) 7258	(1) III	(1) —
(2) 2	(2) 0.75	(2) GY / BK	(2) 7253	(2) II	(2) —	(2) Rear Differential Lock Actuator Low Control	(2) 2	(2) 0.75	(2) GY / BK	(2) 7253	(2) III	(2) —
(3) 3	(3) 0.5	(3) G N / YE	(3) 1616	(3) I	(3) —	(3) Rear Brake Pad Wear Sensor Signal	(3) 3	(3) 0.5	(3) G N / YE	(3) 1616	(3) III	(3) —
(4) 4	(4) 0.5	(4) BK / WH	(4) 2051	(4) I	(4) —	(4) Signal Ground	(4) 4	(4) 0.5	(4) BK / WH	(4) 2051	(4) III	(4) —

X820 Body Rear Wiring Harness to Chassis Wiring Harness (KC9 / KCA)



3960142



4561098

Connector Part Information
- Harness Type: Body Rear Wiring Harness
- OEM Connector: 34900-6219
- Service Connector: Service by Harness - See Part Catalog
- Description: 6-Way F 1.2 MCON-LL Series, Sealed(BK)

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 34899-6120
- Service Connector: 86526152
- Description: 6-Way M 1.2 MCON Series, Sealed(YE)

Terminal Part Information

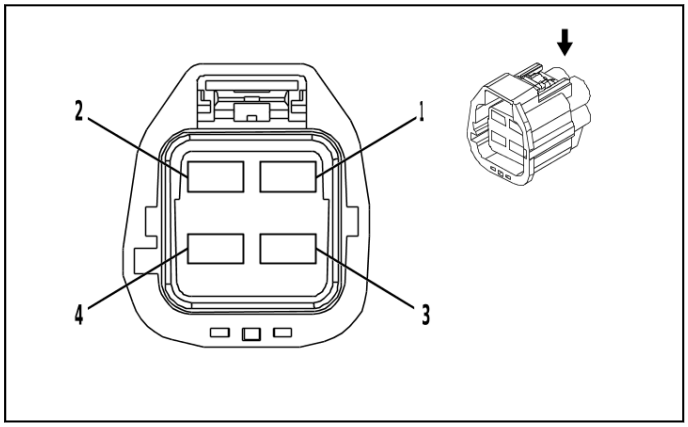
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-12 (BU)	No Tool Required
II	Not required	J-35616-17 (L-GN)	No Tool Required

X820 Body Rear Wiring Harness to Chassis Wiring Harness (KC9 / KCA)

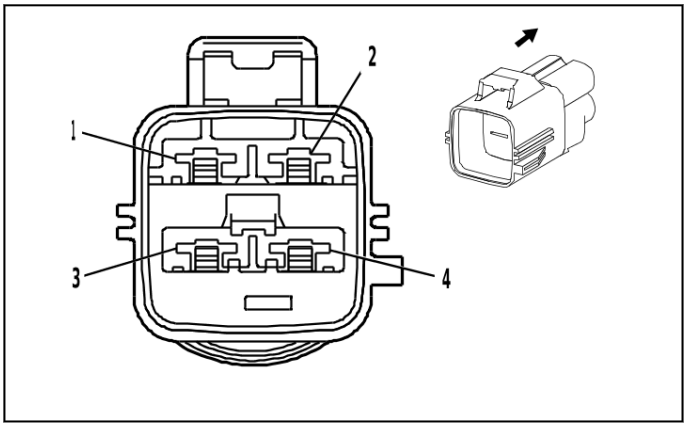
Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) BK	(1) 850	(1) I	(1) —	(1) Ground	(1) 1	(1) 0.5	(1) BK	(1) 850	(1) II	(1) —
(2) 2	(2) 0.5	(2) VT / RD	(2) 4049	(2) I	(2) —	(2) AC Power Outlet Sensor High Reference	(2) 2	(2) 0.5	(2) VT / RD	(2) 4049	(2) II	(2) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(3) 3	(3) 0.5	(3) GN / BN	(3) 2266	(3) I	(3) —	(3) DC/AC Inverter Control 2	(3) 3	(3) 0.5	(3) GN / BN	(3) 2266	(3) II	(3) —
(4) 4	(4) 0.75	(4) BK	(4) 10119	(4) I	(4) —	(4) AC Outlet 2 Low Reference	(4) 4	(4) 0.75	(4) WH	(4) 10119	(4) II	(4) —
(5) 5	(5) 0.75	(5) BK / WH	(5) 10120	(5) I	(5) —	(5) AC Outlet 2 Phase A Control	(5) 5	(5) 0.75	(5) BK / WH	(5) 10120	(5) II	(5) —
(6) 6	(6) 0.75	(6) RD / WH	(6) 10121	(6) I	(6) —	(6) AC Outlet 2 Phase B Control	(6) 6	(6) 0.75	(6) RD / WH	(6) 10121	(6) II	(6) —

X904A Chassis Rear Wiring Harness Extension Harness to Chassis Wiring Harness



2852121



1853524

Connector Part Information
- Harness Type: Chassis Rear Wiring Harness Extension Harness
- OEM Connector: 7283-3601-10
- Service Connector: Service by Harness - See Part Catalog
- Description: 4-Way F 6.3 Series, Sealed(GY)

Connector Part Information
- Harness Type: Chassis Wiring Harness
- OEM Connector: 7288-3029-10
- Service Connector: 19371198
- Description: 4-Way M 6.3 Series, Sealed(GY)

Terminal Part Information

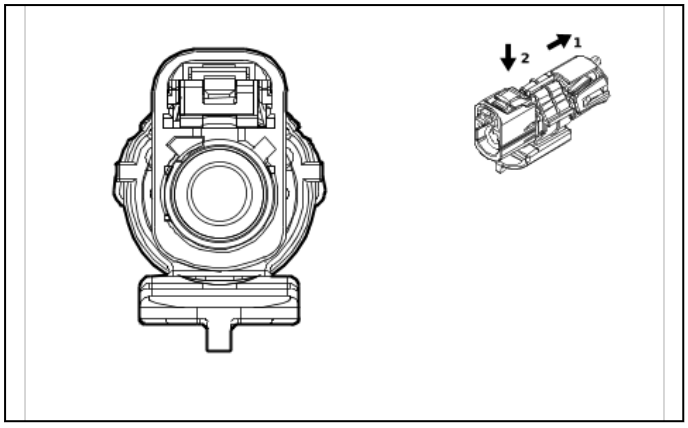
Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-42 (RD)	No Tool Required
II	Not required	J-35616-43 (RD)	No Tool Required

X904A Chassis Rear Wiring Harness Extension Harness to Chassis Wiring Harness

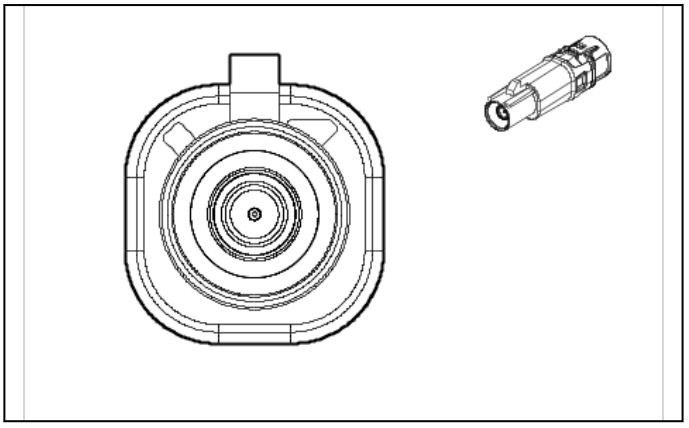
Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 2.5	(1) WH	(1) 2001	(1) I	(1) —	(1) Left Park Brake Motor Apply Control	(1) 1	(1) 5	(1) WH	(1) 2001	(1) II	(1) —
(2) 2	(2) 2.5	(2) GY / BK	(2) 4369	(2) I	(2) —	(2) Left Park Brake Motor Low Reference	(2) 2	(2) 5	(2) GY / BK	(2) 4369	(2) II	(2) —

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(3) 3	(3) 2.5	(3) GN / VT	(3) 1988	(3) I	(3) —	(3) Right Park Brake Motor Apply Control	(3) 3	(3) 5	(3) GN / VT	(3) 1988	(3) II	(3) —
(4) 4	(4) 2.5	(4) GY	(4) 4368	(4) I	(4) —	(4) Right Park Brake Motor Low Reference	(4) 4	(4) 5	(4) GY	(4) 4368	(4) II	(4) —

X933 Chassis Wiring Harness to Rear Object Alarm Sensor Wiring Harness



5519150



5295025

Connector Part Information
- Harness Type: Chassis Wiring Harness COAX
- OEM Connector: 13529796
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type, Sealed(BK)

Connector Part Information
- Harness Type: Rear Object Alarm Sensor Wiring Harness COAX
- OEM Connector: 13517379
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way M Coax Type(BK)

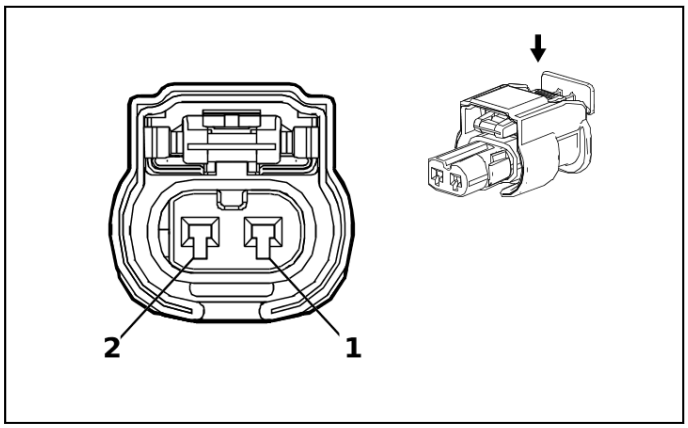
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

X933 Chassis Wiring Harness to Rear Object Alarm Sensor Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
—	—	Coax Cable	—	I	—	Rear Vision Camera Coaxial Video Signal	—	—	Coax Cable	—	I	—

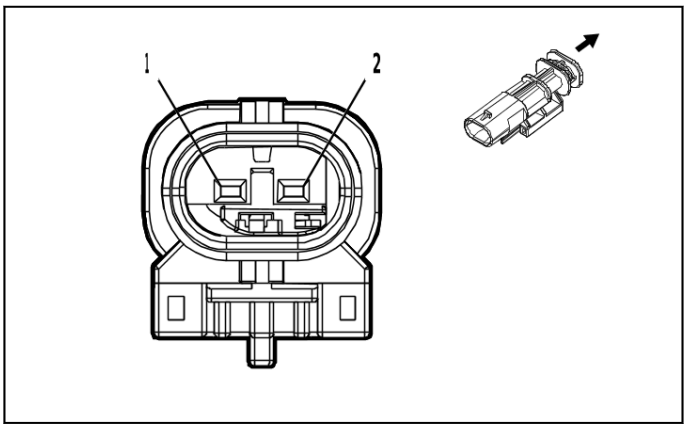
X950 Liftgate Jumper Wiring Harness to Rear Object Alarm Sensor Wiring Harness



5210916

Connector Part Information

- Harness Type: Liftgate Jumper Wiring Harness
- OEM Connector: 34900-2121
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way F 1.2 MCON Series, Sealed(BK)



4994410

Connector Part Information

- Harness Type: Rear Object Alarm Sensor Wiring Harness
- OEM Connector: 34899-2081
- Service Connector: Service by Harness - See Part Catalog
- Description: 2-Way M 1.2 MCON Series, Sealed(GY)

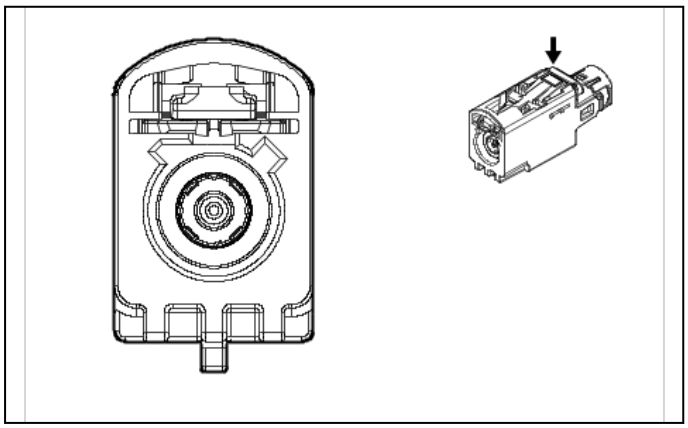
Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	J-35616-16 (L-GN)	No Tool Required
II	Not required	J-35616-17 (L-GN)	No Tool Required

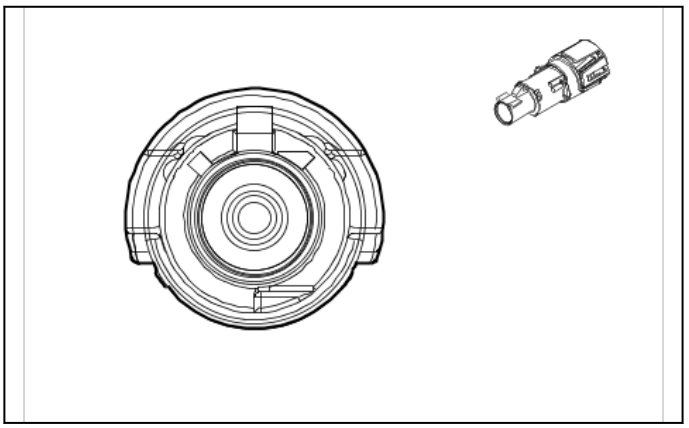
X950 Liftgate Jumper Wiring Harness to Rear Object Alarm Sensor Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
(1) 1	(1) 0.5	(1) GY / VT	(1) 2691	(1) I	(1) —	(1) Rear Closure Actuator Lock Control	(1) 1	(1) 0.5	(1) GY / VT	(1) 2691	(1) II	(1) —
(2) 2	(2) 0.5	(2) GY / BK	(2) 2680	(2) I	(2) —	(2) Lock Actuators Unlock Control 2	(2) 2	(2) 0.5	(2) GY / BK	(2) 2680	(2) II	(2) —

X955 Rear Object Alarm Sensor Wiring Harness to Liftgate Jumper Wiring Harness



5263386



5518522

Connector Part Information
- Harness Type: Rear Object Alarm Sensor Wiring Harness COAX
- OEM Connector: 13517364
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way F Coax Type(BK)

Connector Part Information
- Harness Type: Liftgate Jumper Wiring Harness COAX
- OEM Connector: 13516806
- Service Connector: Service by Cable Assembly — See Part Catalog
- Description: 1-Way M Coax Type, Sealed(BK)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool
I	Not required	No Tool Required	No Tool Required

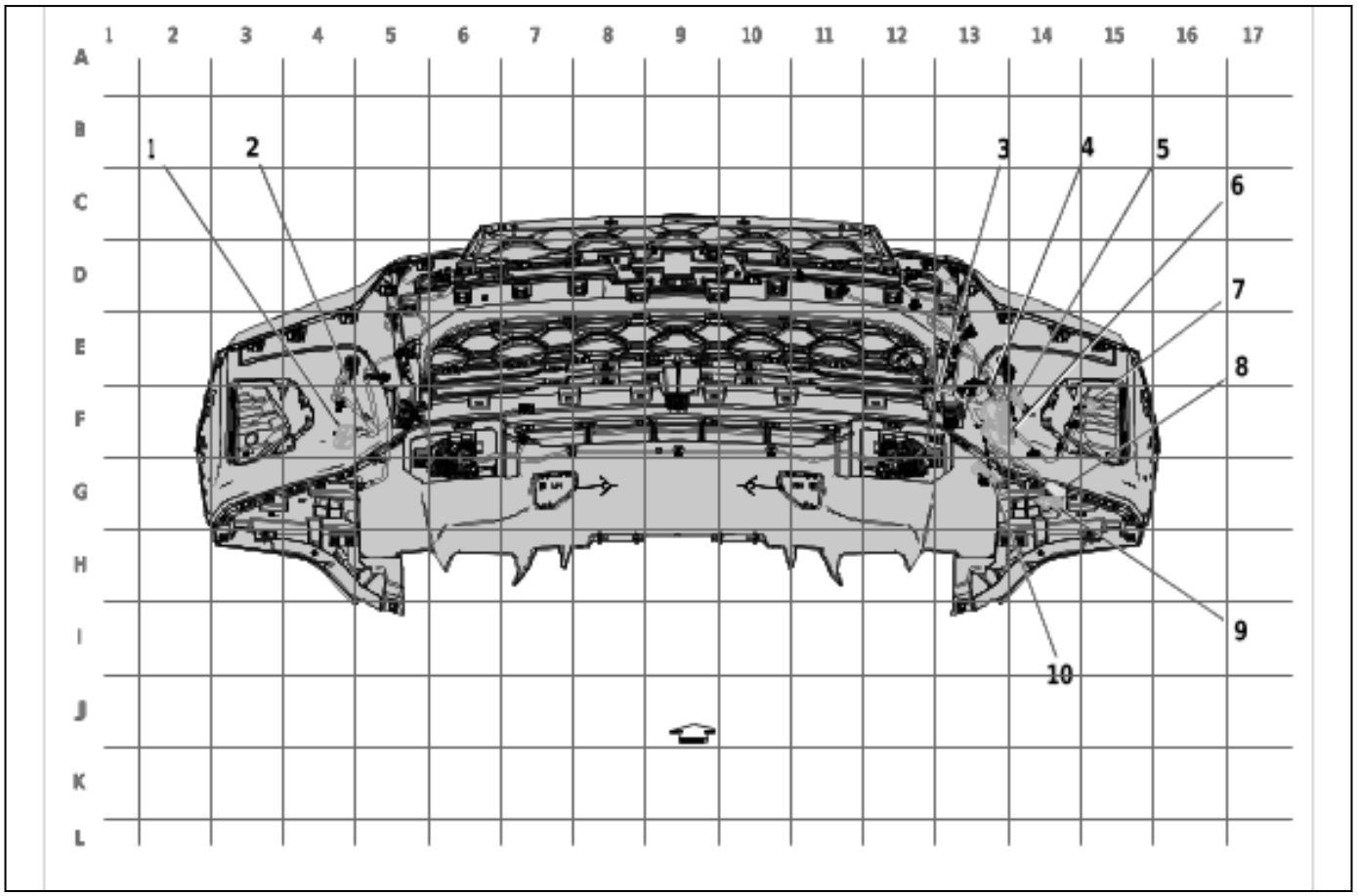
X955 Rear Object Alarm Sensor Wiring Harness to Liftgate Jumper Wiring Harness

Pin	Size	Color	Circuit	Terminal Type ID	Option	Function	Pin	Size	Color	Circuit	Terminal Type ID	Option
—	—	Coax Cable	—	I	—	Rear Vision Camera Coaxial Video Signal	—	—	Coax Cable	—	I	—

Electrical Component Locator and Harness Routing Views

Schematic and Routing Diagrams

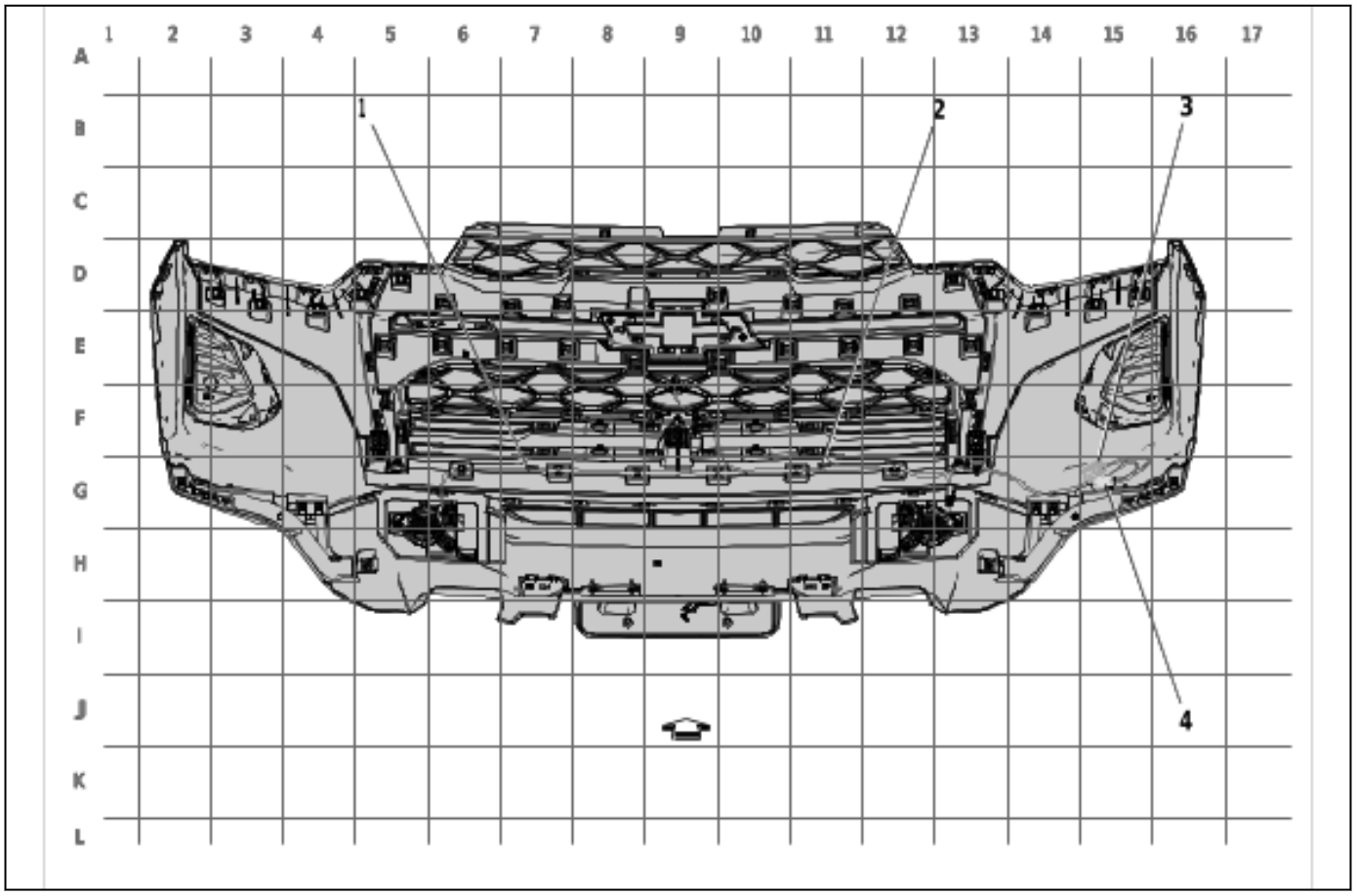
Forward Lamp Harness Routing - Front Fascia



6180243

Items
(1) X150 Body Wiring Harness to Forward Lamp Wiring Harness
(2) J102 Forward Lamp Wiring Harness
(3) J103 Forward Lamp Wiring Harness
(4) J104 Forward Lamp Wiring Harness
(5) X156 Body Wiring Harness to Forward Lamp Wiring Harness (UV2/UXA)
(6) X250R Body Wiring Harness to Forward Lamp Wiring Harness
(7) X250J Windshield Washer Pump Extension Wiring Harness to Forward Lamp Wiring Harness
(8) X195 Forward Lamp Wiring Harness to Front View Camera Switch Wiring Harness
(9) X260 Front Object Alarm Sensor Wiring Harness to Forward Lamp Wiring Harness
(10) X250A Radiator Extension Harness to Forward Lamp Wiring Harness

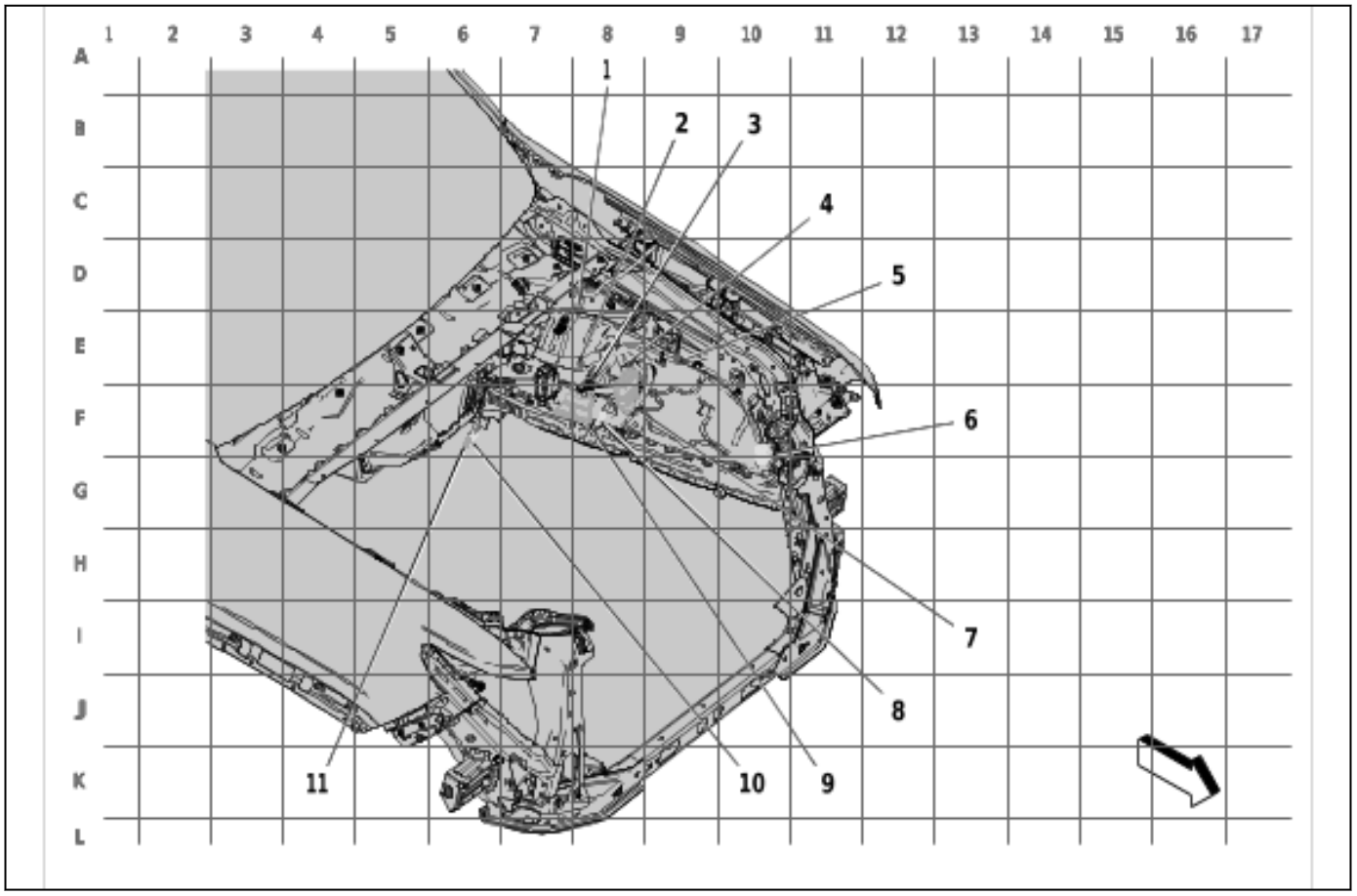
Front Fascia Harness Routing



6180244

Items
(1) J101 Front Object Alarm Sensor Wiring Harness
(2) J100 Front Object Alarm Sensor Wiring Harness
(3) X260 Front Object Alarm Sensor Wiring Harness to Forward Lamp Wiring Harness
(4) X195 Forward Lamp Wiring Harness to Front View Camera Switch Wiring Harness

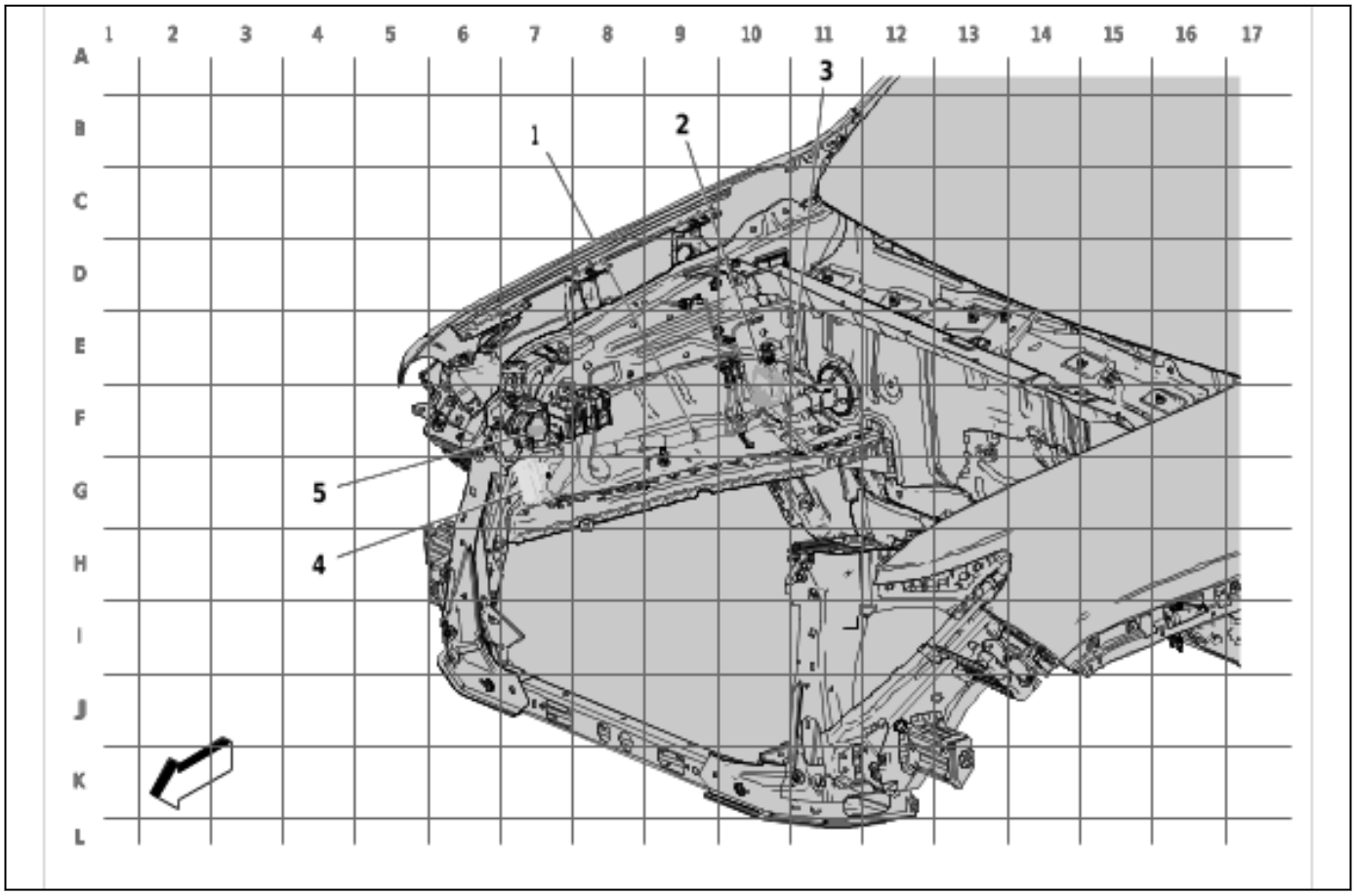
Body Harness Routing - Left Side of Engine Compartment



6180245

Items
(1) J114 Body Wiring Harness
(2) J113 Body Wiring Harness
(3) J112 Body Wiring Harness
(4) J110 Body Wiring Harness
(5) J111 Body Wiring Harness
(6) X150 Body Wiring Harness to Forward Lamp Wiring Harness
(7) X100 Chassis Wiring Harness to Body Wiring Harness
(8) X199 Chassis Wiring Harness to Body Wiring Harness
(9) X101 Body Wiring Harness to Chassis Wiring Harness
(10) X384 Rearview Camera Wiring Harness Jumper to Body Wiring Harness (UXA)
(11) X383 Rearview Camera Wiring Hanress Jumper to Body Wiring Harness

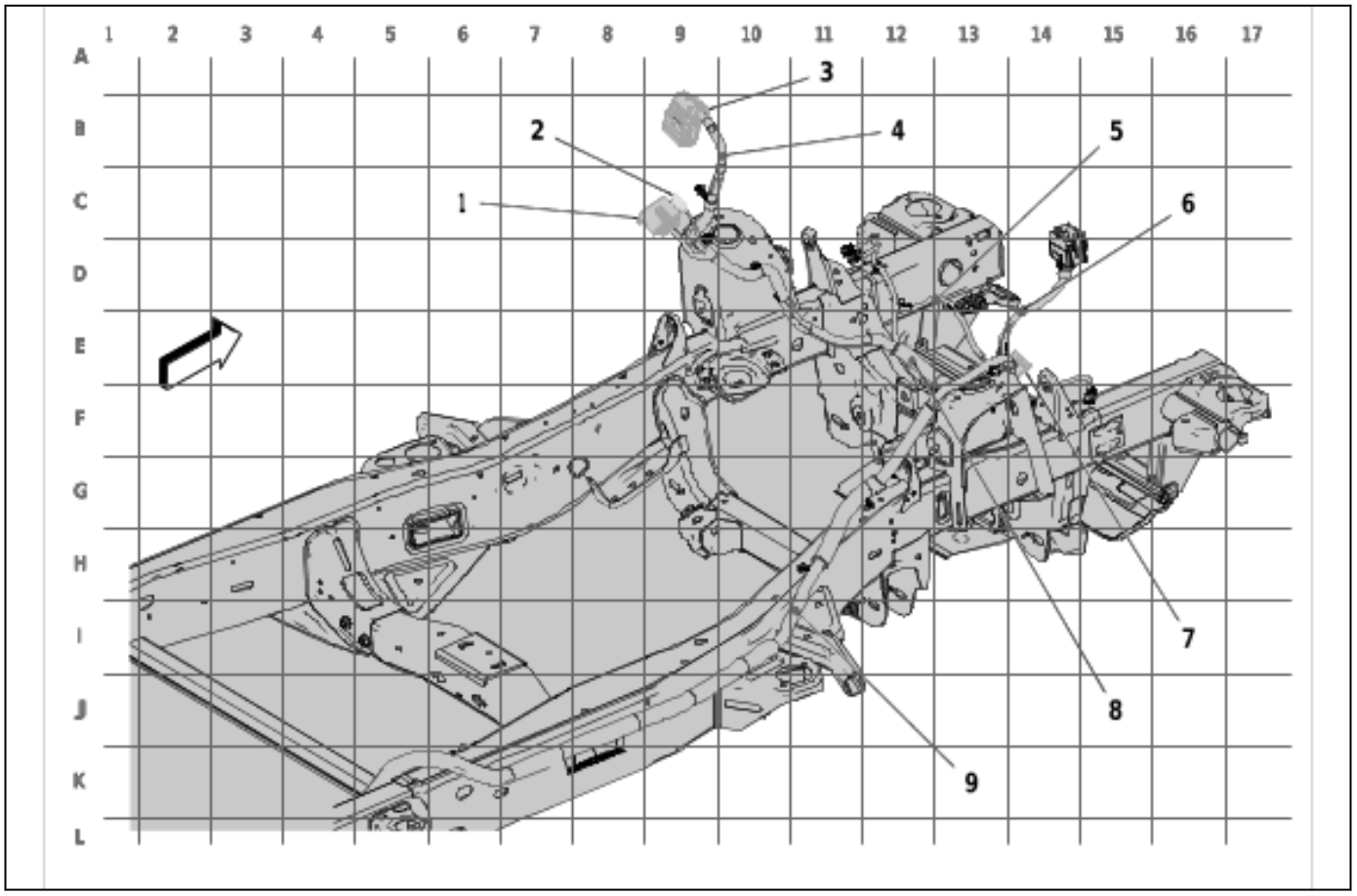
Body Harness Routing - Right Side of Engine Compartment



6180246

Items
(1) J106 Body Wiring Harness
(2) X201 Engine Wiring Harness to Body Wiring Harness
(3) J105 Body Wiring Harness
(4) X250R Body Wiring Harness to Forward Lamp Wiring Harness
(5) X156 Body Wiring Harness to Forward Lamp Wiring Harness (UV2/UXA)

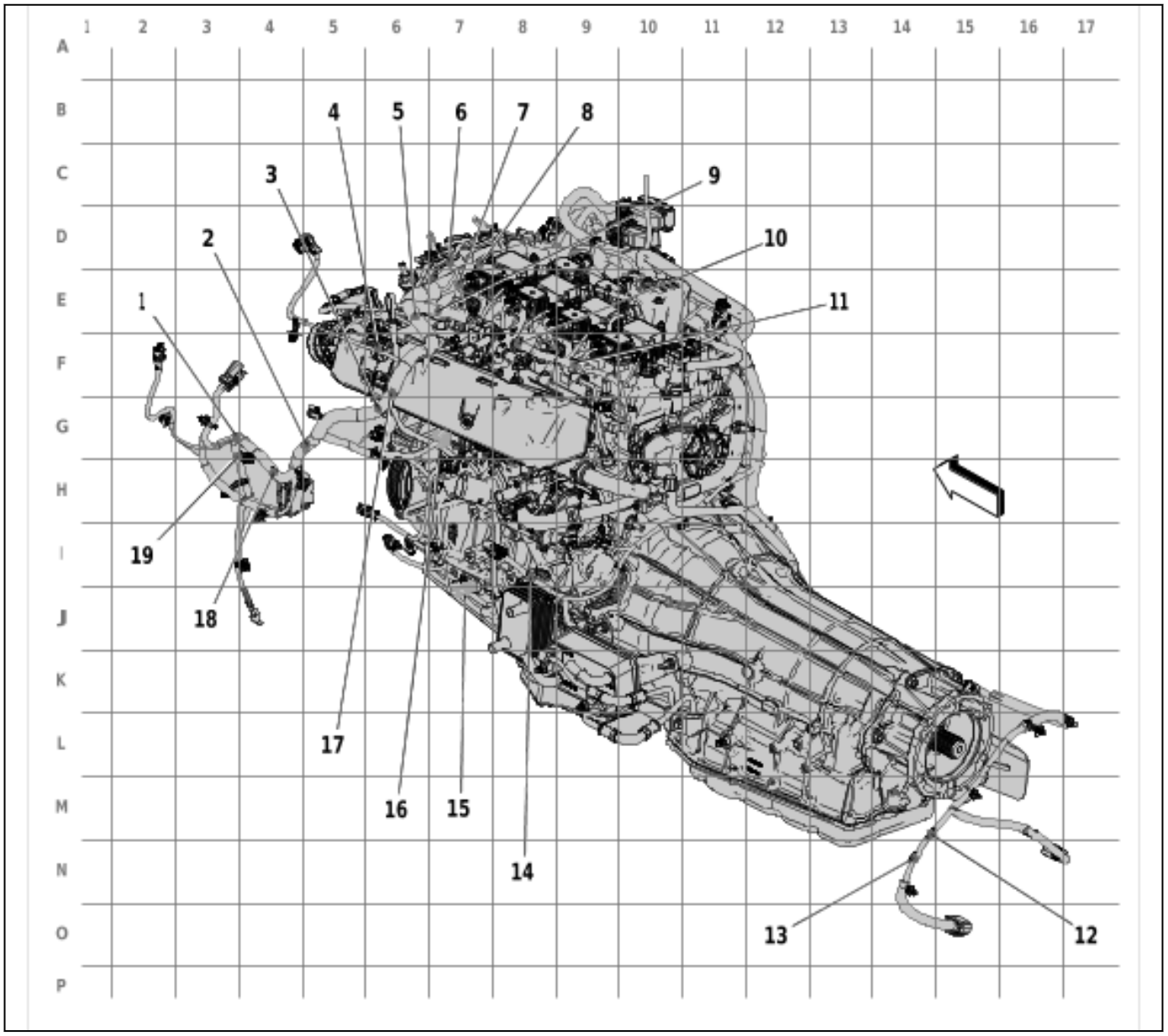
Chassis Harness Routing - Front



6180247

Items
(1) X101 Body Wiring Harness to Chassis Wiring Harness
(2) X199 Chassis Wiring Harness to Body Wiring Harness
(3) X100 Chassis Wiring Harness to Body Wiring Harness
(4) J109 Chassis Wiring Harness
(5) J108 Chassis Wiring Harness
(6) J115 Chassis Wiring Harness
(7) X204 Engine Wiring Harness to Chassis Wiring Harness
(8) X107 Chassis Wiring Harness to Power Steering Wiring Harness
(9) J116 Chassis Wiring Harness

Engine Harness Routing - Left

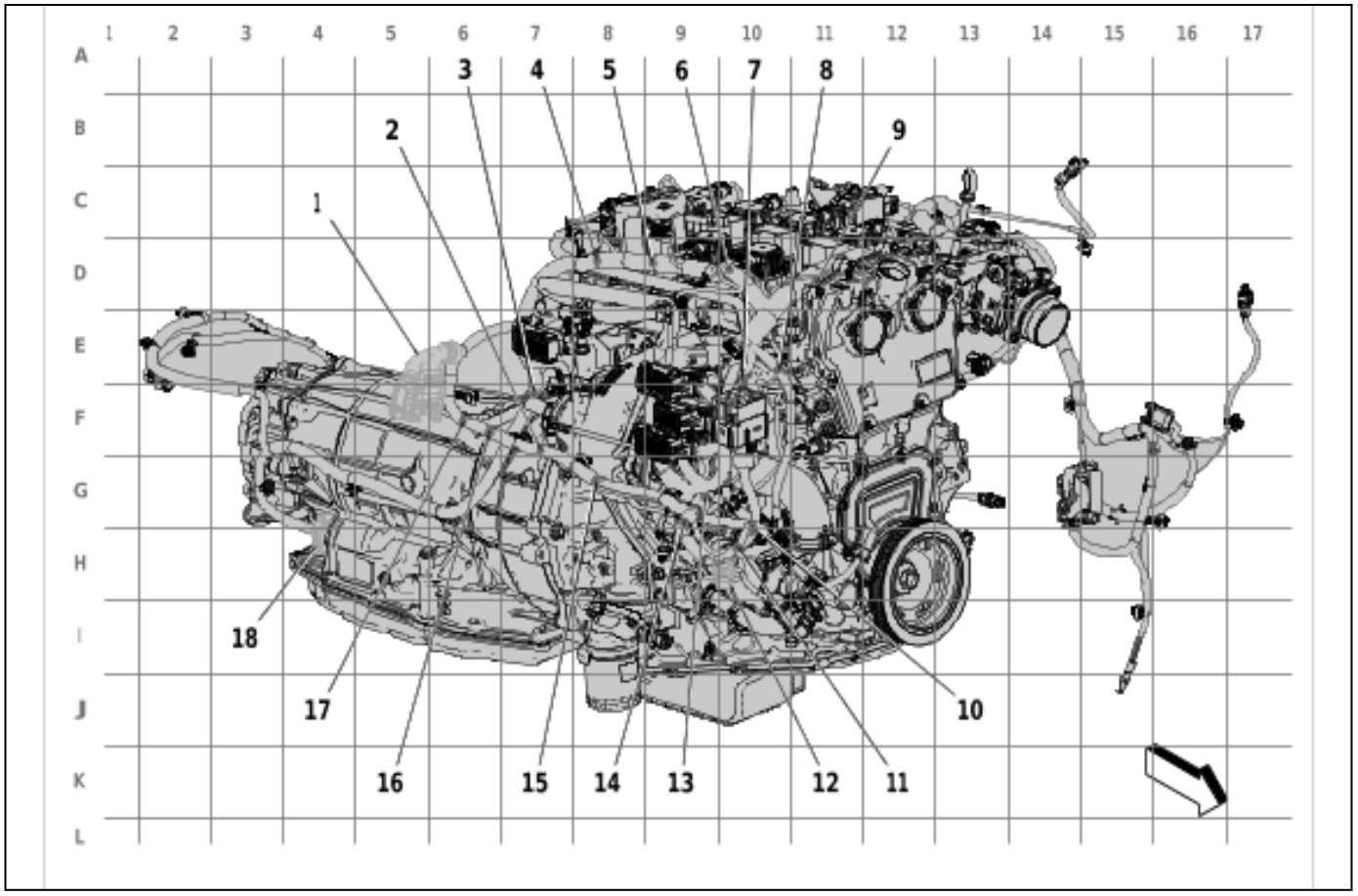


6180248

Items
(1) J151 Engine Wiring Harness
(2) J149 Engine Wiring Harness
(3) J147 Engine Wiring Harness
(4) J142 Engine Wiring Harness
(5) J141 Engine Wiring Harness
(6) J136 Engine Wiring Harness
(7) J135 Engine Wiring Harness
(8) J132 Engine Wiring Harness
(9) J138 Engine Wiring Harness
(10) J140 Engine Wiring Harness
(11) J143 Engine Wiring Harness
(12) J145 Engine Wiring Harness

Items
(13) J146 Engine Wiring Harness
(14) J139 Engine Wiring Harness
(15) X144 Engine Wiring Harness to Oil Pump Flow Control Solenoid Valve Harness
(16) X160 Engine Wiring Harness to Fuel Injector Wiring Harness
(17) J144 Engine Wiring Harness
(18) J150 Engine Wiring Harness
(19) J152 Engine Wiring Harness

Engine Harness Routing - Right Front

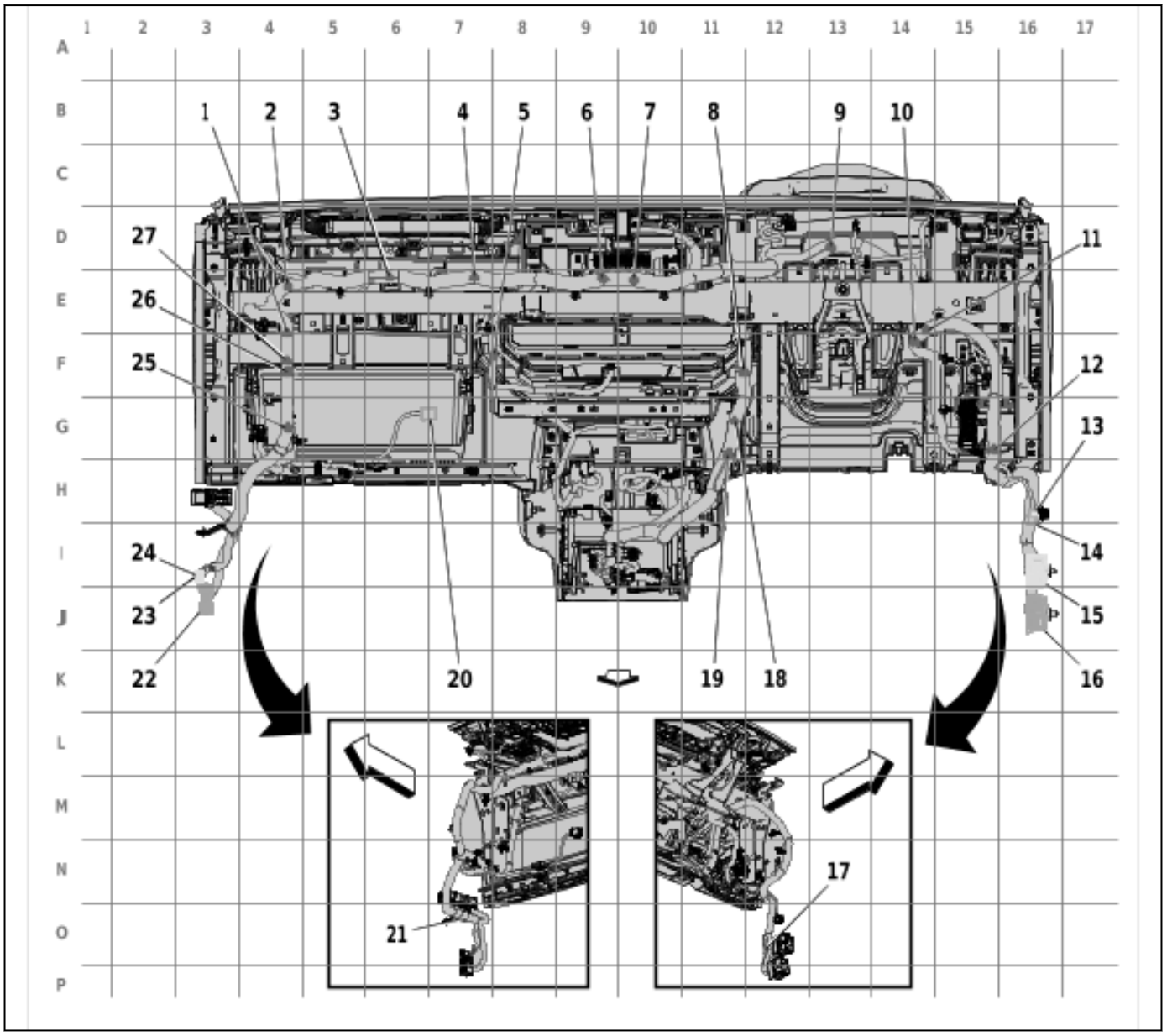


6180249

Items
(1) X201 Engine Wiring Harness to Body Wiring Harness
(2) J123 Engine Wiring Harness
(3) J137 Engine Wiring Harness
(4) J134 Engine Wiring Harness
(5) J133 Engine Wiring Harness
(6) J130 Engine Wiring Harness
(7) J128 Engine Wiring Harness
(8) J129 Engine Wiring Harness
(9) J131 Engine Wiring Harness
(10) J120 Engine Wiring Harness

Items
(11) J121 Engine Wiring Harness
(12) X204 Engine Wiring Harness to Chassis Wiring Harness
(13) J127 Engine Wiring Harness
(14) J122 Engine Wiring Harness
(15) J126 Engine Wiring Harness
(16) J124 Engine Wiring Harness
(17) J125 Engine Wiring Harness
(18) X175 Engine Wiring Harness to Automatic Transmission Wiring Harness

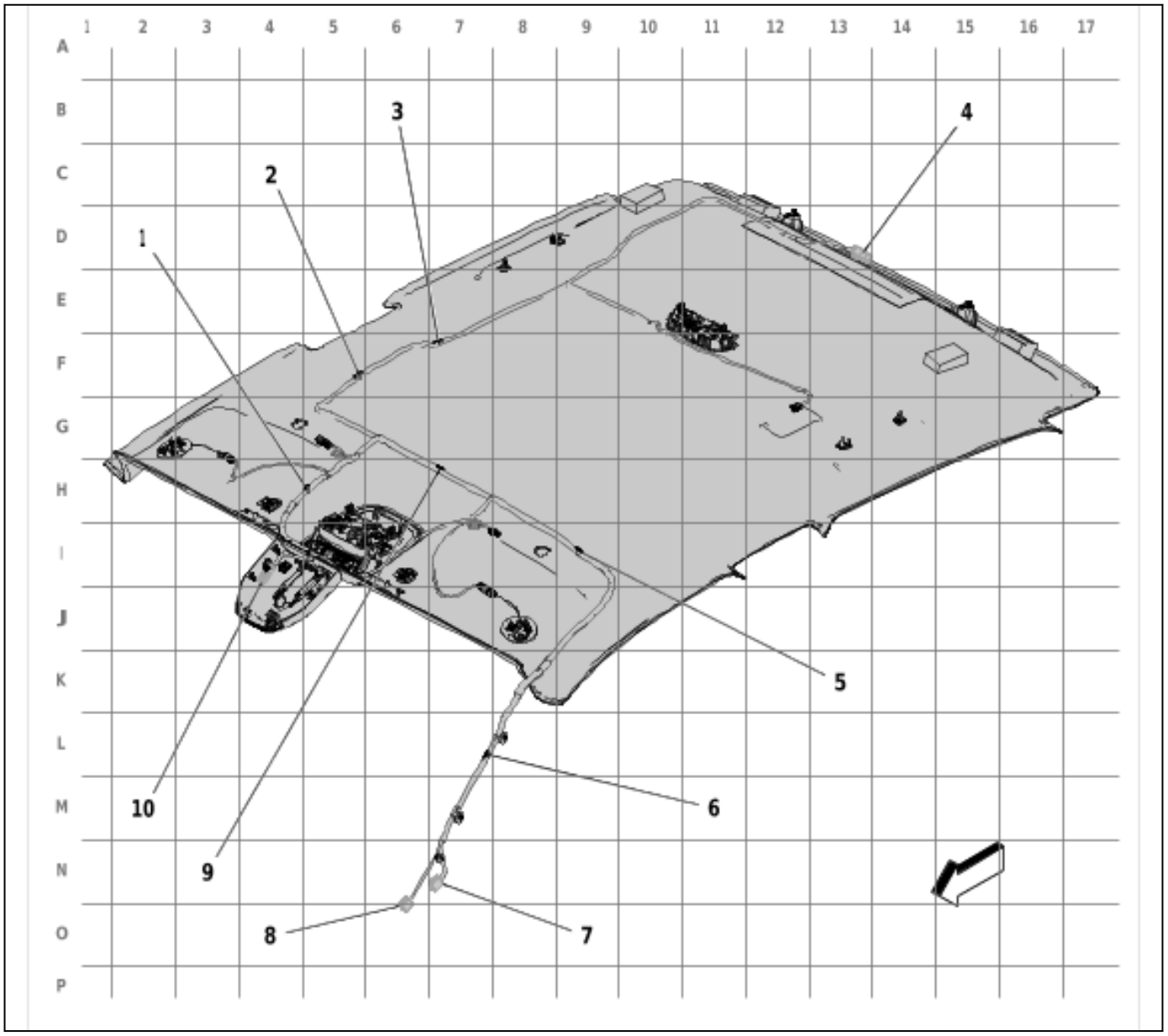
Instrument Panel Harness Routing



6742366

Items
(1) J227 Instrument Panel Wiring Harness
(2) J228 Instrument Panel Wiring Harness
(3) J225 Instrument Panel Wiring Harness
(4) J224 Instrument Panel Wiring Harness
(5) J223 Instrument Panel Wiring Harness
(6) J222 Instrument Panel Wiring Harness
(7) J219 Instrument Panel Wiring Harness
(8) J214 Instrument Panel Wiring Harness
(9) J211 Instrument Panel Wiring Harness
(10) J210 Instrument Panel Wiring Harness
(11) J209 Instrument Panel Wiring Harness
(12) J208 Instrument Panel Wiring Harness
(13) X380 Instrument Panel Wiring Harness to Body Wiring Harness (UV2/UXA-UVB)
(14) X399 Instrument Panel Wiring Harness to Body Wiring Harness (UVB-UV2)
(15) X300 Body Wiring Harness to Instrument Panel Wiring Harness
(16) X301 Body Wiring Harness to Instrument Panel Wiring Harness
(17) W24 Blunt Cut - Trailer Brakes Provision
(18) J213 Instrument Panel Wiring Harness
(19) J212 Instrument Panel Wiring Harness
(20) X315 Instrument Panel Wiring Harness to Air Conditioning Wiring Harness
(21) W25 Blunt Cut - Configurable/Accessory Relay
(22) X400 Instrument Panel Wiring Harness to Body Wiring Harness
(23) X499C Body Wiring Harness to Instrument Panel Wiring Harness
(24) X499A Body Wiring Harness to Instrument Panel Wiring Harness
(25) J230 Instrument Panel Wiring Harness
(26) J229 Instrument Panel Wiring Harness
(27) J226 Instrument Panel Wiring Harness

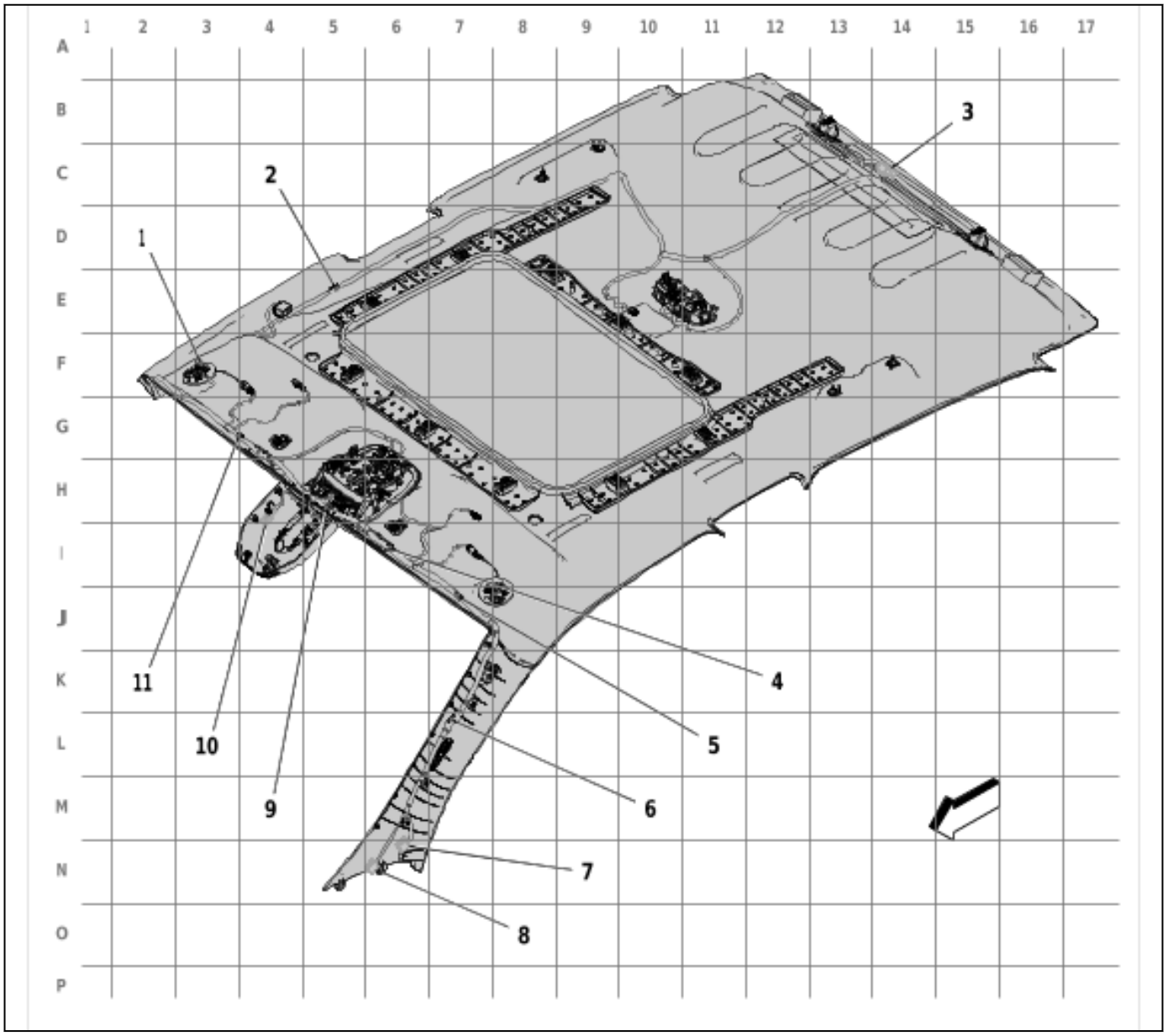
Headliner Harness Routing (- CAC)



6180251

Items
(1) J363 Headlining Wiring Harness
(2) J364 Headlining Wiring Harness
(3) J365 Headlining Wiring Harness
(4) X500 Roof Wiring Harness to Body Wiring Harness
(5) J361 Headlining Wiring Harness
(6) J360 Headlining Wiring Harness
(7) X402C Roof Wiring Harness to Body Wiring Harness
(8) X401 Roof Wiring Harness to Body Wiring Harness
(9) J362 Headlining Wiring Harness
(10) X402D Inside Air Moisture and Windshield Temperature Sensor Jumper to Roof Wiring Harness (CJ2)

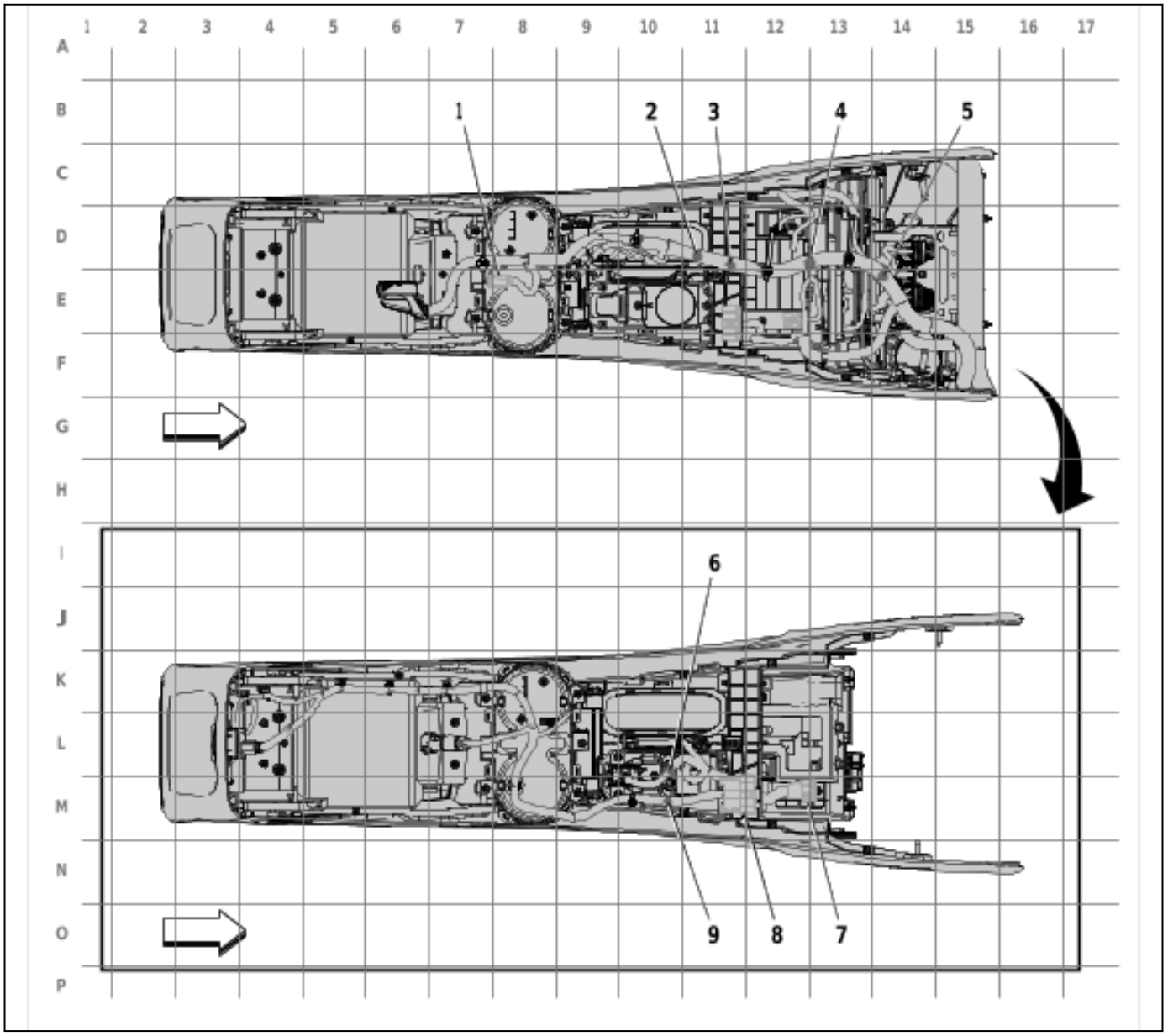
Headliner Harness Routing (CAC)



6180252

Items
(1) J362 Headlining Wiring Harness
(2) J364 Headlining Wiring Harness
(3) X500 Roof Wiring Harness to Body Wiring Harness
(4) J366 Headlining Wiring Harness
(5) J365 Headlining Wiring Harness
(6) J360 Headlining Wiring Harness
(7) X402C Roof Wiring Harness to Body Wiring Harness
(8) X401 Roof Wiring Harness to Body Wiring Harness
(9) J363 Headlining Wiring Harness
(10) X402D Inside Air Moisture and Windshield Temperature Sensor Jumper to Roof Wiring Harness (CJ2)
(11) J361 Headlining Wiring Harness

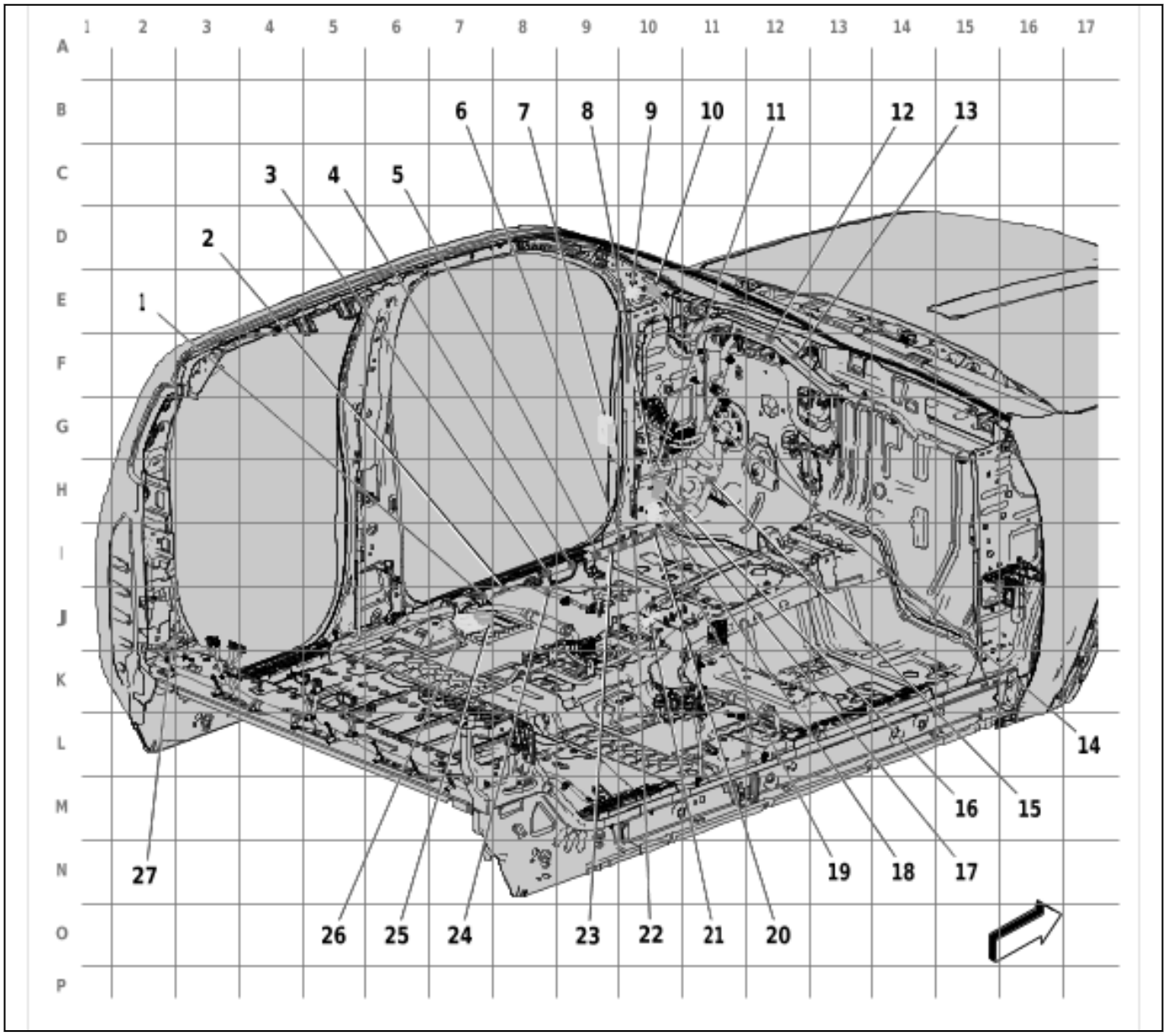
Floor Console Harness Routing



6180253

Items
(1) X367 Instrument Panel Wiring Harness to Body Wiring Harness
(2) J218 Instrument Panel Wiring Harness
(3) J217 Instrument Panel Wiring Harness
(4) J216 Instrument Panel Wiring Harness
(5) J215 Instrument Panel Wiring Harness
(6) J331 Front Floor Console Wiring Harness
(7) X304 Instrument Panel Wiring Harness to Front Floor Console Wiring Harness Extension Harness
(8) X305 Instrument Panel Wiring Harness to Front Floor Console Wiring Harness
(9) J330 Front Floor Console Wiring Harness

Body Harness Routing - Left Front of Passenger Compartment

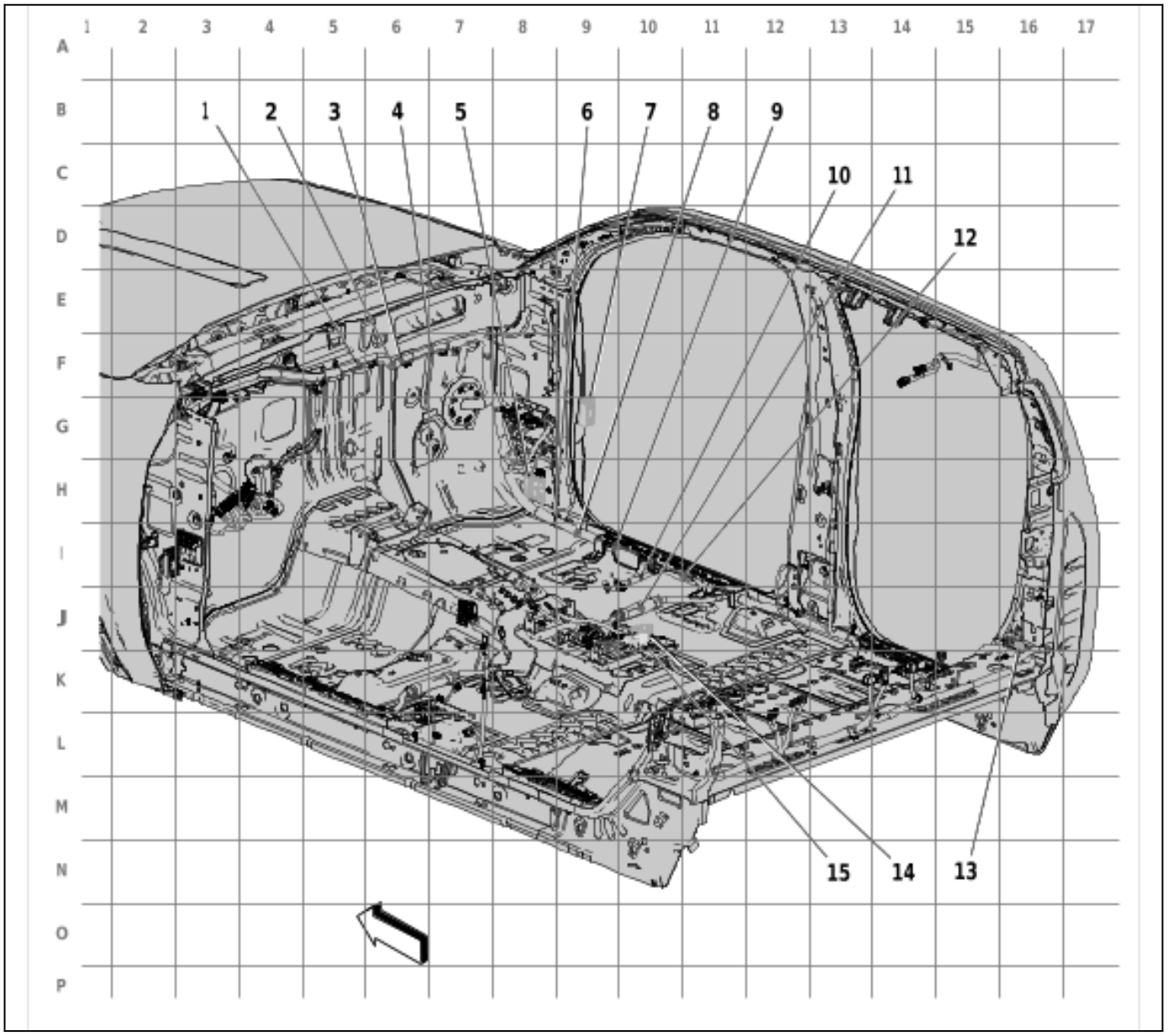


6685728

Items
(1) J312 Body Wiring Harness
(2) J311 Body Wiring Harness
(3) J309 Body Wiring Harness
(4) J308 Body Wiring Harness
(5) J307 Body Wiring Harness
(6) J305 Body Wiring Harness
(7) X303 Body Wiring Harness to Front Side Door Door Wiring Harness - Driver
(8) X399 Instrument Panel Wiring Harness to Body Wiring Harness (UVB-UV2)
(9) X402C Roof Wiring Harness to Body Wiring Harness
(10) X401 Roof Wiring Harness to Body Wiring Harness

Items
(11) X380 Instrument Panel Wiring Harness to Body Wiring Harness (UV2/UXA-UVB)
(12) J201 Body Wiring Harness
(13) J202 Body Wiring Harness
(14) J300 Body Wiring Harness
(15) J207 Body Wiring Harness
(16) J301 Body Wiring Harness
(17) X300 Body Wiring Harness to Instrument Panel Wiring Harness
(18) J302 Body Wiring Harness
(19) X301 Body Wiring Harness to Instrument Panel Wiring Harness
(20) J303 Body Wiring Harness
(21) X367 Instrument Panel Wiring Harness to Body Wiring Harness
(22) J304 Body Wiring Harness
(23) J306 Body Wiring Harness
(24) J310 Body Wiring Harness
(25) X302A Front Seat Wiring Harness - Driver to Body Wiring Harness
(26) X302B Front Seat Wiring Harness - Driver to Body Wiring Harness
(27) F112LR Rear Seat Belt Retractor - Left

Body Harness Routing - Right Front of Passenger Compartment

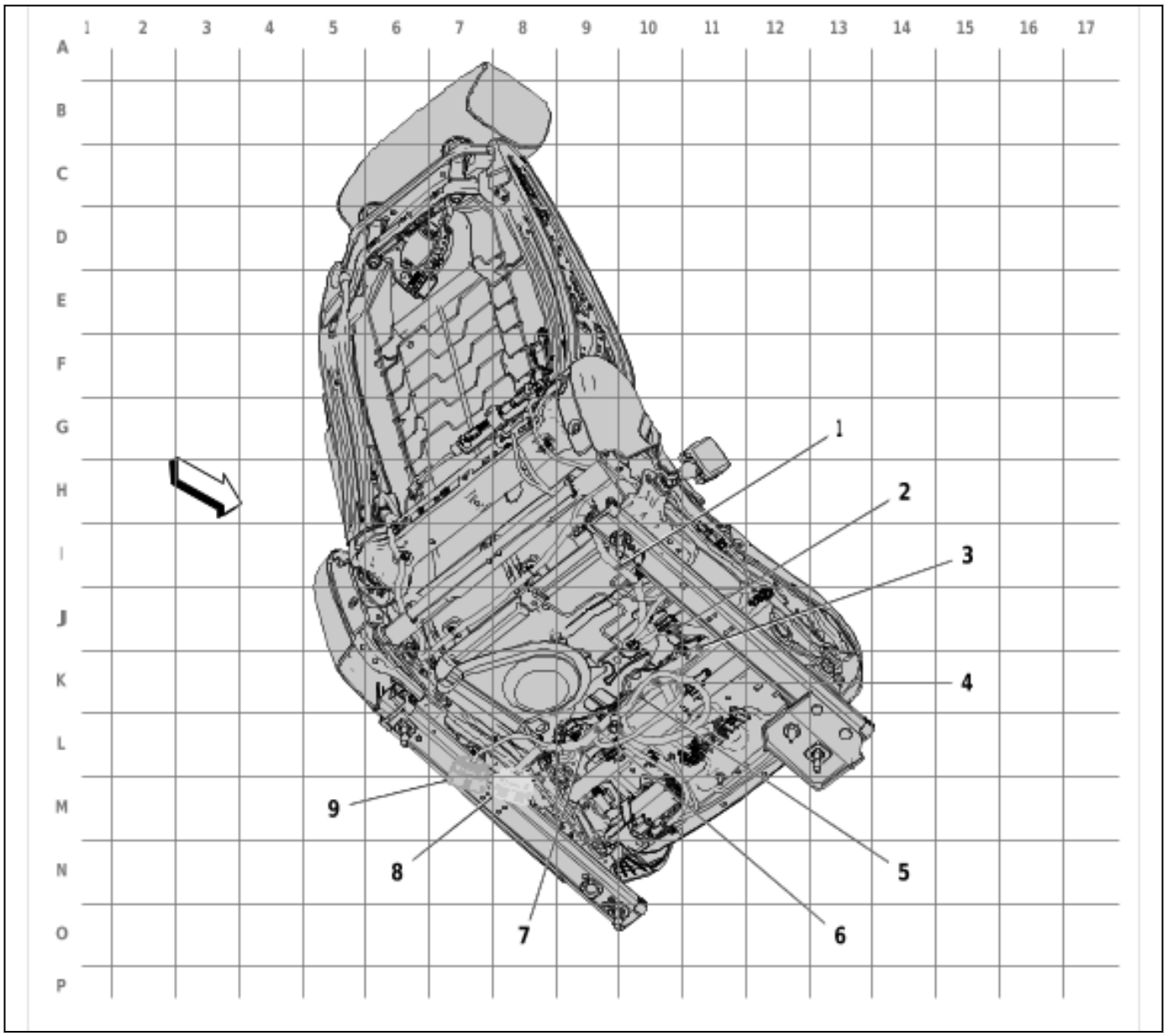


6685729

Items
(1) J203 Body Wiring Harness
(2) J204 Body Wiring Harness
(3) J205 Body Wiring Harness
(4) J206 Body Wiring Harness
(5) X400 Instrument Panel Wiring Harness to Body Wiring Harness
(6) J320 Body Wiring Harness
(7) X404 Body Wiring Harness to Front Side Door Door Wiring Harness - Passenger
(8) J321 Body Wiring Harness
(9) J322 Body Wiring Harness
(10) J324 Body Wiring Harness
(11) J325 Body Wiring Harness

Items
(12) J323 Body Wiring Harness
(13) F112RR Rear Seat Belt Retractor - Right
(14) X402A Front Seat Wiring Harness - Passenger to Body Wiring Harness
(15) X402B Front Seat Wiring Harness - Passenger to Body Wiring Harness

Front Seat Wiring Harness - Driver Routing

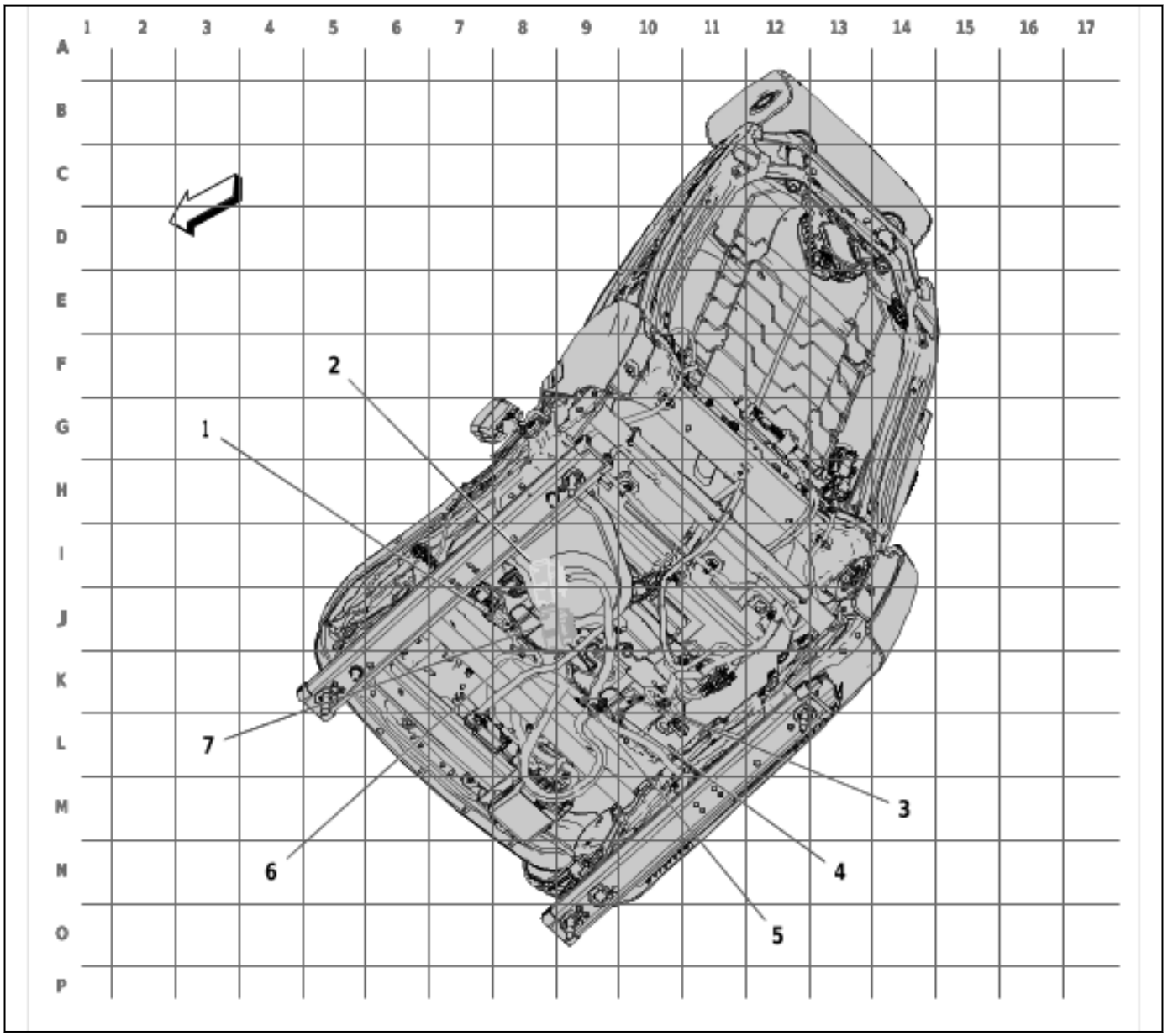


6180256

Items
(1) J345 Front Seat Wiring Harness - Driver
(2) J346 Front Seat Wiring Harness - Driver
(3) J344 Front Seat Wiring Harness - Driver
(4) J343 Front Seat Wiring Harness - Driver
(5) J342 Front Seat Wiring Harness - Driver

Items
(6) J341 Front Seat Wiring Harness - Driver
(7) J340 Front Seat Wiring Harness - Driver
(8) X302A Front Seat Wiring Harness - Driver to Body Wiring Harness
(9) X302B Front Seat Wiring Harness - Driver to Body Wiring Harness

Front Seat Wiring Harness - Passenger Routing

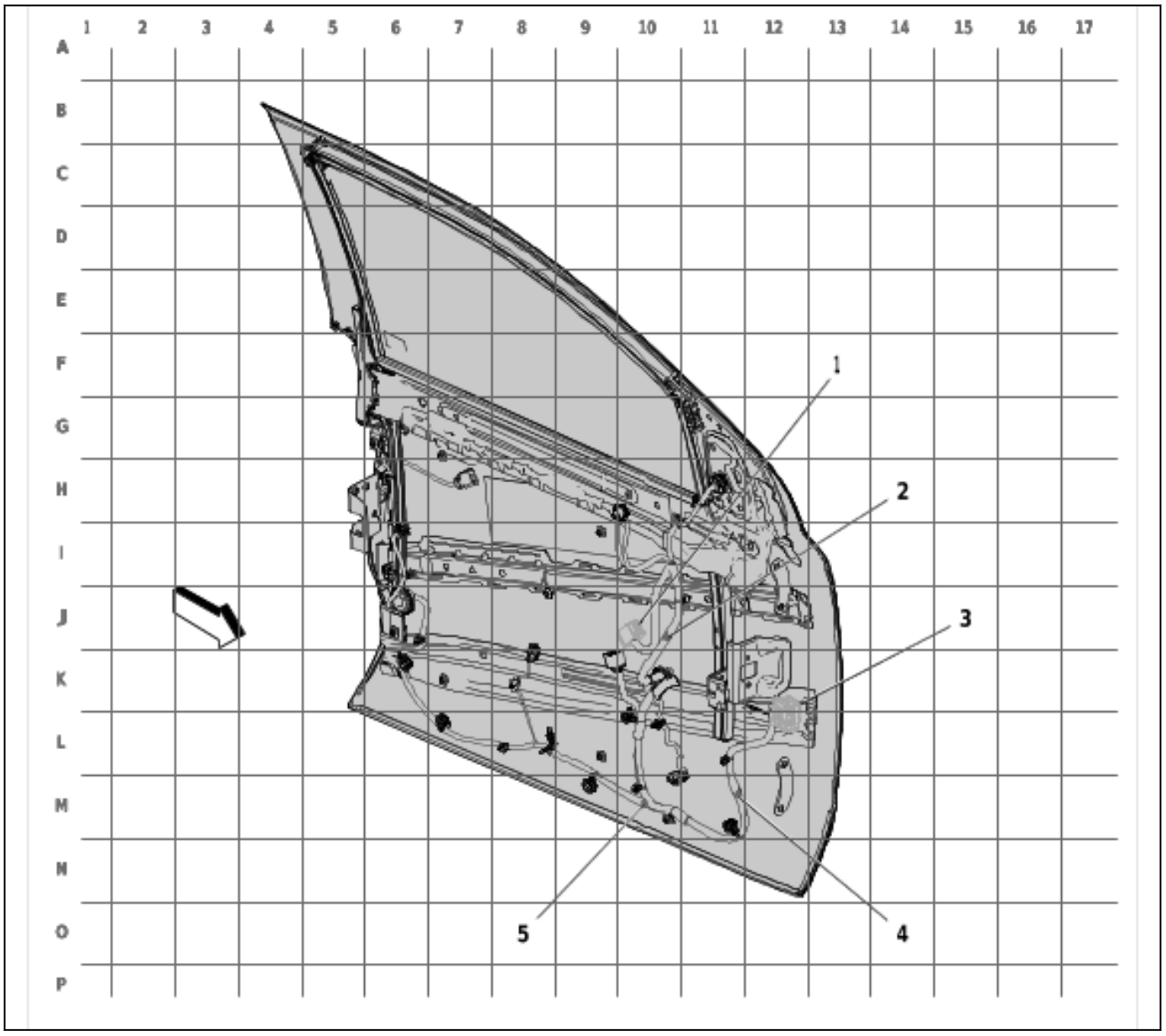


6180257

Items
(1) J348 Front Seat Wiring Harness - Passenger
(2) X402B Front Seat Wiring Harness - Passenger to Body Wiring Harness
(3) J349 Front Seat Wiring Harness - Passenger
(4) J351 Front Seat Wiring Harness - Passenger

Items
(5) J350 Front Seat Wiring Harness - Passenger
(6) J347 Front Seat Wiring Harness - Passenger
(7) X402A Front Seat Wiring Harness - Passenger to Body Wiring Harness

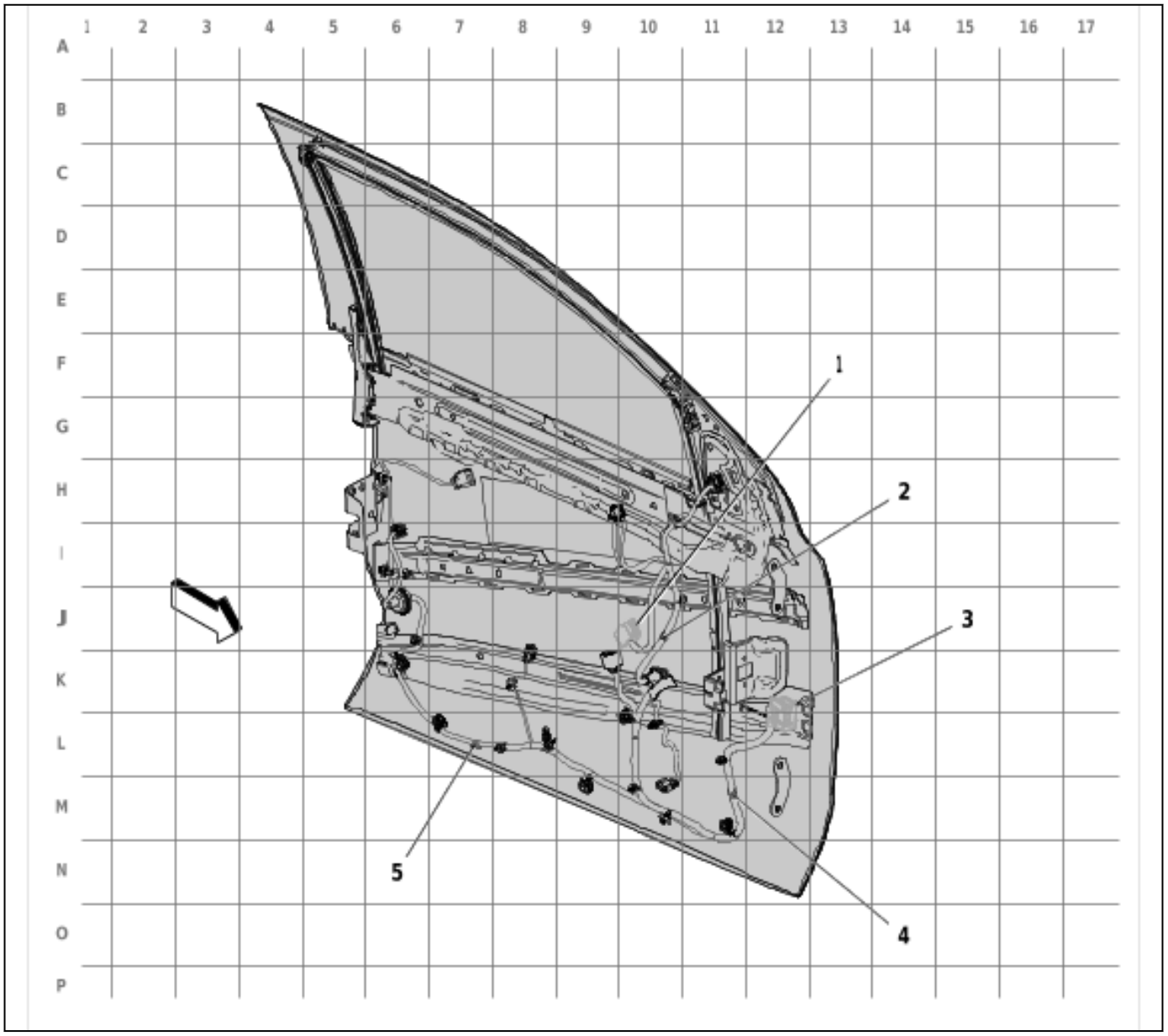
Driver Door Harness Routing (UQ3)



6180258

Items
(1) X393 Front Side Door Door Wiring Harness - Driver to Front Side Door Door Lock Door Wiring Harness - Driver
(2) J500 Front Side Door Door Wiring Harness - Driver
(3) X303 Body Wiring Harness to Front Side Door Door Wiring Harness - Driver
(4) J501 Front Side Door Door Wiring Harness - Driver
(5) J502 Front Side Door Door Wiring Harness - Driver

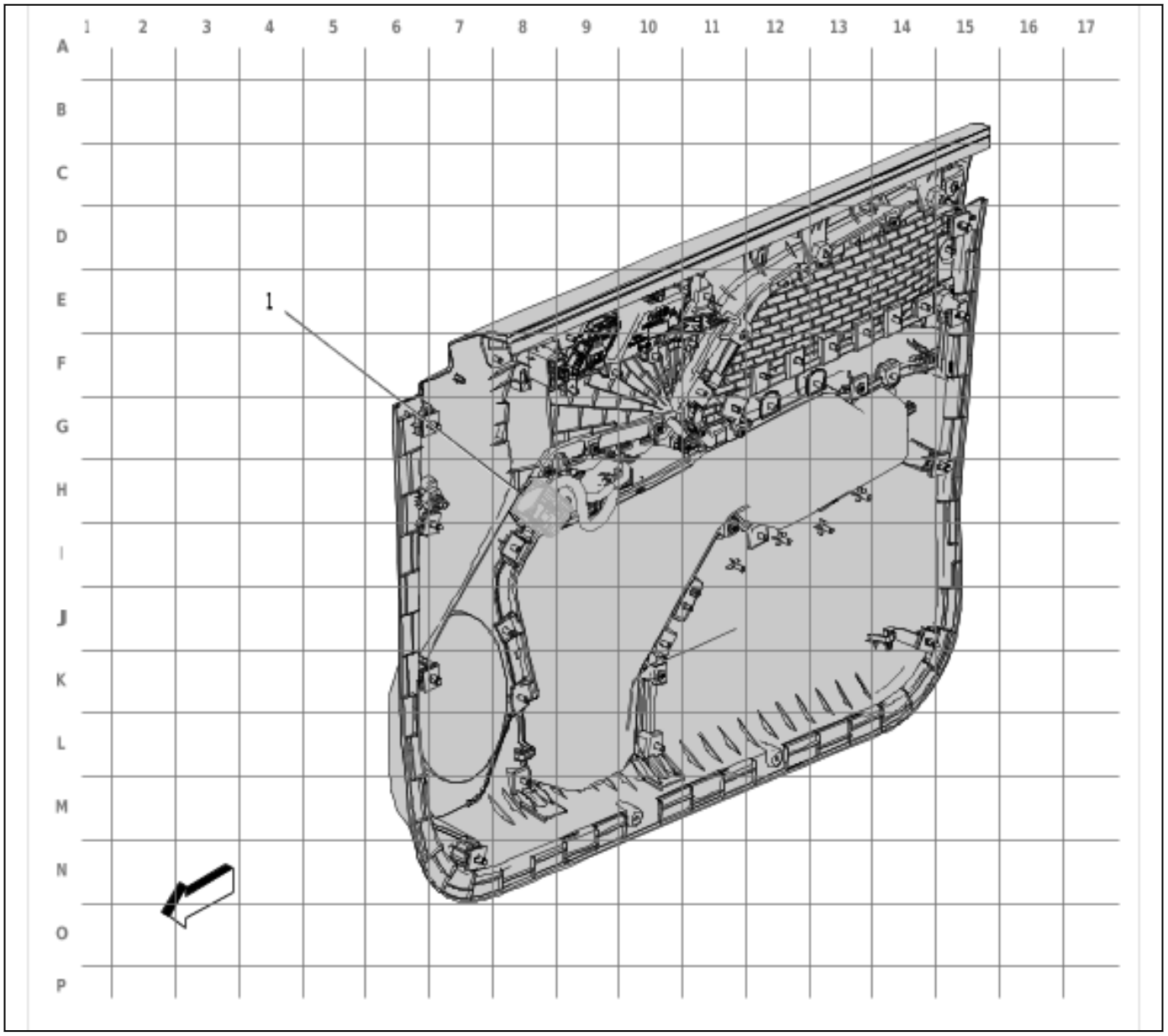
Driver Door Harness Routing (UQA)



6180259

Items
(1) X393 Front Side Door Door Wiring Harness - Driver to Front Side Door Door Lock Door Wiring Harness - Driver
(2) J500 Front Side Door Door Wiring Harness - Driver
(3) X303 Body Wiring Harness to Front Side Door Door Wiring Harness - Driver
(4) J501 Front Side Door Door Wiring Harness - Driver
(5) J502 Front Side Door Door Wiring Harness - Driver

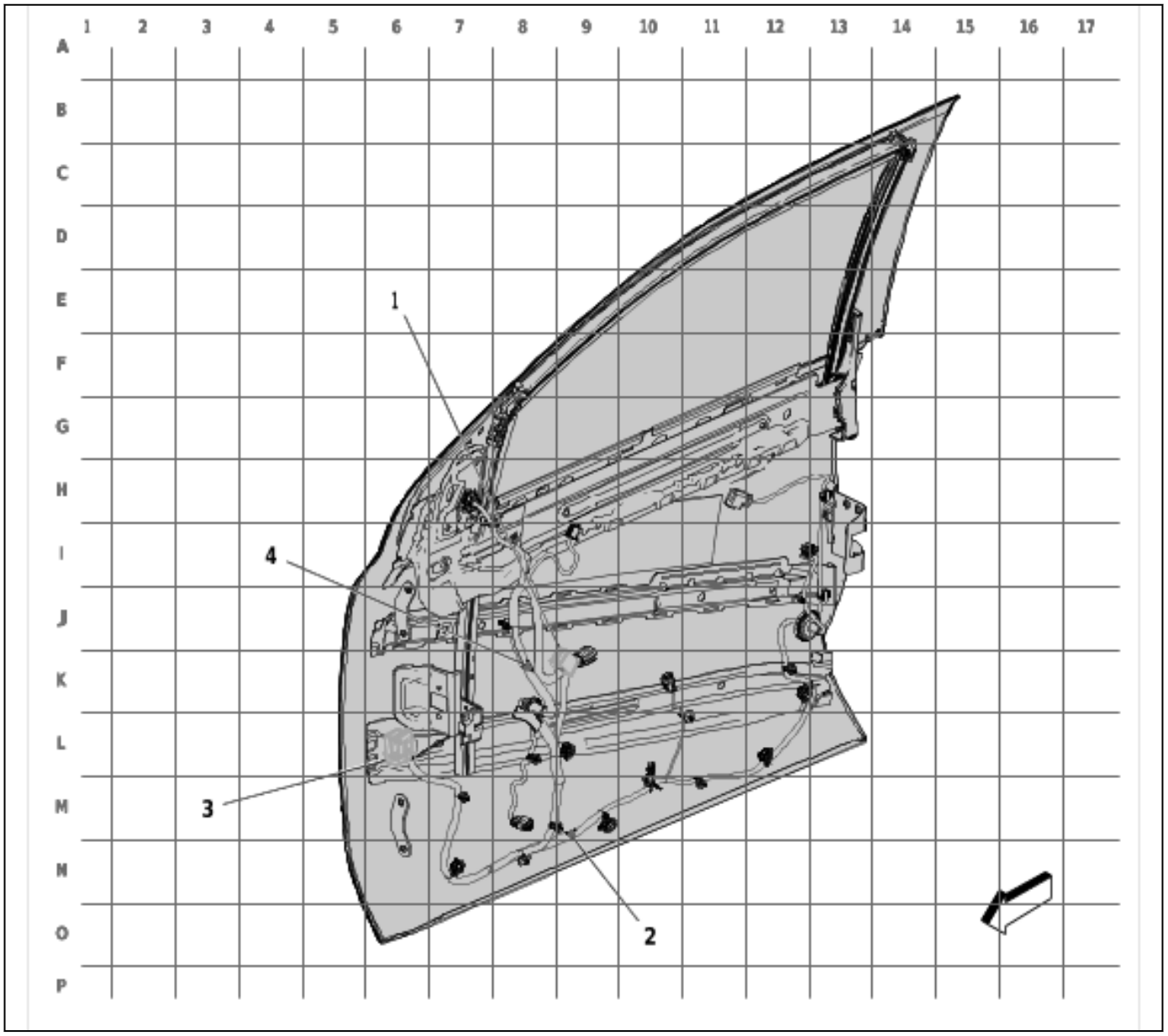
Driver Door Trim Harness Routing



6180260

Items
(1) X393 Front Side Door Door Wiring Harness - Driver to Front Side Door Door Lock Door Wiring Harness - Driver

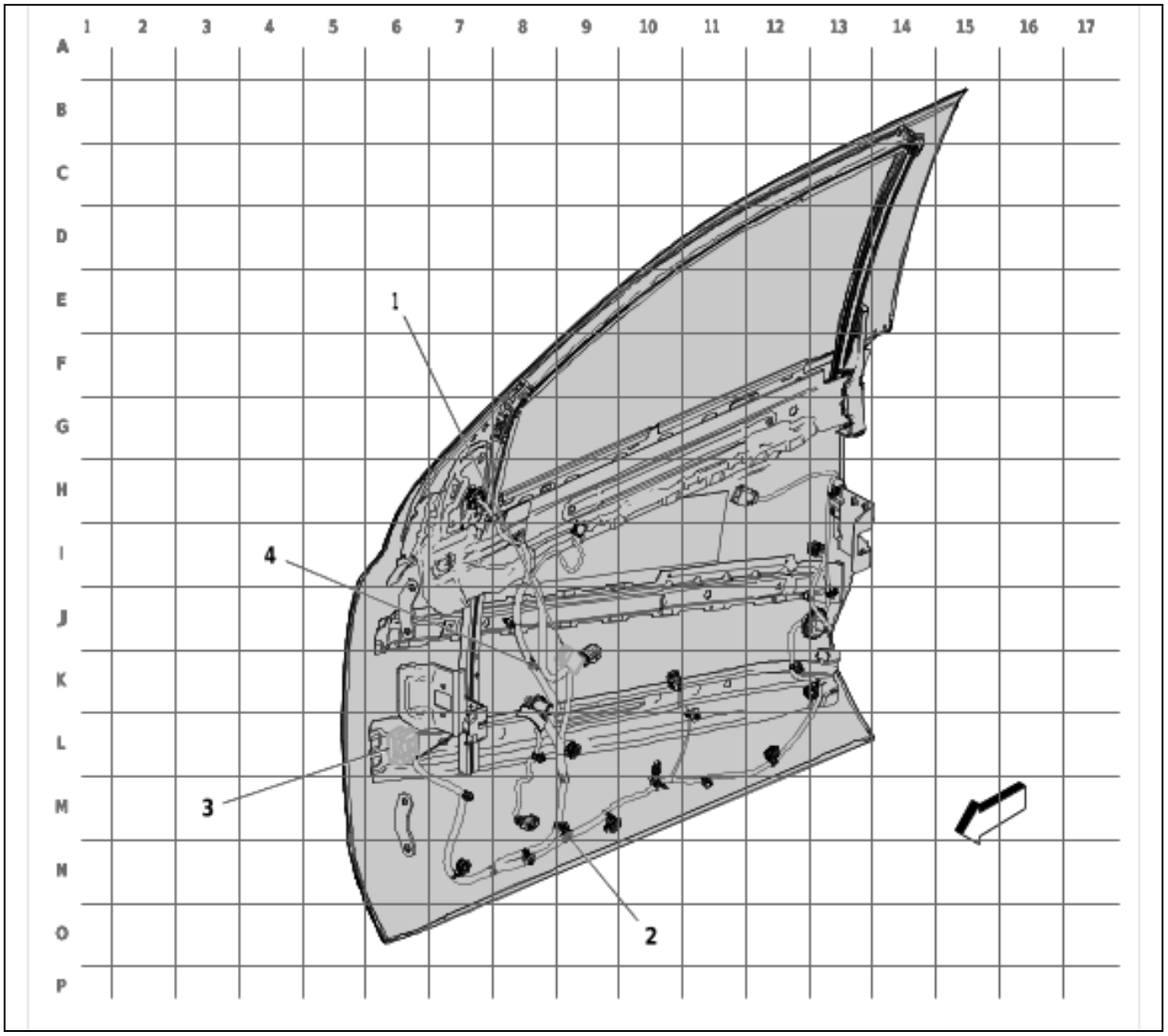
Passenger Door Harness Routing (UQ3)



6180261

Items
(1) X494 Front Side Door Door Wiring Harness - Passenger to Front Side Door Door Lock Door Wiring Harness - Passenger
(2) J601 Front Side Door Door Wiring Harness - Passenger
(3) X404 Body Wiring Harness to Front Side Door Door Wiring Harness - Passenger
(4) J600 Front Side Door Door Wiring Harness - Passenger

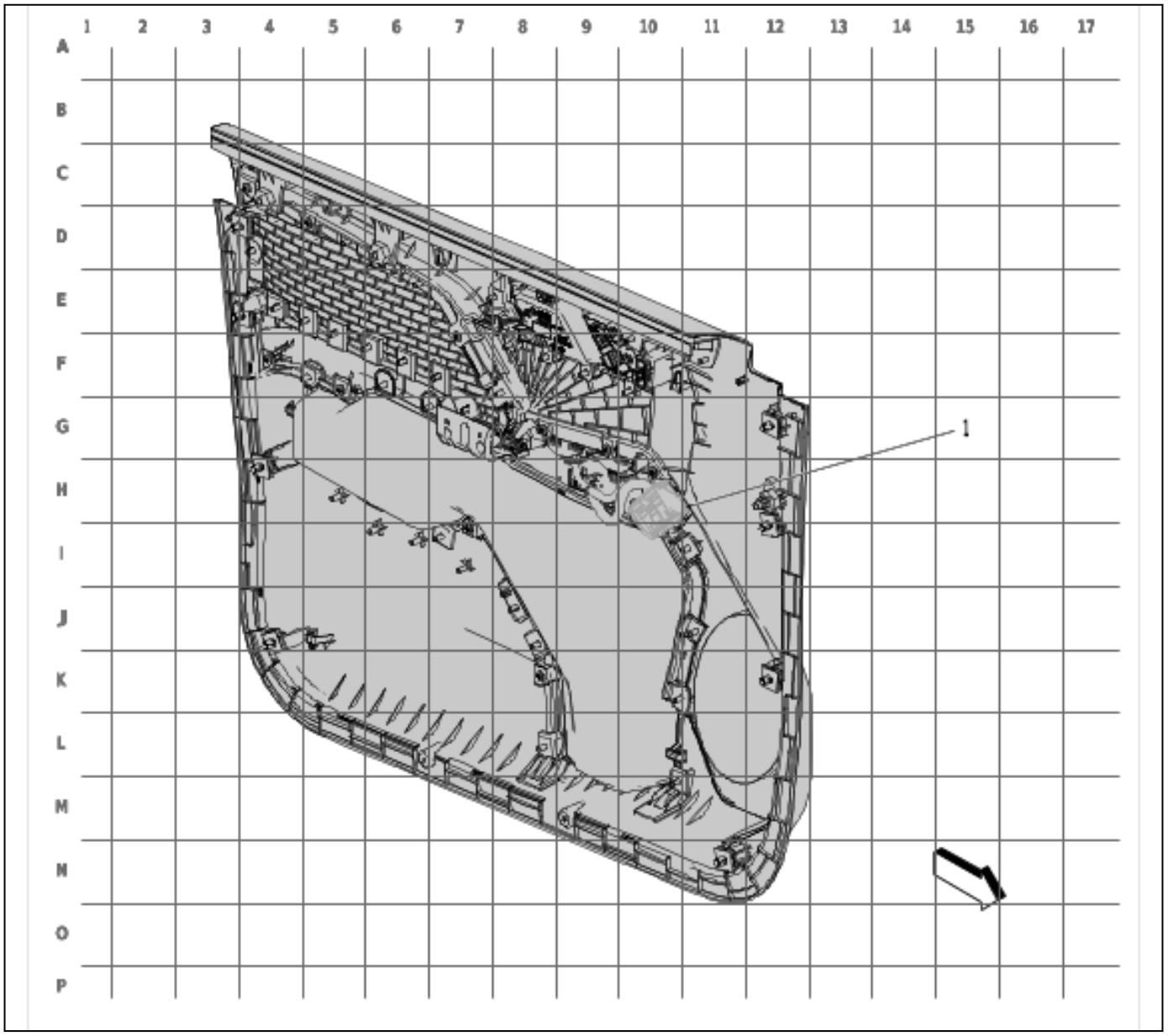
Passenger Door Harness Routing (UQA)



6180262

Items
(1) X494 Front Side Door Door Wiring Harness - Passenger to Front Side Door Door Lock Door Wiring Harness - Passenger
(2) J601 Front Side Door Door Wiring Harness - Passenger
(3) X404 Body Wiring Harness to Front Side Door Door Wiring Harness - Passenger
(4) J600 Front Side Door Door Wiring Harness - Passenger

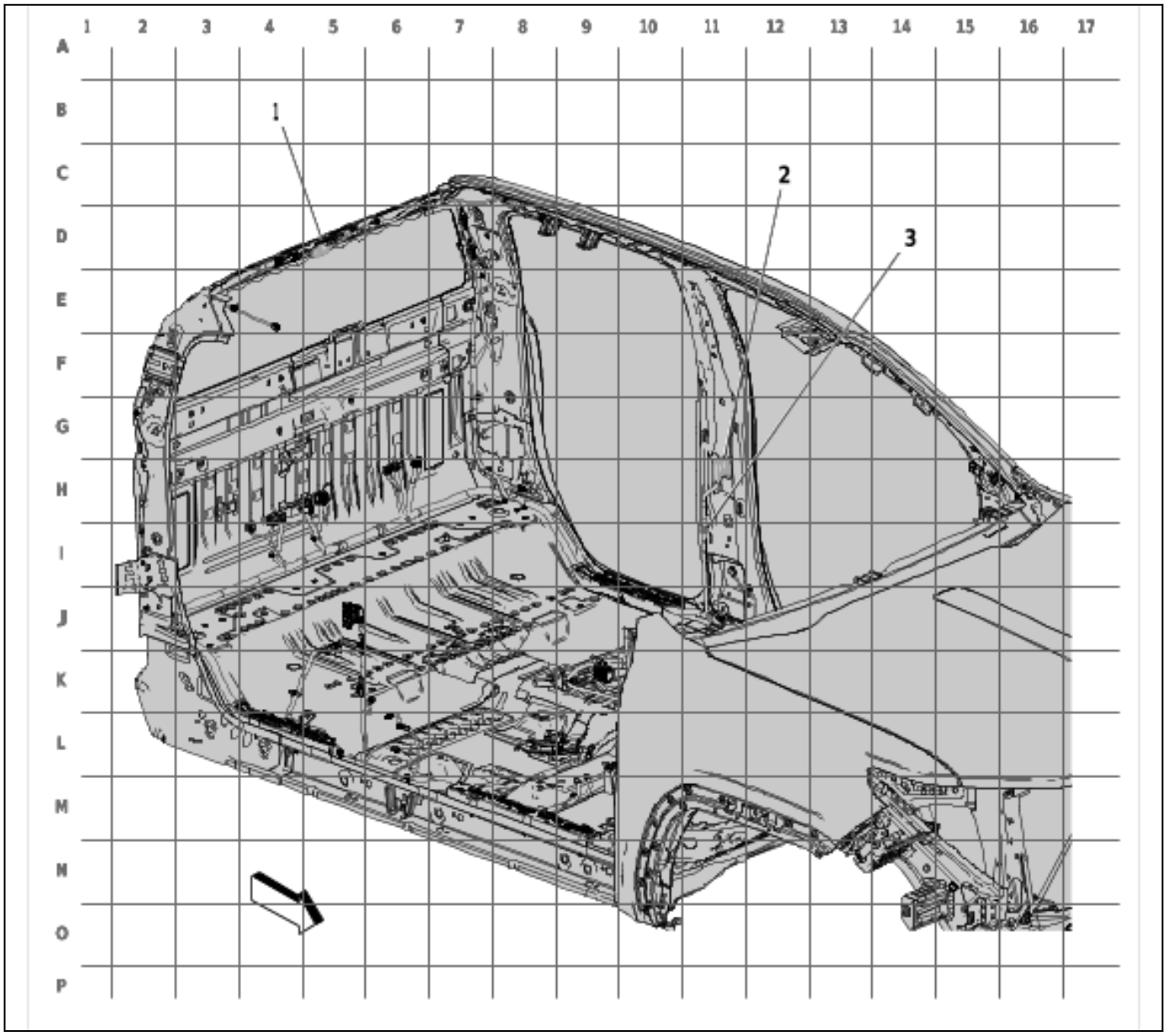
Passenger Door Trim Harness Routing



6180263

Items
(1) X494 Front Side Door Door Wiring Harness - Passenger to Front Side Door Door Lock Door Wiring Harness - Passenger

