2005 GM/Isuzu Truck

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General Motors Isuzu Commercial Truck, LLC (GMICT) and American Isuzu Motors Inc. is striving to provide you with the most up-to-date and accurate information possible. If you have any suggestion to improve the Body Builder's Guide, please call GMICT Application Engineering. In the West Coast call 1-562-229-5314 and in the East Coast call 1-404-257-3013.

Notice of Liability
All specifications contained in this Body Builders Guide are based on the latest product information available at the time of publication. The manufacturer reserves the right to discontinue or change at any time, without prior notice, any parts, materials, colors, special equipment, specifications, designs and models.

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INSTALLATION OF BODY AND SPECIAL EQUIPMENT – Modification of the Frame – (Continued)

VEHICLE SPECIFICATIONS INDEX – NPR HD/W4500, NQR/W5500 Crew Cab Diesel – (Continued)

INTRODUCTION

This guide has been provided as an aid to final stage manufacturers in determining conformity to the applicable Emission Control and Federal Motor Vehicle Safety Standards. Final stage manufacturers should maintain current knowledge of all Emission Regulations and Federal Motor Vehicle Safety Standards and be aware of their specific responsibility in regards to each standard.

Any manufacturer making material alterations to this incomplete vehicle during the process of manufacturing the complete vehicle should be constantly alert to all effects, direct or indirect, on other components, assemblies or systems caused by such alterations. No alterations should be made to the incomplete vehicle that directly or indirectly results in any either component, assembly or system being in nonconformance with applicable Emission Regulations or Federal Motor Vehicle Safety Standards.

General Motors Isuzu Commercial Truck, LLC (GMICT) and American Isuzu Motors Inc. will honor its warranty commitment (**for the cab-chassis only**), to the ultimate consumer, provided: (1) the final stage manufacturer has not made any alterations or modifications which do not conform to any applicable laws, regulations or standards, or adversely affect the operation of the cab-chassis; and (2) the final stage manufacturer complied with the instructions contained in this guide with respect to the completion of the vehicle. Otherwise, the warranty becomes the responsibility of the final stage manufacturer.

The final stage manufacturer is solely responsible for the final certification of the vehicle and for compliance with Emission Control and Federal Motor Vehicle Safety Standards. The information contained in this guide has been provided for the final stage manufacturer's information and guidance.

This guide contains information pertaining to the: NPR/W3500 Gas; NPR/W3500 Diesel; NQR/W5500 Diesel; NPR HD, NQR/W4500, W5500 Diesel Crew Cab; and NRR/W5500-HD Series Chassis Cab.

Following is a list of Federal Motor Vehicle Safety Standards applicable to those vehicles with a GVWR greater than 10,000 lbs. Please refer to the chart on the next page.

FMVSS Chart

List of Federal or Canadian Motor Vehicle Safety Standards applicable to Isuzu/GMC Truck product lines. Gasoline or diesel fueled vehicles with GVWR greater than 10,000 lbs. (4536 Kg)

MVSS No.	Title Upper line FMVSS, Lower Line CMVSS	NPR, NPR HD/ W3500, W4500	NQR/W5500	NRR/W5500-HD	
101	Controls and displays Location and identification of controls and displays	A	A	A	
102	Transmission shift lever sequence, starter interlock and transmission braking effect Transmission control functions	A	A	A	
103	Windshield defrosting and defogging systems Windshield defrosting and defogging	A	A	A	
104	Windshield wiping and washing systems Windshield wiping and washing systems	A	A	A	
105	Hydraulic and electric brake systems Hydraulic and electric brake systems	A	A	A	
106	Brake hoses Brake hoses	A	A	A	
108	Lamps and reflective devices and associated equipment Lighting systems and reflective devices	A	A	A	
111	Rear view mirrors Mirrors	A	A	A	
113	Hood latch system Hood latch system	A	A	A	
115	N/A Vehicle identification system[2]	A	A	A	
116	Motor vehicle brake fluids Hydraulic brake fluids	A	A	A	
118	Power operated window, partition, and roof panel systems N/A	A	A	A	

1 = The letter A or B designates the lettered statement regarding FMVSS / CMVSS.
2 = Canadian MVSS Only.