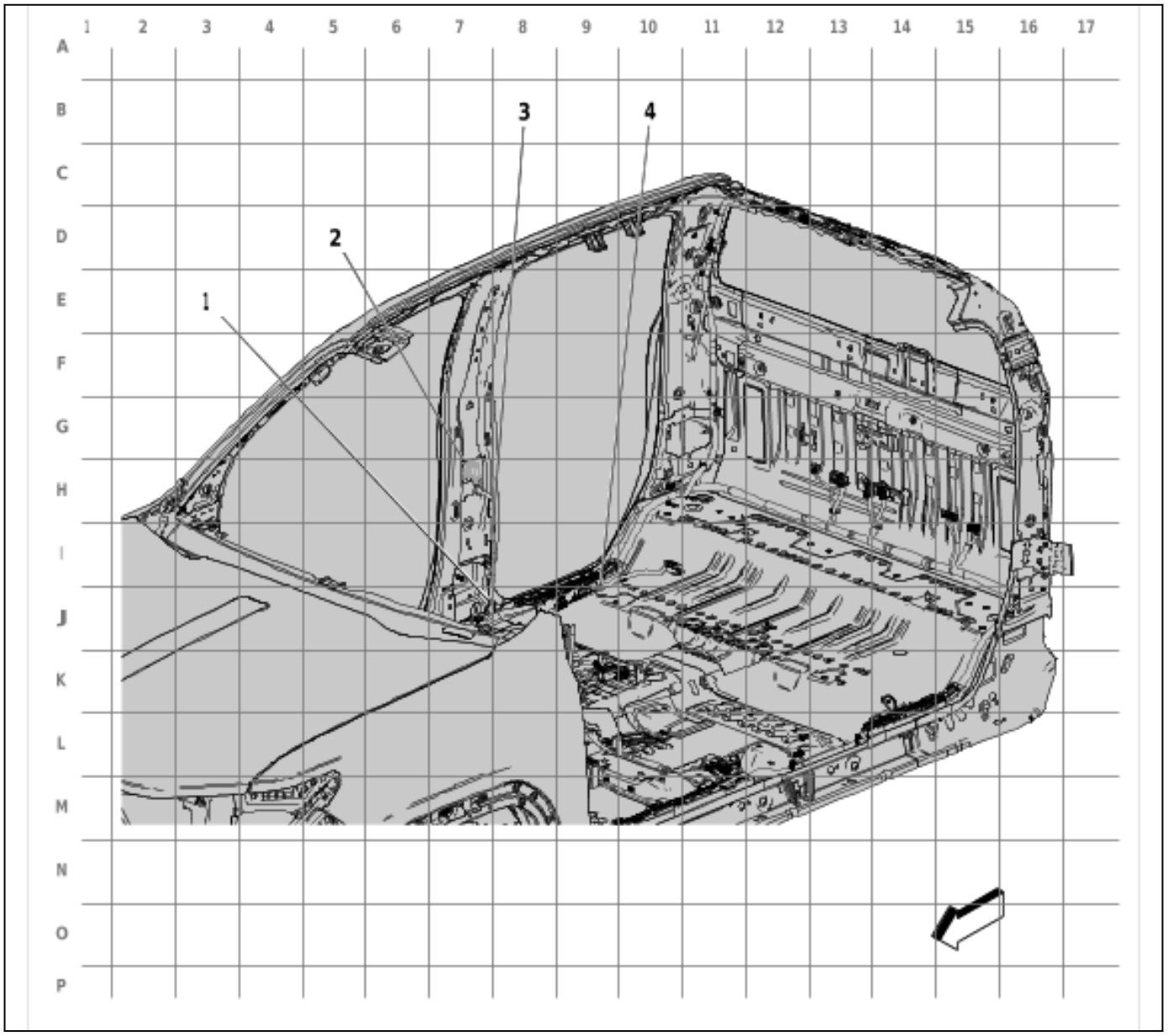
Body Harness Routing - Left Rear of Passenger Compartment



6180264

Items
(1) X500 Roof Wiring Harness to Body Wiring Harness
(2) X503 Rear Side Door Door Wiring Harness - Left to Body Wiring Harness
(3) J313 Body Wiring Harness

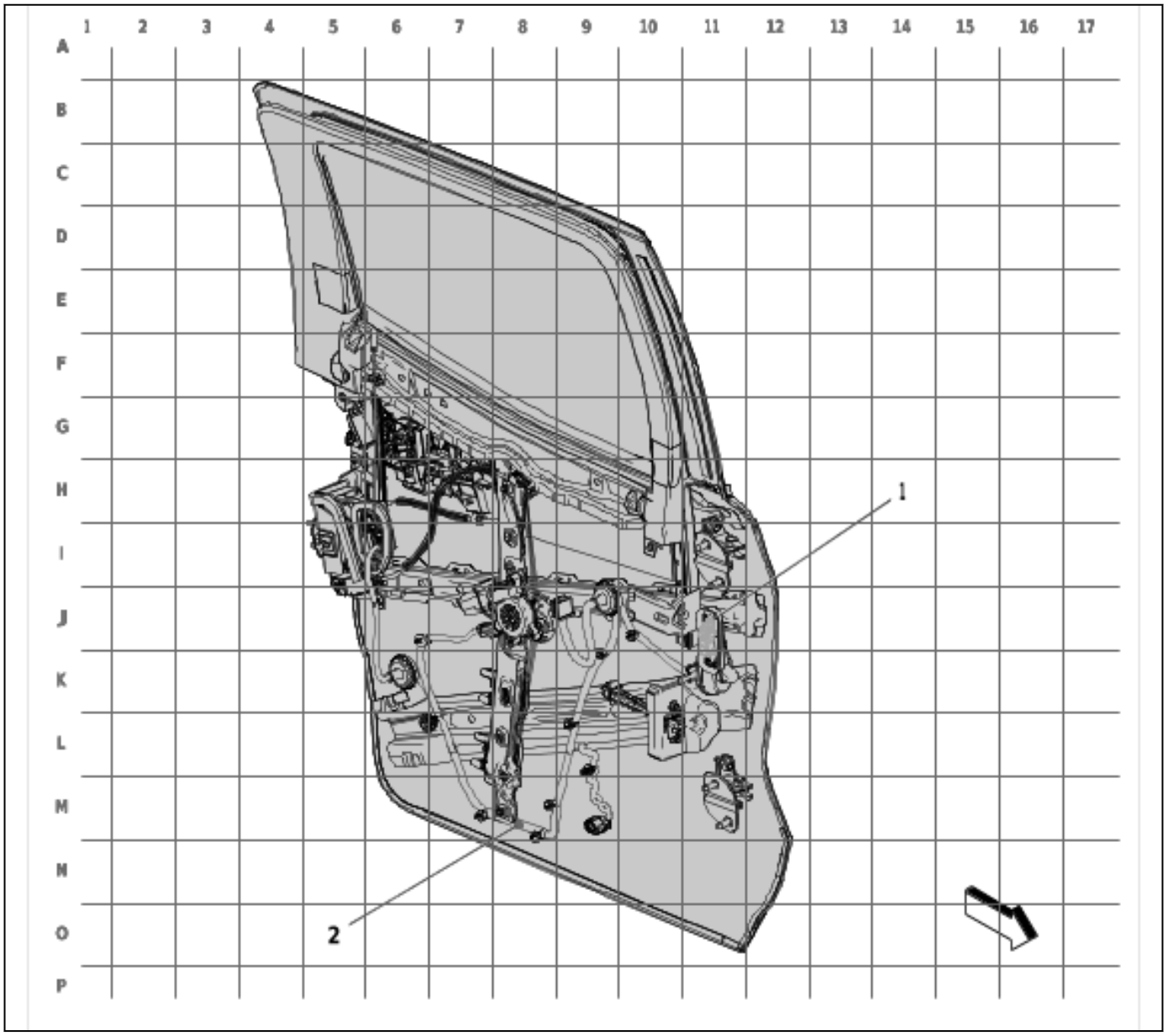
Body Harness Routing - Center and Right of Passenger Compartment



6180265

Items
(1) J326 Body Wiring Harness
(2) X604 Rear Side Door Door Wiring Harness - Right to Body Wiring Harness
(3) J327 Body Wiring Harness
(4) J328 Body Wiring Harness

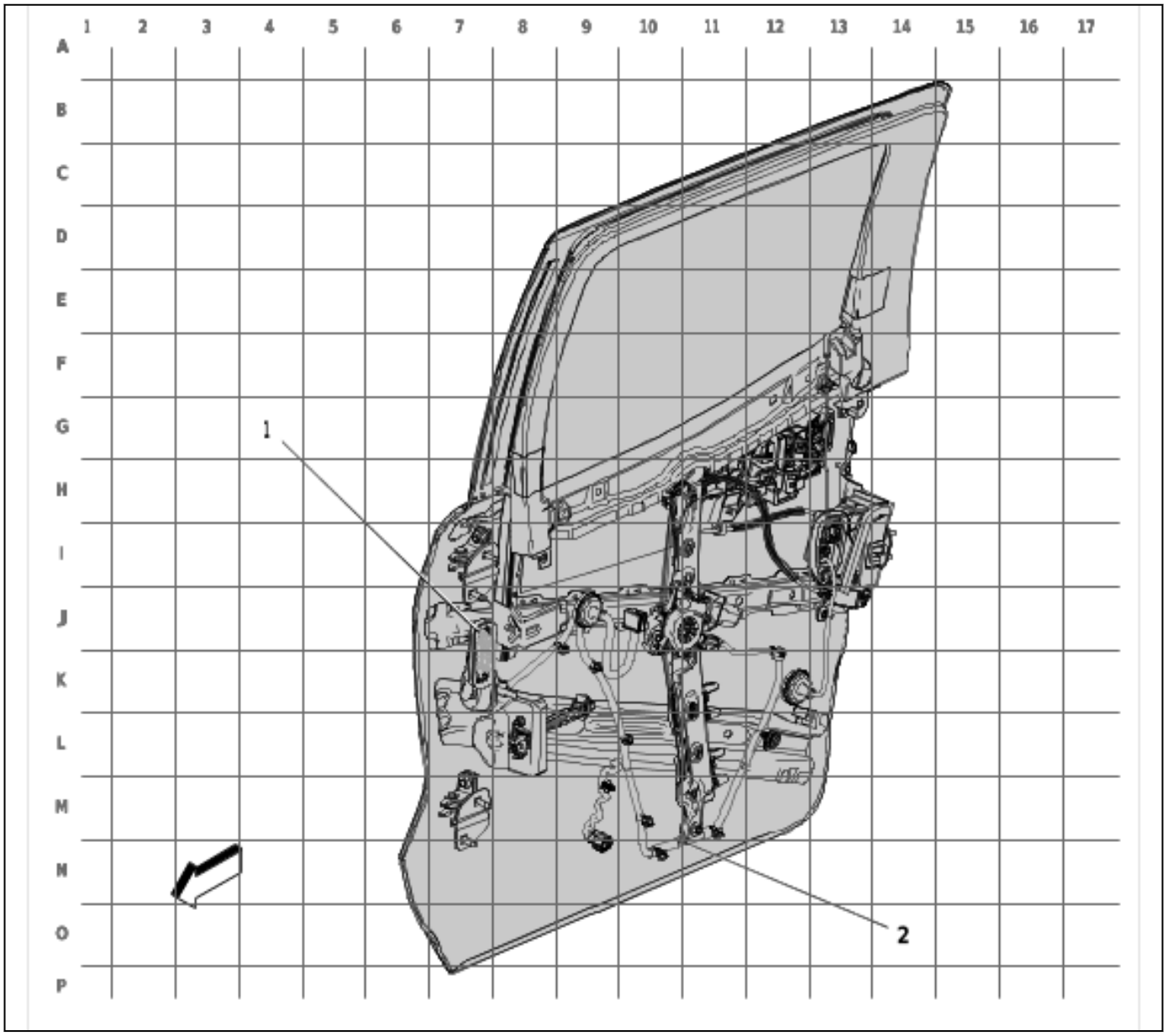
Left Rear Door Harness Routing



6180266

Items
(1) X503 Rear Side Door Door Wiring Harness - Left to Body Wiring Harness
(2) J700 Rear Side Door Door Wiring Harness - Left

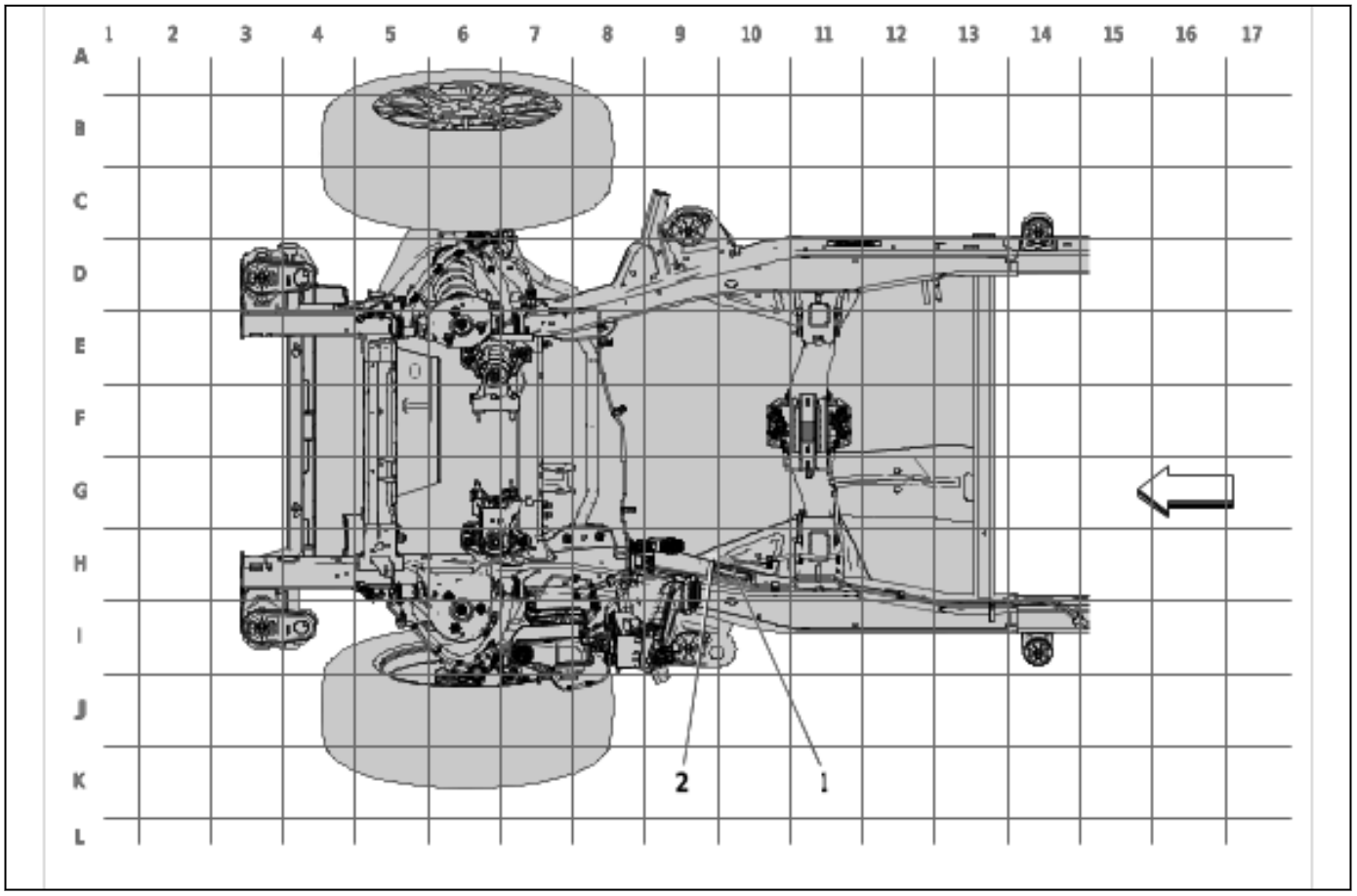
Right Rear Door Harness Routing



6180267

Items
(1) X604 Rear Side Door Door Wiring Harness - Right to Body Wiring Harness
(2) J800 Rear Side Door Door Wiring Harness - Right

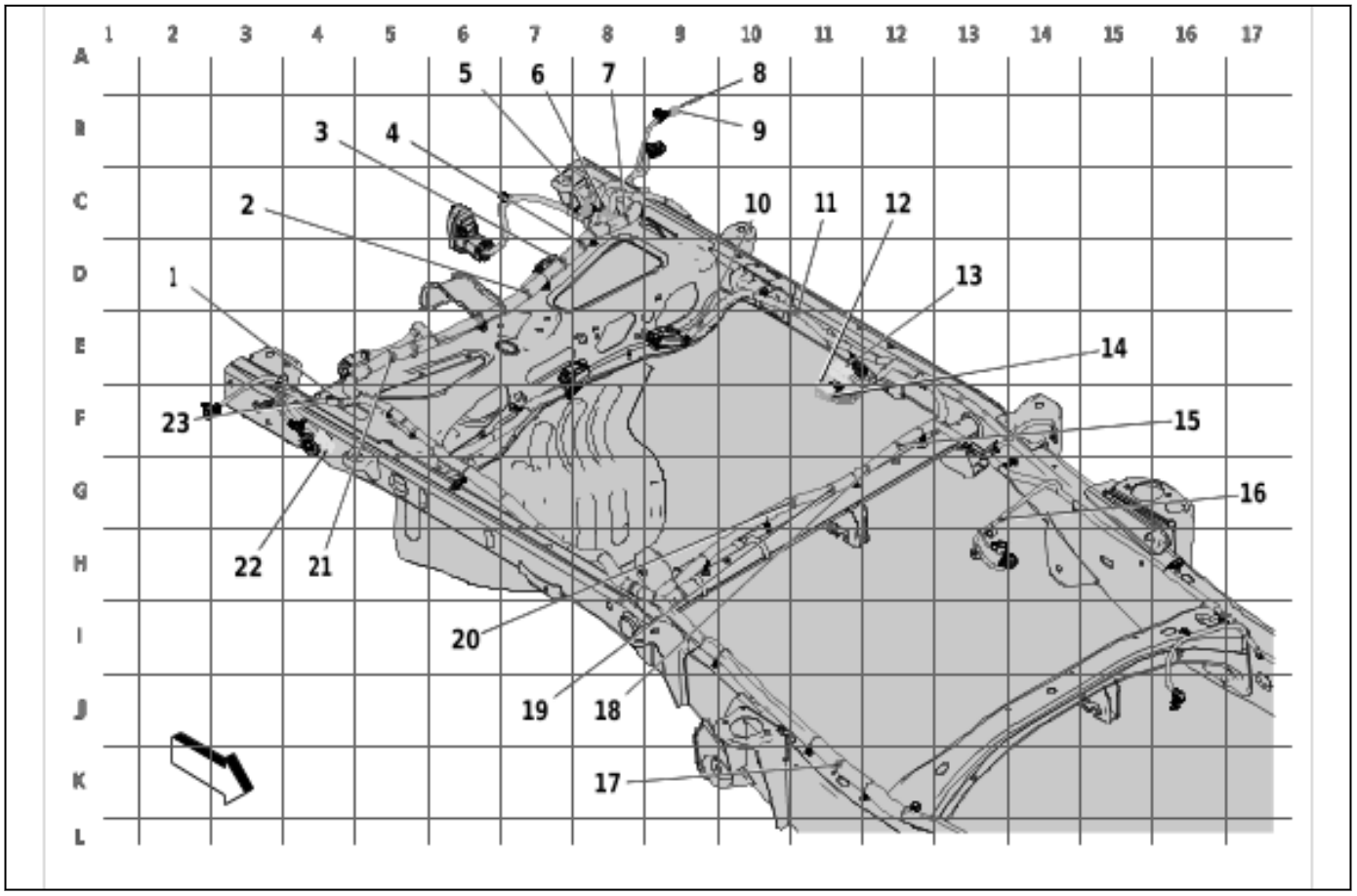
Vehicle Underbody Camera Harness Routing (UXA)



6180268

Items
(1) X372 Front View Underbody Camera Jumper Wiring Harness to Rearview Camera Wiring Harness (UXA)
(2) X371 Rearview Underbody Camera Jumper Wiring Harness to Rearview Camera Wiring Harness (UXA)

Chassis Harness Routing - Rear

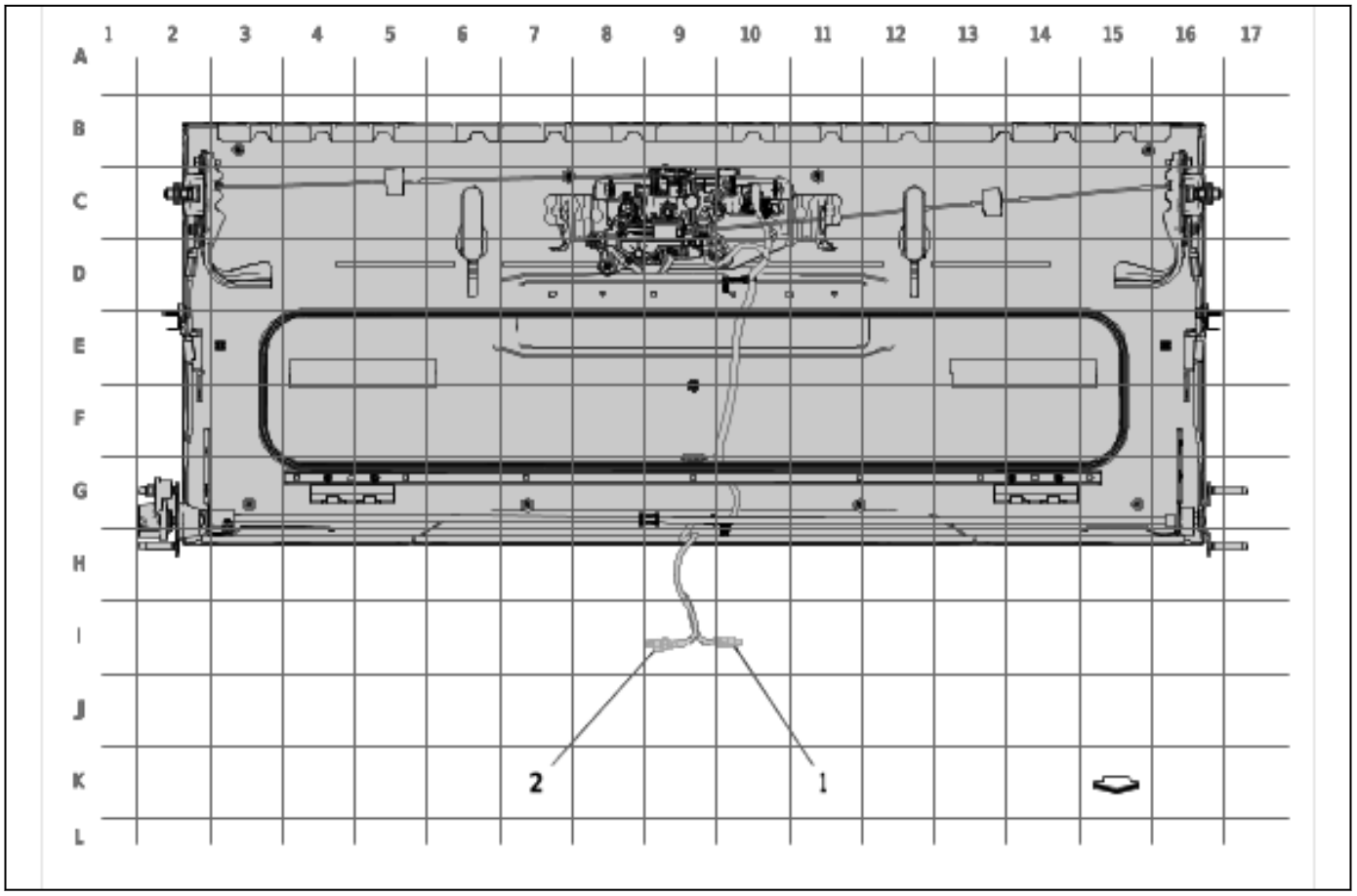


6180269

Items
(1) J408 Chassis Wiring Harness
(2) J411 Chassis Wiring Harness
(3) J412 Chassis Wiring Harness
(4) J414 Chassis Wiring Harness
(5) X933 Chassis Wiring Harness to Rear Object Alarm Sensor Wiring Harness
(6) X700 Rear Object Alarm Sensor Wiring Harness to Chassis Wiring Harness
(7) J415 Chassis Wiring Harness
(8) W26 Blunt Cut - Cargo Lamps Provision
(9) X382 Chassis Wiring Harness to Chassis Wiring Harness
(10) J410 Chassis Wiring Harness
(11) J409 Chassis Wiring Harness
(12) X777 Chassis Rear Wiring Harness Extension Harness to Chassis Wiring Harness (-G94)
(13) X904A Chassis Rear Wiring Harness Extension Harness to Chassis Wiring Harness
(14) X788 Chassis Wiring Harness to Chassis Rear Wiring Harness Extension Harness (G94)
(15) J404 Chassis Wiring Harness
(16) J416 Chassis Wiring Harness
(17) J400 Chassis Wiring Harness

Items
(18) J403 Chassis Wiring Harness
(19) J402 Chassis Wiring Harness
(20) J401 Chassis Wiring Harness
(21) J407 Chassis Wiring Harness
(22) X820 Body Rear Wiring Harness to Chassis Wiring Harness (KC9/KCA)
(23) J413 Chassis Wiring Harness

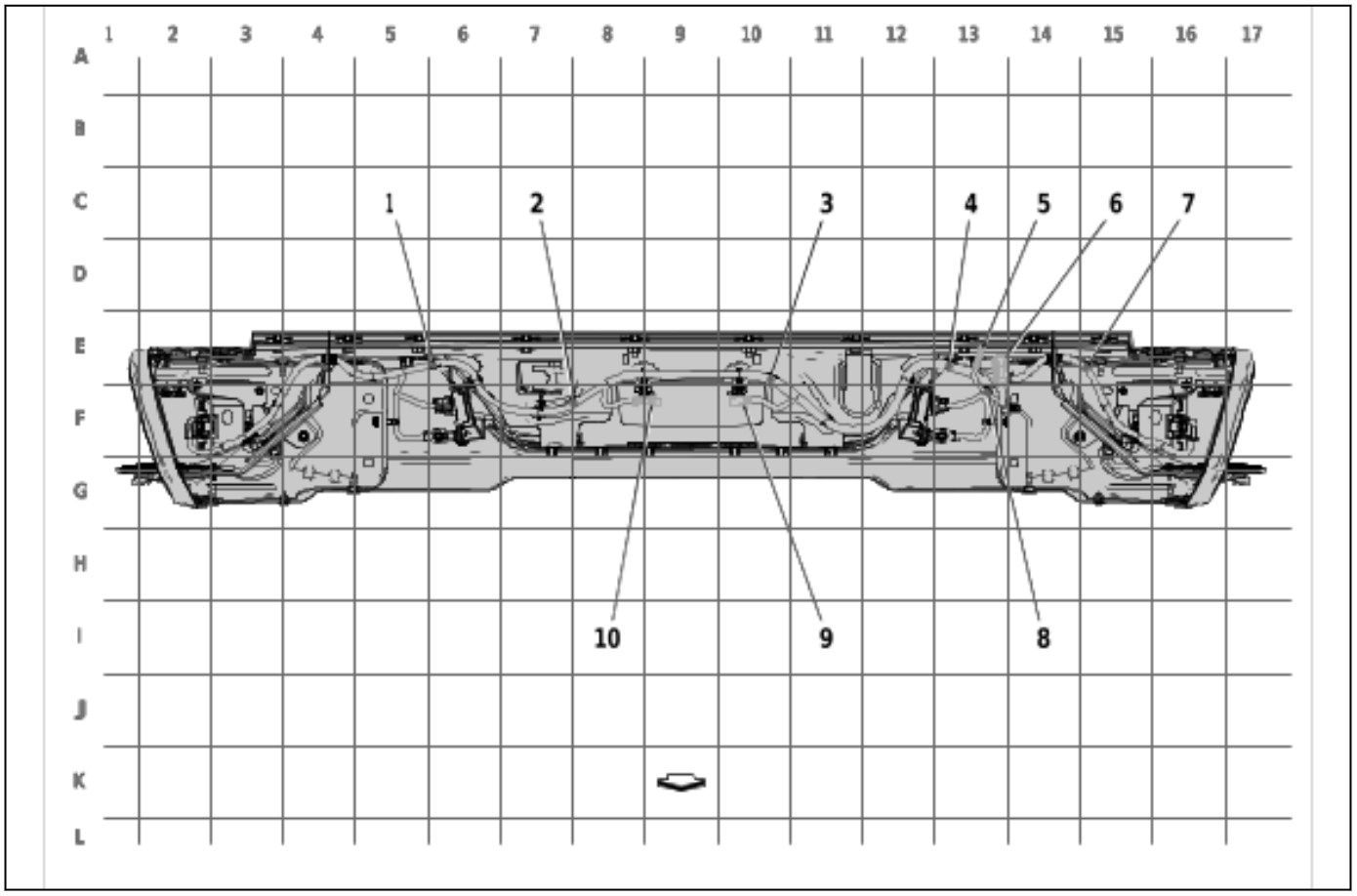
Endgate Harness Routing (A91 / UVB)



6180270

Items
(1) X955 Rear Object Alarm Sensor Wiring Harness to Liftgate Jumper Wiring Harness
(2) X950 Liftgate Jumper Wiring Harness to Rear Object Alarm Sensor Wiring Harness

Rear Fascia Harness Routing



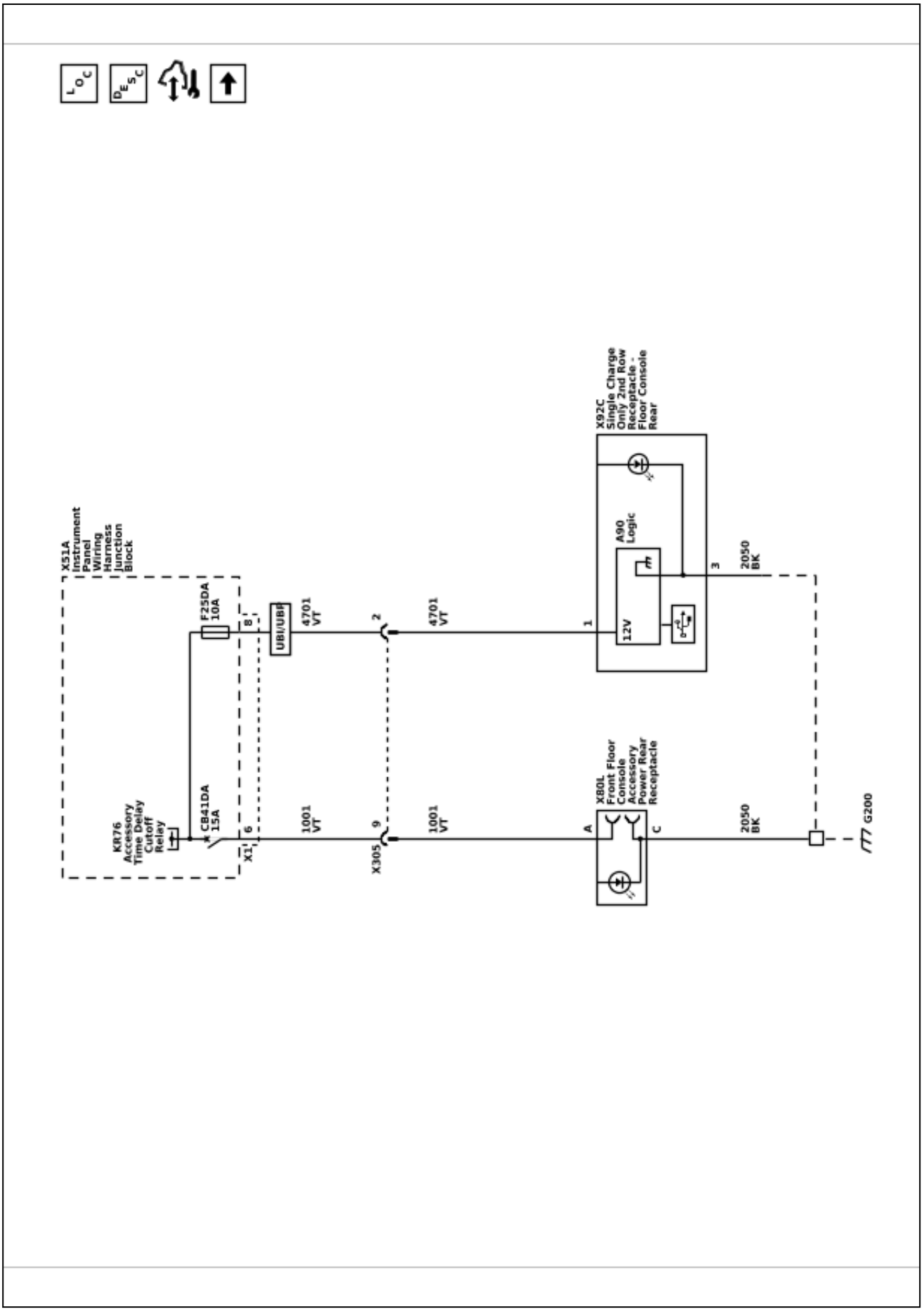
6180271

Items
(1) J900 Rear Object Alarm Sensor Wiring Harness
(2) J901 Rear Object Alarm Sensor Wiring Harness
(3) J902 Rear Object Alarm Sensor Wiring Harness
(4) J903 Rear Object Alarm Sensor Wiring Harness
(5) X933 Chassis Wiring Harness to Rear Object Alarm Sensor Wiring Harness
(6) X700 Rear Object Alarm Sensor Wiring Harness to Chassis Wiring Harness
(7) J905 Rear Object Alarm Sensor Wiring Harness
(8) J904 Rear Object Alarm Sensor Wiring Harness
(9) X955 Rear Object Alarm Sensor Wiring Harness to Liftgate Jumper Wiring Harness
(10) X950 Liftgate Jumper Wiring Harness to Rear Object Alarm Sensor Wiring Harness

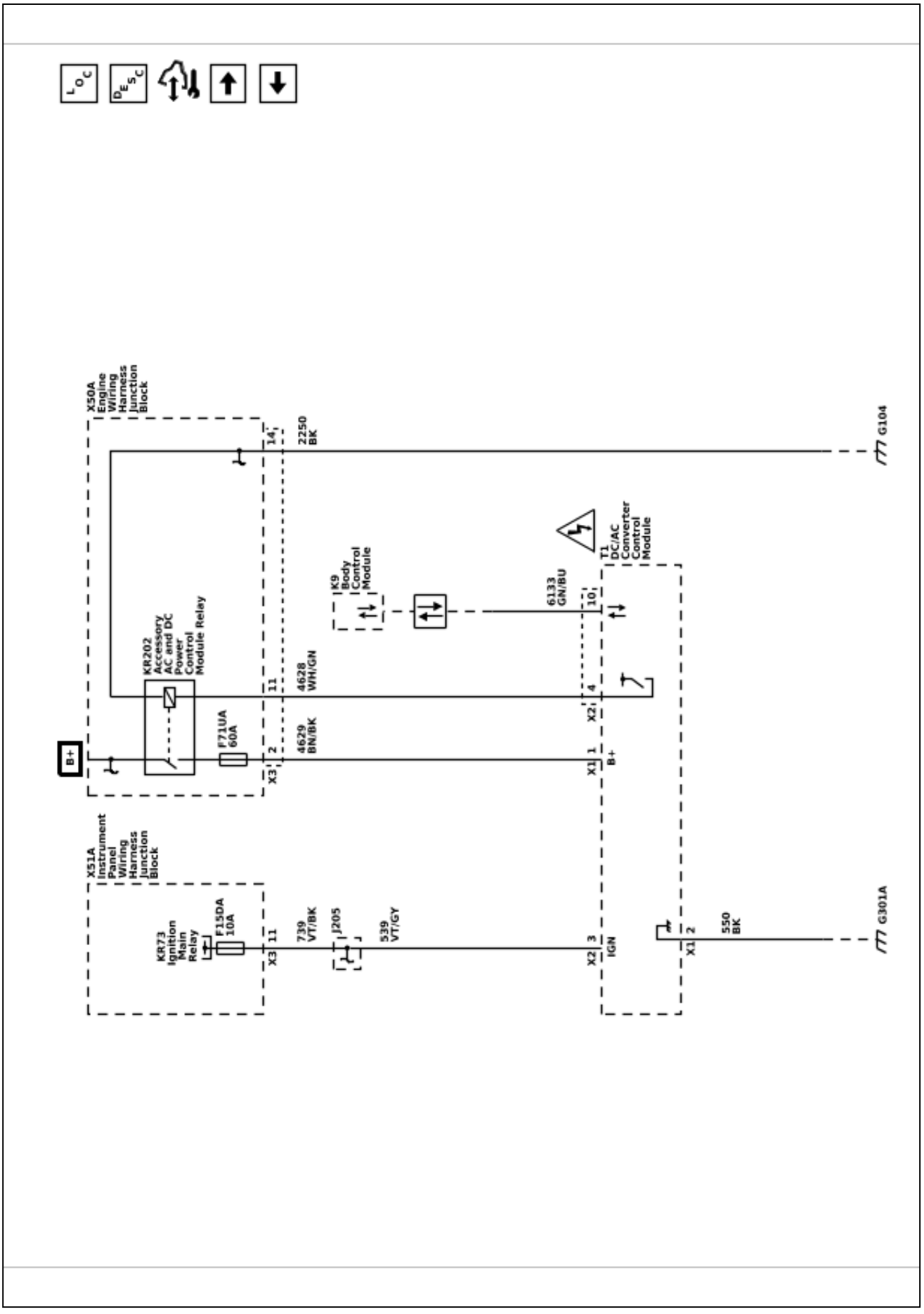
Power Outlets

Schematic and Routing Diagrams

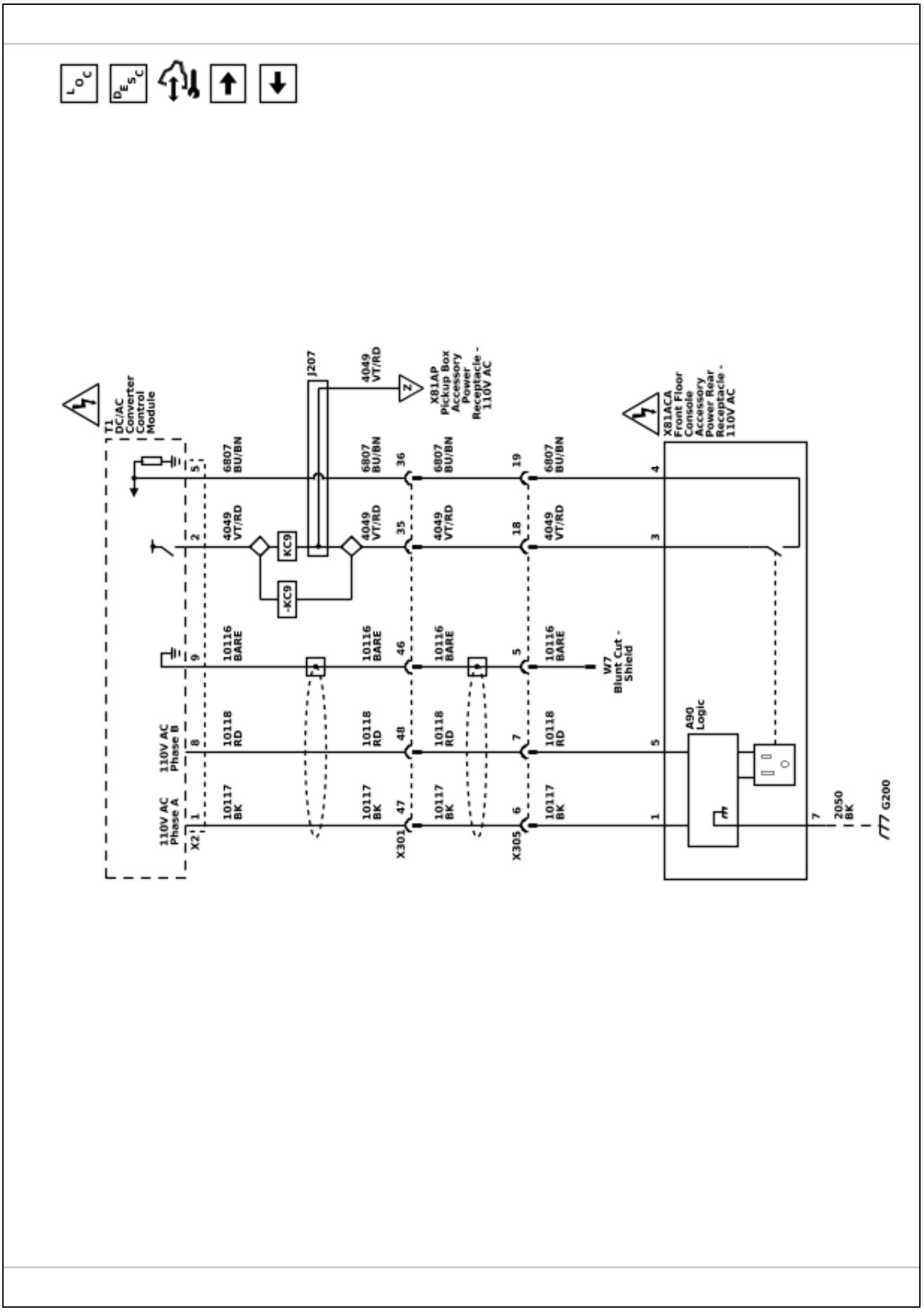
Cigar Lighter/Power Outlet Schematics (Power and Charge Receptacles)



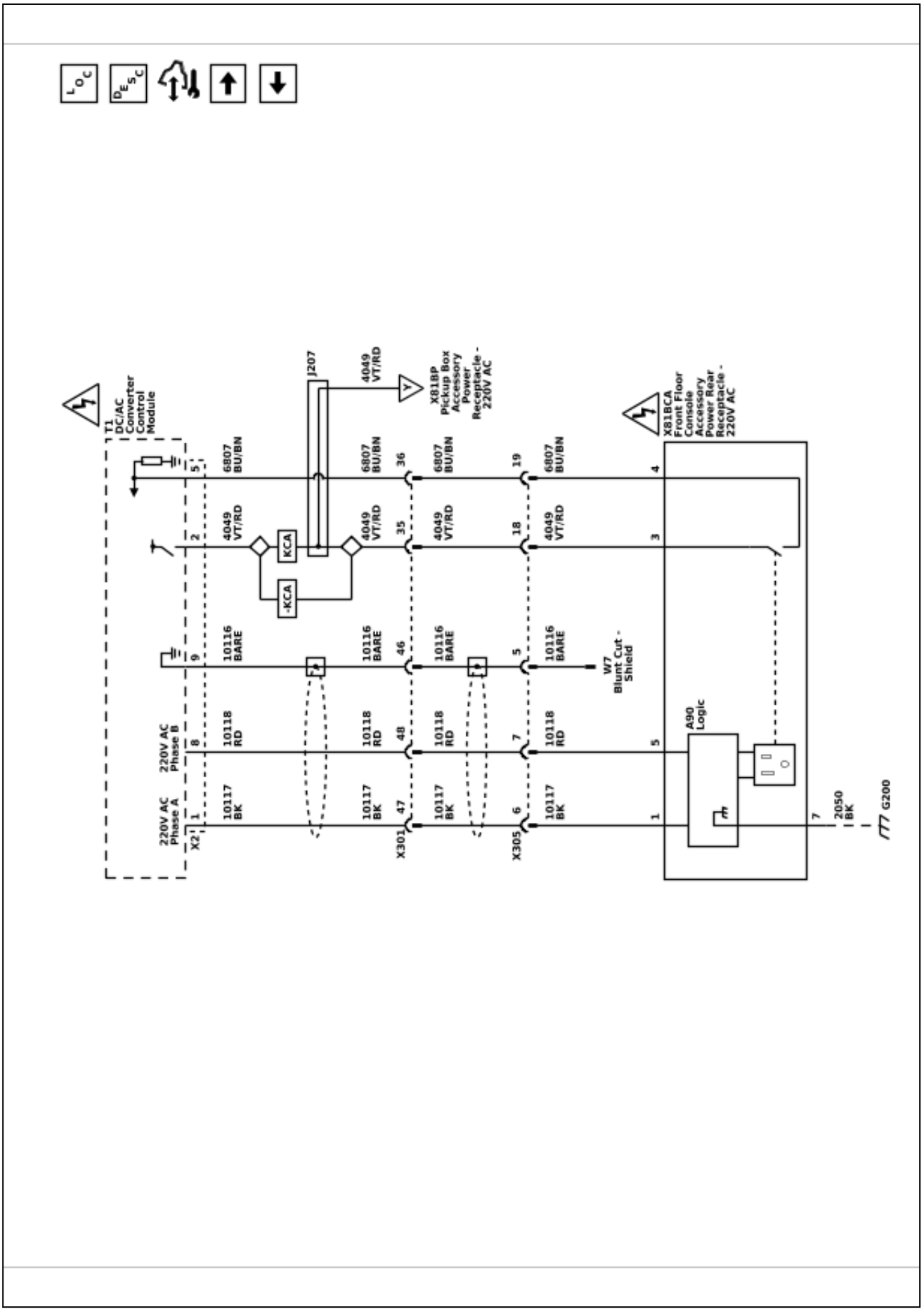
Cigar Lighter/Power Outlet Schematics (Inverter Module Power, Ground, and Serial Data (KI6/ KI7 / KCA / KC9))



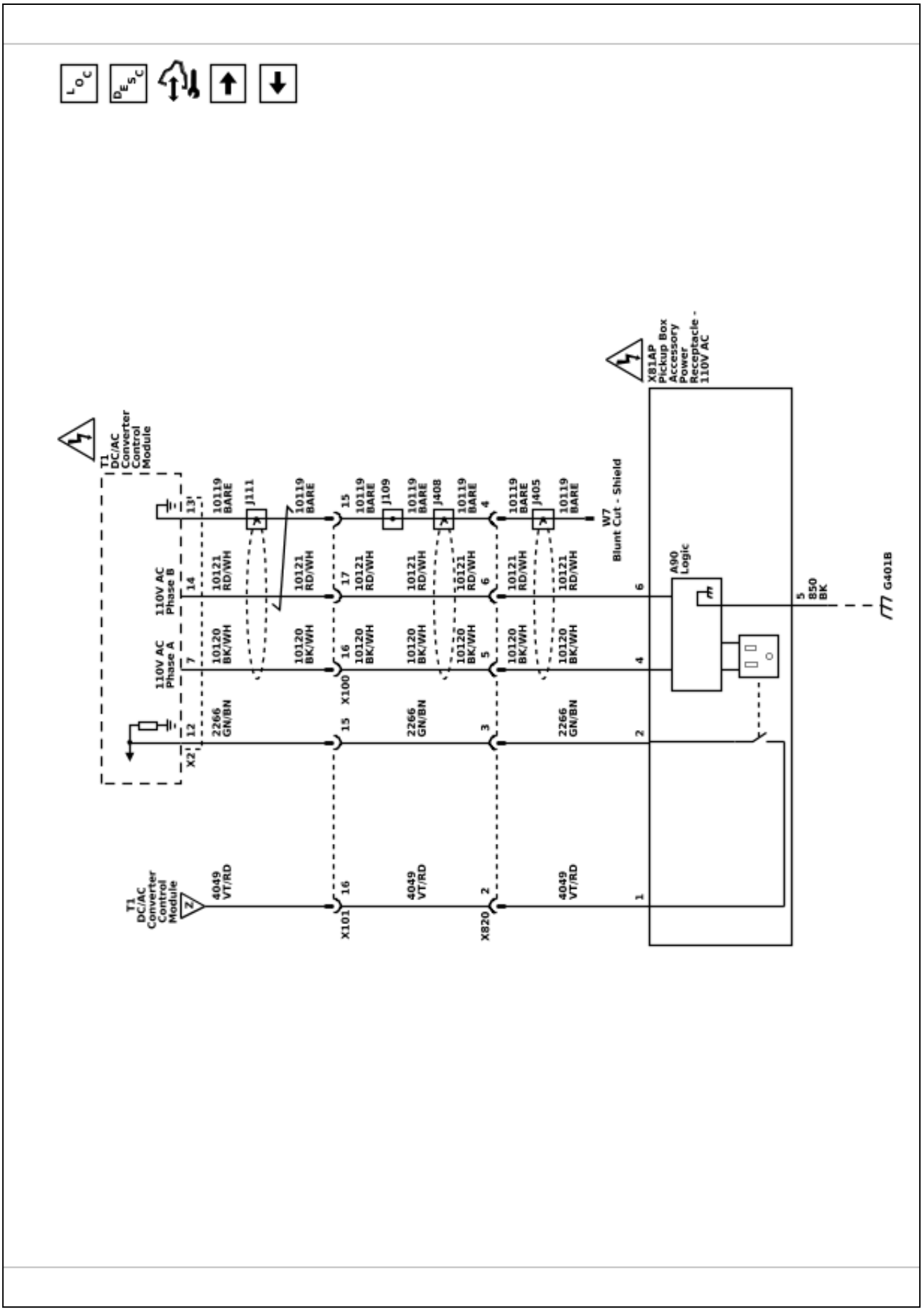
Cigar Lighter/Power Outlet Schematics (110V AC Accessory Power Receptacle - Front Floor Console Rear Receptacle (KI6 / KC9))



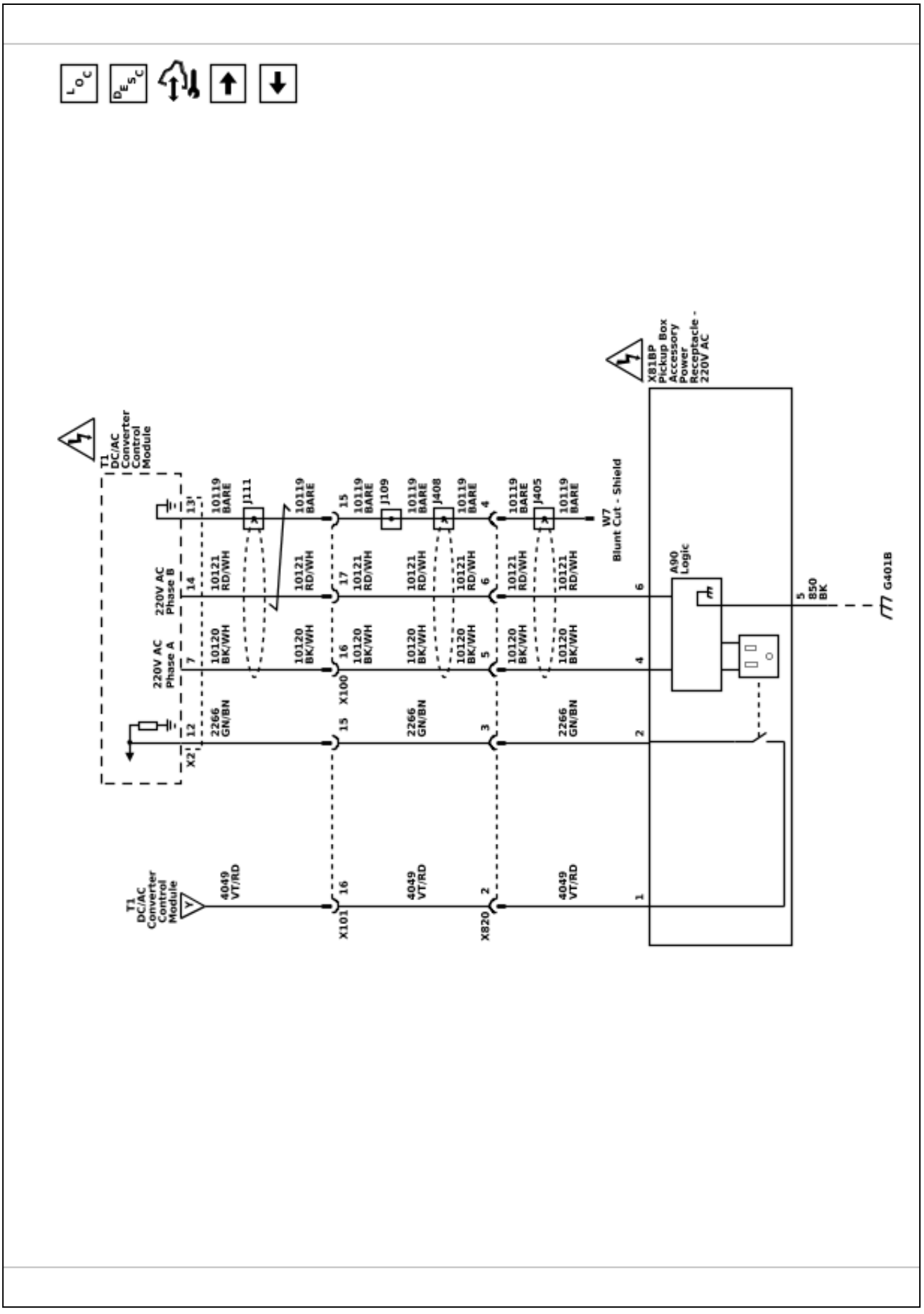
Cigar Lighter/Power Outlet Schematics (220V AC Accessory Power Receptacle - Front Floor Console Rear Receptacle (KI7 / KCA))



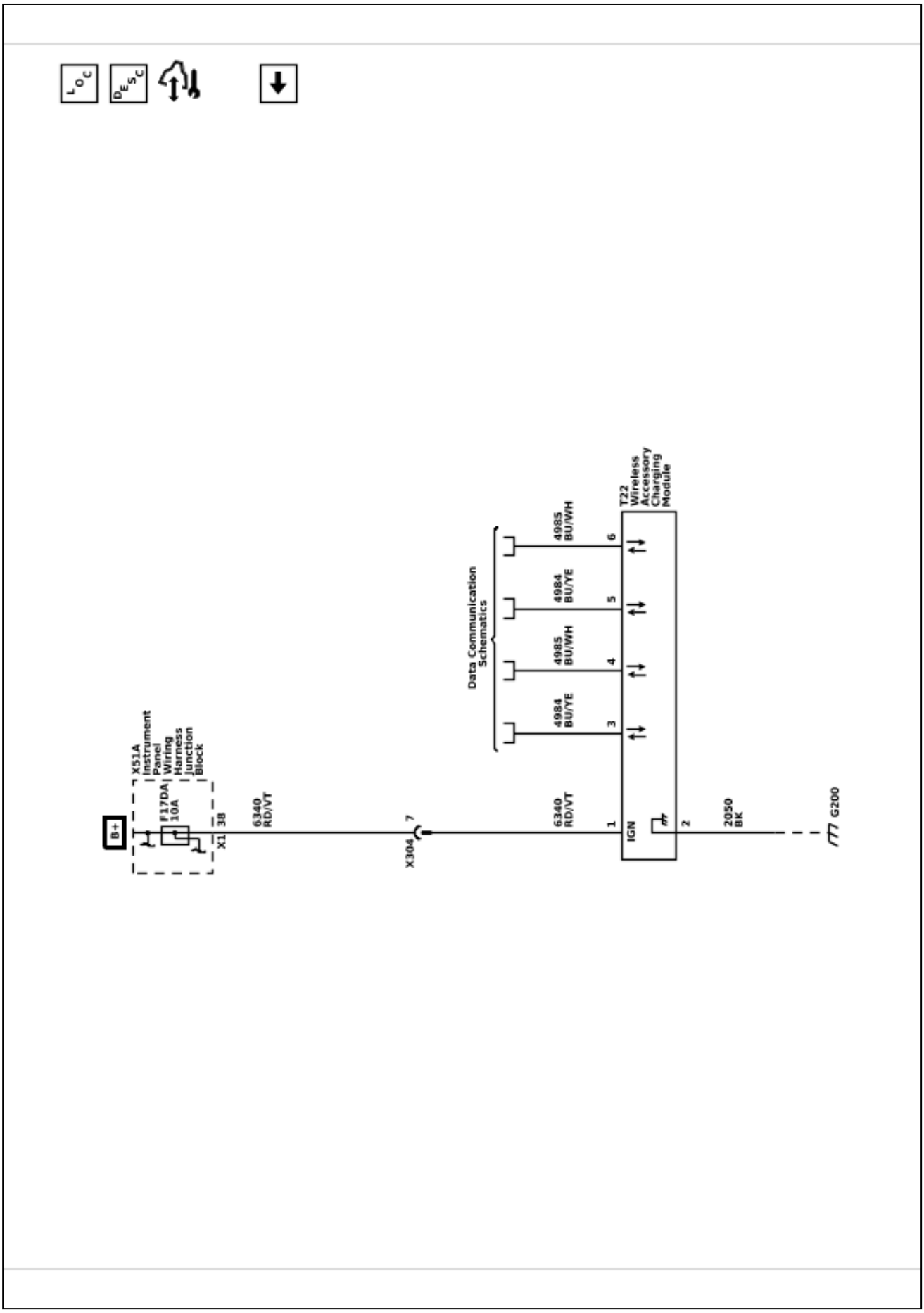
Cigar Lighter/Power Outlet Schematics (110V AC Accessory Power Receptacle - Pickup Box (KC9))



Cigar Lighter/Power Outlet Schematics (220V AC Accessory Power Receptacle - Pickup Box (KCA))



Cigar Lighter/Power Outlet Schematics (Wireless Charging)



Description and Operation

Mobile Device Wireless Charger Description and Operation

Mobile Device Wireless Charging System

The Mobile Device Wireless Charging System (WCS) is an system for wirelessly charging mobile devices. It is capable of charging the batteries of compatible mobile devices. A compatible device is one that is compliant with Power Matters Alliance (PMA), Wireless Power Consortium (WPC) Standard, or Alliance for Wireless Power (A4WP), meaning that it is equipped with a PMA, WPC, or A4WP wireless charge “receiver” that will work with the charge “transmitter” installed in the vehicle. The devices may utilize built-in charging circuitry or an adapter (external plug-in device which contains the charging circuitry). To check for phone or other device compatibility, refer to GM Total Connect.

Warning: Remove all objects from the charging pad before charging your mobile device. Objects, such as coins, keys, rings, paper clips, or cards, between the phone and charging pad will become very hot. On the rare occasion that the charging system does not detect an object, and the object gets wedged between the phone and charger, remove the phone and allow the object to cool before removing it from the charging pad, to prevent burns.

Charging

To charge a device, place it on the charging surface in the vehicle. There is a charging coil located in the center of the charging surface. The device has a charging coil typically near the center of the device. These coils must be lined up in order for charging to proceed. When the interruptible retained accessory power (IRAP) relay is closed (this is true typically when vehicle ignition is in Run or Accessory position), the WCS will detect the device, establish communications with the device to confirm it is a compatible device, and then deliver charging power to the device via wireless interface. The WCS will be able to deliver 5W to 15W of power as requested by the compatible device. It shall only enter a charging state if communication is established and a compatible device is identified.

The WCS shall not enter a charging state if there is no communication established with a compatible device. Due to differences in objects, a foreign object detection protocol is employed to detect a non-compliant device and hold power transfer initiation until the non-compliant object has been removed and a compliant object has been detected. The charger monitors its internal temperature and will shut down if the charger temperature exceeds 185F (85C).

Indicator

The K9 Body Control Module will detect the device battery is charging and send a serial data message on the GMLAN bus to the radio display. The radio display will indicate a device is currently charging by displaying a lightning bolt over the phone icon. When the indicator is toggling on and off this indicates a thermal limit has been reached and the device will not charge. For more information refer to the owners manual.

Cooling

The wireless charger is kept cool using the HVAC system. There is a dedicated HVAC duct that connects to the Wireless Charging Module bracket (which holds the module and the mat).

Power Outlets Description and Operation

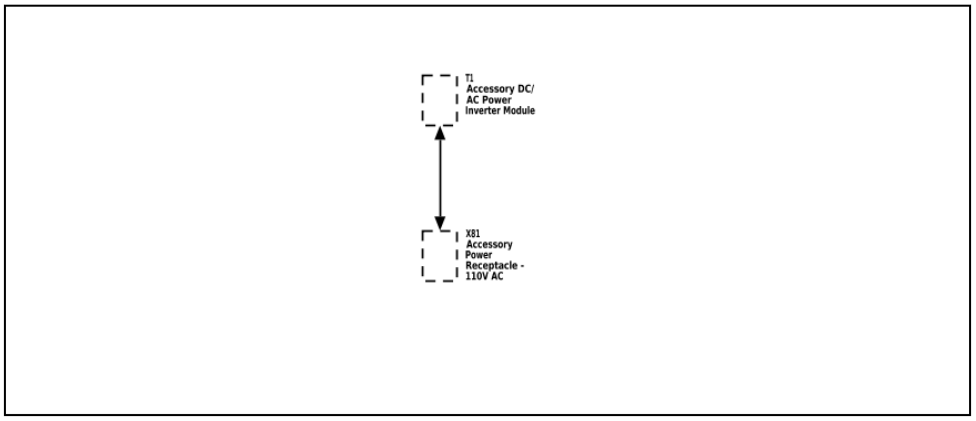
12 Volt Power Outlet Receptacle Description and Operation

The 12 V accessory power receptacles are supplied with power by the accessory relay.

The vehicle is fitted with a cigarette lighter and/or with a 12 V accessory power receptacle. The cigarette lighter and accessory power outlets are controlled by an ignition operated relay. The accessory power receptacle and cigarette lighter are operational when the ignition is turned to either the On or the Accessories positions. To operate the cigarette lighter, press in the lighter knob. When the element is hot, the lighter automatically pops out and is ready for use.

110 Volt Power Outlet Receptacle System Description

Power Outlets Block Diagram



3403851

Hard-Wired

T1 Accessory DC/AC Power Inverter Module

X81 Accessory Power Receptacle - 110V AC

The alternating current (AC) accessory power outlet system consists of the accessory DC/AC power inverter module and the accessory power receptacle – 110 V AC. The accessory DC/AC power inverter module converts 12 V direct current (DC) battery power to 110 V at 60 Hertz (Hz) AC power to operate AC powered devices. The accessory DC/AC power inverter module provides up to 400 watts of power. The accessory power receptacle – 110 V AC provides the usual connection for AC powered devices.

110 Volt Power Outlet Receptacle System Operation

The accessory DC/AC power inverter module receives fuse protected battery voltage and is connected to the 12 V electrical system ground. The accessory power receptacle – 110 V AC has an internal switch, that detects when an AC powered device is plugged into the outlet. When the ignition is ON, and an AC powered device is plugged into the accessory power receptacle – 110 V AC, the normally open switch in the accessory power receptacle – 110 V AC, closes. When the accessory DC/AC power inverter module detects the voltage from the accessory power receptacle – 110 V AC switch, the inverter module begins to supply 110 V AC to the accessory power receptacle – 110 V AC after a 1.5 s delay. The accessory AC power system is protected against circuit overload and circuit shorts to ground.

110 Volt Power Outlet Receptacle Isolation Fault Protection

The accessory DC/AC power inverter module contains a ground fault circuit interrupter (GFCI). GFCI monitors the 110 V circuit for a short to vehicle chassis ground. If a 110 V AC short to ground is detected, the accessory DC/AC power inverter module will turn OFF. The module remains OFF, until the AC powered device is unplugged from the outlet, and then plugged into the outlet after a 3 s delay.

110 Volt Power Outlet Receptacle Overload Shutdown

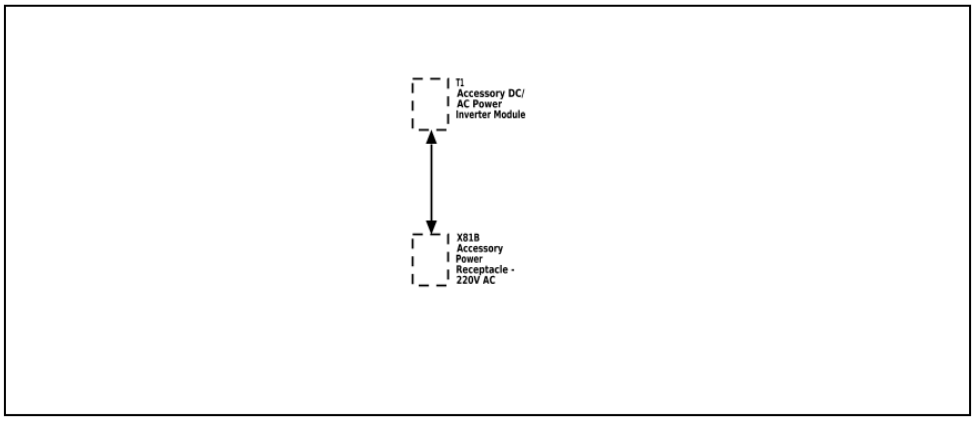
The accessory DC/AC power inverter module will turn OFF if the current in the 110 V circuit is greater than 3.8 A for 1 s , or 2.5 A for 10 s . The module will turn ON again, when the AC powered device is unplugged from the outlet, and then plugged into the outlet after a 3 s delay.

110 Volt Power Outlet Receptacle Internal Shutdown

The accessory DC/AC power inverter module will turn OFF if the B+ supply voltage is greater than 16.5 V or less than 11 V. The module will also turn OFF if the device temperature is greater than 85°C (185°F). The module will turn ON again, after the shutdown condition is corrected, and the AC powered device is unplugged from the outlet, and then plugged into the outlet.

230 Volt Power Outlet Receptacle System Description

Power Outlets Block Diagram



3403853

Hard-Wired

T1 Accessory DC/AC Power Inverter Module

X81B Accessory Power Receptacle - 220V AC

The alternating current (AC) accessory power outlet system consists of the accessory DC/AC power inverter module and the accessory power receptacle – 220V AC. The accessory DC/AC power inverter module converts 12 V direct current (DC) battery power to 220–230 V at 50 Hertz (Hz) AC power to operate AC powered devices. The accessory DC/AC power inverter module provides up to 400 watts of power. The accessory power receptacle – 220V AC provides the usual connection for AC powered devices.

230 Volt Power Outlet Receptacle System Operation

The accessory DC/AC power inverter module receives fuse protected battery voltage and is connected to the 12 V electrical system ground. The accessory power receptacle – 220V AC has an internal switch, that detects when an AC powered device is plugged into the outlet. When the ignition is ON, and an AC powered device is plugged into the accessory power receptacle – 220V AC, the normally open switch in the accessory power receptacle – 220V AC, closes. When the accessory DC/AC power inverter module detects the voltage from the accessory power receptacle – 220V AC switch, the inverter module begins to supply 220–230 V AC to the accessory power receptacle – 220V AC after a 1.5 second delay. The accessory AC power system is protected against circuit overload and circuit shorts to ground.

230 Volt Power Outlet Receptacle Isolation Fault Protection

The accessory DC/AC power inverter module contains a ground fault circuit interrupter (GFCI). GFCI monitors the 230 V circuit for a short to vehicle chassis ground. If a 230 V AC short to ground is detected, the accessory DC/AC power inverter module will turn OFF. The module remains OFF, until the AC powered device is unplugged from the outlet, and then plugged into the outlet after a 3 s delay.

230 Volt Power Outlet Receptacle Overload Shutdown

The accessory AC/DC power control module will turn OFF if the current in the 230 V circuit is greater than 3.8 A for 1 second, or 2.5 A for 10 seconds. The module will turn ON again, when the AC powered device is unplugged from the outlet, and then plugged into the outlet after a 3 second delay.

230 Volt Power Outlet Receptacle Internal Shutdown

The accessory DC/AC power inverter module will turn OFF if the B+ supply voltage is greater than 16.5 V or less than 11 V. The module will also turn OFF if the device temperature is greater than 85°C (185°F). The module will turn ON again, after the shutdown condition is corrected, and the AC powered device is unplugged from the accessory power receptacle – 220V AC, and then plugged into the accessory power receptacle – 220V AC.

USB Receptacle Description and Operation (USS)

The vehicle is fitted with USB charge port receptacles at the rear of the floor console. These USB receptacles are for charging devices only. The USB receptacles are controlled by an ignition operated relay and are operational when the ignition is turned to either the On or the Accessories positions.

Wiring Systems and Power Management

Schematic and Routing Diagrams

How to Use Electrical Schematics

Information Overview

The following explains some of the key parts of the GM wiring diagrams. Included are:

- Color Abbreviations
- Electronic Delivery Navigation Features

Color Abbreviations

The following sequence is used when depicting wire colors:

1. Color modifier of the wire, such as light or dark (if applicable)
2. Primary color of the wire
3. Secondary color of the wire (tracer/stripe)

Wire insulation and connector body colors in schematic information are abbreviated with a two character code as listed below.

Abbreviation	Color	Abbreviation	Color
AM	Amber	OG	Orange
BARE	Bare	PK	Pink
BG	Beige	PU	Purple
BK	Black	RD	Red
BN	Brown	RU	Rust
BU	Blue	SR	Silver
CL	Clear	TL	Teal
CR	Cream	TN	Tan
CU	Curry	TQ	Turquoise
GD	Gold	VT	Violet
GN	Green	WH	White
GY	Gray	YE	Yellow
NA	Natural	—	—
Color Modifiers			
L	Light	D	Dark

Additionally, industry standard cable types are not identified by color, but are listed by cable type as follows:

Abbreviation	Cable Type
COAX	Coax Cable
ENET	Ethernet
FW	Flat Wire
HDMI	High Definition Multimedia Interface
LVDS	Low-voltage Differential Signaling
TWINAX	Twinax Cable
USB	Universal Serial Bus

Electronic Delivery Navigation Features

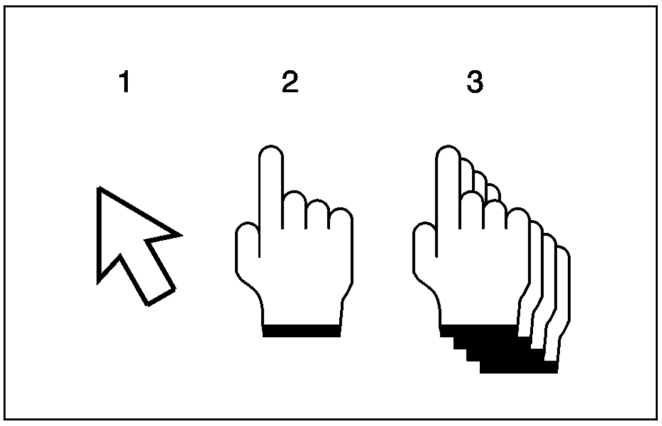
The schematics information has been enhanced for electronic delivery and the following explains the features that are now available.

The enhanced features are categorized into three types:

- Mouse-overs, which are active when the mouse pointer is placed over the activated area

- Hotspots (links to other information), which are active by placing the mouse pointer over the activated area and clicking the left mouse button
- Hotspot Target Highlighting, which is when linking from one graphic to another graphic, the point of interest will be highlighted in red. This feature is available only when linking from a schematic graphic to a component locator/harness routing view, or when linking from a schematic to an electrical center identification view

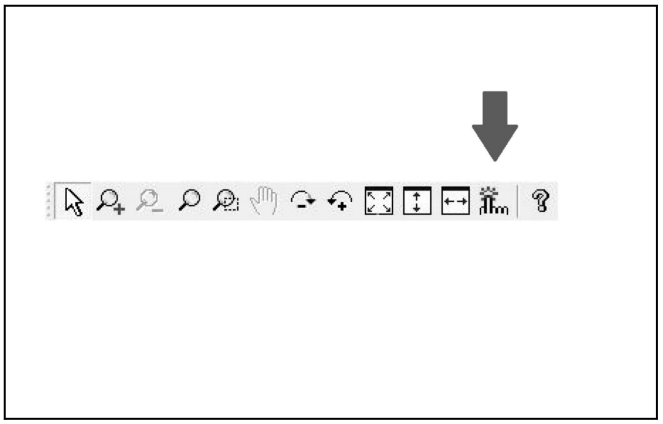
Depending on the amount of information that is linked to from a hotspot, the mouse pointer changes shape.



3819127

1. Basic mouse pointer – this means there are no hotspots available, but there may be a mouse-over available.
2. Single hand pointer – this means there is a mouse-over and hotspot link to a single document. Clicking on these areas will automatically take you to the target link.
3. Multiple hand pointer – this means there is a mouse-over and hotspot link to a multiple document. Clicking on these areas will bring up a pop-up menu that will display all available links. You may then select one of the available links clicking on one of the displayed links.

To see which areas of the schematic information have an available hotspot and/or a mouse-over, select and hold down the highlight hotspots button of the cgm viewer. This will highlight all areas of the graphic that have an available hotspot and/or a mouse-over in red. Once the button is released, the areas of the graphic will no longer be highlighted.



3819130

Each type of schematic related information has some level of these features. The schematic related information consists of the following information types:

- Schematics
- Connector End Views
- Component Locator Views
- Harness Routing Views
- Electrical Center Identification Views
- Master Electrical Component List
- Master Electrical Schematic Icons
- Schematics RPO Code List
- Circuit Number/Wire Colors
- Wire Lines
- Connector Cavities

Schematics

An electrical schematic hotspot is an activated icon or area in the schematic that can be cursor selected to link to additional information. Additionally, each of the hotspots in schematics has a mouse-over.

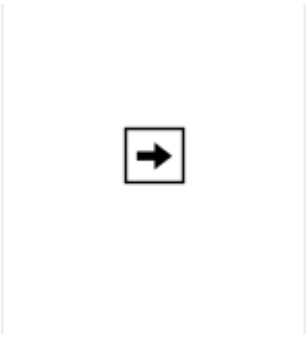
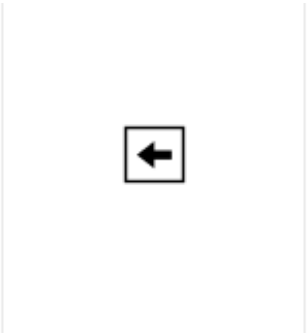
Hotspots in schematics are categorized into three types:

- Schematic Navigational Icon Hotspots
- Schematic Informational Icon Hotspots
- Schematic Navigational Hotspots

Schematic Navigational Icon Hotspots

The following lists icons that may appear on the upper right corner of a schematic that have an available mouse-over and hotspot.

Icon	Mouse-Over	Hotspot Link to Information
1990537	Master Electrical Component List	Links to the vehicle Master Electrical Component List that shows all electrical components and harness items on the vehicle and has links to any available views
1990538	Title of the subsystem description and operation	Links to the System Description and Operation
1988674	Control Module References	Links to the Control Module References table

Icon	Mouse-Over	Hotspot Link to Information
 1990541	Title of the next schematic page	Links to the next schematic of the subsystem schematics
 1990542	Title of the previous schematic page	Links to the previous schematic of the subsystem schematics

Schematic Informational Icon Hotspots

The following lists the icons that may appear anywhere on a schematic that have an available mouse-over and hotspot.

Icon	Mouse-Over	Hotspot Link to Information
Danger 1988672	Master Electrical Schematic Icons	Links to the vehicle Master Electrical Schematic Icons list that describes the message for the icon.
High Voltage 1988673	Master Electrical Schematic Icons	Links to the vehicle Master Electrical Schematic Icons list that describes the message for the icon.
Caution 1990543	Master Electrical Schematic Icons	Links to the vehicle Master Electrical Schematic Icons list that describes the message for the icon.
Supplemental Restraint 1988667	Master Electrical Schematic Icons	Links to the vehicle Master Electrical Schematic Icons list that describes the message for the icon.

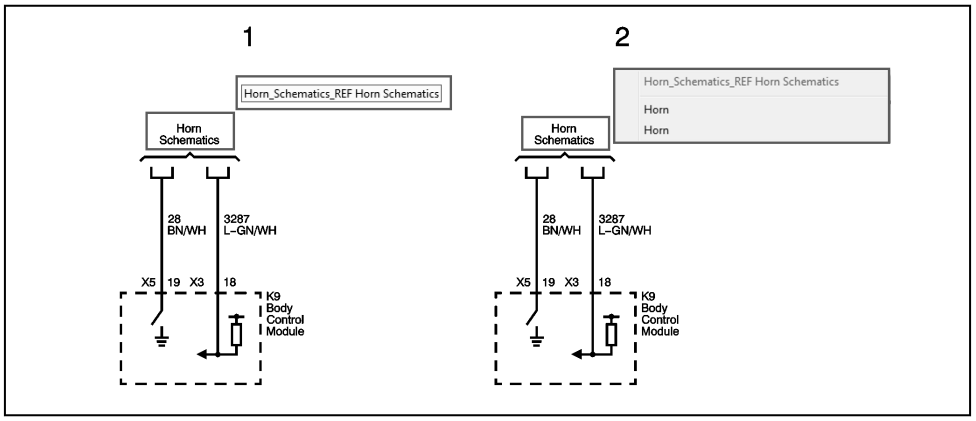
Icon	Mouse-Over	Hotspot Link to Information
Pedestrian Impact 3814889	Master Electrical Schematic Icons	Links to the vehicle Master Electrical Schematic Icons list that describes the message for the icon.
Additional Information 1988670	Master Electrical Schematic Icons	Links to the vehicle Master Electrical Schematic Icons list that describes the message for the icon.

Schematic Navigational Hotspots

In addition to the navigational icons, schematics have other active hotspots that link to supporting information such as related schematics, component locator views, harness routing views, and connector end views.

These hotspots can be either text based or symbol based. The following are the items that will have a mouse-over and hotspot.

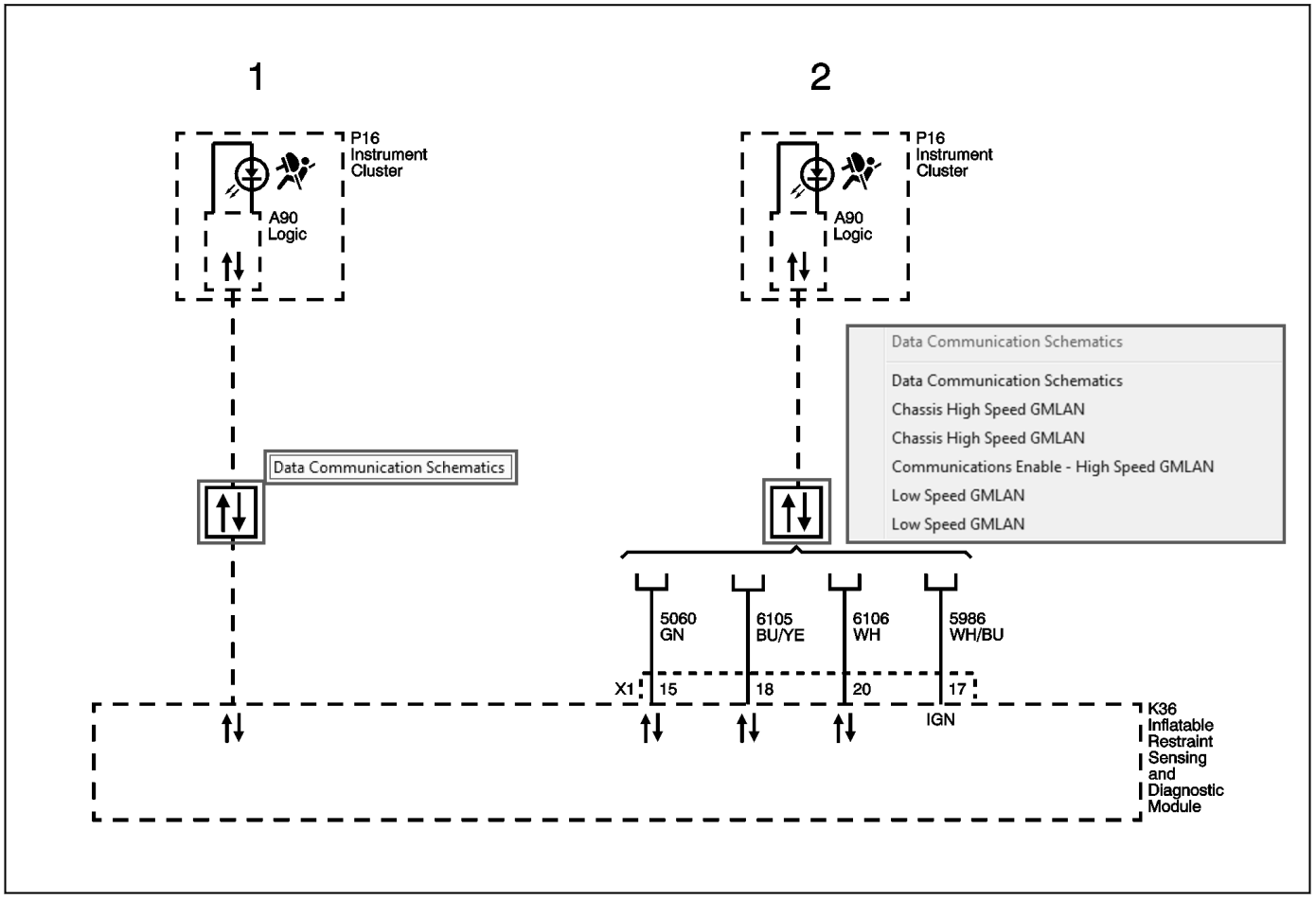
Schematic Title Circuit References



3814891

1. **Mouse-over:** Displays the title of the schematic page linked to.
2. **Hotspot Link to Information:** Links to the individual subsystem schematic page(s) that shows the circuit in detail. If multiple circuits are included, or if the circuit is shown in multiple schematics, a menu will appear when the link is selected. This menu includes links to all schematics that contain the same circuit number as the circuit being referenced. Additionally, when the target schematic is opened, the referenced circuit will be highlighted to draw visual attention. Note that when there are multiple target links, the links may appear to be duplicate in the menu, however, they are not. The exact same title is repeated for each circuit number that is pointing to the same target schematic. A future update will include the circuit number before the link description to further assist in link selection.

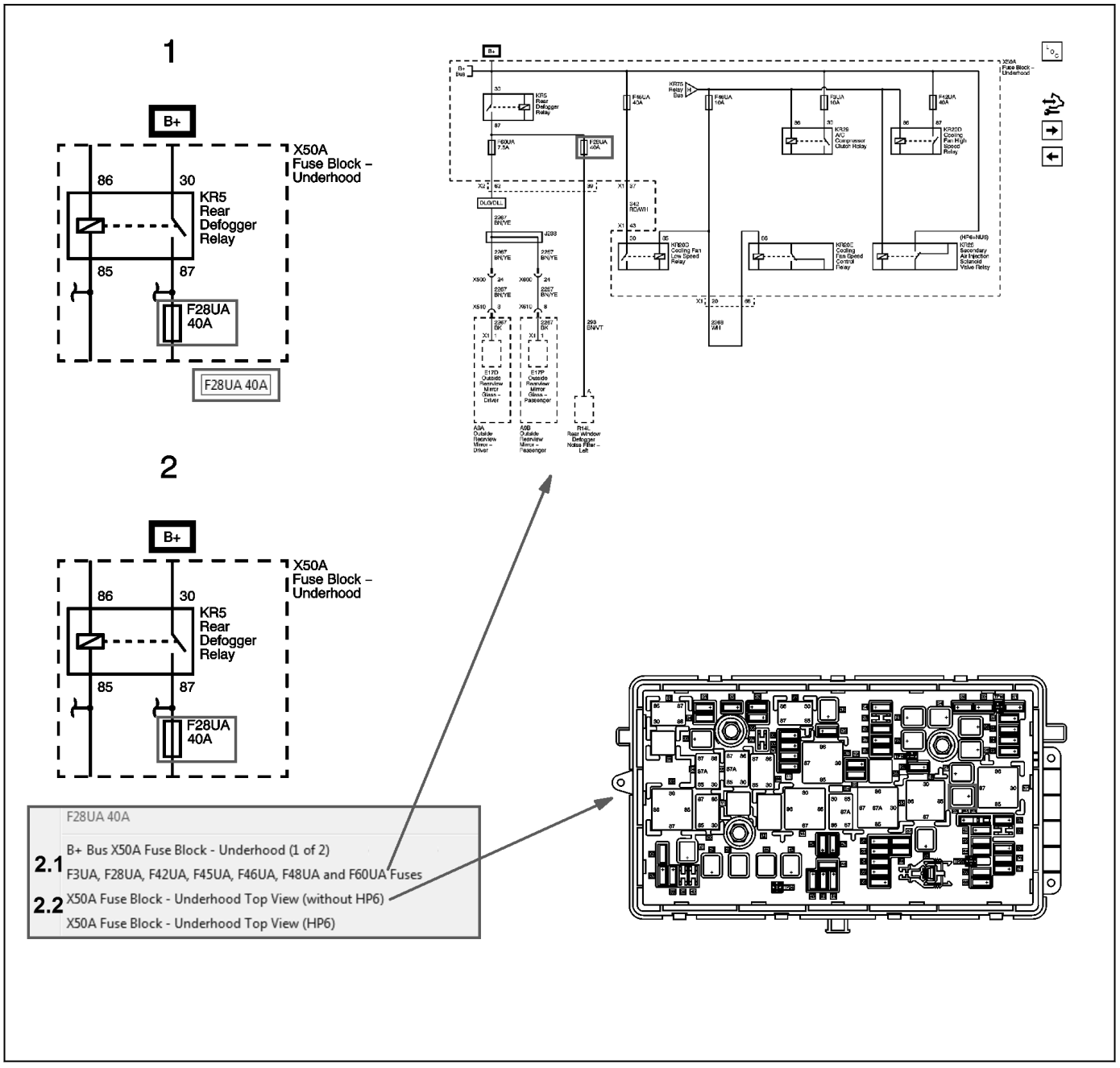
Serial Data Functional Circuit Icon



3818612

1. **Mouse-over:** Displays the schematic title Data Communication Schematics.
2. **Hotspot Link to Information:**
   - ⇒ When a dashed serial data wire and icon are shown without any circuit numbers, the serial data circuit icon will link to the complete list of Data Communication schematic pages, and not a specific schematic. This is due to no circuit numbers are shown.
   - ⇒ When a circuit wire(s) are shown with circuit numbers, a menu will appear when the link is selected. This menu includes links to the list of Data Communication schematic pages as well as links to the individual schematics that contain the same circuit number as the circuit being referenced. Additionally, when the target schematic is opened, the referenced circuit will be highlighted to draw visual attention. Note that when there are multiple target links, the links may appear to be duplicate in the menu, however, they are not. The exact same title is repeated for each circuit number that is pointing to the same target schematic. A future update will include the circuit number before the link description to further assist in link selection.

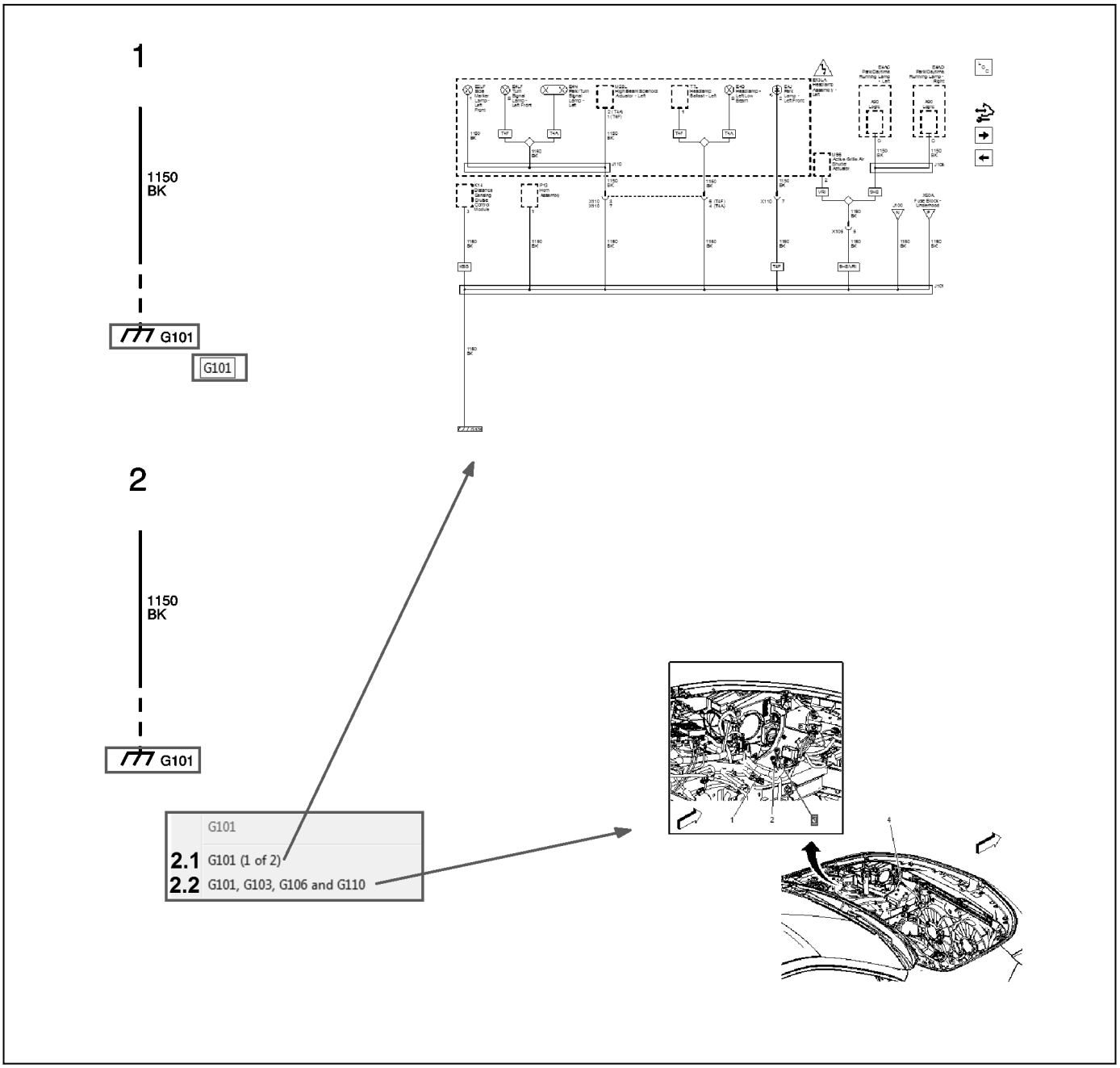
Fuse/Circuit Breaker Symbol and Name within Subsystem Schematics



3818725

1. **Mouse-over:** Displays the code and the amperage of the protection device.
2. **Hotspot Link to Information:**
   ⇒ When multiple links are available, a menu will appear when the link is selected. This menu includes all available links in a structured sequence.
   2.1. Links to the individual schematic page(s) within the Power Distribution Schematics where the circuits are shown in detail. Additionally, when the target schematic is opened, the circuit protection device will be highlighted to draw visual attention.
   2.2. Links to individual fuse block top or bottom view(s) within the Electrical Center Identification Views and will show where the device is located in the fuse block. Additionally, when the target view is opened, the device outline will be highlighted for visual attention.

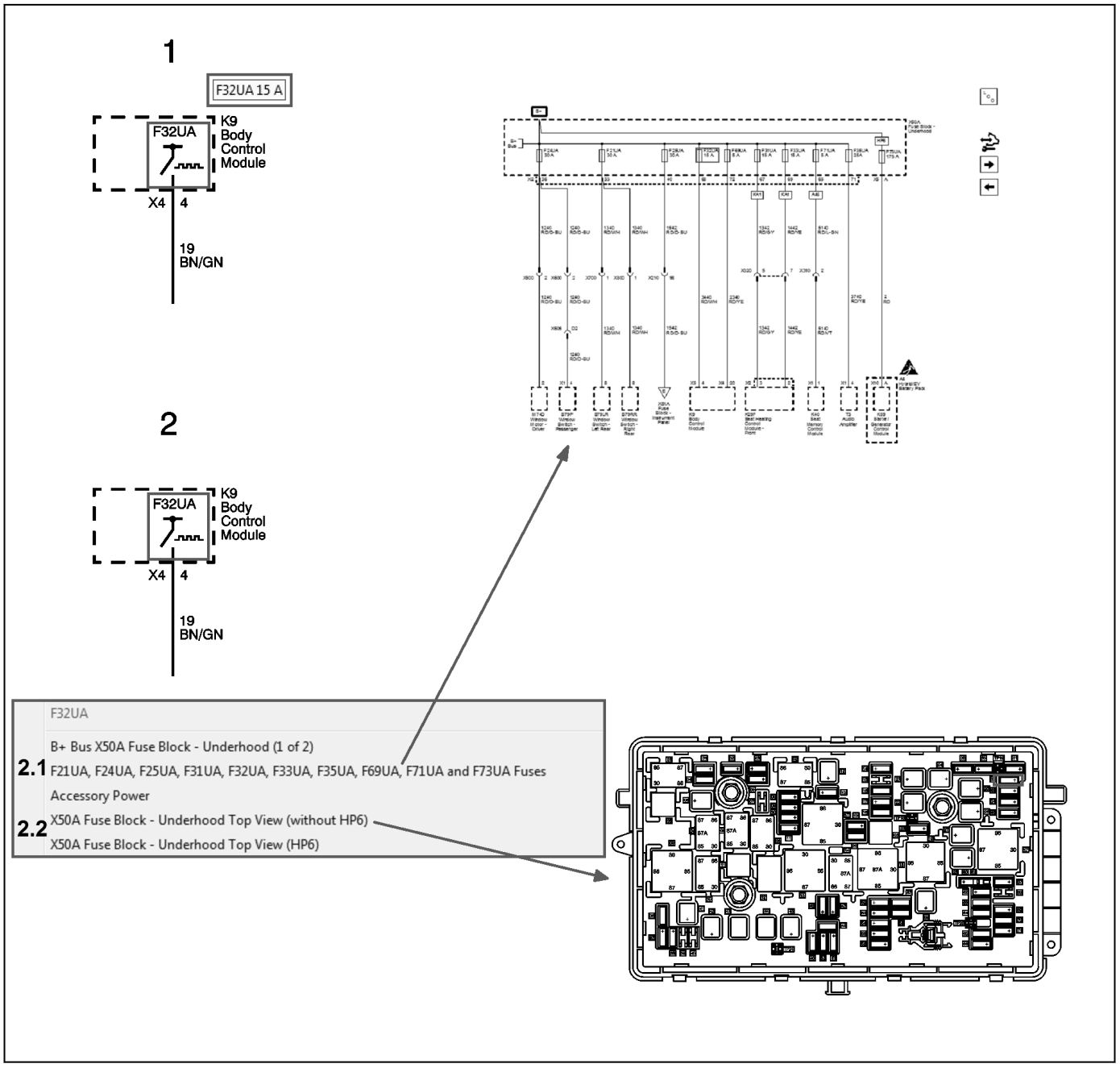
Ground Symbol/Name in Subsystem Schematics



3818918

1. **Mouse-over:** Displays the ground number.
2. **Hotspot Link to Information:**
   - ⇒ When multiple links are available, a menu will appear when the link is selected. This menu includes all available links in a structured sequence.
   - 2.1. Links to the individual schematic page(s) within the Ground Distribution Schematics where the circuits are shown in detail. Additionally, when the target schematic is opened, the ground will be highlighted to draw visual attention.
   - 2.2. Links to the individual locator view(s) within the Ground Views and will show where the ground is located on the vehicle. Additionally, when the target view is opened, the ground and callout leader line/number will be highlighted to draw visual attention.

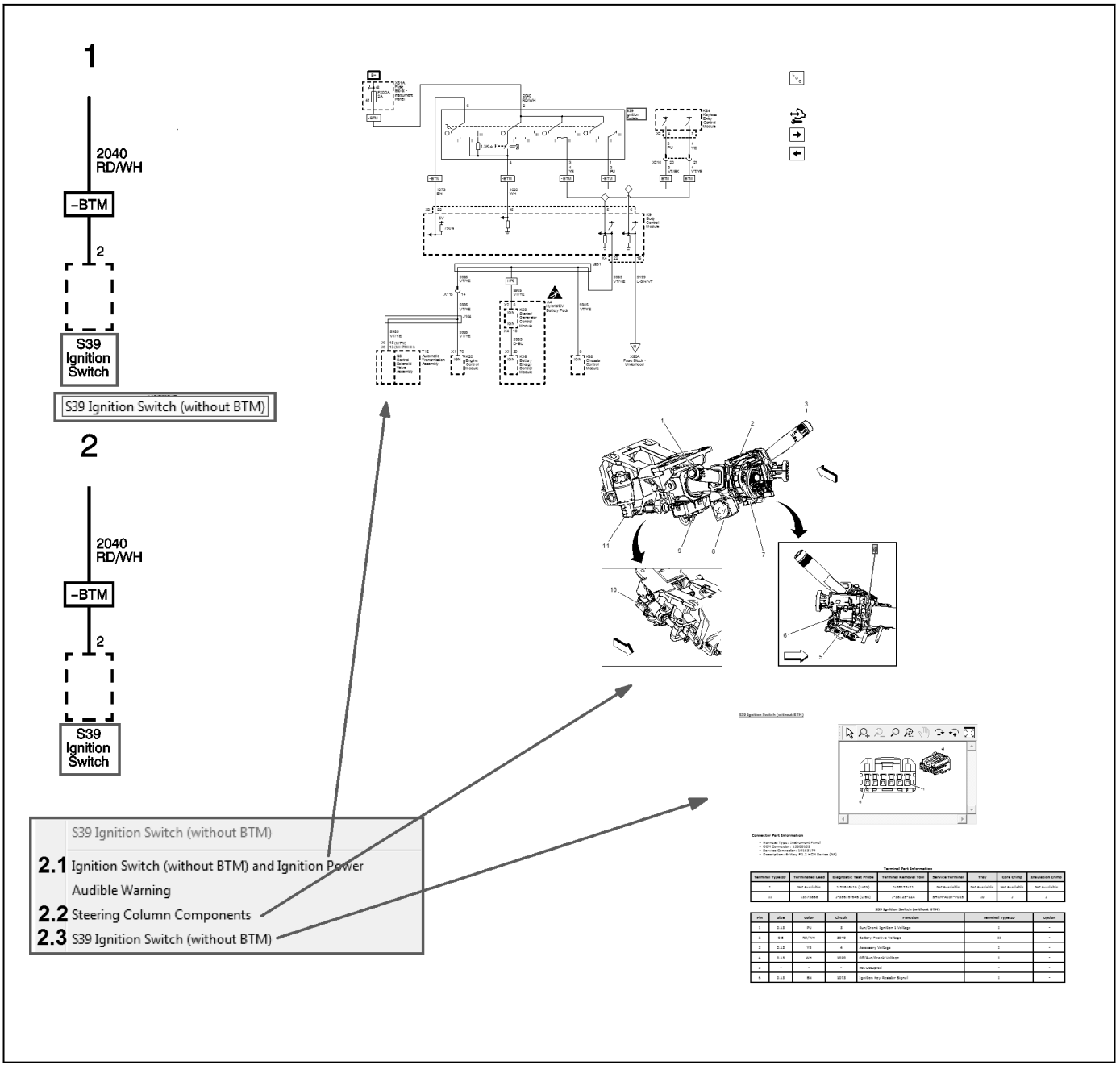
Body Control Module High-Side Driver Output Symbol/Driver Source Fuse Name in Subsystem Schematics



3819026

1. **Mouse-over:** Displays the code of the protection device that supplies the high-side driver output circuit.
2. **Hotspot Link to Information:**
   ⇒ When multiple links are available, a menu will appear when the link is selected. This menu includes all available links in a structured sequence.
   2.1. Links to the individual schematic page(s) within the Power Distribution Schematics where the circuits are shown in detail. Additionally, when the target schematic is opened, the circuit protection device will be highlighted to draw visual attention.
   2.2. Links to individual fuse block top or bottom view(s) within the Electrical Center Identification Views and will show where the device is located in the fuse block. Additionally, when the target view is opened, the device outline will be highlighted for visual attention.

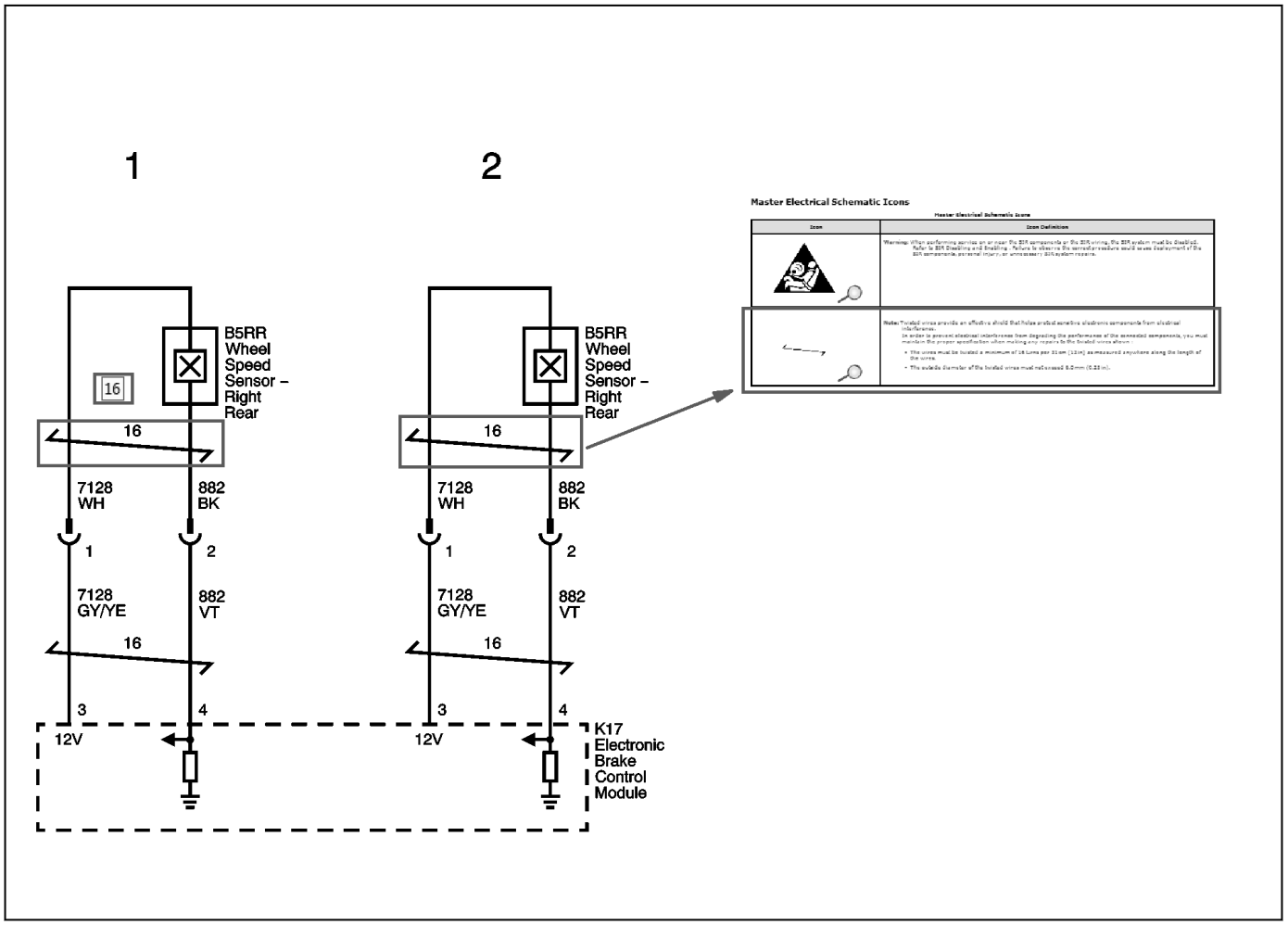
Component Name in Power and Ground Distribution Schematics



3819063

1. **Mouse-over:** Displays the code and name of the component.
2. **Hotspot Link to Information:**
   ⇒ When multiple links are available, a menu will appear when the link is selected. This menu includes all available links in a structured sequence.
   2.1. Links to the individual schematic page(s) within the Subsystem Schematic(s) where the circuits are shown in detail. Additionally, when the target schematic is opened, the component code and name will be highlighted to draw visual attention.
   2.2. Links to the individual locator view(s) within the applicable component view category and will show where the component is located on the vehicle. Additionally, when the target view is opened, the component and callout leader line/number will be highlighted to draw visual attention.
   2.3. Links to individual connector end view(s) within the Component Connector End Views.

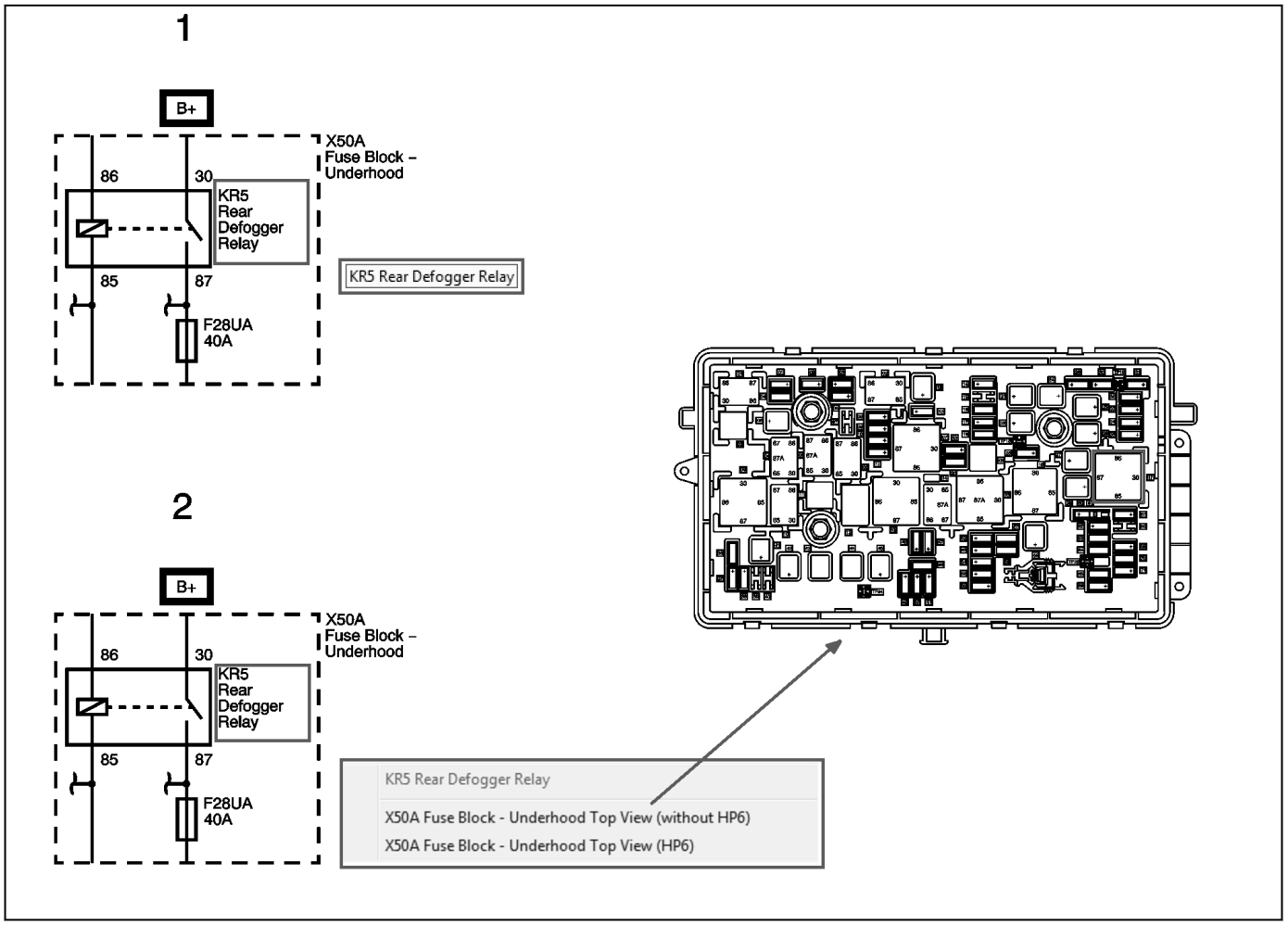
Twisted Pair Symbols



3819064

1. **Mouse-over:** Displays the repair specification for the number of twists of the wire within the specified distance.
2. **Hotspot Link to Information:** Links to the Master Electrical Schematic Icons list that shows the icon along with the repair specification details for the wire.