FMVSS Chart (continued)

List of Federal or Canadian Motor Vehicle Safety Standards applicable to Isuzu/GMC Truck product lines. Gasoline or diesel fueled vehicles with GVWR greater than 10,000 lbs. (4536 Kg)

MVSS No.	Title Upper line FMVSS, Lower Line CMVSS	NPR, NPR HD/ W3500, W4500	NQR/W5500	NRR/W5500 HD		
120	Tire selection and rims for vehicles other than passenger cars Tire selection and rims for vehicles other than passenger cars	A	A	A		
121	Air brake systems Air brake systems	B	B	B		
124	Accelerator control system Accelerator control system	A	A	A		
205	Glazing materials Glazing materials	A	A	A		
206	Door locks and door retention components Door locks and door retention components	A	A	A		
207	Seating systems Anchorage of seats	A	A	A		
208	Occupant crash protection Occupant restraint systems in frontal impacts	A	A	A		
209	Seatbelt assemblies Seatbelt assemblies	A	A	A		
210	Seatbelt assembly anchorages Seatbelt assembly anchorages	A	A	A		
213	Child restraint systems Built in child restraint systems and built in booster cushions	A	A	A		
302	Flammability of interior materials Flammability	A	A	A		

1 = The letter A or B designates the lettered statement regarding FMVSS / CMVSS.
2 = Canadian MVSS Only.

NOTE: This chart is only a guide. For complete information, please refer to “Document for Incomplete Vehicle” provided with each chassis.

EPA Requirements

NPR/W3500 Gas, NPR/W3500 Diesel, NQR/W5500 Diesel, NPR HD, NQR/W4500, W5500 Diesel Crew Cab and NRR/W5500-HD Series Chassis Cab

To assure that U.S.A. and Canada Emission Requirements are met, this Incomplete Vehicle must be completed in strict accordance with all instructions contained in this document, especially the following instructions which relate to:

- **A** **Exhaust emission related components**
- **B** **Noise emission related components**
- **C** **Labels**

A. EXHAUST EMISSION RELATED COMPONENTS

Compliance of this vehicle with EPA, California and Canada Requirements will be maintained providing no alterations are made to the components or systems identified below:

1. DIESEL VEHICLES

Injection Pump
Injector and High Pressure Lines
Turbocharger
Charge Air Cooler and Charge Air Cooler Hoses
Engine Control Module (ECM)
Engine Speed Sensor
Engine Coolant Temperature Sensor
Intake Manifold
Catalytic Converter and Its Location
Variable Swirl System
Exhaust Gas Recirculation System

2. GASOLINE VEHICLES

Vehicle Control Module (VCM)
Fuel Management System
Air Induction System
Ignition System
Catalytic Converter System
Positive Crankcase Ventilation System
Exhaust Gas Recirculation System
Evaporative Emission Control System
Miscellaneous Items Used in Above Systems

CMVSS NO. 1100–VEHICLE EMISSIONS

This incomplete vehicle when completed, will conform to CMVSS 1100 providing no alterations are made which affect the function, physical or mechanical properties environment, locations or vital spatail clearance of the components identified below:

(EPA Requirements – continued on next page)

(EPA Requirements – continued from previous page)

B. NOISE EMISSION RELATED COMPONENTS

Compliance of this vehicle with EPA and Canada requirements will be maintained providing no alterations are made to the components or systems.

CMVSS NO. 1106–NOISE EMISSIONS

This incomplete vehicle, when completed, will conform to CMVSS-1106 providing no alterations are made which effect the function, physical or mechanical properties, environment, locations or vital spatial clearances of the components identified below:

- Engine assembly
- Intake system
- Exhaust system
- Transmission assembly
- Axle
- Tires
- Fan and drive
- Catalytic converter and its location

C. LABELS

The emission control related information labels which are permanently affixed are required by government regulation and must not be obstructed from view or defaced so as to impair its visibility or legibility.

PART 3: RADIO NOISE

CANADIAN RADIO INTERFERENCE REGULATIONS

A. The following statement is applicable to NPR/W Series Chassis-Cab (Gasoline Engine Only).

This incomplete vehicle, when completed, will conform to the above regulations providing no alterations or substitutions are made which affect any parts or components identified below:

A. Distributor

B. Ignition Wires

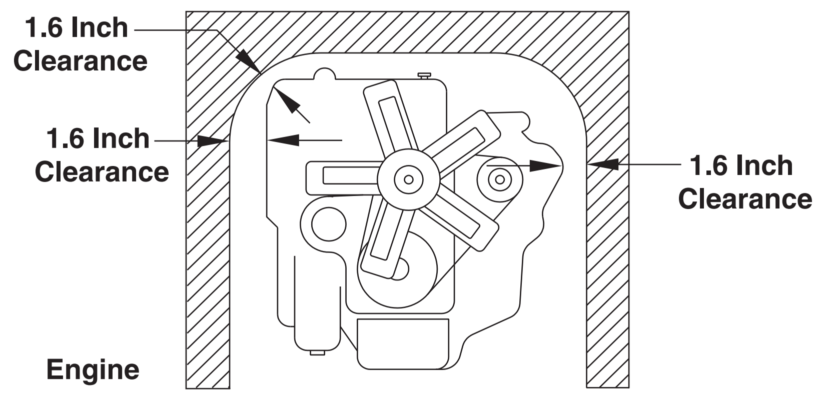
C. Spark Plug Wires

INSTALLATION OF BODY AND SPECIAL EQUIPMENT

Clearances

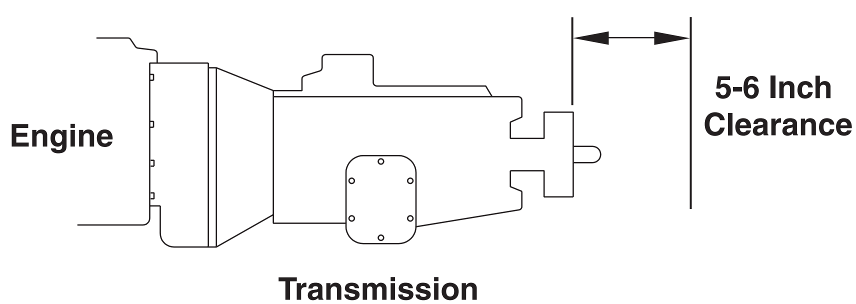
Engine

At least 1.6 inches of clearance should be maintained around the engine. No obstacles should be added in front of the radiator or intercooler.



Transmission

The transmission is removed from the rear. Enough clearance must be provided to allow rearward movement of the transmission assembly. Clearance should be sufficient to allow 5 to 6 inches of unrestricted movement of the transmission assembly. In addition, provide at least 2 inches of clearance around the control lever on the side of the transmission to allow free movement without any binding.



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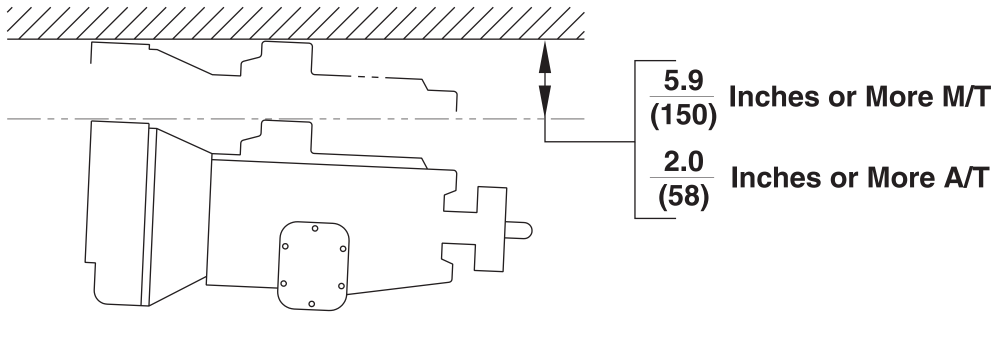
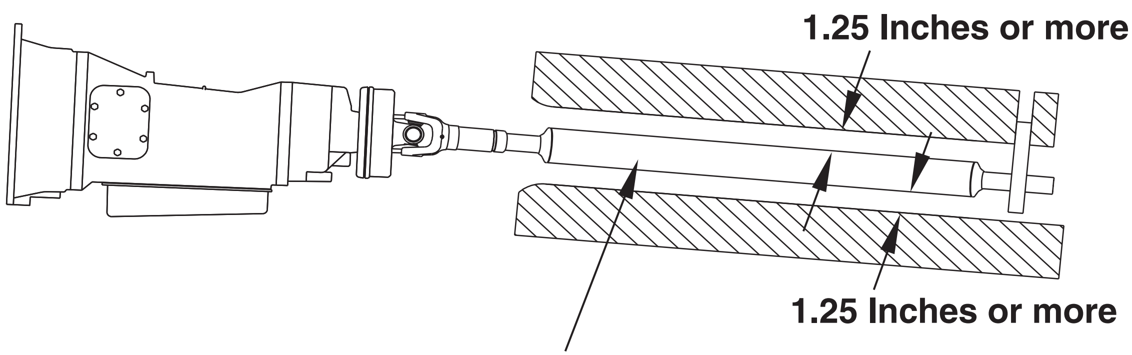
At least 6 inches of clearance should be maintained above the transmission to allow easy removal of the upper cover for manual transmissions. At least 2 inches of clearance should be maintained above the automatic transmission to allow for transmission removal.