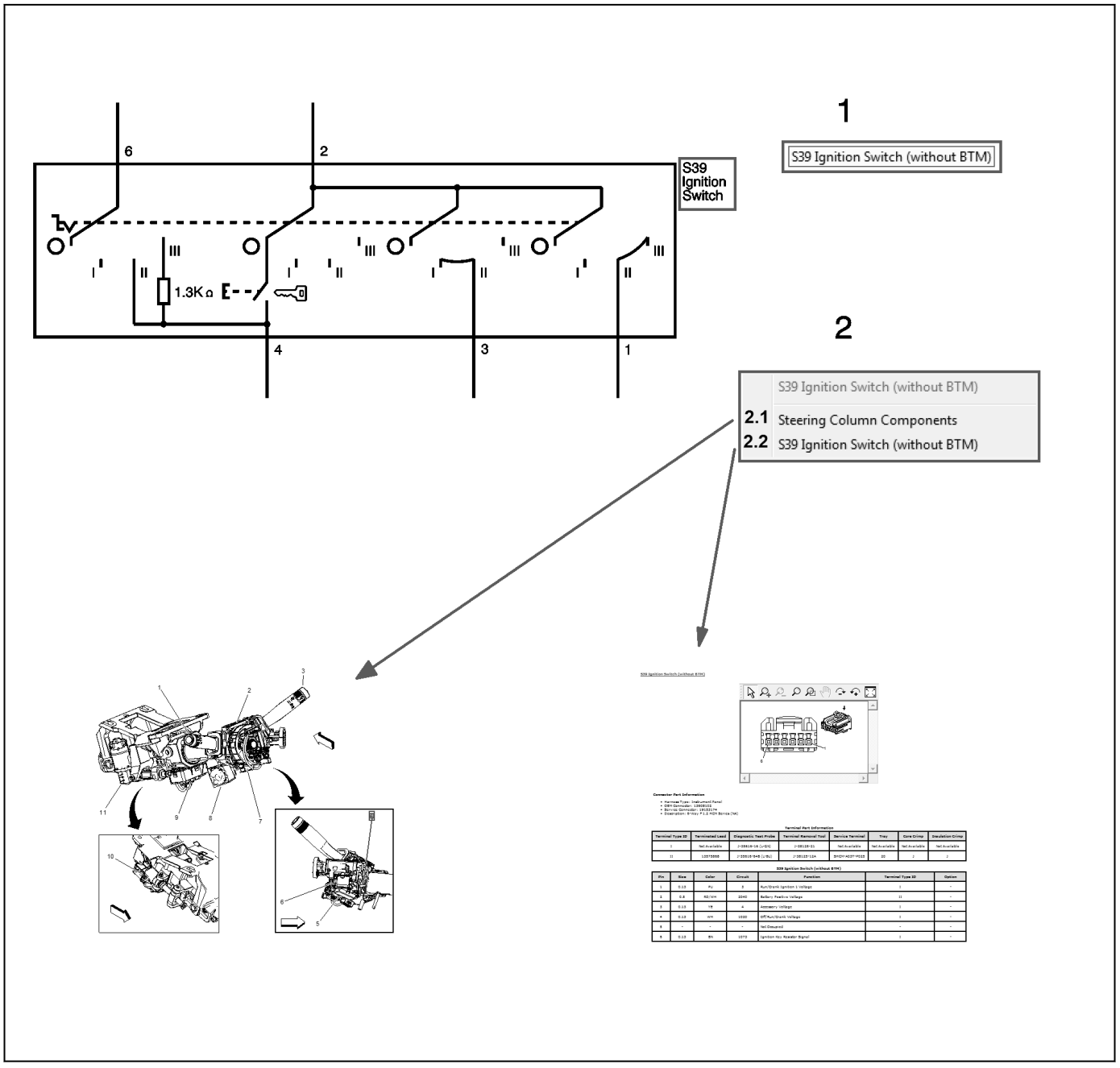
Relay Name (located within a block)



3819124

1. **Mouse-over:** Displays the relay code and name.
2. **Hotspot Link to Information:** Links to individual fuse block top or bottom view(s) within the Electrical Center Identification Views and will show where the device is located in the fuse block. Additionally, when the target view is opened, the device outline will be highlighted for visual attention.

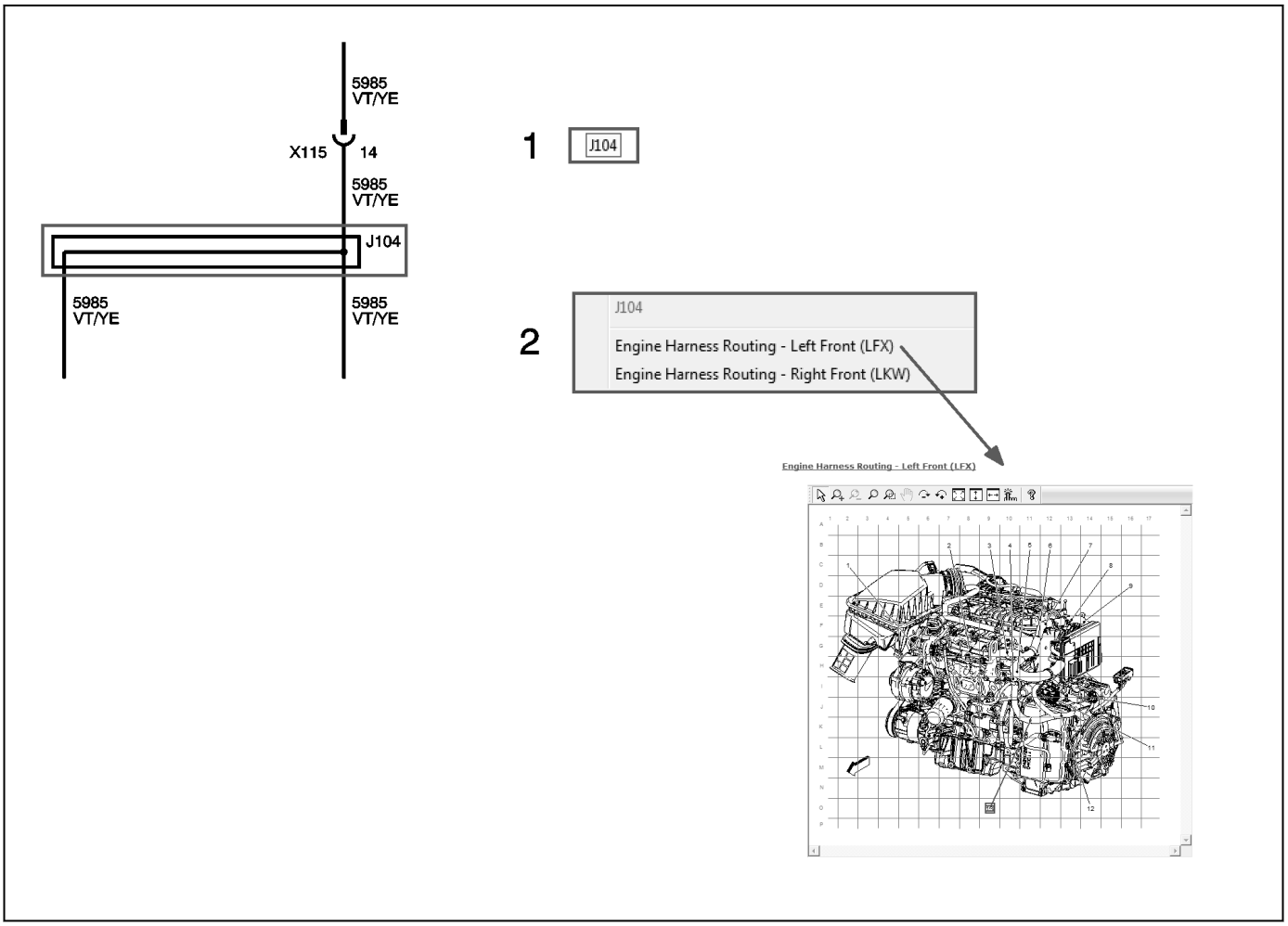
Component Name in Subsystem Schematics



3819141

1. **Mouse-over:** Displays the code and name of the component.
2. **Hotspot Link to Information:**
   ⇒ When multiple links are available, a menu will appear when the link is selected. This menu includes all available links in a structured sequence.
   2.1. Links to the individual locator view(s) within the applicable component view category and will show where the component is located on the vehicle. Additionally, when the target view is opened, the component and callout leader line/number will be highlighted to draw visual attention.
   2.2. Links to individual connector end view(s) within the Component Connector End Views.

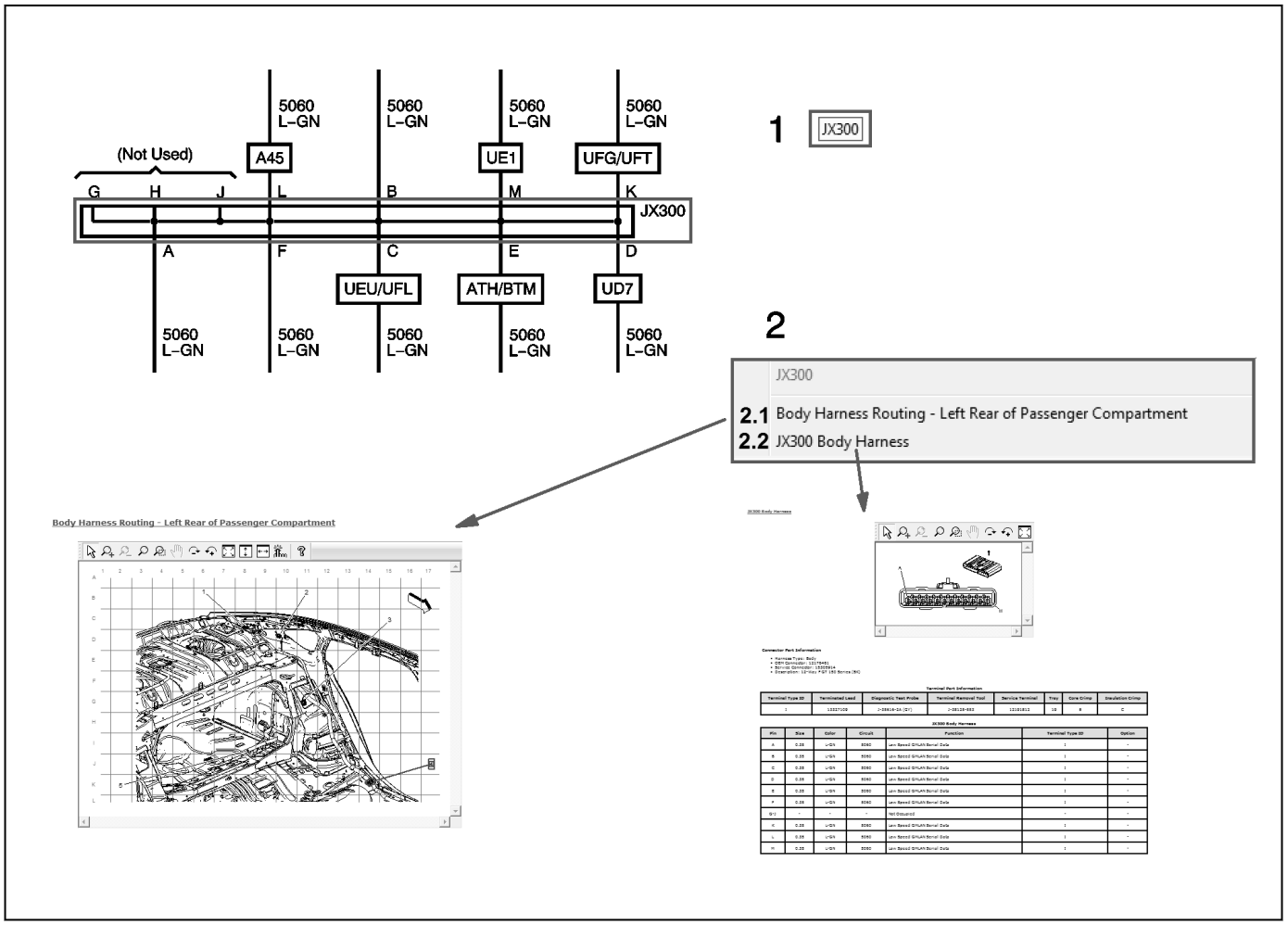
Splice Names



3819287

1. **Mouse-over:** Displays the code of the harness splice.
2. **Hotspot Link to Information:** Links to the individual harness routing view(s) within the Harness Routing Views and will show where the harness item is located on the vehicle harness. Additionally, when the target view is opened, the harness item and callout leader line/number will be highlighted to draw visual attention.

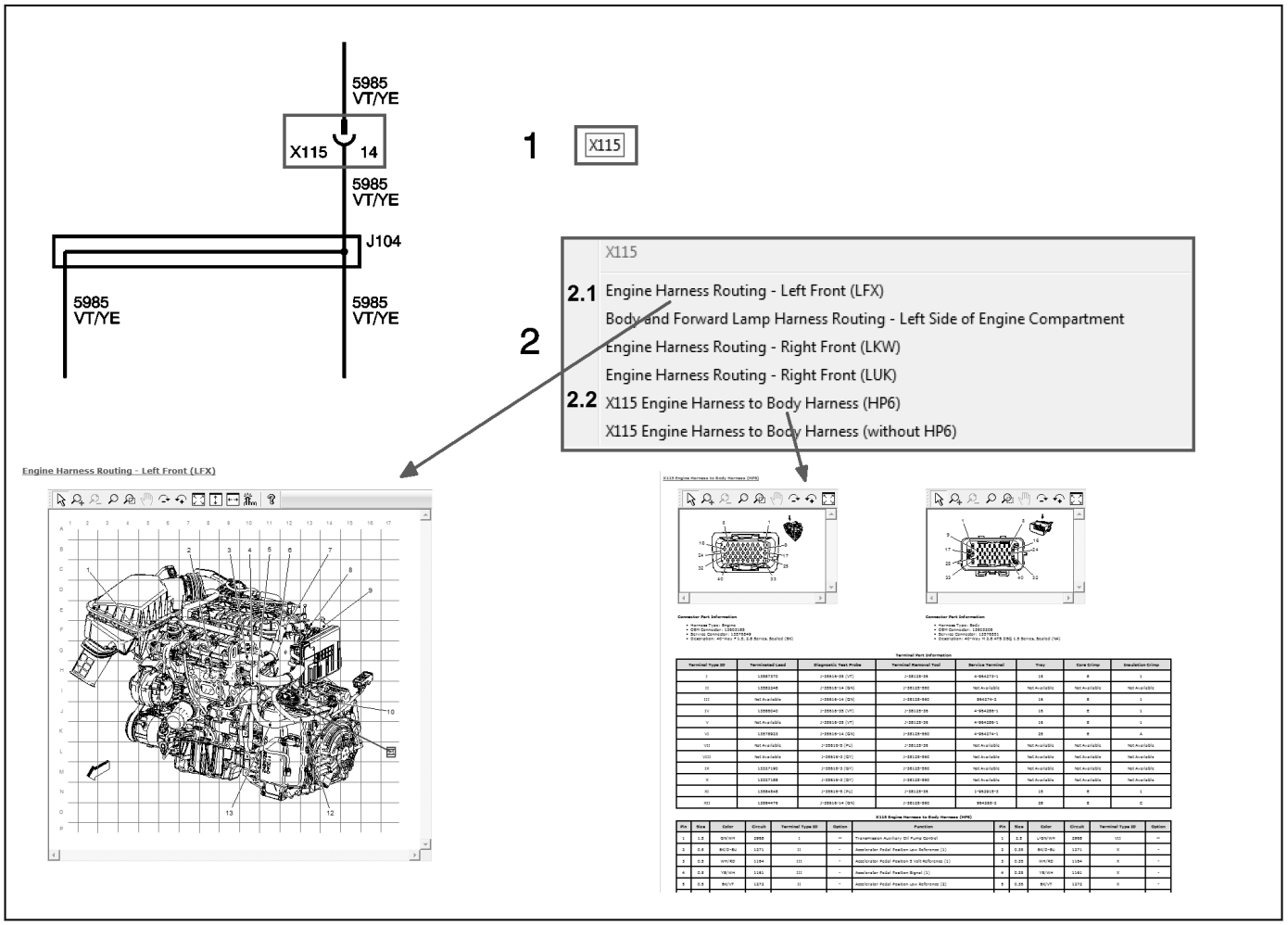
Splice Pack Names



3819454

1. **Mouse-over:** Displays the code of the harness splice pack.
2. **Hotspot Link to Information:**
   - ⇒ When multiple links are available, a menu will appear when the link is selected. This menu includes all available links in a structured sequence.
   - 2.1. Links to the individual harness routing view(s) within the Harness Routing Views and will show where the harness item is located on the vehicle harness. Additionally, when the target view is opened, the harness item and callout leader line/number will be highlighted to draw visual attention.
   - 2.2. Links to individual connector end view(s) within the Splice Pack Connector End Views.

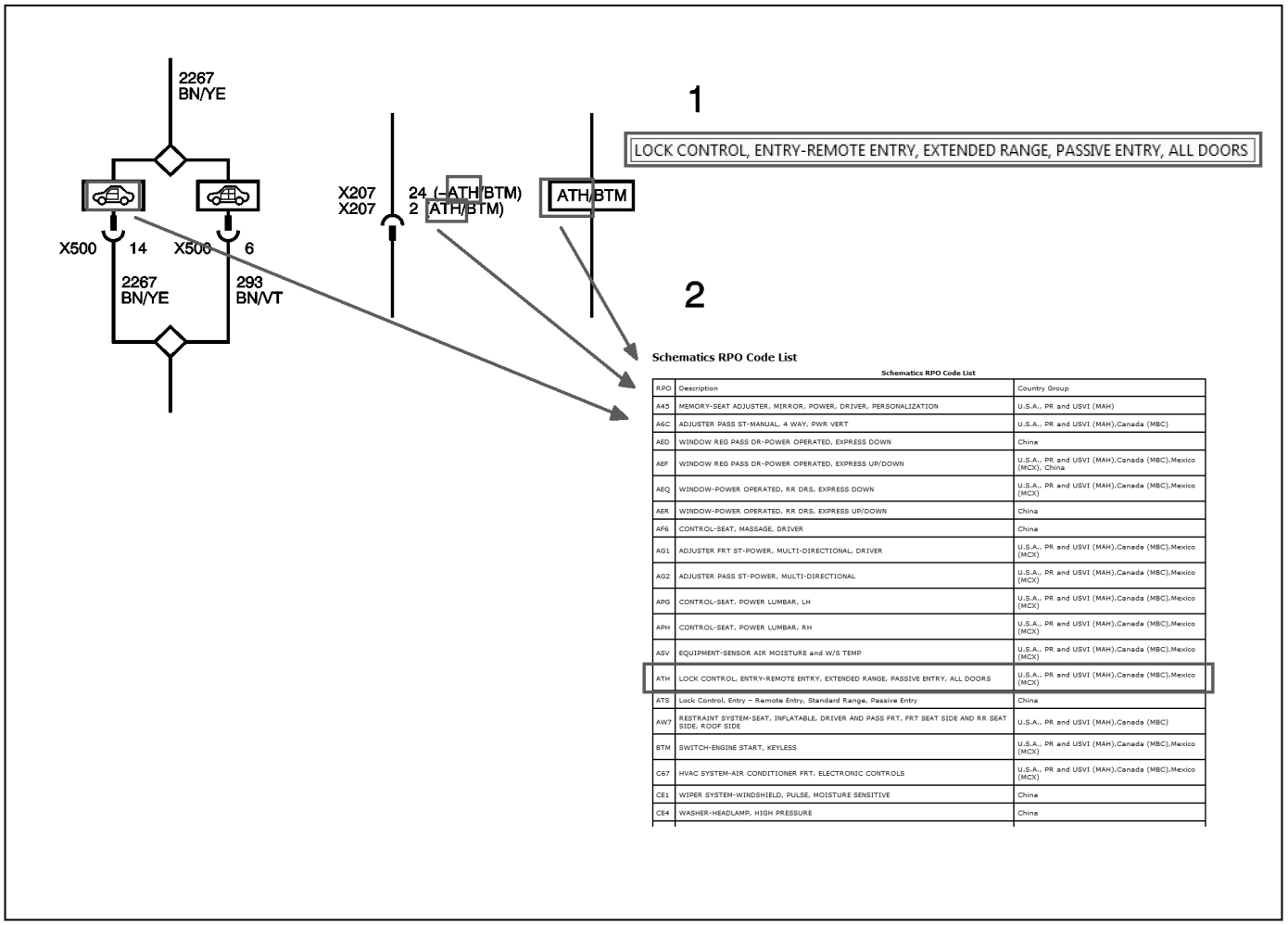
Inline Harness Connector Names



3819345

1. **Mouse-over:** Displays the code of the inline harness connector.
2. **Hotspot Link to Information:**
   - ⇒ When multiple links are available, a menu will appear when the link is selected. This menu includes all available links in a structured sequence.
   - 2.1. Links to the individual harness routing view(s) within the Harness Routing Views and will show where the harness item is located on the vehicle harness. Additionally, when the target view is opened, the harness item and callout leader line/number will be highlighted to draw visual attention.
   - 2.2. Links to individual connector end view(s) within the Inline Harness Connector End Views.

Regular Production Option (RPO) Codes/Icons



Schematics RPO Code List

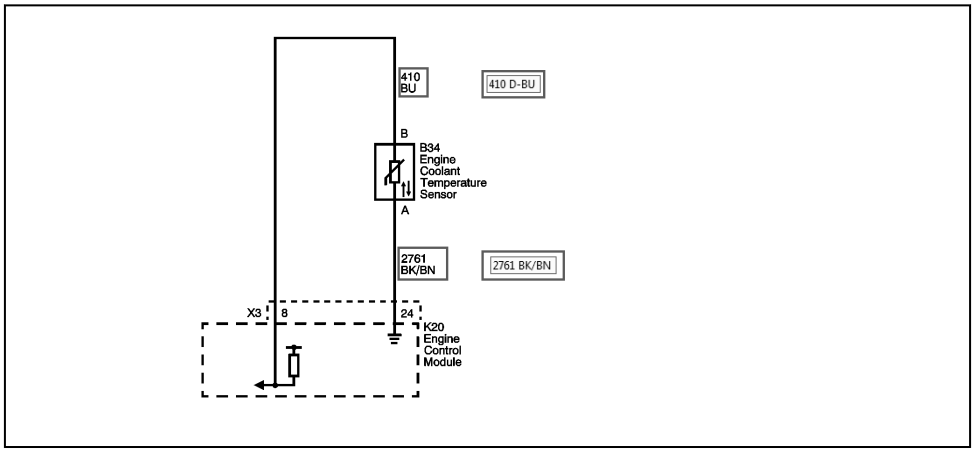
Schematics RPO Code List

RPO	Description	Country Group
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION	U.S.A., PR and USVI (MAH)
A6C	ADJUSTER PASS ST-MANUAL, 4 WAY, PWR VERT	U.S.A., PR and USVI (MAH),Canada (MBC)
AED	WINDOW REG PASS DR-POWER OPERATED, EXPRESS DOWN	China
AEF	WINDOW REG PASS DR-POWER OPERATED, EXPRESS UP/DOWN	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX), China
AEQ	WINDOW-POWER OPERATED, RR DRS, EXPRESS DOWN	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
AER	WINDOW-POWER OPERATED, RR DRS, EXPRESS UP/DOWN	China
AF6	CONTROL-SEAT, MASSAGE, DRIVER	China
AG1	ADJUSTER FRT ST-POWER, MULTI-DIRECTIONAL, DRIVER	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
AG2	ADJUSTER PASS ST-POWER, MULTI-DIRECTIONAL	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
APG	CONTROL-SEAT, POWER LUMBAR, LH	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
APH	CONTROL-SEAT, POWER LUMBAR, RH	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
ASV	EQUIPMENT-SENSOR AIR MOISTURE and W/S TEMP	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
ATH	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
ATS	Lock Control, Entry – Remote Entry, Standard Range, Passive Entry	China
AW7	RESTRAINT SYSTEM-SEAT, INFLATABLE, DRIVER AND PASS FRT, FRT SEAT SIDE AND RR SEAT SIDE, ROOF SIDE	U.S.A., PR and USVI (MAH),Canada (MBC)
BTM	SWITCH-ENGINE START, KEYLESS	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
C67	HVAC SYSTEM-AIR CONDITIONER FRT, ELECTRONIC CONTROLS	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
CE1	WIPER SYSTEM-WINDSHIELD, PULSE, MOISTURE SENSITIVE	China
CE4	WASHER-HEADLAMP, HIGH PRESSURE	China

3819777

1. **Mouse-over:** Displays the description of the RPO code as well as the country group names where the option is possible to order. Note that each RPO shown will have its own mouse-over and description. Also note that the mouse-over does not include any symbols indicating with (shown as a + sign if combined option) or without (shown as a – sign to mean without/except).
2. **Hotspot Link to Information:** Links to the Schematics RPO Code List that shows the RPO, the description of the option, and the country group names where the option is possible to order.

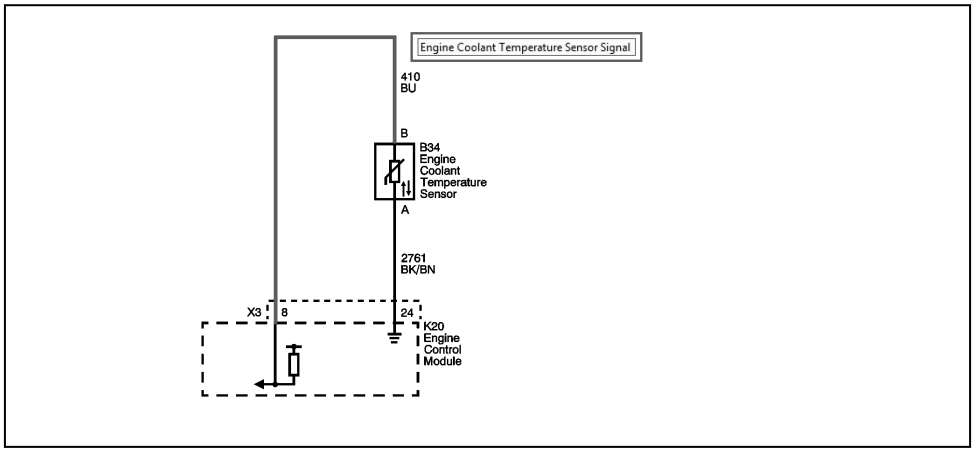
Circuit Number/Wire Colors



3819880

1. **Mouse-over:** Displays the circuit number (if shown) and the color abbreviation of the wire insulation. Refer to Color Abbreviations for an explanation of each wire color abbreviation. A future update may spell out the wire colors in all languages.
2. **Hotspot Link to Information:** None at this time.

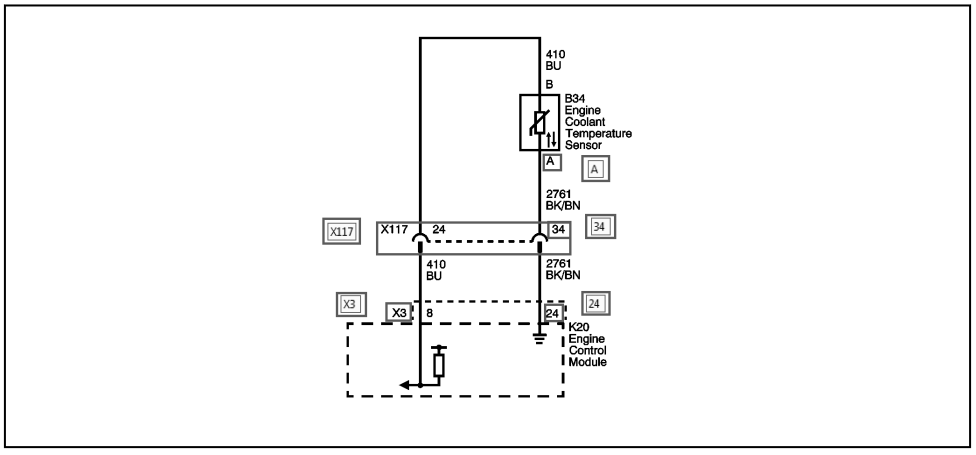
Wire Lines



3819888

1. **Mouse-over:** Displays the circuit function of the wire as used on the vehicle. This same function is shown in the connector end view pinout table for the component the wire connects. Note if there is no circuit number shown, the circuit will not have an associated mouse-over.
2. **Hotspot Link to Information:** None at this time. A future update may include links to harness routing views to show the routing of the circuit within the vehicle harness.

Connector Identifiers and Cavities



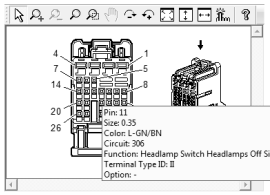
3819889

1. **Mouse-over:** Displays the cavity (pin) identifier (letter/number) for the connection at the component or inline harness connection.
2. **Hotspot Link to Information:** None at this time.

Connector End Views

Connector end view graphics now have mouse-overs to show the wire details of each of the populated cavities. Additionally, the terminal part information has been restructured into an easier to read table.

K9 Body Control Module X1



Connector Part Information

- Harness Type: Instrument Panel
- OEM Connector: 13631051
- Service Connector: 13576639
- Description: 26-Way F 64 Series (NA)

Terminal Part Information

Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327199	J-35616-35 (VT)	J-38125-12A	SNAC-A061T-M2.8	20	E	A
II	13327195	J-35616-64B (L-BU)	J-38125-12A	SNAC3-A021T-M0.64	20	J	J
III	13579954	J-35616-64B (L-BU)	J-38125-12A	Not Available	Not Available	Not Available	Not Available

K9 Body Control Module X1

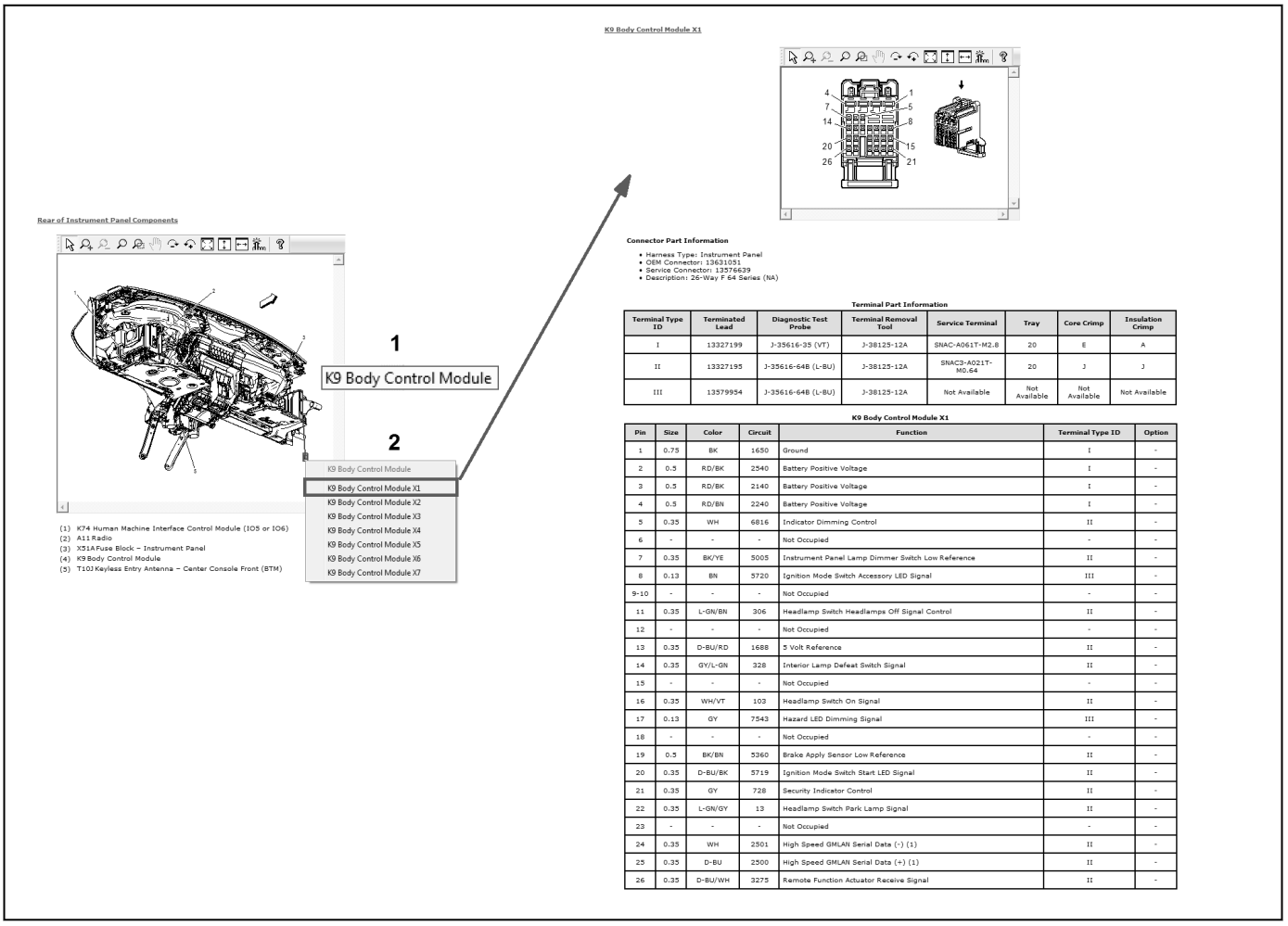
Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	BK	1650	Ground	I	-
2	0.5	RD/BK	2540	Battery Positive Voltage	I	-
3	0.5	RD/BK	2140	Battery Positive Voltage	I	-
4	0.5	RD/BN	2240	Battery Positive Voltage	I	-
5	0.35	WH	6816	Indicator Dimming Control	II	-
6	-	-	-	Not Occupied	-	-
7	0.35	BK/YE	5005	Instrument Panel Lamp Dimmer Switch Low Reference	II	-
8	0.13	BN	5720	Ignition Mode Switch Accessory LED Signal	III	-
9-10	-	-	-	Not Occupied	-	-
11	0.35	L-GN/BN	306	Headlamp Switch Headlamps Off Signal Control	II	-
12	-	-	-	Not Occupied	-	-
13	0.35	D-BU/RD	1688	5 Volt Reference	II	-
14	0.35	GY/L-GN	328	Interior Lamp Defeat Switch Signal	II	-
15	-	-	-	Not Occupied	-	-
16	0.35	WH/VT	103	Headlamp Switch On Signal	II	-
17	0.13	GY	7543	Hazard LED Dimming Signal	III	-
18	-	-	-	Not Occupied	-	-
19	0.5	BK/BN	5360	Brake Apply Sensor Low Reference	II	-
20	0.35	D-BU/BK	5719	Ignition Mode Switch Start LED Signal	II	-
21	0.35	GY	728	Security Indicator Control	II	-
22	0.35	L-GN/GY	13	Headlamp Switch Park Lamp Signal	II	-
23	-	-	-	Not Occupied	-	-
24	0.35	WH	2501	High Speed GMLAN Serial Data (-) (1)	II	-
25	0.35	D-BU	2500	High Speed GMLAN Serial Data (+) (1)	II	-
26	0.35	D-BU/WH	3275	Remote Function Actuator Receive Signal	II	-

3819951

1. **Mouse-over:** Displays all of the pinout table information for each column including Pin, Size, Color, Circuit, Function, Terminal Type ID, and Option. Note, that not used/not occupied cavities will not have a mouse-over at all. For not used/not occupied cavities, the connector graphic will appear to have a mouse-over, but no information will be displayed in a pop-up menu.
2. **Hotspot Link to Information:** None at this time. A future update may include links to individual subsystem schematic(s) for each circuit.

Component Locator Views

Component locator views now have links to component connector end views.



Terminal Type ID	Terminated Lead	Diagnostic Test Probe	Terminal Removal Tool	Service Terminal	Tray	Core Crimp	Insulation Crimp
I	13327199	J-35616-35 (VT)	J-38125-12A	SNAC-A061T-M2.8	20	E	A
II	13327195	J-35616-64B (L-BU)	J-38125-12A	SNAC3-A021T-M0.64	20	J	J
III	13579954	J-35616-64B (L-BU)	J-38125-12A	Not Available	Not Available	Not Available	Not Available

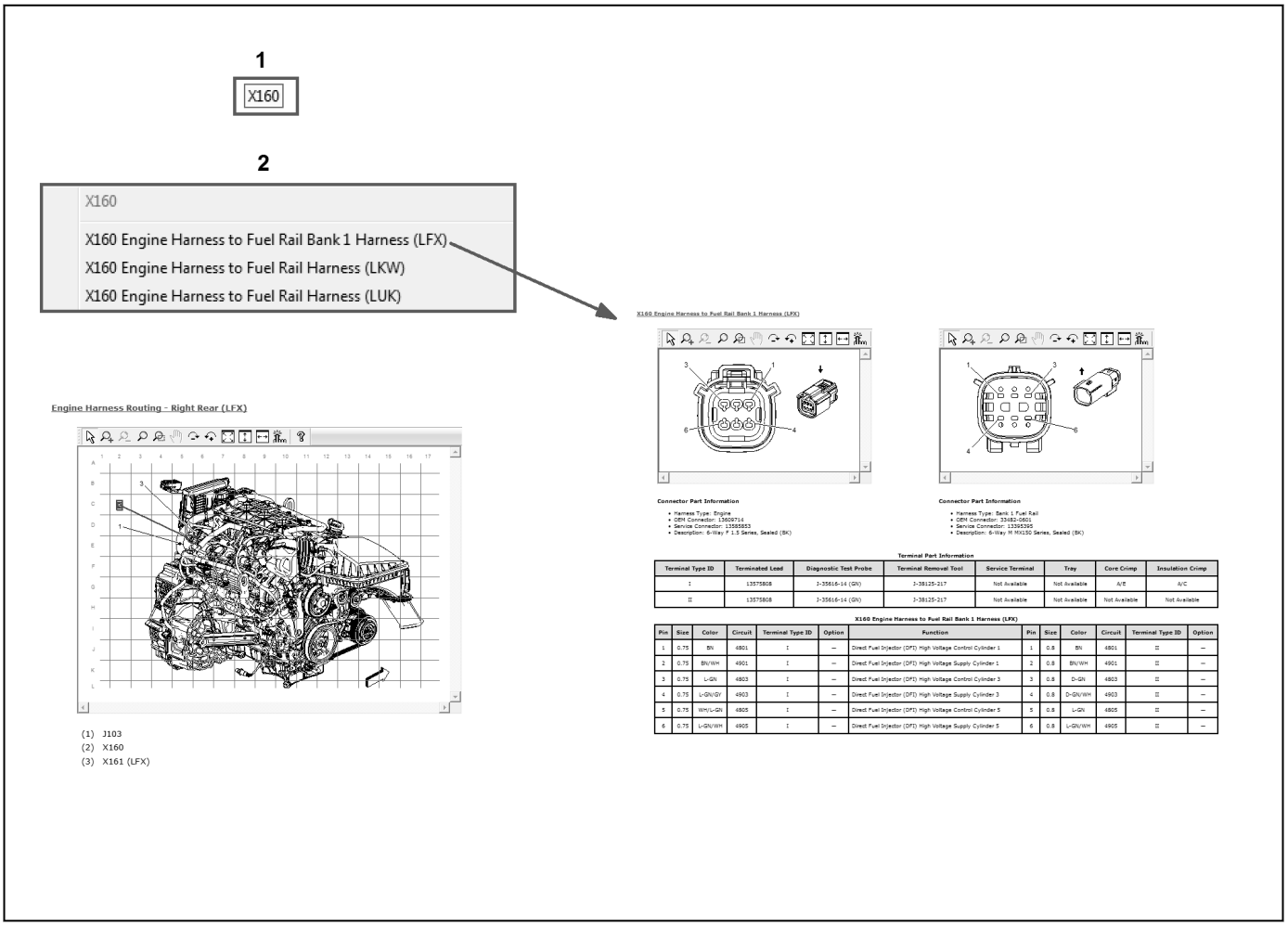
Pin	Size	Color	Circuit	Function	Terminal Type ID	Option
1	0.75	BK	1650	Ground	I	-
2	0.5	RD/BK	2540	Battery Positive Voltage	I	-
3	0.5	RD/BK	2140	Battery Positive Voltage	I	-
4	0.5	RD/BN	2240	Battery Positive Voltage	I	-
5	0.35	WH	6816	Indicator Dimming Control	II	-
6	-	-	-	Not Occupied	-	-
7	0.35	BK/YE	5005	Instrument Panel Lamp Dimmer Switch Low Reference	II	-
8	0.13	BN	5720	Ignition Mode Switch Accessory LED Signal	III	-
9-10	-	-	-	Not Occupied	-	-
11	0.35	L-GN/BN	306	Headlamp Switch Headlamps Off Signal Control	II	-
12	-	-	-	Not Occupied	-	-
13	0.35	D-BU/RD	1688	5 Volt Reference	II	-
14	0.35	GY/L-GN	328	Interior Lamp Defeat Switch Signal	II	-
15	-	-	-	Not Occupied	-	-
16	0.35	WH/VT	103	Headlamp Switch On Signal	II	-
17	0.13	GY	7543	Hazard LED Dimming Signal	III	-
18	-	-	-	Not Occupied	-	-
19	0.5	BK/BN	5360	Brake Apply Sensor Low Reference	II	-
20	0.35	D-BU/BK	5719	Ignition Mode Switch Start LED Signal	II	-
21	0.35	GY	728	Security Indicator Control	II	-
22	0.35	L-GN/GY	13	Headlamp Switch Park Lamp Signal	II	-
23	-	-	-	Not Occupied	-	-
24	0.35	WH	2501	High Speed GMLAN Serial Data (-) (1)	II	-
25	0.35	D-BU	2500	High Speed GMLAN Serial Data (+) (1)	II	-
26	0.35	D-BU/WH	3275	Remote Function Actuator Receive Signal	II	-

3819952

1. **Mouse-over:** Displays the code and name of the component.
2. **Hotspot Link to Information:** Links to individual connector end view(s) within Component Connector End Views.

Harness Routing Views

Harness routing views now have links to splice pack and inline harness connector end views.



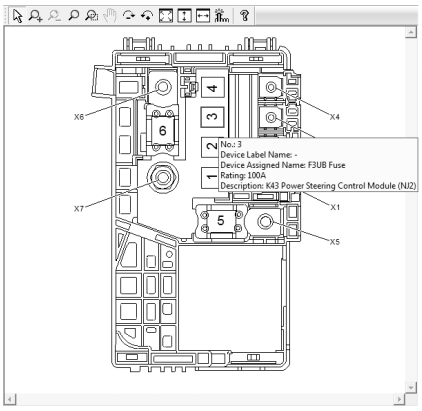
3819958

1. **Mouse-over:** Displays the code of the harness item.
2. **Hotspot Link to Information:** Links to individual splice pack connector end view(s) within Splice Pack Connector End Views for splice packs and to the individual inline harness connector end view(s) within Inline Harness Connector End Views for inline harness connectors.

Electrical Center Identification Views

Electrical center identification views (top and bottom/ front and back) graphics now have mouse-overs to show the function details of each of utilized devices. Note that the label view will not have any mouse-overs or links at all.

X50D Fuse Block - Battery Top View



X50D Fuse Block - Battery Usage

No.	Device Label Name	Device Assigned Name	Rating	Description
1	-	F1UB Fuse	60A	X51A Fuse Block - Instrument Panel
2	-	F2UB Fuse	60A	X51A Fuse Block - Instrument Panel
3	-	F3UB Fuse	100A	K43 Power Steering Control Module (NJ2)
4	-	F4UB Fuse	80A	K43 Power Steering Control Module (NJ1)
5	-	F5UB Fuse	250A	X50A Fuse Block - Underhood
6	-	F6UB Fuse	300A	G13 Generator (without HP6), M64 Starter Motor

3820005

1. **Mouse-over:** Displays all of the usage table information for each column including No., Device Label Name, Device Assigned Name, Rating, and Description. Note, that not used/not occupied devices will not have a mouse-over at all. For not used/not occupied devices, the device graphic may appear to have a mouse-over, but no information will be displayed in a pop-up screen.
2. **Hotspot Link to Information:** None at this time.

Master Electrical Component List

While the master electrical component list format has not changed, it will continue to have links to component locator, harness routing, and connector end views for each of the available electrical devices within the vehicle.

Master Electrical Component List

Master Electrical Component List

Code	Name	Option	Location	Locator View	Connector End View
A3L	Sunshade – Left	–	In the passenger compartment, left front, mounted to the headliner at left front	–	–
A3R	Sunshade – Right	–	In the passenger compartment, right front, mounted to the headliner at right front	–	–
A4	Hybrid/EV battery pack	HP6	In the luggage compartment, right behind rear of the seats	Right Side of Luggage Compartment Components	–
A7	Fuel Pump and Level Sensor Assembly	–	In the vehicle underbody, below rear seats, mounted to fuel tank	Fuel Tank Components	A7 Fuel Pump and Level Sensor Assembly
A9A	Outside Rearview Mirror – Driver	–	On outside of driver door, front middle, forward of window opening	Driver Door Components	–
A9B	Outside Rearview Mirror – Passenger	–	On outside of passenger door, front middle, forward of window opening	Passenger Door Components	–
A10	Inside Rearview Mirror	DD8	In the passenger compartment, front center, mounted to top of windshield	Headliner Components	A10 Inside Rearview Mirror (DD8)
A11	Radio	–	In the passenger compartment, front right in instrument panel, near instrument panel courtesy lamp - right	Rear of Instrument Panel Components	• A11 Radio X1 • A11 Radio X2 • A11 Radio X4 • A11 Radio X6 (U2K or U2M) • A11 Radio X7 (IO3) • A11 Radio X8 (IO3)
A14D	Seat Lumbar Support Pump – Driver	–	In the passenger compartment, left forward of center, in driver seat back outboard side	Driver Seat Components	A14D Seat Lumbar Support Pump - Driver
A14P	Seat Lumbar Support Pump – Passenger	APH	In the passenger compartment, right forward of center, in the passenger seat back outboard side	Passenger Seat Components	A14P Seat Lumbar Support Pump - Passenger (APH)
A15	Starter/Generator	HP6	In the engine compartment, right front of engine	–	• A15 Starter/Generator X1 (HP6) • A15 Starter/Generator X2 (HP6)
A22	Radio Controls	–	In the passenger compartment, center front, part of the info display module, in instrument panel, above HVAC controls	Front of Instrument Panel Components	–
A23D	Door Latch Assembly – Driver	–	Inside the driver door, at rear below middle	Driver Door Components	A23D Door Latch Assembly - Driver
A23LR	Door Latch Assembly – Left Rear	–	Inside the left rear door, at rear below middle	Left Rear Door Components	A23LR Door Latch Assembly - Left Rear
A23P	Door Latch Assembly – Passenger	–	Inside the passenger door, at rear below middle	Passenger Door Components	A23P Door Latch Assembly - Passenger
A23RR	Door Latch Assembly – Right Rear	–	Inside the right rear door, at rear below middle	Right Rear Door Components	A23RR Door Latch Assembly - Right Rear
A24D	Door Handle Assembly – Driver Exterior	ATH	On the outside of driver door, rear middle	Driver Door Components	A24D Door Handle Assembly - Driver Exterior (ATH)
A24LR	Door Handle Assembly - Left Rear Exterior	ATH	On the outside of left rear door, rear middle	Left Rear Door Components	A24LR Door Handle Assembly - Left Rear Exterior (ATH)
A24P	Door Handle Assembly – Passenger Exterior	ATH	On the outside of passenger door, rear middle	Passenger Door Components	A24P Door Handle Assembly - Passenger Exterior (ATH)
A24RR	Door Handle Assembly - Right Rear Exterior	ATH	On the outside of right rear door, rear middle	Right Rear Door Components	A24RR Door Handle Assembly - Right Rear Exterior (ATH)
A26	HVAC Controls	–	In the passenger compartment, front center, on instrument panel, below radio controls	Front of Instrument Panel Components	A26 HVAC Controls
A33	Media Disc Player	–	In the passenger compartment, front center, on instrument panel, below and forward of radio controls	–	A33 Media Disc Player
B1	A/C Refrigerant Pressure Sensor	–	At the front of vehicle, right of center, front of A/C condenser, mounted to right side near bottom	Radiator Assembly Components	• B1 A/C Refrigerant Pressure Sensor (LFX or L0K) • B1 A/C Refrigerant Pressure Sensor (LKW)
B5LF	Wheel Speed Sensor – Left Front	–	At the left front suspension, mounted to knuckle, rearward of axle	Fuel Composition Sensor, Wheel Speed Sensors and Parking Brake	B5LF Wheel Speed Sensor - Left Front
B5LR	Wheel Speed Sensor – Left Rear	–	At the left rear suspension, mounted to knuckle, forward side	Fuel Composition Sensor, Wheel Speed Sensors and Parking Brake	B5LR Wheel Speed Sensor - Left Rear
B5RF	Wheel Speed Sensor – Right Front	–	At the right front suspension, mounted to knuckle, rearward of axle	Fuel Composition Sensor, Wheel Speed Sensors and Parking Brake	B5RF Wheel Speed Sensor - Right Front
B5RR	Wheel Speed Sensor – Right Rear	–	At the right rear suspension, mounted to knuckle, forward side	Fuel Composition Sensor, Wheel Speed Sensors and Parking Brake	B5RR Wheel Speed Sensor - Right Rear
B7D	Air Temperature Sensor – Duct Left Lower	CJ2	In the passenger compartment, within the instrument panel, center front, left side middle of HVAC assembly	HVAC Assembly Components (CJ2)	B7D Air Temperature Sensor - Duct Left Lower (CJ2)
B7E	Air Temperature Sensor – Duct Right Lower	CJ2	In the passenger compartment, within the instrument panel, center front, right side middle of HVAC assembly	HVAC Assembly Components (CJ2)	B7E Air Temperature Sensor - Duct Right Lower (CJ2)
B7H	Air Temperature Sensor – Duct Left Upper	CJ2	In the passenger compartment, within the instrument panel, center front, left side top of HVAC assembly	HVAC Assembly Components (CJ2)	B7H Air Temperature Sensor - Duct Left Upper (CJ2)
B7J	Air Temperature Sensor – Duct Right Upper	CJ2	In the passenger compartment, within the instrument panel, center front, right side top of HVAC assembly	HVAC Assembly Components (CJ2)	B7J Air Temperature Sensor - Duct Right Upper (CJ2)
B9	Ambient Air Temperature Sensor	–	At the front of vehicle, left of center, mounted to rear of lower grille	Front of Vehicle Components	B9 Ambient Air Temperature Sensor
B10B	Ambient Light/Sunload Sensor	–	In the passenger compartment, center front, in instrument panel, rear of windshield defroster outlet	Front of Instrument Panel Components	B10B Ambient Light/Sunload Sensor
B12A	Transmission Fluid Pressure Switch	–	In the engine compartment, part of the control solenoid valve assembly, mounted to the valve body inside the transmission	–	–
B13	Transmission Fluid Temperature Sensor	–	In the engine compartment, part of the control solenoid valve assembly, mounted to the valve body inside the transmission	–	–

3820020

1. **Mouse-over:** None at this time.
2. **Hotspot Link to Information:**
   - ⇒ A future update may include links to individual subsystem schematic(s) for each component/ harness item.
   - ⇒ **Components**
   - − Links to individual locator view within one of the eight component view categories and will show where the component is located in the vehicle.
   - − Links to individual connector end view(s) within Component Connector End Views.
   - ⇒ **Electrical Centers (Fuse Blocks)**
   - − Links to individual locator view within one of the eight component view categories and will show where the component is located in the vehicle.
   - − Links to individual connector end view(s) within Electrical Center Identification Views.
   - ⇒ **Inline Harness Connectors**
   - − Links to individual harness routing view(s) within Harness Routing Views and will show where the harness item is located on the vehicle harness.
   - − Links to individual connector end view(s) within Inline Harness Connector End Views.
   - ⇒ **Grounds**

- Links to individual locator view within Ground Views component view and will show where the ground is located in the vehicle.

⇒ **Splices**

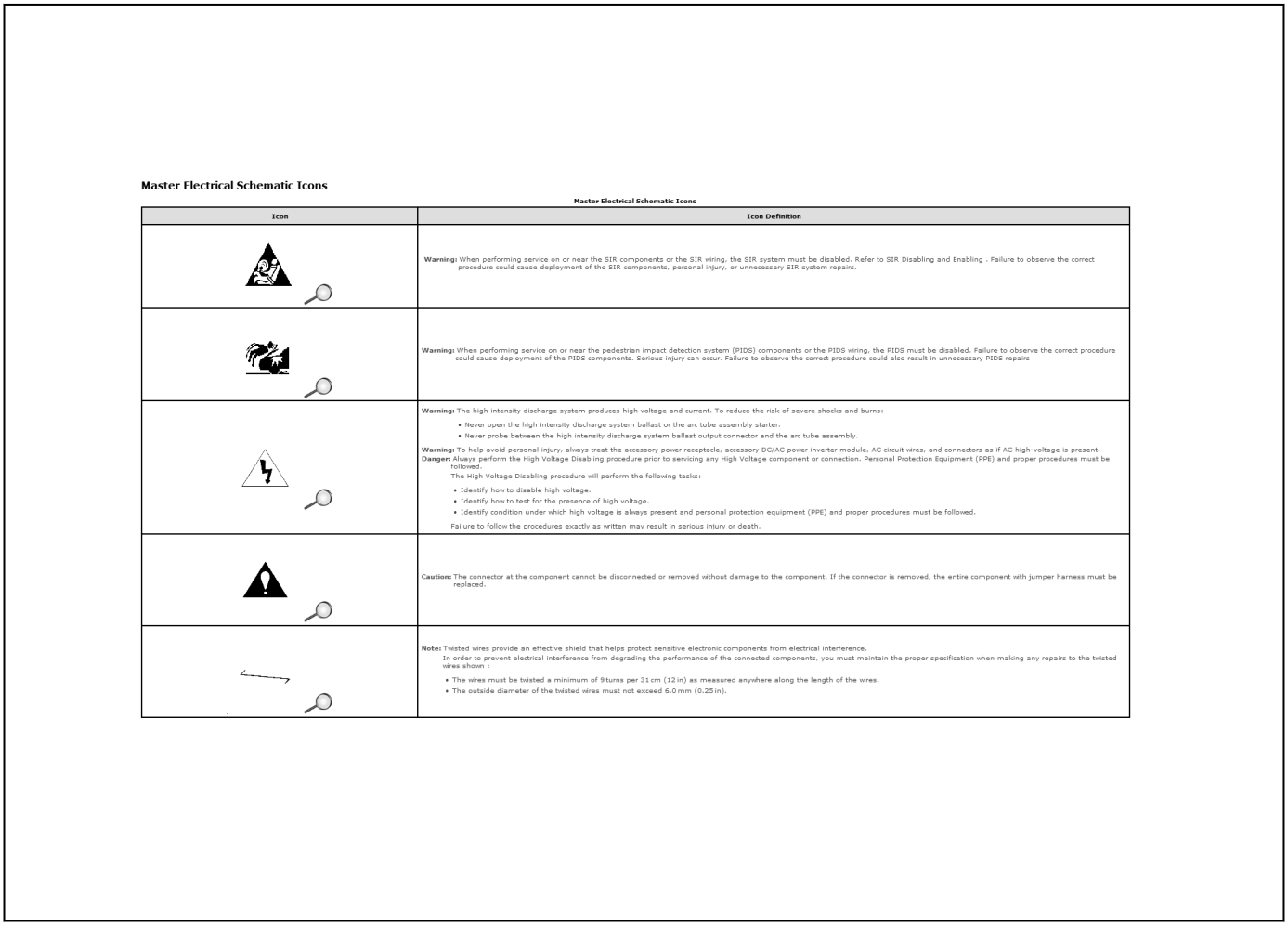
- Links to individual harness routing view(s) within Harness Routing Views and will show where the harness item is located on the vehicle harness.

⇒ **Splice Packs**

- Links to individual harness routing view(s) within Harness Routing Views and will show where the harness item is located on the vehicle harness.
- Links to individual connector end view(s) within Splice Pack Connector End Views.

Master Electrical Schematic Icons

While the master electrical schematic icons list format has not changed, it will continue to include icons used in the vehicle schematics along with the message for the icon.



Master Electrical Schematic Icons

Master Electrical Schematic Icons

Icon	Icon Definition
	Warning: When performing service on or near the SIR components or the SIR wiring, the SIR system must be disabled. Refer to SIR Disabling and Enabling . Failure to observe the correct procedure could cause deployment of the SIR components, personal injury, or unnecessary SIR system repairs.
	Warning: When performing service on or near the pedestrian impact detection system (PIDS) components or the PIDS wiring, the PIDS must be disabled. Failure to observe the correct procedure could cause deployment of the PIDS components. Serious injury can occur. Failure to observe the correct procedure could also result in unnecessary PIDS repairs
	Warning: The high intensity discharge system produces high voltage and current. To reduce the risk of severe shocks and burns: • Never open the high intensity discharge system ballast or the arc tube assembly starter. • Never probe between the high intensity discharge system ballast output connector and the arc tube assembly. **Warning:** To help avoid personal injury, always treat the accessory power receptacle, accessory DC/AC power inverter module, AC circuit wires, and connectors as if AC high-voltage is present. **Danger:** Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed. The High Voltage Disabling procedure will perform the following tasks: • Identify how to disable high voltage. • Identify how to test for the presence of high voltage. • Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed. Failure to follow the procedures exactly as written may result in serious injury or death.
	Caution: The connector at the component cannot be disconnected or removed without damage to the component. If the connector is removed, the entire component with jumper harness must be replaced.
	Note: Twisted wires provide an effective shield that helps protect sensitive electronic components from electrical interference. In order to prevent electrical interference from degrading the performance of the connected components, you must maintain the proper specification when making any repairs to the twisted wires shown : • The wires must be twisted a minimum of 9 turns per 31 cm (12 in) as measured anywhere along the length of the wires. • The outside diameter of the twisted wires must not exceed 6.0 mm (0.25 in).

3820510

1. **Mouse-over:** None at this time.
2. **Hotspot Link to Information:** None at this time.

Schematic RPO Code List

The schematic RPO code list only includes RPOs shown in schematics and also includes the country groupings for the options. This list is in addition to the vehicle RPO Code List that is included in General Information.

Schematics RPO Code List

Schematics RPO Code List

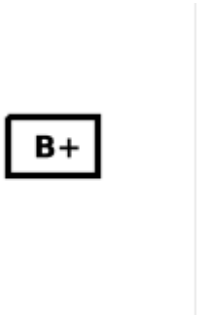
RPO	Description	Country Group
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION	U.S.A., PR and USVI (MAH)
A6C	ADJUSTER PASS ST-MANUAL, 4 WAY, PWR VERT	U.S.A., PR and USVI (MAH),Canada (MBC)
AED	WINDOW REG PASS DR-POWER OPERATED, EXPRESS DOWN	China
AEF	WINDOW REG PASS DR-POWER OPERATED, EXPRESS UP/DOWN	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX), China
AEQ	WINDOW-POWER OPERATED, RR DRS, EXPRESS DOWN	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
AER	WINDOW-POWER OPERATED, RR DRS, EXPRESS UP/DOWN	China
AF6	CONTROL-SEAT, MASSAGE, DRIVER	China
AG1	ADJUSTER FRT ST-POWER, MULTI-DIRECTIONAL, DRIVER	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
AG2	ADJUSTER PASS ST-POWER, MULTI-DIRECTIONAL	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
APG	CONTROL-SEAT, POWER LUMBAR, LH	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
APH	CONTROL-SEAT, POWER LUMBAR, RH	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
ASV	EQUIPMENT-SENSOR AIR MOISTURE and W/S TEMP	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
ATH	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
ATS	Lock Control, Entry – Remote Entry, Standard Range, Passive Entry	China
AW7	RESTRAINT SYSTEM-SEAT, INFLATABLE, DRIVER AND PASS FRT, FRT SEAT SIDE AND RR SEAT SIDE, ROOF SIDE	U.S.A., PR and USVI (MAH),Canada (MBC)
BTM	SWITCH-ENGINE START, KEYLESS	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
C67	HVAC SYSTEM-AIR CONDITIONER FRT, ELECTRONIC CONTROLS	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
CE1	WIPER SYSTEM-WINDSHIELD, PULSE, MOISTURE SENSITIVE	China
CE4	WASHER-HEADLAMP, HIGH PRESSURE	China
CF5	ROOF-SUN, GLASS, SLIDING, ELEC	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
CJ2	HVAC SYSTEM-AIR CONDITIONER FRT, AUTO TEMP CONT, AUX TEMP CONT	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
CZ2	COUNTRY-CHINA	China
DD8	MIRROR I/S R/V-LT SENSITIVE	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
EF7	COUNTRY-UNITED STATES OF AMERICA (USA)	U.S.A., PR and USVI (MAH)
F45	CHASSIS-CONTINUOUSLY VARIABLE REAL TIME DAMPING	U.S.A., PR and USVI (MAH),Canada (MBC)
FHS	VEHICLE FUEL-GASOLINE E85	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
HP6	HYBRID PROPULSION-ELECTRIC, PARALLEL, 14KW CONTINUOUS POWER	U.S.A., PR and USVI (MAH),Canada (MBC)
J71	BRAKE PARKING-POWER OPERATED	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
KA1	HEATER SEAT FRT-DRVR and PASS	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
KD4	RECEPTACLE-ELECTRICAL, FRT CONSOLE	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
K16	RECEPTACLE-ELECTRICAL, FRT CONSOLE RR 110 VOLT	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
KRJ	CONTROL-CONSOLE, INFOTAINMENT, REDUNDANT CONTROLS, JOYSTICK	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
KTA	AUDIO INTERFACE-	China
KU1	VENTILATED SEAT DRVR-FRONT	U.S.A., PR and USVI (MAH)
KU3	VENTILATED SEAT PASS-FRONT	U.S.A., PR and USVI (MAH)
LAF	ENGINE-GAS, 4 CYL, 2.4L, SIDI,DOHC, VVT, ALUM, GM - DO NOT USE AFTER 2013, USE LEA	China
LDK	ENGINE-GAS, 4 CYL, 2.0L, DI, DOHC, TURBO-HO, VARIABLE CAMSHAFT PHASING - DO NOT USE AFTER 2013, USE LHU	China
LHU	ENGINE-GAS, 2.0L, SIDI, L4, DOHC TURBO, E85 MAX, ALUM	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
LLU	ENGINE-GAS, 4 CYL, 1.6L, MFI, DOHC, TURBO, PT-JV, 132KW	China
LTD	ENGINE-GAS, 4 CYL, 2.0L, MFI, ALUM, DOHC, SGM	China
LUK	ENGINE-GAS, 4 CYL, 2.4L, DI, ALUM, DOHC, BAS, ECOTEC	U.S.A., PR and USVI (MAH),Canada (MBC)
MDK	TRANSMISSION-AUTO 6 SPD, AISIN-WARNER, A6-AF40, ELECTRONIC, GEN2	U.S.A., PR and USVI (MAH),Canada (MBC)
MH8	TRANSMISSION-AUTO 6 SPD, HMD, X23F	U.S.A., PR and USVI (MAH),Canada (MBC)
MHH	TRANSMISSION-AUTO 6 SPD, HMD, GM, BAS+, 6T40, HYBRID, FWD	U.S.A., PR and USVI (MAH),Canada (MBC)
MHK	TRANSMISSION-AUTO 6 SPD, 6T50	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
MR6	TRANSMISSION-MAN 6 SPD, OPEL, 83MM, 3.92 1ST, 0.62 6TH (F40 WR), REDUCE HELIX	U.S.A., PR and USVI (MAH),Canada (MBC)
NJ1	STEERING-POWER, NON-VARIABLE RATIO, ELECTRIC	U.S.A., PR and USVI (MAH),Canada (MBC)
NU6	EMISSION SYSTEM-CALIFORNIA, PZEV	U.S.A., PR and USVI (MAH)
NV7	STEERING-POWER, VARIABLE EFFORT	U.S.A., PR and USVI (MAH),Canada (MBC),Mexico (MCX)
NXC	STEERING-POWER, VARIABLE EFFORT, REDUCED RACK TRAVEL	U.S.A., PR and USVI (MAH),Canada (MBC)
T4A	HEADLAMPS-HALOGEN	U.S.A., PR and USVI (MAH),Canada (MBC)

3820023

1. **Mouse-over:** None at this time.
2. **Hotspot Link to Information:** None at this time.

Electrical Schematic Symbols

Voltage Indicators

Symbol	Description
 1988677	Battery Voltage
1988679	Ignition Switch– Off Position
1988682	Ignition Switch– Accessory Position
1988686	Ignition Switch– Run Position
1988691	Ignition Switch– Start Position

General Icons

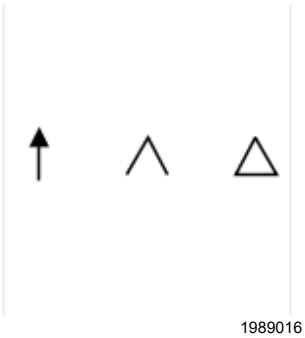
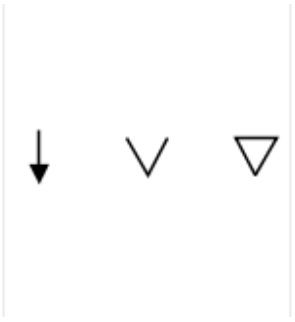
Symbol	Description
1990537	Master Component List Icon This icon is used on the schematic to link to the Master Electrical Component List.
1990538	Description and Operation Icon This icon is used on the schematic to link to the Description and Operation of that particular system.

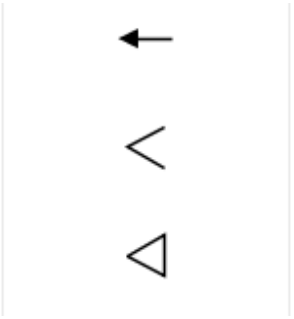
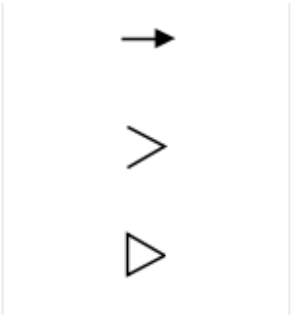
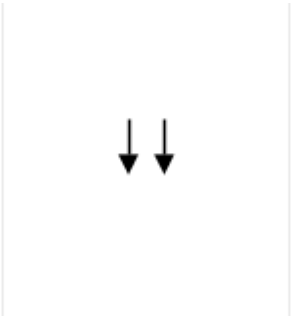
Symbol	Description
1988674	Computer Programming Icon This icon is used on the schematic to link to Control Module References, which identifies which components need programming upon replacement.
1990541	Next Schematic Page Icon This icon is used on the schematic to navigate to the next schematic in the subsystem.
1990542	Previous Schematic Page Icon This icon is used on the schematic to navigate to the previous schematic in the subsystem.
1988667	Supplemental Inflatable Restraint (SIR) or Supplemental Restraint System (SRS) Icon This icon is used to alert the technician that the system contains SIR/SRS components that require certain precautions before servicing.

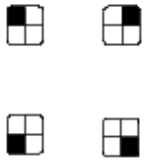
Symbol	Description
1988670	Information Icon This icon is used to alert the technician that there is additional information that will aid in servicing a system.
1988672	Danger Icon This icon is intended to alert the technician that a component within the system contains labeling with the same icon. This icon is used when a source component has potential for 60 volts DC or greater or has potential for 42 volts AC or greater.
1988673	High Voltage Icon This icon is intended to alert the technician that a component within the system contains labeling with the same icon. This icon is used when a component/circuit has potential for 60 volts DC or greater or has potential for 42 volts AC or greater.

Symbol	Description
1990543	Caution Icon This icon is used to advise the technician to use caution when servicing this component. This icon may be used when a component/circuit has a voltage range potential between 30-60 volts DC or 15-42 volts AC.
1988675	Functional Serial Data Communication This icon is used to show the technician that the serial data circuit detail is shown incomplete. It also provides an active link to the Data Communication Schematics were the circuit is shown complete.

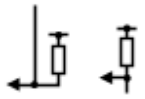
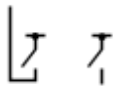
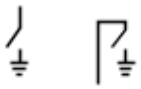
Switch Position Icons

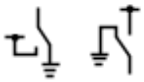
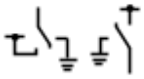
Symbol	Description
 1989016	Generic Up Arrows
 1990554	Generic Down Arrows

Symbol	Description
 1990555	Generic Left Arrows
 1990556	Generic Right Arrows
 1990557	Generic Express Down Arrows
1990558	On/Off Icon

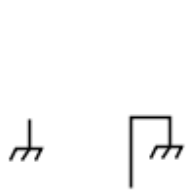
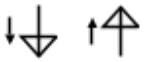
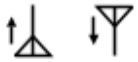
Symbol	Description
1990559	Generic Lock Icon
1990560	Generic Unlock Icon
 1989018	Generic Window Switch Positions– 4 Door
1989020	Generic Window Switch Positions– 2 Door

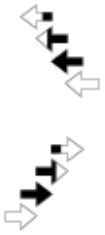
Module Circuit Function Icons

Symbol	Description
1988774	I/O Pull-Down Resistors (−)
 1990567	I/O Pull-Up Resistors (+)
 1988775	I/O High-Side Drive Switch (+)
 1990568	I/O Low-Side Drive Switch (−)

Symbol	Description
 1990570	I/O Bidirectional Switch (+/−)
 6535609	I/O Bidirectional Switch (+/−) Neutral State
1990571	Pulse-Width Modulation Symbol
1990573	Battery Voltage

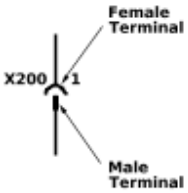
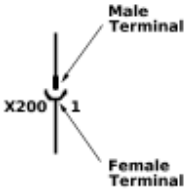
Symbol	Description
1990574	Ignition Voltage
1990576	Voltage Reference
1990577	A/C Voltage
1988986	Low Reference

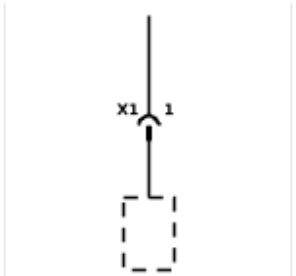
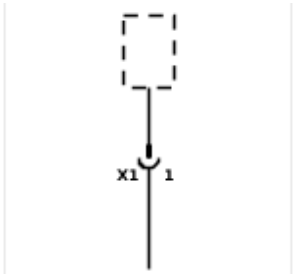
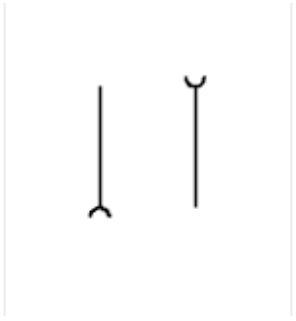
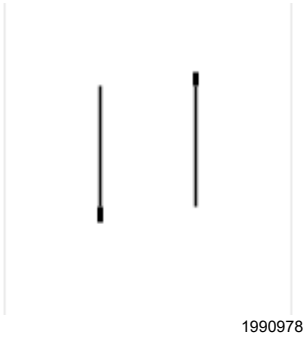
Symbol	Description
 1990578	Ground
1990579	Serial Data
 1988973	Antenna Signal– In
 1988974	Antenna Signal– Out

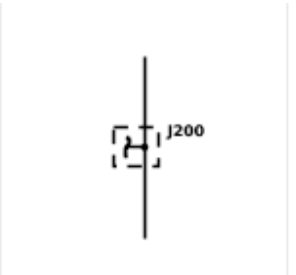
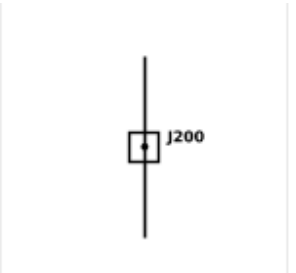
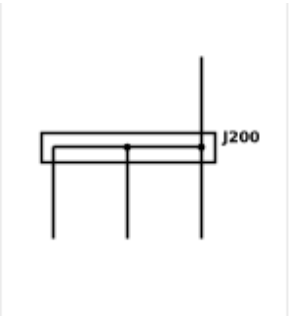
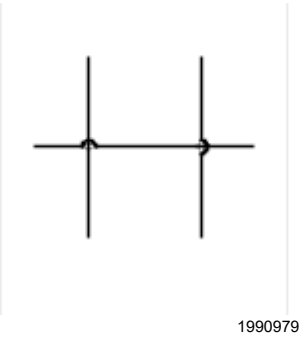
Symbol	Description
2161152	Brake Apply
5371975	Bulb Out
6659366	Approach Lighting Animation
 6659367	Sequential Turn Signal Animation

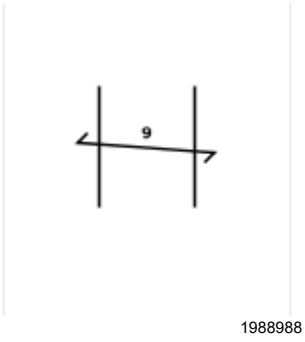
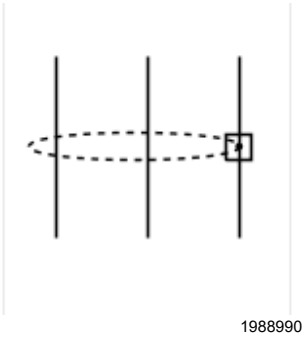
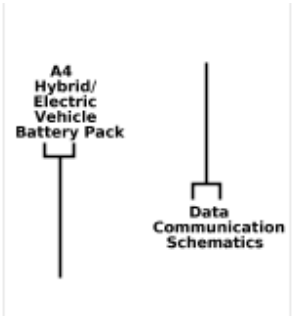
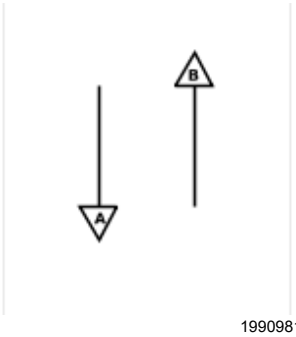
Harness Components

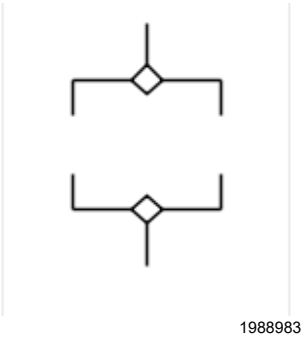
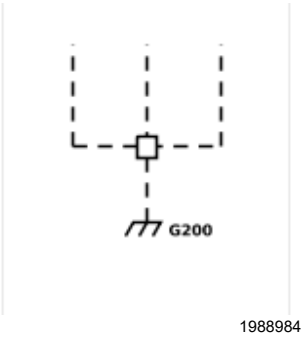
Symbol	Description
1988731	Fuse
1988733	Fuse Supplied by a Relay
1988740	Circuit Breaker
1988745	Fusible Link

Symbol	Description
1988987	Ground
1988746	Case Ground
 1988977	Inline Harness Connector
 1990974	Inline Harness Connector

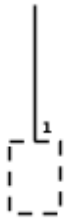
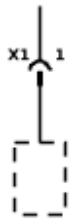
Symbol	Description
 1990975	Pigtail Connection
 1990976	Pigtail Connection
 1990977	Provisional or Diagnostic Connector
 1990978	Blunt Cut Wire

Symbol	Description
 1988980	Incomplete Physical Splice
 1988981	Complete Physical Splice– 2 Wires
 1988982	Complete Physical Splice– 3 or more wires
 1990979	Wire Crosses

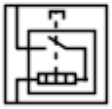
Symbol	Description
 1988988	Twisted Wires
 1988990	Shield
 1990980	Circuit References
 1990981	Circuit Continuation Arrowheads

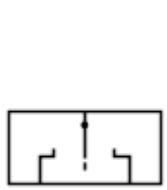
Symbol	Description
 1988983	Option Breakpoint
 1988984	Ground Circuit Connection
1988985	Connector Shorting Clip

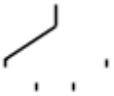
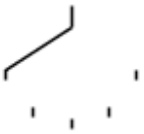
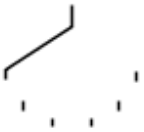
Component Parts

Symbol	Description
1988694	Partial Component When a component is represented in a dashed box, the component or its wiring is not shown in its entirety.
1988698	Entire Component When a component is represented in a solid box the component or its wiring is shown in its entirety.
 1988712	Connector Directly Attached to Component
 1988715	Pigtail Connector

Switches and Relays

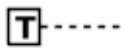
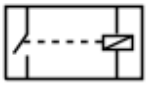
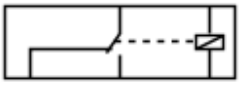
Symbol	Description
1991015	Accessory Power Outlet
 1991016	Cigar Lighter
1988991	Switch– 2 Position Normally Open
1988992	Switch– 2 Position Normally Closed

Symbol	Description
 1988993	Switch– Rocker
1991017	Switch– Contact Plate (1 Wire)
1988994	Switch– Contact Plate (2 Wire)
1991018	Switch– 3 Position

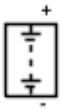
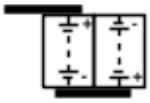
Symbol	Description
 1988995	Switch– 4 Position
 1991019	Switch– 5 Position
 1991021	Switch– 6 Position
1988997	Switch Actuator– Push (Momentary)

Symbol	Description
1988998	Switch Actuator– Push (Latching)
1988999	Switch Actuator– Pull (Momentary)
1989000	Switch Actuator– Pull (Latching)
1989001	Switch Actuator– Rotate (Momentary)

Symbol	Description
1989002	Switch Actuator– Rotate (Latching)
1989003	Switch Actuator– Slide (Momentary)
1989004	Switch Actuator– Slide (Latching)
1989007	Switch Actuator– Pressure (Momentary)

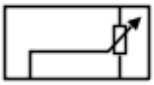
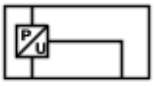
Symbol	Description
 1989010	Switch Actuator– Temperature (Momentary)
1989013	Switch Actuator– Volume (Latching)
 1988975	4-Pin Single Pole/Throw Relay– Normally Open
 1990539	5-Pin Relay– Normally Closed

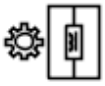
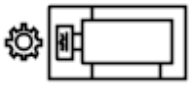
Devices and Sensors

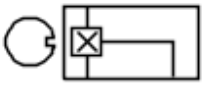
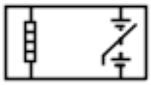
Symbol	Description
 1988751	Battery
 1988753	Battery Assembly– Hybrid
1988717	Single Filament Light Bulb
1988719	Double Filament Light Bulb

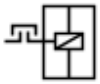
Symbol	Description
1988722	Light Emitting Diode (LED)
1988725	Photo Sensor
1990988	Gauge
1988776	Diode

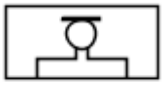
Symbol	Description
1988748	Capacitor
1988755	Resistor
1988759	Variable Resistor
1990991	Variable Resistor– NTC

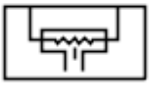
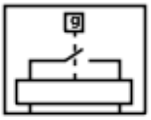
Symbol	Description
1990992	Breakable Wire
1988778	Heating Element
 1988771	Position Sensor
 1988773	Pressure Sensor

Symbol	Description
1990993	Knock Sensor
 1990994	Inductive Type Sensor– 2-Wire
 1990996	Inductive Type Sensor– 3-Wire
1990998	Hall Effect Sensor– 2-Wire

Symbol	Description
 1990999	Hall Effect Sensor– 3-Wire
1991000	Oxygen Sensor– 2-Wire
 1991001	Heated Oxygen Sensor– 4-Wire
1988970	Solenoid– Actuator

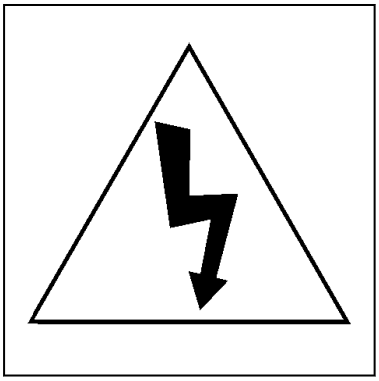
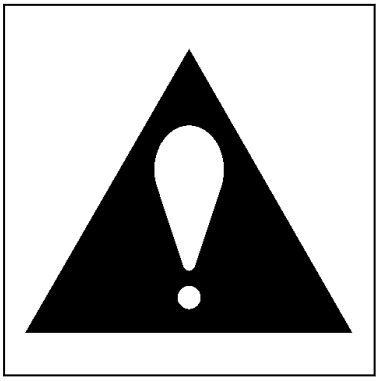
Symbol	Description
1988971	Solenoid– Valve
 1988972	Clutch
1988779	Motor
1991003	Motor with PTC

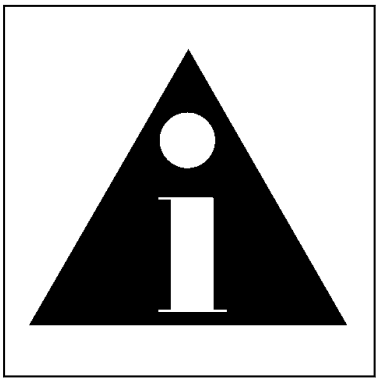
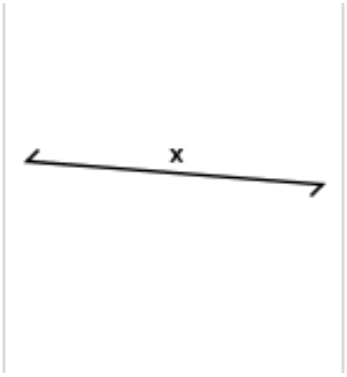
Symbol	Description
1988729	Antenna
1991005	Speaker
1991006	Horn
 1991007	Microphone

Symbol	Description
 1991008	Airbag
1991009	SIR Coil
 1991010	SIR Impact Sensor

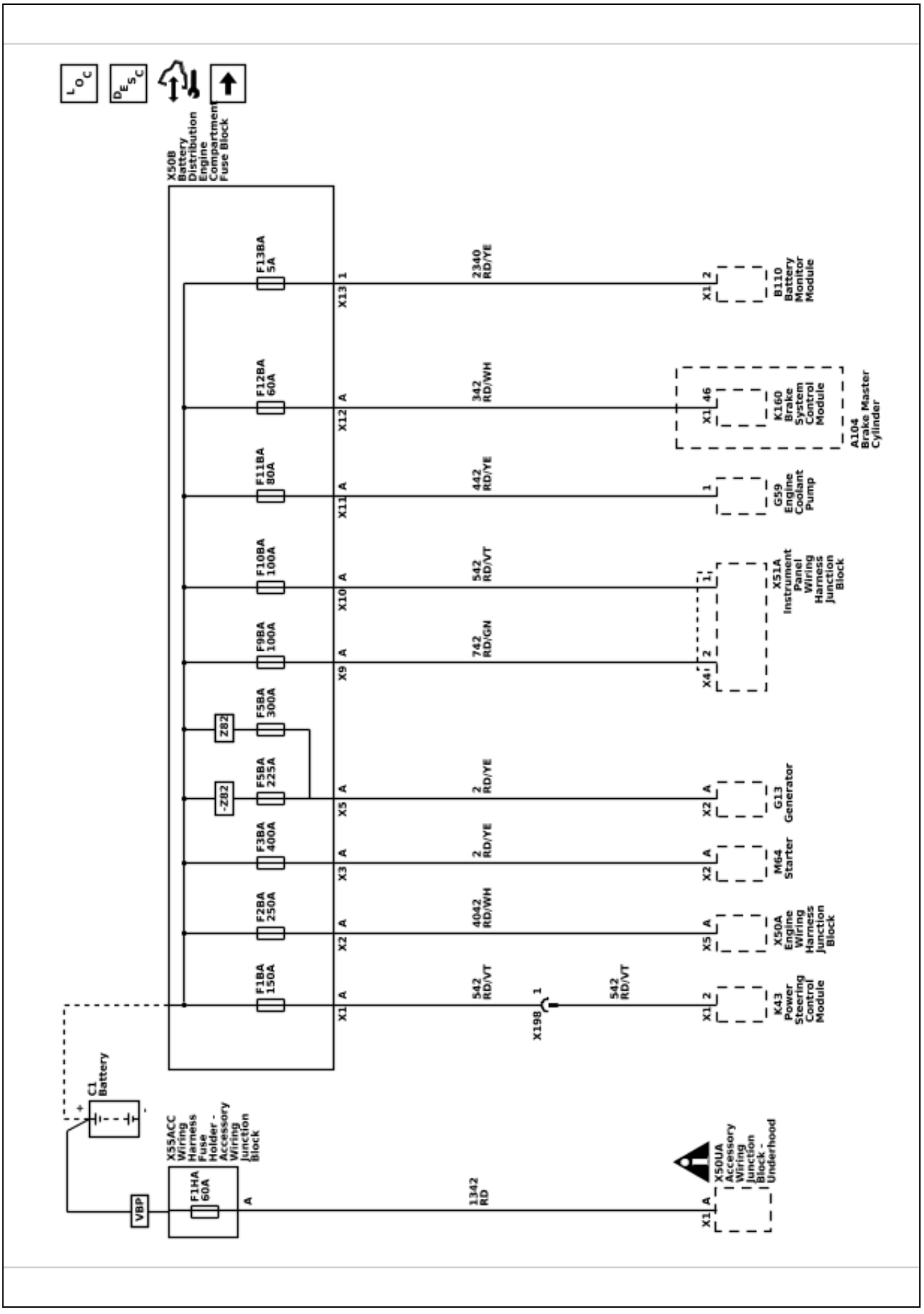
Master Electrical Schematic Icons

Master Electrical Schematic Icons

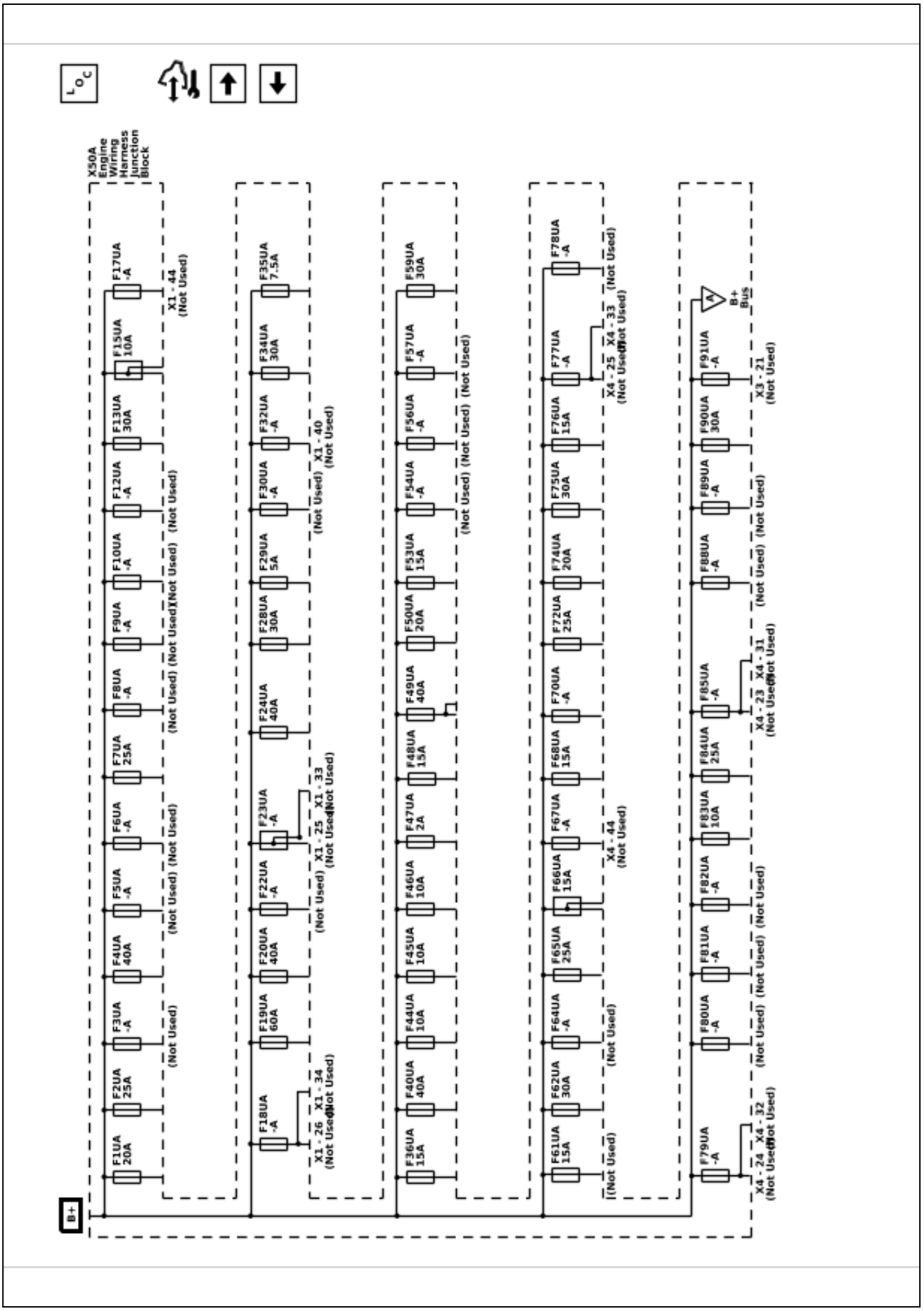
Icon	Icon Definition
19386	***Warning: When performing service on or near the SIR components or the SIR wiring, the SIR system must be disabled. Refer to SIR Disabling and Enabling . Failure to observe the correct procedure could cause deployment of the SIR components, personal injury, or unnecessary SIR system repairs.***
 296943	***Warning: To help avoid personal injury, always treat the accessory power receptacle, accessory DC/AC power inverter module, AC circuit wires, and connectors as if AC high-voltage is present.***
 296880	**SIR Schematics:** ***Warning: The connector at the Inflatable Restraint Module cannot be disconnected or removed without damage to the module. If the connector is removed from the module, the entire module with harness must be replaced.***

Icon	Icon Definition
 1822496	**X50UA Accessory Wiring Junction Block – Underhood:** **Note:** This relay and fuse center does not come with relays or fuses populated. They will be populated when add on accessories are installed. • Total current draw of this relay and fuse center must not exceed 60 amps. • Fuse size selection must be based on host OEM wiring size. • Maximum fuse value must not exceed 25 amps. **Exterior Lights Schematics:** **Note:** Due to accessories not having reserved locations, the Fuse, Relay, related Pin-Out, Circuit Numbers and Circuit Colors cannot be provided. Please refer to the respective Upfitter Schematics.
 902886	**Note:** Twisted wires provide an effective shield that helps protect sensitive electronic components from electrical interference.In order to prevent electrical interference from degrading the performance of the connected components, you must maintain the proper specification when making any repairs to the twisted wires shown : • The wires must be twisted a minimum of 9 turns per 31 cm (12 in) as measured anywhere along the length of the wires. • The outside diameter of the twisted wires must not exceed 6.0 mm (0.25 in).

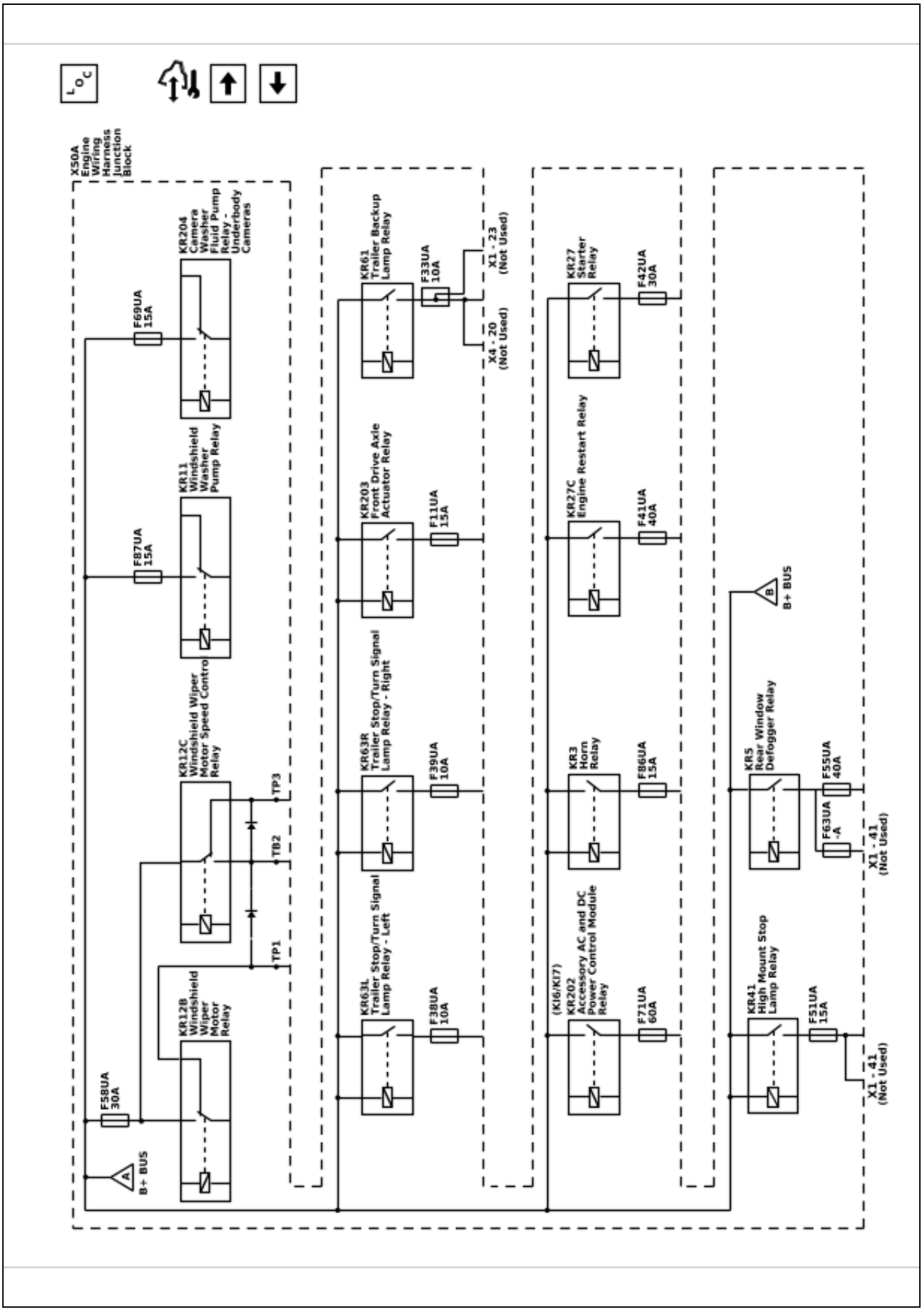
Power Distribution Schematics (B+ Bus - X50B Battery Distribution Engine Compartment Fuse Block)



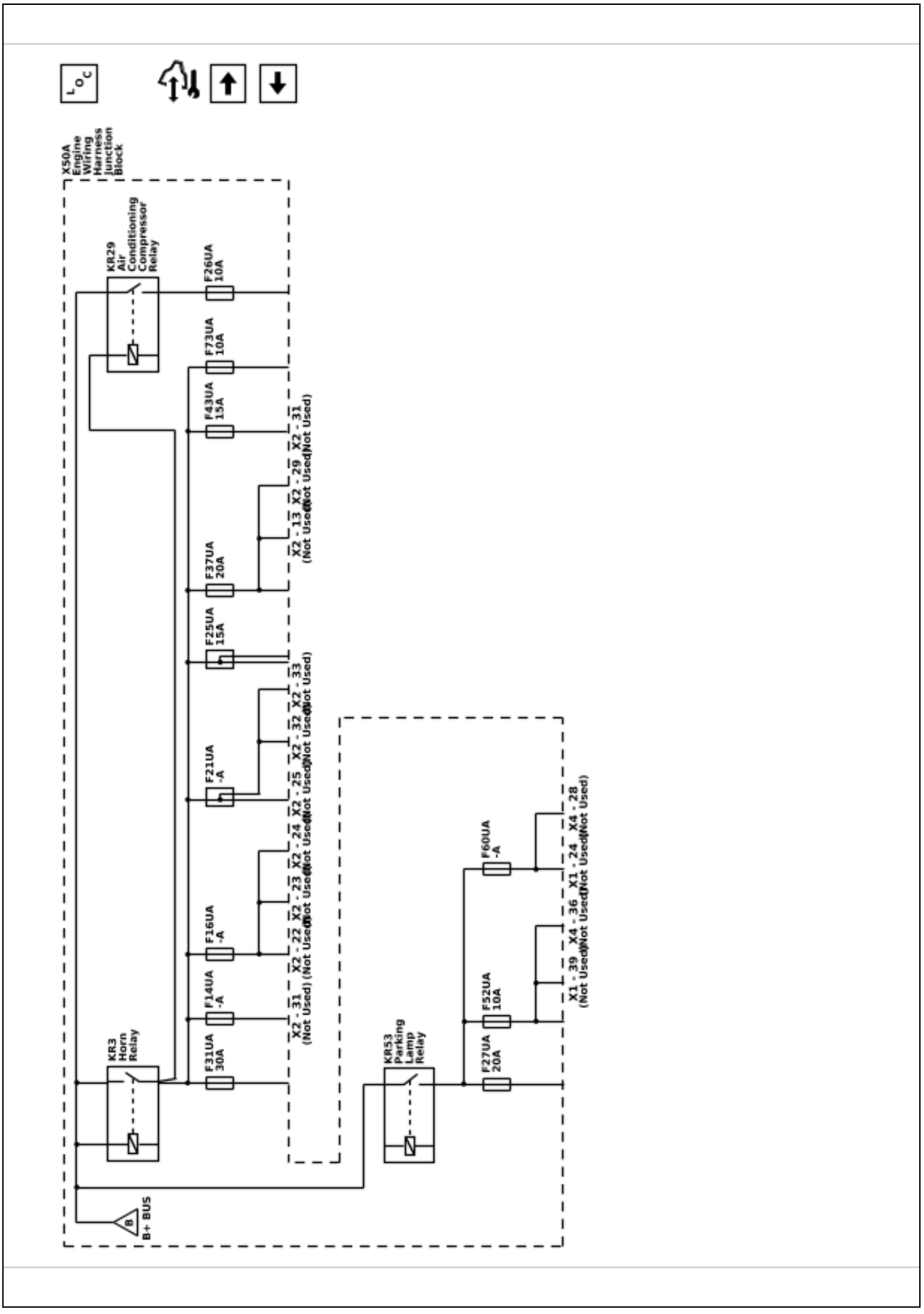
Power Distribution Schematics (B+ Bus - X50A Engine Wiring Harness Junction Block - Fuses)



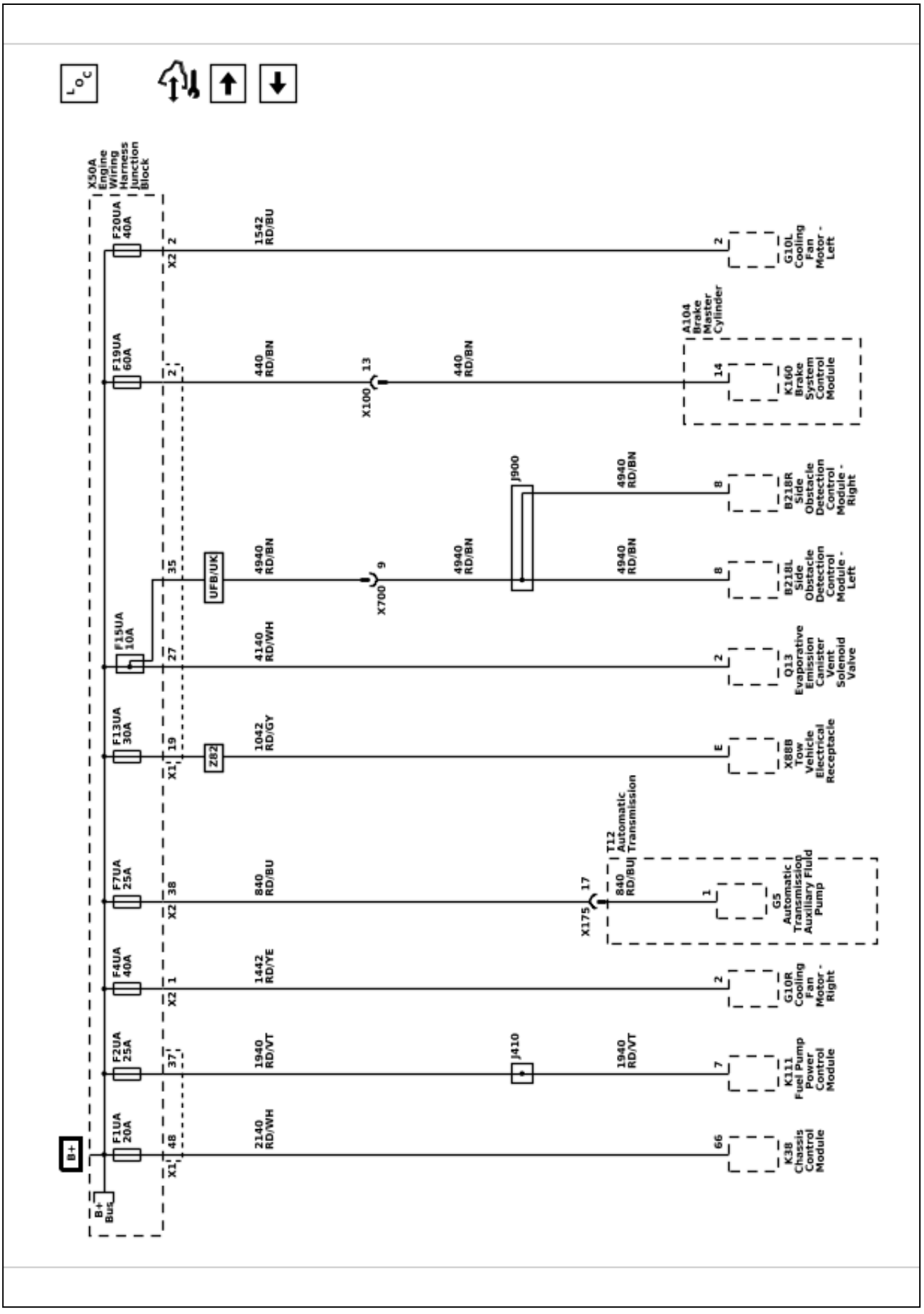
Power Distribution Schematics (B+ Bus - X50A Engine Wiring Harness Junction Block - Relays 1 of 2)



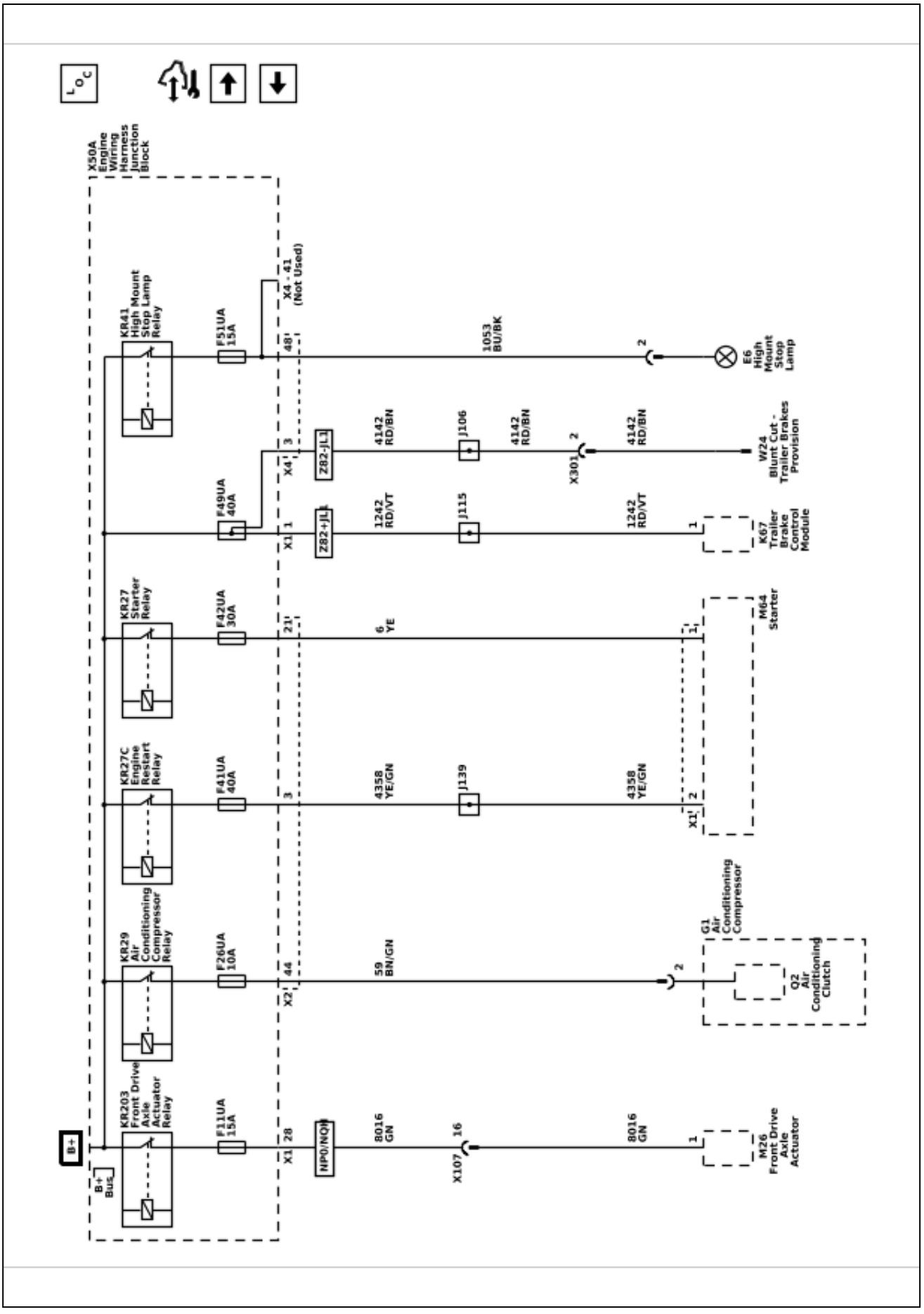
Power Distribution Schematics (B+ Bus - X50A Engine Wiring Harness Junction Block - Relays 2 of 2)



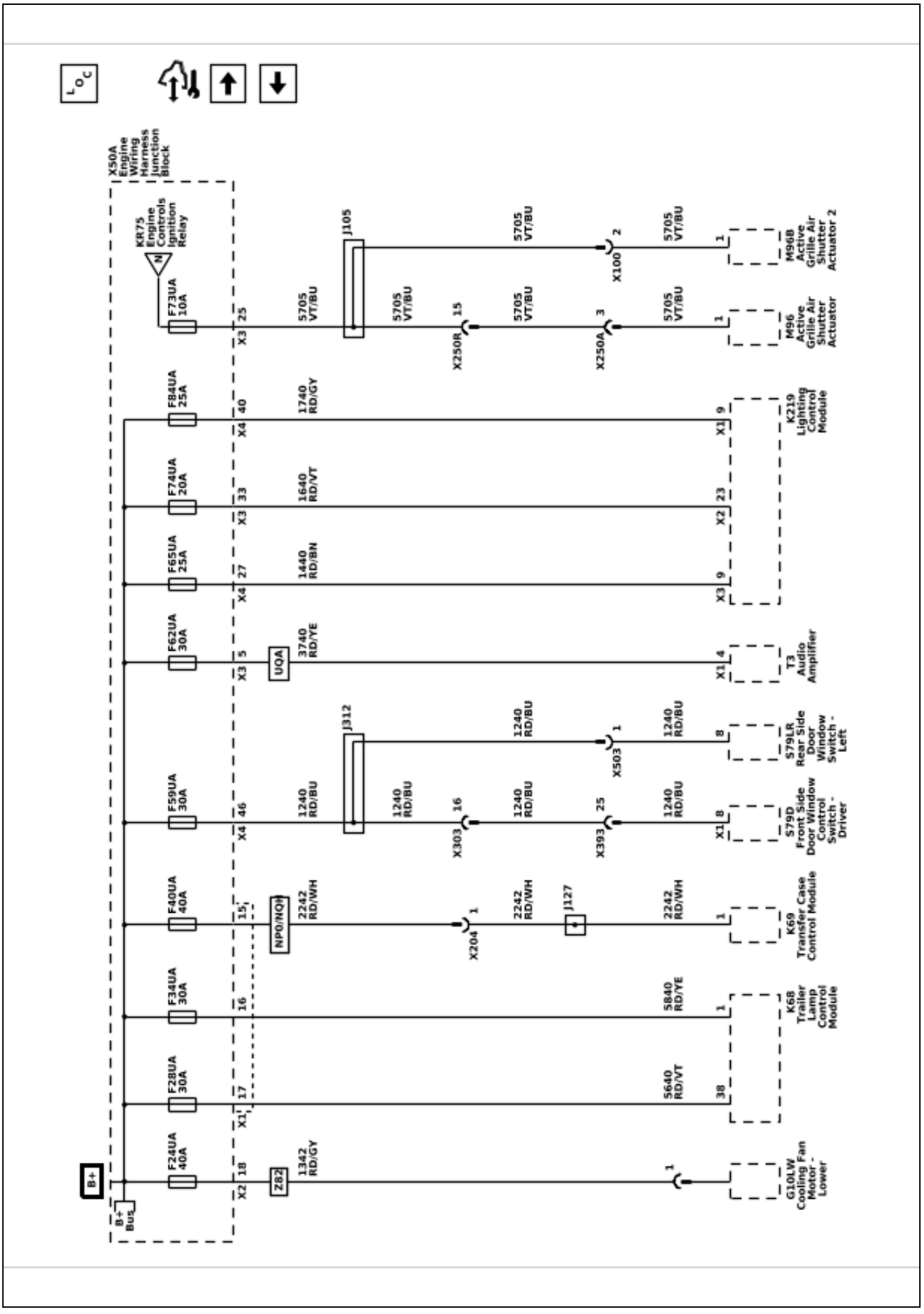
Power Distribution Schematics (F1UA, F2UA, F4UA, F7UA, F13UA, F15UA, F19UA,and F20UA Fuses)