Front and Center Propeller Shafts

At least 1.25 inches of clearance should be maintained around front and center propeller shafts.



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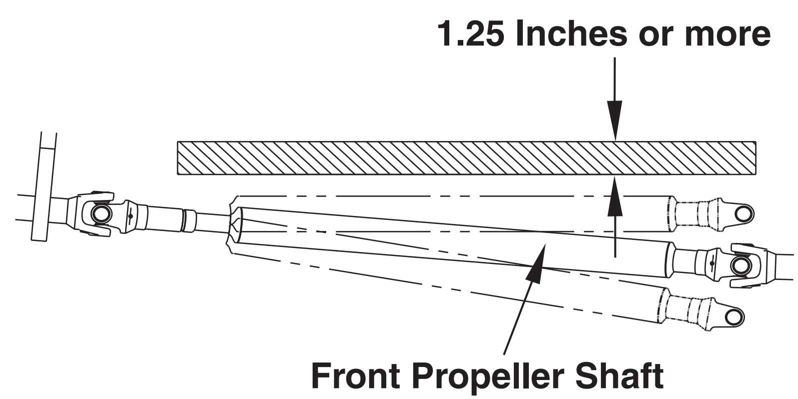
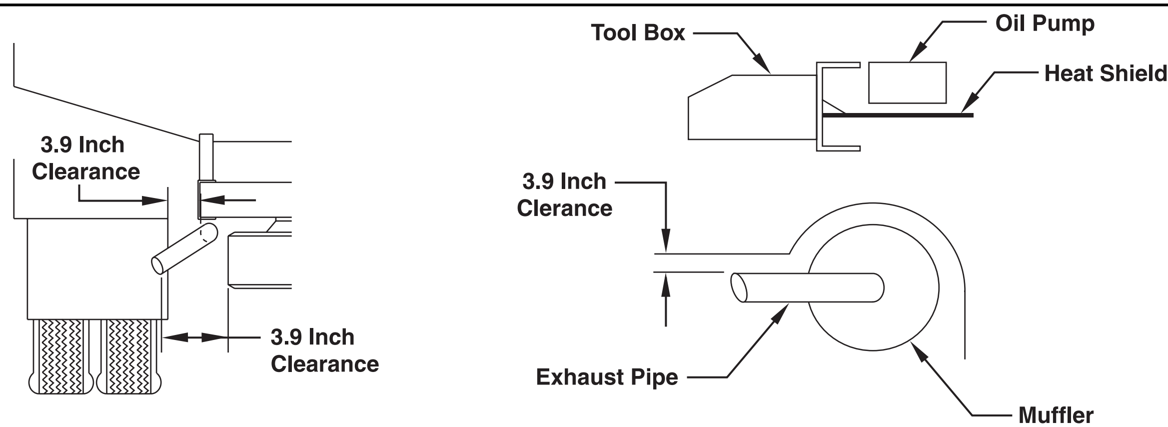
Rear Propeller Shaft

With the rear springs at maximum deflection, at least 1.25 inches of clearance should be provided over the rear propeller shaft.



Exhaust System

If flammable materials such as wood are used in the body, provide at least 3.9 inches of clearance between the body and any parts of the exhaust pipe, muffler and catalytic converter. If it is impossible to maintain this minimum clearance, use a heat shield. Also use a heat shield if an oil pump or line is located above the exhaust pipe, muffler or catalytic converter.



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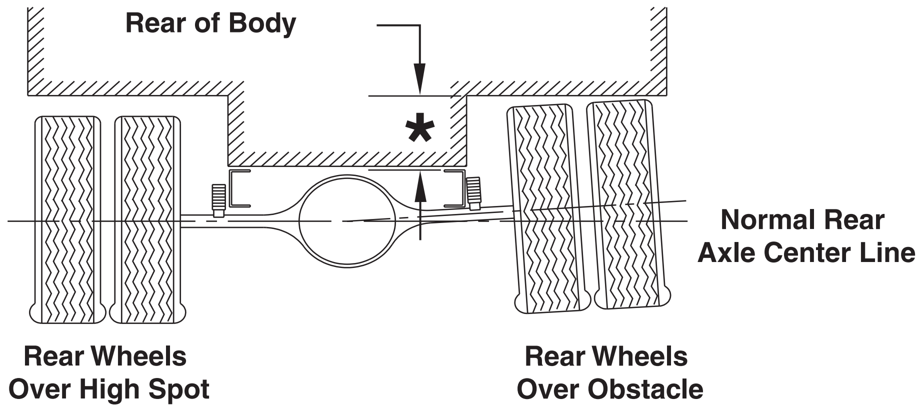
Rear Wheel and Axle

The design and installation of the body should allow sufficient clearance for full vertical movement of the rear wheels and axle when the vehicle travels over rough or unlevel surfaces.



Note: For recommended clearances, please refer to the Rear Axle Chart in each model's respective section.

Other Clearances

The transmission control cable may be broken if it is bent by or interferes with the body and its fixtures. To prevent this, 1 inch of minimum clearance should be provided. When cable is detached from body mounting, be sure not to bend the cable.

Accessibility to the grease nipple on the rear spring bracket/shackle should be provided so that serviceability with a grease gun is not hampered.

Parts	Minimum Clearance	Location
Brake Hose	6.7 in. 1.6 in.	Axle Side Frame Side
Parking Brake Cable	1.2 in.	–
Fuel Hose	1.6 in.	–
Shock Absorber	2.4 in. 1.2 in.	Axle Side Frame Side

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Body Installation

Chassis

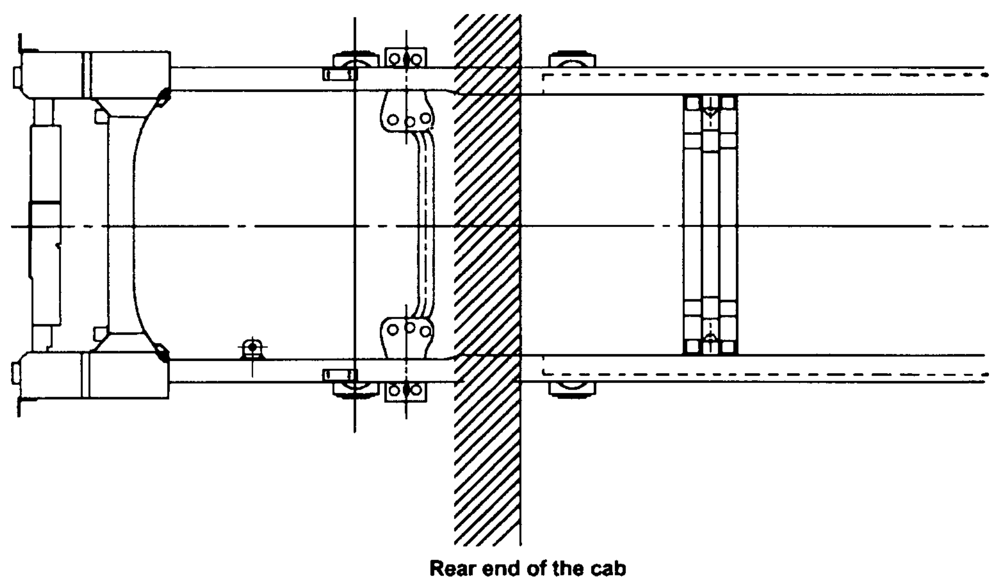
To maintain the performance of the truck chassis, either a side member or subframe should always be used for body mounting. Body mounting with low rigidity will often adversely affect riding comfort.