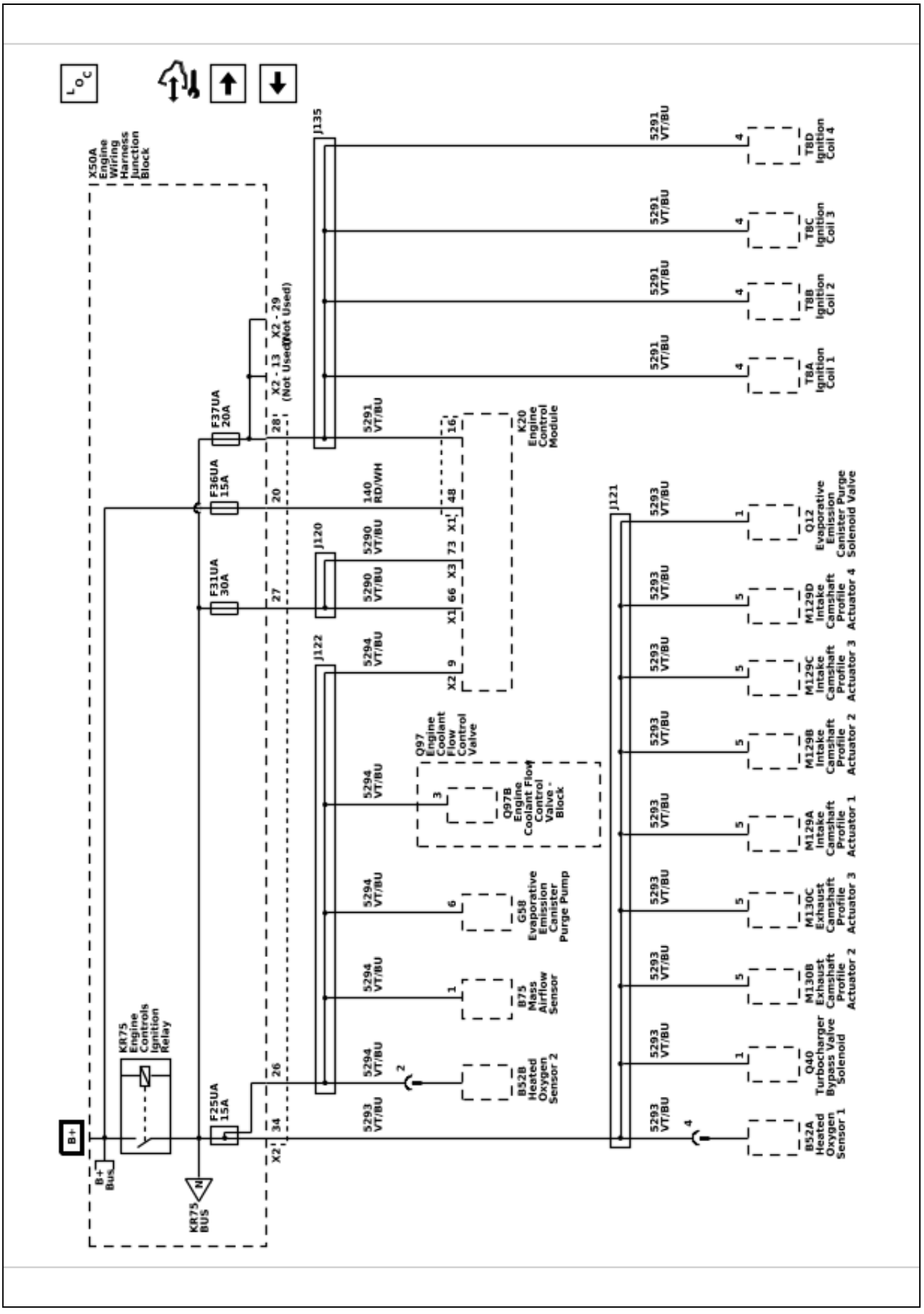
Power Distribution Schematics (F11UA, F26UA, F41UA, F42UA, F49UA and F51UA Fuses)



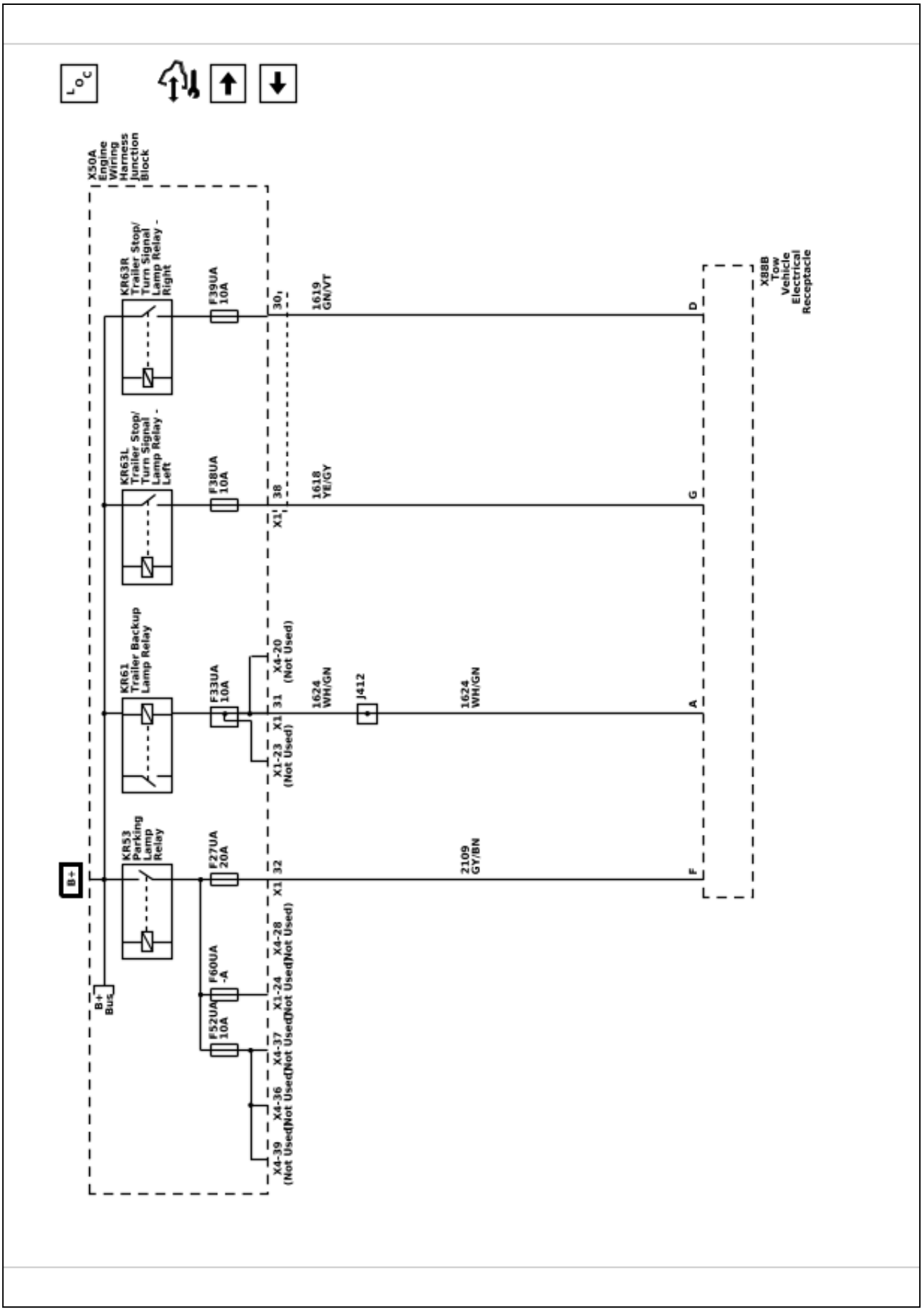
Power Distribution Schematics (F24UA, F28UA, F34UA, F40UA, F59UA, F62UA, F65UA, F73UA, F74UA, and F84UA Fuses)



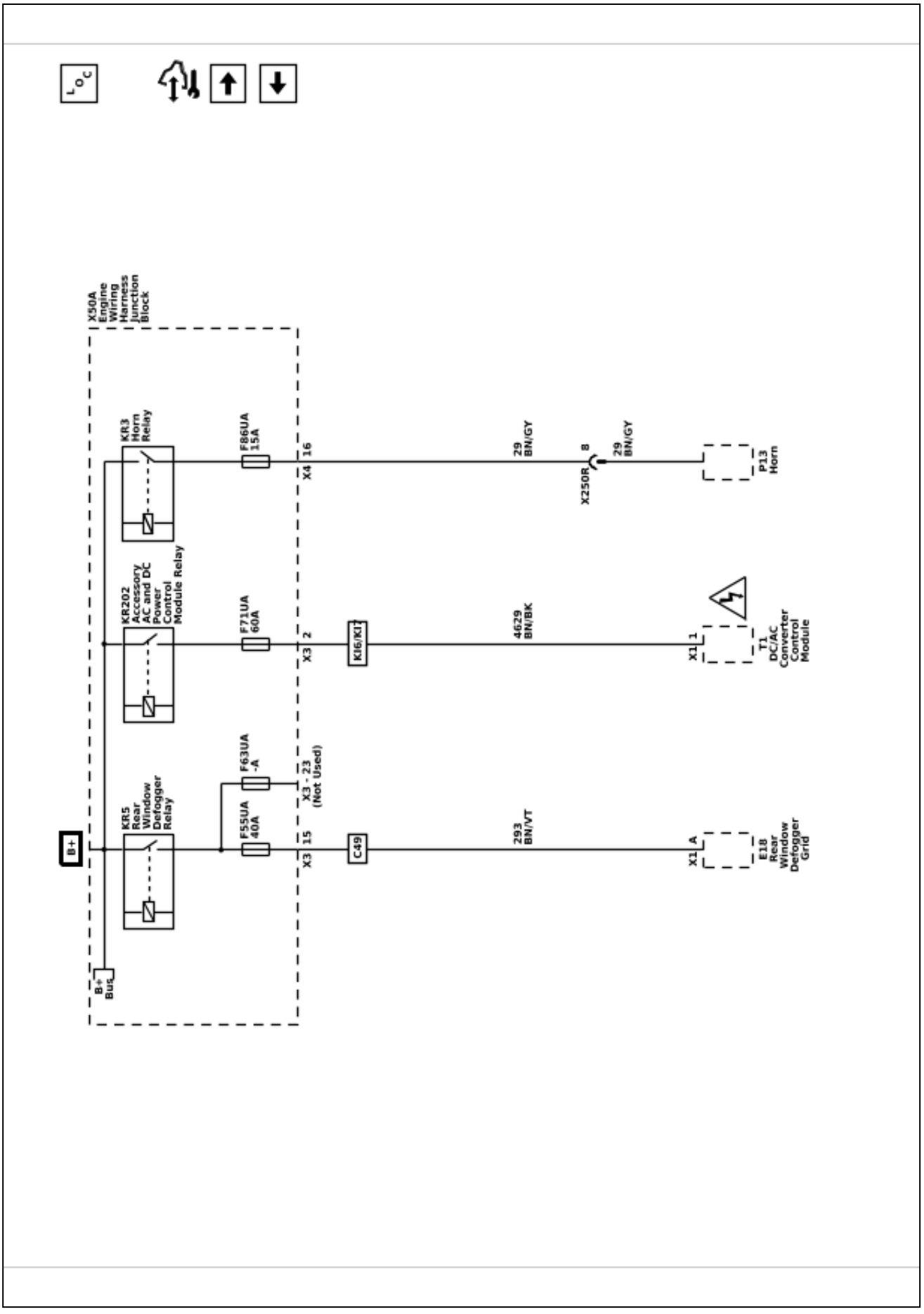
Power Distribution Schematics (F25UA, F31UA, F36UA, and F37UA)



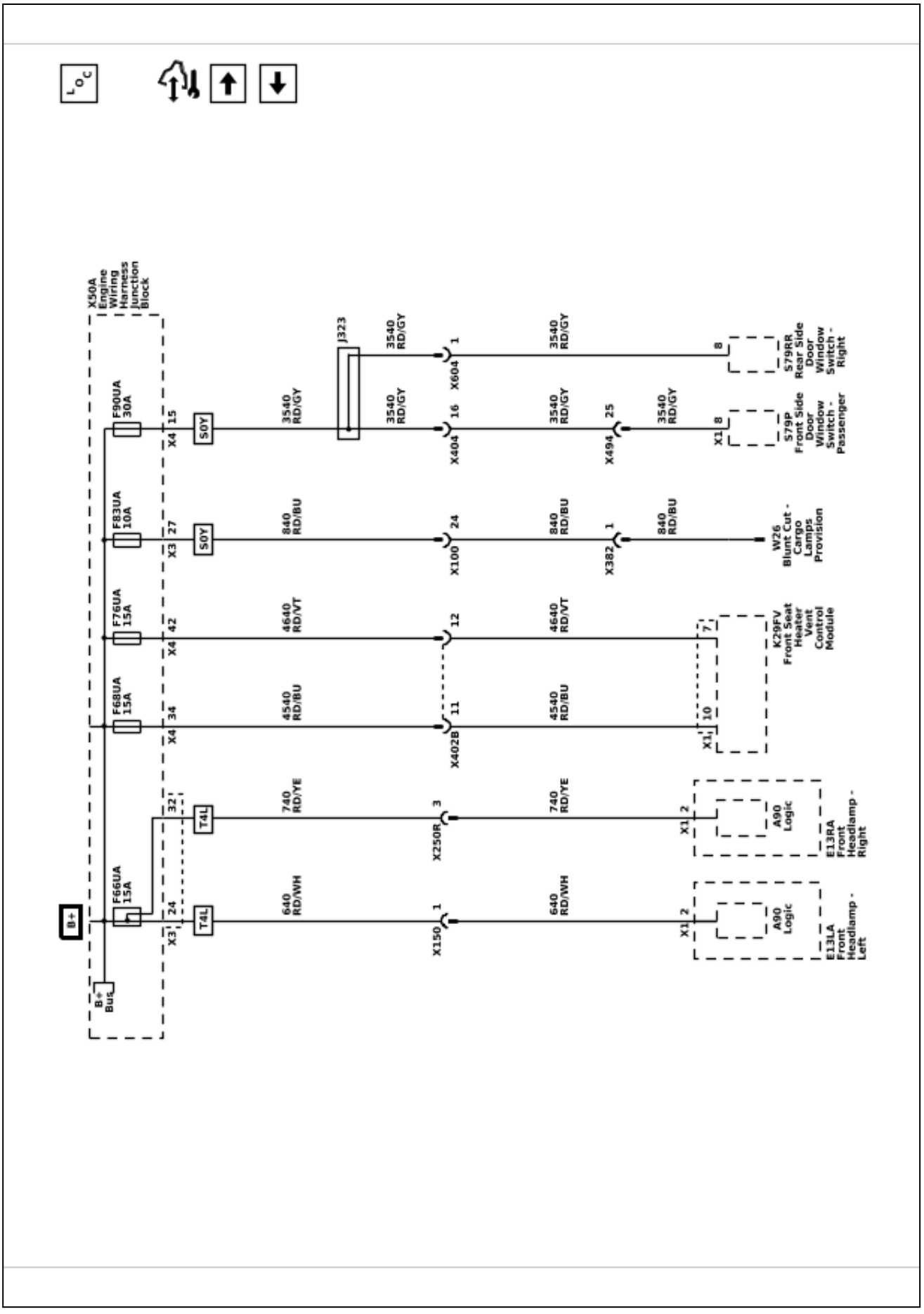
Power Distribution Schematics (F27UA, F33UA, F38UA, F39UA, F52UA, and F60UA Fuses)



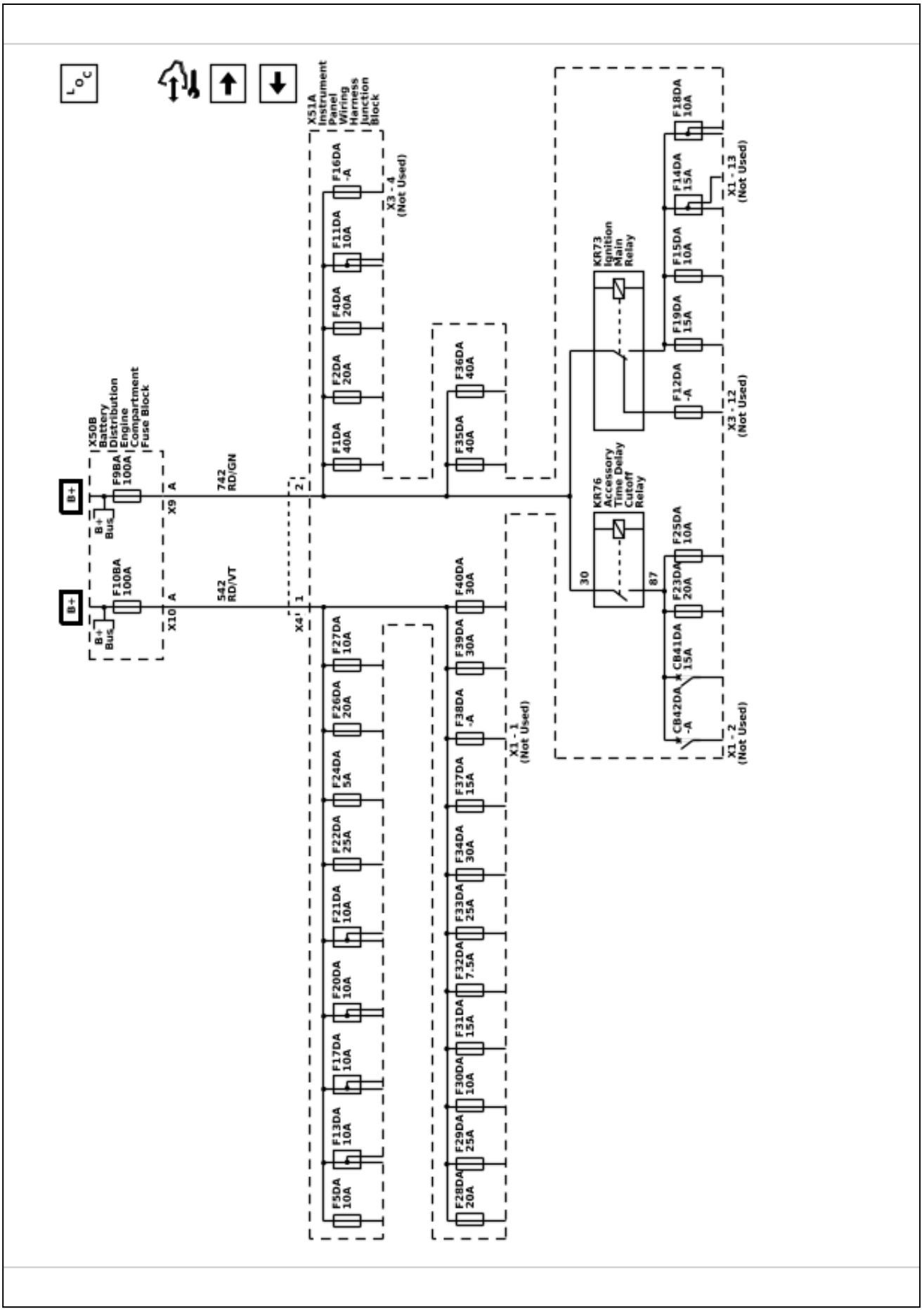
Power Distribution Schematics (F55UA, F63UA, F71UA, and F86UA Fuses)



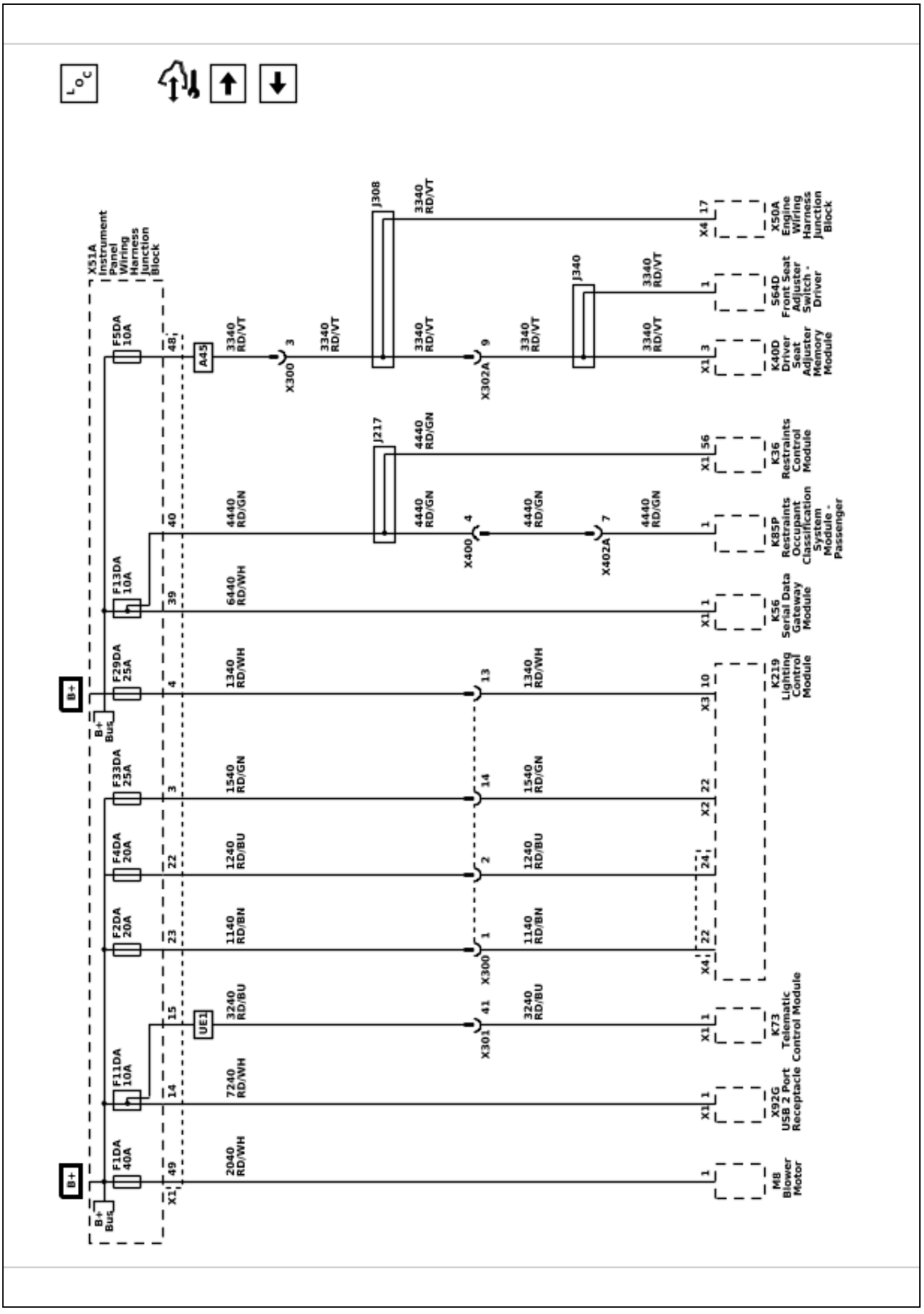
Power Distribution Schematics (F66UA, F68UA, F76UA, F83UA and F90UA Fuses)



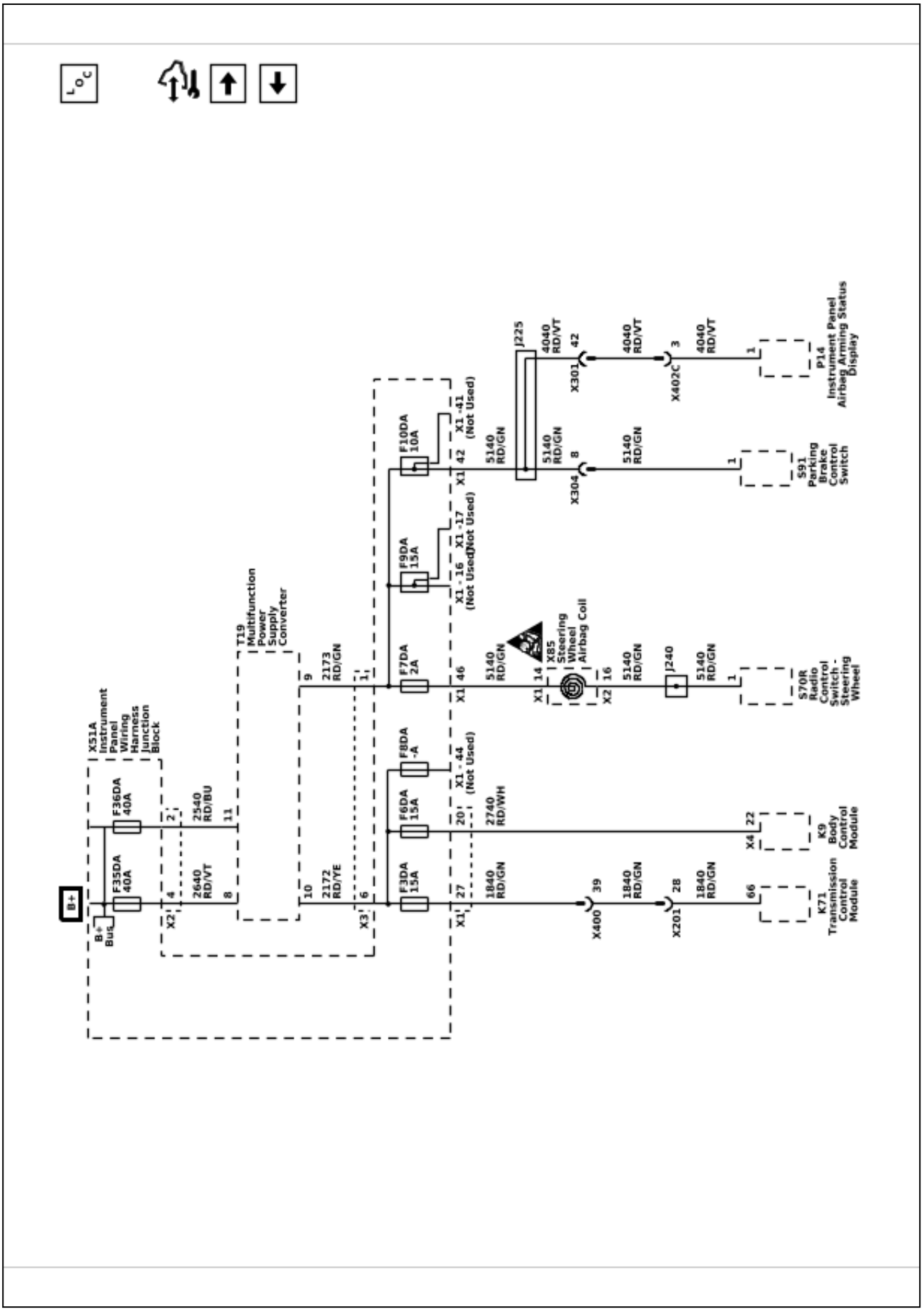
Power Distribution Schematics (B+ Bus - X51A Instrument Panel Wiring Harness Junction Block)



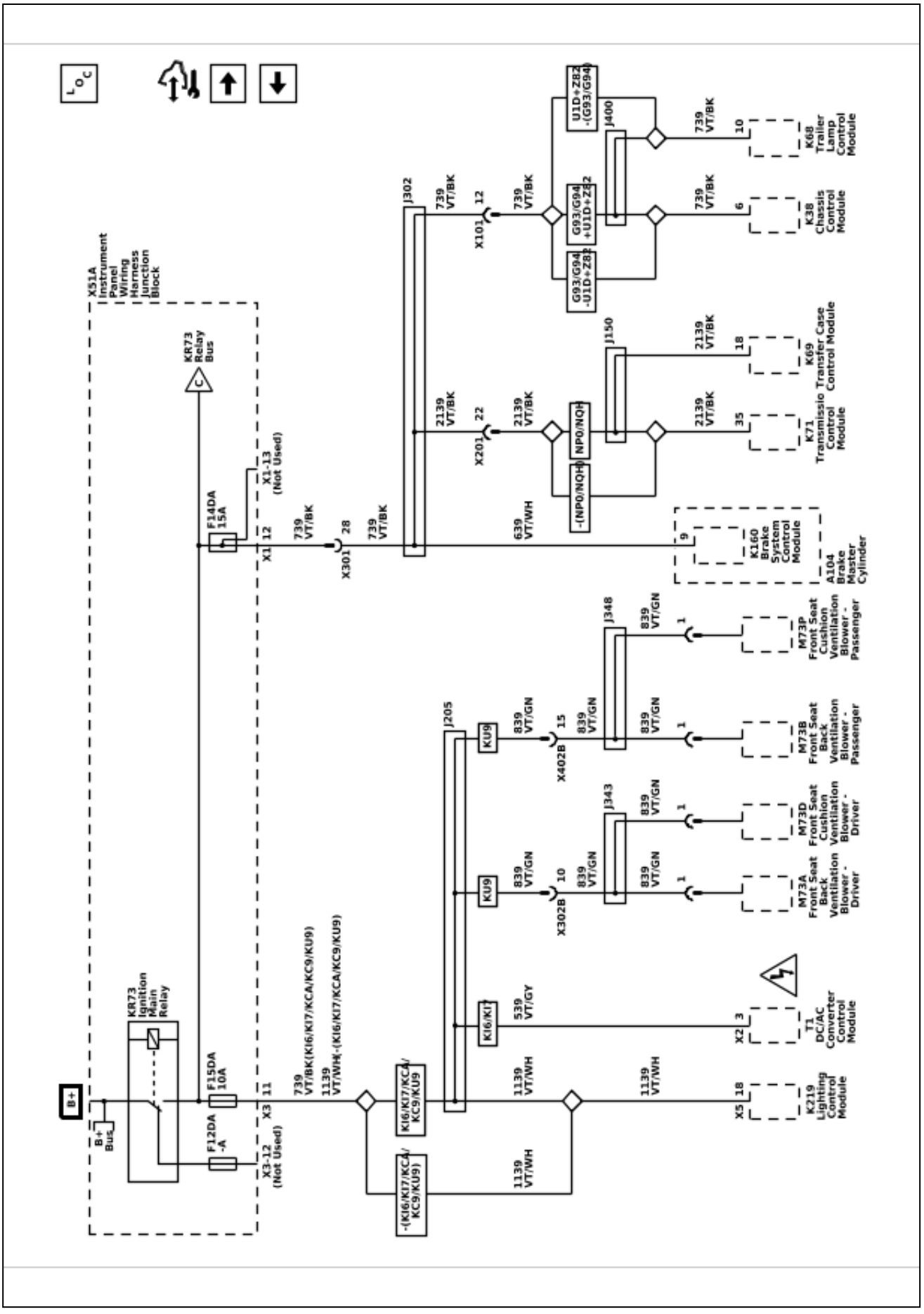
Power Distribution Schematics (F1DA, F2DA, F4DA, F5DA, F11DA, F13DA, F29DA, and F33DA Fuses)



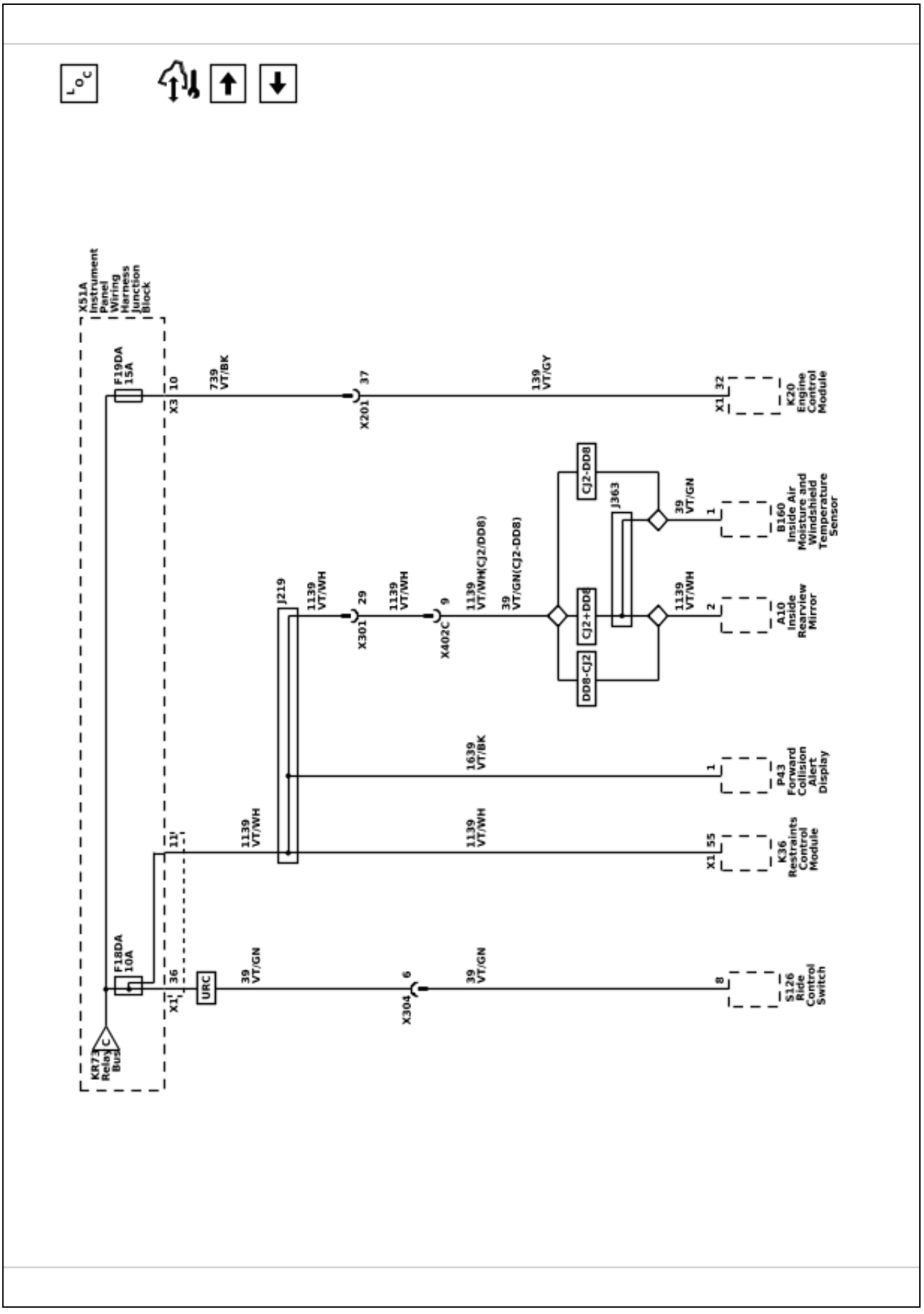
Power Distribution Schematics (F3DA, F6DA, F7DA, F8DA, F9DA, F10DA, F35DA and F36DA Fuses)



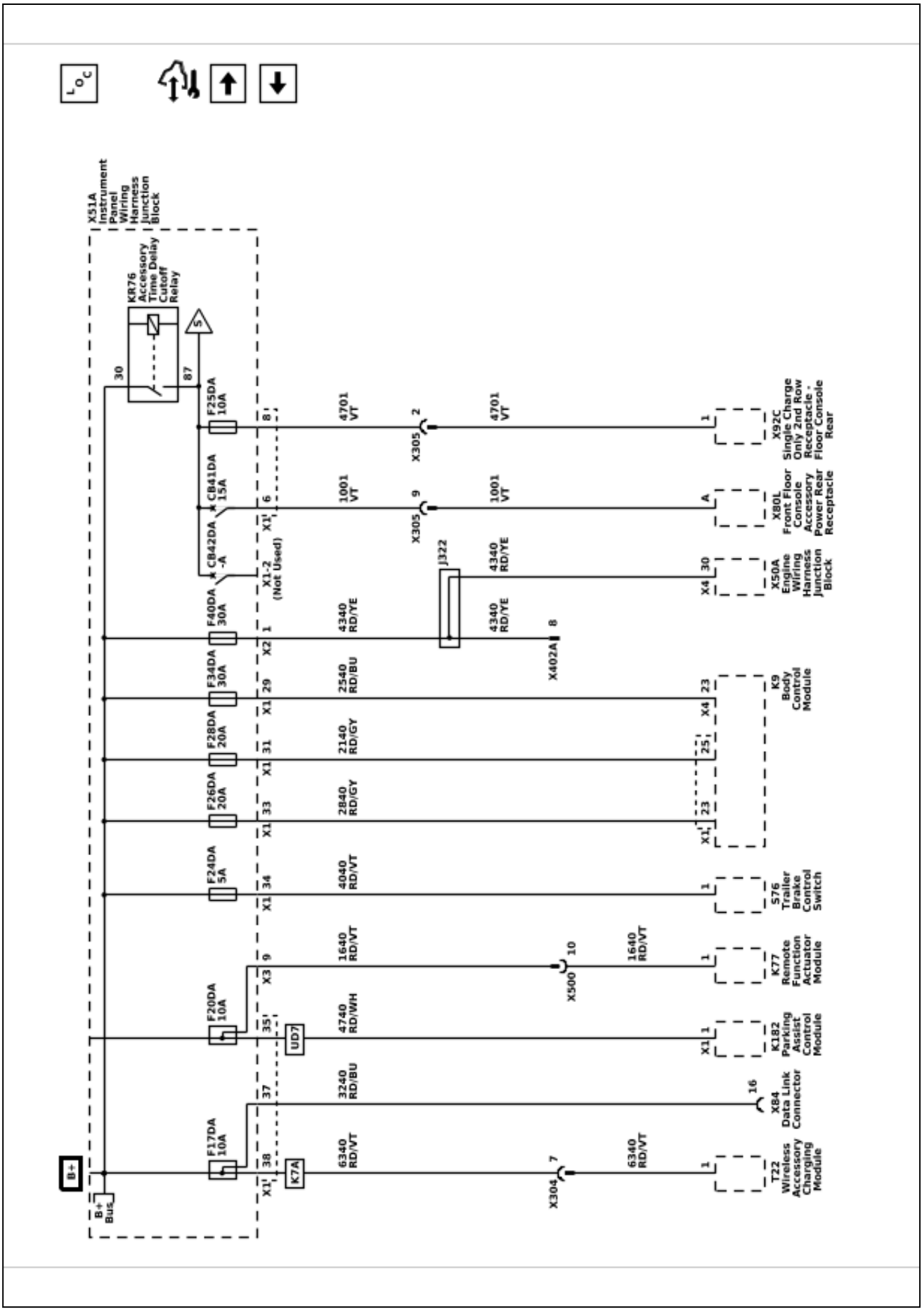
Power Distribution Schematics (F12DA, F14DA, and F15DA Fuses)



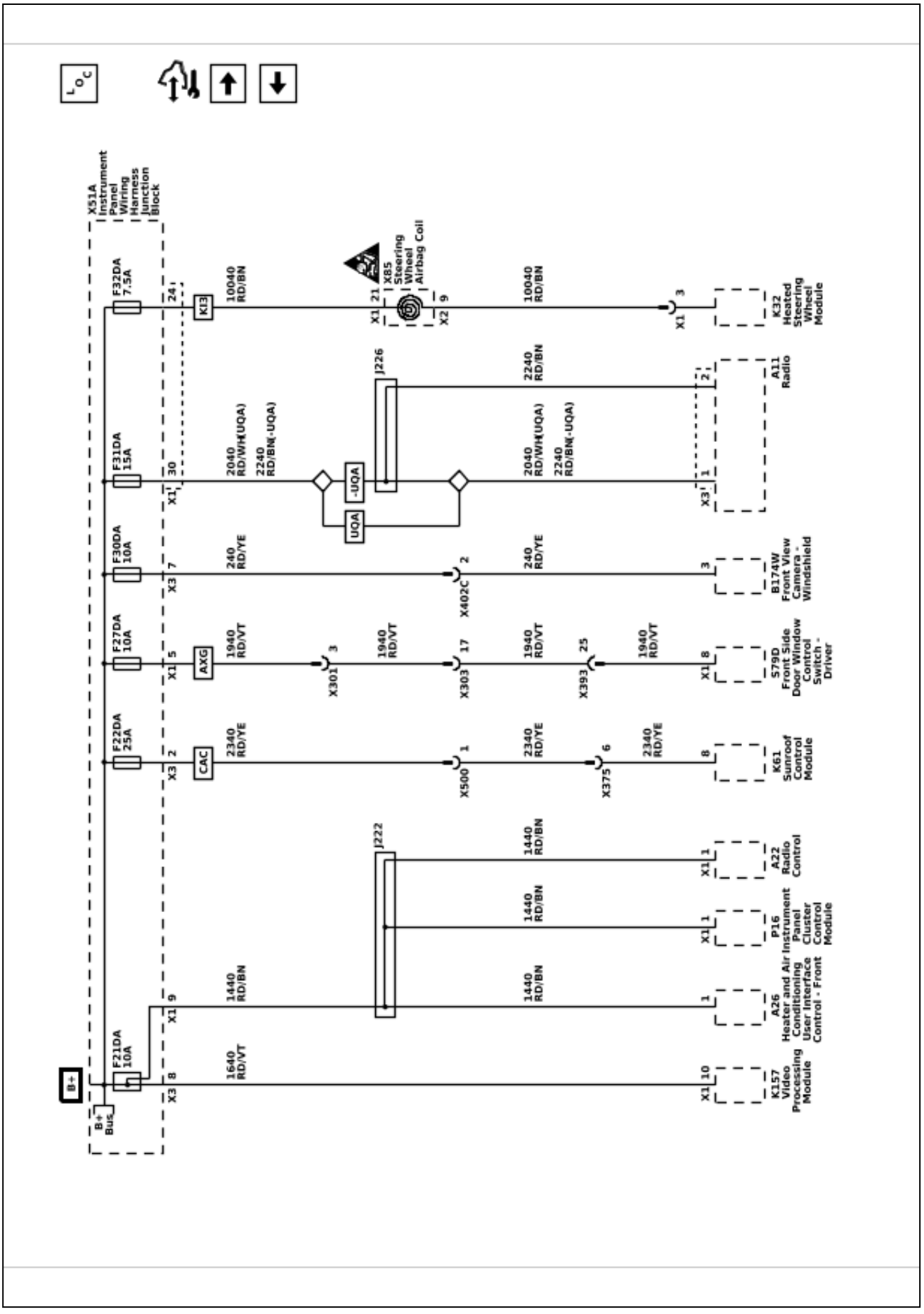
Power Distribution Schematics (F18DA and F19DA Fuses)



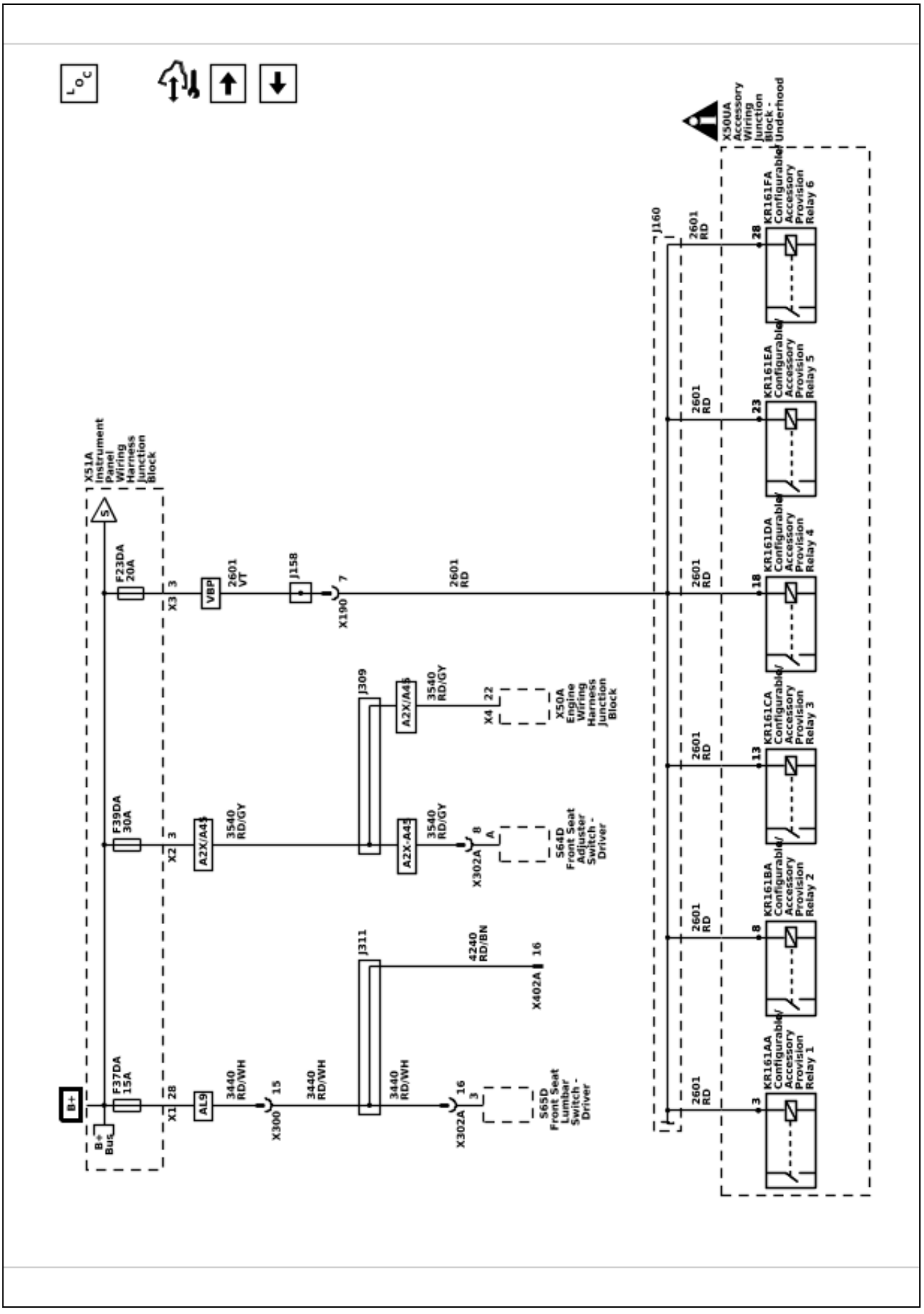
Power Distribution Schematics (F17DA, F20DA, F24DA, F25DA, F26DA, F28DA, F34DA, F40D, CB41DA, and CB42DA Fuses)



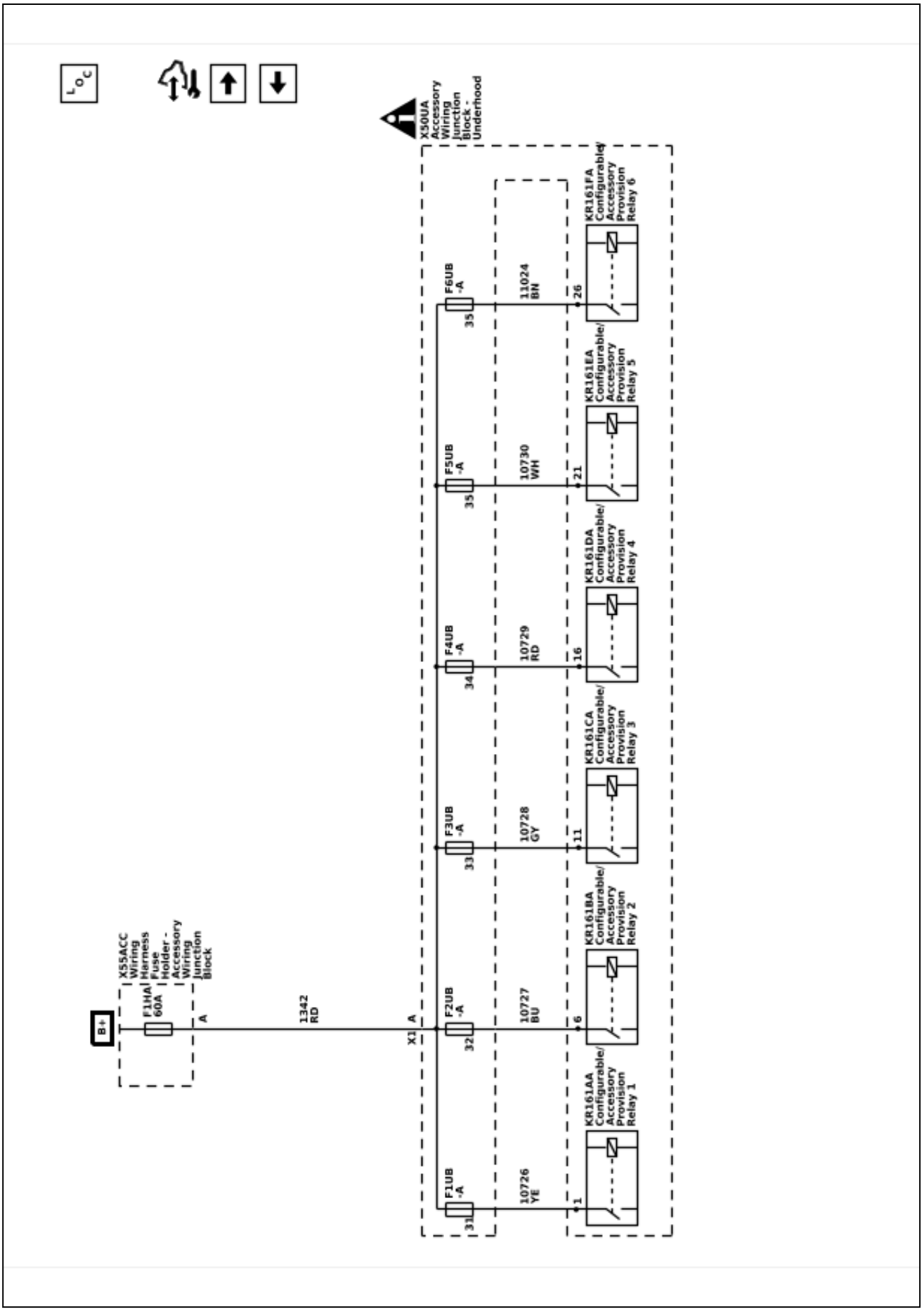
Power Distribution Schematics (F21DA, F22DA, F27DA, F30DA, F31DA, and F32DA Fuses)



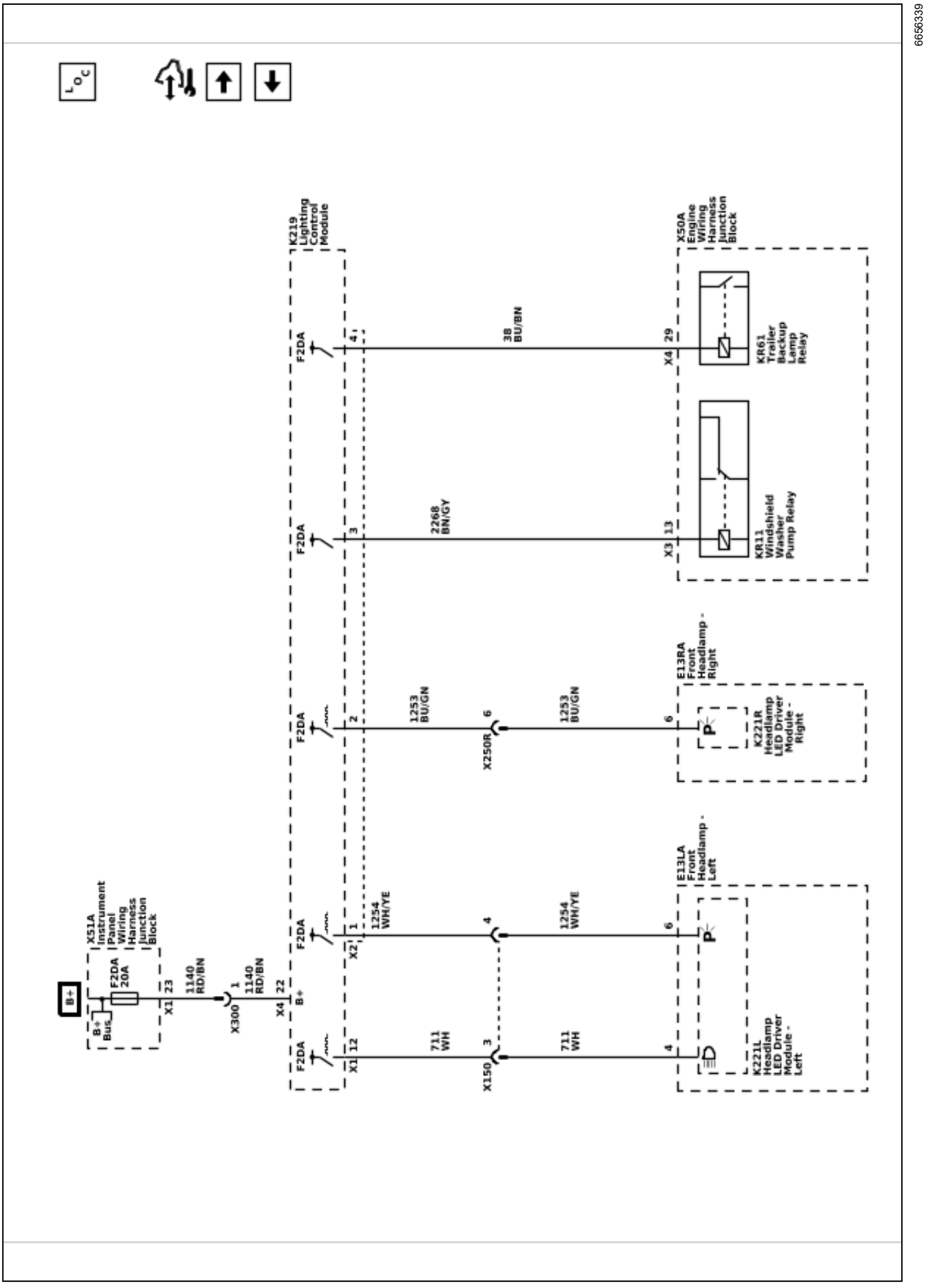
Power Distribution Schematics (F23DA, F37DA and F39DA Fuses)



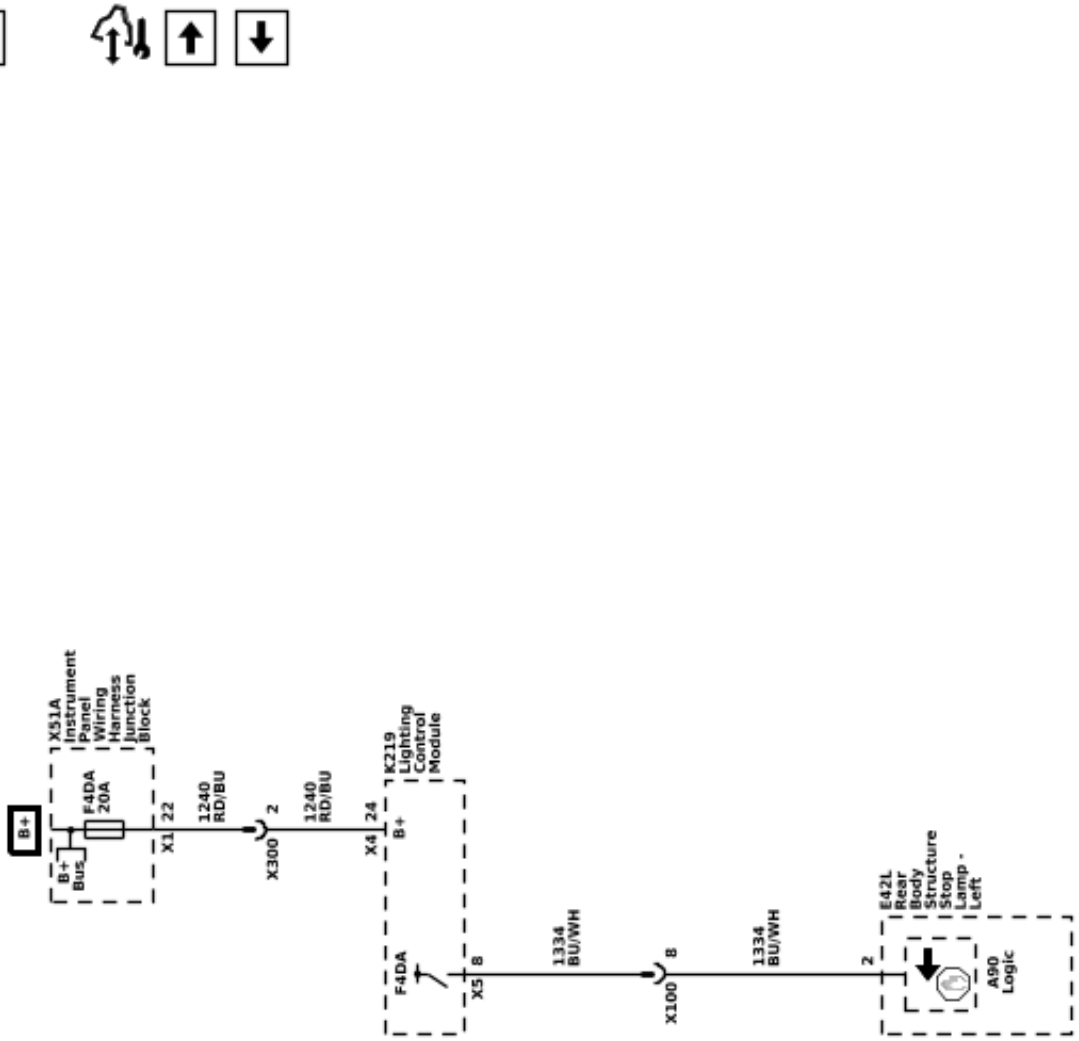
Power Distribution Schematics (B+ Bus – X50UA Accessory Wiring Junction Block – Underhood (VBP))



Power Distribution Schematics (F2DA Fuse and Lighting Control Module Fused Outputs)



Power Distribution Schematics (F4DA Fuse and Lighting Control Module Fused Outputs)



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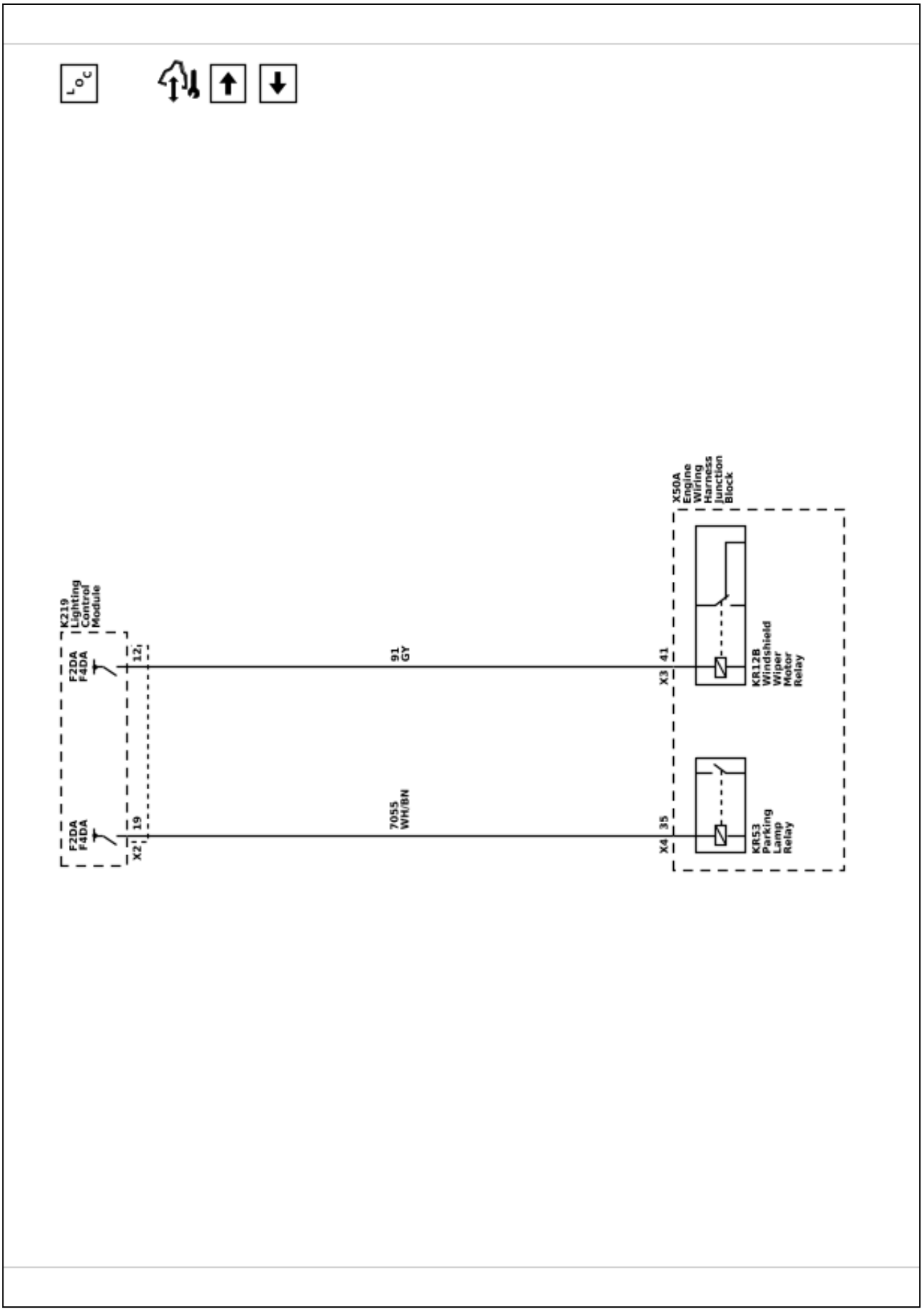
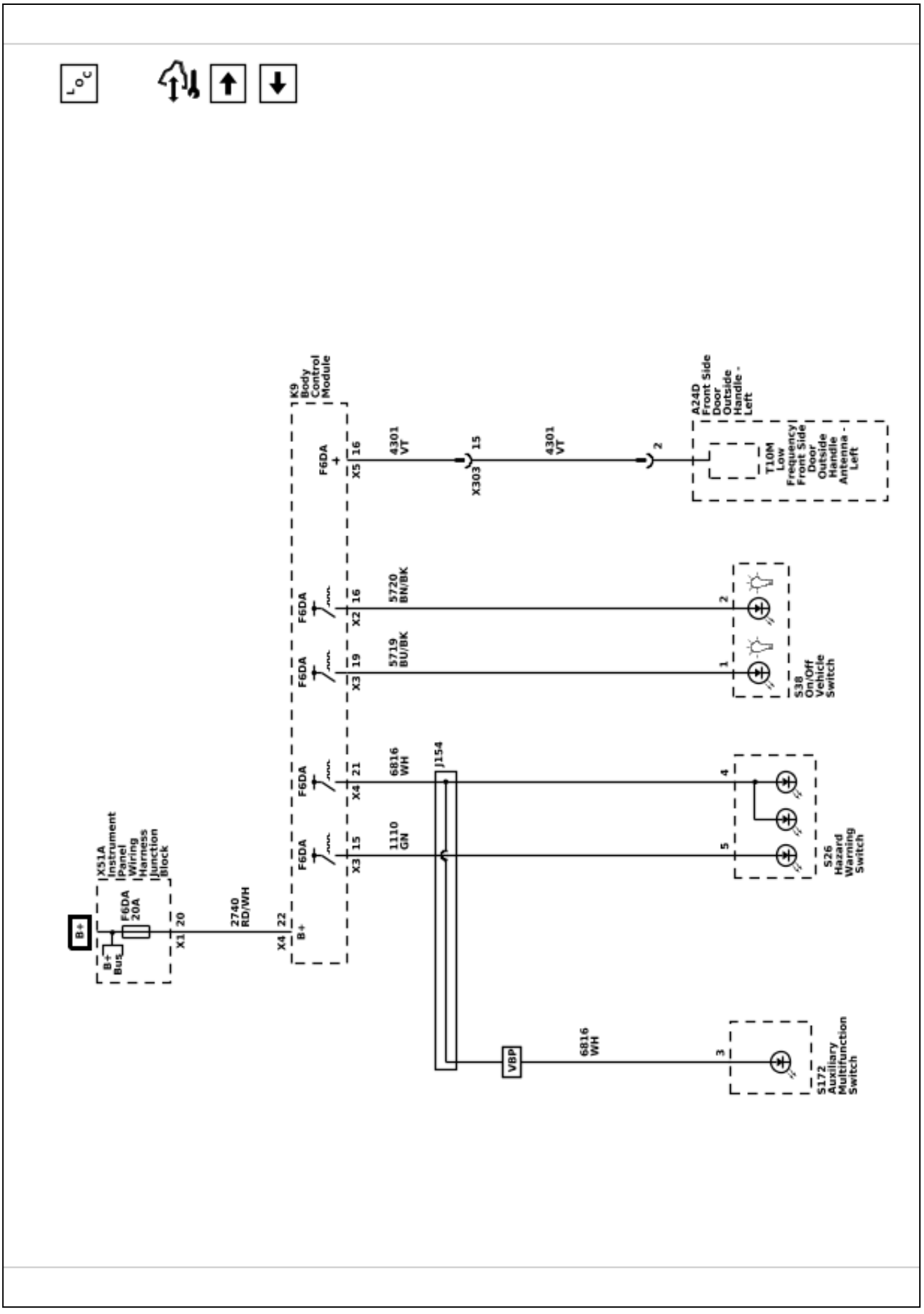
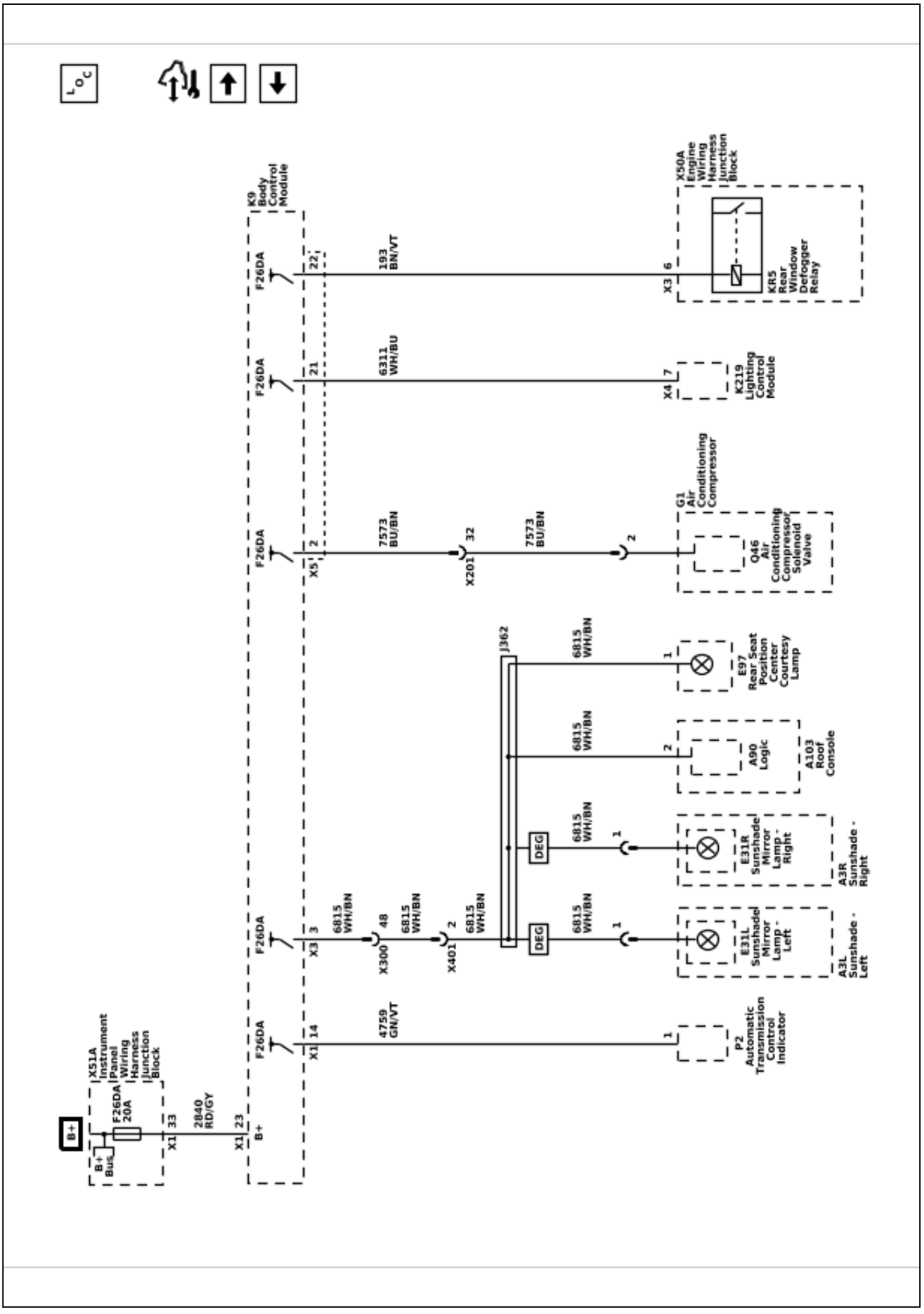
Power Distribution Schematics (F2DA and F4DA Fuses and Lighting Control Module Redundant Fused Outputs)



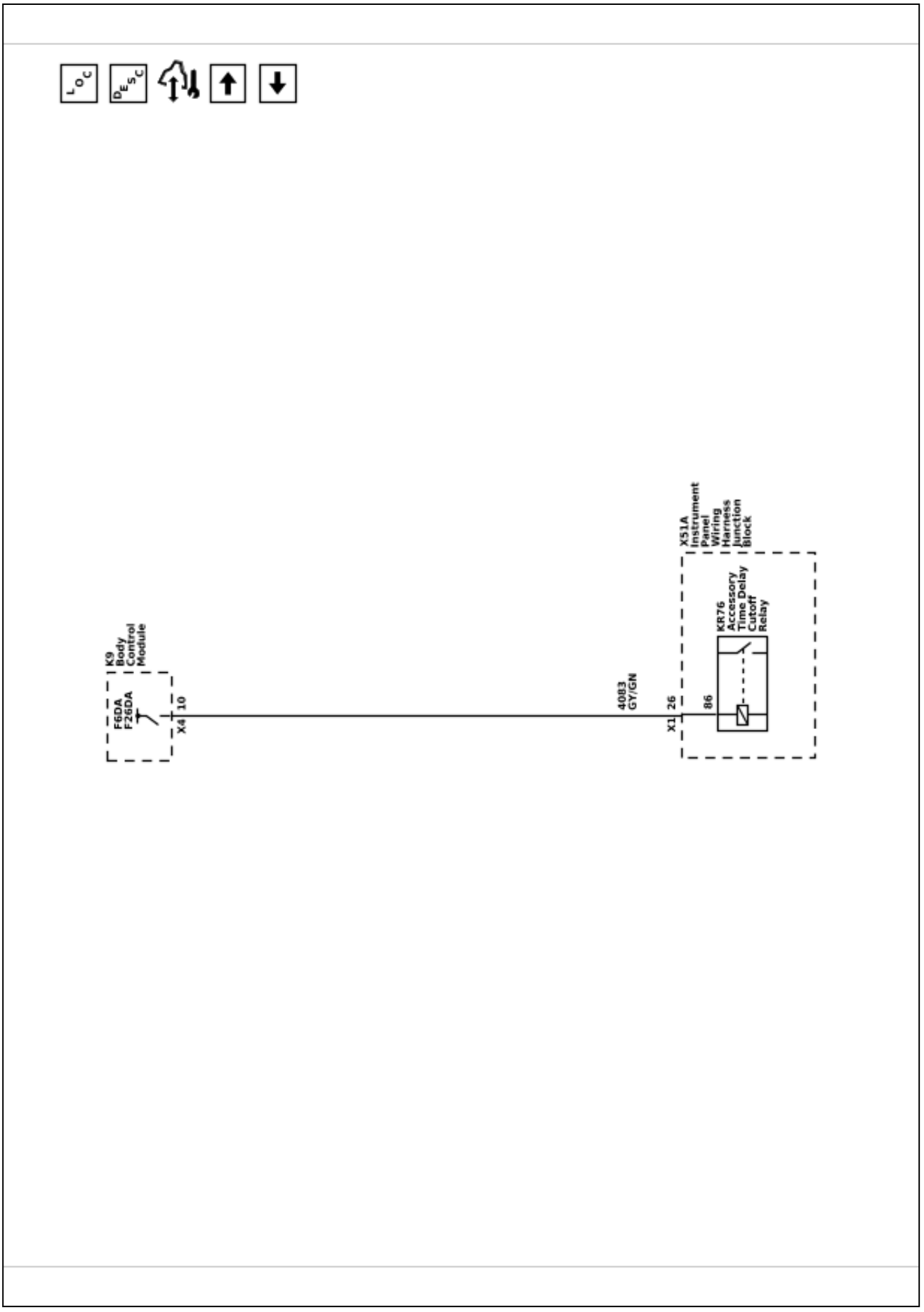
Power Distribution Schematics (F6DA Fuse and Body Control Module Fused Outputs)



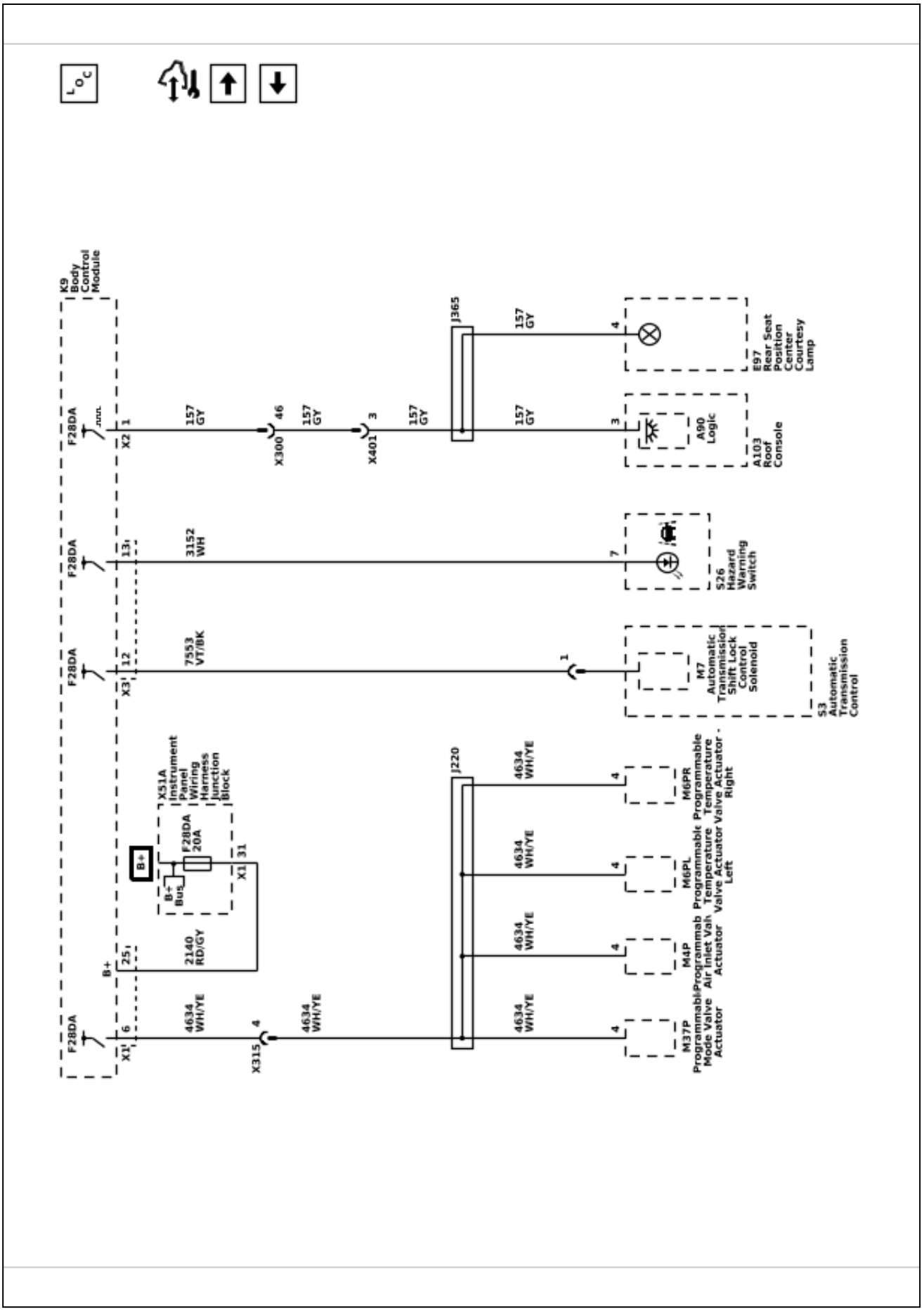
Power Distribution Schematics (F26DA Fuse and Body Control Module Fused Outputs)



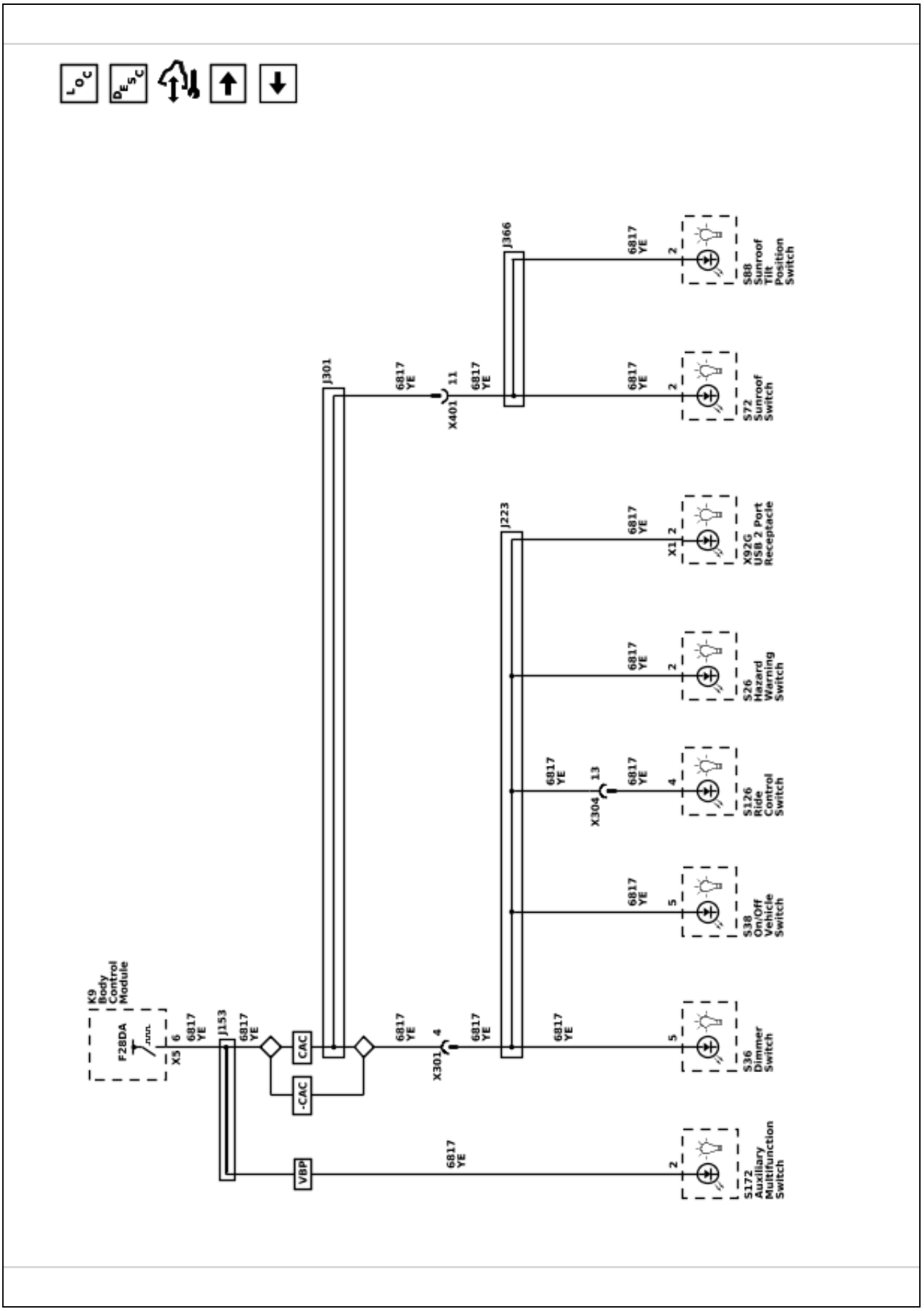
Power Distribution Schematics (F6DA and F26DA Fuses and Body Control Module Redundant Fused Outputs)



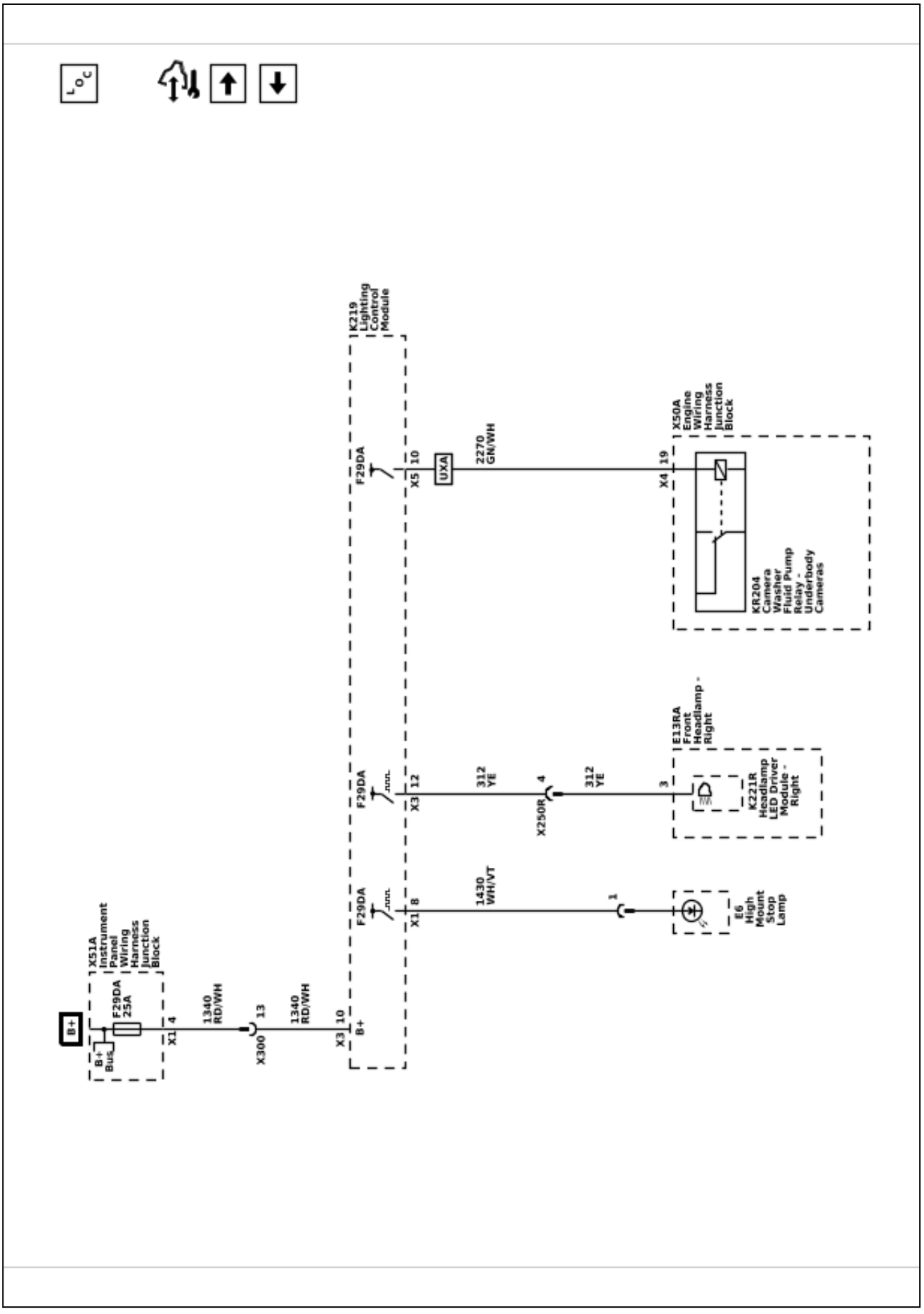
Power Distribution Schematics (F28DA Fuse and Body Control Module Fused Outputs - 1 of 2)



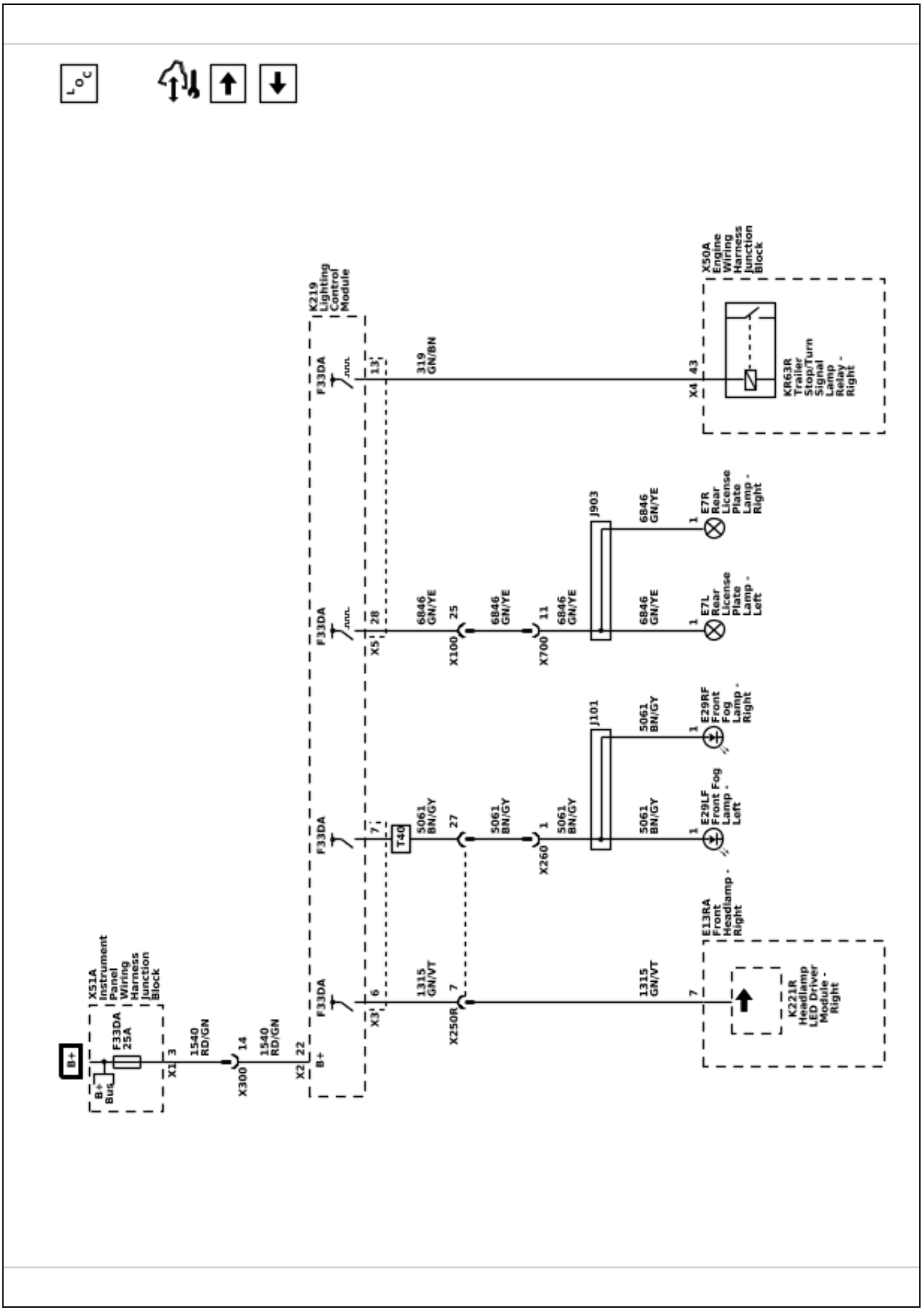
Power Distribution Schematics (F28DA Fuse and Body Control Module Fused Outputs - 2 of 2)



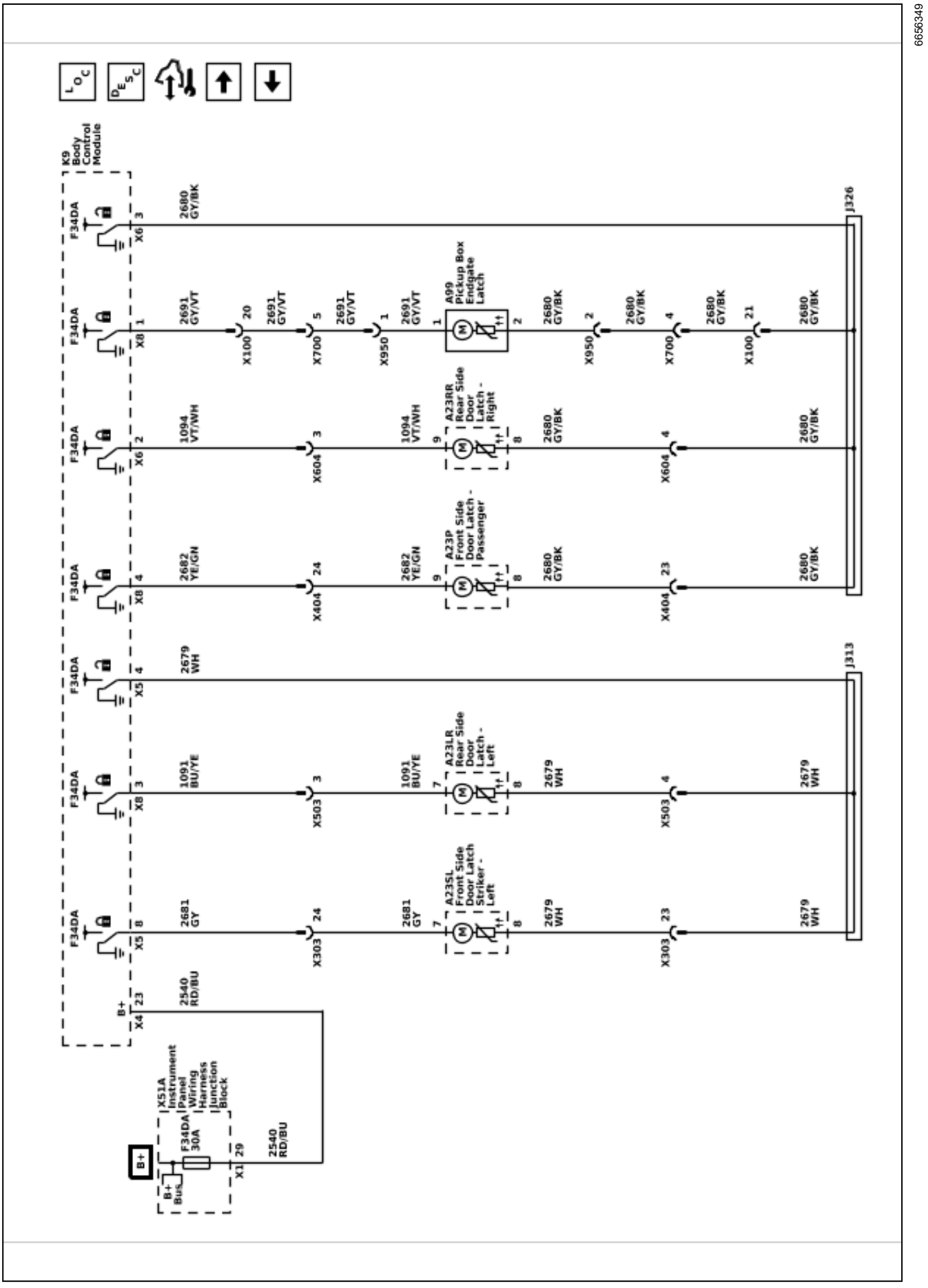
Power Distribution Schematics (F29DA Fuse and Lighting Control Module Fused Outputs)



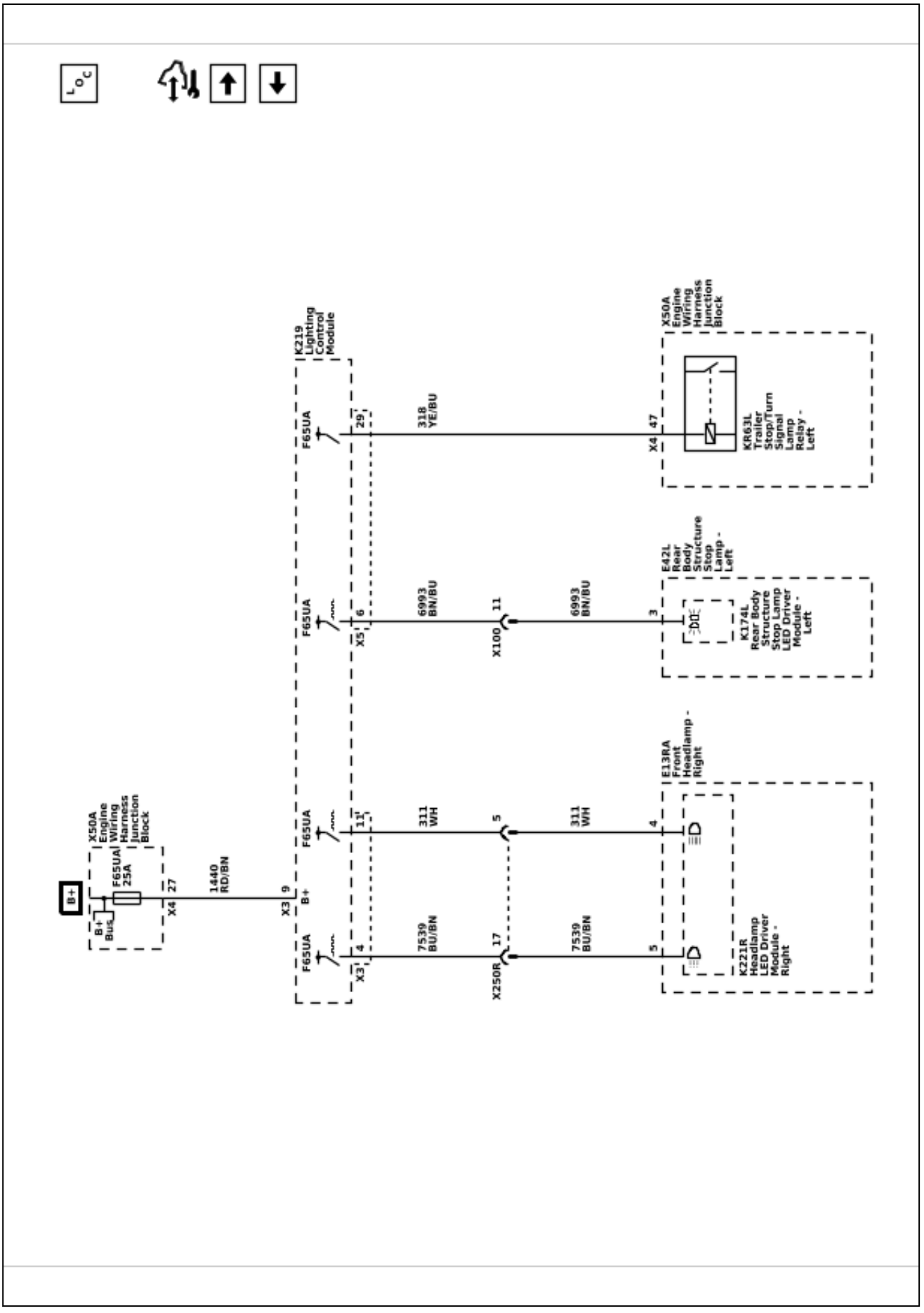
Power Distribution Schematics (F33DA Fuse and Lighting Control Module Fused Outputs)



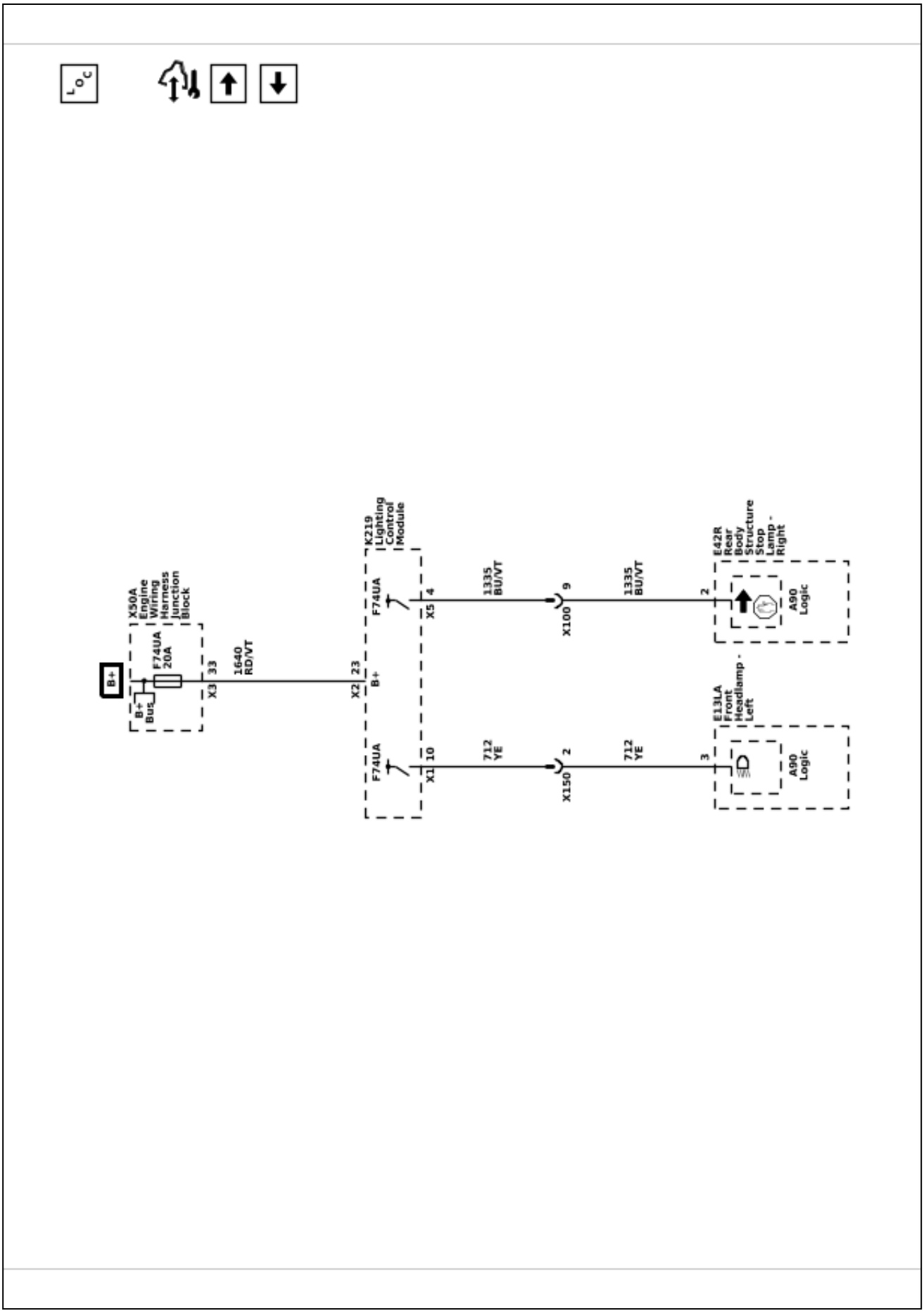
Power Distribution Schematics (F34DA Fuse and Body Control Module Fused Outputs)



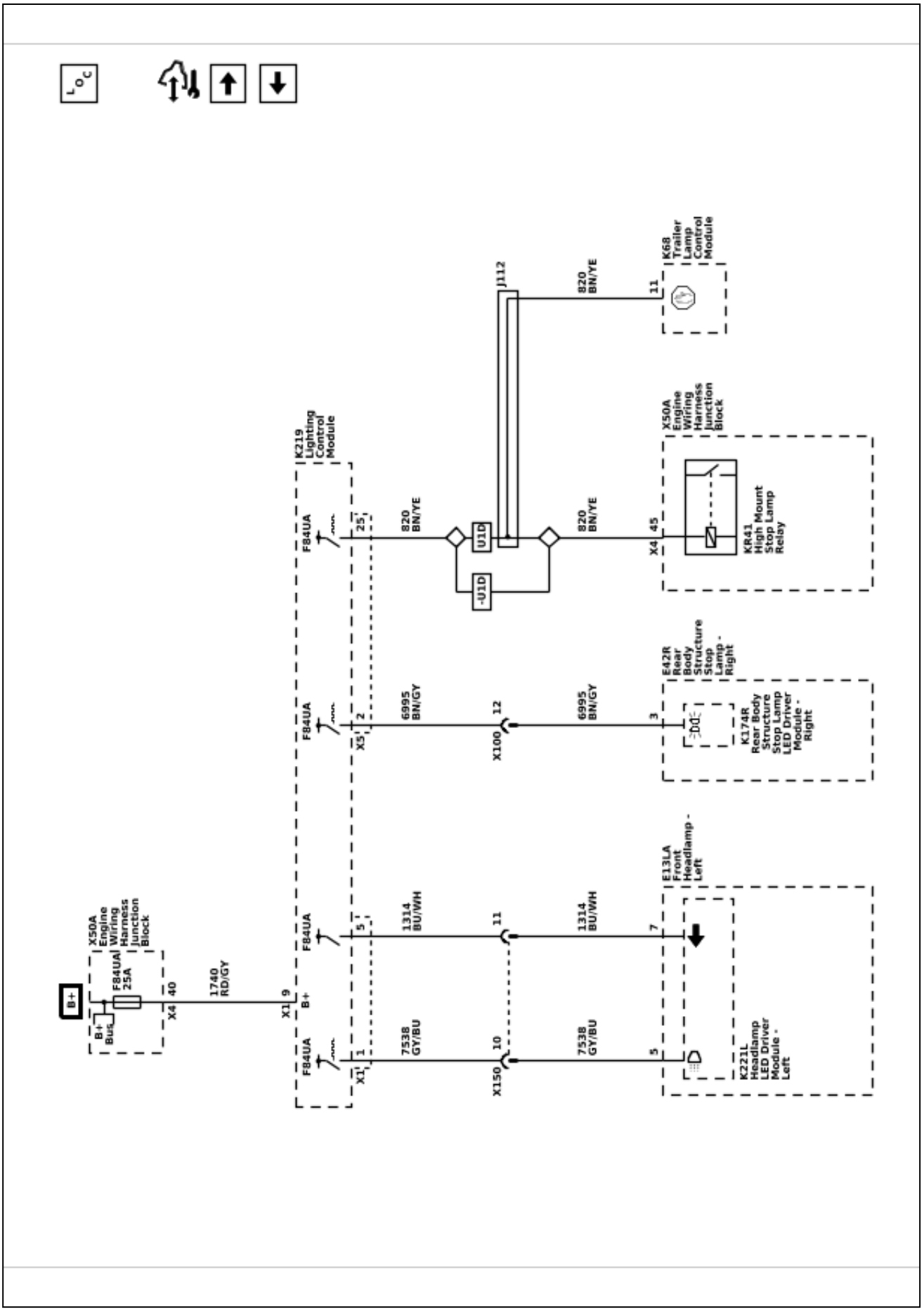
Power Distribution Schematics (F65UA Fuse and Lighting Control Module Fused Outputs)



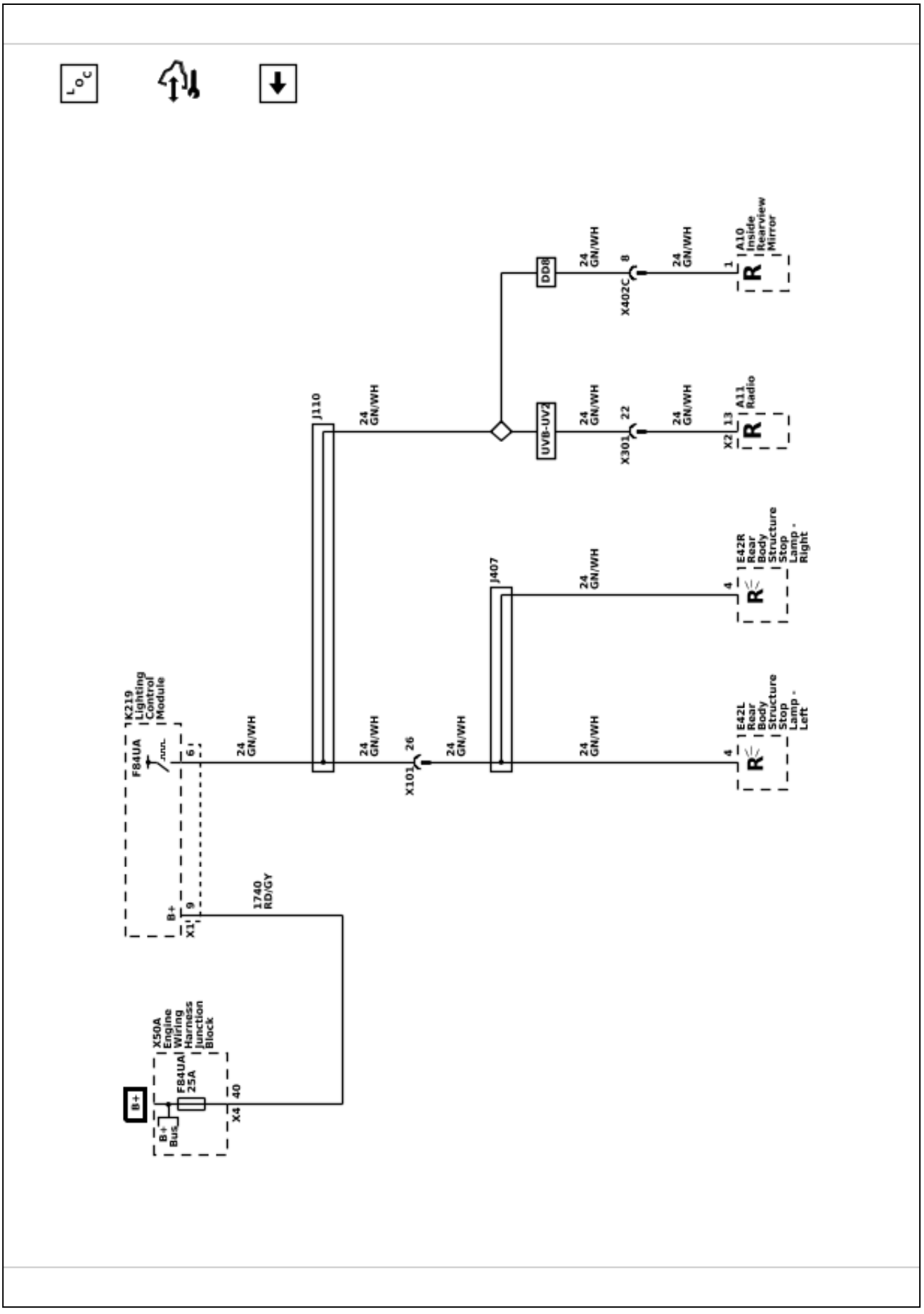
Power Distribution Schematics (F74UA Fuse and Lighting Control Module Fused Outputs)



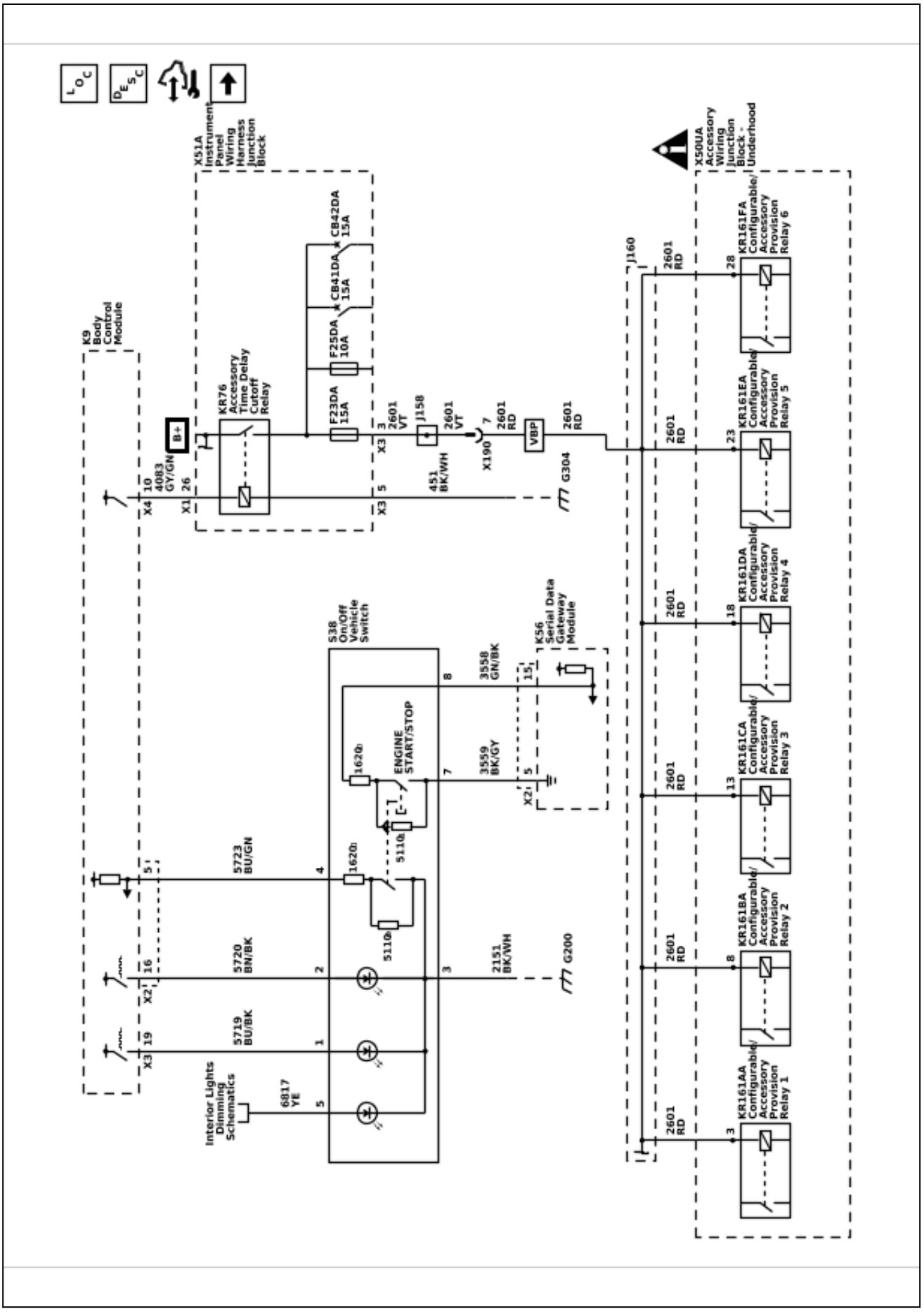
Power Distribution Schematics (F84UA Fuse and Lighting Control Module Fused Outputs - 1 of 2)



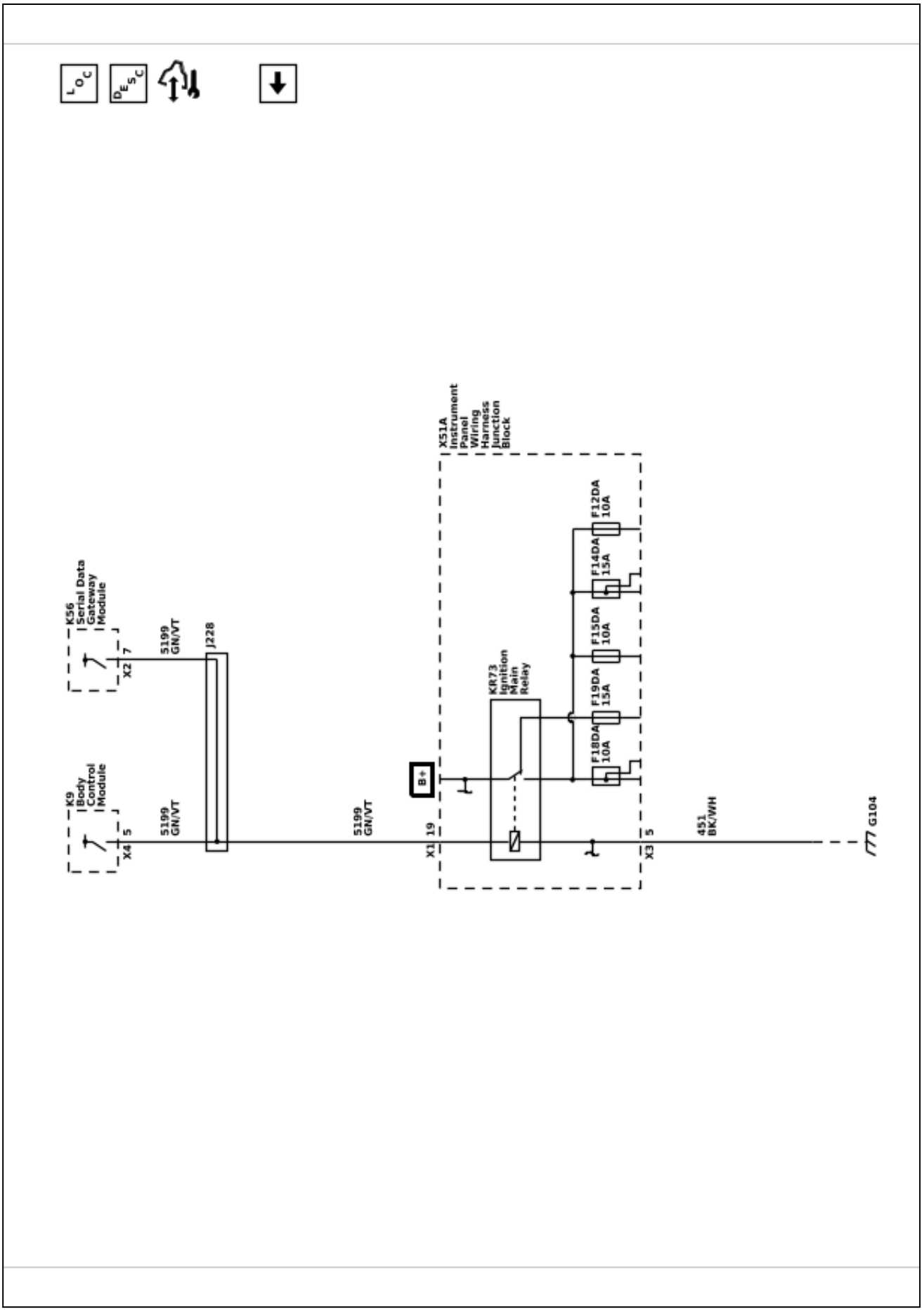
Power Distribution Schematics (F84UA Fuse and Lighting Control Module Fused Outputs - 2 of 2)



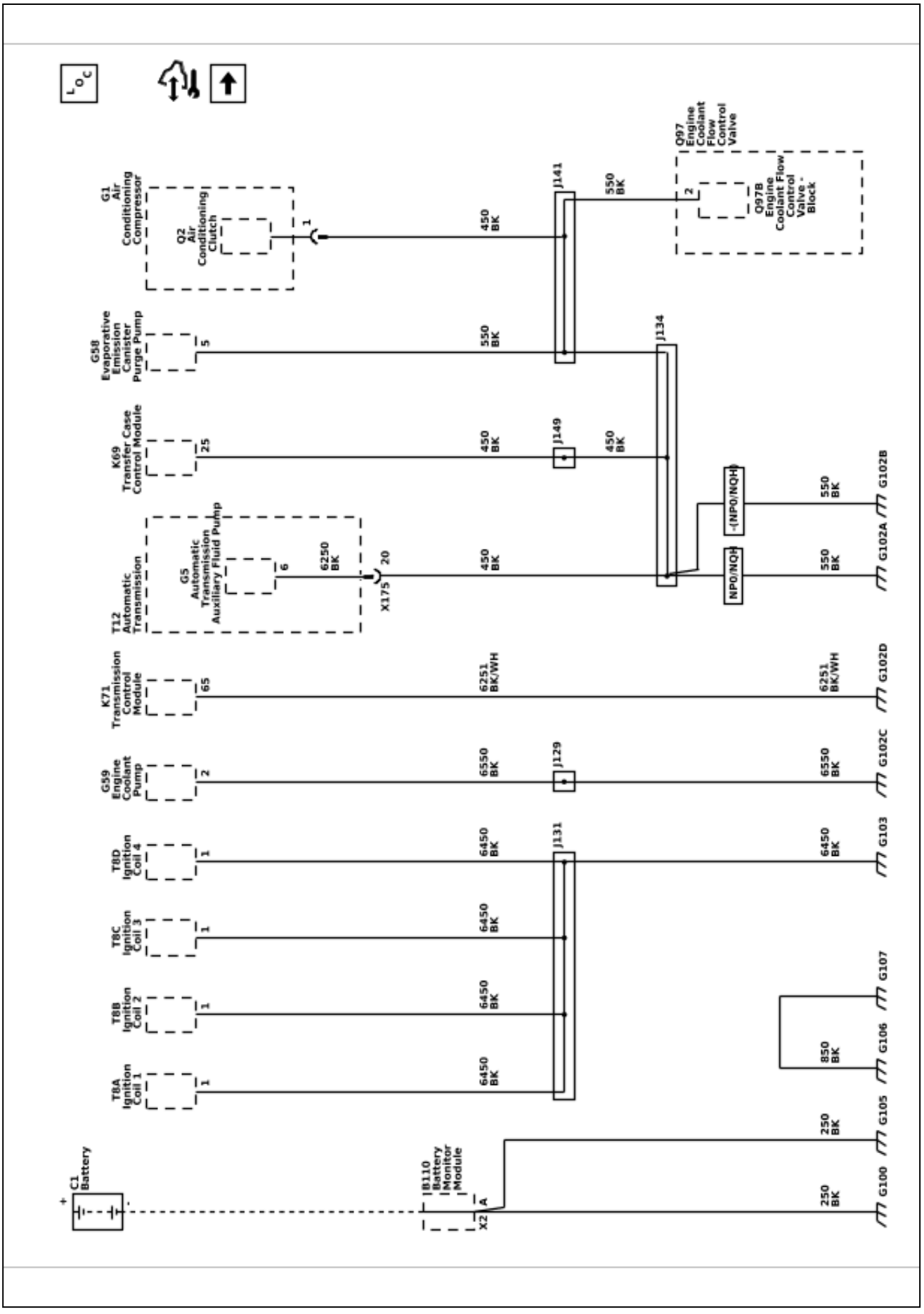
Power Moding Schematics (On/Off Vehicle Switch and Retained Accessory Power)



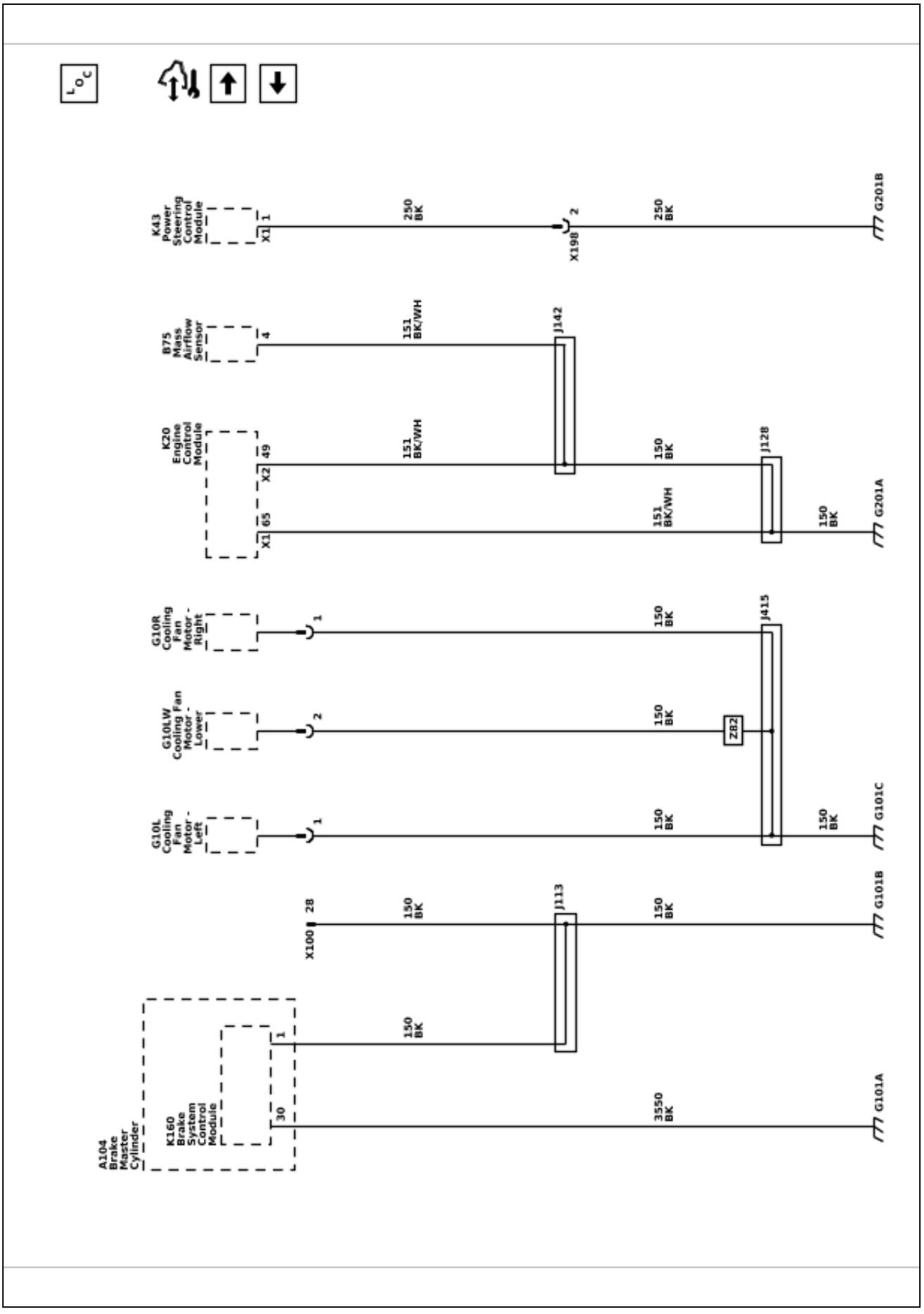
Power Moding Schematics (Ignition Main Relay)



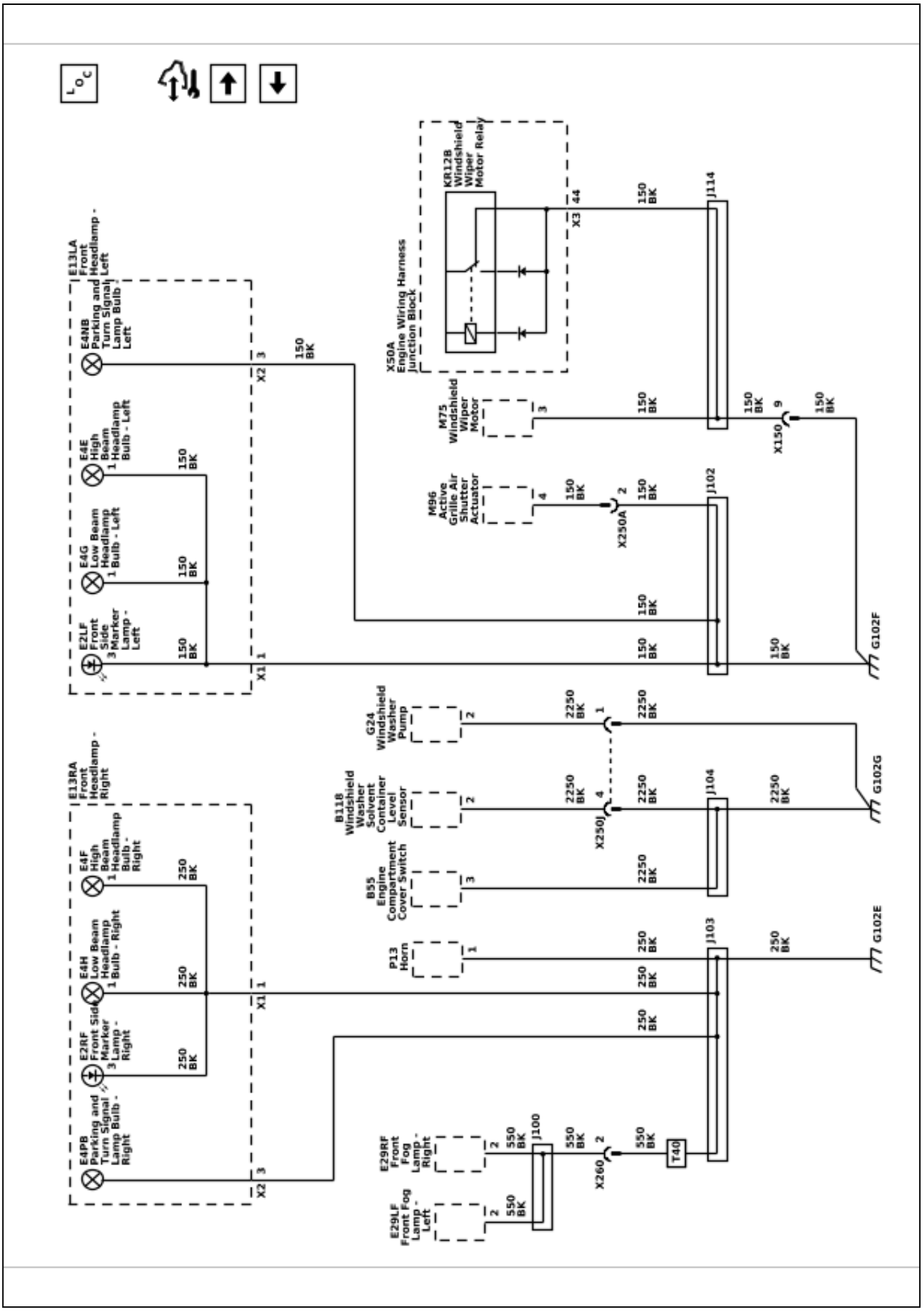
Ground Distribution Schematics (G100, G102A, G102B, G102C, G102D, G103, G105, G106, and G107)



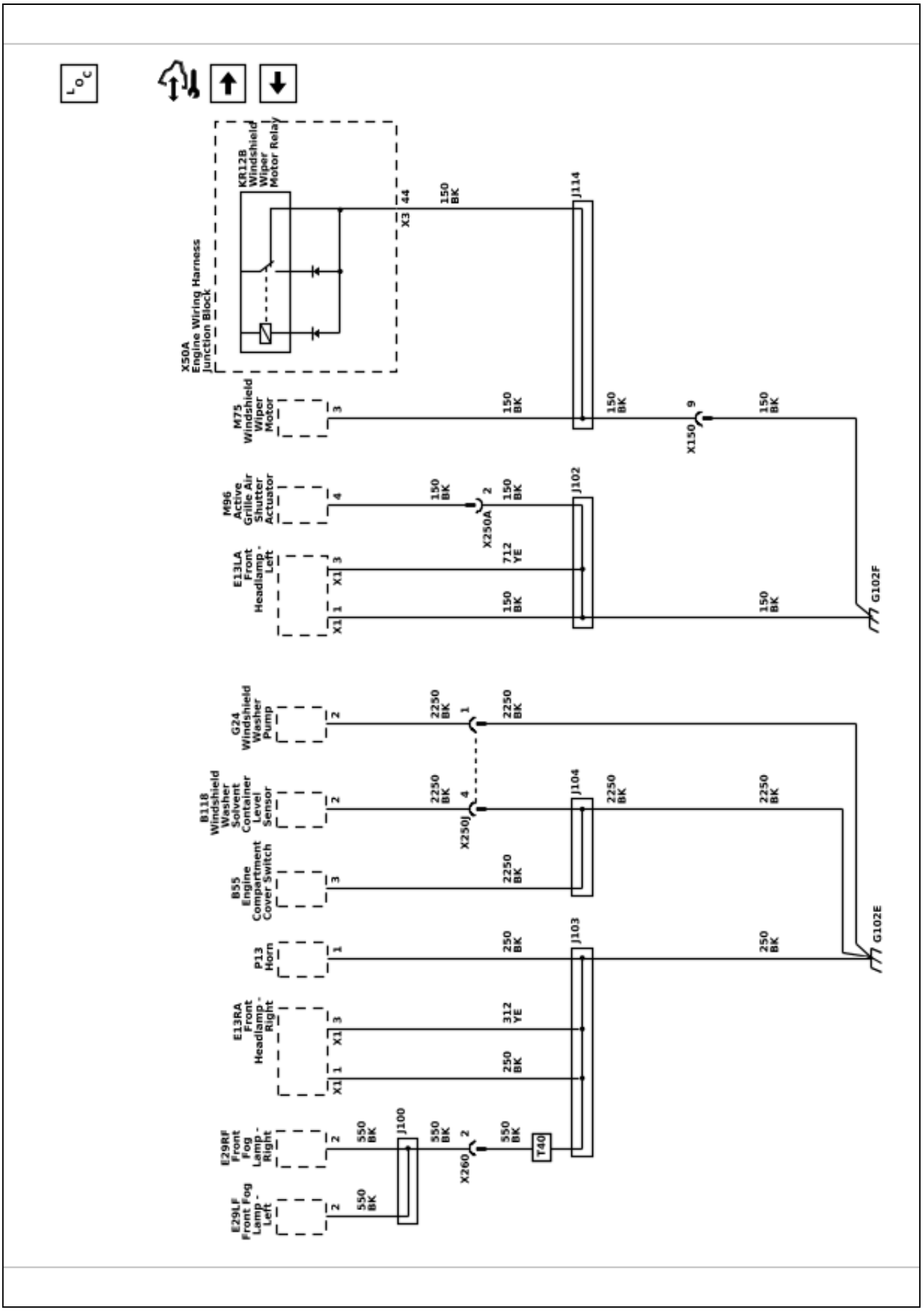
Ground Distribution Schematics (G101A, G101B, G101C, G201A, and G201B)



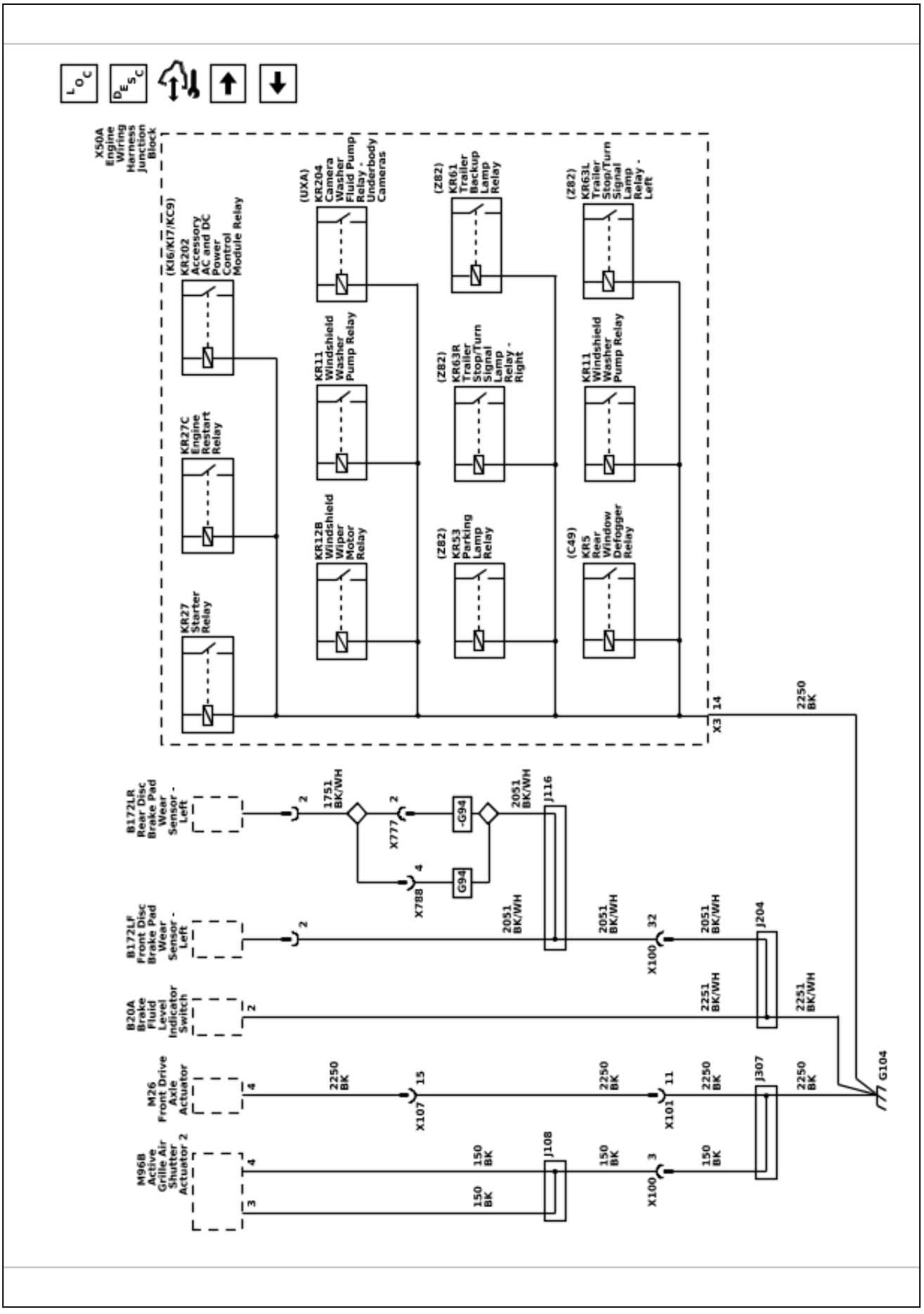
Ground Distribution Schematics (G102E and G102F (T4A))



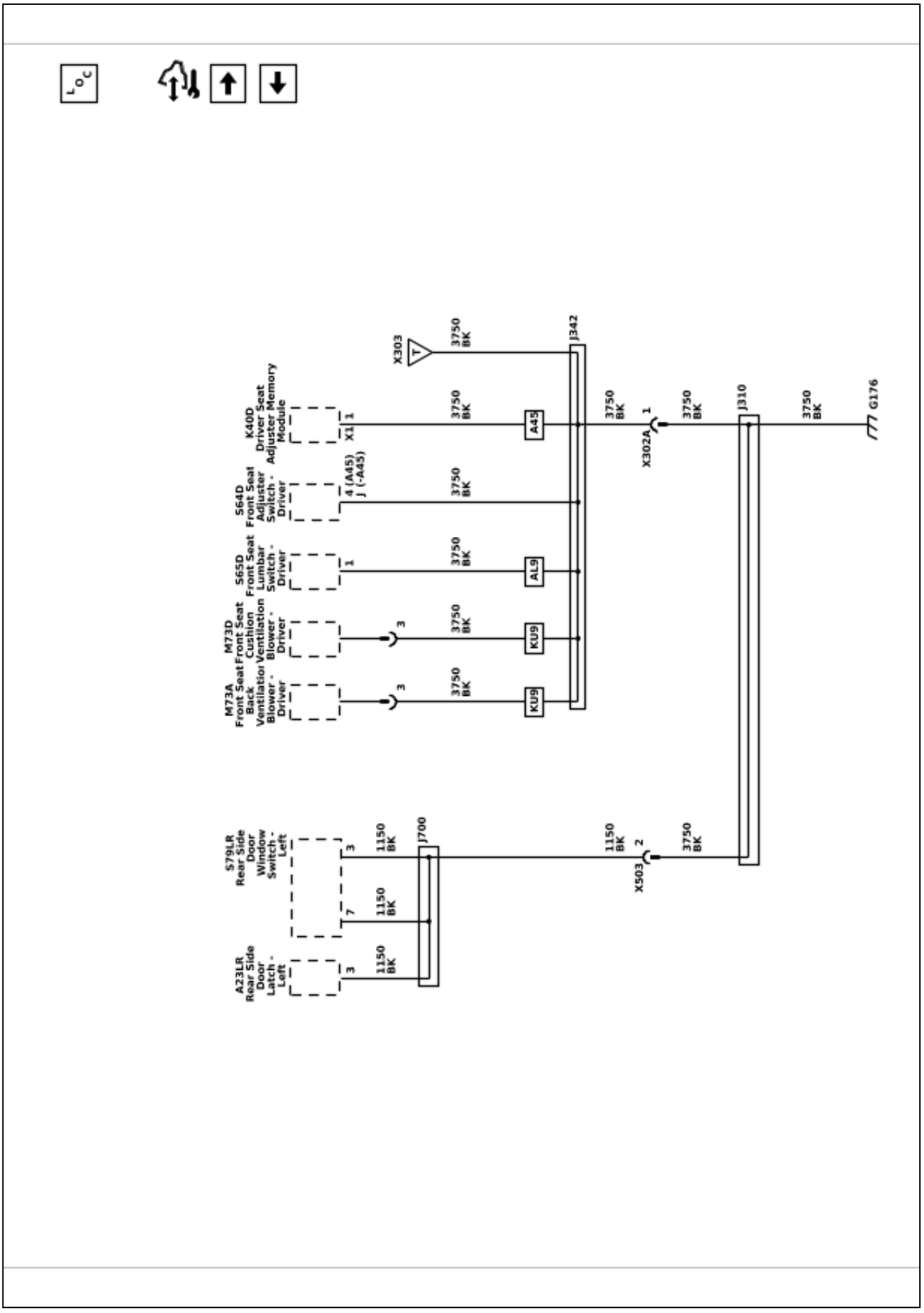
Ground Distribution Schematics (G102E and G102F (T4L))



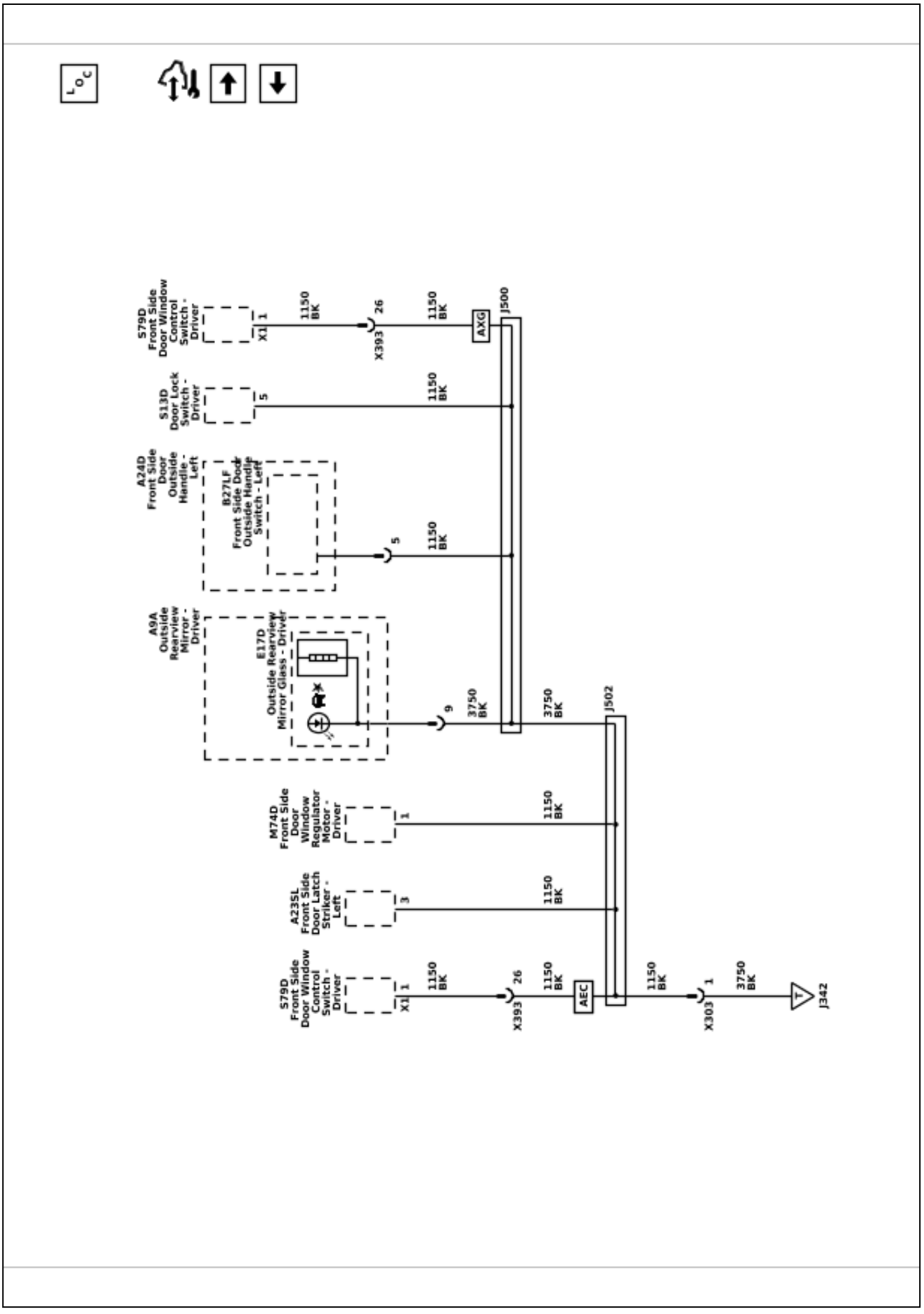
Ground Distribution Schematics (G104)



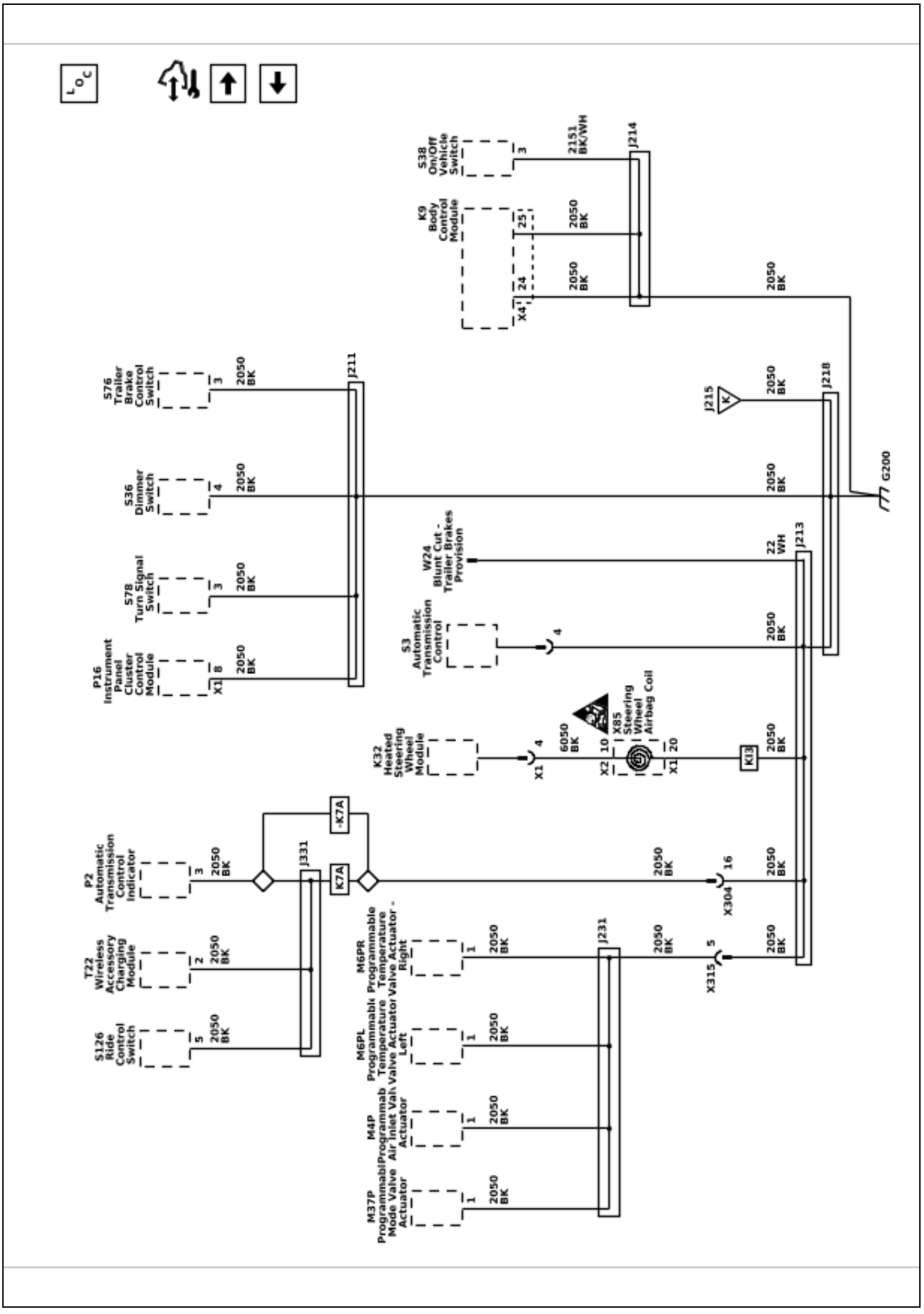
Ground Distribution Schematics (G176 1 of 2)



Ground Distribution Schematics (G176 2 of 2)



Ground Distribution Schematics (G200 1 of 2)



Ground Distribution Schematics (G200 2 of 2)

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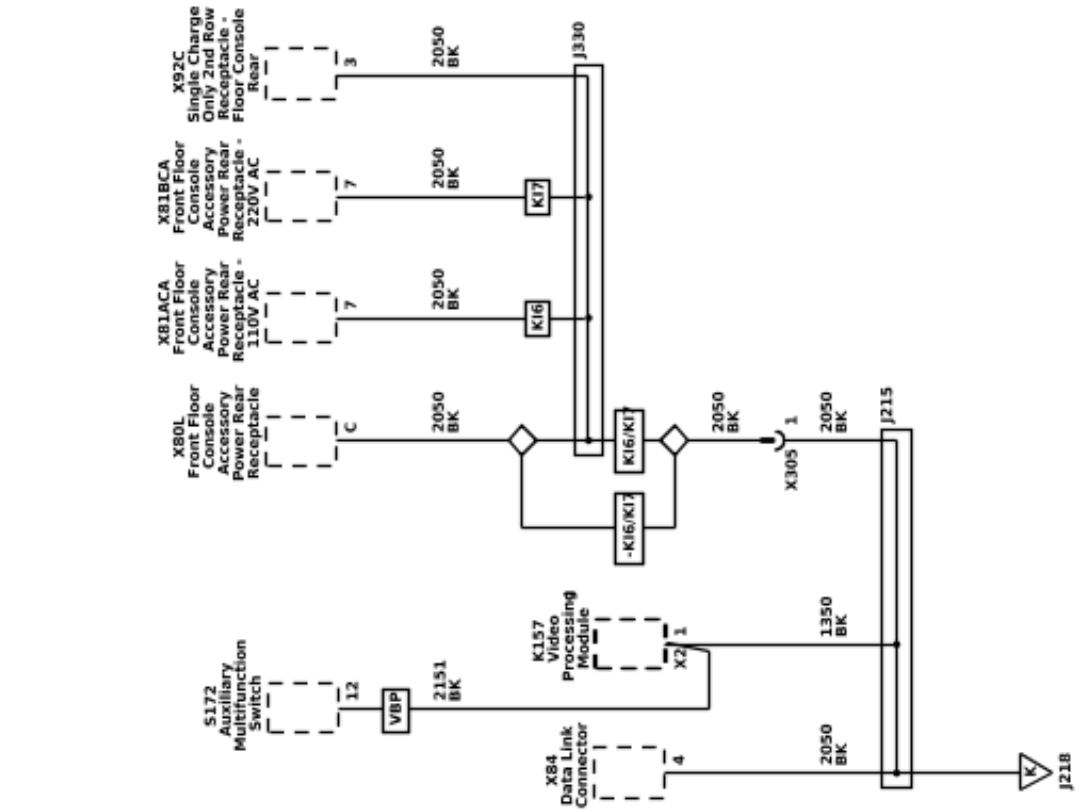
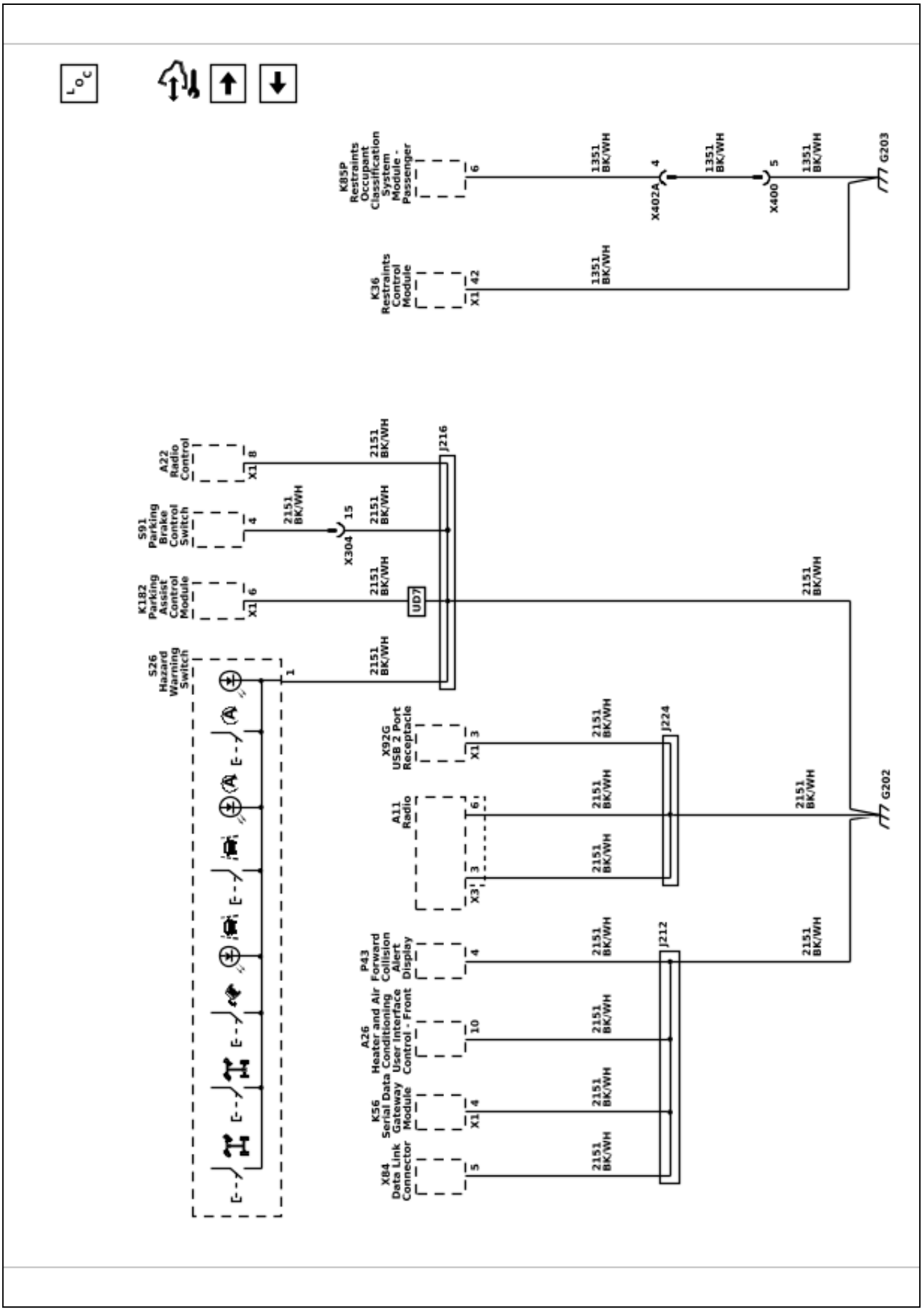
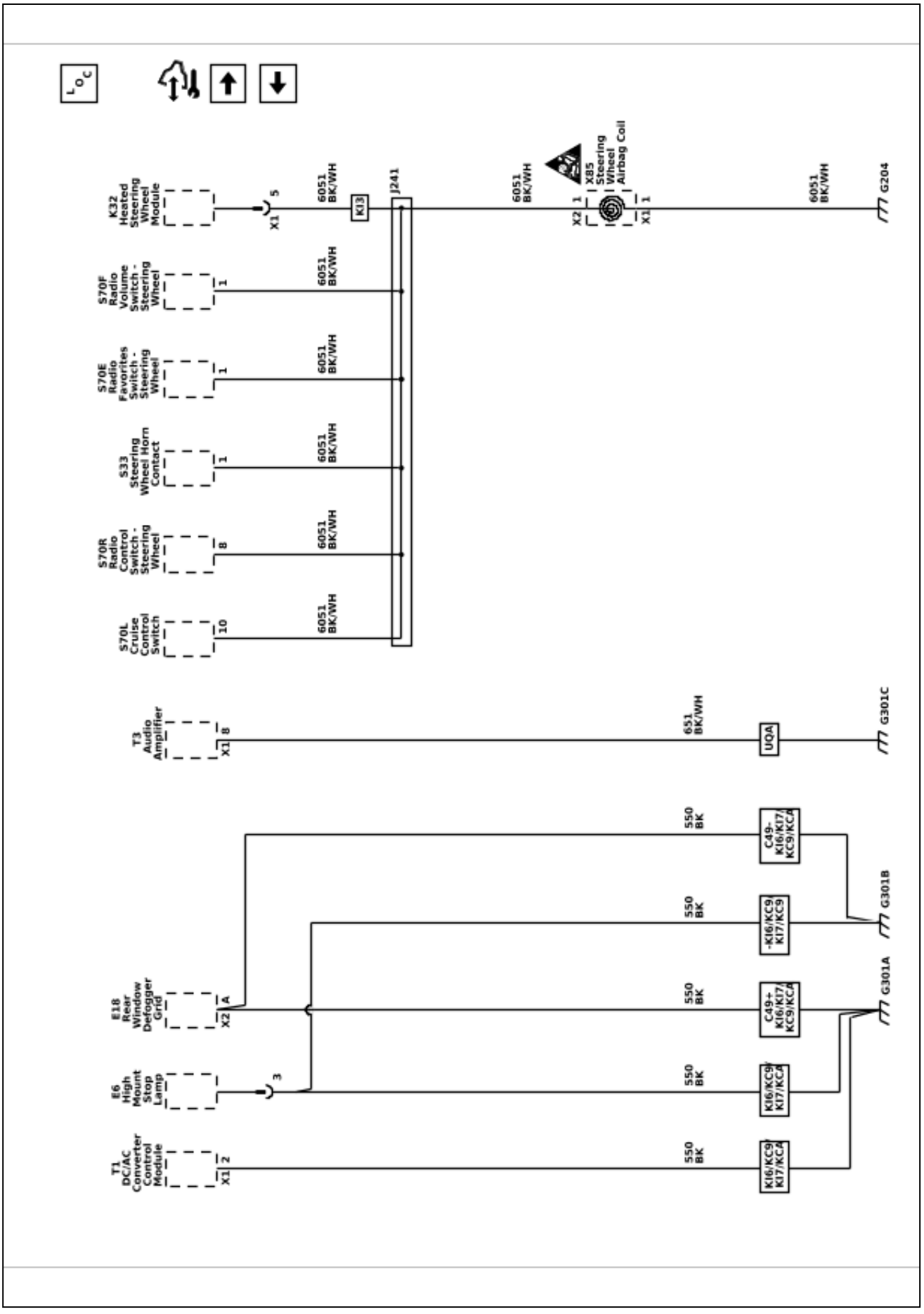


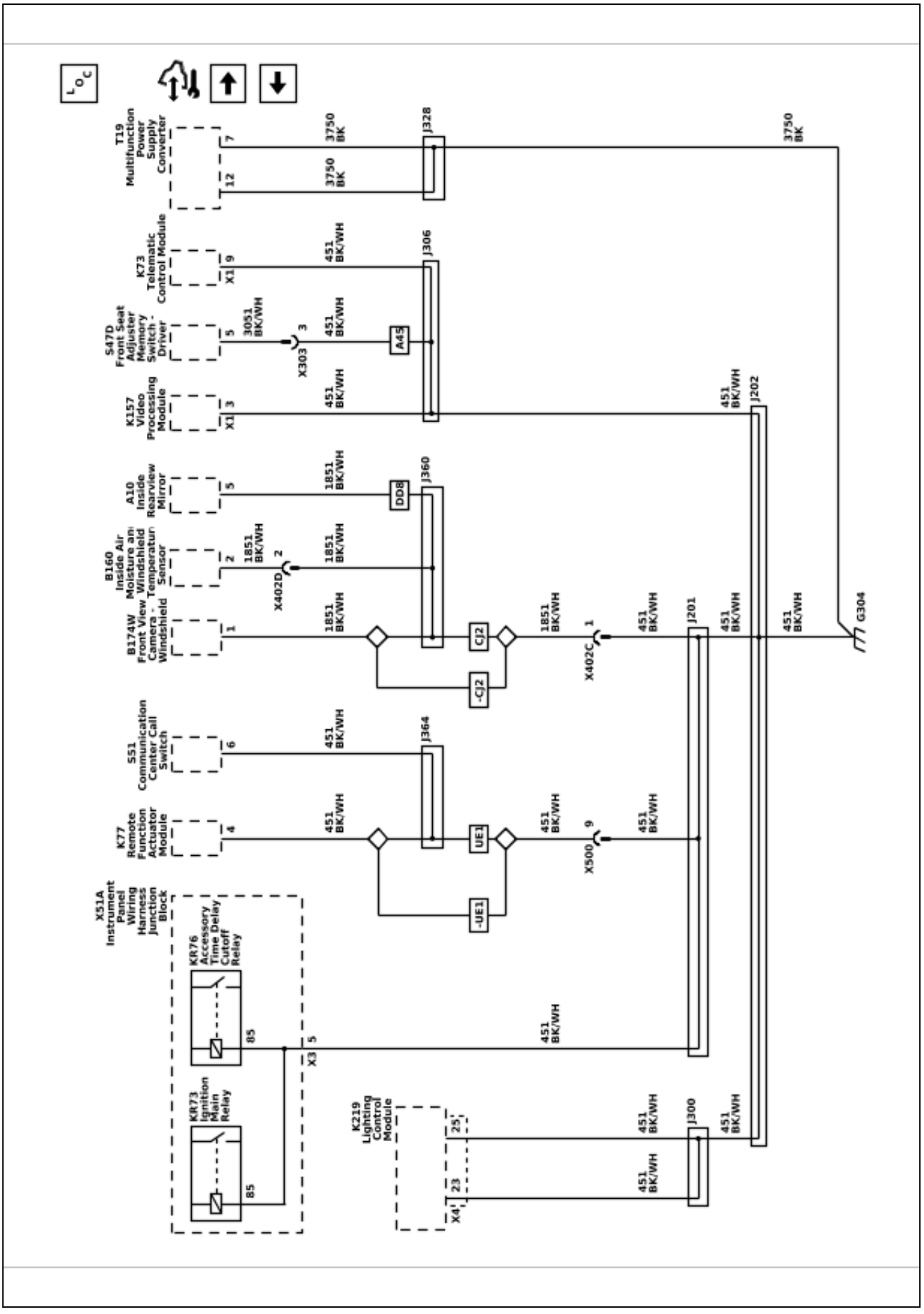
Ground Distribution Schematics (G202 and G203)



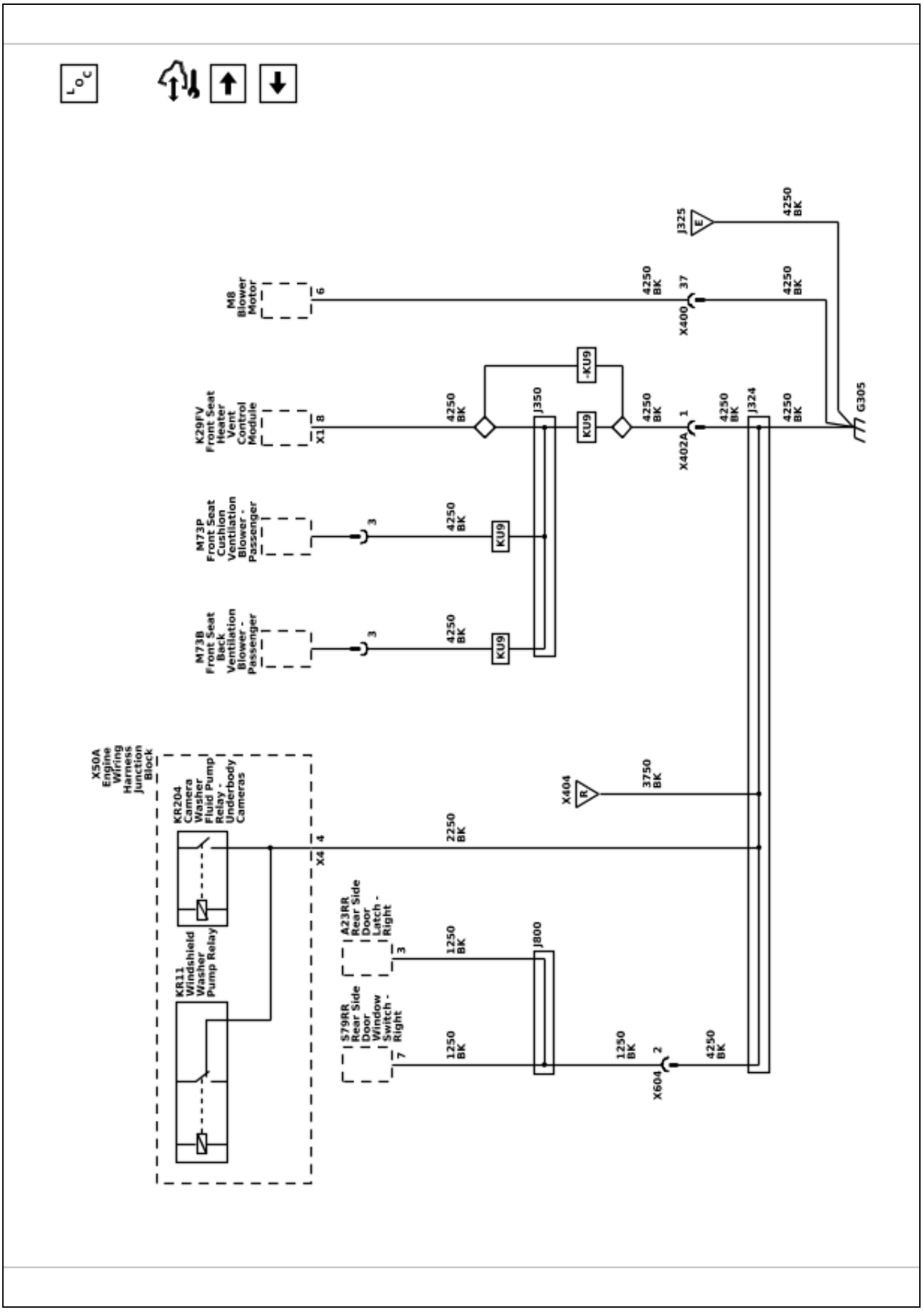
Ground Distribution Schematics (G204, G301A, G301B, and G301C)



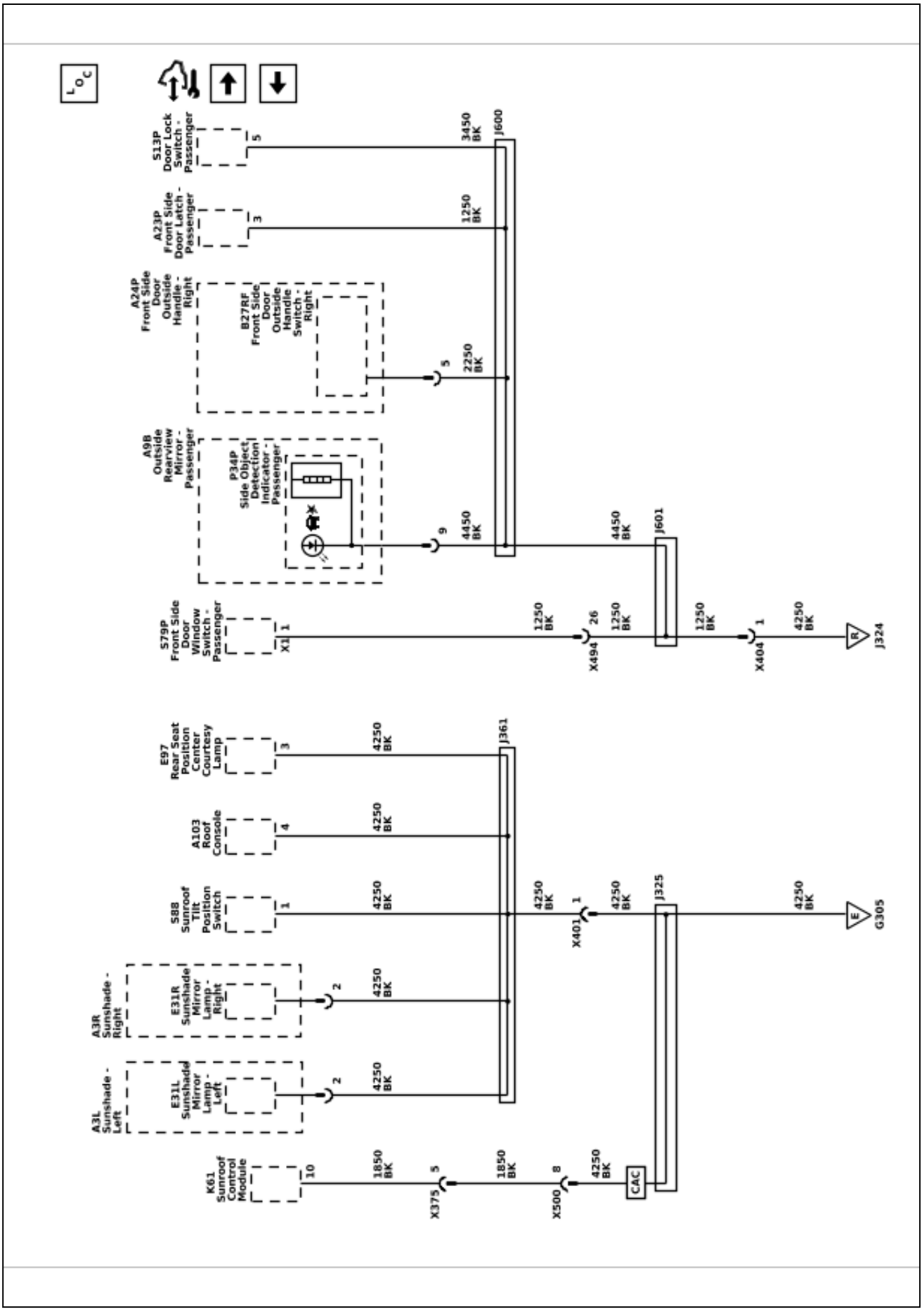
Ground Distribution Schematics (G304)



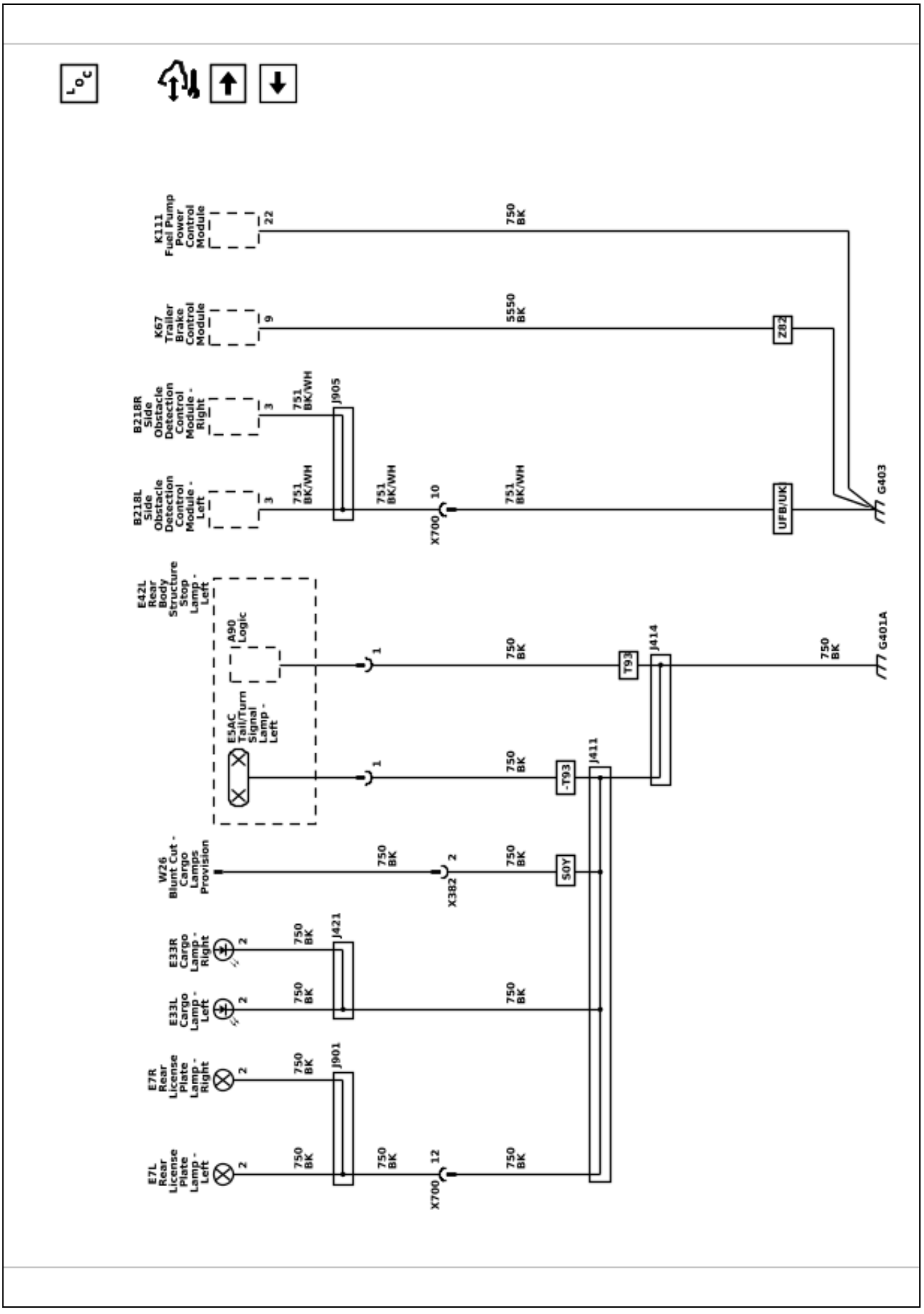
Ground Distribution Schematics (G305 1 of 2)



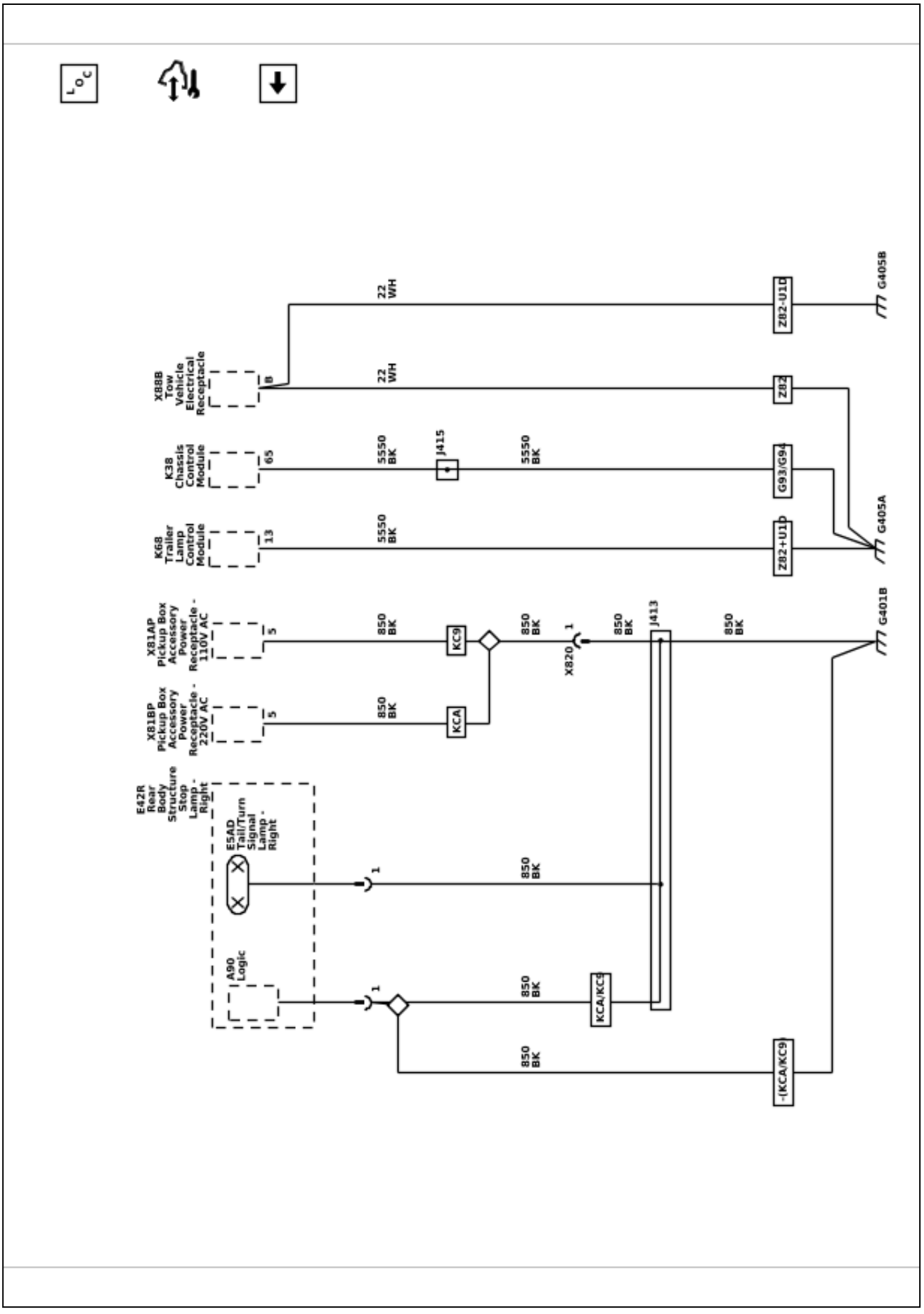
Ground Distribution Schematics (G305 2 of 2)



Ground Distribution Schematics (G400, G401, and G402)



Ground Distribution Schematics (G401B, G405A, and G405B)



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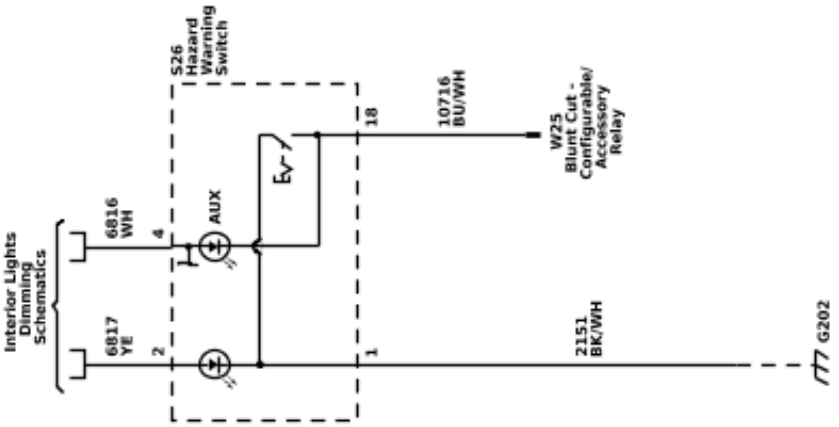
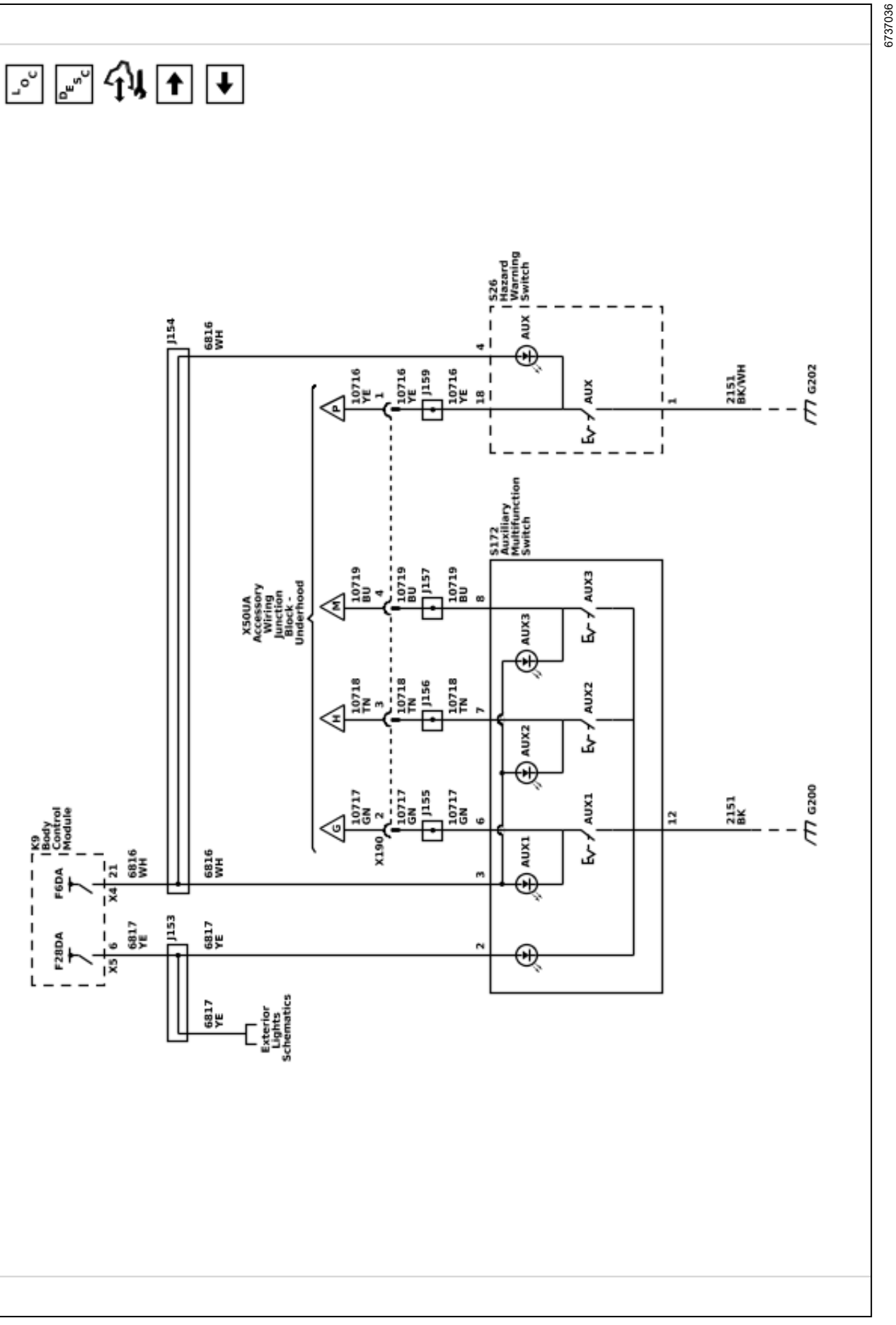
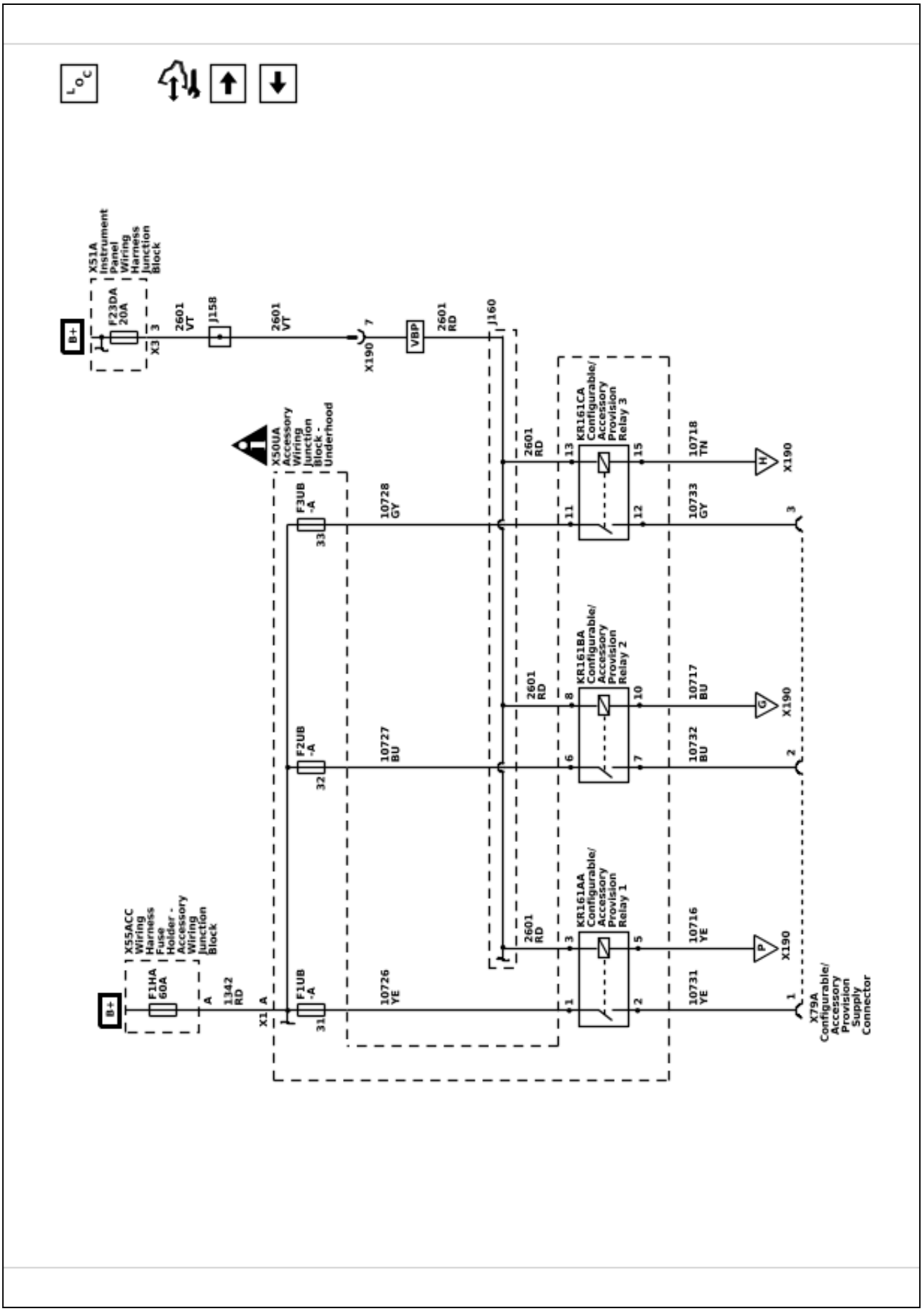
Upfitter Provision Schematics (Accessory Provision (-VBP))



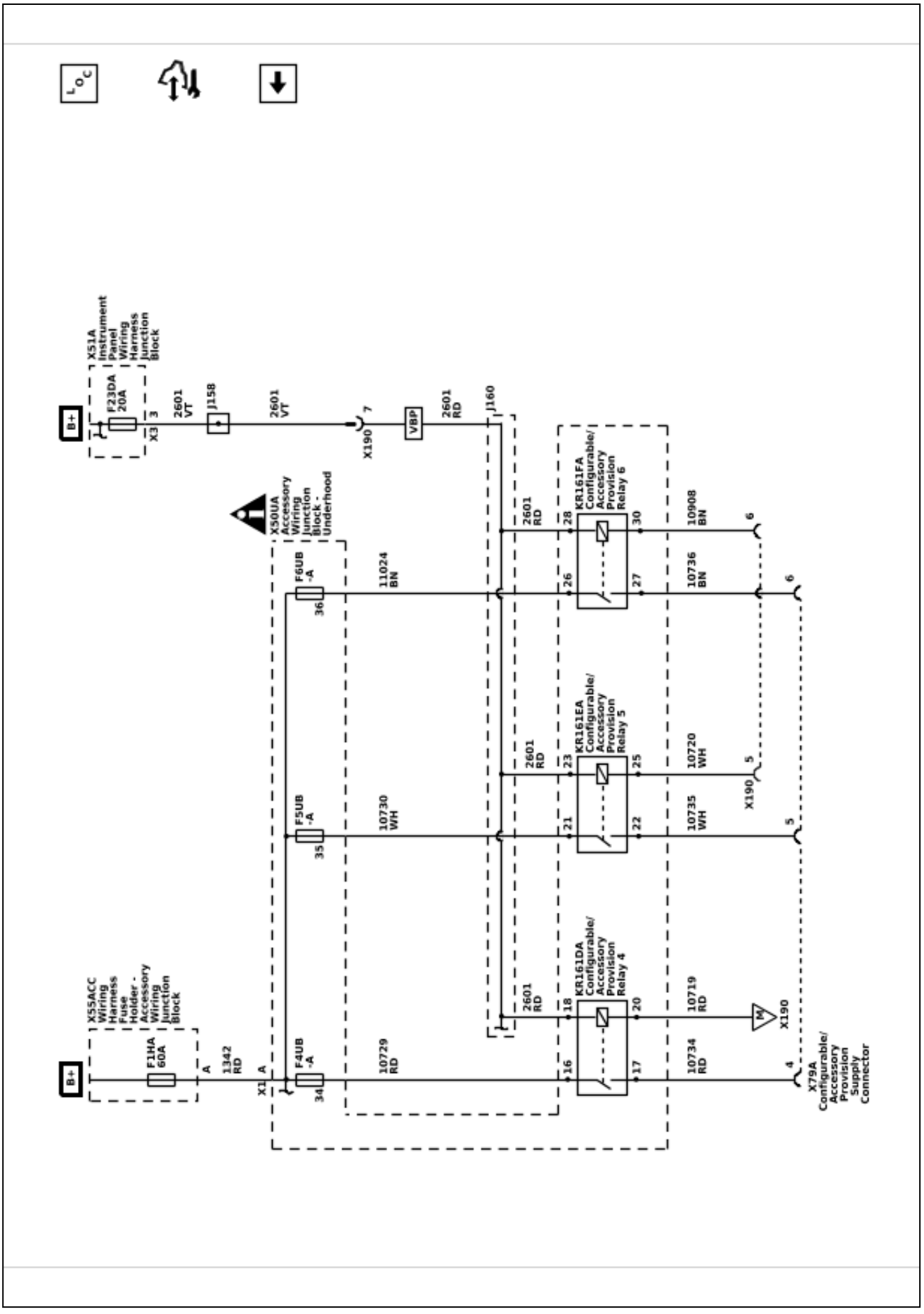
Upfitter Provision Schematics (Accessory Wiring Junction Block Control Switches (VBP))



Upfitter Provision Schematics (Configurable/Accessory Provision 1, 2 and 3 (VBP))



Upfitter Provision Schematics (Configurable/Accessory Provision 4, 5 and 6 (VBP))



Description and Operation

Power Mode Description and Operation

Serial Data Power Mode Master

The K9 Body Control Module (BCM) is the Power Mode Master and the K56 Serial Data Gateway Module is the Back-Up Power Mode Master.

The Power Mode Master uses various vehicle status conditions and inputs to determine the desired vehicle power mode state. The Power Mode (Off, Accessory, Run, Propulsion, Start) is communicated to other modules via Serial Data and other electrical signals in order to provide the proper feature operation for the appropriate power mode.

If the Power Mode Master cannot control or determine the correct Power Mode, the Backup Power Mode Master will take over and become the vehicle Power Mode Master and place the vehicle into the proper Power Mode by communicating with other modules via Serial Data to provide the proper electrical signals to provide the proper feature operation for the appropriate power mode.

S38 On/Off Vehicle Switch

There are 5 power modes to convey driver intent:

- OFF – A low power mode that allows maximum stand time until next start
- ACCY – Allows use of certain features that require operator authorization (Power windows for example). Propulsion is specifically disallowed.
- RUN – All features enabled except propulsion (motive force)
- PROPULSION – All features enabled
- START - This will transition to PROPULSION, including turning off non-essential loads to provide additional power for starting.

Power Mode States

Customer Action	Expected Vehicle Power Mode	S38 Vehicle On/Off Switch BCM Scan Tool Parameter	S38 Vehicle On/Off Switch Voltages
Vehicle OFF, S38 On/Off Vehicle Switch not pressed, Transmitter in Range	Vehicle Off Mode	Inactive	1.4 – 3.0 V (Switch Pressed) 3.35 – 4.26 V (Switch Released) 4.5 — 5.0 V (Switch Disconnected)
Vehicle OFF, S38 On/Off Vehicle Switch not pressed, Transmitter out of Range/Away from vehicle	Vehicle Off Mode	Inactive	
Vehicle in any Power Mode EXCEPT OFF, then Press the S38 On/Off Vehicle Switch Foot On or Off the Brake Pedal, Transmitter in Vehicle	Vehicle Off Mode	Active (pushed) / Inactive (not pushed)	
Vehicle in Propulsion Mode, momentarily Press and Release the S38 On/Off Vehicle Switch Foot On or Off the Brake Pedal, Transmitter out of Range/Away from vehicle	Run Mode, With DIC Message No Remote Detected Press Brake to Restart	Active (pushed) Inactive (not pushed)	
Vehicle Off Power Mode, then Press the S38 On/Off Vehicle Switch for less than 5 s with foot Off the Brake Pedal; Transmitter in Vehicle	Vehicle Accessory Mode	Active (pushed) / Inactive (not pushed)	
Vehicle Off Power Mode, then S38 On/Off Vehicle Switch with foot On the Brake Pedal; Transmitter in Vehicle	Vehicle Start/Propulsion Mode (vehicle cranks then engine running (for Internal Combustion Engine) or Propulsion System Active for EV) power mode timeout is enabled	Active (pushed) / Inactive (not pushed)	
Vehicle Off Power Mode, then S38 On/Off Vehicle Switch with foot On the Brake Pedal for 5 to 10 s; Transmitter in Vehicle	Vehicle Start/Propulsion Mode (vehicle cranks then Propulsion Mode Active) power mode timeout will be disabled.	Active (pushed) / Inactive (not pushed)	

Customer Action	Expected Vehicle Power Mode	S38 Vehicle On/Off Switch BCM Scan Tool Parameter	S38 Vehicle On/Off Switch Voltages
Vehicle OFF Power Mode, then Press and Hold the S38 On/Off Vehicle Switch for 5 s with foot Off the Brake Pedal; Transmitter in Vehicle	Vehicle Run Mode (Ignition ON without the Propulsion system Active)	Active (pushed) / Inactive (not pushed)	
Vehicle OFF Power Mode, then Press and Hold the S38 On/Off Vehicle Switch for 5 s with foot Off the Brake Pedal; Transmitter in Vehicle	Vehicle Start/Propulsion Mode (vehicle cranks then Propulsion Active) power mode timeout is disabled	Active (pushed) / Inactive (not pushed)	
Vehicle Propulsion Mode with vehicle speed detected above 4 km/h (2.5 MPH) press and hold S38 On/Off Vehicle Switch for 2 s or press and release it 2 times within 5 S.	Vehicle will transition from Propulsion Mode to Run Mode (Ignition On Propulsion system Inactive).	Active (pushed) / Inactive (not pushed)	
NOTE: If the transmitter is not moved for more than 1 hour it will become inactive.			

Service Mode

Service Mode is the Run Power Mode with power mode timeout disabled. This can only be done with the Service Tool.

Automatic Power Mode Timeouts

Note: If the Transmitter/Fob remains stationary and is not moved for one hour, it will go to sleep and may create a fob not in range condition.

This system is designed to prevent batteries from going dead in the event the ignition is left on while unattended, it is also designed to shut the vehicle off if left running unattended. After a Power Mode timeout, the Power Mode Master is responsible for shutting down the or transitioning the vehicle into the low parasitic sleep state “OFF” Power Mode. This Power Mode timeout strategy uses Vehicle Speed, Vehicle Power Mode, Parked Status and other Vehicle Conditions to make the timeout determination.

Accessory Power Mode

The Accessory Power Mode will timeout after approximately 5 minutes. The timer will Start once the system has determined it is in the Accessory Power Mode status. After the timer expires the Power Mode will change to the OFF Power Mode.

Run Power Mode

If the conditions listed below are met the Run Power Mode will timeout after approximately 40 minutes if the transmitter is in range, or 20 minutes if the transmitter is out of range. The timer will Start once the system has determined it is in the Run Power Mode status and all of the following conditions are met. After the timer expires the Power mode will change to OFF Power Mode.

If any of the following conditions are not met and/or if there is a change in the Brake Pedal or Clutch Pedal status, the Run Mode timeout timer will be disabled, and the timer will restart after all of the conditions are met again.

- Vehicle in Run Mode (Vehicle powered up S38 On/Off Vehicle Switch Green indicator on Propulsion Mode Inactive)
- Propulsion is Inactive
- Vehicle in Park.
- Vehicle Speed is 0 KM/MPH.
- Fast Idle is inactive (If Equipped).
- PTO Remote Start Status is inactive (If Equipped).
- Particulate Filter Cleaning Status is Inactive (if Equipped)
- S38 Vehicle On/Off switch is held for more than 5 to 10 seconds while starting the vehicle. The actual time may vary based on model and/or year.

Propulsion Power Mode

If the following conditions listed below are met the Propulsion Power Mode will timeout after approximately 30 minutes if the transmitter is in range, or 15 minutes if the transmitter is out of range. The timer will Start once the system has determined it is in the Propulsion Power Mode status and all of the following conditions are met. After the timer expires the Power mode will change to the OFF Power Mode.

The Propulsion Power Mode timeout can be disabled with the vehicle in Off Power Mode, apply and continue to hold the brake pedal, then press and hold the S38 Vehicle On/Off switch for 5 to 10 seconds (the actual time may vary based on model and/or year). A DIC message will be displayed when Power Mode timeout is disabled.

If any of the following conditions are not met and/or if there is a change in the Brake Pedal or Clutch Pedal status, the Propulsion Mode timeout timer will be disabled, and the timer will restart after all of the conditions are met again.

- Vehicle in Propulsion Mode (Propulsion Active).
- Vehicle in Park.
- Vehicle Speed is 0 KM/MPH.
- Fast Idle is Inactive (If Equipped).
- PTO Remote Start Status is inactive (If Equipped).
- Particulate Filter Cleaning Status is Inactive (if Equipped)
- S38 Vehicle On/Off switch iss held for more than 5 to 10 seconds while starting the vehicle. The actual time may vary based on model and/or year.

Relay Controlled Power Mode

The BCM uses discrete push button switch inputs, transmitter in range status, current power mode state, and brake pedal position state to distinguish the correct power mode (Off, Accessory Mode, Run Mode, Start/Propulsion Mode). The BCM, after determining the desired power mode, will activate the appropriate relays for that power mode.

The retained accessory power relay remains on for a timed period after the Ignition Mode is OFF. Refer to *Retained Accessory Power Description and Operation 7-600* for more information on the retained accessory power function.

Push Button Start

The ignition mode switch has 2 LEDs that indicate the vehicle power mode Amber for Accessory Mode and Green for Run or Start/Propulsion Modes. When the vehicle is in the OFF mode, both LED's will be OFF. Momentarily pressing the S38 On/Off Vehicle Switch button once, brake pedal not applied, the vehicle will enter into the Accessory Mode and the Amber LED will illuminate. The Accessory Mode will timeout after approximately 5 min to help reduce battery drain. With the ignition OFF, brake pedal not pressed, then pressing and holding the S38 On/Off Vehicle Switch for 5 s will place the vehicle in Run Mode (Ignition ON without the Propulsion Mode Active). The vehicle will stay powered up for approximately 40 minutes if the transmitter is in range, or 20 minutes if the transmitter is out of range, and the Green LED will illuminate.

With the ignition OFF brake pedal pressed, then press and release the S38 On/Off Vehicle Switch, the vehicle will enter Start/Propulsion Mode and the Green LED will illuminate, the engine will crank and the engine will be running for Internal Combustion Engines (ICE), or Propulsion mode will go Active on Electric Vehicles (EV). The Propulsion Mode will timeout after approximately 30 minutes if the transmitter is in range, or 15 minutes if the transmitter is out of range. The timer will stop when the vehicle is shifted out of PARK or the brake pedal is pressed and released, the timer will reset after the vehicle is placed back in PARK with the Propulsion Mode Active.

Both LED's have the voltage supplied from the body control module (BCM). The ignition mode switch sends the ignition mode switch status to the passive entry passive start module (PEPS) and to the BCM. The PEPS module sends a redundant signal to the BCM with the ignition mode switch status.

Transport Mode

Transport Mode is designed to reduce the parasitic load of some modules during shipping and/or during vehicle storage. Some features may be disabled or have reduced functionality while Transport Mode is ON. Transport Mode is enabled and disabled by either of the following methods:

- With the Scan Tool Diagnostics > Body Control Module > Control Functions > Power Mode.
- Turning the hazard flashers ON, apply and hold the brake pedal, then press and hold the ignition mode switch for greater than 15 s. For vehicles equipped with a DIC a message Transport Mode On when it is enabled and Transport Mode Off when it is disabled will be displayed for a predetermined amount of time. For vehicles equipped without a DIC, the battery indicator light will constantly flash on the Instrument Cluster when Transport Mode is enabled.

Battery Saver Mode

There are 7 different Battery Saver Modes. Battery Saver Modes 1 to 3 occur in Accessory and Run Power Modes (vehicle on propulsion system Inactive) if the battery voltage drops below approximately 11.5 V. Battery Saver Modes 4 to 7 occur in the Off Power Mode only. Battery Saver Modes 4 to 7 may set DTC's.

- Battery Saver Mode 1: DIC message "Battery Low, Start Vehicle", 4 chimes
- Battery Saver Mode 2: DIC message "Battery Low, Start Vehicle", Load Shed Level 3 is activated
- Battery Saver Mode 3: DIC message "Battery Low, Start Vehicle", Radio/Infotainment shut off, Load Shed Level 3 active

- Battery Saver Mode 4: Battery Saver Mode Ignition Off – Parasitic Current draw of 100 mA or greater
- Battery Saver Mode 5: Battery Saver Mode Ignition Off – Parasitic Current draw of 1 A or greater
- Battery Saver Mode 6: Battery Saver Mode Ignition Off – Battery Voltage less than 12.0 V
- Battery Saver Mode 7: Battery Saver Mode Ignition Off – Battery Voltage less than 11.6 V

Load Shedding

Prior to Load shedding Idle Boost will occur, the idle speeds will be increased by 25 to 300 RPM to help maintain a normal battery voltage. Idle Boost may be noticeable to the driver. If the battery voltage continues to drop below a normal state then load shedding will go active and it will start to reduce electric loads for components that will not impact the safe operation of vehicle. At load shed levels 2 and 3 a DIC message will be displayed “Reducing Features To Save Battery”. When load shedding is active the customer may begin to notice features starting to have reduced functions or may become inoperative. Examples of affected loads are radio, HVAC blower(s) front and rear (if equipped), heated/ventilated seats, heated mirrors, rear defogger and other devices with heavy electrical draws. Idle Boost and load shed levels can be observed with the scan tool.

Idle Boost 1
Idle is increased by 25-100 RPM and generally is not noticeable to most drivers.

Idle Boost 2
Idle is increased by 50–200 RPM and generally is not noticeable to most drivers.

Idle Boost 3
Idle is increased by 100–300 RPM and may be noticeable to most drivers.

Load Shed Level 1
Reduces load current by 25%.

Load Shed Level 2
Reduces load current by 50%.

Load Shed Level 3
Electric loads for components that will not impact the safe operation of vehicle will be turned Off.

BCM Awake/Sleep States

The BCM is able to control or perform all of the BCM functions in the awake state. The BCM enters the sleep state when active control or normal monitoring of system functions has stopped and a time limit has passed. The BCM must detect certain wake-up inputs before entering the awake state. The BCM monitors for these inputs during the sleep state.

The BCM will enter the awake state if any of the following wake-up inputs are detected:

- Activity on the serial data line
- Detection of a battery reconnect
- Any door open signal
- Headlamps ON
- Ignition ON
- Park lamps ON
- Keyless entry or remote start message

The BCM will enter a sleep state when all of the following conditions exist:

- Ignition OFF, transmitter is out of range
- No activity exists on the serial data line.
- No outputs are commanded.
- No delay timers are actively counting.
- No wake-up inputs are present.

If all these conditions are met, the BCM will enter a low power or sleep condition.

Retained Accessory Power Description and Operation

Retained Accessory Power

The Retained Accessory Power (RAP) & Interruptible RAP (IRAP) Circuits are controlled by the K9 Body Control Module (BCM). The BCM is the Power Mode Master, it utilizes various Vehicle inputs to determine the Vehicle Power Mode and sends this information via Serial Data and providing associated electrical signals to the entire vehicle for proper feature operation.

The BCM monitors the vehicles power modes, and door ajar/open switch status to determine whether the retained accessory power should be initiated and remain active or be terminated. The RAP output is optional based on the vehicles option contents. When utilized, the RAP Output control can be used to control a RAP Relay, it may provide direct power, or a serial data message to vehicle devices/modules from the BCM.

Retained Accessory Power Relay Coil Control Circuit (If Equipped)

The BCM keeps the device or relay (if equipped) energized during all power modes, except Off-Awake and Crank. The device(s) remain active for approximately 10 min after the Vehicle is placed into the OFF Power Mode, provided none of the doors are opened.

Retained accessory power will end when one of the following conditions are met:

- The BCM receives an input from any door ajar switch indicating the opening of the door after the OFF Power Mode is achieved.

Note: If the BCM receives a door open/ajar active signal when the vehicle is placed into the OFF Power Mode, the retained accessory power will not initiate.

- The BCM internal timer for the retained accessory power expires after approximately 10 min.

Systems powered by the retained accessory power control circuit during the retained accessory power mode are as follows:

Note: The vehicle may not be equipped with all components as listed below.

- 12 V Accessory Power Receptacle
- Cigarette Lighter Receptacle
- Window Switches
- Sunroof Control Module (If Equipped)
- Sunroof Switch (If Equipped)
- Mobile Device Wireless Charger Module
- Mobile Telephone Control Module (If Equipped)
- Traffic Data Receiver (If Equipped)
- Transmission Shift Lever Position Indicator (w/floor mounted console gear shift)

Serial Data Controlled Retained Accessory Power

Retained accessory power systems controlled by serial data are as follows:

Radio

Radio retained accessory power activation/termination is the same as relay operation with one exception; the only door that will turn the radio off during retained accessory power is the driver door open/ajar switch. The USB Ports will function the same as the radio.

Vehicle Communication Interface Module (VCIM) (Onstar®) (If Equipped)

VCIM RAP activation/termination is the same as radio operation with 1 exception; if there is an active call and the vehicle is placed in the OFF Power Mode, the VCIM will remain in RAP mode, and keep the radio in RAP mode until the call is terminated.

Interruptible Retained Accessory Power

The Power Mode Master (PMM) Controls components as needed If equipped with a RAP relay, the BCM controls the Retained Accessory Power with an exception, Interruptible Retained Accessory Power (IRAP) is deactivated during transmitter authentication. During Transmitter Authentication the PMM will deactivate components including IRAP to prevent Radio Frequency (RF) Interference (RFI) that may cause a “NO REMOTE DETECTED” message to be displayed on the drivers information center.

Note: If transmitter Authentication occurs while in Run or Propulsion Modes, it is normal to for IRAP to be interrupted momentarily (i.e. items connected to auxiliary power ports or chargers may momentarily go off then come back on).

If a remote transmitter was not been previously detected, Transmitter Authentication can occurs under any of the following conditions:

- The drivers side front door is opened.
- The drivers side rear door is opened.
- The S38 Vehicle On/Off Switch is pressed.

Section 8

Roof

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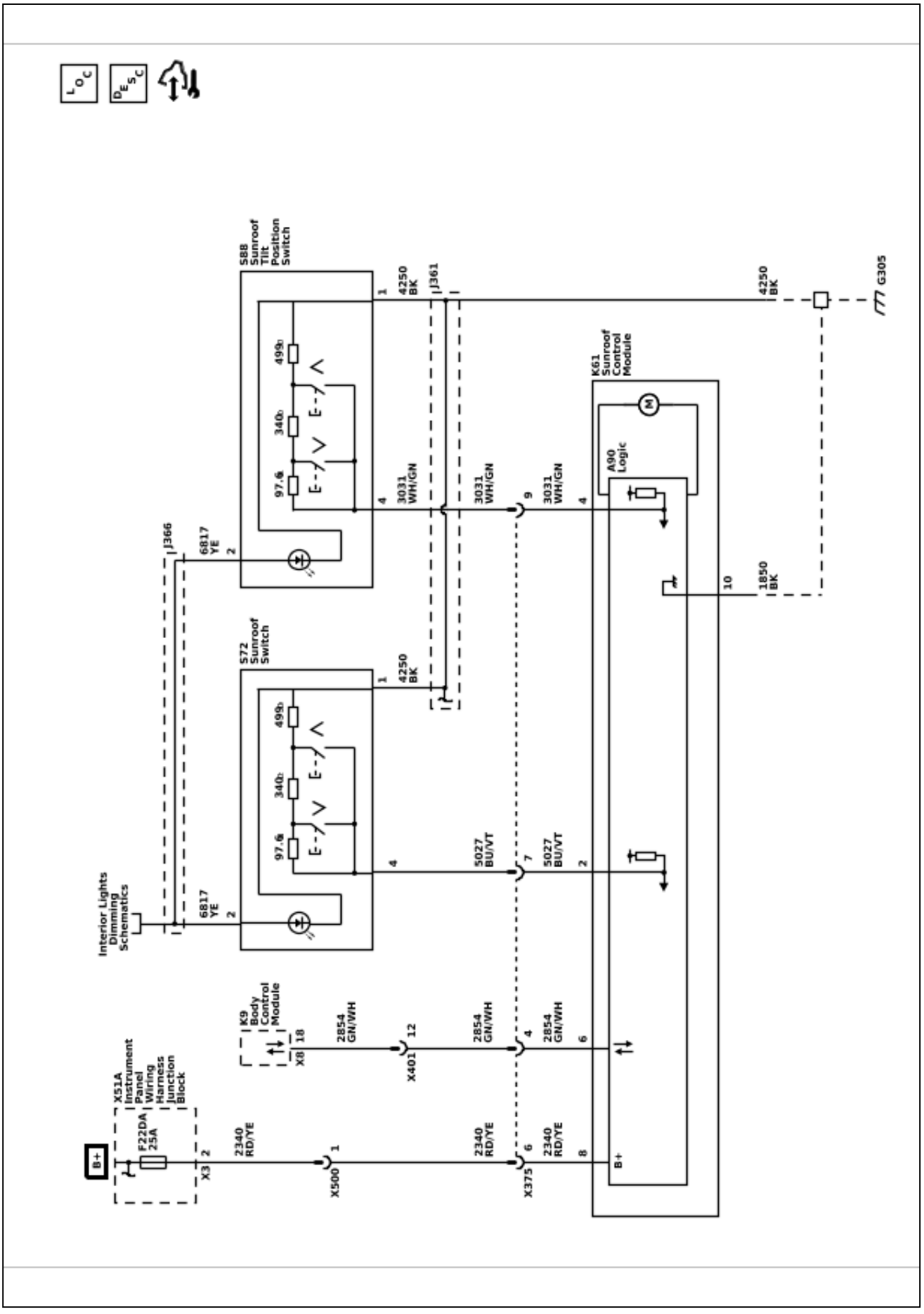
Sunroof Description and Operation 8-4

Roof

Sunroof

Schematic and Routing Diagrams

Sunroof Schematics (Sunroof (CAC))



Description and Operation

Sunroof Description and Operation

Note: Not all sunroof systems use an electrically controlled sunshade.

To view the locations of the sunroof system components, refer to [Link target (target-id 62031-) not found]

The sunroof system consists of a glass panel, sunshade, sunroof motor/module, sunshade motor/module or manual sunshade, sunroof slide and/or tilt switches, sunshade switch, and the body control module (BCM). The electrical portion of the system controls the movement of the sunroof and sunshade (if equipped). The BCM communicates with the sunroof and sunshade motor/module to enable or disable sunroof and sunshade operation. The sunroof and sunshade motors/modules provide system status and diagnostic information to the BCM for diagnostic reporting and operational purposes. The sunroof and sunshade are each controlled by the integrated motor/controller containing the necessary electronics, motor, hall effect position sensors, as well as the interface to the driver control switches. Each motor/controller is capable of controlling motion based on control switch activation and commands from the BCM. The sunroof and sunshade operation is interdependent on some vehicles, in which case they are controlled by the BCM. If the system is overloaded, the power supply is temporarily cut off.

Sunroof and Sunshade Control Switches

The sunroof slide, tilt, and sunshade slide open/close operations are controlled by switches. Some switches may support express open/close operation. Not all vehicles are equipped with all three switches and the behavior of the sunroof for each switch press is vehicle dependent. Some vehicles may have a tilt switch while others may have a vent feature linked to the slide switch. Not all vehicles are equipped with an electrically controlled sunshade, thus lacking the sunshade switch.

System Protection

Normal operation of the sunroof system may be altered when system protection is engaged.

Obstacle or Blockage Detection

Obstacle detection is active when moving in the closing direction and while the sunroof or sunshade opening is approximately 4–200 mm (0.16–7.87 in). When an obstacle is detected in this range, the motion in the closing direction will stop and the sunroof/sunshade will reverse direction for a short distance. The reversal will complete regardless of operating mode. If the travel is outside the range defined above, the sunroof/sunshade motor will continue closing until it detects a motor stall condition or the system is at one of the defined stops.

Motor Stall

If the sunroof or sunshade is moving in the open or close direction and stops moving for 350 ms while a command is active, and no obstacle has been detected, the motor will be turned off to prevent overheating.

Sunroof System Thermal Protection

The sunroof/sunshade controllers have a thermal protection algorithm to protect the sunroof/sunshade controls and motors from damage due to overheating conditions resulting from immoderate switch actuations. The thermal protection algorithm will cause any new sunroof/sunshade open commands to be ignored until the motors cool. A defined number of close requests are allowed during an over temperature condition. If the thermal protection is triggered during an obstacle detection event, the sunroof/sunshade reversal will finish first.

Sunroof and Sunshade Coordination

For vehicles with an electrically controlled sunshade, the BCM will command the sunshade to open to predefined positions based on the requested sunroof position. This interaction may also prohibit the sunshade from closing past these points depending on the sunroof position. Faults on the sunroof or sunshade motor/module circuits will disable the system.

Opening

If the sunroof is opened anywhere between the fully closed and vent position, the BCM will command the sunshade to a minimum open position provided that the sunshade is not opened adequately at the time of the sunroof command. If the sunroof receives an open or express open command beyond vent position, the BCM will command the sunshade to open approximately halfway if the sunshade is not opened adequately. This position corresponds to a point behind the leading edge of a fully opened sunroof glass.

Closing

The sunshade can only be closed completely with the sunshade switch if the sunroof is completely closed. If the sunroof is opened past the vent position, the sunshade will not be allowed to close past the halfway point.

Service Tool Commanded Open

When a service tool commands the sunshade to open, it results in the sunshade moving to the half way position or to the fully open position depending on the calibration. If the half way point is calibrated on, this position is as far as the sunshade can be opened with the service tool. To go beyond this point a switch activation must be used.

Rear Sunshade Operation

If equipped, the rear window sunshade is controlled by a switch with open, close, express open, and express close functionality.

Section 9

Safety and Security

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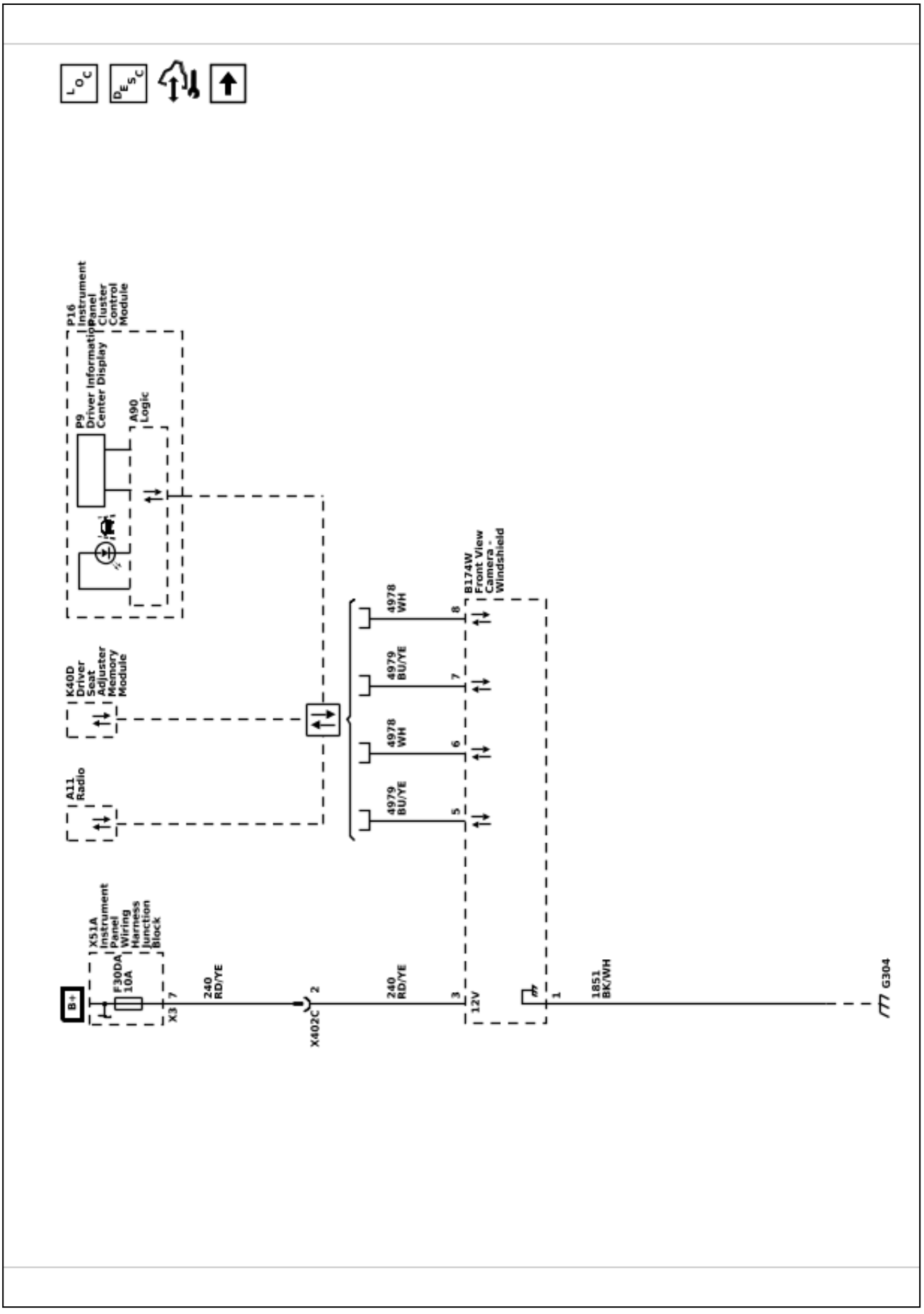
Safety and Security

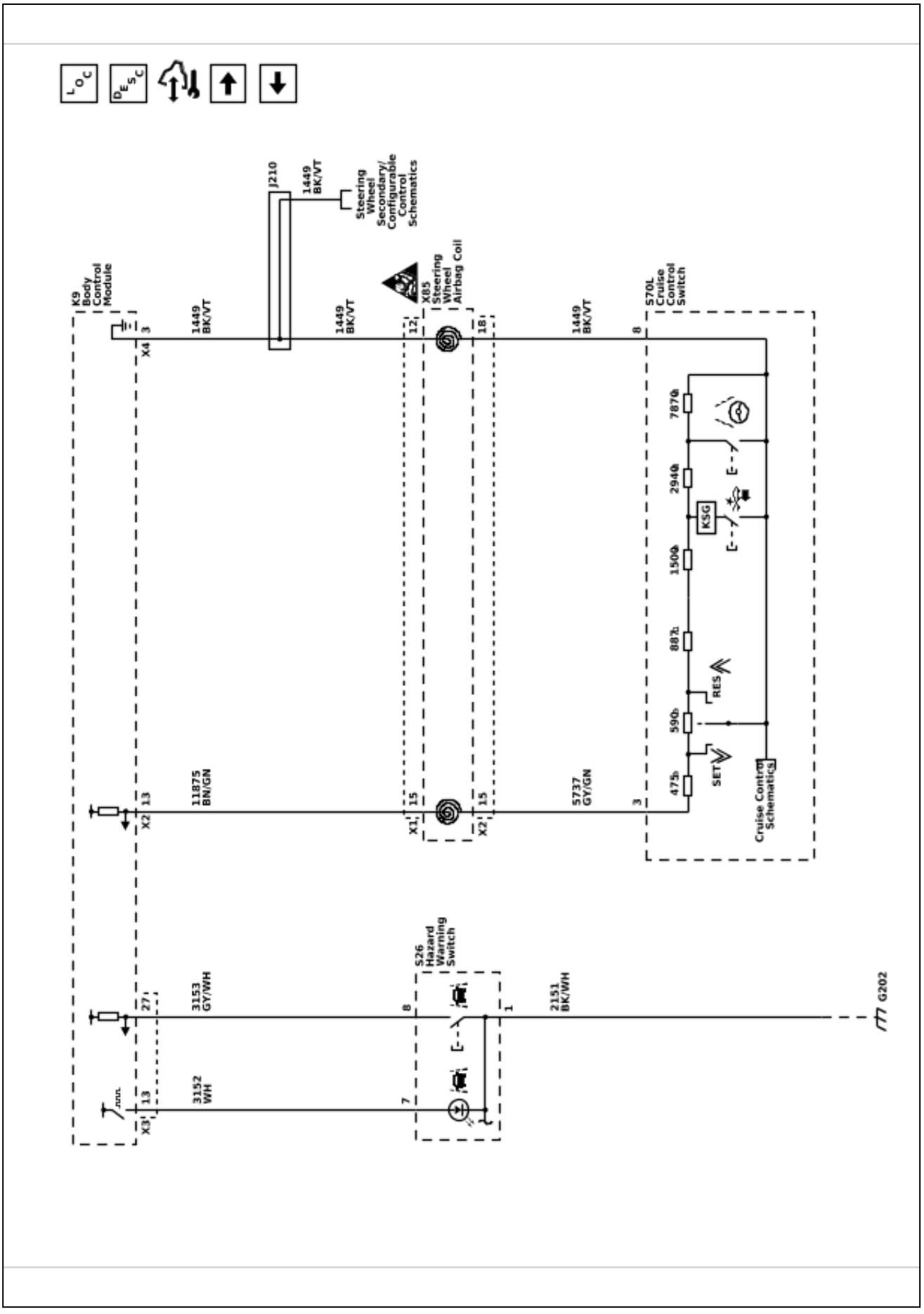
Driver Assistance Systems

Schematic and Routing Diagrams

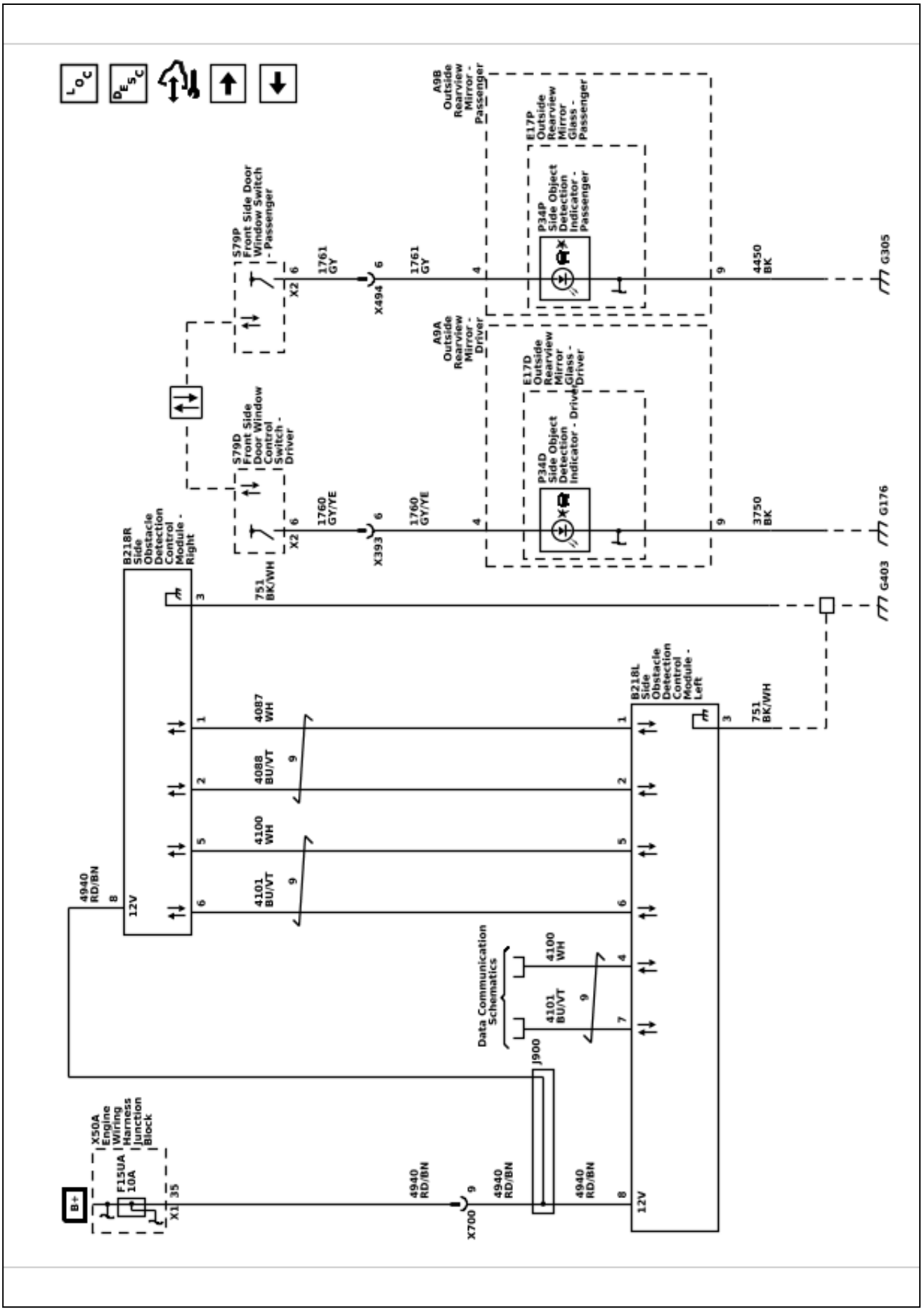
Driver Assistance Systems Schematics (Lane Keep Assist and Forward Collision Alert - Module Power, Ground, and Serial Data)



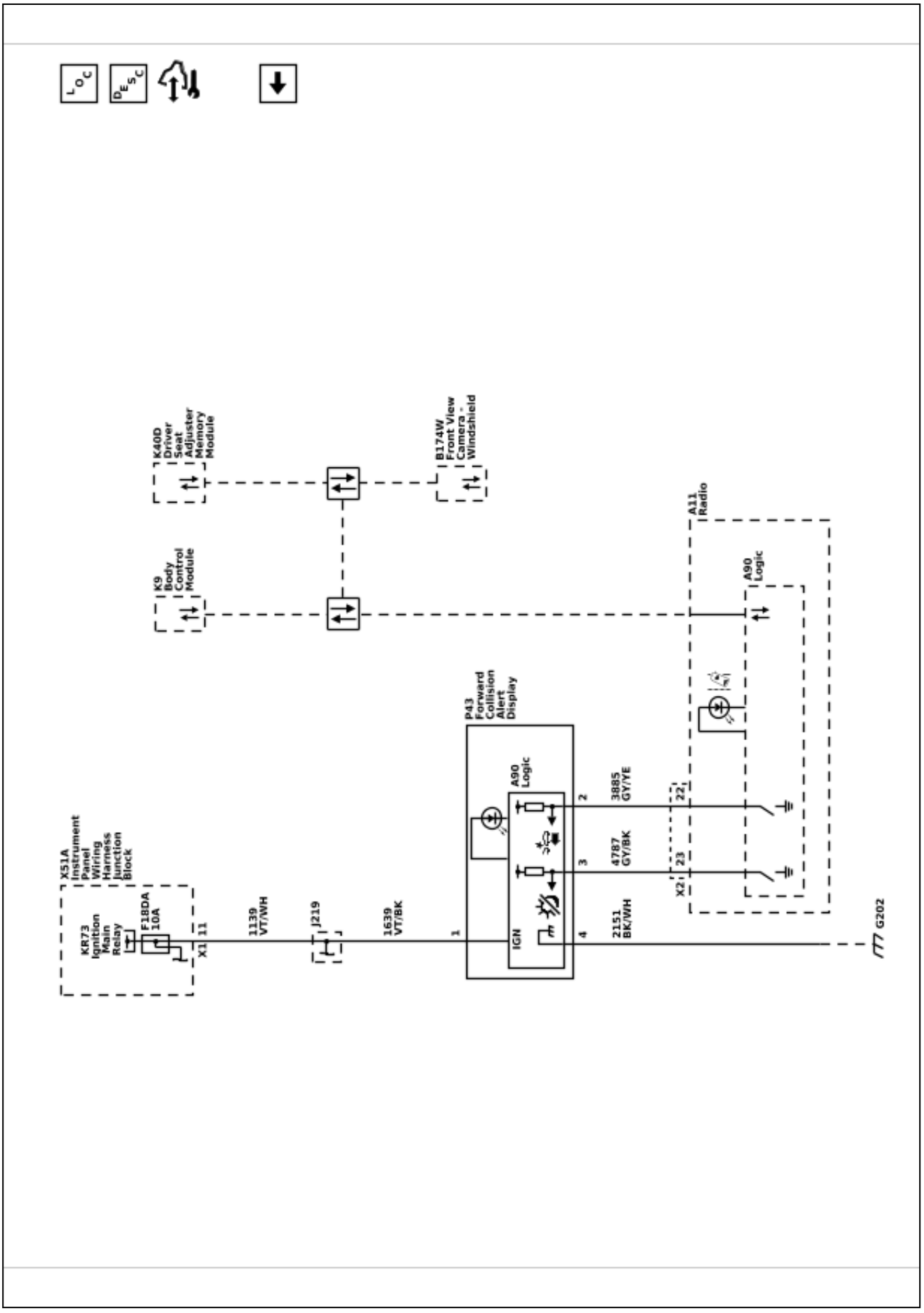
Driver Assistance Systems Schematics (Lane Keep Assist and Forward Collision Alert - Controls)



Driver Assistance Systems Schematics (Rear Cross Traffic Alert and Side Blind Zone Indicators (UFB))



Driver Assistance Systems Schematics (Collision Alert Indicators)



Description and Operation

Adaptive Cruise Control Description and Operation

The adaptive cruise control system is an enhanced cruise control system with the ability to sense and react to forward traffic. Compared to the common cruise control system found on many vehicles, the main functional enhancement of the adaptive cruise control system is the ability to detect the presence of a vehicle in the path of the adaptive cruise control vehicle. Adaptive cruise control retains the existing cruise control feature that controls the vehicle speed to the driver selected speed. However, adaptive cruise control allows a driver to set and maintain a following distance to the preceding nearest vehicle in the path ahead. The B174W Front View Camera Module controller calculates a follow speed limit to ensure an acceptable distance is maintained to the preceding vehicle in front, should one be present. The adaptive cruise control system automatically adjusts the speed when the vehicle comes up behind a slower travelling vehicle in front. The system applies limited automatic braking and throttle control without driver input when necessary to maintain the set following distance. The preceding vehicle's speed and acceleration along with the active cruise control vehicle speed and acceleration and the distance between the two vehicles are factors used by the B174W Front View Camera Module controller to determine the follow speed limit. The vehicle speeds up to the original driver selected set speed when the pathway becomes clear without driver input.