Special Equipment on the Chassis

When installing special equipment on the chassis, extra consideration must be given to the weight and construction of the equipment to assure proper distribution of the load. Localization of the load should be prevented. All special equipment should be properly secured into position. We recommend the use of subframe members when installing special equipment.

Subframe Design and Mounting

The subframe assembly should be mounted as close to the cab as possible. It should be contoured to match the shape and dimensions of the chassis frame as closely as possible.



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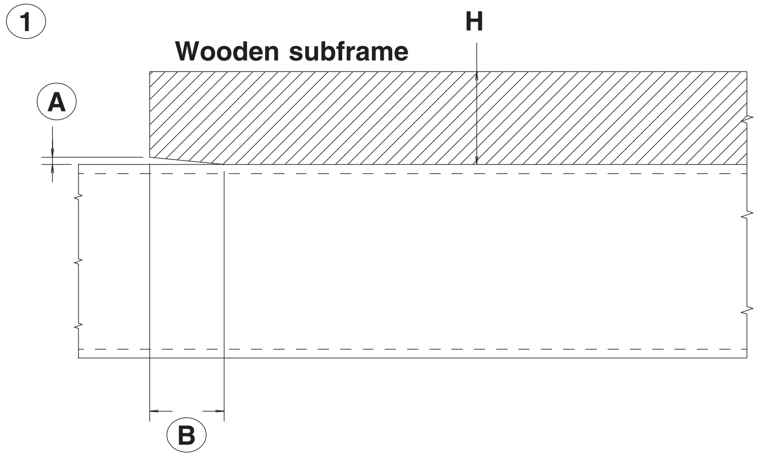
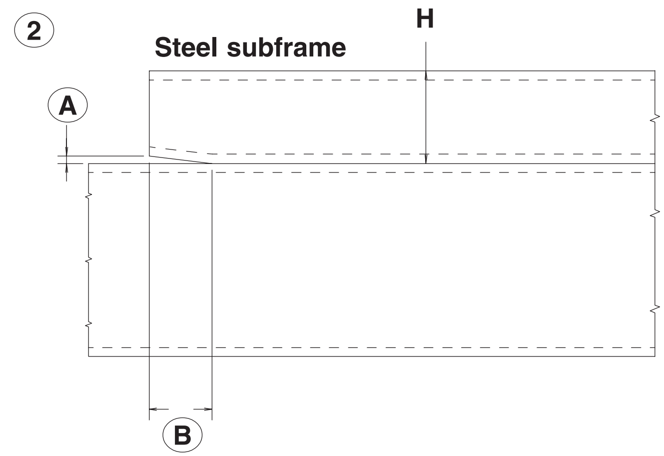
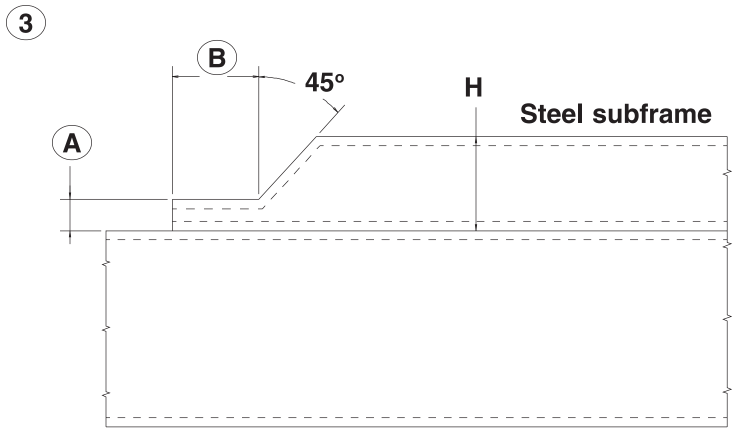
Subframe Contour

Contouring of the front end of the subframe members as shown in the three illustrations below will prevent stresses from being concentrated on certain areas of the chassis frame.