The adaptive cruise control functionality depends on various modules on the vehicle to function and each module performs a function that is critical to the proper operation of the adaptive cruise control system. Adaptive cruise control will not operate if any components fail. Communication between modules is via serial data. The following is a functional description of the B174W Front View Camera Module and the other associated components:

- K9 Body Control Module
- B174W Front View Camera Module
- K160 Brake System Control Module
- P16 Instrument Panel Cluster Control Module
- Cruise Control Switch
- Gap Switch

B174W Front View Camera Module

The B174W Front View Camera Module analyzes data from various modules, sensors, and switches to provide enhanced safety features. In addition to enhanced safety features, the B174W Front View Camera Module provides the adaptive cruise control system functionality. The B174W Front View Camera Module analyzes data to identify and classify objects in the road environment. The system scans the road environment to detect targets within its specified field of view. The B174W Front View Camera Module then sends throttle and/or brake commands to the K107 Drive Motor Control Module and K160 Brake System Control Module via serial data in order to control the vehicle acceleration/deceleration based on the data from the modules. The K107 Drive Motor Control Module and K160 Brake System Control Module provide throttle control and automatic braking needed for proper cruise speed adjustment. The following is a list of the B174W Front View Camera Module functions pertaining to the adaptive cruise control functionality:

- The B174W Front View Camera Module processes the road environment to get data concerning any vehicle ahead of the adaptive cruise control vehicle. Detection, parameter estimation, tracking, object classification and diagnostics are the primary functions. When an object is detected, the controller calculates the object range, range rate, acceleration and azimuth angle parameters.
- The B174W Front View Camera Module performs adaptive cruise control state processing automatically – distance control or speed control. The adaptive cruise control operates in two possible states – cruise or follow. The normal operating state is cruise, whereby the vehicle speed is controlled to match the driver selected set speed. When a preceding forward target is identified, the adaptive cruise control system will automatically transition into the follow speed state to provide proper lane spacing behind the target vehicle in front. The preceding vehicle's speed and acceleration, with the adaptive cruise control vehicle speed, acceleration and distance between the two vehicles will be used to determine the adaptive cruise control follow speed limit. The adaptive cruise control follow speed limit will ensure that an acceptable distance is maintained to the preceding vehicle.
- The B174W Front View Camera Module determines the follow speed limit for throttle control by the K107 Drive Motor Control Module.
- The B174W Front View Camera Module arbitrates the adaptive cruise control system brake and throttle control between the K160 Brake System Control Module and the K107 Drive Motor Control Module.
- The B174W Front View Camera Module requests brake light activation during automatic braking.
- The B174W Front View Camera Module provides operational feedback to the vehicle driver. The B174W Front View Camera Module sends signals

for telltales and messages to be displayed on the P16 Instrument Panel Cluster Control Module or driver information center.

K9 Body Control Module
The following are the adaptive cruise control system functions provided by the K9 Body Control Module:

- The K9 Body Control Module reads all cruise control switches and the gap switch. The B174W Front View Camera Module monitors a variety of user operated switches from the K9 Body Control Module switch status information sent via CAN.
- The K9 Body Control Module illuminates the brake light based on a CAN message from the B174W Front View Camera Module during automatic braking.
- The K9 Body Control Module measures the brake pedal position and sends brake pedal travel status via CAN to the K107 Drive Motor Control Module. The K107 Drive Motor Control Module disengages the adaptive cruise control system when the brake is applied by the driver pressing the brake pedal.

K160 Brake System Control Module
The following are the adaptive cruise control System functions performed by the K160 Brake System Control Module:

- The K160 Brake System Control Module controls the operation of the Antilock Brake System.
- The K160 Brake System Control Module provides automatic braking for the adaptive cruise control system. The B174W Front View Camera Module will request vehicle deceleration via high speed CAN serial data circuit.
- The K160 Brake System Control Module determines when the driver–applied brake pressure is active. The K160 Brake System Control Module will communicate this status via CAN to the K9 Body Control Module.
- The K160 Brake System Control Module releases vehicle automatic braking when there is a throttle override by the driver pressing the accelerator.
- The K160 Brake System Control Module predicts brake temperatures. Due to automatic braking, the brake system may overheat. When the brakes are overheated, the K160 Brake System Control Module requests the adaptive cruise control system to be temporarily shut down by the K107 Drive Motor Control Module until the brakes cool to a normal operating temperature.

P16 Instrument Panel Cluster Control Module
The driver information center is a part of the P16 Instrument Panel Cluster Control Module and displays the adaptive cruise control system warning messages. The B174W Front View Camera Module requests messages to be displayed on the driver information center by sending a CAN request to the P16 Instrument Panel Cluster Control Module requesting the display of the warning message. When the message is acknowledged by the driver and the cause of the message resolved, the driver information center turns the message off. The adaptive cruise control system will not operate if the driver information center fails.

Cruise Control Switch
The cruise control switch, functionally is a common feature that is shared between the adaptive cruise control system and the regular cruise control system. The adaptive cruise control system will not operate if any cruise switch fails. The cruise control switch comprises the following cruise control function switches:

- On/Off switch
- Set/decrease switch
- Resume/increase switch

The cruise control function switches are arranged in a resistive ladder design whereby each switch function is set up with different resistance values. The K9 Body Control Module through the cruise control switch signal circuit detects a predetermined voltage value when any cruise control switch function is activated. The associated cruise control function signal detected by the K9 Body Control Module is then sent to the K107 Drive Motor Control Module as a CAN message. The K107 Drive Motor Control Module on receiving the message provides the cruise control function requested by the K9 Body Control Module. The K107 Drive Motor Control Module is responsible for recognizing and responding to cruise control switch requests sent by the K9 Body Control Module. The cruise control function switches are used by the K107 Drive Motor Control Module to communicate to the B174W Front View Camera Module the driver selected vehicle speed. The driver selected vehicle speed is communicated through CAN serial data circuit to the B174W Front View Camera Module and the K9 Body Control Module. The adaptive cruise control system engages and adjusts vehicle speeds based on the activation of the following cruise control function switches:

Cruise Control On/Off Switch
The K9 Body Control Module monitors the switch signal circuit in order to determine when the On/Off switch is disabled or activated. The K9 Body Control Module detects a predetermined voltage value on the switch signal circuit. The On/Off switch state is then relayed to the K107 Drive Motor Control Module via CAN. The K107 Drive Motor Control Module sends the On/Off switch input status to the B174W Front View Camera Module. When the On/Off switch is turned ON, the adaptive cruise control system enters either a standby enabled or a standby disabled mode. The standby

enabled mode indicates that every condition required for the adaptive cruise control system to function has been met, but the adaptive cruise control is not engaged. When the adaptive cruise control is in the standby disabled mode, the conditions necessary for the adaptive cruise control system to function has not been met. When the On/Off switch is turned OFF, the adaptive cruise control will enter the disabled mode. The adaptive cruise control will not activate in the disabled mode.

Cruise Control Set/Decrease Switch
The adaptive cruise control system is engaged when the adaptive cruise control On/Off switch is turned ON and the set/decrease switch is momentarily pressed and released . When the set/decrease switch is pressed, the selected vehicle speed is set to the current vehicle speed by the K107 Drive Motor Control Module. The vehicle speed must be at or greater than 40 km/h (25 MPH). The selected vehicle speed is displayed by the driver information center. While in the engaged state, the selected vehicle speed and the following distance can be adjusted. Pressing and holding the set/decrease switch, when the adaptive cruise control system is engaged, will decrease the selected vehicle speed without deactivating the adaptive cruise control. Momentarily pressing and releasing the set/decrease switch, when the adaptive cruise control is engaged, decreased the selected vehicle speed by 1.6 km/h (1 MPH) for each time that the set/decrease switch is pressed.

Cruise Control Resume/Increase Switch
The resume/increase switch is used in order to increase the selected vehicle speed when adaptive cruise control is active. The amount selected vehicle speed can be increased from the resume/increase switch depends on how long the switch is pressed. The presence of a slower moving vehicle in the path of the adaptive cruise control vehicle will limit the extent to which the selected vehicle speed can be achieved. If there is no preceding vehicle in front, limiting the adaptive cruise control vehicle acceleration, then the vehicle speed that is attained is the new selected vehicle speed. The current selected vehicle speed is displayed by the driver information center. Acceleration is terminated when the resume/increase switch is released. Momentarily pressing and releasing the resume/increase switch will allow the selected vehicle to accelerate in at 1.6 km/h (1 MPH) increments for each time that the resume/increase switch is momentarily pressed.

Gap Switch
The gap switch allows the driver to determine how closely the adaptive cruise control vehicle follows a target vehicle while adaptive cruise control is engaged. When the adaptive cruise control vehicle speed is being limited due to a slower travelling vehicle, the adaptive cruise control vehicle speed is automatically controlled to the follow speed limit. The gap switch has 3 following distance selections that range from 1–2 s. The gap switch following distance between the adaptive cruise control vehicle and the target vehicle is expressed in time as opposed to actual distance. The distance maintained for a selected gap will vary based on vehicle speed. The faster the vehicle speed, the further back you will follow. The gap setting can only be adjusted when the adaptive cruise control system is engaged. The gap switch is hard-wired to the K9 Body Control Module. Based on voltage variations, the K9 Body Control Module is able to read the gap switch selection and communicates the switch status via CAN to the B174W Front View Camera Module. The gap switch is a momentary switch.

The initial push of the gap switch recalls the current setting and activates the display. Subsequent pushes of the gap switch will change the gap setting.

Driver Information Messages

Adaptive Cruise Control Temporarily Unavailable
The B174W Front View Camera Module will send this message if the adaptive cruise control has been disengage or disabled. There are many reasons that can cause this, some will also set DTCs. Check vehicle for DTCs and also check the adaptive cruise control enable and disengage scan tool data. Definitions of parameters can be found in B174W Front View Camera Module scan tool information.

Service Driver Assist System
This message can be set by either the B174W Front View Camera Module if there is a problem with the driver assist system or by the memory seat module if there is a problem with the haptic seat circuits. Check vehicle for DTCs.

Service Adaptive Cruise Control and Service Front Camera
The message is set if the B174W Front View Camera Module is not communicating to the P16 Instrument Cluster . Check vehicle for DTCs.

Set Speed
The adaptive cruise control vehicle set speed is displayed at all times in the driver information center when adaptive cruise control is engaged. The B174W Front View Camera Module set speed display request is sent to the P16 Instrument Cluster via the CAN serial data circuit.

Follow Distance
The driver information center displays the driver selected following distance when adaptive cruise control is engaged and the gap switch is active. The current follow distance setting is displayed in the driver information center for a few seconds after the gap switch is pressed to increase or decrease the following

distance. The B174W Front View Camera Module follow distance display request is sent to the P16 Instrument Cluster via the CAN serial data circuit.

Vehicle Ahead Indicator
The vehicle ahead indicator is displayed in the P16 Instrument Cluster hen the radar identifies an in-path vehicle. The vehicle ahead indicator is a warning to the driver that a vehicle is ahead. The indicator also serves as a feedback to the driver that the radar is functioning properly. The B174W Front View Camera Module commands the display of the vehicle ahead indicator via a CAN serial data message to the P16 Instrument Cluster . The vehicle ahead indicator only displays with the adaptive cruise control active and may sometimes display for stationary road objects.

Adaptive Cruise Control Operation

Adaptive cruise control uses the B174W Front View Camera Module to look directly ahead and monitor the vehicle traffic that the driver is following. Adaptive cruise control helps drivers follow a vehicle ahead at the following gap they select — Far, Medium or Near — while they steer. This reduces the driver's need to frequently brake and accelerate.

If the system does not detect a vehicle ahead, adaptive cruise control will resort to traditional cruise control operation. When the system detects a vehicle ahead in the driving lane, the vehicle ahead icon will appear in green on the P16 Instrument Panel Cluster Control Module. When the vehicle detected ahead is within the selected following gap setting, adaptive cruise control can automatically slow the vehicle down and adjust vehicle speed to follow the vehicle ahead at the selected following gap. Like regular cruise control, adaptive cruise control uses ON/OFF, CANCEL, SET and RESUME buttons on the steering wheel.

Getting started:

- To turn adaptive cruise control on, the driver should press the cruise control ON/OFF button.
- When the system is turned on, the driver information center in the P16 Instrument Panel Cluster Control Module will show a white adaptive cruise control icon.
- To choose a cruise speed, the driver should press the SET button while driving at the desired speed. The white adaptive cruise control icon will change to green, indicating that adaptive cruise control is engaged.
- The adaptive cruise control gap switch on the steering wheel lets drivers select a Far, Medium or Near following gap between their vehicle and the vehicle ahead. Both adaptive cruise control i and forward collision alert are set at the same setting.

Adaptive cruise control can follow a vehicle ahead to a stop. When the vehicle ahead starts moving again, the driver should check that it is safe to proceed, then continue to automatically follow the vehicle ahead by pressing the accelerator or resume button. If the driver doesn't respond soon after the stop, the vehicle ahead icon will flash. In addition, an audible notification will sound, or if equipped, the safety alert seat will pulse to remind the driver to check traffic ahead before proceeding.

If the adaptive cruise control is controlling speed and detects that the vehicle is approaching a vehicle ahead too quickly and adaptive cruise control cannot apply sufficient braking, such as when vehicles ahead suddenly slow or stop, drivers will receive a forward collision alert to warn them to quickly take action. This alert includes a red flashing visual alert, an audible notification, or, if equipped, the safety alert seat will pulse.

If the driver uses the accelerator pedal while adaptive cruise control is active, a driver information center warning message will indicate that automatic braking will not occur. In some vehicles, instead of the message, the green adaptive cruise control icon will change to blue.

Switching between cruise control modes (if available):

- The driver should press and hold the cruise control CANCEL button.
- The driver will see either the adaptive cruise control icon or the regular cruise control icon on the driver information center. This icon indicates which cruise control mode has been selected.
- Drivers should check which cruise control icon is displayed before setting their cruise control speed.

The driver can end adaptive cruise control by doing any of the following:

- Stepping lightly on the brake pedal
- Pressing the cruise control CANCEL button
- Pressing the cruise control ON/OFF button

Adaptive Cruise Control Operational Checks

Safety Considerations

- The system can only apply limited braking. The driver's complete attention is always required while driving
- The system may not react to parked, stopped or slow-moving vehicles; the driver should always be ready to take action and apply the brakes
- Driver should not use adaptive cruise control on winding or hilly roads, on freeway exit or entrance

ramps or when trailering. In these driving conditions, the system may not detect the vehicle ahead

- The system cannot detect traffic lights or traffic signs, so the driver needs to safely brake accordingly whenever approaching an intersection with a traffic light or stop sign
- If no vehicle ahead is detected, adaptive cruise control will work like regular cruise control
- When using adaptive cruise control, the driver should keep in mind that the system is designed to follow detected vehicles ahead at a longer distance when traveling at higher speeds than at lower speeds
- To avoid using adaptive cruise control by accident, advise customers to keep the cruise control button off when they don't need it. They should press the ON/OFF button and verify that the adaptive cruise control icon is not lit

Adaptive cruise control may have difficulty detecting the following objects:

- Vehicles in front of the driver's vehicle that have a rear aspect that is low, small or irregular
- A truck or trailer that has no cargo in the cargo bed
- Vehicles with cargo extending from the back end
- Non-standard shaped vehicles, such as vehicle transport, vehicles with a sidecar or horse carriages
- Vehicles that are low to the road surface
- Objects that are close to the front of the driver's vehicle

Weather conditions can affect adaptive cruise control:

- If the vehicle's interior temperature is extremely high, the P16 Instrument Panel Cluster Control Module may indicate that adaptive cruise control is temporarily unavailable. This can be caused by extreme hot weather conditions. Adaptive cruise control will return to normal operation once the ambient is cooler
- Conditions that are associated with low visibility, such as rain, snow or road spray, may limit the performance of adaptive cruise control.

Forward Collision Alert Description and Operation (without UGN)

Forward Collision Alert (UEU)

The forward collision alert system is a convenience feature of the B174W Front View Camera - Windshield that can warn drivers of a possible front-end collision situation with a vehicle they are following. The B174W Front View Camera - Windshield is located behind the windshield, looking out at the road ahead and detecting vehicles directly ahead. When a vehicle is detected ahead, a green icon is displayed. This indicator will turn amber if the driver is following too closely. If the system detects that the driver is seconds away from a possible front-end collision, it sends an alert. The P43 Forward Collision Alert Display, which includes a series of red collision alert LEDs, will flash. An audible alert sound will simultaneously sound. If the vehicle is equipped with safety alert seat (HS1), both sides of the seat will pulse. The forward collision alert system can be set to "far," "medium," or "near" timing using the forward collision alert switch and can be turned off using this control or through the vehicle personalization.

Forward collision alert does not provide a warning to help avoid a crash unless it detects a vehicle. Forward collision alert may not detect a vehicle ahead if the B174W Front View Camera - Windshield is blocked by dirt, snow, or ice, or if the windshield is damaged. It may also not detect a vehicle on winding or hilly roads, or in conditions that can limit visibility such as fog, rain, or snow, or if the headlamps or windshield are not cleaned or in proper condition. Keep the windshield, headlamps, and B174W Front View Camera - Windshield area clean and in good repair.

Forward collision alert may provide unnecessary alerts for turning vehicles, vehicles in other lanes, objects that are not vehicles, or shadows. These alerts are normal operation and the vehicle does not need service.

Forward Automatic Braking (UHY)

Forward automatic braking detects vehicles ahead in your path that are traveling in the same direction and may help reduce crash severity or avoid the crash altogether by applying the brakes automatically or enhancing the driver's braking in some emergency front-end collision situations . It can provide braking assist, such as brake system pre-fill, or automatically brake the vehicle if an imminent collision is determined. This can help avoid or lessen the severity of crashes when driving in a forward gear. Depending on the situation, the vehicle may automatically brake moderately or hard. Forward automatic braking can only occur if a vehicle is detected. When a vehicle is detected ahead, a green icon is displayed. The forward automatic braking system works when driving in a forward gear between 8 km/h (5 mph) and 60 km/h (37 mph). It can detect vehicles up to approximately 60 m (197 ft) away.

If the system detects that the driver is seconds away from a possible front-end collision with the vehicle it is following, it will first send an alert. If the driver doesn't respond quickly or the situation happens suddenly, forward automatic braking enhances the driver's braking or automatically applies the brakes. Drivers can override automatic braking at any time by pressing the accelerator or by braking. If the system slows a vehicle to a complete stop, the electronic parking brake will apply. The electronic parking brake can be release in

typical fashion by pressing the electronic parking brake switch.

Through vehicle personalization, the forward automatic braking can be been set to the ALERT setting or turned completely off. This setting disables most automatic braking functions. The driver information center will display FORWARD COLLISION SYSTEM REDUCED or AUTOMATIC COLLISION PREP REDUCED. This is normal operation when the forward automatic braking or forward collision alert system is set to OFF or ALERT. This message is not present when the forward automatic braking or forward collision alert system are set to ALERT and BRAKE.

Forward Collision Alert/Forward Automatic Braking Components

- B174W Front View Camera - Windshield
- P16 Instrument Panel Cluster Control Module
- P43 Forward Collision Alert Display (without UV6)
- P29 Head-Up Display (with UV6)
- Forward Collision Alert Switch
- Infotainment System
- Safety Alert Seat (with HS1)

B174W Front View Camera - Windshield
The B174W Front View Camera - Windshield detects vehicles in front of the vehicle. The B174W Front View Camera - Windshield communicates with the P16 Instrument Cluster via serial data to illuminate the appropriate amber or green vehicle ahead indicator or P43 Forward Collision Alert Display. The B174W Front View Camera - Windshield also communicates via serial data with the infotainment system to request audible alerts.

P16 Instrument Panel Cluster Control Module
The P16 Instrument Panel Cluster Control Module communicates via serial data with the B174W Front View Camera - Windshield and will illuminate the amber or green vehicle ahead indicator as requested by the B174W Front View Camera - Windshield. The P16 Instrument Panel Cluster Control Module also controls the P43 Forward Collision Alert Display.

P43 Forward Collision Alert Display (without UV6)
The P43 Forward Collision Alert Display are a series of red LEDs that will flash when approaching another vehicle too rapidly. The P43 Forward Collision Alert Display are located in the upper instrument panel area and reflect off the windshield when illuminated.

The P43 Forward Collision Alert Display receive power and ground and are discretely controlled by the P16 Instrument Cluster through a pair of low control circuits. When requested by the B174W Front View Camera - Windshield, the P16 Instrument Cluster will pulse the low control circuits, flashing the LEDs as a visual alert that another vehicle is being approached too rapidly.

P29 Head-Up Display (with UV6)
The P16 Instrument Cluster controls the P29 Head-Up Display via serial data. The P16 Instrument Cluster will command the P29 Head-Up Display to flash the collision alert indicator as a visual alert when approaching another vehicle too rapidly as requested by the B174W Front View Camera - Windshield.

Forward Collision Alert Switch
The forward collision alert switch provides an input to the B174W Front View Camera - Windshield to select the alert timing sensitivity when approaching another vehicle too rapidly. The forward collision alert switch is part of the S70L Cruise Control Switch and provides inputs to the K9 Body Control Module, which then communicates with the B174W Front View Camera - Windshield via serial data.

The K9 Body Control Module applies voltage and monitors a low signal voltage from the normally open switch. When the switch is pressed, the signal circuit is pulled low through a specific series of resistors, indicating that the system has been requested to change the alert timing sensitivity. The first button press will show the current alert timing setting on the driver information center. With every subsequent button press, the alert timing sensitivity is changed.

Infotainment System
The infotainment system controls the audible alerts for the forward collision alert system. If the vehicle is approaching another vehicle too rapidly, the B174W Front View Camera - Windshield will command the infotainment system issue an audible alert to the driver.

Safety Alert Seat (with HS1)
The K9 Body Control Module (without A45) or K40D Driver Seat Adjuster Memory Module (with A45) controls the haptic alert provided by the seats. If the vehicle is approaching another vehicle too quickly, the B174W Front View Camera - Windshield will command the control module to pulse both sides of the seat.

Forward Collision Alert and Forward Automatic Braking Operational Checks

If the forward collision alert system is off, inoperative, or not functioning, check the following:

- Verify there are no active driver information center messages and that no DTCs are set.
- Verify that the system is enabled through vehicle personalization. Vehicle personalization allows the system to be set to “Off,” “Beeps,” ”Alert,” “Safety Alert Seat,” or “Alert & Brake”.

- Attempt to replicate the customer concern. While driving, if the vehicle-ahead telltale display illuminates green when following a vehicle above 8 km/h (5 mph) , forward collision alert is operating properly.

If the driver is receiving false forward collision alerts, check the following:

- Verify the B174W Front View Camera - Windshield is not blocked by dirt, snow, or ice, and the windshield is not damaged.
- The system may be identifying vehicles farther ahead than the customer is expecting. Forward collision alert detects vehicles within a distance of approximately 60 m (197 ft) and operates at speeds above 8 km/h (5 mph).
- Forward collision alert may provide unnecessary alerts to turning vehicles, vehicles in other lanes, objects that are not vehicles, or shadows. These alerts are normal operation and the vehicle does not need service.

If forward collision alert beeps, but the seat does not vibrate, check the following:

- Verify the vehicle is equipped with safety alert seat (RPO HS1).
- Verify there are no active driver information center messages and that no DTCs are set.
- Verify that the system is enabled through vehicle personalization: It may be set to “Beeps” or “Alert Only” instead of “Safety Alert Seat” or “Alert & Brake”.

If FORWARD COLLISION SYSTEM REDUCED or AUTOMATIC COLLISION PRE REDUCED is displayed on the driver information center, check the following:

- Verify that the system is enabled through vehicle personalization: It may be set to “Alert Only” instead of ”Off” or Alert & Brake”.

If SERVICE FRONT CAMERA is displayed on the driver information center, check the following:

- Verify there are no active driver information center messages and that no DTCs are set.
- If the message is only displayed upon startup, check the following:
  - Verify the B174W Front View Camera - Windshield is not blocked by dirt, snow, or ice, and the windshield is not damaged.
  - Verify the vehicle is not parked closed to a wall or the B174W Front View Camera - Windshield is not in an over-temperature condition, such as sitting for long periods in high ambient temperatures and direct sun.
- If the message is displayed beyond startup, check the following:
  - Verify there are no active driver information center messages and that no DTCs are set.

If FRONT CAMERA IS BLOCKED is displayed on the driver information center, check the following:

- Check for any other driver information center service messages.
- Verify the B174W Front View Camera - Windshield is not blocked by dirt, snow, or ice, and the windshield is not damaged.

If SERVICE DRIVER ASSIST is displayed on the driver information center, check the following:

- Check for any other driver information center service messages.
- Verify there are no active driver information center messages and that no DTCs are set.

Lane Keep Assist Description and Operation

The lane keep assist system is a convenience feature that utilizes the B174W Front View Camera - Windshield maintains the vehicle location between identified lane markings. The B174W Front View Camera - Windshield is located behind the windshield, looking out at the road ahead and detecting any lane markings. If the vehicle begins to approach an identified lane marking, automatic correction will be applied by the electric power steering to move the vehicle back toward the center the lane. An integrated function of lane keep assist is lane departure warning. When the vehicle unintentionally leaves a detected lane, visual and audible or haptic (if equipped) alerts are given to the driver. The visual alert cannot be changed, but the driver can select between audible or haptic alerts in the vehicle personalization menus.

Lane Keep Assist System Components

The lane keep assist system is made up of the following components:

- B174W Front View Camera - Windshield
- P16 Instrument Panel Cluster Control Module
- Multi-axis acceleration sensor (part of the K36 Restraints Control Module)
- Steering wheel angle sensor (part of the K43 Power Steering Control Module)
- K43 Power Steering Control Module
- Lane keep assist switch
- Infotainment system
- Safety alert seat (with HS1)

B174W Front View Camera - Windshield
The B174W Front View Camera - Windshield detects visual queues such as lane markings. When it is determined that the vehicle is approach an identified lane marking, automatic correction will be applied by the electric power steering to move the vehicle back toward the center the lane. Using the multi-axis acceleration sensor and steering wheel angle sensor, the B174W Front View Camera - Windshield determines the vehicles path and compares this to it's own intended path based on lane markings. The B174W Front View Camera - Windshield will then request the K43 Power Steering Control Module to perform the appropriate steering correction. The B174W Front View Camera - Windshield receives an input via serial data from the lane keep assist switch and controls the lane keep assist switch indicator output.

P16 Instrument Panel Cluster Control Module
The P16 Instrument Panel Cluster Control Module contains green and amber lane keep assist indicators. These indicate to the driver the current status of the lane keep assist system and are controlled via serial data by the B174W Front View Camera - Windshield. When the vehicle speed is above the minimum required speed (refer to owner manual) and the system has detected the required lane markings and is ready to assist, the green indicator will be illuminated on the P16 Instrument Panel Cluster Control Module. If the vehicle has unintentionally left the lane, the amber indicator will flash.

Multi-axis Acceleration Sensor
The steering intervention is based on the forward looking sensor outputs, such as lateral offset of the vehicle, relative yaw angle and time to line crossing. Over that, other vehicle dynamics signals are needed, e.g. velocity, steering angle, yaw rate for the purpose of a driver suppression. The multi-axis acceleration sensor measures vehicle dynamics signals such as velocity and yaw rate for the purpose of determining the vehicles path. The multi-axis acceleration sensor is an integrated part of the K36 Restraints Control Module.

Steering Wheel Angle Sensor
The steering intervention is based on the forward looking sensor outputs, such as lateral offset of the vehicle, relative yaw angle and time to line crossing. Over that, other vehicle dynamics signals are needed, e.g. velocity, steering angle, yaw rate for the purpose of a driver suppression. The steering wheel angle sensor measures vehicle dynamics signals such as steering angle for the purpose of determining the vehicles path. The steering wheel angle sensor is an integrated part of the steering gear and K43 Power Steering Control Module.

K43 Power Steering Control Module
The K43 Power Steering Control Module uses a torque sensor to detect driver inputs and relays that information to the B174W Front View Camera - Windshield. The electric power steering is used to maintain lane centering.

Lane Keep Assist Switch
The lane keep assist switch provides an input to the B174W Front View Camera - Windshield via serial data to turn the lane keep assist system on and off. The B174W Front View Camera - Windshield provides a signal voltage to the normally open momentary switch. When the switch is pressed, the signal circuit is pulled to ground, indicating to the B174W Front View Camera - Windshield that the system has been requested to turn ON or OFF. The lane keep assist switch also contains the lane keep assist switch indicator, which is controlled by the B174W Front View Camera - Windshield to indicate the ON and OFF status of the lane keep assist system. When the system has been enabled by the lane keep assist switch, the B174W Front View Camera - Windshield applies ground to the switch indicator via serial data and illuminates the LED. The location of the lane keep assist switch can vary with different vehicles. For the exact location please refer to the vehicle owner's manual.

Infotainment system
The radio controls the audible alert for the lane keep assist. If the vehicle has unintentionally left the lane, the radio will command three beeps as an audible alert to the driver.

Safety Alert Seat (with HS1)
The K9 Body Control Module (without A45) or K40D Driver Seat Adjuster Memory Module (with A45) controls the haptic alert provided by the seats. If the vehicle has unintentionally left the lane and the K43 Power Steering Control Module determines the corrective action requires an above threshold amount of effort, three pulses to the left or right side of the seat will be commanded, depending on the lane departure direction.

Lane Keep Assist Operation

Lane keep assist with lane departure warning provides gentle steering wheel input and alerts to help prevent drivers from unintentionally drifting out of their intended lane.

There is two stages of warning/intervention for the driver: The first stage is the steering push back, if the lane keep assist system detects that the vehicle will cross the lane marking despite it is intervening, a second stage warning shall be issued. The second stage warning is a chime or a haptic alert through the safety alert seat (if equipped). If a haptic seat vibration is used as stage 2 warning, the vibration will occur on the side of the seat, where the lane departure occurred.

System operation can be described by the following modes:

- Off State: The system has been turned off by the driver using the lane keep assist switch. The lane keep assist indicator will not be illuminated.
- Not Ready To Assist: The system is enabled and the lane keep assist indicator is illuminated, but not ready to assist when any of the following conditions is true:
  - Vehicle speed is less than required for lane keep assist operation. Refer to Owner's Manual for operational speed.
  - The system cannot detect lane markings. This may be because there are no lane markings, as on a country road or that the lane markings cannot be determined due to snow, rain, or other driving conditions.
  - The windshield area in front of the camera or the camera lens is blocked by fog, dirt, damage to the windshield or other elements that may prevent the camera from detecting lane markings.
- Ready To Assist: The system is enabled and ready to warn of the unintentional lane crossing. The system is ready to assist when the green lane keep assist indicator is illuminated on the P16 Instrument Cluster.

Lane Crossing Alerts

- When one of the following conditions are met, the system will not give alerts:
  - The correct turn signal is activated. An activated turn signal is interpreted as an intentional lane crossing.
  - The operator makes an intentional steering maneuver.
  - The operator makes an intentional accelerating maneuver.
  - The operator makes an intentional braking maneuver.
- Lane crossing alert consists of the following:
  - The amber lane keep assist indicator will flash.
  - "push-back" steering torque input (or nudge) from electric power steering to help prevent a lane departure
  - Three chimes are activated through the radio or three pulses to the left or right side of the active safety seat (if equipped).

Safety Alert Seat Description and Operation

The safety alert seat uses pulsing driver seat vibrations to intuitively communicate the direction of a possible crash threat. Two P45 Front Seat Lane Departure Warning Actuators are utilized to create the vibration and are located on the left and right sides of the seat cushion. Utilizing two motors allows the vibration to be localized to the left or right side of the seat, depending on the side of the vehicle generating the alert, or to vibrate both simultaneously.

Note: The following systems may not be available on all vehicles.

The following systems utilize the safety alert seat:

- Lane Departure Warning and Lane Keep Assist – Utilizes left or right-side pulses to alert drivers if they unintentionally drift out of their lane
- Rear Cross Traffic Alert – Utilizes left or right-side pulses to the direction of an approaching vehicle
- Forward Collision Alert – Simultaneously pulses on both sides to warn drivers of a possible collision with the vehicle that they're following
- Front Pedestrian Braking – Simultaneously pulses on both sides to warn drivers of a possible collision with a pedestrian
- Front Parking Assist, Rear Parking Assist, and Backing Warning (part of the Rear Automatic Braking system) – Simultaneously pulses on both sides to warn drivers of a possible low-speed collision

Safety Alert Seat Components

The active safety seat utilizes the following components:

- K9 Body Control Module (without A45)
- P45L Front Seat Lane Departure Warning Actuator - Left
- P45R Front Seat Lane Departure Warning Actuator - Right

K9 Body Control Module (without A45)

The K9 Body Control Module receives serial data messages from other modules and provides voltage to control the P45 Front Seat Lane Departure Warning Actuators. The K9 Body Control Module will pulse the left, right, or both P45 Front Seat Lane Departure Warning Actuators with the number of pulses requested over serial data. The K9 Body Control Module monitors the control circuits for open, short to ground, and short to voltage conditions and will set DTCs if a circuit fault is detected.

P45 Front Seat Lane Departure Warning Actuator

The P45 Front Seat Lane Departure Warning Actuator is DC motor located in the driver's seat bottom cushion.

Two P45 Front Seat Lane Departure Warning Actuators are used in the seat bottom cushion, positioned on the left and right side. An offset weight is attached to the motor. When activated, the spinning offset weight creates a vibration felt by the driver through the seat cushion.

Each P45 Front Seat Lane Departure Warning Actuator receives a constant chassis ground. The motor is controlled by the K9 Body Control Module by providing voltage through a dedicated control circuit. When an alert is required, the control module will apply voltage, activating the P45 Front Seat Lane Departure Warning Actuator

Side Blind Zone Alert Description and Operation

The side blind zone alert system detects and reports “objects of interest" on either side of the vehicle, within a specified “blind spot” zone. The system is designed to alert the driver, with a visual display placed on the side view mirror, to the presence of objects of interest that may not be visible in the inside rearview mirror and outside rear view mirrors. Although this system is intended to help drivers avoid lane change collisions, it does not replace driver vision and therefore should be considered a lane change aid. Even with the side blind zone alert system, the driver must check carefully for objects outside of the reporting zone (e.g., a fast approaching vehicle) before changing lanes. In the event that the system senses a malfunction through its diagnostic routines, the system will be disabled and the driver will be visually notified.

When the system detects a vehicle in the side blind zone while driving forward, an amber warning symbol will light up in the appropriate outside mirror. This indicates that it may be unsafe to change lanes. If the driver then activates the turn signal, the amber warning symbol starts flashing as an extra warning not to change lanes.

Side blind zone alert is active when the vehicle is out of park, or the parking brake is off on manual transmission vehicles, and at speeds up to approximately 140 km/h (87 MPH). If a vehicle is detected in the blind zone, the warning symbols will illuminate on the appropriate side. When the vehicle is started, both outside mirror indicators will briefly illuminate to indicate that the system is operating. The warning symbols will vary brightness based on the ambient light conditions.

Side Blind Zone Alert Components

- B218L Side Obstacle Detection Control Module - Left
- B218R Side Obstacle Detection Control Module - Right
- K9 Body Control Module
- S79D Front Side Door Window Control Switch - Driver
- S79P Front Side Door Window Switch - Passenger
- A9A Outside Rearview Mirror – Driver
- A9B Outside Rearview Mirror – Passenger
- Safety Alert Seat (HS1)

B218 Side Obstacle Detection Control Module
The B218L Side Obstacle Detection Control Module - Left and B218R Side Obstacle Detection Control Module - Right are located on each side of the vehicle behind the rear fascia and are not directly visible from outside the vehicle. The B218 Side Obstacle Detection Control Modules use radar to determine the presence of objects nearby. Both B218 Side Obstacle Detection Control Modules communicates with the vehicle via serial data. The B218L Side Obstacle Detection Control Module - Left and B218R Side Obstacle Detection Control Module - Right also communicate with one another on a private CAN serial data bus. When an object is detected in the side blind zone, the B218L Side Obstacle Detection Control Module - Left and B218R Side Obstacle Detection Control Module - Right will send a CAN message to the K9 Body Control Module to illuminate the appropriate side blind zone alert indicator.

K9 Body Control Module
The B218L Side Obstacle Detection Control Module - Left and the B218R Side Obstacle Detection Control Module - Right will send a CAN message to the K9 Body Control Module when requesting the driver or passenger indicator be illuminated. The K9 Body Control Module then sends a LIN message to the S79D Front Side Door Window Control Switch - Driver or S79P Front Side Door Window Switch - Passenger with the indicator request.

S79 Front Side Door Window Control Switch
The B218L Side Obstacle Detection Control Module – Left and the B218R Side Obstacle Detection Control Module – Right will send a CAN message to the K9 Body Control Module when requesting the driver or passenger indicator be illuminated. The K9 Body Control Module then sends a LIN message to the S79D Front Side Door Window Control Switch - Driver or S79P Front Side Door Window Switch - Passenger with the indicator request. The S79D Front Side Door Window Control Switch - Driver or S79P Front Side Door Window Switch - Passenger will apply voltage to the indicator control circuit to illuminate the appropriate indicator.

A9 Outside Rearview Mirror
The A9A Outside Rearview Mirror – Driver and A9B Outside Rearview Mirror – Passenger each contain an icon that is backlit with high intensity, amber-colored LED’s located on the mirror surface. The display

brightness adapts to day/night conditions. The P43D Side Object Detection Indicator – Driver and P43P Side Object Detection Indicator – Passenger in the appropriate A9 Outside Rearview Mirror is illuminated if the specific B218 Side Obstacle Detection Control Module detects a vehicle in the side blind zone to inform the driver that there is a vehicle driving in the blind spot zone.

Safety Alert Seat (HS1)
The K40 Seat Memory Control Module (with A45) or K9 Body Control Module (without A45) controls the P45 Front Seat Lane Departure Warning Actuators. The P45 Front Seat Lane Departure Warning Actuators provide haptic alert to the driver. If an object is detected, the system will command pulses to the P45LR Seat Haptic Movement Motor – Driver Left Rear or P45RR Seat Haptic Movement Motor – Driver Right Rear, depending on the location of the object, as an alert to the driver.

Side Blind Zone Alert Operation

When the vehicle is started, both A9 Outside Rearview Mirror indicators will briefly illuminate to indicate that the system is operating. The system is designed to detect objects of interest as small as a 125cc motorcycle with rider. The detection zone starts at the outside rearview mirror and extends out to 3.5 m (11 ft) at the back corner of the vehicle and 3 m (10 ft) behind the vehicle at a height of 0.5 m (1.5 ft) and 2.0 m (6 ft) above the ground. The system may illuminate an indicator due to guardrails, signs, trees, shrubs, and other non-moving objects. This is normal system operation; the vehicle does not need service.

When the system detects a vehicle in the side blind zone or lane change alert area while driving forward, independent if passing a vehicle or being passed, an amber warning symbol will illuminate in the appropriate A9 Outside Rearview Mirror. This indicates that it may be unsafe to change lanes. If the driver then activates the turn signal, the amber warning symbol starts flashing as an extra warning not to change lanes.

Foul weather may affect the operation of the side blind zone and lane change alert systems. Occasional missed alerts can occur under normal circumstances and will increase in wet conditions. The number of missed alerts will increase with increased rainfall or road spray. Heavy rainfall, as well as mud, dirt, snow, ice, or slush build-up on the rear fascia, can completely disable the system.

If the vehicle is towing a trailer or has an object such as a bicycle rack attached to the rear of the vehicle, the side blind zone and lane change alert systems may not function properly and the indicators may illuminate intermittently or remain illuminated all the time.

Lane Change Alert Operation

An integrated function of the side blind zone alert system is lane change alert. Lane change alert supplements the side blind zone alert system by detecting approaching vehicles on either side of the vehicle that may not yet be in the side blind zone alert area. The detection zone for lane change alert starts at the outside rearview mirror and extends out to 3.5 m (11 ft) at the back corner of the vehicle and up to 70 m (230 ft) behind the vehicle at a height between 0.5 m (1.5 ft) and 2.0 m (6 ft) above the ground. The system determines when the indicator will illuminate based on the rate of closure, or approach speed, of an approaching vehicle. As the rate of closure become faster, the indicator will illuminate sooner.

Rear Cross Traffic Alert Operation

Rear cross traffic alert displays a red warning triangle with a left or right pointing arrow on the infotainment display to warn of traffic coming from the left or right. This system detects objects coming from up to 20 m (65 ft) from the left or right side of the vehicle. When an object is detected, either three beeps sound from the left or right or three safety alert seat pulses occur on the left or right side, depending on the direction of the detected vehicle.

Driver Information Center Messages

SIDE BLIND ZONE ALERT OFF or LANE CHANGE ALERT OFF

This message indicates that the system has been disabled through the driver information center. Refer to the vehicle owner's manual for instructions on how to set personalization options on the driver information center.

SERVICE SIDE DETECTION SYSTEM

This message indicates that the system requires service. When the message is displayed, the indicators will remain illuminated at all times, notifying the driver that the side blind zone system should not be relied upon when changing lanes. Since the sensors are also used for rear cross traffic alert, this feature will also be inoperative.

SIDE DETECTION SYSTEM UNAVAILABLE

This message indicates that the system has been temporarily disabled because the sensor is blocked or can otherwise not accurately detect vehicles or objects. Such instances may be mud, dirt, snow, ice, or slush build-up on the rear fascia, heavy rainfall, excessive road spray, fascia damage or stickers. An over or under-voltage condition or over-temperaure will also cause the message to display.

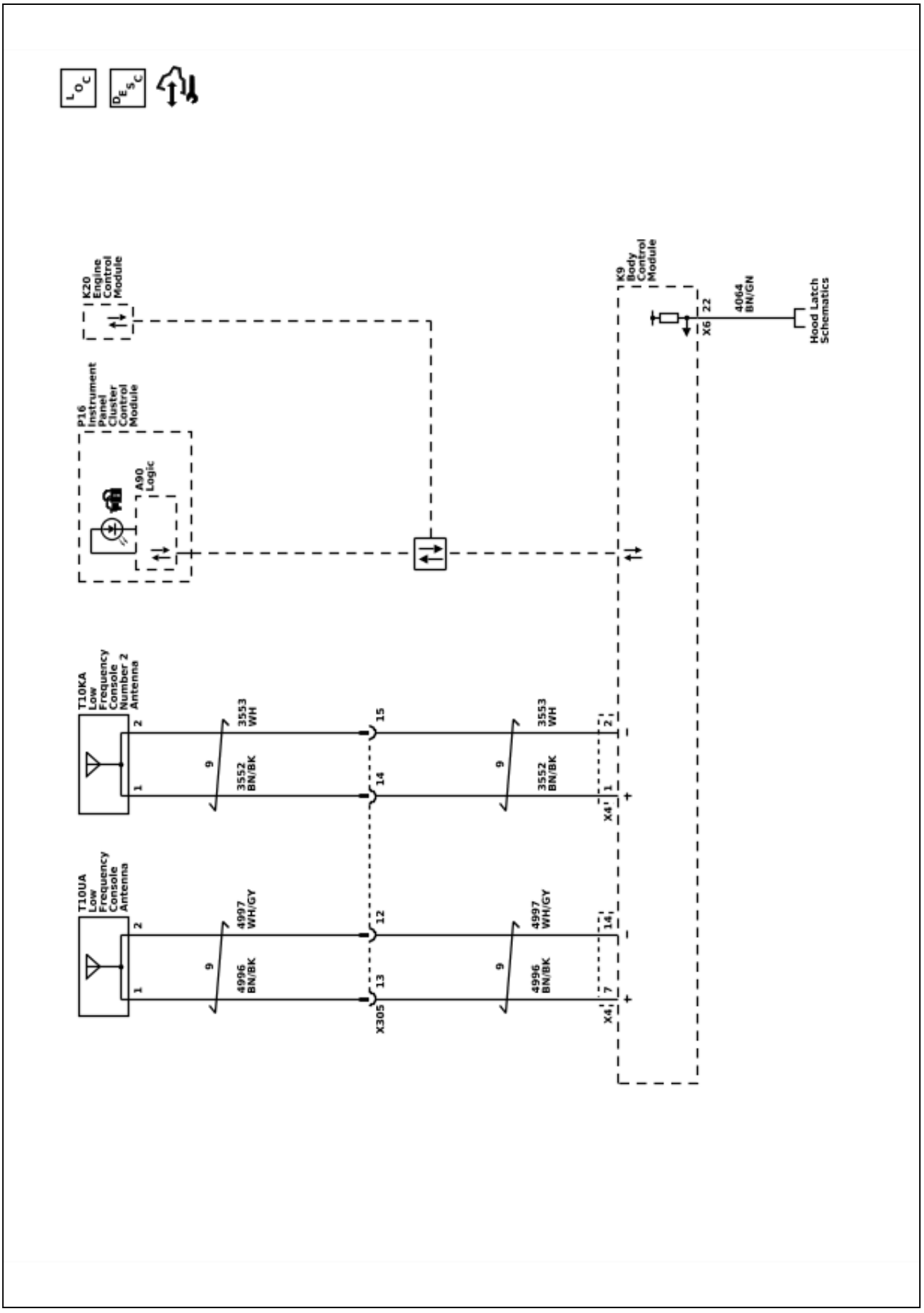
The rear cross traffic alert system will read the GPS latitude and longitude on the serial data bus and calculate if the vehicle is within a Radio Astronomy zone. These zones are located in Europe and Japan and require the sensors to be turned off. The “Side Detection System Unavailable” message will be displayed to the driver when this occurs.

The system is continuously fine tuning the radar alignment. If the B218 Side Obstacle Detection Control Module is removed or significantly disturbed, such as removing the rear fascia or sensor bracket, an initial alignment is automatically performed by the system to enable system operation. However, the SIDE DETECTION SYSTEM UNAVAILABLE may remain for several hours of driving as the system fine tunes the radar alignment to ensure satisfactory alert performance.

Immobilizer

Schematic and Routing Diagrams

Immobilizer Schematics (Immobilizer)



Description and Operation

Immobilizer Description and Operation

The immobilizer system functions are provided by the Steering Column Lock Module, the Body Control Module (BCM), and the Engine Control Module (ECM), as well as any control modules which store and report the environment identifier. The Body Control Module uses low frequency antennas in different locations on the vehicle to determine the location of the transmitter. Multiple transmitting antennas are used to ensure complete coverage of the vehicle interior and rear compartment. These antennas transmit to the keyless entry transmitter.

When the vehicle Stop/Start switch is pressed, the low frequency antennas emit a challenge to the keyless entry transmitter. The transmitter receives this challenge and emits it's response as an RF message. The BCM then compares this value to a value stored in memory. The BCM also monitors various control modules to determine if the stored environment identifiers match.

If the correct transponder is detected, the electric steering column is unlocked, and there is no start disable from OnStar the BCM will send the prerelease allowed message via serial data to the ECM. The vehicle will be allowed up to 3 seconds run time. If the theft check is incorrect, the environment identifier check fails, the incorrect transponder is detected, the electric steering column is locked, or there is a start disable from OnStar, the BCM will send a negative response and the ECM will not start the vehicle or will immediately shut off the vehicle if prerelease allowed the vehicle to start.

If RF communication is interrupted, a "No Remote Detected" message will be displayed on the DIC. In these cases, the transmitter can be placed in the transmitter pocket. The immobilizer coil antenna is located in the immediate vicinity of the transmitter pocket. Placing the transmitter in the pocket/slot will create a low powered coupling between the transmitter and immobilizer coil antenna, allowing communications to occur and enabling vehicle starting.

The components of the immobilizer system are as follows:

- BCM
- ECM
- Steering column lock control module
- Immobilizer coil antenna
- Low frequency antenna
- Ignition key/Keyless entry transmitter
- Security indicator
- Various control modules which store and report the environment identifier

Body Control Module (BCM)

The immobilizer system is an integral part of the BCM and is controlled internally within the BCM. The BCM can learn up to 8 keys (transponder values). The BCM uses low frequency antennas in three different locations on the vehicle to determine the location of the transmitter. Multiple antennas are used to ensure complete coverage of the vehicle interior and rear compartment. The BCM monitors the ignition mode switch. When the ignition mode is changed, the BCM will command, or “ping”, the low frequency antenna.

The BCM uses the following inputs:

- Environment identifier exchange with various modules
- Encrypted code from the vehicle key, received by the immobilizer coil antenna if the keyless entry transmitter signal isn’t detected as indicated by the “No Remote Detected” message
- Encrypted code from the vehicle key

The BCM uses the following outputs:

- Prerelease Allowed signal communication with ECM
- Challenge/Response with ECM

When a transponder value is received by the BCM, the BCM will compare this value to the learned key code stored in memory. The BCM then performs one of the following functions:

- If the encrypted code value matches the values stored in the BCM memory, the BCM will send the Prerelease Allowed signal to the ECM via serial data.
- If the encrypted code unique value does not match the value stored in the BCM, the BCM will send the start disable message to the ECM via serial data.
- If the BCM is unable to receive the vehicle key encrypted code value, the BCM will not send any messages to the ECM.

Engine Control Module (ECM)

The ECM receives the BCM Prerelease Allowed signal and simultaneously the ECM sends a challenge to the BCM via the serial data circuit upon seeing the vehicle transition from OFF to any other power mode. Both the ECM and BCM perform a calculation on this challenge. If the calculated response from the BCM equals the calculation performed by the ECM, the ECM will allow vehicle starting.

Low Frequency Antenna

When commanded, or “pinged”, the low frequency antenna broadcast a challenge to the keyless entry transmitter. Because of the low power of the antenna, this challenge is only broadcast in an approximate three meter range of the antenna. Multiple antenna are used to ensure complete coverage of the vehicle interior and rear compartment.

Steering Column Lock Control Module

On vehicles with electronic steering column lock that use a steering column lock control module the immobilizer system will prevent vehicle starting if there is a fault or no communication with the steering column lock control module.

Keyless Entry Transmitter

Each keyless entry transmitter contains a transponder with a unique encrypted value. The transponder's encrypted value is fixed and unable to be changed. The immobilizer system uses the keyless entry transmitter transponder value to determine if a valid keyless entry transmitter is being used to start the vehicle.

Security Indicator

The BCM will command the Instrument Cluster to illuminate the security indicator when the vehicle is ON to indicate a fault has occurred within the immobilizer system.

Remote Vehicle Speed Limiting Description and Operation

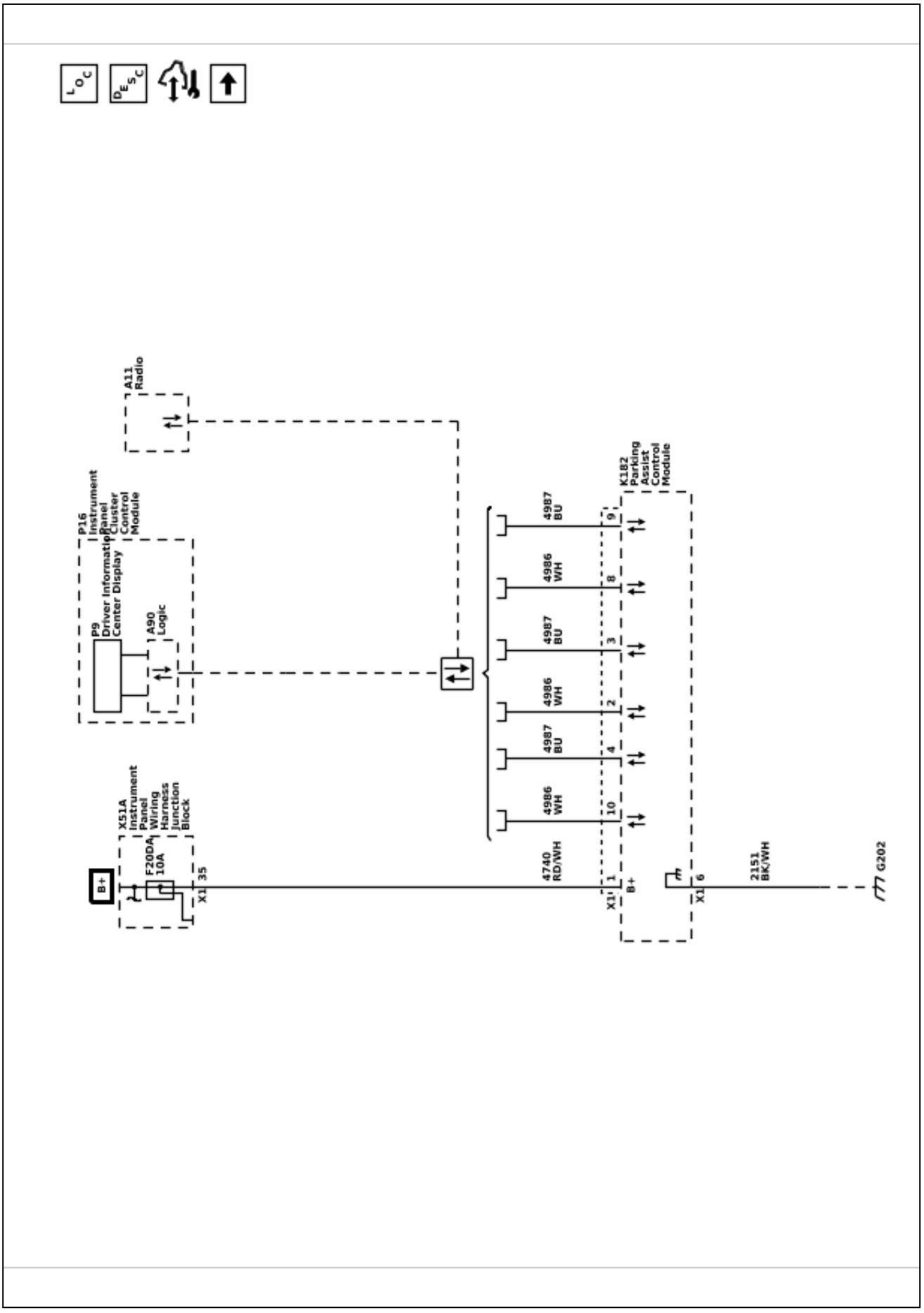
Certain vehicles equipped with OnStar® now have an additional feature that allows for remote limiting of the vehicle's speed. This OnStar® feature is called Stolen Vehicle Slow-Down and is now part of the OnStar® Stolen Vehicle Assistance service. This feature, when used in conjunction with local law enforcement and strict guidelines at the OnStar® Call Center, will slow the vehicle by interacting with the engine control system.

When the engine control system receives a valid request from the OnStar® telematics communications interface module, it will enter into a reduced engine power/vehicle speed limiting mode, which will decelerate the vehicle. Once the request is active the engine control module begins reducing engine torque to match requested vehicle speed and a REDUCED ENGINE POWER indication is displayed. No DTCs will be set during this process.

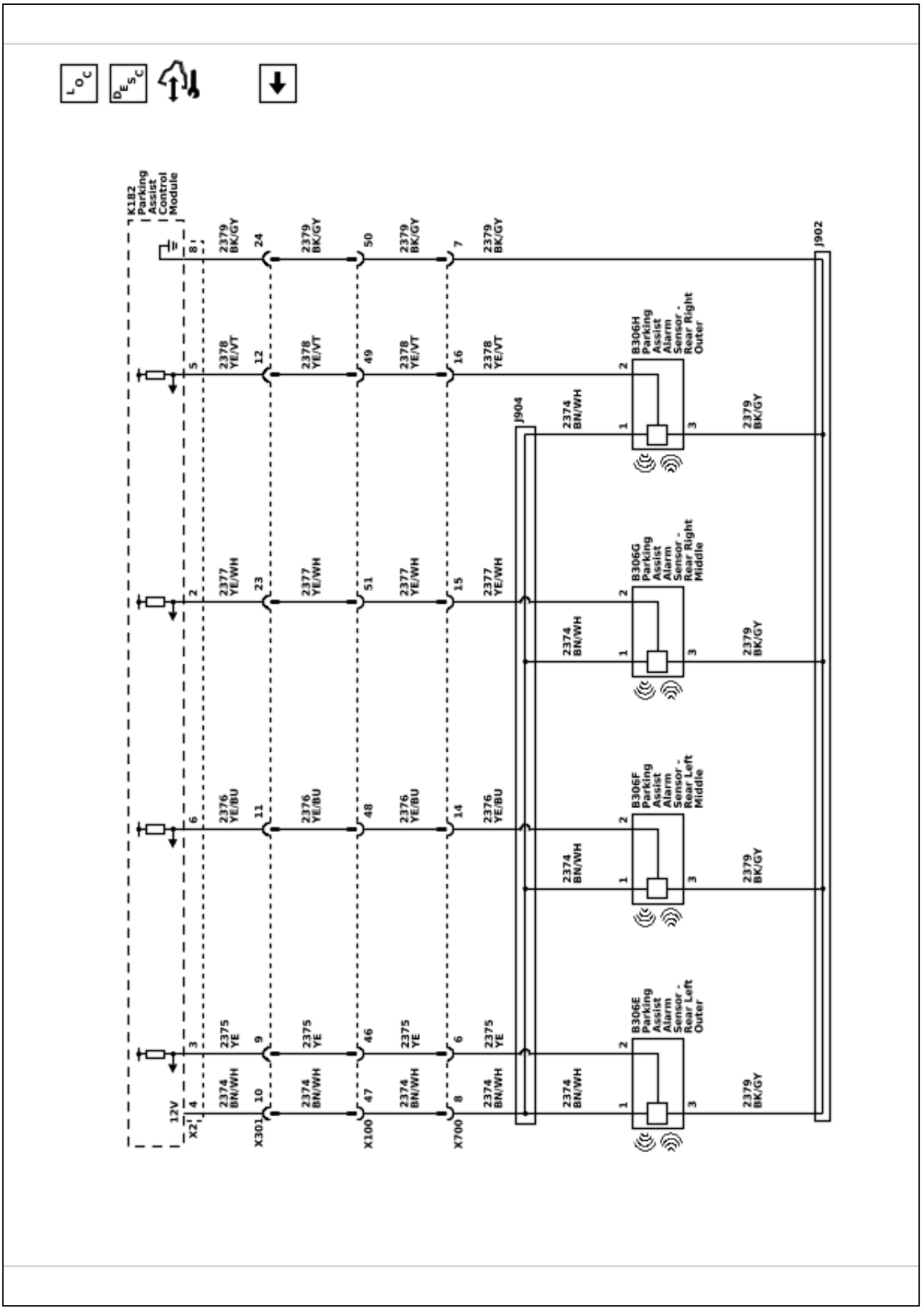
Parking Assistance Systems

Schematic and Routing Diagrams

Parking Assistance Systems Schematics (Park Assist - Power, Ground, and Serial Data (UD7))



Parking Assistance Systems Schematics (Park Assist - Rear Sensors (UD7))



Description and Operation

Parking Assist Description and Operation (UD5)

The parking assist system can help drivers avoid certain objects in their path during low-speed parking. The distance and location of the object is determined by four object sensors located in the rear fascia. The parking assist system may not detect all children, pedestrians, bicyclists, animals or objects below the bumper. Drivers should remember to always check the area around the vehicle before shifting into REVERSE. The parking assist system will not stop or slow down a vehicle. It does not engage a vehicle's throttle or braking. No safety system can take the place of an alert and engaged driver.

The parking assist system is made up of the following components:

- K182 Parking Assist Control Module
- B306 Parking Assist Alarm Sensors
- Infotainment system

K182 Parking Assist Control Module

The K182 Parking Assist Control Module provides a reference voltage and a low reference to the B166/B306 Parking Assist Alarm Sensors. The K182 Parking Assist Control Module receives individual signals from each of the four B166/B306 Parking Assist Alarm Sensors and determines the location and distance of an object based on these inputs. When an object is detected, the K182 Parking Assist Control Module will send a serial data message to the infotainment system requesting an audible alert.

B166/B306 Parking Assist Alarm Sensors

The B166/B306 Parking Assist Alarm Sensors are located in the rear fascia of the vehicle. The sensors are used to determine the distance between an object and the bumper. Each sensor emits an ultrasonic frequency which is reflected off any object located behind the vehicle. These reflections are received by the sensors. The time difference between the emission of the frequency and when the reflection is received is known as sensor echo time; it is used to determine the distance to the object. The sensors report this information to the K182 Parking Assist Control Module.

Infotainment System

The infotainment system controls the audible alert for the parking assist system. If the an object is detected the infotainment system will command beeps as an audible alert to the driver.

Rear Parking Assist Operation

The rear parking assist system uses four B166/B306 Parking Assist Alarm Sensors located on the rear fascia and functions when the transmission is in REVERSE. When a driver is backing up at a low speed, up to about 11 km/h (7 mph), the B166/B306 Parking Assist Alarm Sensors may detect objects up to 1.8 m (6 ft) behind the vehicle. When an object is within the measuring range of the B166/B306 Parking Assist Alarm Sensors, the ultrasonic pulse is reflected and is received by the sending or a neighboring sensor. The sensor converts this signal into a voltage signal and sends this signal to the K182 Parking Assist Control Module. The K182 Parking Assist Control Module evaluates the received sensor signals.

When an object is within 0.6 m (2 ft) of the rear bumper, 5 repeating low-pitched beeps are played from the rear speakers, followed by a continuous tone. If the vehicle is equipped with the Safety Alert Seat (HS1), it will pulse 5 times on both sides.

Some vehicles may have a park assist display on the P16 Instrument Panel Cluster Module with bars that show "distance to object," driving direction, and object location information for the parking assist system. As the vehicle gets closer to the detected object, distance-to-object information and caution triangles may be displayed that changes from yellow to amber to red.

The parking assist system can be turned on and off using the parking assist switch.

The K182 Parking Assist Control Module carries out a self test and monitors the sensors for electrical and mechanical faults. Monitored is the power supply of each sensor and the sensor signals. Mud, ice and snow may cause obstruction of the function of the sensors. The K182 Parking Assist Control Module also determines if the correct type of sensor is installed. If any of these tests fails, a DTC with corresponding symptom is set and the parking assist system is deactivated.

Parking Assist System Messages

SERVICE PARKING ASSIST or SERVICE DRIVER ASSIST

The driver information center displays SERVICE PARKING ASSIST or SERVICE DRIVER ASSIST when the K182 Parking Assist Control Module detects a malfunction in the parking assist system and the system is disabled.

PARK ASSIST OFF

The PARK ASSIST OFF message is displayed in the driver information center when the parking assist system is disabled due to conditions that disable or inhibit the system. The K182 Parking Assist Control Module requests the driver information center display PARK ASSIST OFF when it detects such a condition.

Parking Assist System Operational Checks

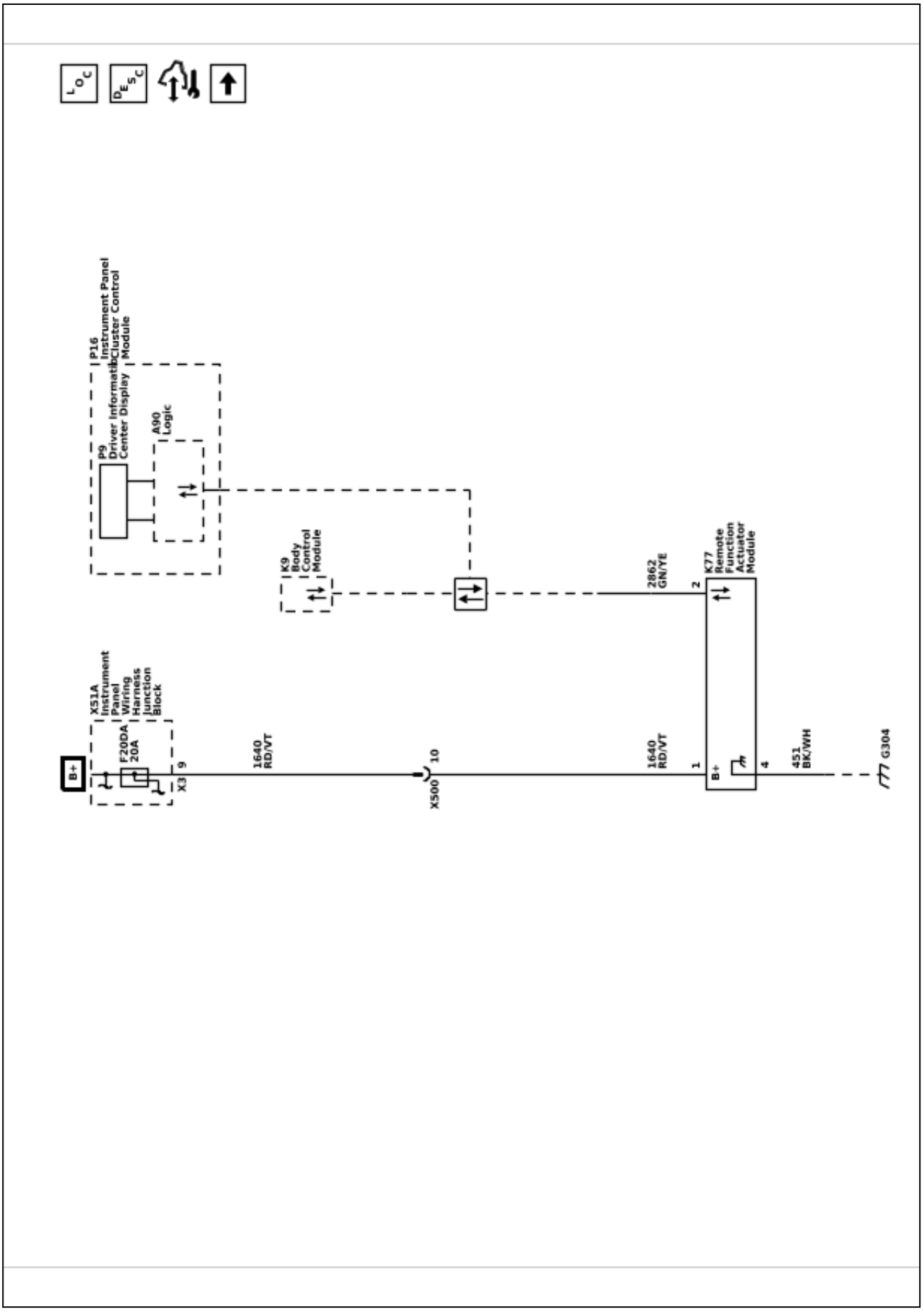
The scan tool Parking Assist Disable History 1–8 data can be used to diagnose a malfunction within the parking assist system or an intermittent concern. The following is a brief description of potential causes which may aid in diagnosis. For each potential issue, perform an appropriate inspect of the component or system and refer to the specific service information subsection related to that system for further diagnosis:

- Disable by Switch – The parking assist system has been disabled through the parking assist switch.
- Disabled by Customization Menu – The parking assist system has been disabled through the vehicle personalization menu.
- Vehicle Speed Too High – The vehicle is travelling too fast in reverse at speeds of greater than 8 km/h (5 mph).
- Vehicle Speed Invalid – The vehicle is unable to determine the vehicle speed.
- Steering Angle Signal Invalid – The vehicle is unable to determine the steering angle.
- Front Attached Object Detected – An object has been determined to be attached to the front of the vehicle. Common items such as a brush guards, light bars, and license plates may cause this concern. Additionally, damage to the front of the vehicle or a misaligned sensor may cause this concern. If the vehicle is damaged in a manner that causes the sensor to detect the bumper itself, the parking assist control module will interpret this as an attached object and disable the system. Carefully inspect the bumper, bumper mounting surface, and sensor retainers before continuing with normal diagnosis. After the detected cause has been addressed the vehicle must be driven at speed greater than 40 km/h (25 MPH).
- Rear Attached Object Detected – An object has been determined to be attached to the rear of the vehicle. Common items such as a hitch receiver, trailer, or a bicycle rack may cause this concern. Additionally, damage to the rear of the vehicle or a misaligned sensor may cause this concern. If the vehicle is damaged in a manner that causes the sensor to detect the bumper itself, the parking assist control module will interpret this as an attached object and disable the system. Carefully inspect the bumper, bumper mounting surface, and sensor retainers before continuing with normal diagnosis. After the detected cause has been addressed the vehicle must be driven at speed greater than 40 km/h (25 MPH).
- Front And Rear Attached Object Detected – An object has been determined to be attached to the front and rear of vehicle.
- Parking Assist Alarm Sensor Blocked – One of the following conditions may be present:
  - One or more of the sensors may be blocked by snow, mud, ice, or other debris. This might happen after going through a car wash in cold weather.
  - Silicone insulator surrounding sensor maybe missing, cut, or twisted.
  - Improperly installed sensor, sensor maybe be crooked due to a tight wire harness.
  - One or more of the sensors may be scratched or the paint maybe chipped.
  - Excessive paint thickness on a sensor may cause an excessive sensor ring time. When replacing or refinishing a sensor, do not apply an excessive amount of paint or clear coat.
- Haptic Seat Malfunction – A fault exists with the safety alert seat. Check for DTCs.
- Chime Malfunction – A fault exists with the vehicle chime. Check for DTCs.
- Parking Assist Switch Malfunction – A fault exists with the parking assist switch. Check for DTCs.
- Invalid Gear – The vehicle has determine a plausibility fault exists with the transmission range.
- Incorrect Power Mode – The vehicle is in an incorrect power mode for parking assist operation.

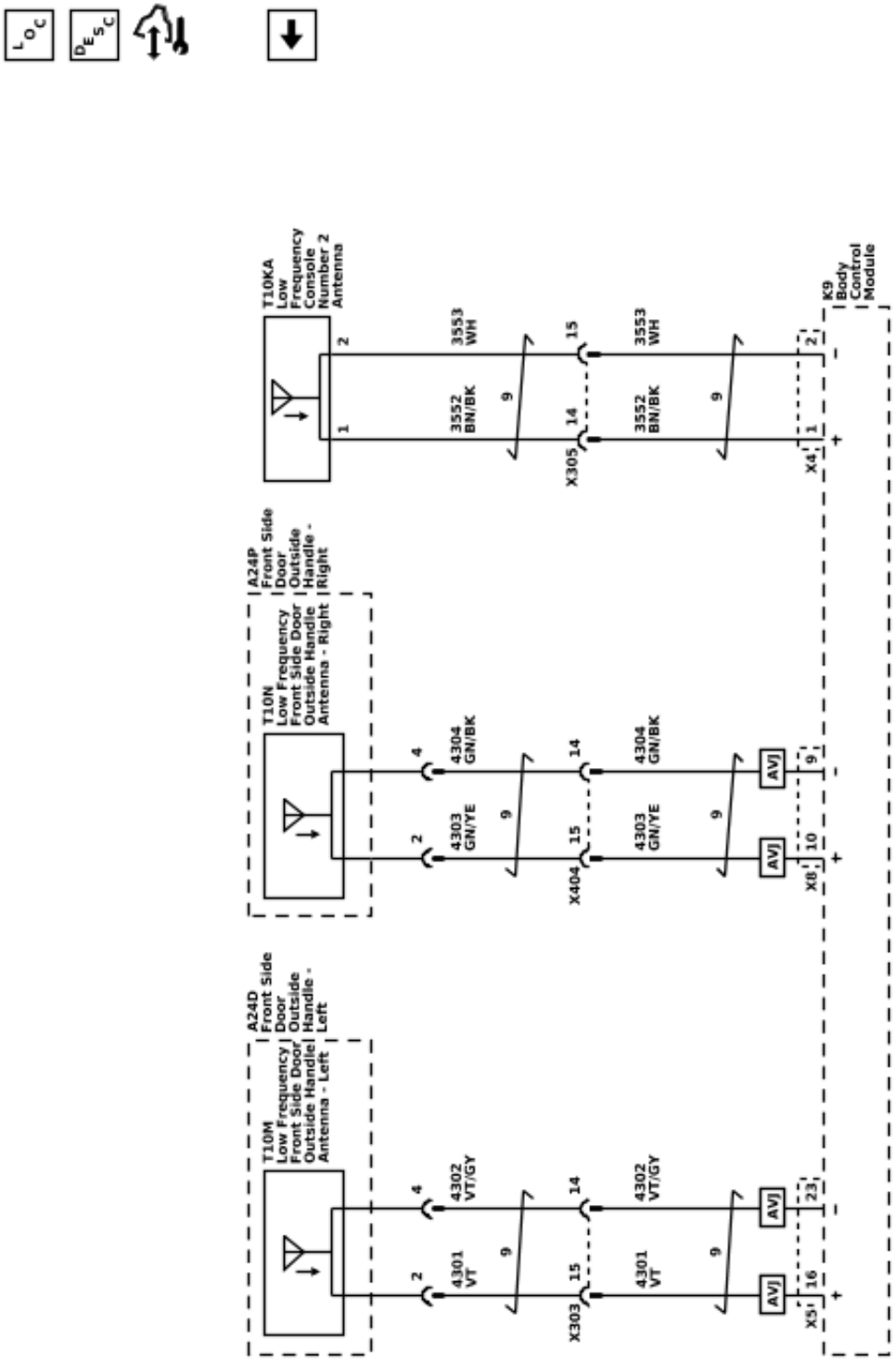
Remote Functions

Schematic and Routing Diagrams

Remote Function Schematics (Keyless Entry - Active)



Remote Function Schematics (Keyless Entry - Passive and Keyless Start (AVJ))



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Description and Operation

Front Side Door Access Control Transmitter Description and Operation

Front Side Door Access Control Transmitter Description and Operation

The Front Side Door Access Control Transmitter is an accessory offered to be used as a vehicle entry device. Similar to the Keyless Entry Transmitter, the Front Side Door Access Control Transmitter will send a radio frequency signal to the Remote Function Actuator. Next, the Remote Function Actuator sends a signal to the Body Control Module via LIN communication. The BCM will interpret this signal and either lock or unlock the vehicle as a result. A low transmitter battery or radio frequency interference from aftermarket devices, such as 2-way radios, power inverters, computers, etc., may cause a system malfunction. High radio frequency traffic areas, such as gas stations that use pay-at-the-pump radio frequency transponders, may also cause interference that could lead to a malfunction.

Like the Keyless Entry Transmitter, the Front Side Door Access Control Transmitter is programmed to the vehicle's Body Control Module. This means the Front Side Door Access Control Transmitter will populate one of the 8 programmable spaces in the BCM for Keyless Entry Transmitters. The Front Side Door Access Control Transmitter will need to be reprogrammed in the event of BCM replacement. This can only be achieved with the Master Code. If the Master Code is not retrievable, a new Front Side Door Access Control Transmitter with accompanying wallet card will need to be programmed to the new BCM.

The Front Side Door Access Control Transmitter has 5 buttons depicting numbers from 0 to 9. Each button represents a character of a 5 digit code that the vehicle owner may program, which will be referred to as a personal code. The user has 3 attempts to input the correct access code before the Front Side Door Access Control Transmitter enters lockout mode for 1 minute. This will occur up to 2 more times if the incorrect access code is entered repeatedly. After that, any additional 3 attempts will cause the Front Side Door Access Control Transmitter to enter lockout mode for 23 minutes. There is an LED light at the top of the Front Side Door Access Control Transmitter that provides feedback to the user. Each Front Side Door Access Control Transmitter is sold with a wallet card that contains a master code that may be used for keyless entry as well as programming a personal code. The master code will always allow operation of the Front Side Door Access Control Transmitter and may be used to program a new personal code. Entering the 5 digit access code will unlock the driver door. Pressing the 3/4 key within 5 seconds of entering the 5 digit access code with unlock all doors. Pressing the 7/8 and 9/0 button will lock all doors. To change the personal code, refer to the wallet card included with the Front Side Door Access Control Transmitter.

The Front Side Door Access Control Transmitter contains a button cell battery that is not serviceable. Once the battery exceeds the expected lifetime, the Front Side Door Access Control Transmitter will need to be replaced. A new Front Side Door Access Control Transmitter will come with new wallet card.

Keyless Entry System Description and Operation

Keyless Entry System Description and Operation – Active

The keyless entry system is a vehicle entry device. The keyless entry system is used in conjunction with the door locks to unlock the vehicle. Keyless entry will lock/unlock a door or open the rear compartment lid when a corresponding button on the keyless entry transmitter is pressed. This is accomplished by the transmitter sending a radio frequency to the remote control door lock receiver that has a direct link to the body control module (BCM). The BCM interprets the signal and activates the requested function or requests the appropriate ECU to activate the function via a serial data message. A low transmitter battery or radio frequency interference from aftermarket devices, such as 2-way radios, power inverters, computers, etc., may cause a system malfunction. High radio frequency traffic areas, such as gas stations that use pay-at-the-pump radio frequency transponders, may also cause interference that could lead to a malfunction. Keyless entry allows you to operate the following features:

- Door lock/unlock

- Rear compartment lid release
- Illuminated entry lamps
- Panic alarm/vehicle locator
- Remote vehicle start
- Passive keyless entry able/disable
- Automatic window express down, if equipped
- Automatic window express up, if equipped
- Automatic power mirror folding/unfolding, if equipped

Keyless Entry System Description and Operation – Passive

Passive keyless entry allows entry to a locked vehicle without pressing any buttons on the keyless entry transmitter. The passive entry system uses low frequency antennas in several different areas on the vehicle to determine the location of the transmitter. When passively opening a locked door or the rear compartment, you must have a programmed transmitter with you in your pocket, purse, or briefcase within a one meter range.

When an exterior door handle button is pressed or the rear compartment touch pad is pressed, the body control module activates the low frequency antenna which sends out a challenge to the keyless entry transmitter. Because of the low frequency, communication range is limited. The antenna will emit the challenge in a one meter range. The transmitter must be within this range to receive the challenge. The transmitter receives this challenge and emits it's response as an RF message, which is received by the remote control door lock receiver. If the response is correct, entry into the vehicle will be allowed.

As a customer convenience feature, the keyless entry system will notify the driver if the transmitter has been left in the vehicle after exiting by chirping the vehicle horn three times and displaying a message on the DIC. This may be turned off using vehicle personalization. Also, if the transmitter is left in the vehicle after the central door lock switch has been used to lock the vehicle, the driver door will remain unlocked after exiting the vehicle. This is intended to prevent locking the transmitter in the vehicle and being unable to access it.

Keyless Entry System Description and Operation – Keyless Start

The keyless start portion of the keyless entry system allows vehicle starting, having only the transmitter as your key. The keyless start system uses low frequency antennas in three different locations on the vehicle to determine the location of the transmitter. Multiple antenna are used to ensure complete coverage of the vehicle interior and rear compartment. When using the keyless start system, a programmed transmitter must be in the vehicle's interior, in the driver's pocket, purse, or briefcase.

When the ignition mode switch is pressed, the low frequency antennas emit a challenge to the keyless entry transmitter. The transmitter receives this challenge and emits it's response as an RF message, which is received by the remote control door lock receiver. If the response is correct, vehicle starting will be allowed. If RF communication is interrupted, a “No Remote Detected” message will be displayed on the DIC. In these cases, the transmitter can be placed in the transmitter pocket located in the center console. The immobilizer antenna coil is located directly beneath the transmitter pocket. Placing the transmitter in the pocket will create a low powered coupling between the transmitter and immobilizer antenna, allowing communications to occur and enabling vehicle starting. If the key has been idle the DIC may display “Key In Sleep Mode, Move Key, Then Start”. In this case move the vehicle key to start the vehicle.

The keyless entry system has the following components:

- Keyless entry integrated key/transmitter
- Driver and passenger side antennas
- Driver and passenger door handle switches (part of the door handle assembly)
- Rear fascia antenna
- Immobilizer antenna coil (front console antenna function)
- Rear console antenna
- Trunk antenna (rear compartment)
- Body control module (BCM)
- Remote control door lock receiver

Keyless Entry Transmitters

By operating any of the exterior door handle buttons or the start/stop switch, a nearby transmitter is challenged by a keyless entry antenna. The transmitter will send an RF response to the remote control door lock receiver, which communicates with the BCM. The BCM will interpret this communication and either allow or deny vehicle entry or starting.

Side Antennas

The keyless entry side antennas are used to transmit low frequency communications to the keyless entry transmitters.

The keyless entry side antennas are located in the driver and passenger body sides. The antennas are controlled by the body control module. When the exterior door handle button is pressed, the respective antenna will send out a challenge to the keyless entry transmitter, which begins the passive entry communications.

Rear Fascia Antenna

The rear fascia antenna is used to transmit low frequency communication to the keyless entry transmitters for entry to rear compartment.

The rear fascia antenna is located behind the rear fascia. The antenna is controlled by the body control module. When the rear compartment touch pad is pressed, the antenna sends out a challenge to the keyless entry transmitter, which begins the passive entry communications.

Immobilizer Coil Antenna

This antenna is located in the front of the center console.

The Immobilizer antenna coil is used for vehicle starting functions and for learning vehicle keys. When the ignition mode switch is pressed, the antenna is energized or "pinged". This emits a low frequency challenge signal that is received by the keyless entry transmitter. The transmitter will then reply to this challenge with a response and, if correct, vehicle starting will occur. If the transmitter battery is dead, weak, or the RF signal is being interrupted, the transmitter may be placed in the pocket to create a low powered coupling between the transmitter and immobilizer coil antenna, allowing communications to occur and enabling vehicle starting.

Rear Console Antenna

This antenna is located in the rear of the center console.

The rear console antenna is used for vehicle starting functions. When the ignition mode switch is pressed, the antenna is energized or "pinged". This emits a low frequency challenge signal that is received by the keyless entry transmitter. The transmitter will then reply to this challenge with a response and, if correct, vehicle starting will occur.

Rear Compartment Antenna

This antenna is located near the center of the rear compartment area.

The rear compartment antenna is used for vehicle starting functions. When the ignition mode switch is pressed, the antenna is energized or "pinged". This emits a low frequency challenge signal that is received by the keyless entry transmitter. The transmitter will then reply to this challenge with a response and, if correct, vehicle starting will occur.

OnStar® Remote Link

A vehicle operator may have the ability to perform some of the keyless entry functions using applications on personal devices such as smart phones. Refer to *OnStar Description and Operation 4-12*.

Body Control Module (BCM)

The BCM is a multi-function module that performs the following functions:

- Receive and authenticate active transmitter and keyless start/entry signals from the remote control door lock receiver
- Determines the function requested by the transmitter signal
- Performs the function requested by the transmitter signal
- Activating vehicle antennas for passive keyless entry functions
- Activating vehicle antennas for keyless start functions
- Backup control for the ECM accessory wakeup and the run/crank relay
- If equipped, controls the electronic steering column lock
- Receiver of the exterior door handle switch inputs and door open switch (not the door ajar switch)
- Ignition mode switch monitoring

Unlock Driver Door Only – Active

Momentarily press the transmitter UNLOCK button in order to perform the following functions:

- Unlock only the driver door or all doors, if enabled through personalization
- Illuminate the interior lamps for a determined length of time, or until the ignition is turned ON
- Flash the exterior lights, if enabled through personalization
- Disarm the Content Theft Deterrent (CTD) system
- Deactivate the CTD system when in the alarm mode

Unlock All Doors – Second Operation – Active

Momentarily press the transmitter UNLOCK button a second time, within 5 seconds of the first press, to perform the following function:

Unlock the remaining doors

Unlock Driver Door Only – Passive

If enabled through personalization, approach the driver door with a valid keyless entry transmitter and press the door handle button to perform the following functions:

- Unlock and open only the driver door
- Disarm the CTD system, if equipped
- Deactivate the CTD system when in the alarm mode

Unlock All Doors – Passive

Approach any non driver door (front or rear) or, if enabled through personalization, the driver door with a valid keyless entry transmitter and press the door handle button to perform the following functions:

- Unlock all vehicle doors
- Disarm the CTD system, if equipped
- Deactivate the CTD system when in the alarm mode

Lock All Doors – Active

Press the transmitter LOCK button to perform the following functions:

- Lock all vehicle doors
- Immediately turn off the interior lamps
- Flash the exterior lights, if enabled through personalization
- Chirp the horn, if enabled through personalization
- Arm the CTD system

Lock All Doors – Passive

Exit the vehicle (with ignition off) with the keyless entry transmitter to automatically perform the following functions, if equipped.

- Lock all vehicle doors after a delay
- Flash the exterior lights, if enabled through personalization
- Chirp horn, if enabled through personalization
- Arm the CTD system

When all doors are closed, they can also be locked from the exterior by operating a front door handle button or touch pad while having a valid transmitter within range. Vehicles equipped with a rear door button can also lock all doors from the rear doors.

Rear Compartment Lid Release – Active

If the vehicle transaxle is in PARK or NEUTRAL, a double press of the transmitter rear compartment release button will open the rear compartment lid.

Rear Compartment Lid Release – Passive

Approach the rear of a locked vehicle with a valid keyless entry transmitter. Press the rear compartment lid release touch pad. The rear compartment lid will open.

Vehicle Locator/Panic Alarm/Active

A single press of the panic button performs the following functions. Some functions may be dependent on personalization settings:

- Pulses the horn three times
- Flashes the exterior lamps three times

A press and hold of the panic button performs the following functions:

- Pulses the horn and flashes the parking lamps for 30 second or until the following conditions occur:
  - The panic button is pressed
  - The ignition switch is turned to the RUN position with a valid key

Remote Vehicle Start/Active

The remote vehicle start function allows engine starting while not in the vehicle. It also allows the vehicle HVAC system and other vehicle systems to enable, providing a comfortable vehicle upon entry. The remote vehicle start sequence begins by pressing and releasing the remote vehicle start button on the keyless entry transmitter twice. The turn signal lamps will illuminate to indicate the vehicle has received the remote start request. Each time a remote vehicle start is performed, the vehicle doors are locked, however they may then be unlocked/locked with the transmitter at any time. Once activated, the engine is allowed to run for 15 minutes. The remote start operation can be repeated as many times as desired up to a total run time of 30 minutes. The remote vehicle start event may be cancelled at any time by pressing only the remote vehicle start button on the transmitter or by entering the vehicle and turning ON the hazard lamps.

Hood Ajar Switch/Active

The hood switch provides status of the hood to the BCM for remote vehicle start purposes. The switch is integrated into the hood latch assembly. The hood ajar switch provides 2 separate inputs to the BCM. These separate inputs allow the BCM to actively monitor for a hood ajar switch fault.

Remote Vehicle Start Circuit Description/ Active

The BCM receives a signal from the keyless entry transmitter indicating a remote vehicle start request. The BCM and ECM use the following inputs to verify the system is ready to enable a remote vehicle start event:

- Vehicle is not in valet mode
- Vehicle is in park
- Keyless entry transmitter is not in the vehicle
- The hood is closed
- The hazard switch is OFF
- Vehicle power mode is OFF
- The malfunction indicator lamp (MIL) is not commanded ON by the ECM
- Remote start timer does not equal 0 (the 30 minute maximum time has not been used)

When the BCM determines all conditions meet those required for a remote vehicle start event, a message is sent via serial data to the ECM. While the ECM is in remote vehicle start mode it will cut fuel to the engine if any of the following monitored conditions occur:

- Vehicle speed is greater than 0
- Transmission is not in P
- Excessive engine coolant temperature
- Low oil pressure
- Engine crank time is greater than 30 seconds
- Excessive engine speed
- Accelerator pedal position too high
- Immobilizer system indicates a theft attempt

If any conditions prevent a remote start or cause a remote start operation to be cancelled there is a record of the cause in the scan tool.

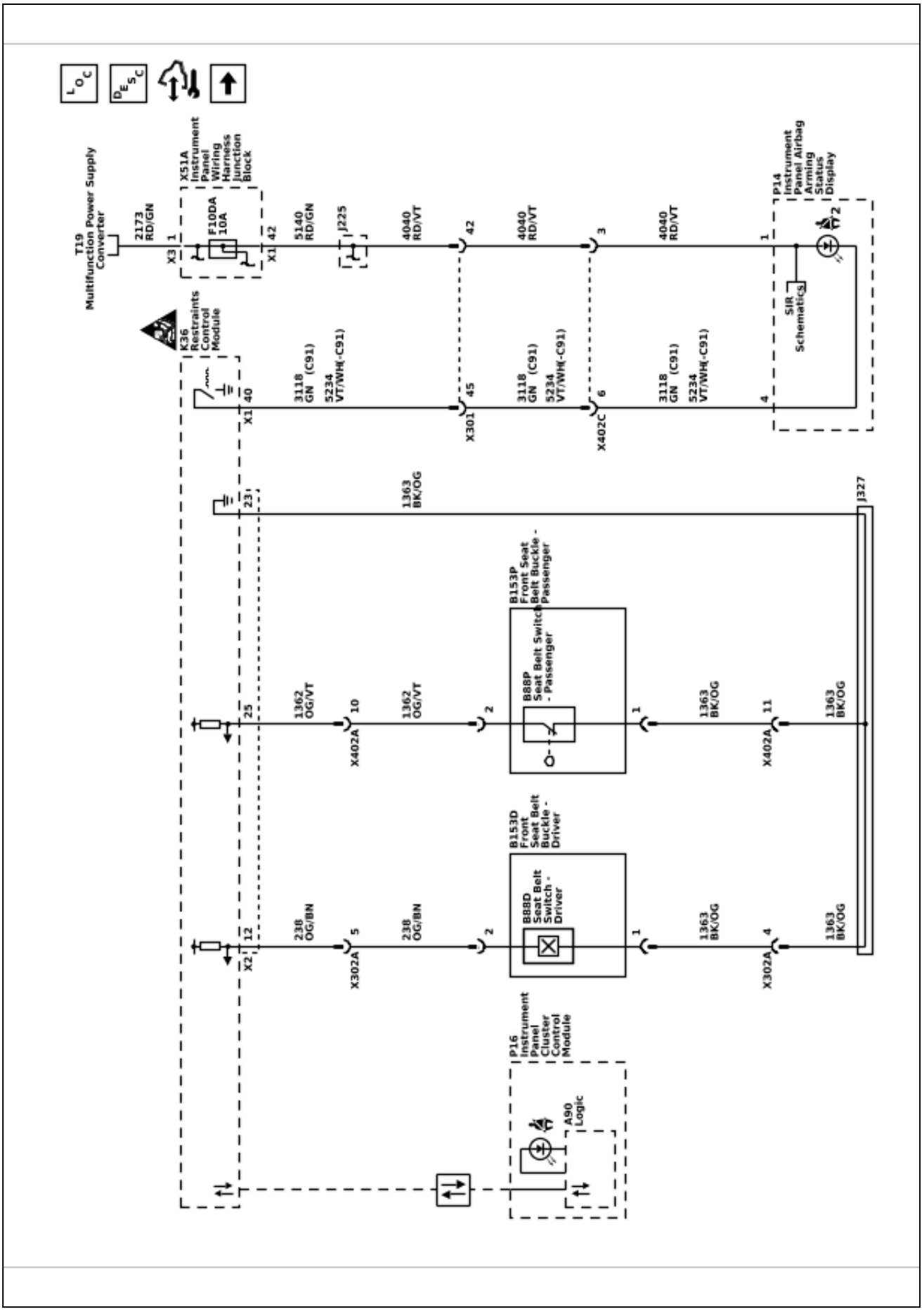
Keyless Entry Personalization

Vehicle lock/unlock functions and remote vehicle start settings may be personalized for the vehicle. This includes the capability of turning the passive entry system completely off. For functional descriptions and programming instructions, refer to the vehicle owners manual.

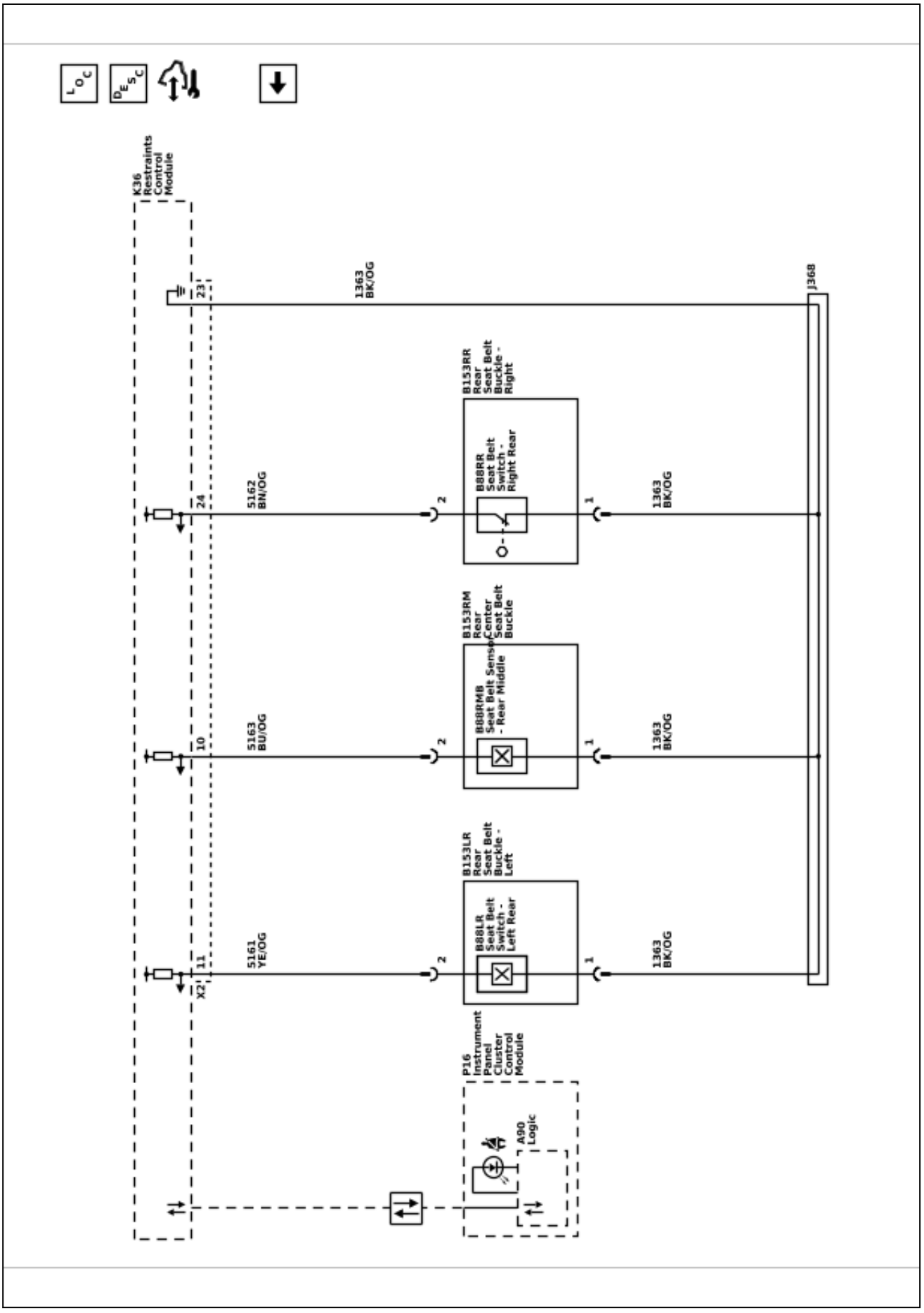
Seat Belts

Schematic and Routing Diagrams

Seat Belt Schematics (Front Seat Belt Switches and Indicator)



Seat Belt Schematics (Rear Seat Belt Switches)



Description and Operation

Seat Belt System Description and Operation

Restraint System

The primary means of occupant restraint are the front and rear seat belts. Seat belts help to keep the occupants inside the passenger compartment and gradually reduce the impact forces during the following events:

- Frontal impact
- Rear impact
- Side impact
- Rollover event

All seat belt retractors have emergency locks. The retractors remain unlocked during normal operation and under normal driving conditions to allow free movement of the upper body of each occupant. The seat belt webbing is locked into position by a pendulum, which causes a locking bar to engage a cog on the spool of the retractor mechanism, when the following conditions occur:

- Rapid extraction of the seat belt webbing from the retractor
- Abrupt change in vehicle velocity
- Operation of the vehicle on a steep slope

The seat belts have an automatic locking (cinch) feature. The cinch feature is activated when the seat belt webbing is completely extended from the retractor. It prevents the webbing from extending beyond the position at which it can retract. Use of the cinch feature is recommended for securing a child seat. The cinch feature may be cancelled by allowing the webbing to wind back completely into the retractor. After the cinch feature is cancelled, the webbing is unlocked. This vehicle is also equipped with a Supplemental Inflatable Restraint (SIR) system. Refer to *Supplemental Inflatable Restraint System Description and Operation 9-46*.

Motorized Seat Belts

A motorized seat belt is a seat belt with a motor coupled to the shoulder belt retractor. The motor performs a reversible, pretightening action (retraction) to reduce the slack in the seat belt. The motorized seat belt provides the driver and passenger a sense of safety and, in the case of severe braking or a crash, more quickly couples the occupant to the vehicle, enhancing the safety to the occupant.

Motorized seat belts monitor vehicle information to determine when to perform each of the following retractions

- Full retraction for such situations but not limited to: panic braking and or skidding
- Dynamic support for lateral and longitudinal dynamics
- Slack removal when the vehicle speed above enable speed

Preconditions for motorized seat belt retractions

- Seat belt buckle is latched
- Vehicle speed greater than or equal to 25 kph (16 mph)
- All messages on serial data are received as valid

Triggers that may cause motorized seat belt retractions

- Emergency Braking
- Sudden Emergency / Panic Braking
- High Vehicle Deceleration Detection
- Ice Braking Detection
- Oversteer and Understeer

Motorized seat belt inputs

- Vehicle Power Mode
- Transmission Gear
- Wheel Speeds
- Vehicle Acceleration
- Accelerator Pedal Position
- Steering Wheel Angle and Gradient
- Yaw Rate and Lat/Long Acceleration
- Brake Pedal Position, Gradient, Pressure, Initial Travel
- Vehicle Stability

Motorized seat belt output signals

- Driver information center message – motorized seat belt Failed “Service Automatic Seatbelt Tightening”
- Driver information center message – motorized seat belt Unavailable “Automatic Seatbelt Tightening Unavailable”

Motorized seat belt retractions are inhibited when seat belt unbuckled.

Driver and passenger motorized seat belts operate independently.

Front Seat Belt System

The front seat belt system includes the driver and passenger seat belts, seat belt reminder indicators, retractors, and anchor pretensioners. They are all part of the SIR system, refer to *Supplemental Inflatable Restraint System Description and Operation 9-46* . The driver seat belt reminder indicator is controlled by a switch in the driver seat belt buckle. The passenger seat belt reminder indicator is controlled by a switch in the passenger seat belt buckle and the Restraint Occupant Classification System Module. For more on the Restraint Occupant Classification System Module, refer to *Supplemental Inflatable Restraint System Description and Operation 9-46*. When the vehicle is on, the seat belt reminder indicator and tone alarm will operate in the following cases:

- The driver seat belt is unbuckled.
- The passenger seat belt is unbuckled while the seat is occupied.

Rear Seat Belt System

The rear seat belt system includes the following components:

- The rear seat belt retractor located at the wheel-house panel and attached to the floor panel.
- The rear seat belt buckles and the center seat belt buckle attached to the seat.

Child Seat Restraint System

Warning: A child in a rear-facing child restraint can be seriously injured if the front passenger air bag inflates, because the back of a rear-facing child restraint would be very close to the inflating air bag. NEVER use a rear-facing child restraint in this vehicle. If a forward-facing child restraint is suitable for your child, ALWAYS move the front passenger seat as far back as it will go and then install the child restraint. Be sure the child restraint position does not conflict with any additional requirements provided by the manufacturer. For more information, refer to the vehicle owner's manual and the instructions that came with the child restraint.

All vehicles are equipped with a dual-mode type retractor with emergency and automatic locking features. The automatic locking feature is for the restraint of a child seat. The child seat can be secured by pulling the seat belt all the way out to lock it, then tightening the seat belt around the child seat. If the child seat has a top strap, the child seat should be anchored. This applies to the seats designed with the top strap provision and for the vehicles sold in Canada. To ensure the correct top strap angle, the child seat is only to be used at the seating position for which the top strap anchor is installed. The child seat should be installed and secured according to the manufacturer's directions.

Seat Belt Reminder Indicators

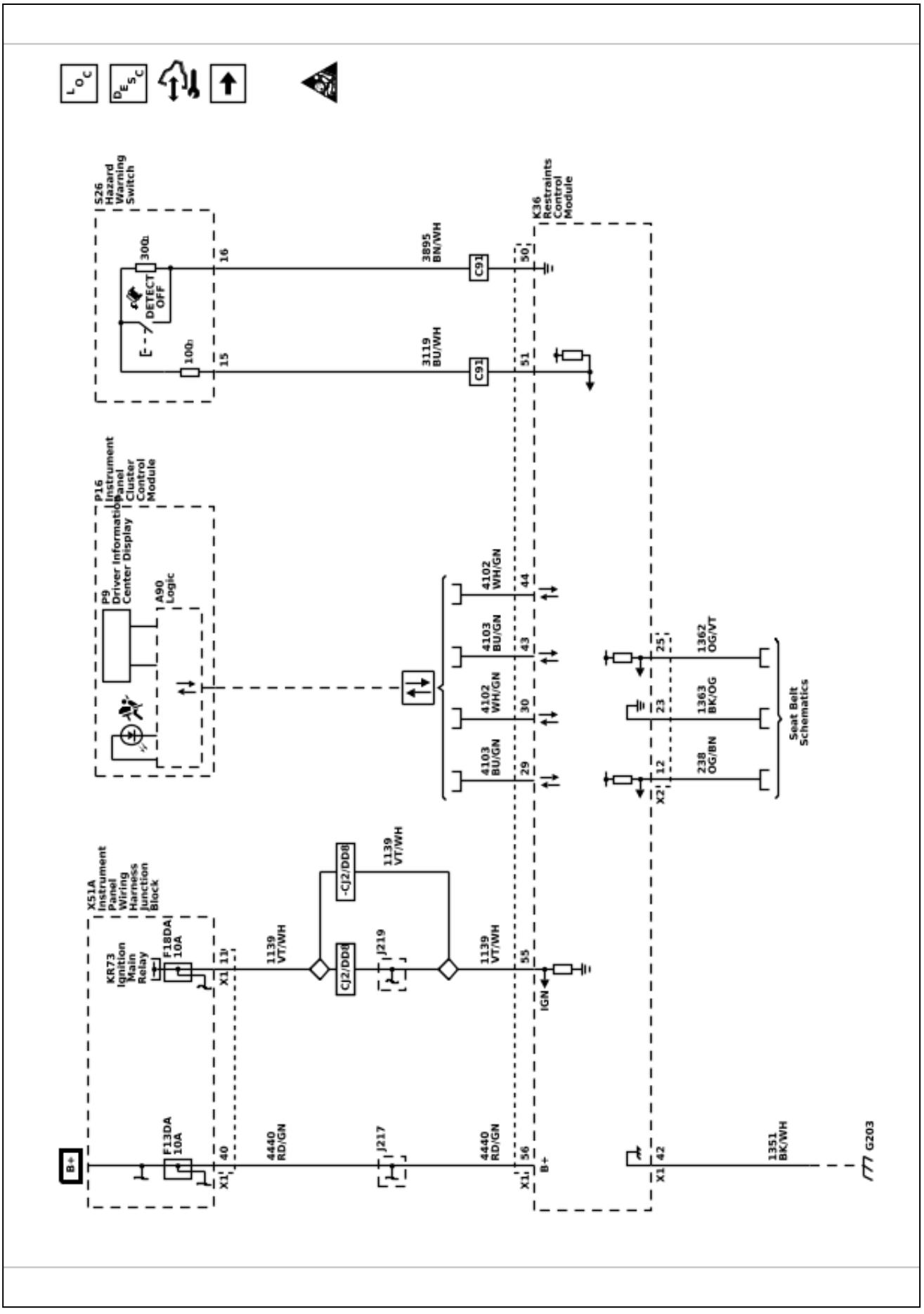
There is a driver seat belt reminder indicator located on the instrument cluster and a passenger seat belt reminder located on the overhead console. There also may have a rear seat belt reminder located in the instrument cluster. The state of the seat belt reminder indicators is determined by the Restraints Control Module. The seat belt reminder indicator illuminates under the following conditions:

- The Restraints Control Module sends the status of the driver seat belt to the instrument cluster via serial data. The passenger seat belt status is sent to the driver information center via serial data. The rear seat belt status is sent to the driver information center via serial data. If any of the seat belts are unfastened, the instrument cluster will send a message requesting a chime sound to be turned ON after a system check.

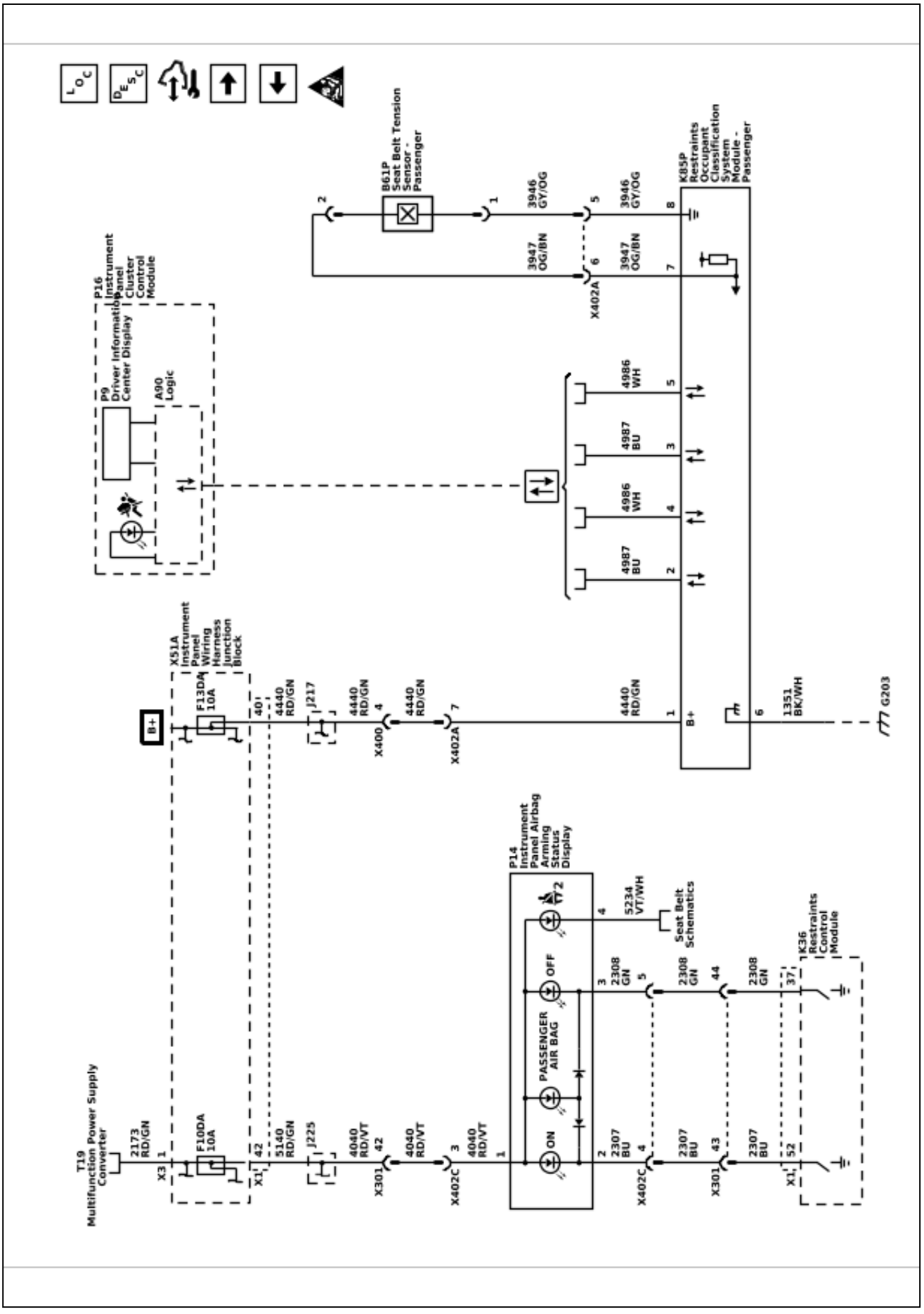
Supplemental Restraints

Schematic and Routing Diagrams

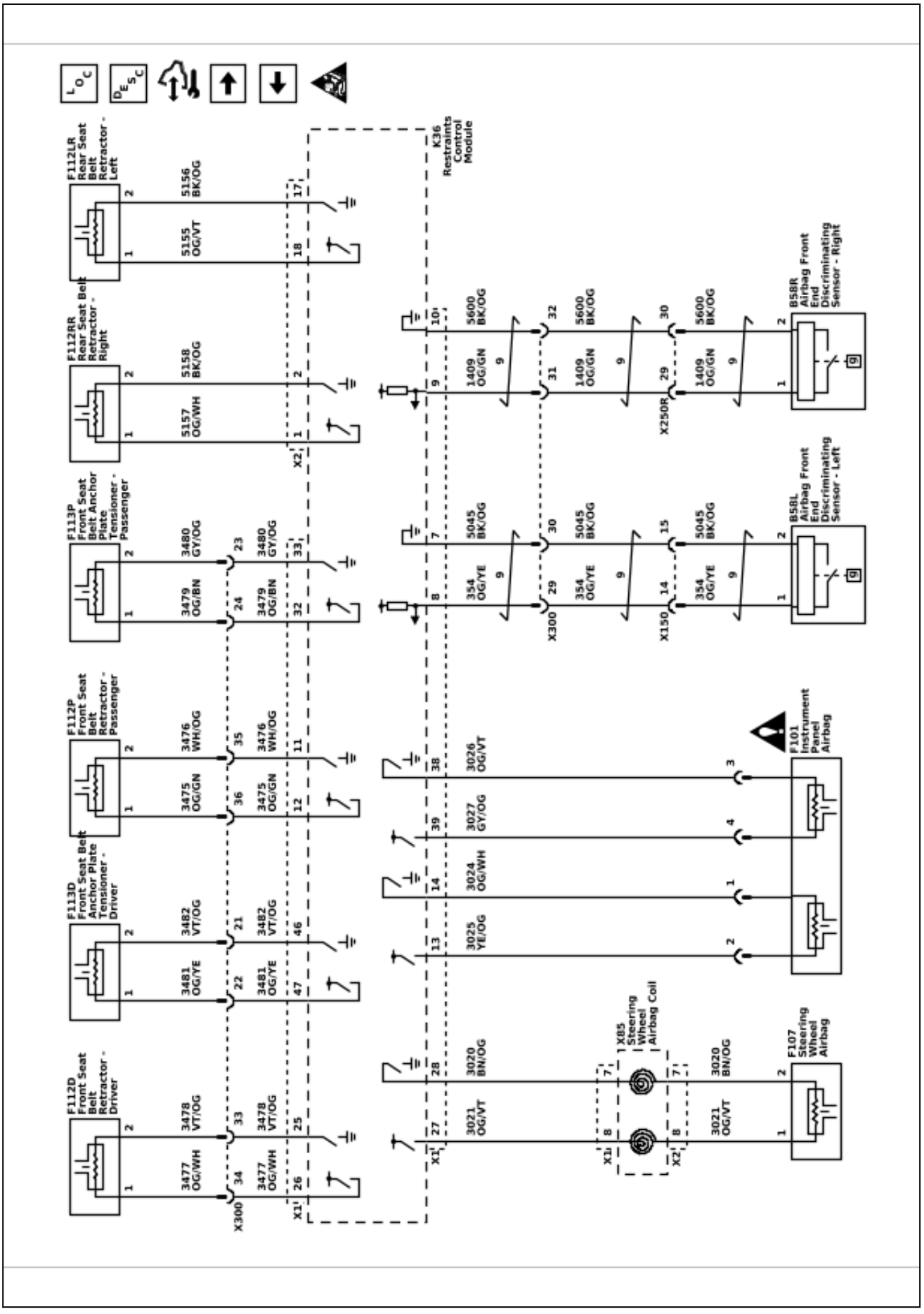
SIR Schematics (Module Power, Ground, Serial Data, Controls, Indicators, and Subsystem References)



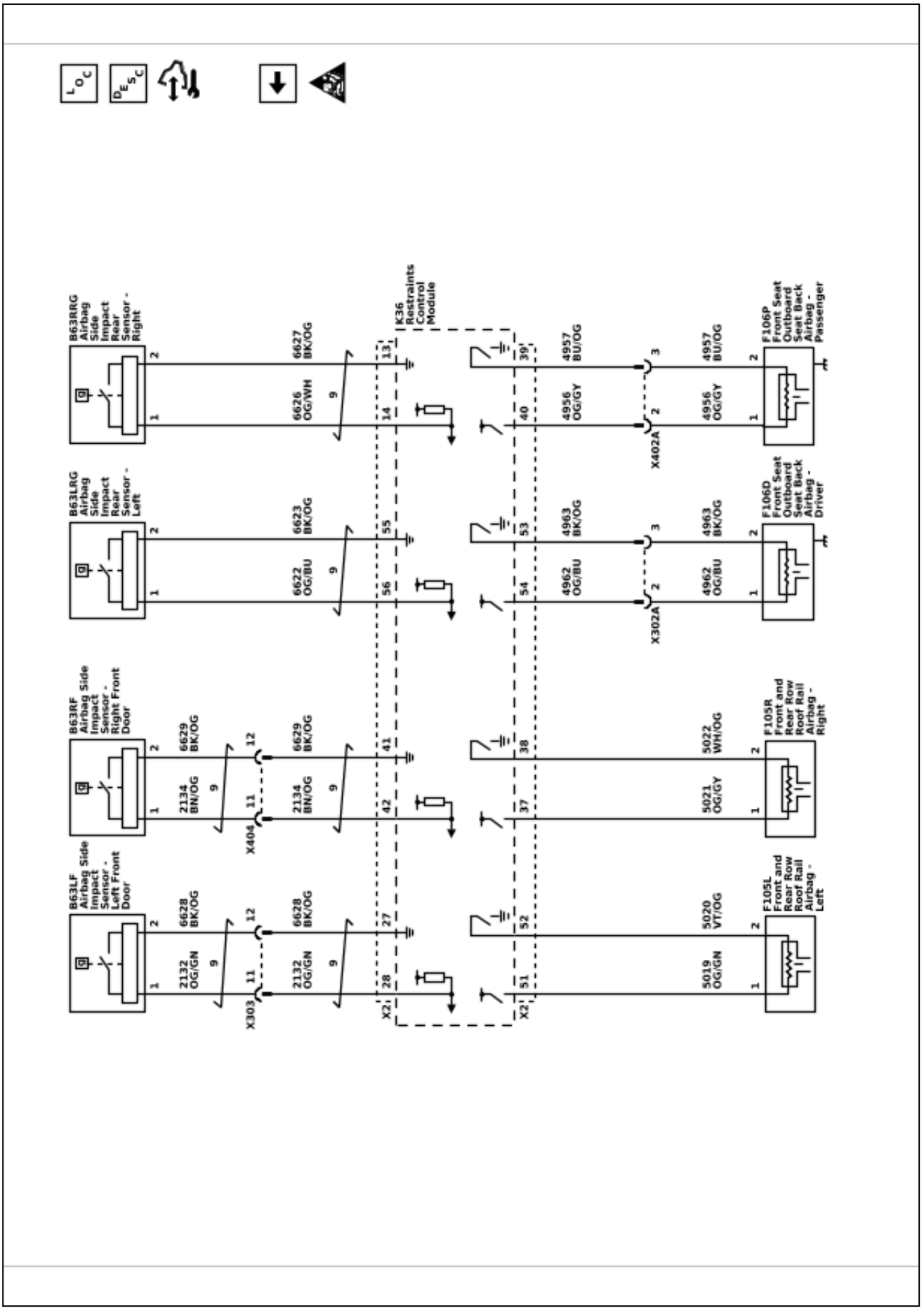
SIR Schematics (Passenger Presence Module)



SIR Schematics (Frontal Impact Sensing and Deployment)



SIR Schematics (Side Impact Sensing and Deployment)



Description and Operation

Supplemental Inflatable Restraint System Description and Operation

The supplemental inflatable restraint (SIR) system, comprised of the Restraints Control module (RCM), impact sensors, Airbags, Restraint Occupant Classification System Module, and seat belt Pretensioners, supplements the protection offered by the seat belts. The RCM determines the severity of a collision using data collected from impact sensors located at strategic points on the vehicle. The RCM processes the information provided by the sensors to provide the safest combination of Airbag and pretensioner deployment. The RCM will deploy the Airbags and Pretensioners if it detects a collision of sufficient force. If the force of the impact is not sufficient to warrant Airbag deployment, the RCM may still deploy the seat belt Pretensioners. The RCM contains a sensing device that translates vehicle acceleration to an electrical signal. The RCM compares these signals to the threshold values stored in memory. If the signals exceed the stored threshold value, the RCM will determine the severity of the event and may deploy restraints. The RCM continuously monitors the deployment loops and electrical components for malfunctions. Upon detection of a circuit malfunction, the RCM will set a DTC and illuminate the SIR system Airbag indicator.

Note: The SIR System may be active up to 30 seconds after the ignition transitions to OFF.

The supplemental inflatable restraint system utilizes the following components:

- Restraints Control Module
- Airbag Indicator
- Airbags
- Seat Belt Pretensioners
- Impact Sensors
- Restraints Occupant Classification System Module (AL0)
- Passenger Airbag Indicator (C99 / AL0)
- Passenger Airbag Disable Switch (C99)
- Seat Belt Tension Sensor
- Seat Belt Indicators
- Event Data Recorder (EDR) Data
- Non-locked event storage overwrite mechanism and over writable event types

Restraints Control Module
The RCM is the control unit for the SIR system. The RCM contains internal sensors in addition to the external impact sensors. The RCM contains sensors which translate vehicle acceleration into an electrical signal, which may be used by other modules. In the event of a collision, the RCM compares the signals from the internal and external impact sensors to a threshold value stored in memory. When the generated signals exceed the stored value, the RCM will cause current to flow through the appropriate deployment loops to deploy the restraints. The RCM records the SIR system status when a deployment occurs and illuminates the SIR system Airbag indicator. The RCM performs continuous diagnostic monitoring of the SIR system electrical components and circuitry when the ignition is ON. If the RCM detects a malfunction, a DTC will set and the RCM will command the instrument cluster to illuminate the SIR system Airbag indicator, notifying the driver that a malfunction exists. If power is lost during a collision, the RCM maintains a limited energy reserve for deployment of the Airbags. It is important when disabling the SIR system for servicing or rescue operations to allow the limited energy reserve to dissipate, which could take up to 2 minutes.

Airbag Indicator
The SIR system Airbag indicator, located in the instrument cluster, is used to notify the driver of SIR system malfunctions and verify that the RCM is communicating with the instrument cluster. When the ignition is turned ON, the RCM is active. The instrument cluster will momentarily turn on the SIR system Airbag indicator. While the indicator is on, the RCM conducts tests on all SIR system components and circuits. If no malfunctions are detected the RCM will communicate with the instrument cluster through the serial data circuit and command the SIR system Airbag indicator to turn OFF. The RCM provides continuous monitoring of the SIR system components and circuits by conducting a sequence of checks. If a malfunction is detected the RCM will set a DTC and command the instrument cluster to illuminate the SIR system Airbag indicator via serial data. The presence of an SIR system malfunction could result in non-deployment of the inflatable restraints or deployment in conditions that normally would not warrant deployment. The SIR system Airbag indicator will remain on for the duration of the malfunction or until the system has been repaired.

Airbags
The vehicle will contain a number of Airbags, depending on vehicle available and optional equipment:

- Steering wheel
- Instrument panel
- Driver seat
- Passenger seat
- Instrument Panel Lower Airbag
- Passenger knee
- Left roof rail
- Right roof rail

To view the locations of the Airbags refer to: [Link target (target-id 62031-) not found] .

Airbags contain a housing, inflatable Airbag, an initiating device, a canister of gas generating material and, in some cases, stored compressed gas. Each Airbag has a discrete deployment loop to supply current and deploy the Airbag. The current passing through the Airbags ignite the material in the canister producing a rapid generation of gas and is some cases, the release of compressed gas. The gas produced from this reaction rapidly inflates the Airbag. Once the Airbag is inflated, it deflates through the Airbag vent holes and/or the bag fabric.

The steering wheel and instrument panel Airbag will either be a dual-stage or a single stage design. A dual-stage Airbag uses two stages of deployment, which varies the amount of restraint to the occupant according to the collision severity. For moderate frontal collisions, the Airbag deploys at less than full deployment which consists of stage 1 of the Airbag. During a more severe frontal collision, a full deployment is initiated which consists of stage 1 and stage 2 of the Airbag.

Seat Belt Pretensioners
The vehicle will contain a number of seat belt Pretensioners, depending on vehicle available and optional equipment:

- Driver – Seat belt anchor
- Driver – Seat belt retractor
- Passenger – Seat belt anchor
- Passenger – Seat belt retractor
- Rear Outboard Left/Right Passenger – Seat belt retractor

To view the locations of the Airbags refer to: [Link target (target-id 62031-) not found] .

The seat belt Pretensioners consist of a housing, seat belt retractor, seat belt anchor, seat belt webbing, initiator, and a canister of gas generating materials. The initiator is part of the seat belt pretensioner deployment loop. When the vehicle is involved in a collision of sufficient force, the RCM causes current to flow through the seat belt deployment loops to the initiator. Current passing through the initiator ignites the material in the canister producing a rapid generation of gas. The gas produced from this reaction deploys the seat belt Pretensioners which removes the slack in the seat belts. Depending on the severity of the collision, the seat belt Pretensioners may deploy without the frontal inflator modules deploying, or they will deploy immediately before the frontal inflator modules deploy.

Impact Sensors
The vehicle will contain a number of impact sensors, depending on vehicle available and optional equipment:

- Front Impact Sensor — Left
- Front Impact Sensor — Right
- Side Impact Sensor — Left Front
- Side Impact Sensor — Right Front
- Side Impact Sensor — Left Middle
- Side Impact Sensor — Right Middle
- Side Impact Sensor — Left Rear
- Side Impact Sensor — Right Rear

To view the locations of the Airbags refer to: [Link target (target-id 62031-) not found] .

The impact sensors contain a sensing device which monitors vehicle acceleration or pressure to detect collisions that are severe enough to warrant Airbag deployment. The impact sensors are not part of the deployment loop, but instead provide input to the RCM.

Restraints Occupant Classification System Module
The Restraints Occupant Classification System Module is used to monitor the type of occupant that is sitting in the front passenger seat and communicate the status to the RCM. The RCM then uses this information to determine whether to enable or suppress the deployment of the passenger instrument panel Airbag. The Restraints Occupant Classification System Module consists of an electronic control module, a sensor mat in the seat, Seat Belt Tension Sensor (if equipped), and a harness.

Passenger Airbag Indicator
The passenger Airbag indicator identifies the status of the instrument panel Airbag. The RCM will momentarily turn on the passenger Airbag indicators after ignition is turned ON. If an occupant is not detected in the passenger seat or the occupant type is not suitable for Airbag deployment, the Restraints Control module will illuminate the passenger Airbag OFF indicator. If an occupant is detected in the passenger seat, the Restraints Control module will illuminate the passenger Airbag ON indicator.

Seat Belt Tension Sensor
The seat belt tension sensor (if equipped) is mounted on the passenger seat belt retractor to measure the seat belt tension. If the shoulder portion of a passenger seat belt is fully extended, the infant car seat restraint locking feature may be engaged, disabling the passenger Airbag.

Passenger Airbag Disable Switch
The passenger Airbag disable switch provides the means to manually disable the ability for the passenger instrument panel Airbag to deploy. The vehicle has a

passenger Airbag status indicator to inform the driver when the passenger Airbag is on or off based on the disable switch position.

Seat Belt Indicators
The seat belt indicators are controlled by the RCM. For further information on seat belt indicators refer to: *Seat Belt System Description and Operation 9-39*.

Event Data Recorder (EDR) Data
The vehicle is equipped with an event data recorder (EDR). When a specific collision or similar condition occurs (such as airbag deployment or hitting a road obstacle), the recorder records the data related to vehicle dynamics and safety systems within a short period of time, such as the status of occupant safety components, status of accelerator/brake pedals, vehicle speed, etc., helping understand the operating conditions of vehicle systems.

The data elements recorded by EDR mainly include the following data:

No.	Data Element	Data Source	Collection Method
A1	Longitudinal delta V	EDR acceleration sensor in EDR controller	None
A2	Maximum recorded longitudinal delta V	EDR acceleration sensor in EDR controller	None
A3	Time to maximum recorded longitudinal delta V	EDR acceleration sensor in EDR controller	None
A4	Clipping flag	Since B1 lateral acceleration has been recorded, it is not necessary to record the clipping flag	None
A5	Vehicle velocity	Wheel speed sensor, transmitted via CAN bus after calculation	CAN bus
A6	Service brake, on or off	Brake pedal position sensor, transmitted via CAN bus after calculation	CAN bus
A7	Driver safety belt status	Driver seat belt buckle	Hard wire
A8	Accelerator pedal position, percentage of fully open position	Accelerator pedal position sensor, transmitted via CAN bus after calculation	CAN bus
A9	Revolution Per Minute (RPM)	Engine crankshaft position sensor, transmitted via CAN bus after calculation *Not required for electric vehicles	CAN bus *Not required for electric vehicles
A10	Power-on cycle at event	EDR controller	None
A11	Power-on cycle at reading	EDR controller	None
A12	Complete status of event data record	EDR controller	None
A13	Time interval from this event to the last event	EDR controller	None
A14	Vehicle Identification Number(VIN)	EDR controller	None
A15	ECU hardware number	EDR controller	None
A16	ECU serial number	EDR controller	None
A17	ECU software number	EDR controller	None
B1	Longitudinal acceleration	EDR acceleration sensor in EDR controller	None

No contents related to intelligent control are available now for Level A elements above.

The recorded vehicle speed data is obtained from the on-board CAN bus. They are obtained by a vehicle speed sensor connected to other modules on the vehicle (such as engine control or transmission control module or new energy control, etc.), and transmitted and released via CAN bus after calculation.

The above data can be extracted by purchased general on-board diagnostic tools that meet the requirements in SAE J1962 and ISO 15765 and their referenced standards. (Such as CDR tools from BOSCH or MDI2 tools used at SAIC General Motors service stations)

Non-locked event storage overwrite mechanism and over writable event types

Locking Conditions:

- Deployment event of irreversible restraints will be permanently locked.

- Non-deployment events will be locked, but become non-locked events after 255 ignition cycles.

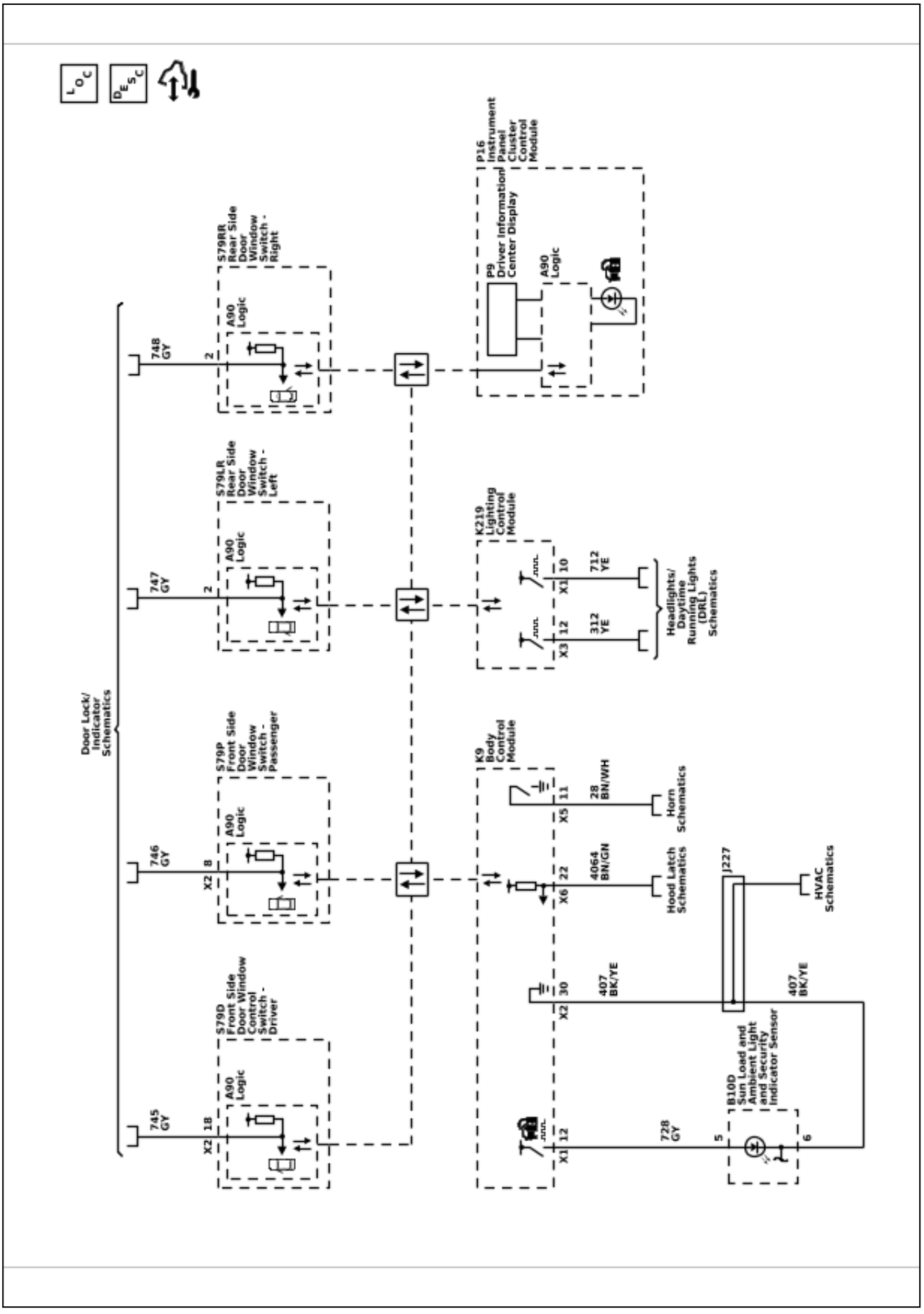
Overwrite Mechanism:

- Permanently locked events will not be overwritten. Only the non-locked EDR events can be overwritten, overwriting the earliest event first.
- If the EDR storage space is insufficient, the deployment events of irreversible restraints can overwrite any non-deployment events.
- If the EDR storage space is insuficcient, the non-deployment events can overwrite any non-deployment events that become non-locked after 255 ignition cycles.

Theft Deterrent

Schematic and Routing Diagrams

Theft Deterrent System Schematics (Content Theft Deterrent Indicator, Inputs, and Outputs)



Description and Operation

Theft Systems Description and Operation

When armed, the content theft deterrent system is designed to deter vehicle content theft by pulsing the horns and exterior lamps for approximately 30 seconds when an unauthorized vehicle entry is detected. However, the content theft deterrent system does not affect engine starting.

An unauthorized entry can be any of the following with the content theft deterrent system armed:

- Unauthorized entry into the engine area
- Unauthorized entry into the vehicle compartments
- When any door is opened without using the UNLOCK command from a keyless entry transmitter
- After a battery reconnect, if the battery was disconnected with the content theft deterrent system armed

The components of the content theft deterrent system are:

- Body Control Module (BCM)
- Remote control door lock receiver
- Security indicator
- Door ajar switches
- Hood ajar switch
- Liftgate ajar switch, if equipped
- Intrusion sensor, if equipped
- Intrusion sensor disable switch, if equipped
- Glass breakage sensor, if equipped
- Alarm siren, if equipped

Arming the Content Theft Deterrent System

Use the following procedure in order to arm the system:

1. Place the vehicle in P (park).
2. Ignition OFF/Vehicle OFF.
3. Open any door.

Note: The system is not armed if the doors are locked manually; the power door lock switch or remote keyless entry transmitter must be used to arm the content theft deterrent system.

4. Lock the doors with the power door lock switch or by pressing the LOCK button on the transmitter. The system is in standby mode and will not start the arming timer until all doors are closed.
5. The system will begin the arm sequence immediately after the last door is closed. If the keyless entry transmitter is used to arm the system after the vehicle doors are closed, the arm sequence will begin as soon as the LOCK command is received from the transmitter.
6. Pressing the LOCK button on the keyless entry transmitter a second time will bypass the delayed arming function and force the system to arm.

Locking the Vehicle Without Arming the Content Theft Deterrent System

Locking the vehicle may be accomplished without arming the content theft deterrent system. Use of the manual door locks will lock the vehicle, but will not arm the content theft deterrent system.

Disarming an Armed System/Silencing an Alarm

If system arming has been requested by the power door lock switch or the keyless entry transmitter, it must be disarmed.

Note: Disconnecting the battery or removing fuses does not disable the arm or alarm modes, since the BCM stores the content theft deterrent mode status in memory.

- To disarm the content theft deterrent system in standby mode, perform one of the following:
  - Press the UNLOCK button on the keyless entry transmitter.
  - Approach the vehicle with a valid keyless entry transmitter and pull the vehicle door handle.
  - Turn the ignition ON/Vehicle ON.
- To disarm the content theft deterrent system in the armed mode (non-event) or when activated (during an alarm event):
  - Press the UNLOCK button on the keyless entry transmitter.
  - Turn the ignition ON/Vehicle ON.

Content Theft Deterrent Circuit Description

The following is a description of each component used in the content theft deterrent system:

Body Control Module
The content theft deterrent system is an internal function of the BCM which utilizes serial data and various switch inputs information to perform content theft deterrent functions. When the BCM detects an unauthorized entry, it activates the horns and exterior lamps. The BCM has 4 basic modes (disarmed, standby, armed, and alarm) for operating the content theft deterrent system. The different modes are described below.

1. The BCM has the content theft deterrent system in a disarmed mode until the following conditions are detected:

- Ignition OFF/Vehicle OFF.
- Doors locked by either the power door lock switch or the LOCK button on the transmitter.

2. The BCM enters the standby mode when the above conditions are detected. If a door was already opened when the arm mode was requested, the standby mode does not start the timer until the last door is closed.
3. When the last door is closed, a 15 second timer is activated. Once the timer has expired, the BCM enters the armed mode. After this delay, any unauthorized entry will activate the alarm mode.
4. When the BCM detects an unauthorized entry, the BCM enters the alarm mode. The BCM activates the horns and exterior lamps for 30 seconds. This is followed by a three minute time-out with the horn no longer active. If no new intrusions are detected after the time-out, the horn is not active. The system must be disarmed or the intrusion condition removed after the time-out for the system to exit alarm mode.

Remote Control Door Lock Receiver
The keyless entry system can arm and disarm the content theft deterrent system. When the remote control door lock receiver receives a door lock or unlock signal from the transmitter, the remote control door lock receiver sends a message to the BCM via serial data to perform the appropriate arm/disarm functions.

Security Indicator
The security LED is illuminated on the upper I/P by the BCM. The content theft deterrent system uses the security LED to inform the driver of system status prior to arming.

Door Ajar Switches
The content theft deterrent system uses the door ajar switches as a status indicator to activate the alarm. The door ajar switches are monitored by the body control module via a discrete input from each door ajar switch. If the BCM receives a signal indicating a door is opened when the content theft deterrent system is armed, the BCM activates the alarm.

Hood Ajar Switch
The content theft deterrent system uses the hood ajar switch as a status indicator to activate the alarm. The BCM monitors the hood ajar switch via a discrete input from the switch. If the BCM receives a signal indicating the hood has been opened when the content theft deterrent system is armed, the BCM activates the alarm.

Liftgate Ajar Switch
The content theft deterrent system uses the liftgate ajar switch as a status indicator to activate the alarm. The BCM monitors the liftgate ajar switch via a discrete input from the switch. If the BCM receives a signal indicating the liftgate has been opened when content theft deterrent system is armed, the BCM activates the alarm.

Intrusion Sensor
The intrusion sensor is located in the overhead console and uses two ultrasonic sensors to detect any motion inside the vehicle. If motion is detected inside the vehicle while the content theft deterrent system is armed, the system will transition to the alarm mode. The intrusion sensor also acts as an inclination sensor. The inclination sensor determines the vehicles level when the content theft deterrent system is armed. If the vehicle level is changed while the system is armed, such as being lifted by a tow truck or raised with a jack, the alarm will be activated. The intrusion sensor can be disabled using the intrusion sensor disable switch. The intrusion sensor disable switch also shows the intrusion sensor status using a status LED.

Glass Breakage Sensor
The glass breakage sensors (if equipped) are located on the rear side windows and are supplied battery voltage at all times. The BCM monitors the glass breakage sensor signal circuit. If the rear side glass is broken, the glass breakage sensor signal circuit will open and the BCM will enter the alarm mode.

Alarm Siren
The content theft deterrent system uses the alarm siren as an audible alert device to alert individuals near the vehicle that a vehicle intrusion is occurring. The siren is supplied battery voltage and ground for operation and communicates with the body control module (BCM) via a dedicated LAN circuit.

Inputs
The BCM monitors the following inputs for content theft deterrent:

- Door ajar switches
- Keyless entry transmitter LOCK/UNLOCK buttons; a message from the remote control door lock receiver
- Immobilizer status—The BCM uses the immobilizer status for disarming the system or silencing an alarm when the correct vehicle key is used to start the vehicle
- Liftgate ajar switch
- Hood ajar switch
- Intrusion sensor
- Glass breakage sensor

Outputs
The BCM controls the following for content theft deterrent:

- Horn relay
- Exterior lamps
- Alarm siren

Section 10

Seats

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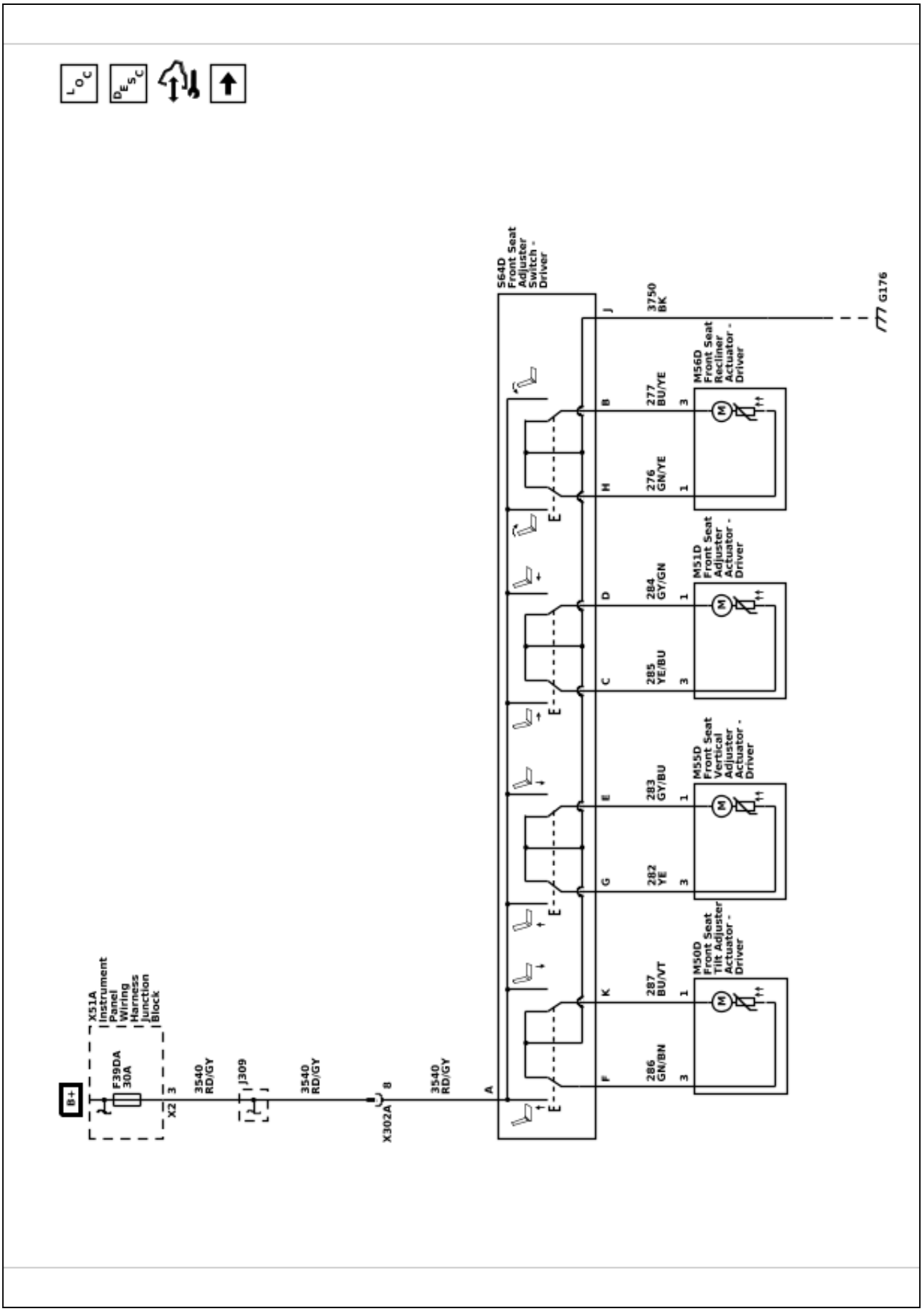
Seats

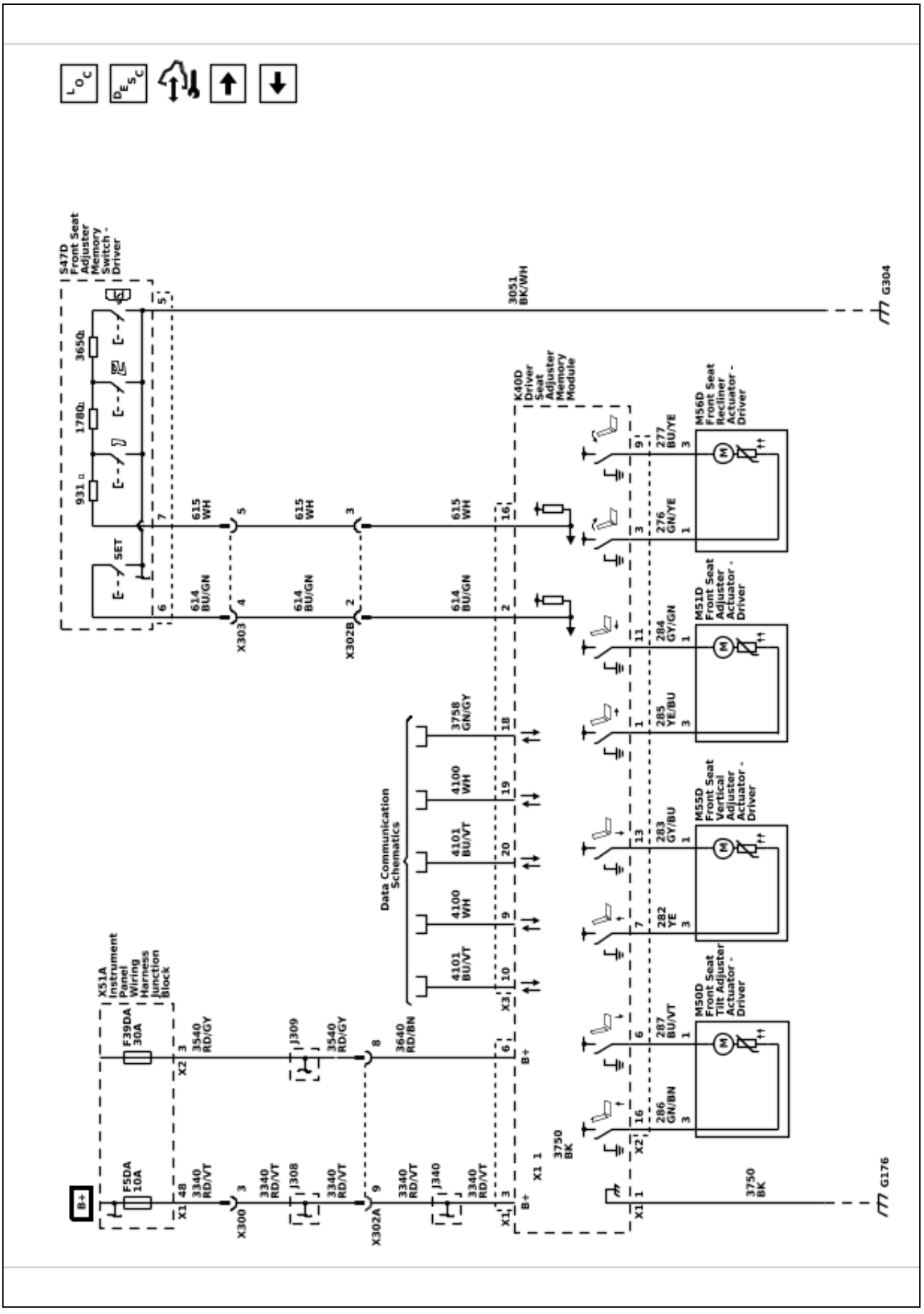
Power Seats

Schematic and Routing Diagrams

Driver Seat Schematics (Power Seat (A2X - A45))



Driver Seat Schematics (Module Power, Ground, Serial Data, Motors, and Memory Controls (A45))



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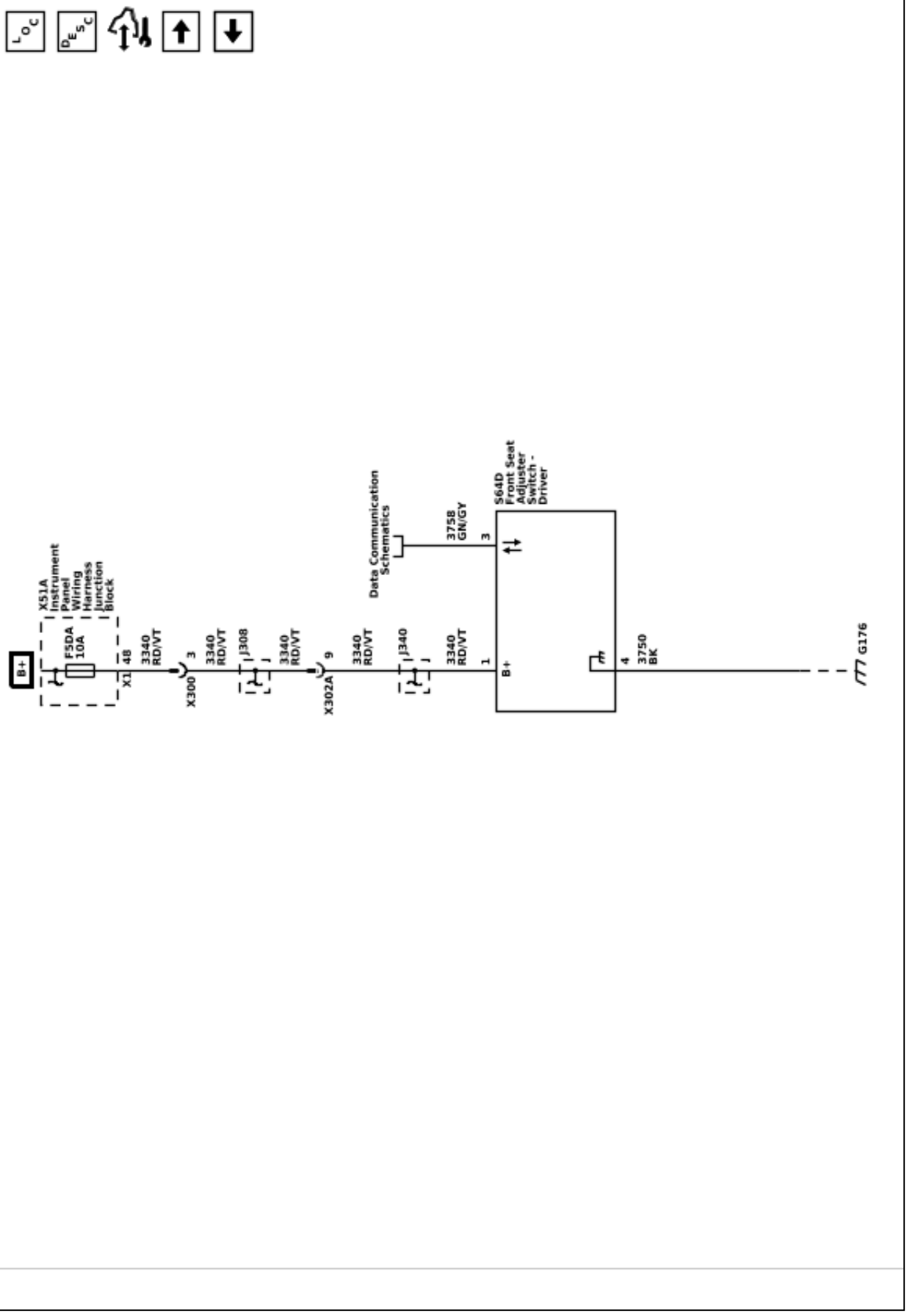
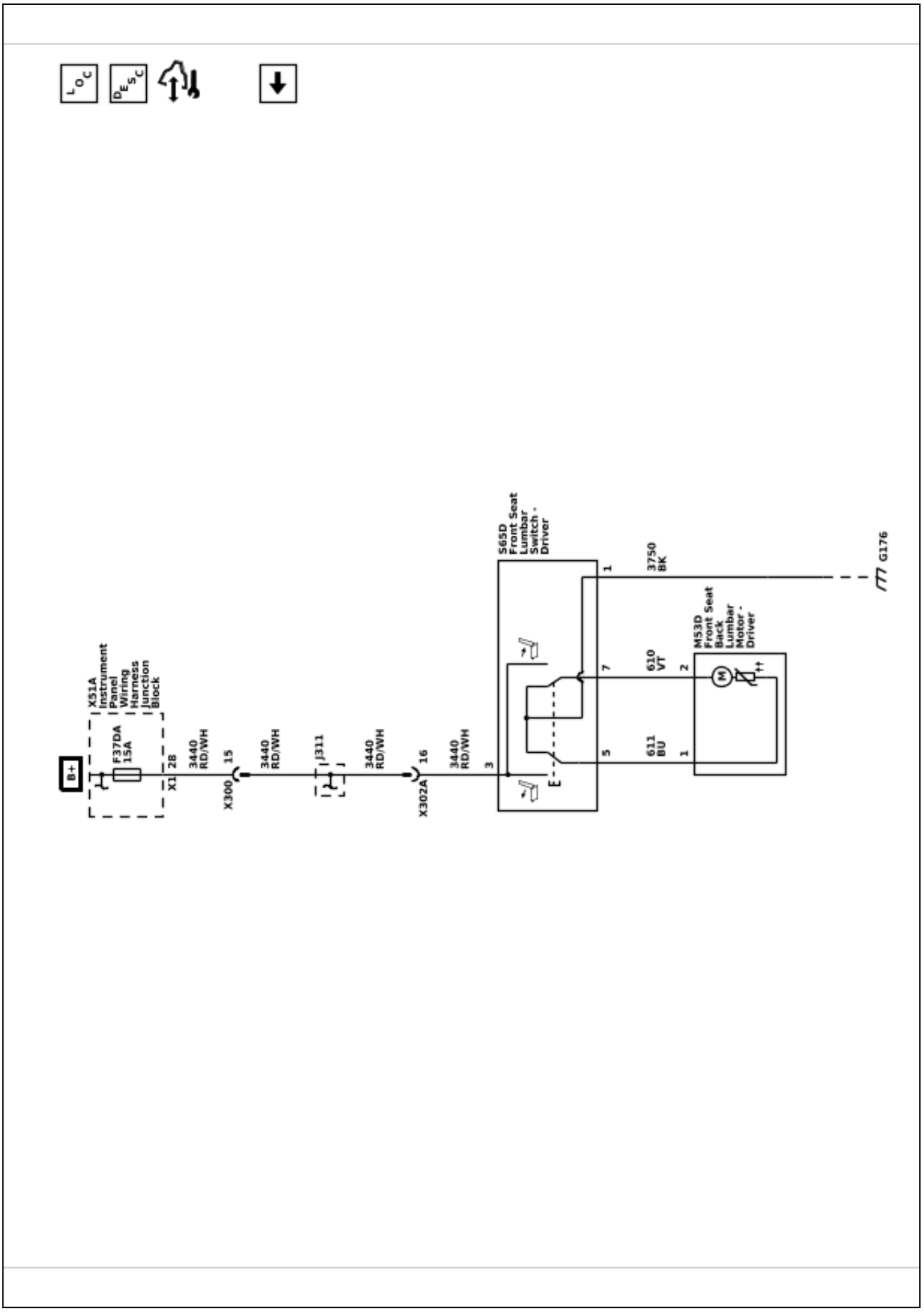
Driver Seat Schematics (Seat Adjuster (A45))



Driver Seat Schematics (Seat Lumbar/Bolster (A2X))



Description and Operation

Power Seats System Description and Operation

The driver and passenger power seat systems each consist of the following components:

- Seat adjuster switch
- Seat horizontal motor
- Seat front vertical motor (If Equipped)
- Seat rear vertical motor
- Seat recline motor

Seat Motors

The seat switches provide both power and ground to the selected seat motors.

All of the seat motors operate independently of each other. Each motor contains an electronic circuit breaker (PTC) that opens in the event of a circuit overload and will reset only after voltage has been removed from the circuit. There are four seat position motors and two lumbar motors. These are the horizontal motor, front vertical motor, rear vertical motor, and the seat back recline motor. The seat horizontal motor moves the entire seat forward and rearward. The seat vertical motors may operate independently to tilt the front or rear of the seat cushion up or down. Both motors can also run simultaneously to move the entire seat up or down. The recline motor moves the angle of the seat back forward or rearward.

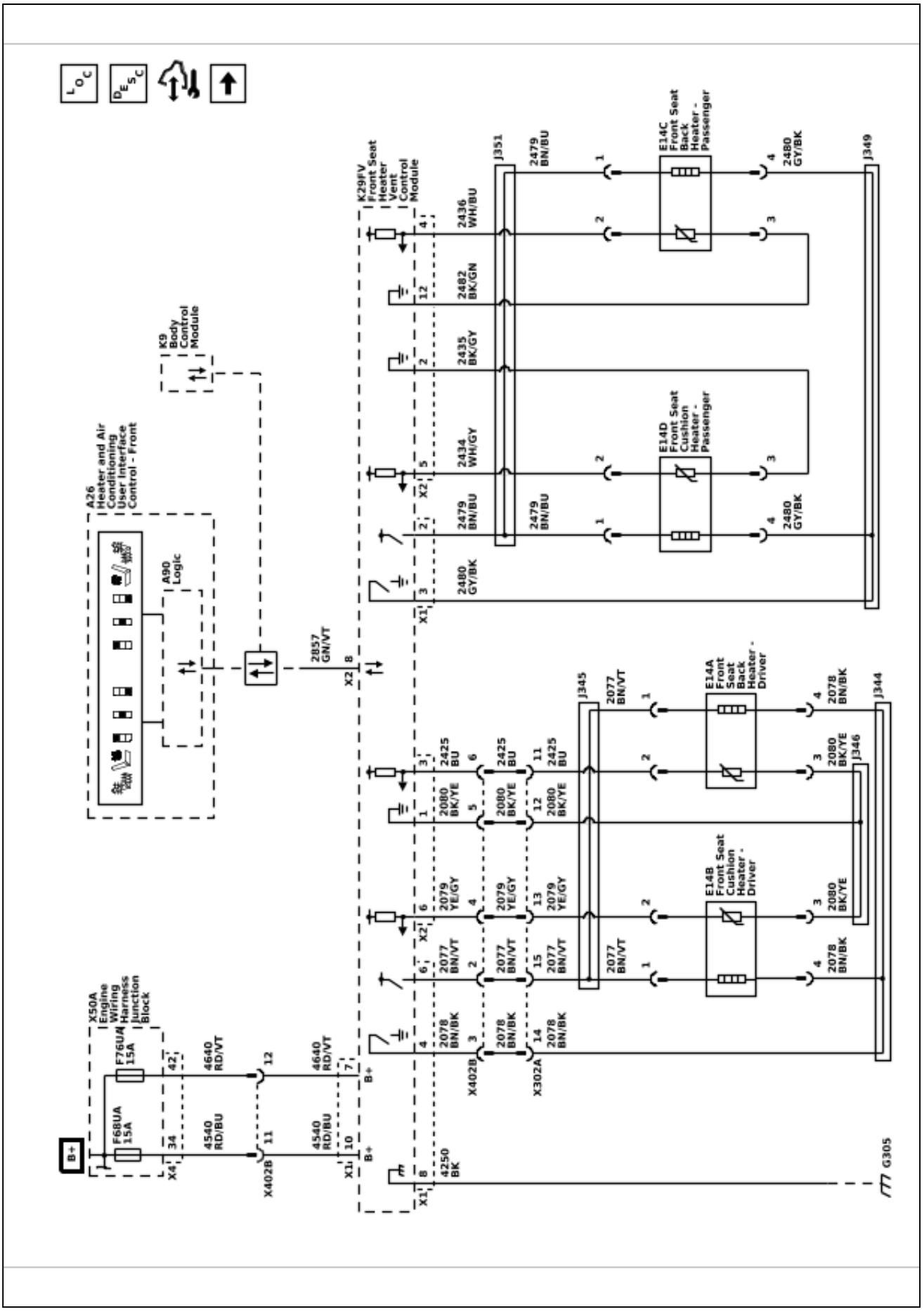
Seat Operation

All seat motors are reversible. For example, when the seat horizontal forward switch is pressed to move the entire seat forward, battery voltage is applied through the switch contacts and the seat horizontal motor forward control circuit to the motor. With the horizontal motor rearward switch contacts closed to the switch ground circuit, the motor runs in order to drive the entire seat forward until the switch is released. Moving the entire seat rearward works similarly to moving the entire seat forward, except that battery voltage and ground are applied on opposite circuits causing the motor to run in the opposite direction. All seat motors are powered this way.

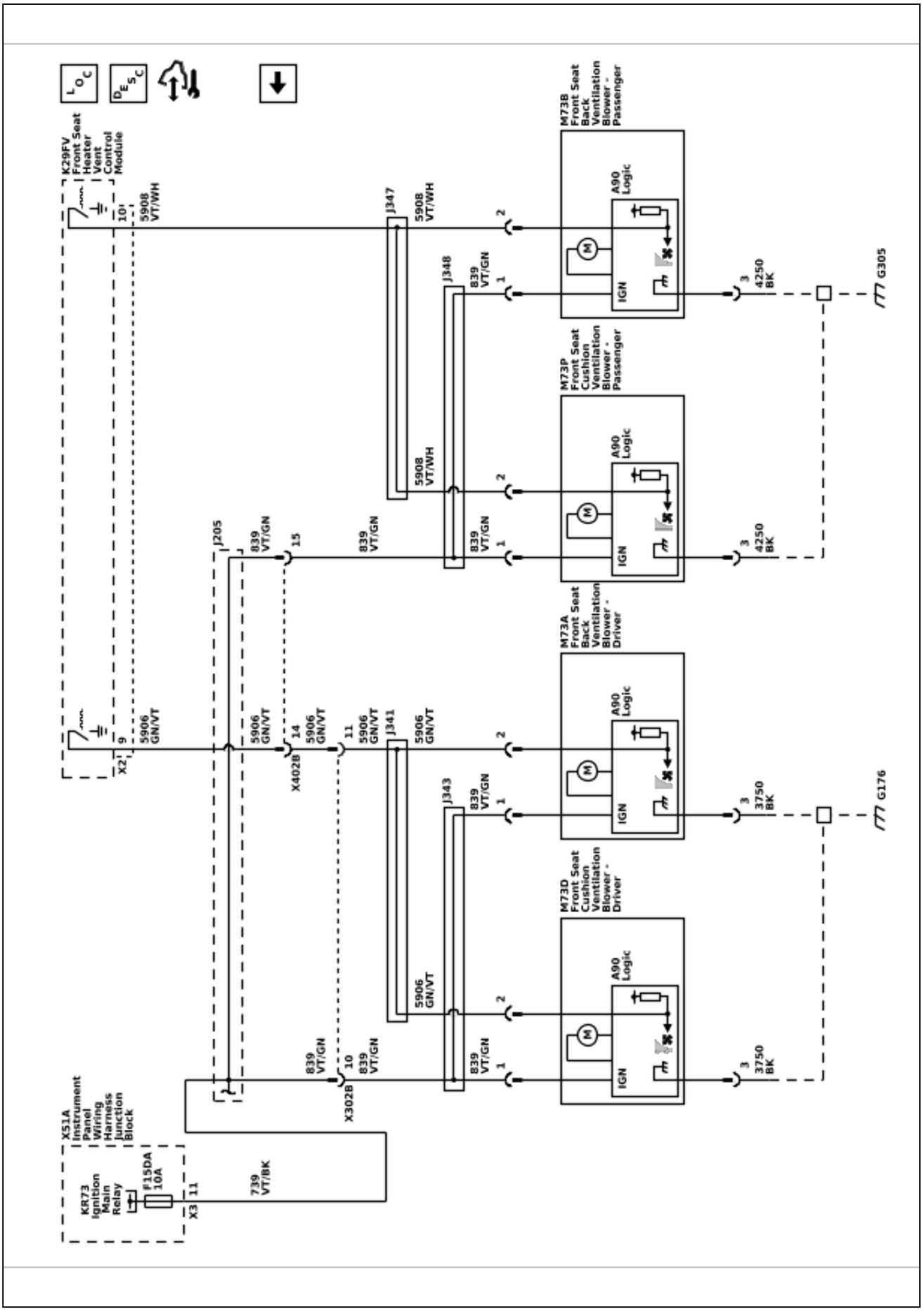
Seat Heating and Cooling

Schematic and Routing Diagrams

Heated/Cooled Seat Schematics (Heated Seats (KA1))



Heated/Cooled Seat Schematics (Vented Seats (KU9))



Description and Operation

Heated/Vented Seat Description and Operation

Heated and Vented Seat Components

The heated/vented seat system consists of the following components:

- Heated and vented seat switches
- Body control module
- Front seat heater control module
- Driver seat cushion heating element
- Driver seat cushion temperature sensor
- Driver seat back heating element
- Driver seat back temperature sensor
- Driver seat cushion blower motor
- Driver seat back blower motor
- Passenger seat cushion heating element
- Passenger seat cushion temperature sensor
- Passenger seat back heating element
- Passenger seat back temperature sensor
- Passenger seat cushion blower motor
- Passenger seat back blower motor

Heated/Vented Seat Switches

The driver and passenger heated and vented seat switches are located near the HVAC controls on the center stack. The BCM is the heated and vented seat system master. It monitors heated/vented seat switch activations to determine user requested operating mode. Based on the requested operating mode, the BCM sends a LIN Bus serial data message to the front seat heater control module how to drive the self-regulated heating pads or ventilation motors. The BCM also controls the indicators used to provide the operator with feedback as to the operating status of the system. With each press of the switch, the system will cycle through High, Medium, Low, and then back to Off again. The BCM also controls the seat temperature and mode indicators, via the serial data line, used to provide the operator with feedback as to the operating status of the system.

Heated Seat Operation

The front seat heater control module controls heated seat operation for the driver and passenger seats. When active, power is applied to the seat cushion and back heater elements through a common pulse width modulated (PWM) voltage supply control circuit. Each individual heater element is switched to ground by the module through a common low side drive control circuit.

When inactive the front seat heater control module connects the heating element low side outputs to a common reference point internal to the module which is biased to approximately 3.5 V. The module uses this biased voltage in order to check the high side and low side control circuits for a short to battery or ground before enabling the driver and passenger seat heating elements. During heated seat operation, the front seat heater control module interrupts control of the heating elements every 10 s for approximately 10 ms to make this biased voltage check.

With both the seat cushion and seat back heater elements disconnected, if the high side output of the module is measured it will display a low current 12 V bleed off voltage. This bleed off voltage does not have a meaningful diagnostic purpose. With one or both of the heater elements connected you would just see the 3.5 V biased voltage from this circuit.

Temperature Regulation

The seat back and cushion temperature sensors (thermistors) are packaged with the seat heating elements located just under the seat covers. The front seat heater control module supplies each temperature sensor with a 5 V reference signal circuit and a low reference circuit. The module monitors the voltage from the signal circuit to determine the temperature of the seat.

The temperature sensor varies in resistance based on the temperature of the heating element causing the signal voltage to change. Once the module senses the seat reached the set temperature, it will then begin regulate the current flow through the heater elements in order to maintain the desired seat temperature based on the feedback voltage from the sensor.

If the heated seats are on high, the temperature level may automatically be lowered after approximately 30 min of operation.

Front Vented Seat Operation

Each vented seat consists of 2 blower motors blower motors; one in the seat back and one in the seat cushion. During vented seat operation, the vented seat blower motors move cabin air through channels in the foam pad and small holes in the seat covers causing a cooling effect to the occupant.

With the Vehicle ON, battery voltage from the ignition main relay is applied through a 10 A fuse located in the rear body fuse block to the seat cushion and seat back blower motors. Ground for each blower motor is provided through separate ground circuits and a common ground connection.

When the front seat heater control module receives a ventilation seat command, it sends a low side drive pulse width modulation (PWM) signal through the blower motor control circuit to the seat back and cushion blower motors indicating the seat ventilation command. The logic in the blower motors sets the blower speed to the switch set point. The blower motors run causing a cooling effect to the occupant.

Auto Heated Seat Operation with Vehicle ON

Refer to Heated and Ventilated Front Seats and Vehicle Personalization in the Owner's Manual for information regarding Auto Heated and Ventilation Seat operation.

Heated and Cooled Seat Operation During Remote Start

Refer to Vehicle Personalization in the Owner's Manual for Remote Start Auto Heated and Ventilation Seats.

During remote start, the heated seats will turn ON when the ambient temperature is below 10° C (50° F).

During remote start, the seat ventilation system will turn ON when the ambient temperature is above 27° C (80° F).

Load Shed Management

The electrical power management function is designed to monitor the vehicle electrical load and determine when the battery is potentially in a high discharge condition. The heated seat system is one of the vehicle loads that is subject to reduction during a battery discharge condition. For more information on load management refer to *Electrical Power Management Description and Operation 5-76*.

Section 11

Steering

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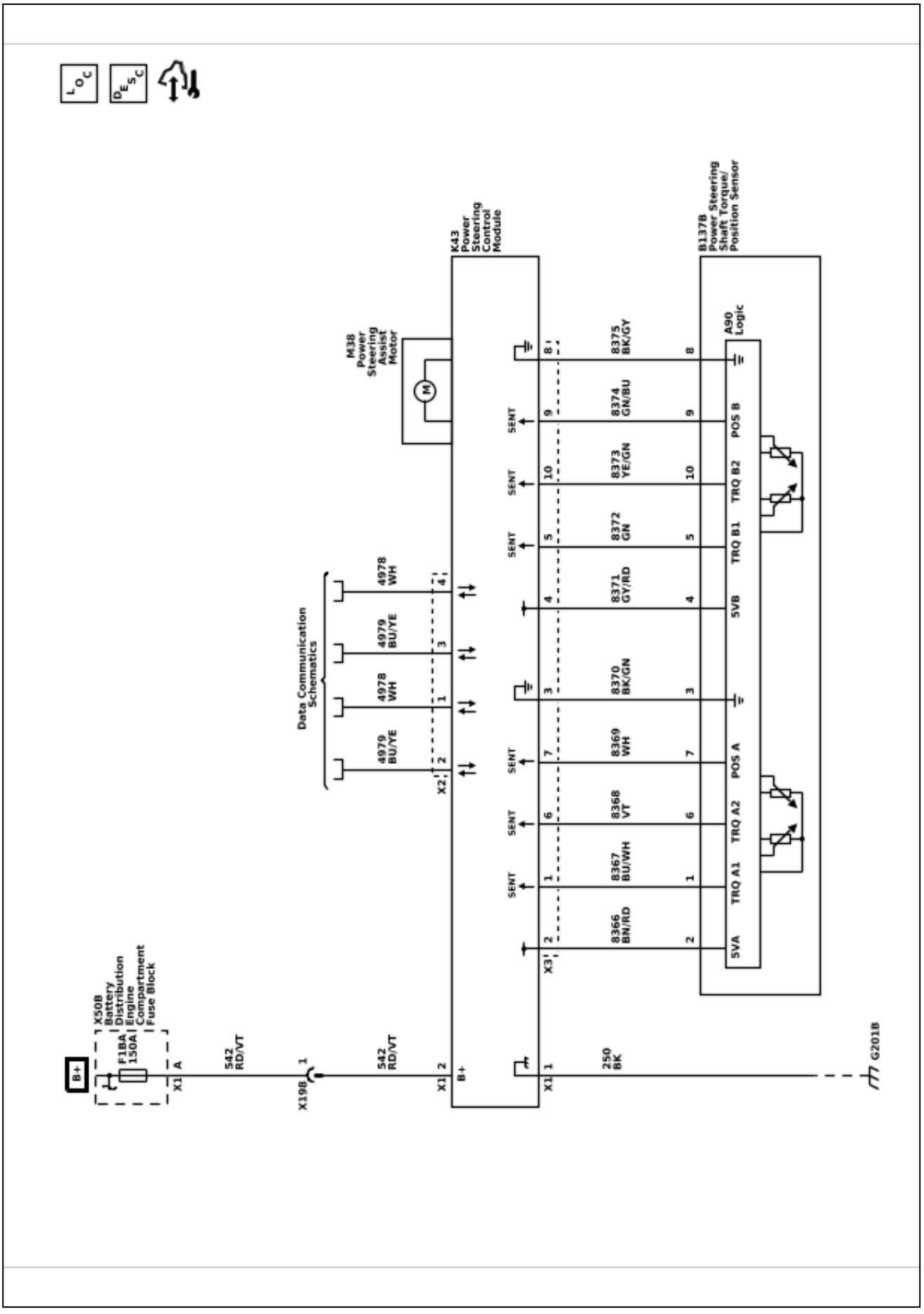
Steering

Power Steering

Schematic and Routing Diagrams

Power Steering Schematics (Electric Power Steering)



Description and Operation

Power Steering System Description and Operation

The belt driven electronic power steering system consists of the following components:

- A belt drive and a ball nut mechanism
- A power pack; containing the power steering control module, its sensors, the power steering motor
- A torque sensor
- The steering gear (rack and pinion)

The belt driven electric power steering system reduces the amount of effort needed to steer the vehicle by utilizing the power steering control module to control the power steering motor to maneuver the steering rack. The power steering control module uses input from the torque sensor, motor rotational sensor, battery voltage circuit and CAN 5 serial data circuit to determine the level of motor assist. Vehicle speed and engine speed from the CAN 5 serial data circuit is also used to adjust the amount of steering assist needed to steer the vehicle. At low speeds more assist is provided for easy turning during parking maneuvers. At higher speeds less assist is provided for improved road feel and directional stability

To account for mechanical wear in the steering gear, the electronic power steering system contains a feature called Center Compensation. The power steering control module learns the amount of friction contained within the steering gear and as parts begin to wear mechanically, it will add torque compensation to maintain the original feel of the steering gear.

The torque sensor is attached to the steering gear housing near the input shaft, and is critical to proper operation of the electronic power steering system. As the steering wheel is turned and torque is applied to the steering shaft, the torque sensor monitors the amount of input torque.

The power steering control module responds to the torque sensor and motor rotational sensor by commanding current to the power steering motor.

The power steering control module and motor are attached to the base of the steering gear housing, and applies power assist through the belt drive and ball nut mechanism to the steering rack. The ball nut mechanism translates the rotational movement of the belt drive system to lateral movement of the steering rack. The power steering control module has the ability to detect malfunctions within the electric power steering system. Any malfunction detected that disables steering assist will cause the SERVICE POWER STEERING message to be displayed on the driver information center. Additionally, the power steering control module calculates an internal system temperature which is used to protect the power steering system from damage caused by high temperature. When the calculated temperature exceeds a pre-determined level the amount of current commanded to the power steering motor is reduced. This will result in a temporary reduced level of assist. Full assist will return once the calculated temperature drops below the pre-determined level.

Lead and Pull Compensation will actively learn and compensate for any offset in steering torque when driving straight down the road. This value needs to be reset in the scan tool after the following procedures:

- Wheel alignment
- New tires installed
- Any complaint of vehicle pulling in a direction

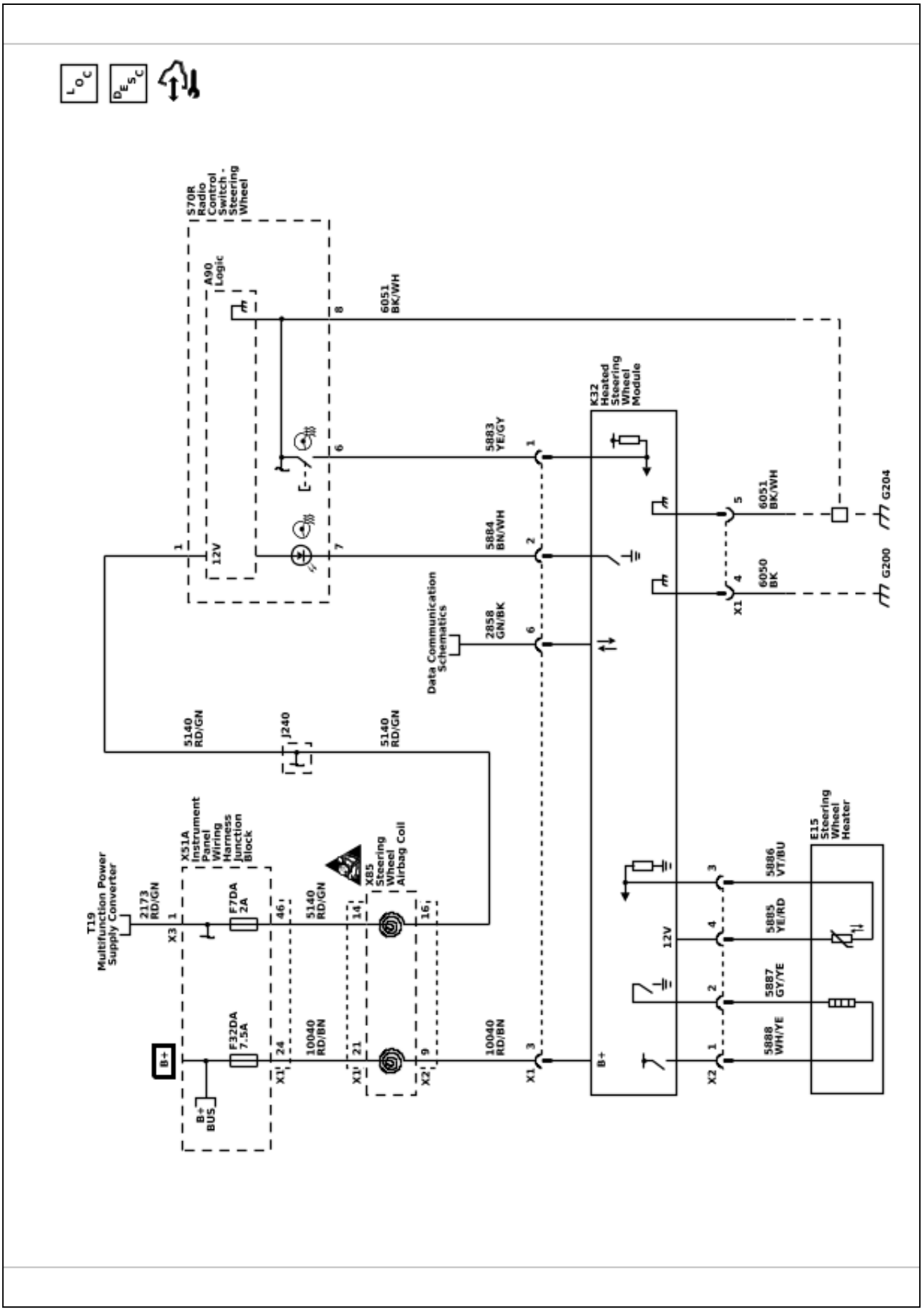
After reset the vehicle must power down for the changes to take place.

The power steering system contains two torque sensors and two steering angle sensors for redundancy in order to limit situations where total loss of assist occur. If a malfunction occurs in only one of the two sensors, the power steering system will continue to provide steering assist for a short period of time.

Steering Wheel and Column

Schematic and Routing Diagrams

Steering Wheel Schematics (Heated Steering Wheel (KI3))



Description and Operation

Steering Wheel and Column Description and Operation

Column Lock (if equipped)

The Column Lock Module (CLM) controls the steering wheel theft deterrent lock function, which allows the column to be electronically locked. When a valid key is used to start the vehicle, the BCM recognizes this and will send the encrypted password to the CLM. The CLM will compare its own stored password to the encrypted password sent by the BCM. If the data matches, the steering column will be unlocked.

In order for the steering column to be locked the CLM has to see 3 inputs.

1. The BCM power mode is OFF.
2. The vehicle is stationary based on zero speed reported from all ABS wheel speed sensors.
3. The driver door is reported open by the BCM.

When the CLM receives these inputs, the steering column will be locked.

The CLM monitors the column lock system and will set DTC codes when the module detects malfunctions within the system. When a malfunction occurs the driver information center (DIC) will display the Service Column Lock Now message indicating DTC codes are set within the CLM. The immobilizer system will prevent vehicle starting if there is a fault or no communication with the CLM.

Tilt/Telescoping Description (if equipped)

The steering column has a tilt/telescoping control system that consists of an electronic control module capable of LIN message communication, a steering column power assembly with positioning actuators and sensors, and a steering column control switch.

Column Position Module has two versions of operation:

1. N38 – Power Steering Column-Tilt/Telescope, and A45 – Memory Seats

   The column position module will wake up either by the LIN bus or by the tilt/telescope steering column switch. The memory seat module is the master and column position module is the slave. All DTCs and the data from column position module are reported through the LIN bus and stored in the memory seat module.

2. N38 – Power Steering Column-Tilt/Telescope Only

   The column position module will wake up with the tilt/telescope steering column switch. No DTCs or data is available. Vehicle symptoms will cause the customer to bring the vehicle in for service.

Tilt/Telescoping Switch Operation

The tilt/telescope steering column has a four-position switch. The switch may be used to adjust the position of the steering wheel in or out which is telescope and up or down which is tilt. The position of the column may be changed as follows:

- Press the switch up to tilt the column up.
- Press the switch down to tilt the column down.
- Press the switch forward and the column moves toward the front of the vehicle.
- Press the switch rearward and the column moves toward the rear of the vehicle.

Actuators

Both the tilt and telescoping actuators are reversible. For example, the tilt actuator moves the column both up and down. When the column position module receives an input to move the column up, the column position module supplies battery positive voltage and ground to the tilt actuator in order to move the column up. When the column position module receives a column down input, the column position module supplies battery positive voltage and ground to the same actuator, but with reverse polarity. When the voltage polarity is reversed, the actuator runs in the opposite direction and moves the column down.

Position Sensors with A45 Memory Seats

Two position sensors are Hall Effect sensors and are used by the column position module. The column position module provides a 5 V reference voltage and a ground to both the tilt and telescoping position sensors. The sensor feedback circuit voltage varies from 0–5 V. Each sensor is part of the actuator assembly. When the actuator rotates, the voltage of the sensor varies on the scan tool. The column position module monitors the feedback voltage to determine the column position.

Without the A45 Memory Seat option, scan tool data is not available.

Tilt/Telescoping Memory with A45 Memory Seats
Memory settings and the personalization of steering wheel positions are available with the tilt/telescoping steering column only with the A45 Memory Seat option. The data stored consists of entry positions and exit positions. The entry position is the position that the steering column moves in when the ignition is turned ON. The exit position is the direction that the steering column moves in when the ignition is turned OFF and the driver's door is opened. The memory seat module stores memory positions and commands column position module to move actuators to specific positions through a LIN message.

An initial memory setting is set in the memory seat module at the assembly plant. This setting may be changed by the customer at any time.

Without the A45 Memory Seat option, memory settings, personalization, and the entry and exit function is not available.

Driver Safety

The steering wheel and column has safety features to protect the driver. The following components may be mounted on or near the steering column:

Energy-Absorbing Steering Column: The energy-absorbing steering column compresses in the event of a front-end collision, which reduces the chance of injury to the driver. The energy-absorbing feature, collapsible steering shaft, and break away mounting features help reduce the injury in the event of an accident.

Heated Steering Wheel (if equipped)

The heated steering wheel system consists of a heated steering wheel, a heated steering wheel switch, and a steering wheel heat module. The heated steering wheel includes non-serviceable heating elements and a temperature sensor. The heating elements and sensor are located in the left and right sides of the rim of the steering wheel. The heated steering wheel switch is located in the left steering wheel control switch assembly. The steering wheel heat control module is located at the bottom of the steering wheel center hub. When the switch is pressed, the switch signal circuit is grounded and the heat module turns the heated steering wheel on. The system then remains on until the customer turns it off. The wheels normal operating temperature is 32°C (89.6°F). The wheel takes approximately 3 to 4 minutes to reach the normal operating temperature. The wheel will take longer to heat up if the vehicle temperature is below -21°C (-5.8°F). The built-in temperature sensor provides input to the controller to limit the temperature to the normal operating temperature. The wheel will not operate if the vehicle temperature is at or above 32°C (89.6°F).

The heated steering wheel control module is on the LIN bus. This allows the heated steering wheel to be activated during remote vehicle start.

For vehicles equipped with UKL, the K180S Driver Monitoring System Module controls the steering wheel heater, the steering wheel LED display and the steering wheel touch sensors. The K180S Driver Monitoring System Module - Steering Wheel is integral to the steering wheel and cannot be replaced by itself. The K180S Driver Monitoring System Module - Steering Wheel is also a LIN device to the K124 Image Processing Module.

Section 12

Transmission

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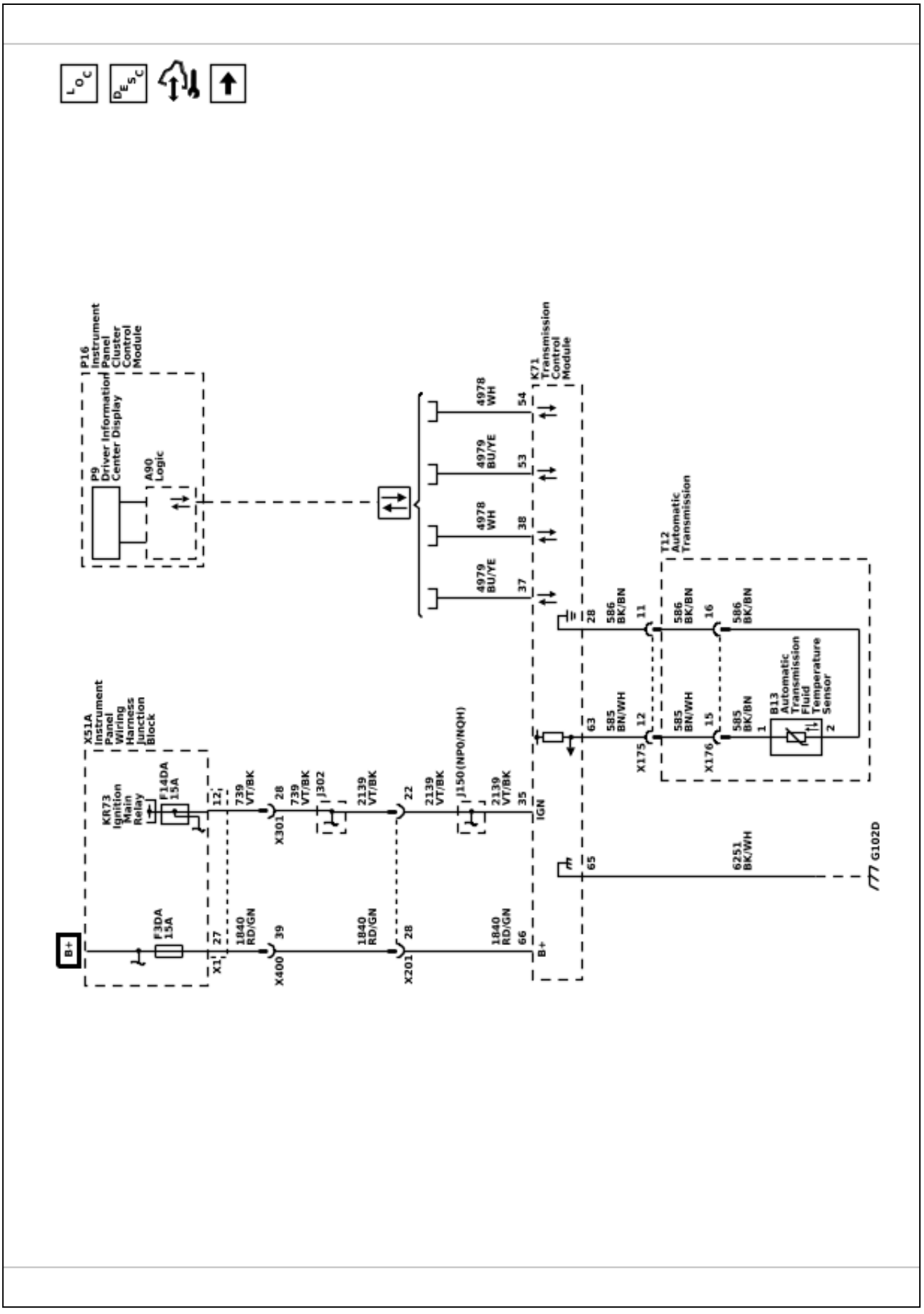
Transmission

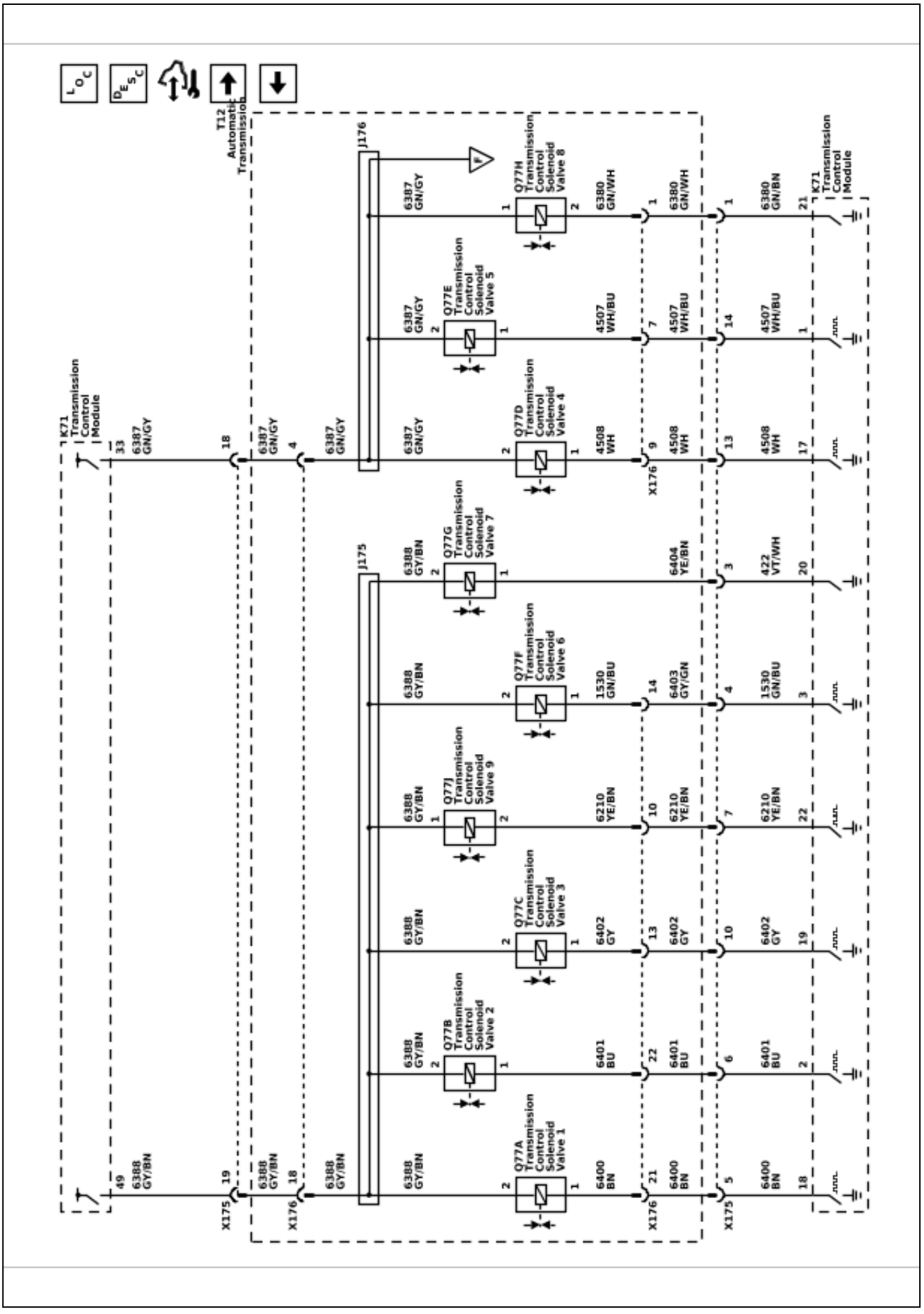
Automatic Transmission - 8L45/8L80

Schematic and Routing Diagrams

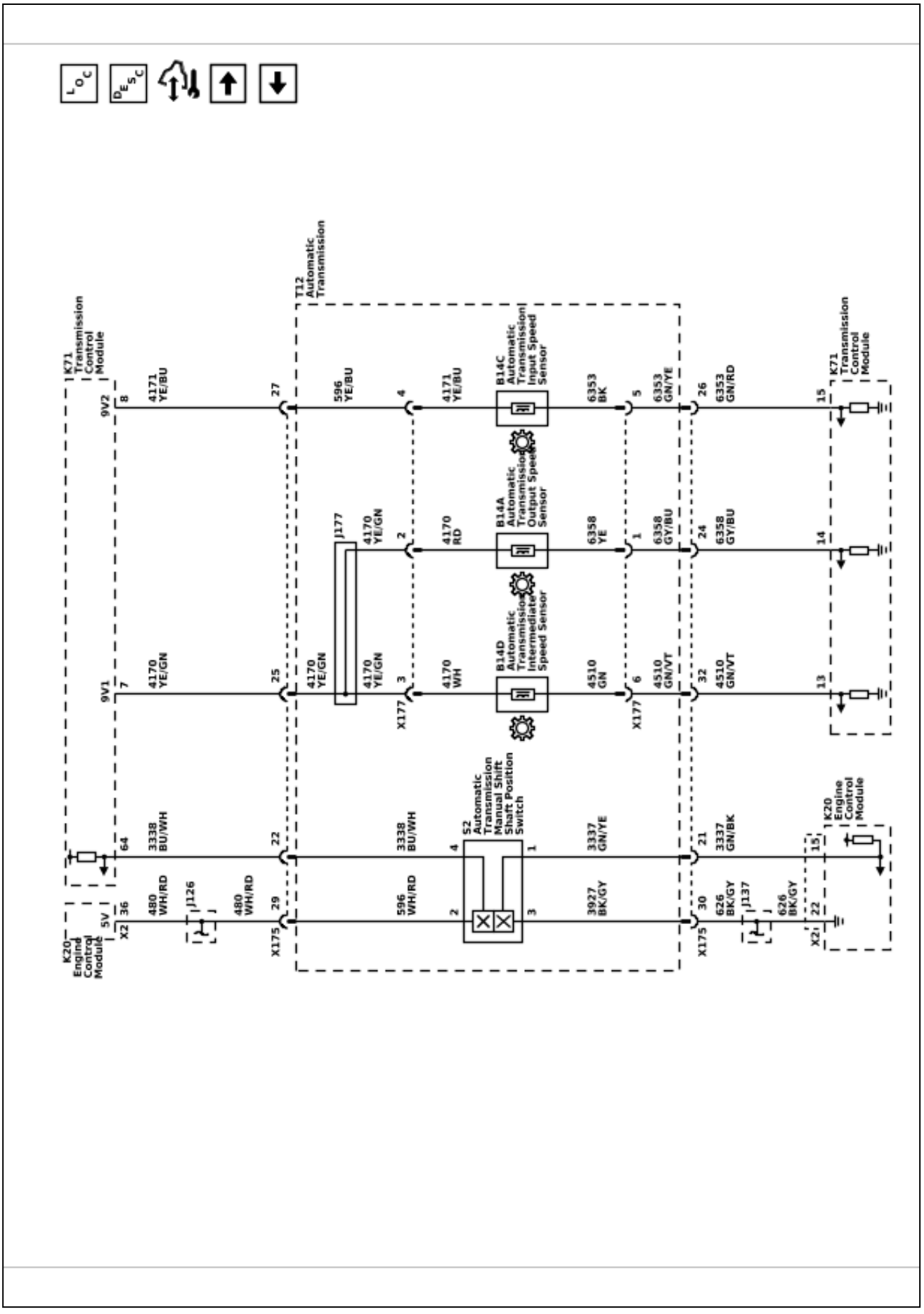
Automatic Transmission Controls Schematics (Power, Ground, Serial Data, MIL and Fluid Temperature)



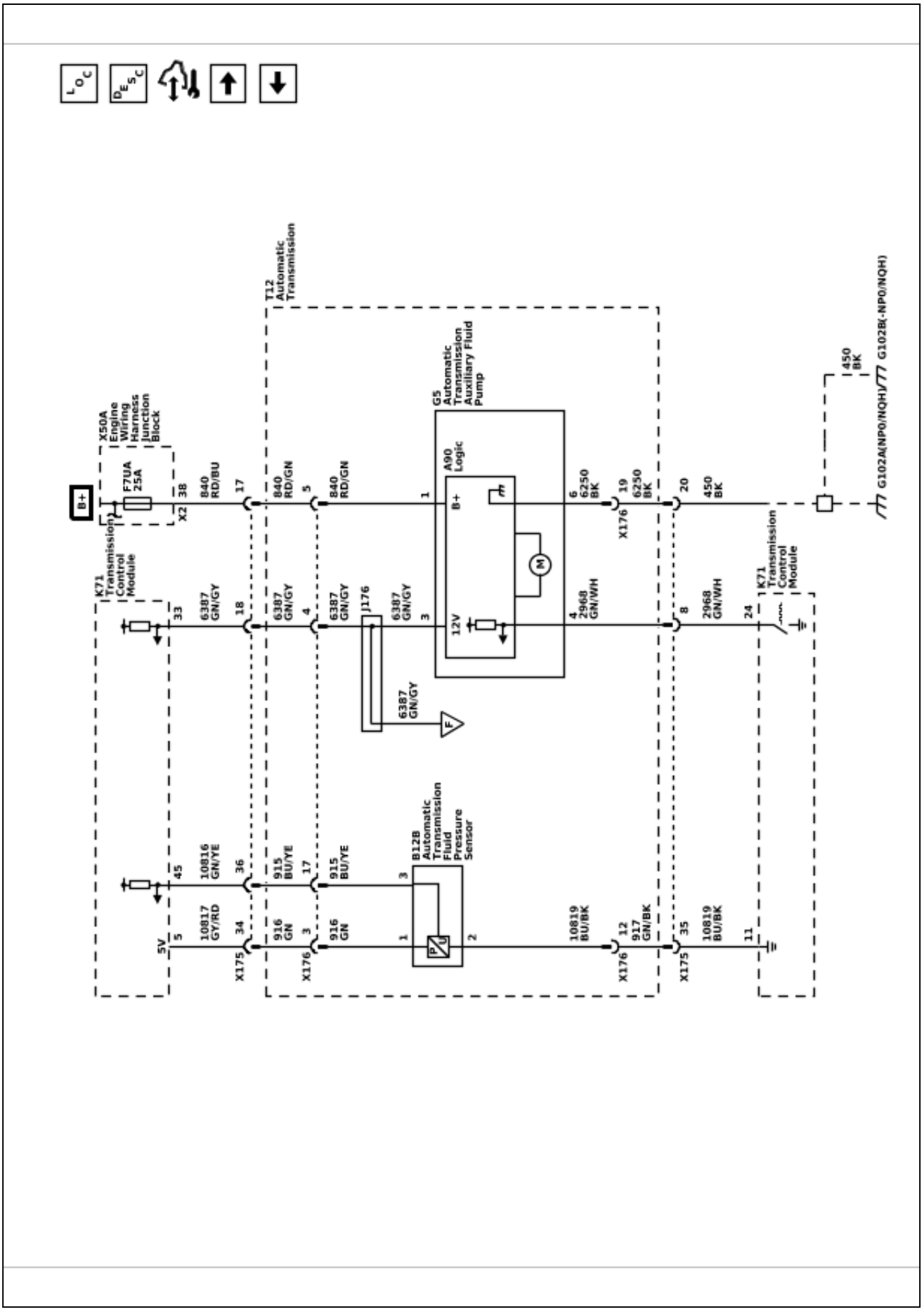
Automatic Transmission Controls Schematics (Pressure and Shift Controls)



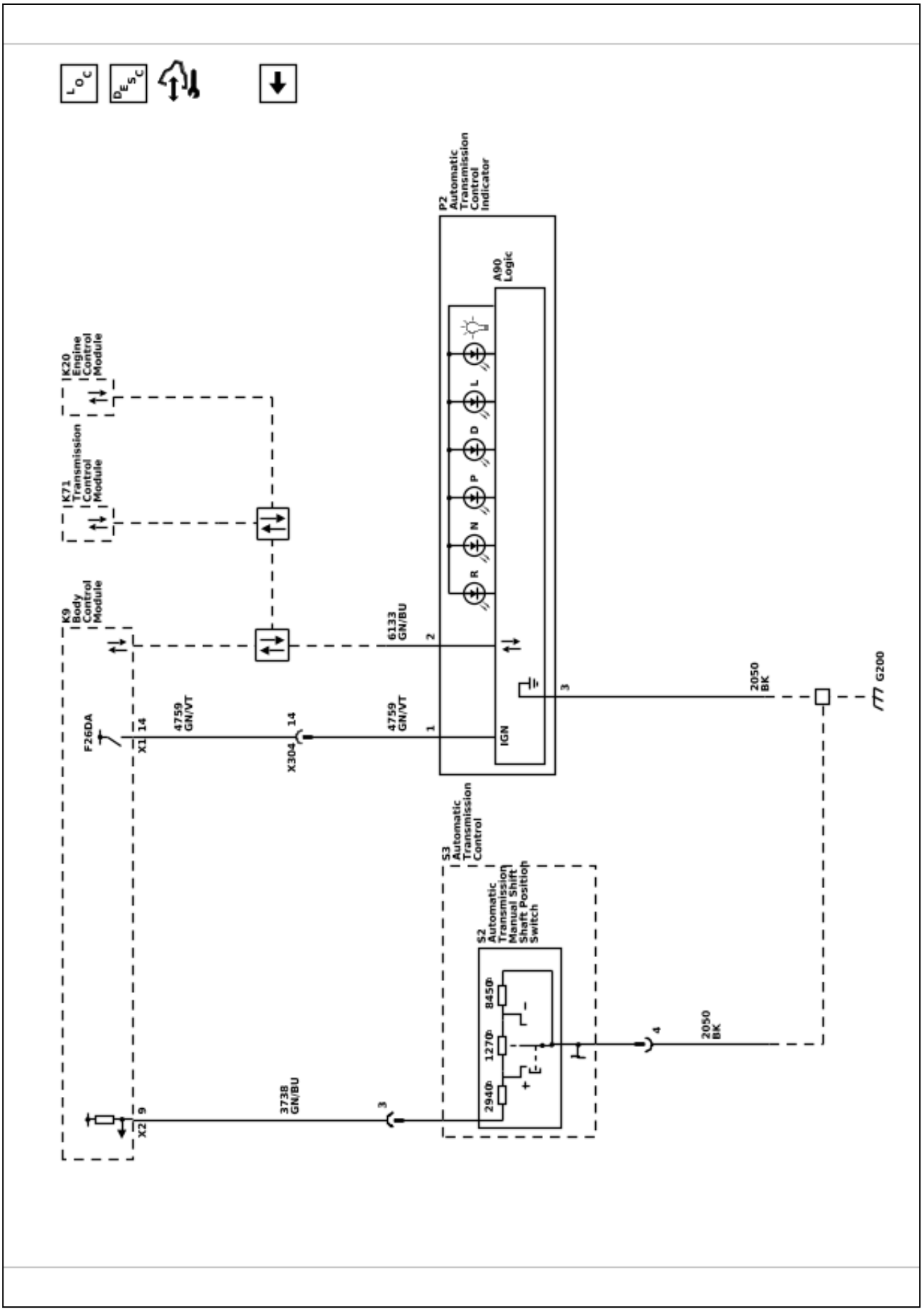
Automatic Transmission Controls Schematics (Speed Sensors and Internal Mode Switch)



Automatic Transmission Controls Schematics (Transmission Auxiliary Fluid Pump and Pressure Sensor)



Automatic Transmission Controls Schematics (Tap Up/Tap Down Switches and Shift Indicator)



Shift Lock Control

Schematic and Routing Diagrams

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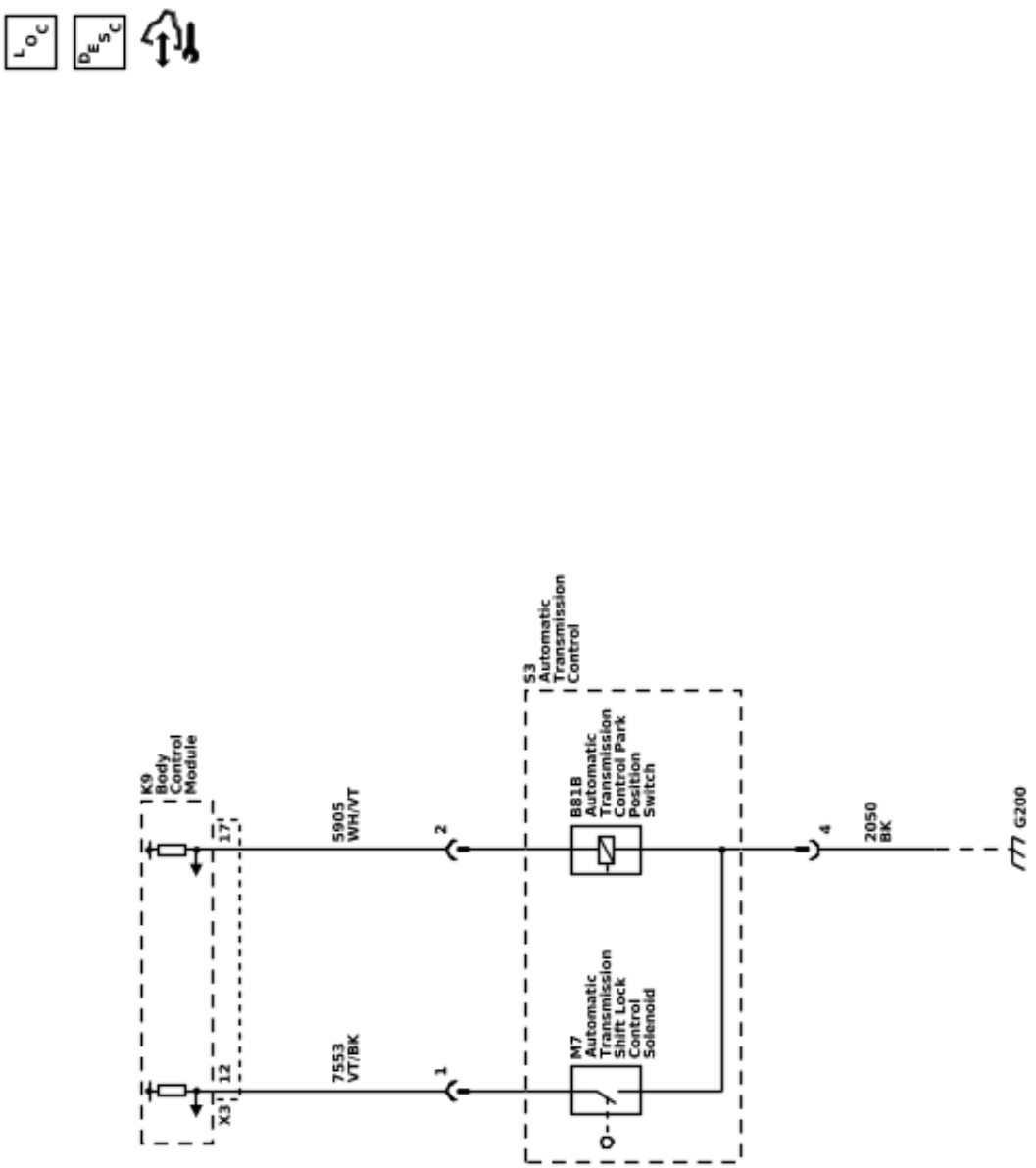
Shift Lock Control Schematics (Shift Lock Control)



Description and Operation

Automatic Transmission Shift Lock Control Description and Operation

The Automatic Transmission Shift Lock Control System is a safety device that prevents an inadvertent shift out of PARK when the engine is running. The driver must press the brake pedal before moving the shift lever out of the PARK position. The system consists of the following components:

- The Automatic Transmission Shift Lock Solenoid (serviced as the S3 Automatic Transmission Shift Lock Actuator)
- The Body Control Module (BCM)
- The Engine Control Module (ECM)

The BCM controls the voltage to the shift lock control solenoid though the shift lock control solenoid controlled voltage circuit. The following conditions must be met before the BCM will supply voltage to the shift lock control solenoid:

- The ignition is in the ON position.
- The ECM sends an input via GMLAN serial data to the BCM when the Transmission Control Module (TCM) indicates the transmission is in the PARK position.
- The BCM receives a brake applied input from the stop lamp switch.

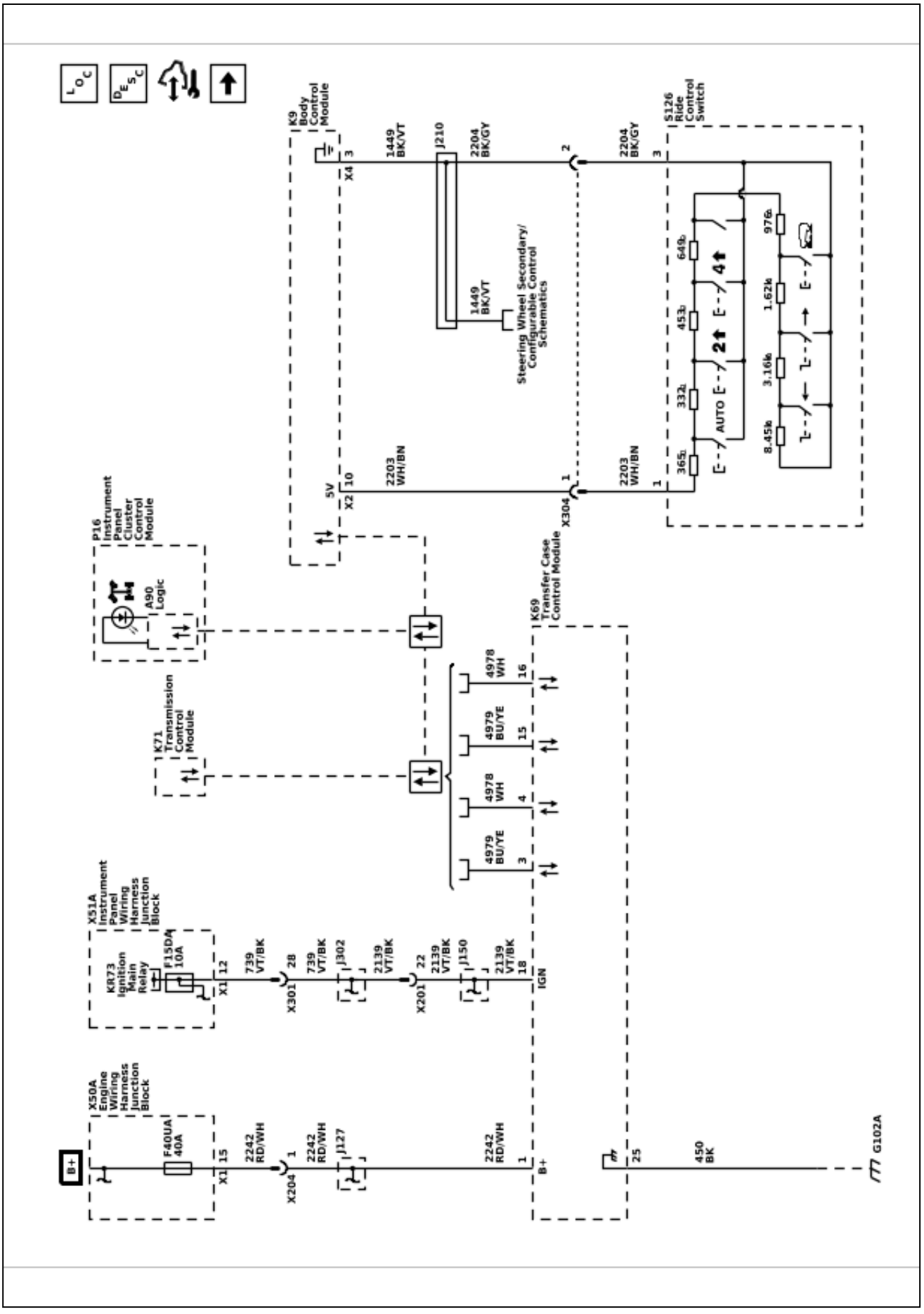
Since the shift lock control solenoid is permanently grounded, the BCM supplies voltage to the automatic transmission shift lock control solenoid, releasing the mechanical lock on the shift lever as the solenoid energizes. The energized solenoid allows the driver to move the shift lever out of the PARK position. When the brake pedal is not applied, the BCM turns the control voltage output of the shift lock control solenoid OFF, de-energizing the shift lock control solenoid. When the transmission is in the PARK position, the de-energized shift lock control solenoid will prevent shifting as the lever is mechanically locked in the PARK position.

During remote start operation the BCM will de-energize the automatic transmission shift lock control circuit, locking the shift lever in the PARK position

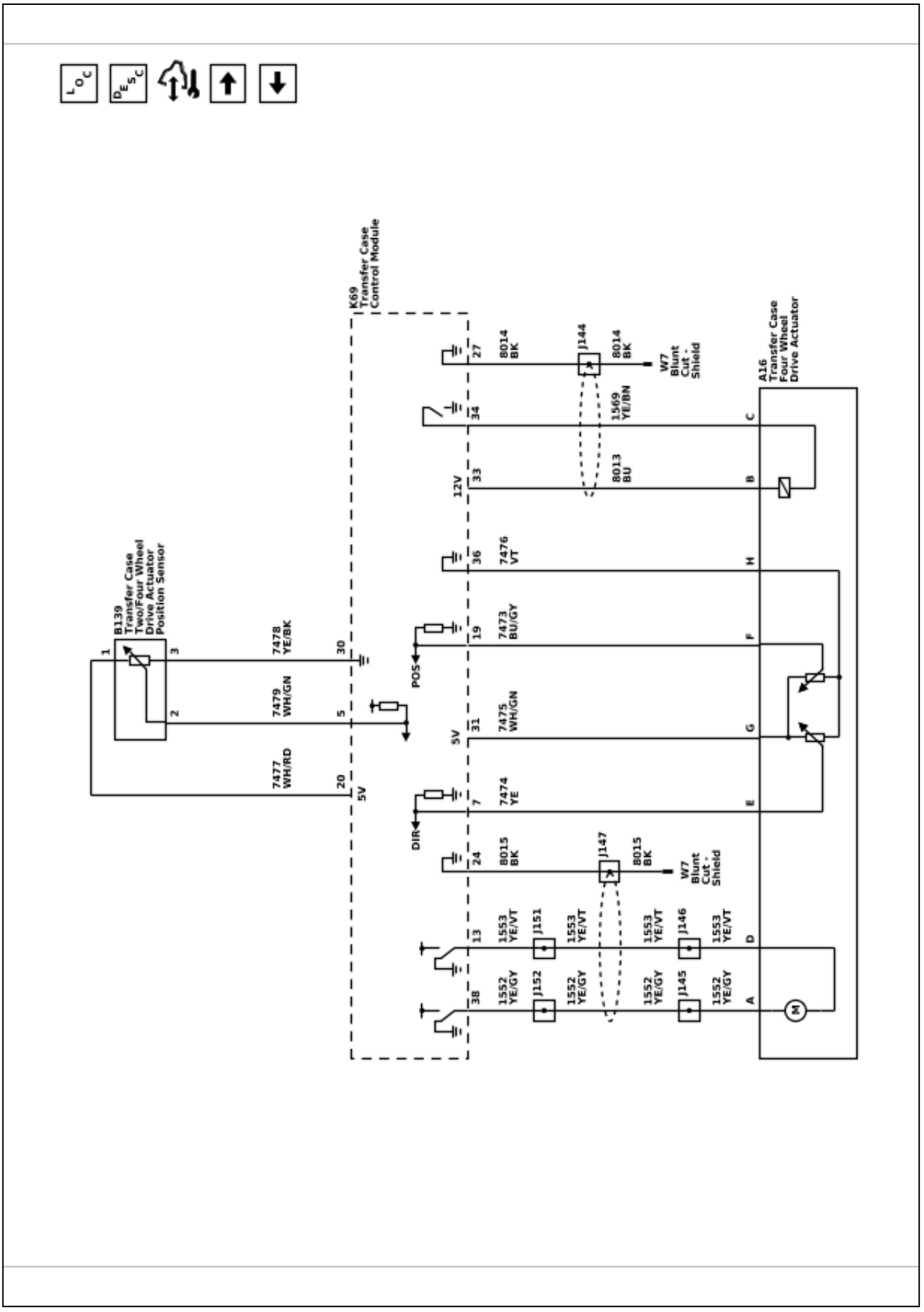
Transfer Case - MP 3010/3015

Schematic and Routing Diagrams

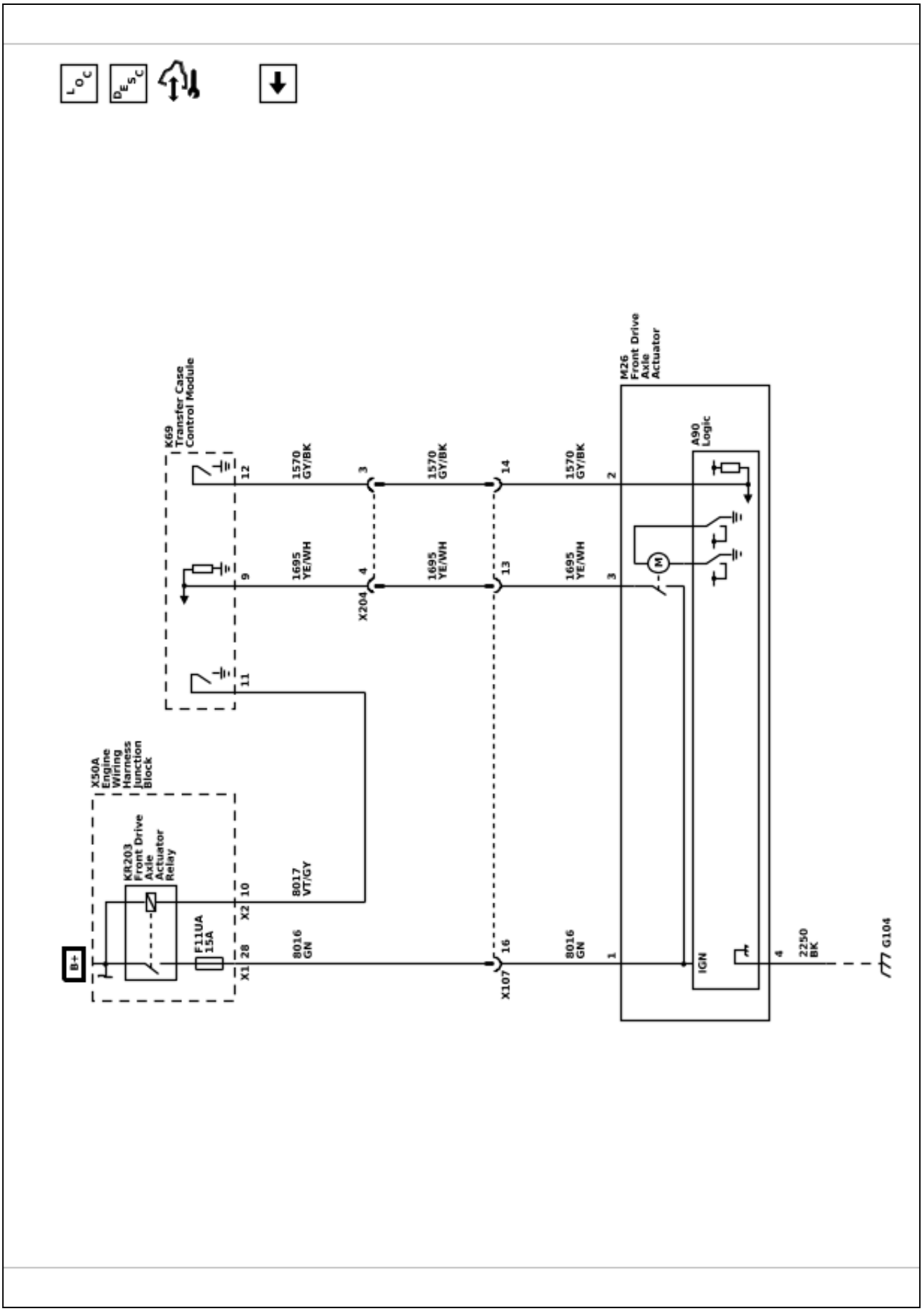
Transfer Case Control Schematics (Power, Ground, Serial Data, and Shift Controls)



Transfer Case Control Schematics (Transfer Case Controls)



Transfer Case Control Schematics (Front Axle Controls)

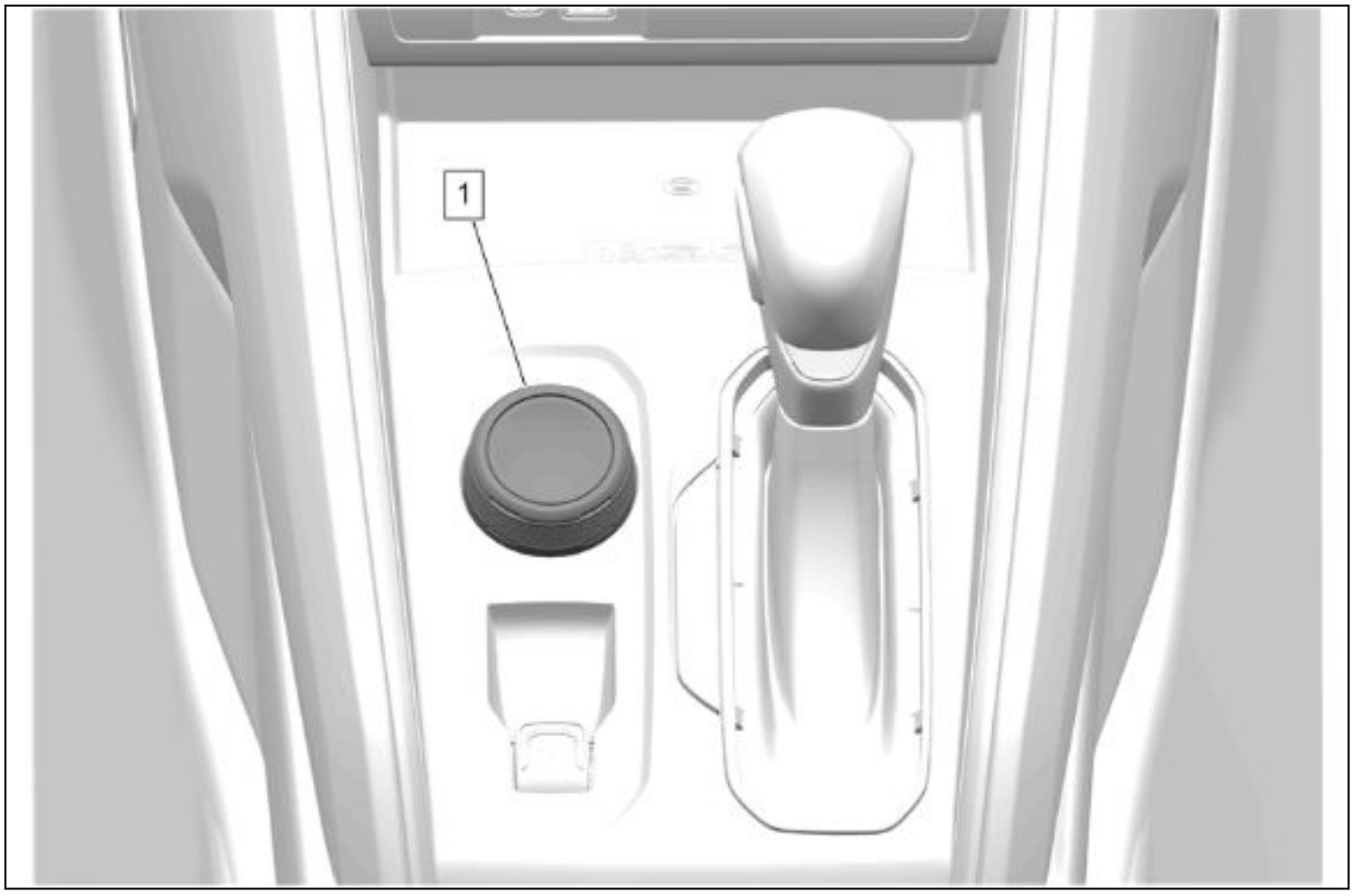


Description and Operation

Transfer Case Description and Operation

The Magna Powertrain (MP) model 3010/3015 RPO NP0 transfer case is a 1 speed automatic, active transfer case (ATC). The MP 3010/3015 ATC provides 3 modes, Auto 4WD, 4HI, and 2HI. The Auto 4WD position allows the capability of an active transfer case, which provides the benefits of on-demand torque biasing wet clutch and easy vehicle tuning through software calibrations. The software calibrations allow more features, such as flexible adapt ready position and clutch preload torque levels. The technology allows for vehicle speed dependent clutch torque levels to enhance the performance of the system. For example, the system is calibrated to provide 0–6.78 N•m (0–5 lb ft) of clutch torque during low speed, low engine torque operation, and predetermined higher torque for 40 km/h (25 mph) and greater. This prevents crow-hop and binding at low speeds and provides higher torque biases at higher vehicle speeds, in order to enhance stability.

Ride Control Switch



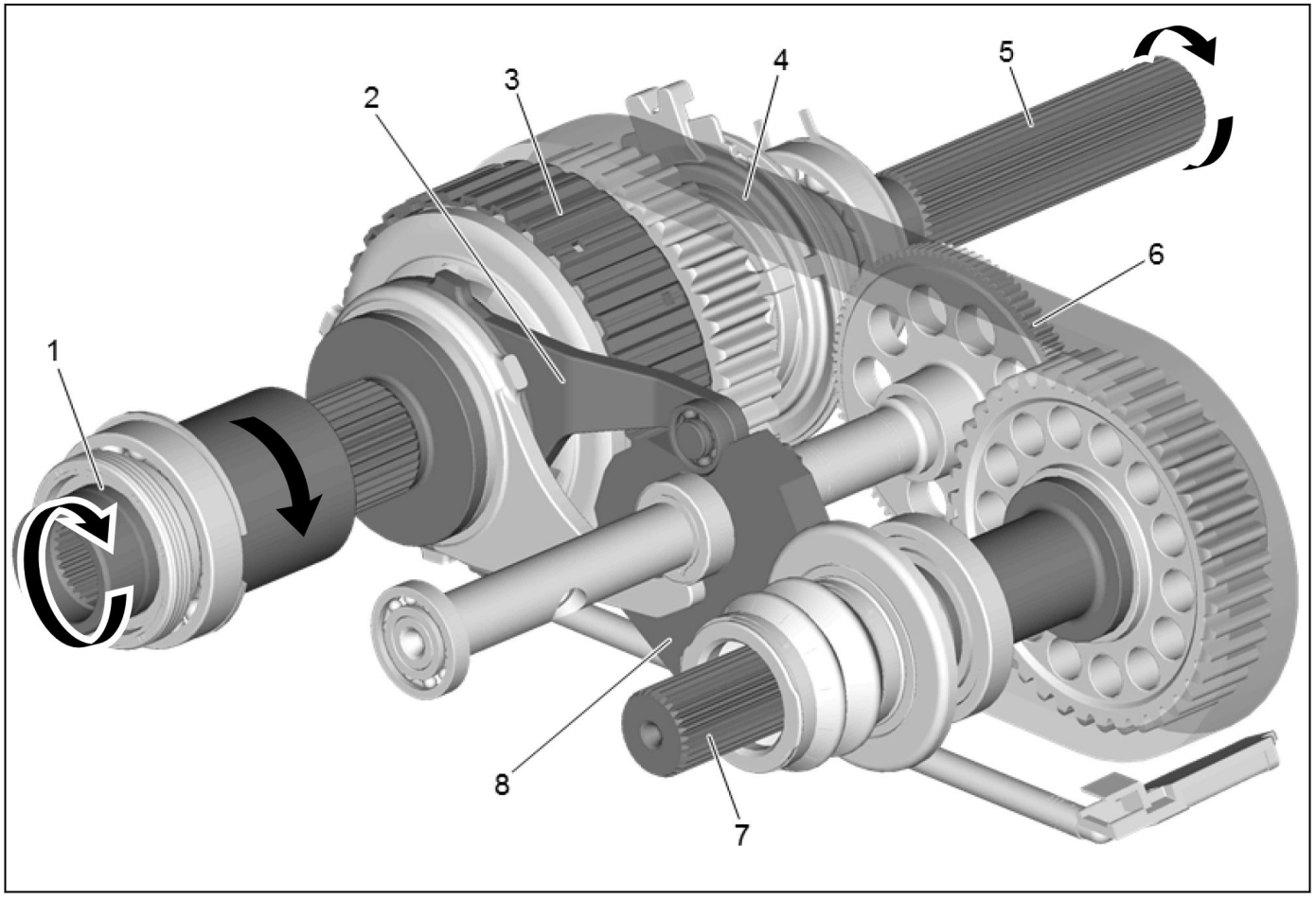
6213167

The MP 3010/3015 ATC transfer case features a 3 mode ride control switch (1) located on the console. When the ignition key is in the RUN position, the transfer case shift control module monitors the ride control switch (1) to determine if the driver desires a new mode position. At a turn of the ride control switch (1), the lamp of the new desired position begins flashing to inform the driver that the transfer case shift control module has received the request for a new mode position. The lamp continues to flash until all shifting criteria has been met and the new mode position has been reached, or has been engaged. Once the mode position is fully active, the switch indicator lamp for the new position remains ON constantly. During normal driving situations, the transfer case can operate in the Auto 4WD mode. In the Auto 4WD mode, the transfer case shift control module monitors rear wheel slip speed, based on the inputs from the wheel speed sensors and/or vehicle speed sensor. When the vehicle experiences a rear wheel slip condition, the transfer case shift control module sends a pulse width modulated (PWM) signal to an electronic motor, which is the transfer case 2/4 wheel drive actuator assembly. This actuator rotates the transfer case control actuator shaft, applying a clutch. The clutch is designed to deliver a variable amount of torque, normally delivered to the rear wheels, and transfers it to the front wheels. Torque is ramped up to the front wheels until the front wheels speed sensor values equals that of the rear wheel speed sensors and/or vehicle speed sensor. Torque is ramped down to the front wheels. The process would repeat if rear wheel slip is detected again.

The MP 3010/3015 TC transfer case has the added feature of also providing the driver with 2 manual mode positions:

- 4HI –4 Wheel Drive High Mode
- 2HI – 2 Wheel Drive High Mode

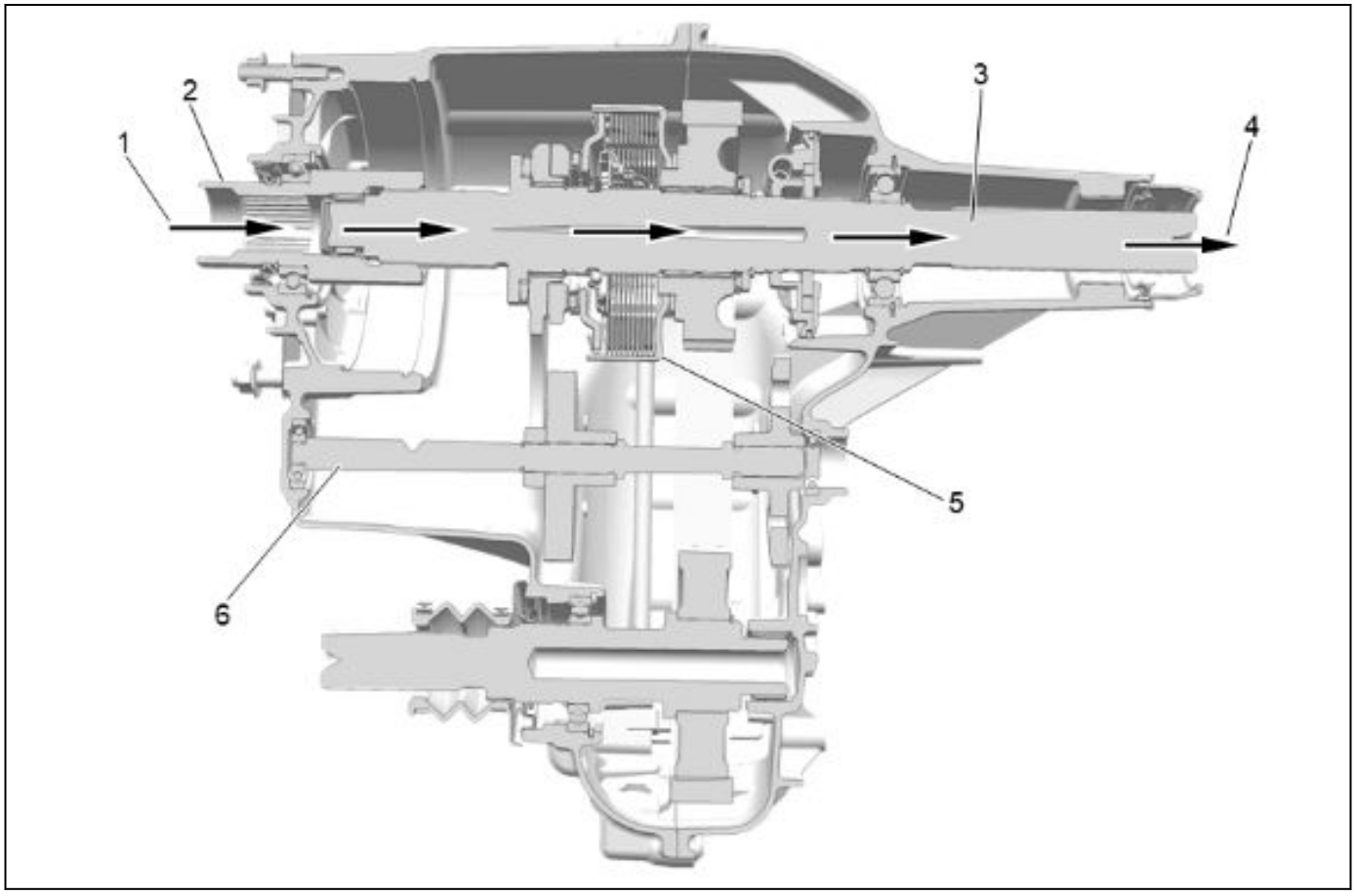
2WD Mode Power Flow



5071108

(1) Transfer Case Input Shaft
(2) Transfer Case Scissor Mechanism Lever
(3) Transfer Case Four Wheel Drive Clutch Pack
(4) Transfer Case Front Output Shaft Drive Chain Assembly
(5) Transfer Case Rear Output Shaft

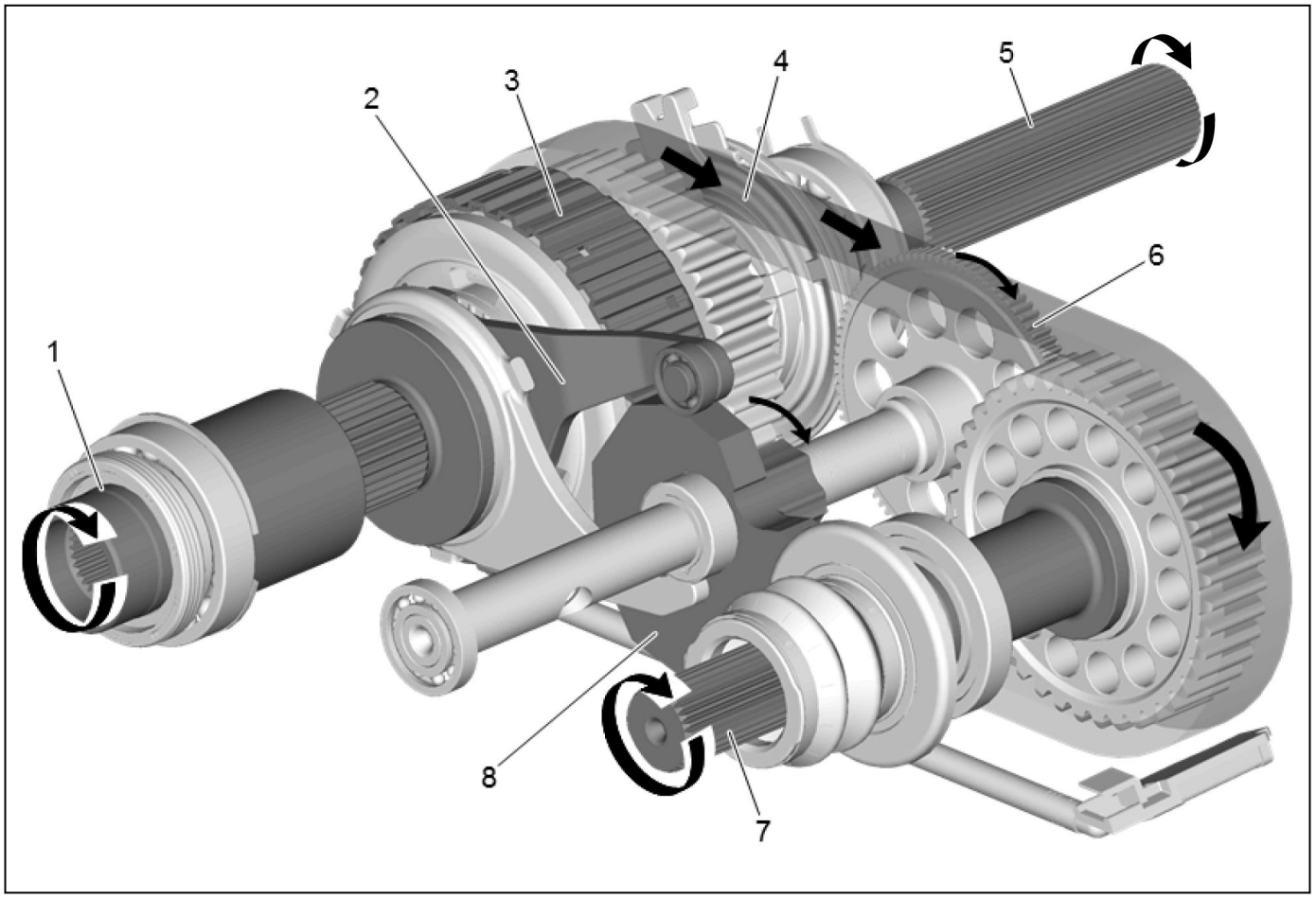
(6) Transfer Case Two/Four Wheel Drive Actuator Shaft Gear
(7) Transfer Case Front Output Shaft
(8) Transfer Case Two/Four Wheel Drive Actuator Cam



6261442

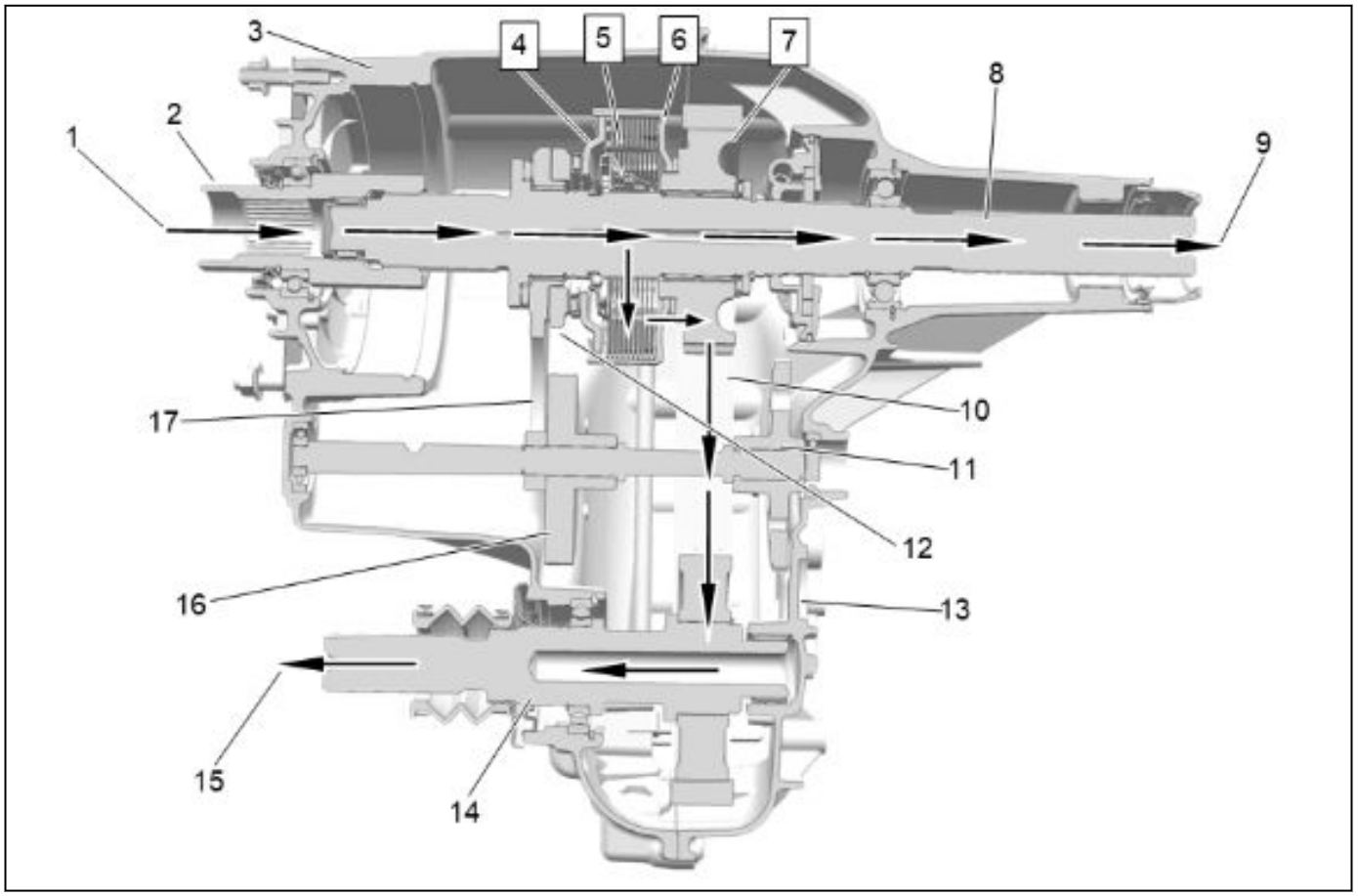
When the MP 3010/3015 ATC is in the 2WD mode, the power flows from the transmission (1) to the input shaft (2). The input shaft (2) is splined to the rear output shaft (3). The rear output shaft (3) delivers the power flow to the rear propeller shaft (4). The position of the control actuator shaft (6) allows no clutch (5) engagement.

4HI Mode Power Flow



5071136

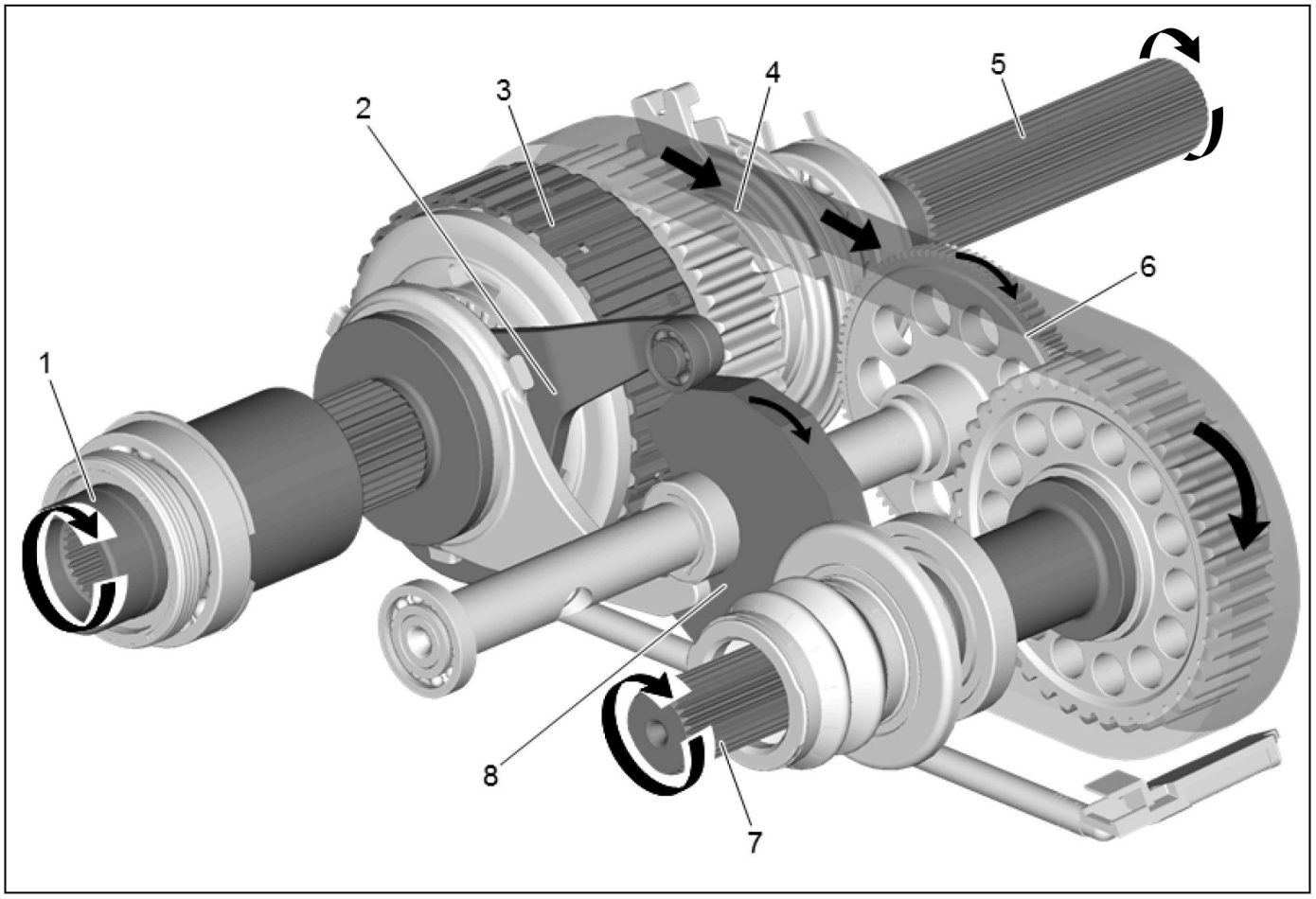
(1) Transfer Case Input Shaft
(2) Transfer Case Scissor Mechanism Lever
(3) Transfer Case Four Wheel Drive Clutch Pack
(4) Transfer Case Front Output Shaft Drive Chain Assembly
(5) Transfer Case Rear Output Shaft
(6) Transfer Case Two/Four Wheel Drive Actuator Shaft Gear
(7) Transfer Case Front Output Shaft
(8) Transfer Case Two/Four Wheel Drive Actuator Cam



6261444

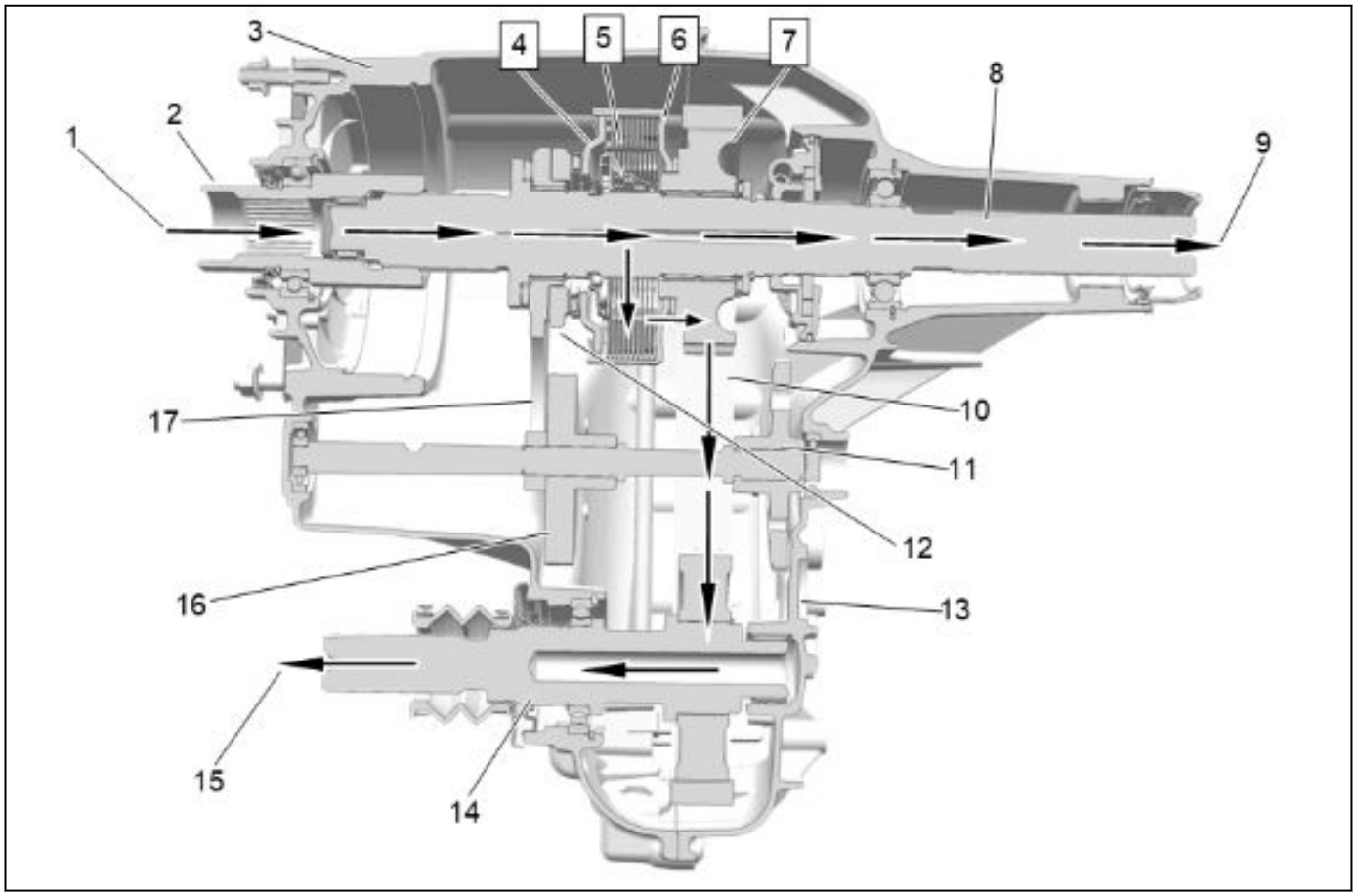
In the 4HI mode, the power flow to the rear propeller shaft (9) is the same as it is in the 2WD mode. To deliver power flow to the front propeller shaft (15) during the 4HI position, the transfer case control module commands the 2/4 wheel drive actuator assembly (13) to apply the clutch to a calibrated torque. The 2/4 wheel drive actuator assembly (13) turns the control actuator shaft. A brake in the 2/4 wheel drive actuator assembly (13) holds the control actuator shaft in the full clutch position. The control actuator shaft is cam designed and the cam action moves the transfer case scissor mechanism lever (12). The transfer case scissor mechanism lever (12) pivots against the transfer case scissor mechanism lever (17) and moves toward the clutch pressure plate (4), to engage the clutch (5). As more pressure is applied to the clutch pressure plate (4), the clutch discs (5) are compressed. Using inner clutch discs, which are engaged with the clutch hub, and the outer clutch discs, which are engaged with the transfer case four wheel drive clutch housing (6), the power flow is delivered to the transfer case four wheel drive clutch housing (6). The clutch hub is splined to the rear output shaft (8), and the transfer case four wheel drive clutch housing (6) rotates on a needle bearing on the rear output shaft (8). The transfer case front output shaft drive sprocket (7) is splined to the transfer case four wheel drive clutch housing (6). The power flows from the transfer case front output shaft drive sprocket (7), through the transfer case front output shaft drive chain (10), to the transfer case front output shaft driven sprocket. The transfer case front output shaft driven sprocket is splined to the front output shaft (14). The power flow is delivered to the front propeller shaft (15) through the front output shaft (14).

4HI Auto Mode Power Flow



5071147

(1) Transfer Case Input Shaft
(2) Transfer Case Scissor Mechanism Lever
(3) Transfer Case Four Wheel Drive Clutch Pack
(4) Transfer Case Front Output Shaft Drive Chain Assembly
(5) Transfer Case Rear Output Shaft
(6) Transfer Case Two/Four Wheel Drive Actuator Shaft Gear
(7) Transfer Case Front Output Shaft
(8) Transfer Case Two/Four Wheel Drive Actuator Cam



6261444

In the 4HI Auto mode, the power flow to the rear propeller shaft (9) is the same as it is in the 2WD mode. To deliver power flow to the front propeller shaft (15) during the 4HI position, the transfer case control module commands the 2/4 wheel drive actuator assembly (13) to apply the clutch to a calibrated torque. The 2/4 wheel drive actuator assembly (13) rotates the control actuator shaft to the correct torque level positions. Rotating the control actuator shaft to the various positions changes the clutch torque level. The control actuator shaft is cam designed and the cam action moves the transfer case scissor mechanism lever (12). The transfer case scissor mechanism lever (12) pivots against the transfer case scissor mechanism lever (17) and moves toward the clutch pressure plate (4), to engage the clutch discs (5). As more pressure is applied to the clutch pressure plate (4), the clutch discs (5) are compressed. Using inner clutch discs, which are engaged with the clutch hub, and the outer clutch discs, which are engaged with the transfer case four wheel drive clutch housing (6), the power flow is delivered to the transfer case four wheel drive clutch housing (6). The clutch hub is splined to the rear output shaft (8), and transfer case four wheel drive clutch housing (6) rotates on a needle bearing on the rear output shaft (8). The transfer case front output shaft drive sprocket (7) is splined to the transfer case four wheel drive clutch housing (6). The power flows from the transfer case front output shaft drive sprocket (7), through the transfer case front output shaft drive chain (10), to transfer case front output shaft driven sprocket. The transfer case front output shaft driven sprocket is splined to the front output shaft (14). The power flow is delivered to the front propeller shaft (15) through the front output shaft (14). When a difference of front wheel speed to rear wheel speed is recognized, the transfer case control module commands for more or less clutch torque.

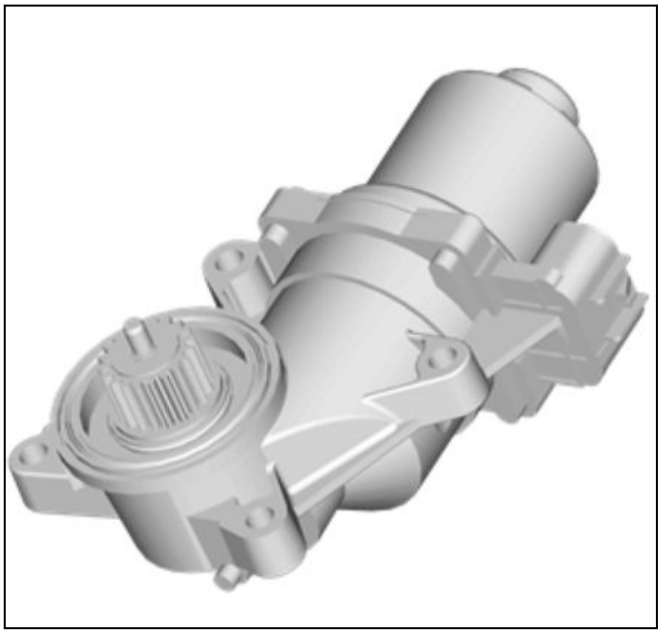
Service 4 Wheel Drive Message

The Service 4 Wheel Drive Message is a display within the driver information center (DIC) and cannot be serviced separately. This message is used to inform the driver that a transfer case system condition has occurred. The Service 4 Wheel Drive Message is controlled by the transfer case shift control module via GMLAN.

Transfer Case Two/Four Wheel Drive Incremental Sensor

The incremental sensor is mounted within the transfer case actuator and is replaced as an assembly. The incremental sensor converts the shift detent lever shaft position, representing a mode, into an electrical signal input to the transfer case shift control module. The module detects what position the transfer case is in by monitoring the voltage returned on the incremental encoder impulse signal circuit. This voltage translates into AUTO 4WD, 2HI, and 4HI or in transition between gears.

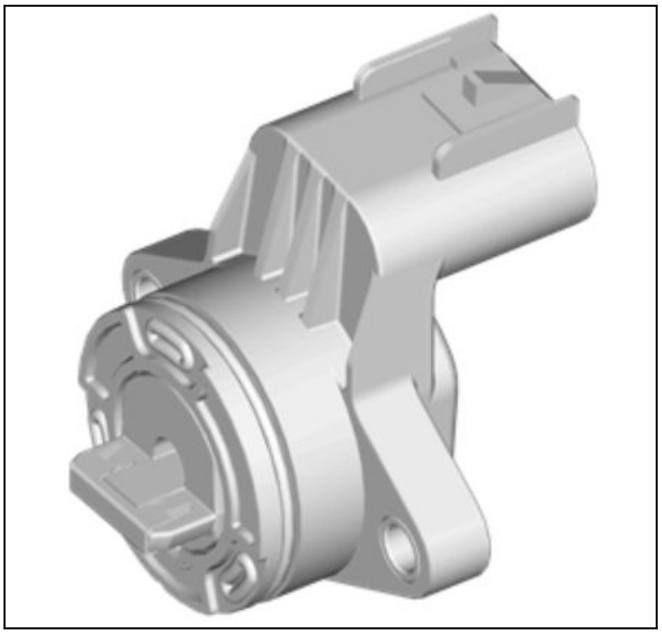
Transfer Case Two/Four Wheel Drive Actuator Assembly



1986212

The transfer case two/four wheel drive actuator assembly consists of a permanent magnet DC motor and gear reduction assembly. It is located on the left hand side, driver's side, of the transfer case. When activated, it turns the shift detent lever shaft of the transfer case, clockwise or counterclockwise, to shift the transfer case. The motor/encoder is controlled with a PWM signal by the transfer case shift control module. This circuit consists of a driver on both the Motor A and Motor B circuits. The encoder motor is bi-directional in order to allow the motor to shift the transfer case from 2HI to 4HI positions.

Transfer Case Actuator Shaft Position Sensor Assembly



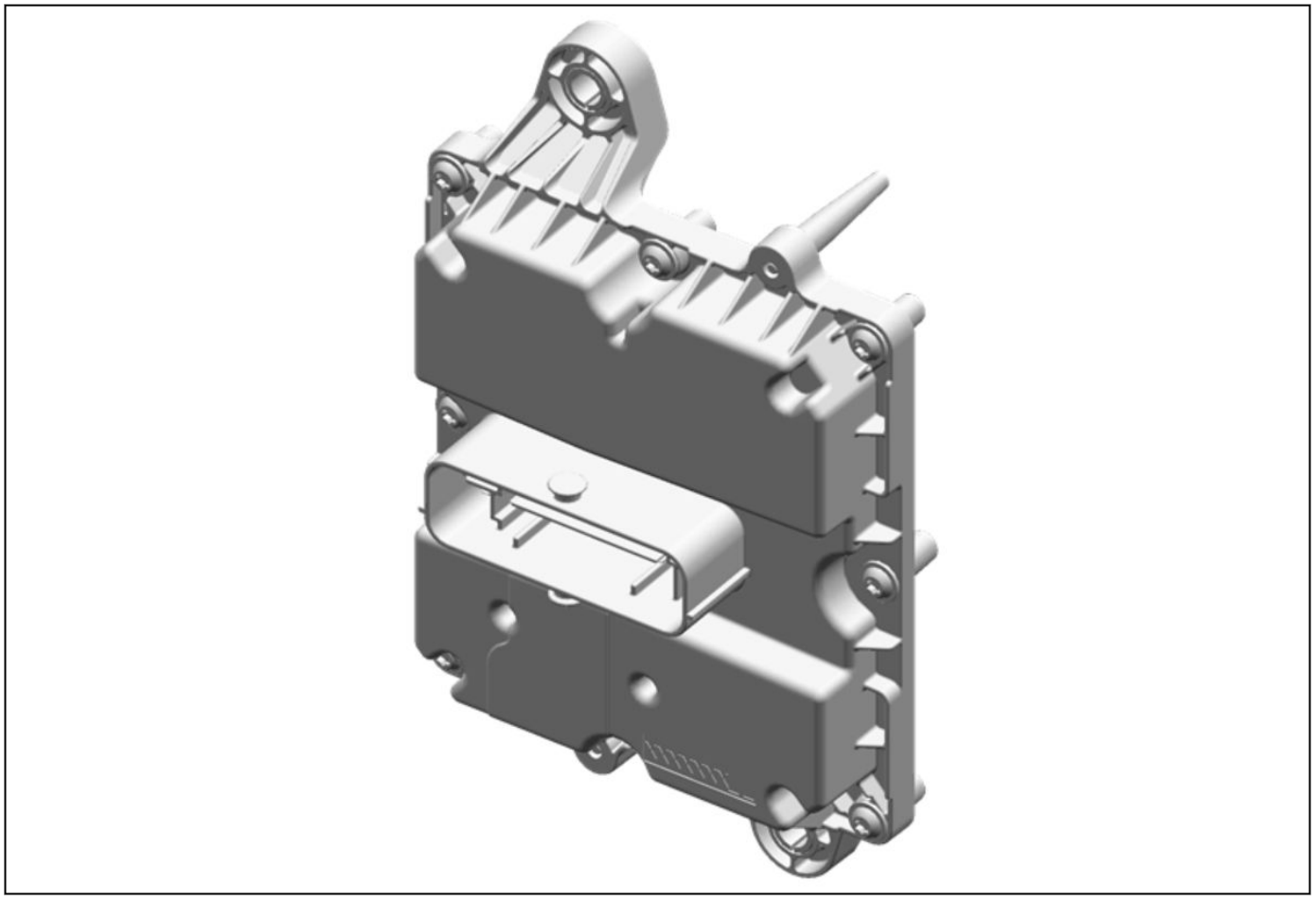
1986213

This sensor works in conjunction with the incremental sensor and shows transfer case position in degrees.

Transfer Case Motor Lock

The transfer case motor lock is used to provide a 2HI and 4HI feature. When the lock circuit is energized, the transfer case encoder motor is allowed to turn. When the transfer case is placed 2HI or 4HI the motor lock circuit is de-energized and the lock is applied. This assures that the transfer case remains in the current gear position until a new gear position is requested. When AUTO 4WD is selected, the motor lock remains applied until an adaptive mode, torque being applied to the front propeller shaft, is required. During an adaptive mode the motor lock circuit is energized and the motor lock is released, enabling the encoder motor to turn and apply or release torque at the front propeller shaft.

Transfer Case Shift Control Module



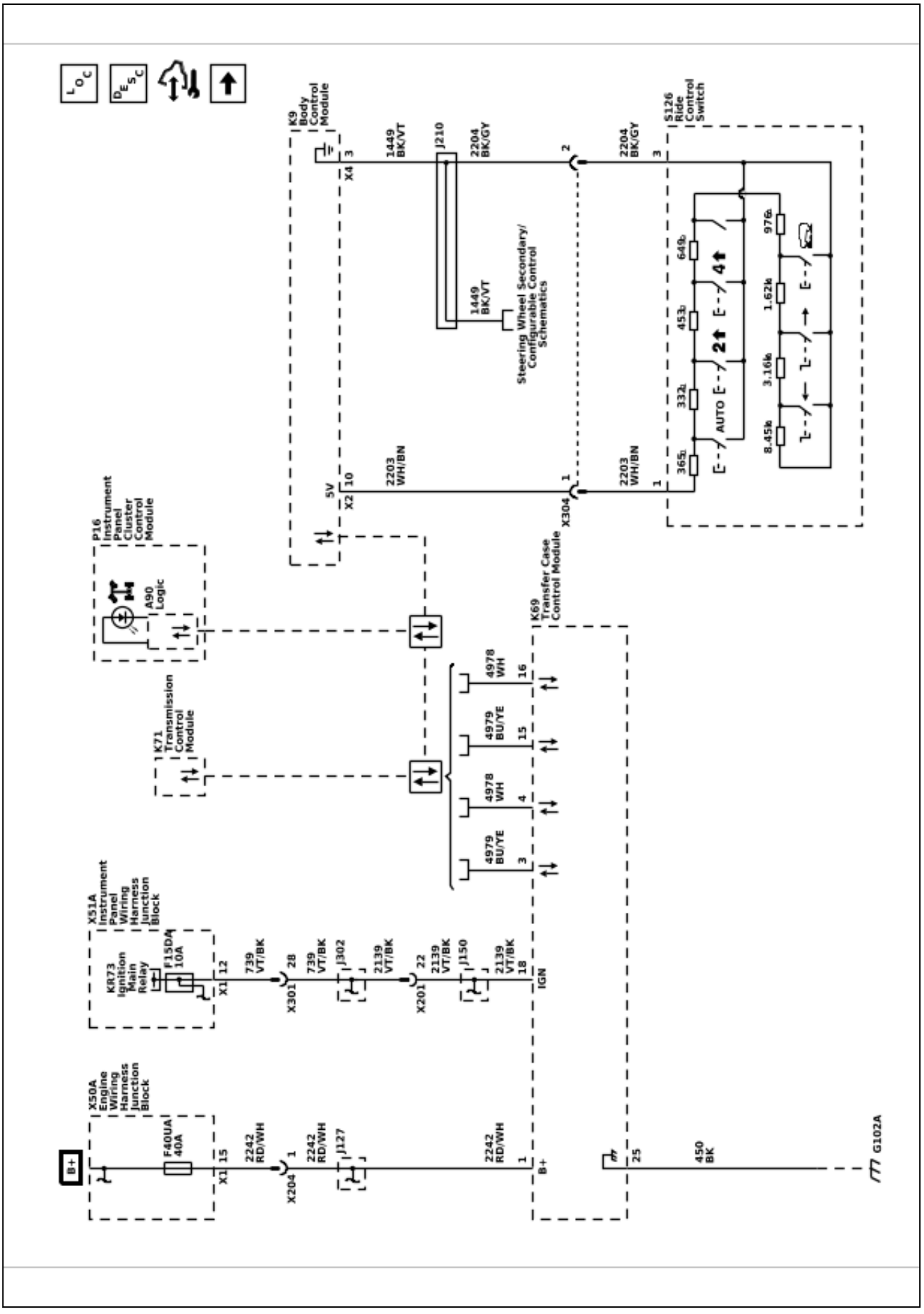
5071149

The transfer case shift control module uses the vehicle identification number (VIN) for calculations based on axle ratio, transmission, tire size, and engine size. For StabiliTrak applications, when the vehicle is in AUTO 4WD mode, the transfer case shift control module monitors the wheel speed via the four wheel speed sensors in order to detect wheel slippage. For non-StabiliTrak applications, when the vehicle is in AUTO 4WD mode, the transfer case shift control module monitors the wheel speed via the two front wheel speed sensors and the vehicle speed sensor in order to detect slippage. When wheel slippage is detected, the module applies a clutch pack contained inside the transfer case. This clutch pack is used to lock-in and apply the front propeller shaft, transferring torque to the front wheels. The clutch pack is applied by a motor/encoder assembly. When slip is no longer detected by the transfer case shift control module, the clutch is no longer applied.

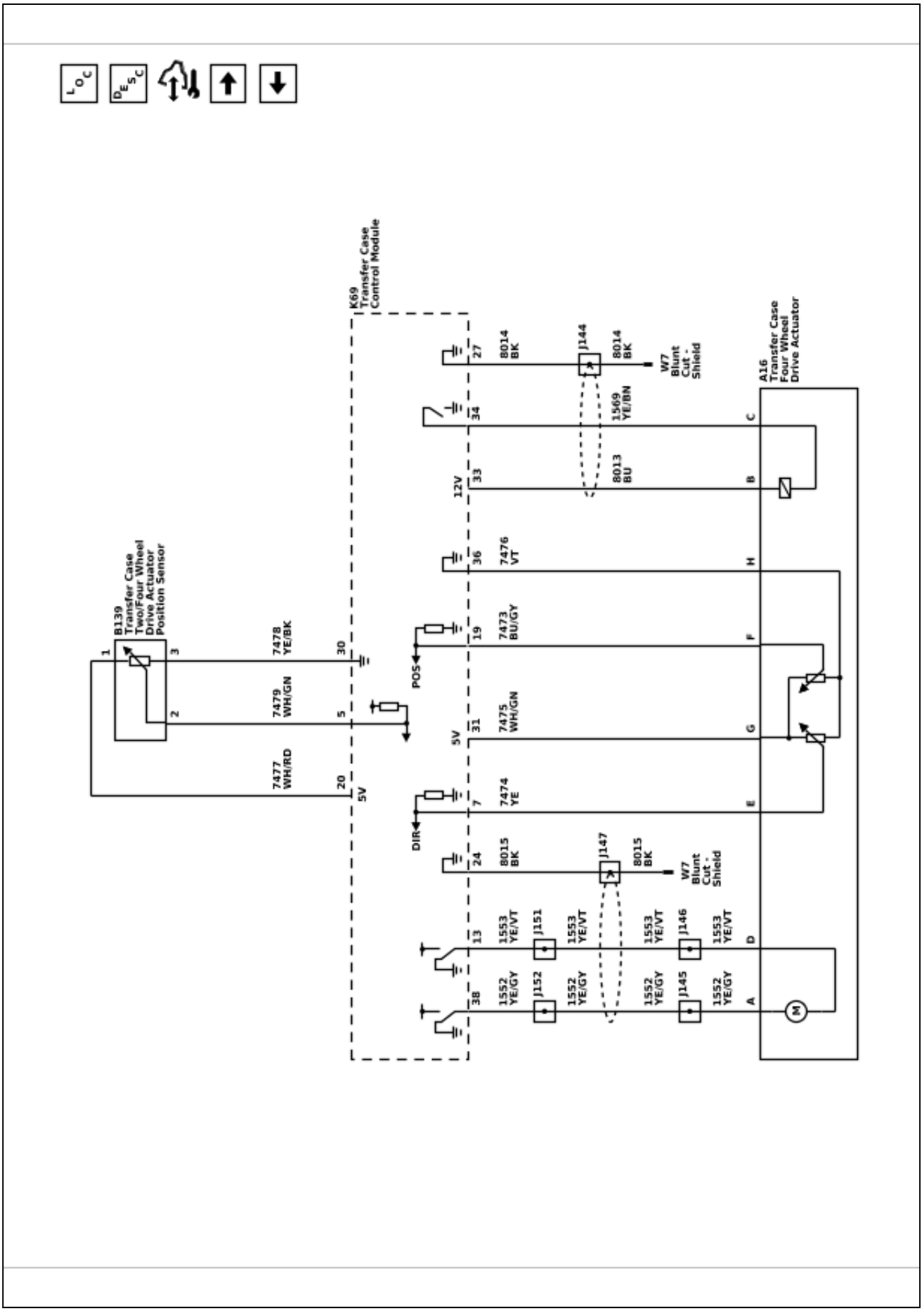
Transfer Case - MP 3023/3024/3025

Schematic and Routing Diagrams

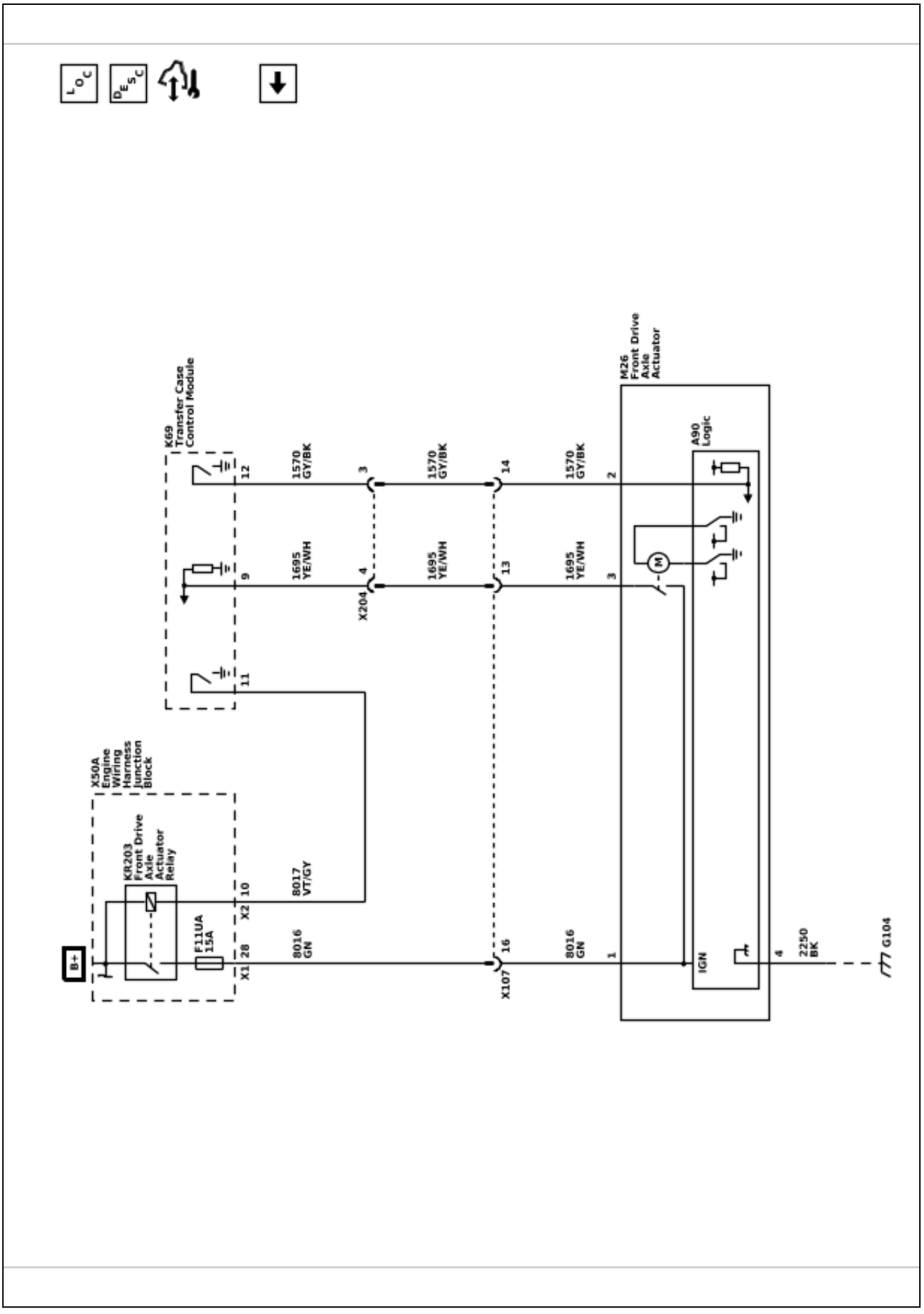
Transfer Case Control Schematics (Power, Ground, Serial Data, and Shift Controls)



Transfer Case Control Schematics (Transfer Case Controls)



Transfer Case Control Schematics (Front Axle Controls)

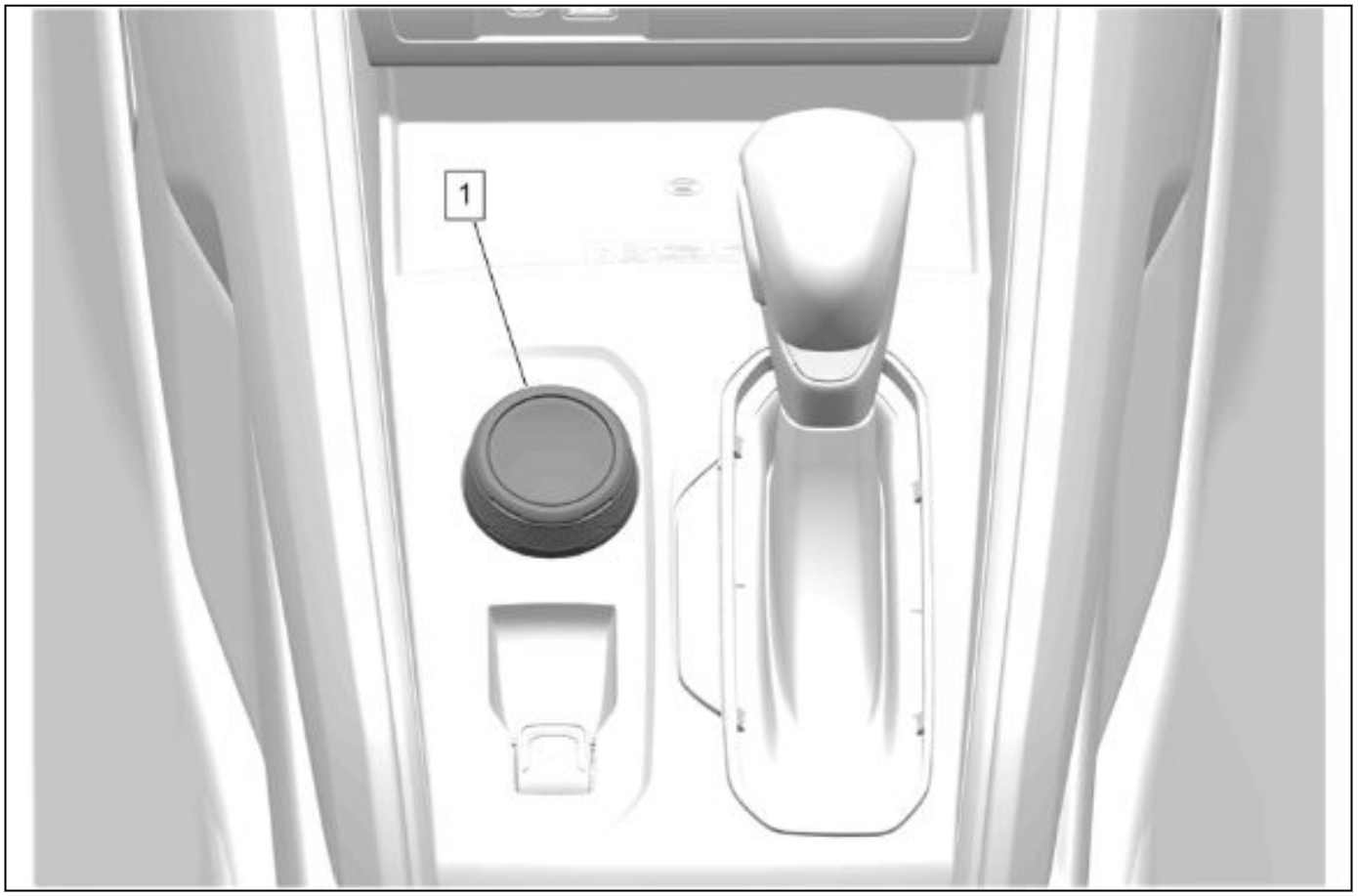


Description and Operation

Transfer Case Description and Operation

The Magna Powertrain (MP) model 3023/3024/3025 RPO NQH transfer case is a 2 speed automatic, active transfer case (ATC). The MP 3023/3024/3025 ATC provides 5 modes, Auto 4WD, 4HI, 4LO, 2HI and NEUTRAL. The Auto 4WD position allows the capability of an active transfer case, which provides the benefits of on-demand torque biasing wet clutch and easy vehicle tuning through software calibrations. The software calibrations allow more features such as flexible adapt ready position and clutch preload torque levels. The technology allows for vehicle speed dependent clutch torque levels to enhance the performance of the system. For example, the system is calibrated to provide 0–6.78 newtonm (0–5 lb ft) of clutch torque during low speed, low engine torque operation, and predetermined higher torque for 40 km/h (25 mph) and greater. This prevents crow-hop and binding at low speeds and provides higher torque biases at higher vehicle speeds, in order to enhance stability.

Ride Control Switch



6213167

The MP 3023/3024/3025 ATC transfer case features a 5 mode ride control switch located on the instrument panel. When the ignition key is in the RUN position, the transfer case shift control module monitors the ride control switch to determine if the driver desires a new mode/range position.

To command a shift, press button of the new desired state. The actual 4x4 shift request is only made after the button is released. Transfer Case state will be displayed in the Cluster at all times. Graphic location could vary depending on trim level. However, graphics will be consistent. The graphic in the cluster will blink while a shift is in progress. The graphic will change to indicate the mode requested. When the shift is complete, the graphic will stop blinking and become steady. If the transfer case cannot complete a shift, the graphic will return to the previously selected mode. While shift is in progress, cluster will display following DIC message: “4WD Shift in Progress”. The DIC message will turn off once the shift is complete.

During normal driving situations, the transfer case can operate in the Auto 4WD mode. In the Auto 4WD mode, the transfer case shift control module monitors rear wheel slip speed, based on the inputs from the wheel speed sensors and/or vehicle speed sensor. When the vehicle experiences a rear wheel slip condition, the transfer case shift control module sends a pulse width modulated (PWM) signal to an electronic motor, which is the transfer case 2/4 wheel drive actuator assembly. This actuator rotates the transfer case control actuator shaft, applying a clutch. The clutch is designed to deliver a variable amount of torque, normally delivered to the rear wheels, and transfers it to the front wheels. Torque is ramped up to the front wheels until the front wheel speed sensor matches that of the rear wheel speed sensors and/or vehicle speed sensor. Torque is ramped down to the front wheels. The process would repeat if rear wheel slip is detected again.

The MP 3023/3024/3025 ATC transfer case has the added feature of also providing the driver with 4 manual mode/range positions:

- 4HI – 4 Wheel Drive high range
- 2HI – 2 Wheel Drive high range
- 4LO – 4 wheel drive low range, 2.72:1 gear ratio reduction.
- Neutral

The driver may choose to select any of these mode/range positions while driving the vehicle. However, the transfer case will not allow a shift into or out of 4LO unless the following criteria has been met:

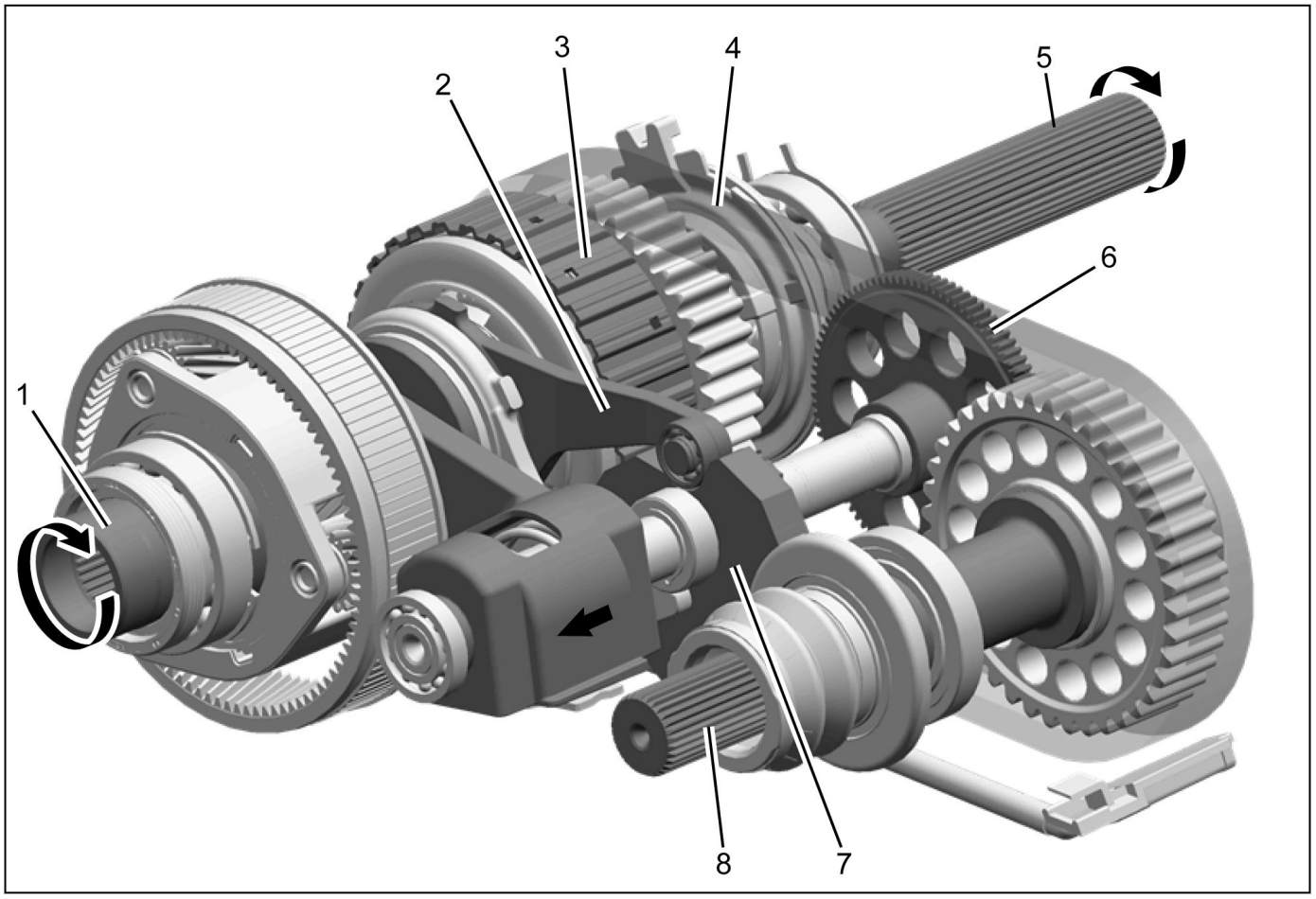
- The ignition switch is in RUN.
- The automatic transmission is in NEUTRAL.
- The vehicle speed is below 5 km/h (3 mph).

This transfer case also has a NEUTRAL position. A shift to the NEUTRAL position allows the vehicle to be towed without rotating the transmission output shaft. In the NEUTRAL position, the rear propeller shaft rotates the transfer case rear output shaft, in turn rotating the oil pump, thus providing constant lubrication during towing. NEUTRAL position may be obtained only if the following criteria have been met:

- Start the vehicle or turn the ignition on.
- Shift the transmission to NEUTRAL.
- Shift the transfer case to 2 HI. (Shifts to transfer case neutral are only allowed when transfer case initial state is 2 HI.)
- Apply park brake and/or Service brake. If Park Brake and/or service brake is not applied within 20 seconds, transfer case will remain in original state.

Once these conditions have been met, Press 2 HI 5 sequential times in 10 seconds until the Transfer Case N (Neutral) graphic starts blinking in cluster. When shift to Transfer Case N (Neutral) is complete, graphic in cluster will be steady. When the system completes the shift to NEUTRAL, the red NEUTRAL lamp will illuminate.

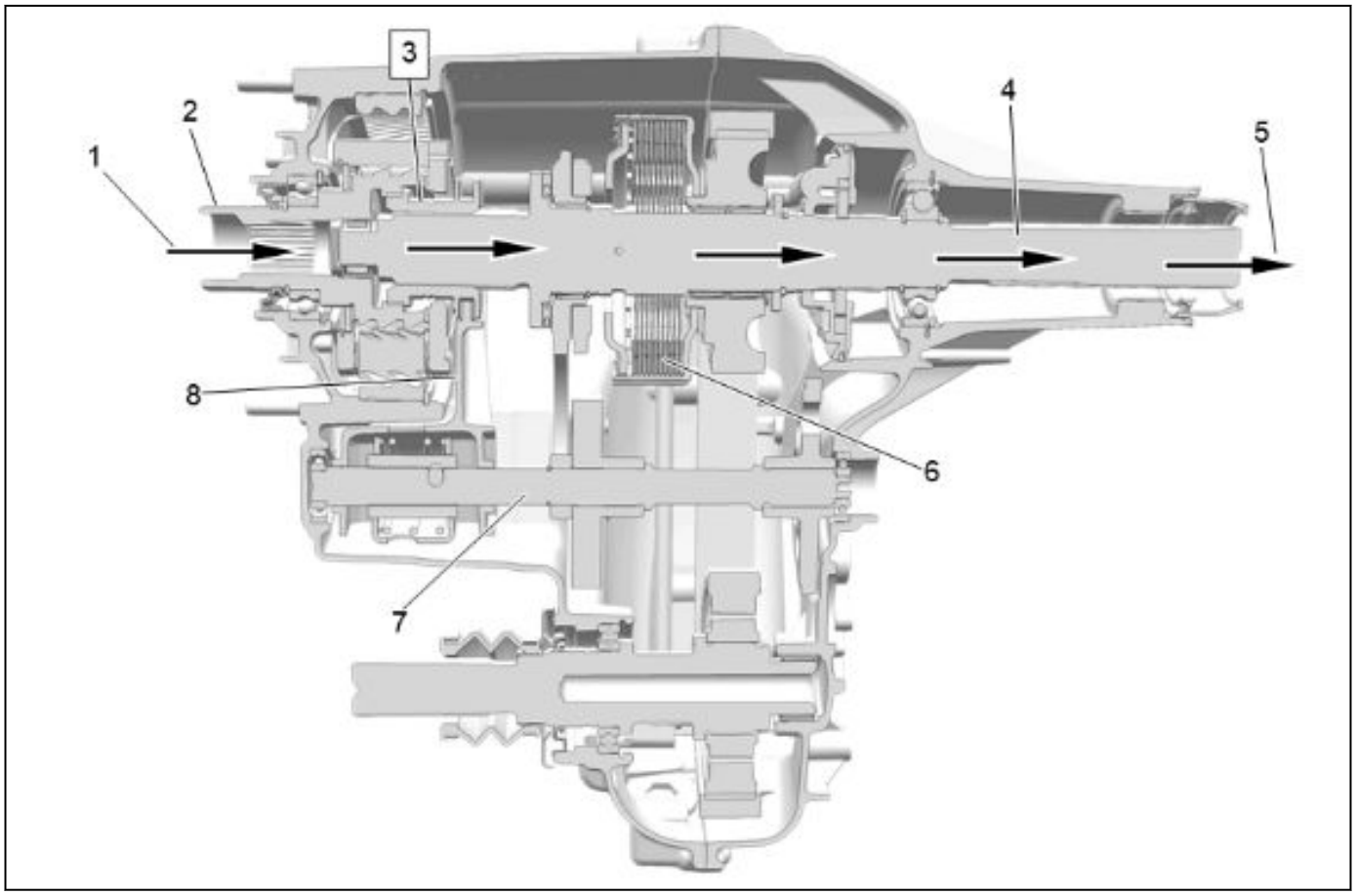
2WD Mode Power Flow



4994663

(1) Transfer Case Input Shaft
(2) Transfer Case Scissor Mechanism Lever
(3) Transfer Case Four Wheel Drive Clutch
(4) Transfer Case Front Output Shaft Drive Chain Assembly
(5) Transfer Case Rear Output Shaft
(6) Transfer Case Two/Four Wheel Drive Actuator Shaft Gear
(7) Transfer Case Two/Four Wheel Drive Actuator Cam
(8) Transfer Case Front Output Shaft

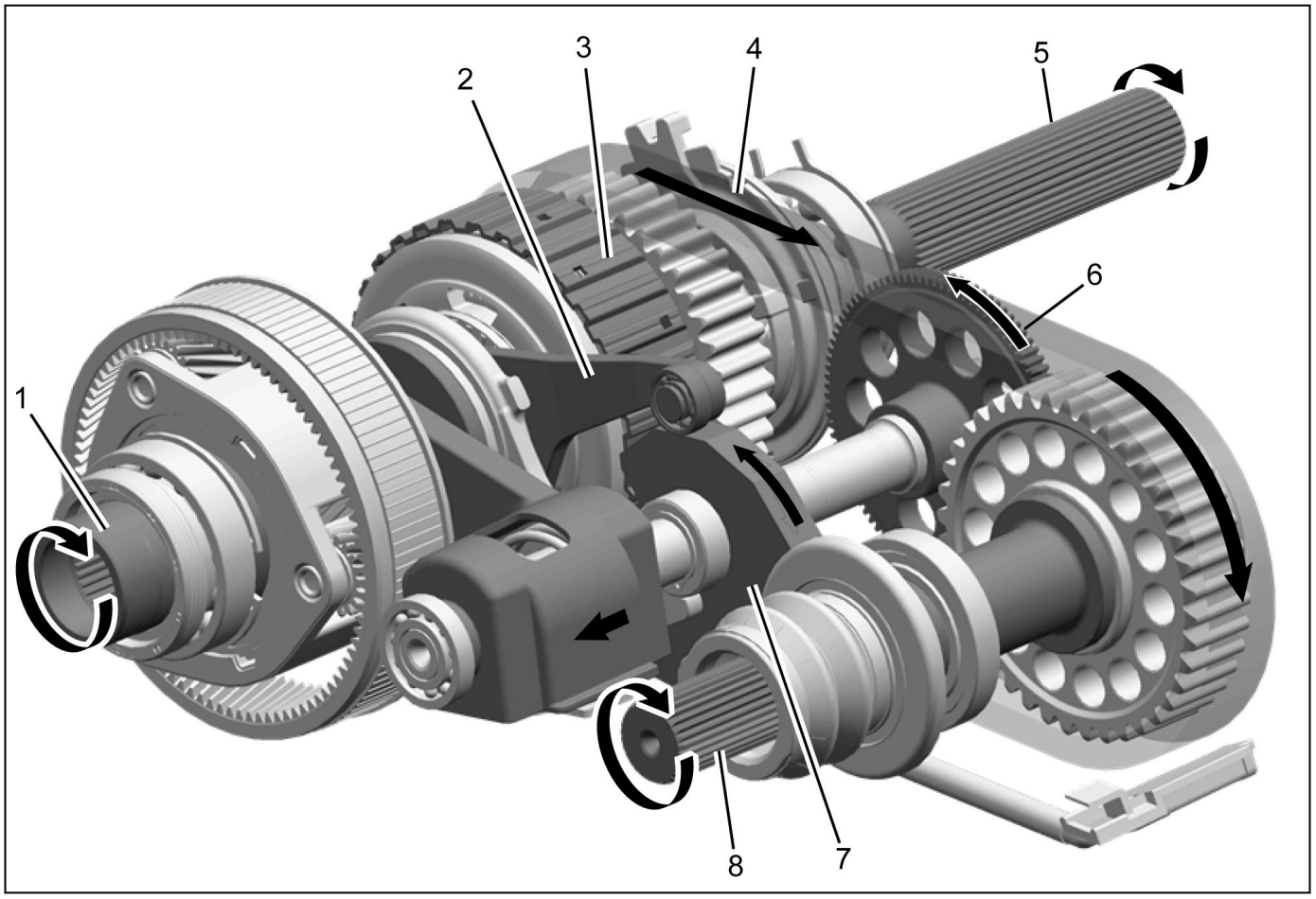
2WD Mode Power Flow



6261448

When the MP 3023/3024/3025 ATC is in the 2WD mode, the power flows from the transmission (1) to the input shaft (2). The input shaft (2) is connected to the rear output shaft (4) by the transfer case high/low clutch (3). The transfer case high/low planetary carrier (3) outer teeth are engaged with the input shaft (2) inner, high-speed position teeth. At the same time the transfer case high/low planetary carrier is slip splined to the rear output shaft (4). The rear output shaft (4) delivers the power flow to the rear propeller shaft (5). The position of the transfer case two/four wheel drive actuator shaft (7) allows no clutch (6) engagement. The transfer case high/low shift fork (8), is in the high-speed position on the transfer case two/four wheel drive actuator shaft (7).

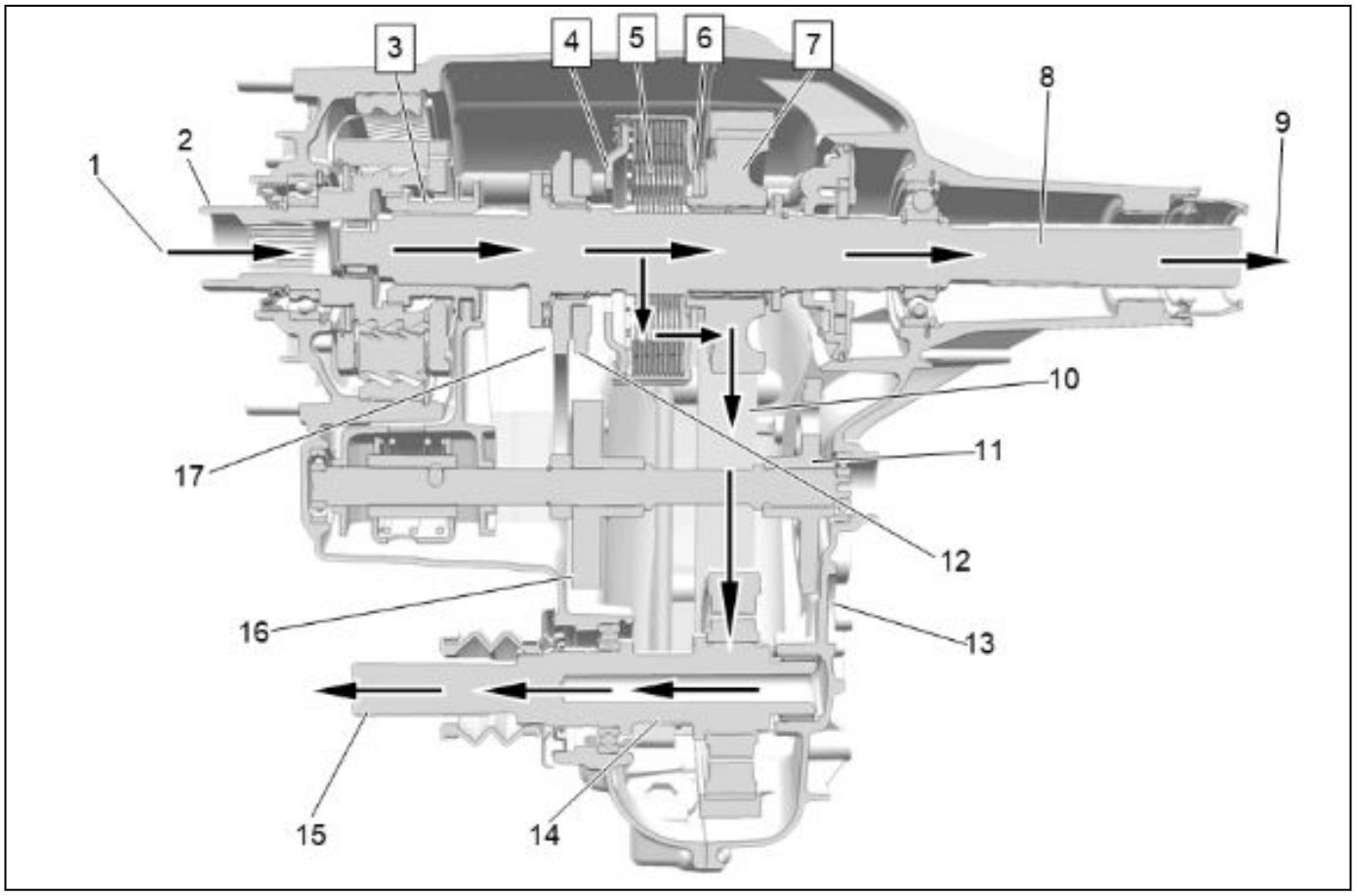
4HI Mode Power Flow



4994666

(1) Transfer Case Input Shaft
(2) Transfer Case Scissor Mechanism Lever
(3) Transfer Case Four Wheel Drive Clutch
(4) Transfer Case Front Output Shaft Drive Chain Assembly
(5) Transfer Case Rear Output Shaft
(6) Transfer Case Two/Four Wheel Drive Actuator Shaft Gear
(7) Transfer Case Two/Four Wheel Drive Actuator Cam
(8) Transfer Case Front Output Shaft

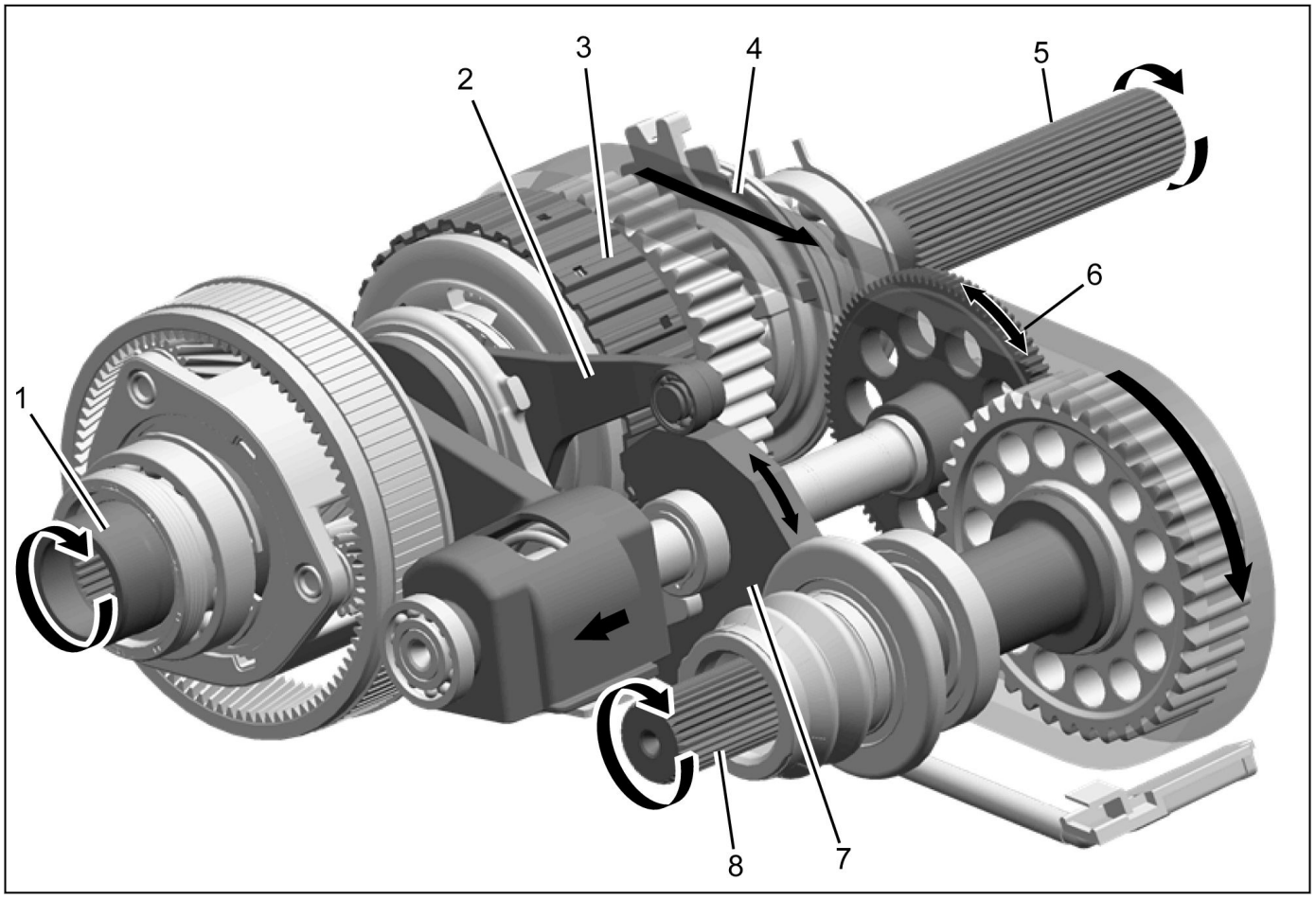
4HI Mode Power Flow



6261449

In the 4HI mode, the power flow to the rear propeller shaft (9) is the same as it is in the 2WD mode. To deliver power flow to the front propeller shaft (15) during the 4HI position, the transfer case control module commands the 2/4 wheel drive actuator assembly (13) to apply the clutch to a calibrated torque. The 2/4 wheel drive actuator assembly (13) turns the control actuator shaft. A brake in the 2/4 wheel drive actuator assembly (13) holds the control actuator shaft in the full clutch position. The control actuator shaft is cam designed and the cam action moves the transfer case scissor mechanism lever (12). The transfer case scissor mechanism lever (12) pivots against the transfer case scissor mechanism lever (17) and moves toward the clutch pressure plate (4), to engage the clutch (5). As more pressure is applied to the clutch pressure plate (4), the clutch discs (5) are compressed. Using inner clutch discs, which are engaged with the clutch hub, and the outer clutch discs, which are engaged with the clutch housing (6), the power flow is delivered to the clutch housing (6). The clutch hub is splined to the rear output shaft (8), and the clutch housing (6) rotates on a needle bearing on the rear output shaft (8). The chain drive sprocket (7) is splined to the transfer case four wheel drive clutch housing (6). The power flows from the transfer case front output shaft drive sprocket (7), through the transfer case front output shaft drive chain (10), to the transfer case front output shaft driven sprocket. The transfer case front output shaft driven sprocket is splined to the front output shaft (14). The power flow is delivered to the front propeller shaft (15) through the front output shaft (14).

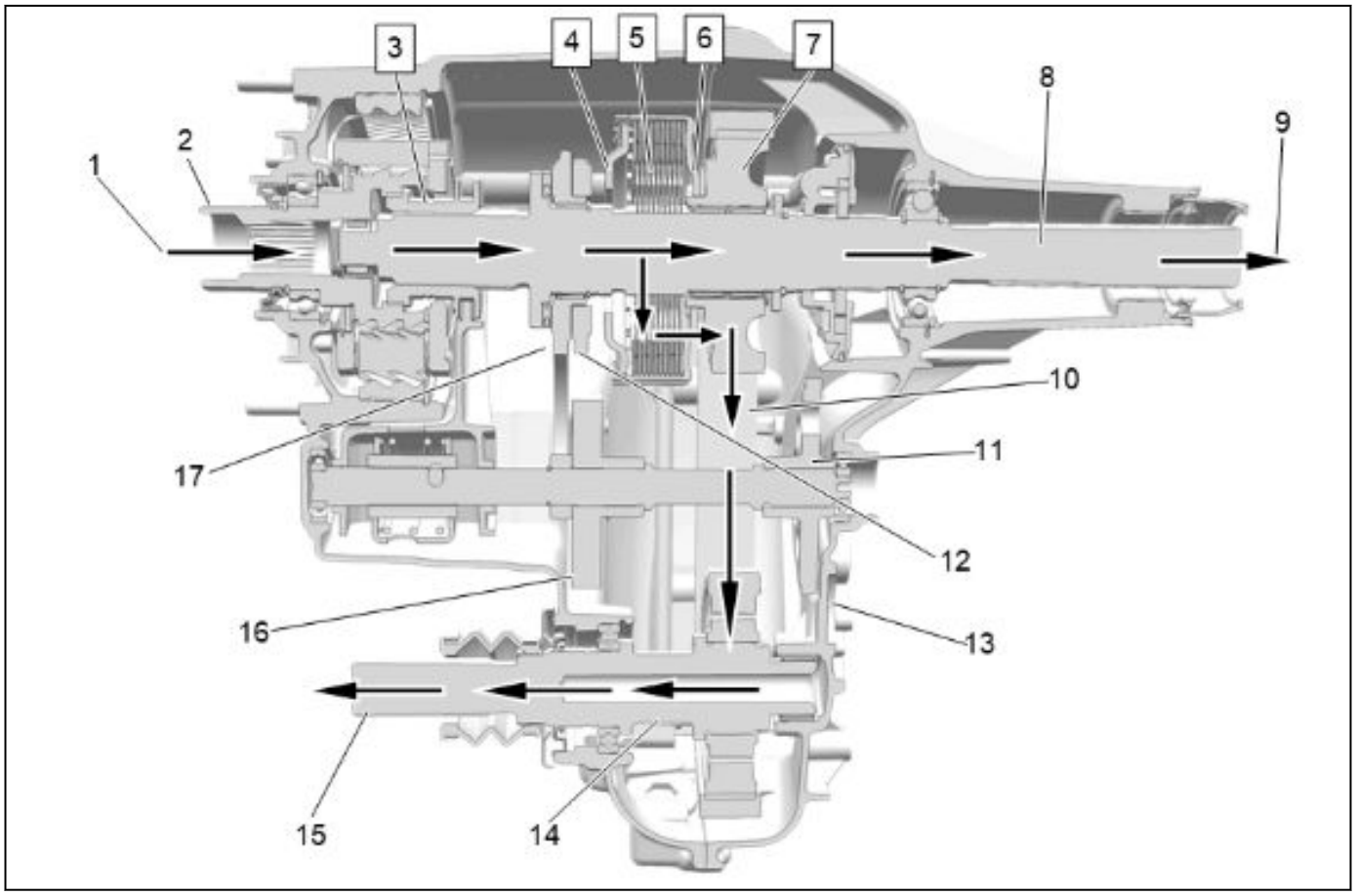
Auto 4WD Mode Power Flow



4994668

(1) Transfer Case Input Shaft
(2) Transfer Case Scissor Mechanism Lever
(3) Transfer Case Four Wheel Drive Clutch
(4) Transfer Case Front Output Shaft Drive Chain Assembly
(5) Transfer Case Rear Output Shaft
(6) Transfer Case Two/Four Wheel Drive Actuator Shaft Gear
(7) Transfer Case Two/Four Wheel Drive Actuator Cam
(8) Transfer Case Front Output Shaft

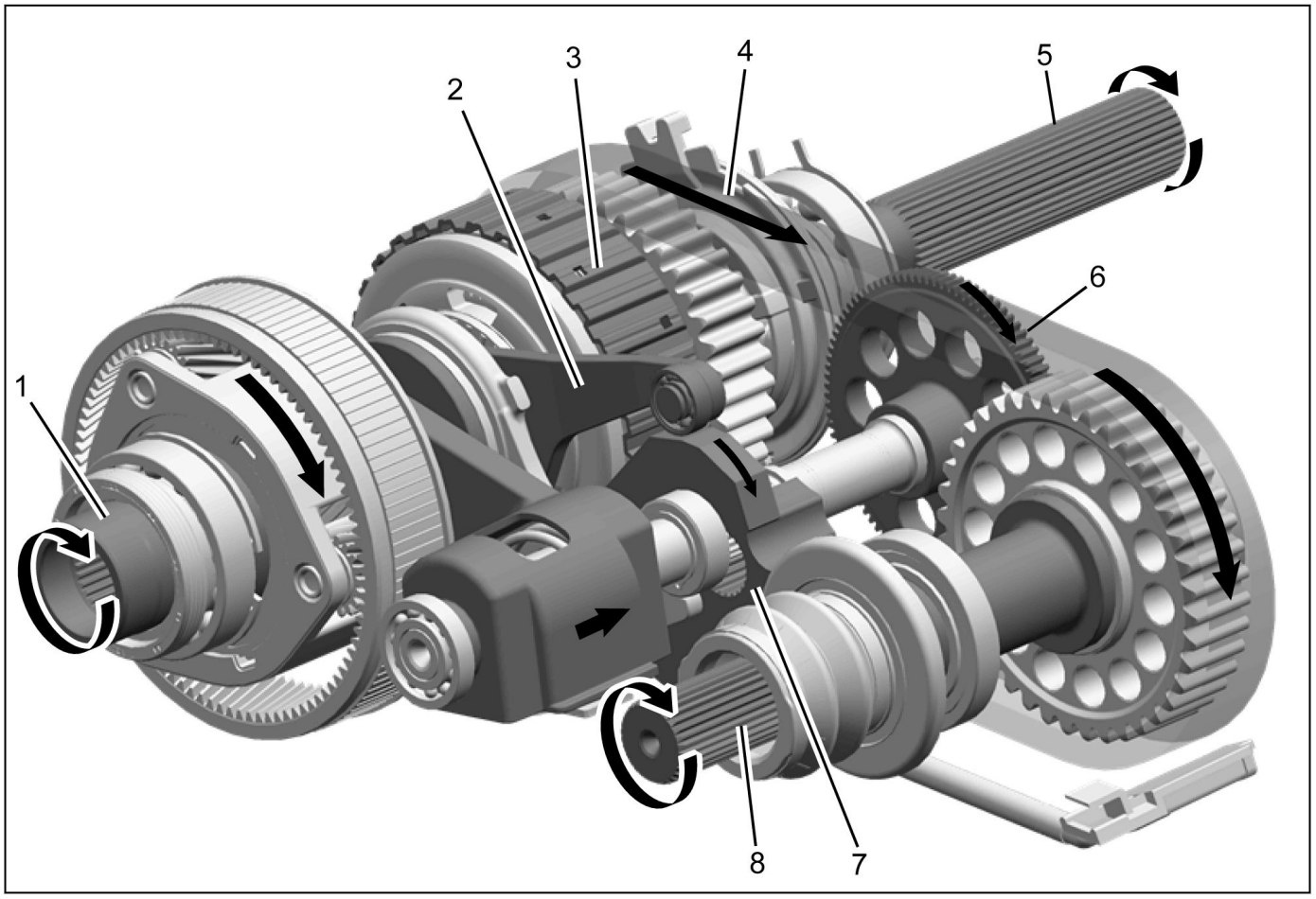
AUTO 4WD Mode Power Flow



6261449

During the Auto 4WD mode, the power flow is the same as it is in the 4HI mode. Except, during the Auto 4WD mode, the 2/4 wheel drive actuator assembly (13) rotates the control actuator shaft to the correct torque level positions. Rotating the control actuator shaft to the various positions changes the clutch torque level. When a difference of front wheel speed to rear wheel speed is recognized, the transfer case control module commands for more or less clutch torque.

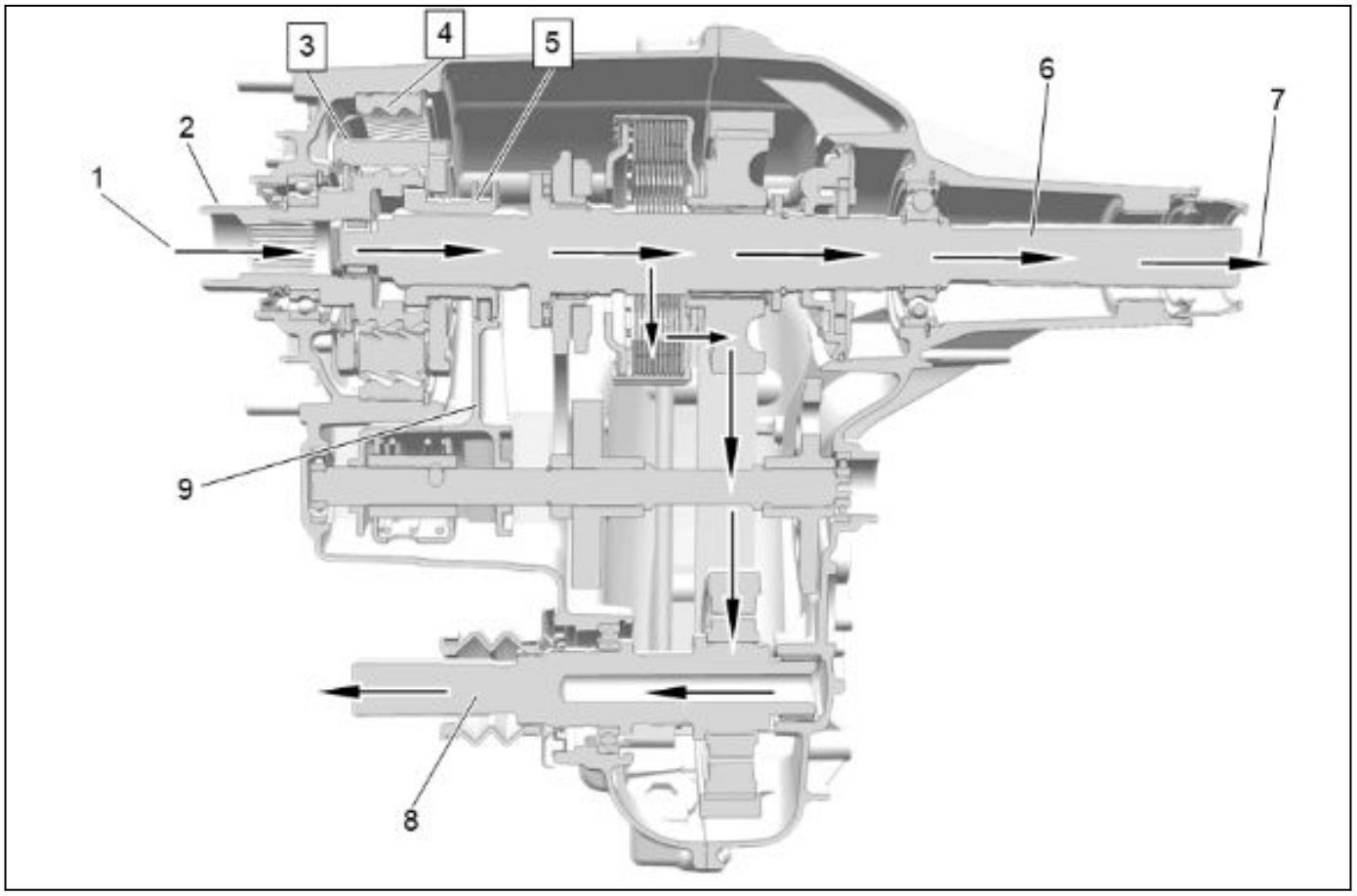
4LO Mode Power Flow



4994671

(1) Transfer Case Input Shaft
(2) Transfer Case Scissor Mechanism Lever
(3) Transfer Case Four Wheel Drive Clutch
(4) Transfer Case Front Output Shaft Drive Chain Assembly
(5) Transfer Case Rear Output Shaft
(6) Transfer Case Two/Four Wheel Drive Actuator Shaft Gear
(7) Transfer Case Two/Four Wheel Drive Actuator Cam
(8) Transfer Case Front Output Shaft

4LO Mode Power Flow



6261450

When shifting the transfer case to the 4LO mode, it commands the 2/4 wheel drive actuator assembly to turn the control actuator shaft, to move the transfer case high/low shift fork (9). The transfer case high/low shift fork (9) moves the transfer case high/low clutch (5), which is slip splined on the rear output shaft (6) toward the rear of the transfer case. The transfer case high/low clutch (5) outer teeth disengage from the input shaft (2) inner teeth. The transfer case high/low clutch (5) outer teeth then engage in the planetary carrier teeth. The power flow is now from the input shaft (2) planetary teeth to the planetary gears (3) in the carrier. Rotating the planetary gears (3), which are engaged in the high/low internal gear (4), the planetary carrier rotates. The planetary carrier engaged to the transfer case high/low clutch (5), drives the rear output shaft (6), providing a 2.72 reduction to the speed of the rear output shaft (6). The power flow to the front propeller shaft (8) is the same as it is in the 4HI.

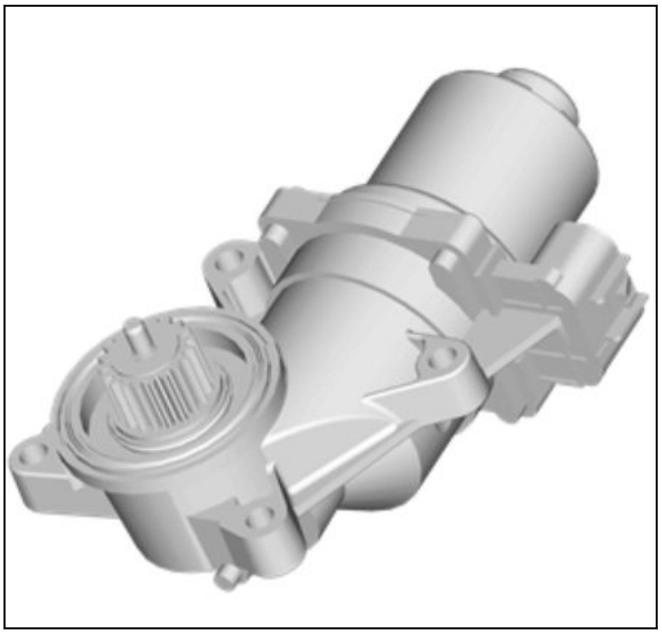
NEUTRAL Mode Power Flow

Shifting to the NEUTRAL position, the high/low clutch is centered between the input shaft and the high/low planetary carrier. The high/low clutch is not engaged with either the input shaft or the high/low planetary carrier teeth.

Service 4 Wheel Drive Message

The Service 4 Wheel Drive Message is a display within the Drivers Information Center (DIC) and cannot be serviced separately. This message is used to inform the driver that a transfer case system malfunction has occurred. The Service 4 Wheel Drive Message is controlled by the transfer case shift control module via GMLAN.

Transfer Case Two/Four Wheel Drive Actuator Assembly



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The transfer case two/four wheel drive actuator assembly consists of a permanent magnet DC motor and gear reduction assembly. It is located on the left hand side, driver's side, of the transfer case. When activated, it rotates the shift detent lever shaft of the transfer case, clockwise or counterclockwise, to shift the transfer case. The motor/encoder is controlled with a PWM signal by the transfer case shift control module. This circuit consists of a driver on both the Motor A and Motor B circuits. The encoder motor is bi-directional in order to allow the motor to shift the transfer case from 2HI or 4HI to NEUTRAL and 4LO positions. The two/four wheel drive incremental sensor and motor lock are internal to the actuator motor assembly.

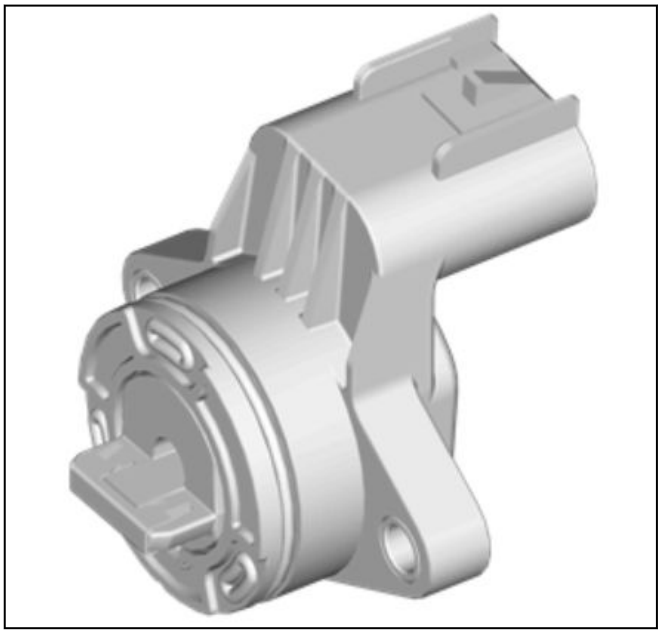
Transfer Case Motor Lock

The transfer case motor lock is internal to the transfer case actuator motor and is replaced with the actuator motor as an assembly. The motor lock is used to provide a 2HI, 4HI, and 4LO motor locking feature. When the lock circuit is energized, the transfer case actuator motor is allowed to turn. When the transfer case is placed 2HI, 4HI, or 4LO the motor lock circuit is de-energized and the lock is applied. This assures that the transfer case remains in the current gear position until a new gear position is requested. When AUTO 4WD is selected, the motor lock remains applied until an adaptive mode torque being applied to the front propeller shaft is required. During an adaptive mode condition the motor lock circuit is energized and the motor lock is released, enabling the actuator motor to turn and apply or release torque at the front propeller shaft.

Transfer Case Two/Four Wheel Drive Incremental Sensor

The incremental sensor is internal to the transfer case actuator motor and is replaced with the motor as an assembly. The incremental sensor converts the shift detent lever shaft position, representing a mode or range, into an electrical signal input to the transfer case shift control module. The module detects what position the transfer case is in by monitoring the voltage returned on the incremental encoder impulse signal circuit. This voltage translates into AUTO 4WD, 2HI, 4HI, NEUTRAL, and 4LO or in transition between gears.

Transfer Case Actuator Shaft Position Sensor Assembly



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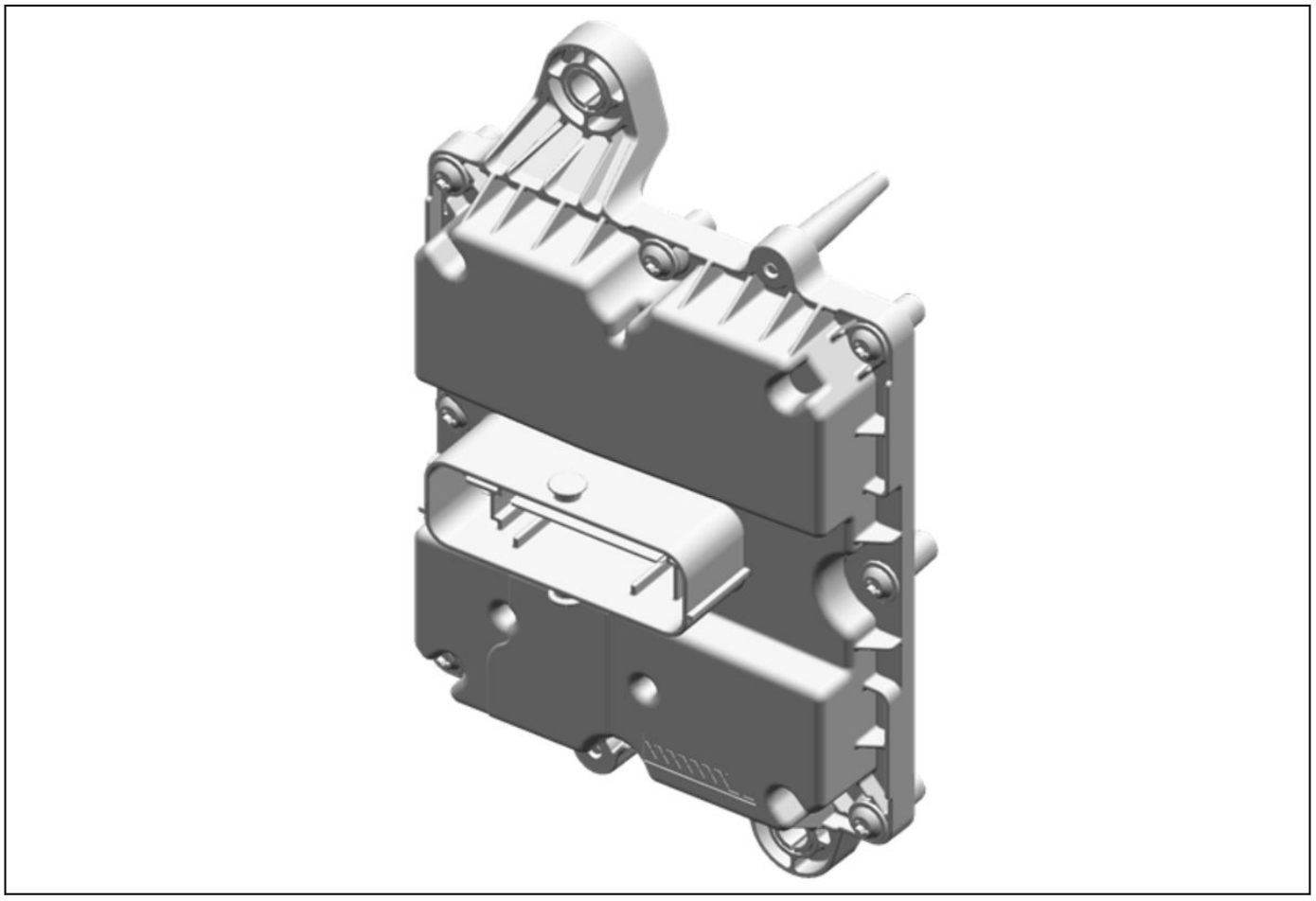
This sensor works in conjunction with the incremental sensor and shows transfer case position in degrees.

Transfer Case Shift Control Module



5071149

The transfer case shift control module uses the vehicle identification number (VIN) information for calculations based on axle ratio, transmission, tire size, and engine size. For StabiliTtrak applications, when the vehicle is in the AUTO 4WD mode, the transfer case shift control module monitors the wheel speed via the four wheel speed sensors in order to detect wheel slippage. For non-StabiliTrak applications, when the vehicle is in the AUTO 4WD mode, the transfer case shift control module monitors the wheel speed via the two front wheel speed sensors and the vehicle speed sensor in order to detect wheel slippage. When wheel slippage is detected, the module applies a clutch pack contained inside the transfer case. This clutch pack is used to lock-in and apply the front propeller shaft, transferring torque to the front wheels. The clutch pack is applied by a motor/encoder assembly. When slip is no longer detected by the transfer case shift control module, the clutch is no longer applied.

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