Drawing	A	B
1	0.2 in.	$\frac{H}{2} \sim H$
2	0.2 in.	H or more
3	$\frac{H}{3}$	H or more

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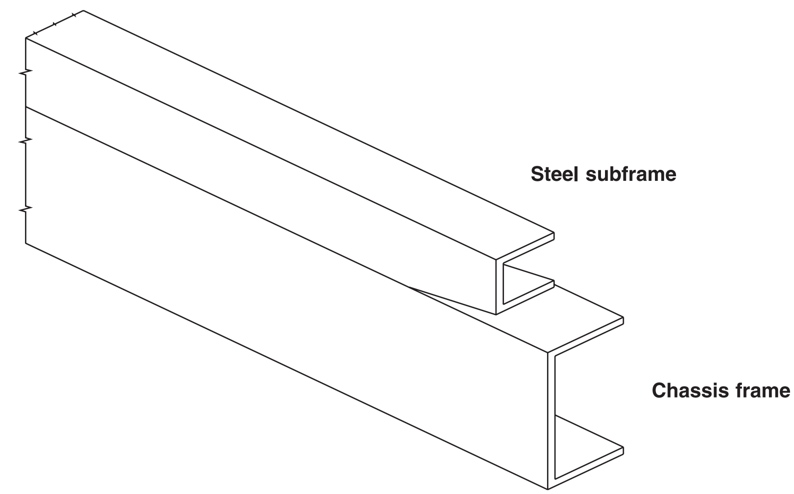
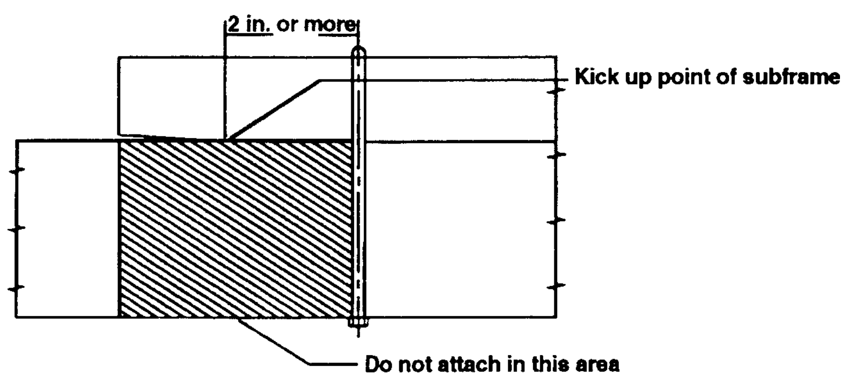
When using a steel subframe, do not close the end of the subframe.



Prohibited Attachment Areas

Do not attach the subframe with a bolt on bracket to the chassis frame at the points indicated by shading in the following illustrations.

1. At the front end of the subframe. The attaching bolt or bracket must be at least 2 inches behind the kick up point of the subframe.



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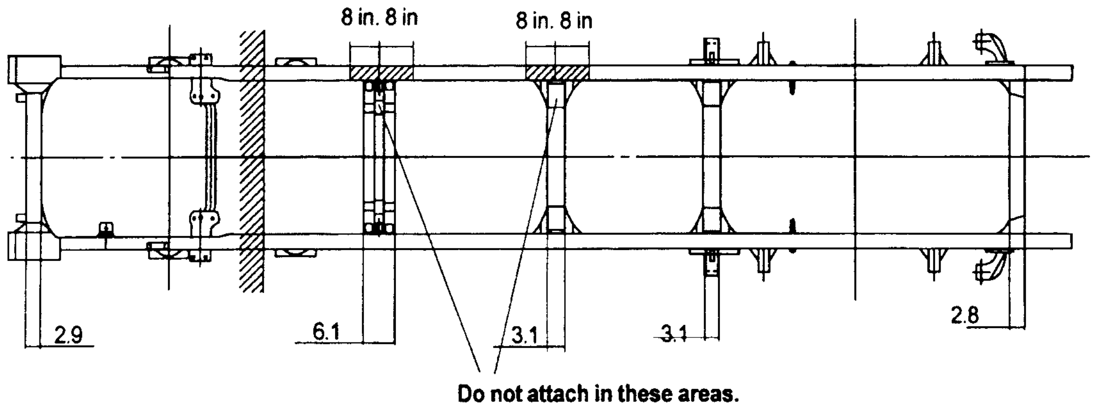
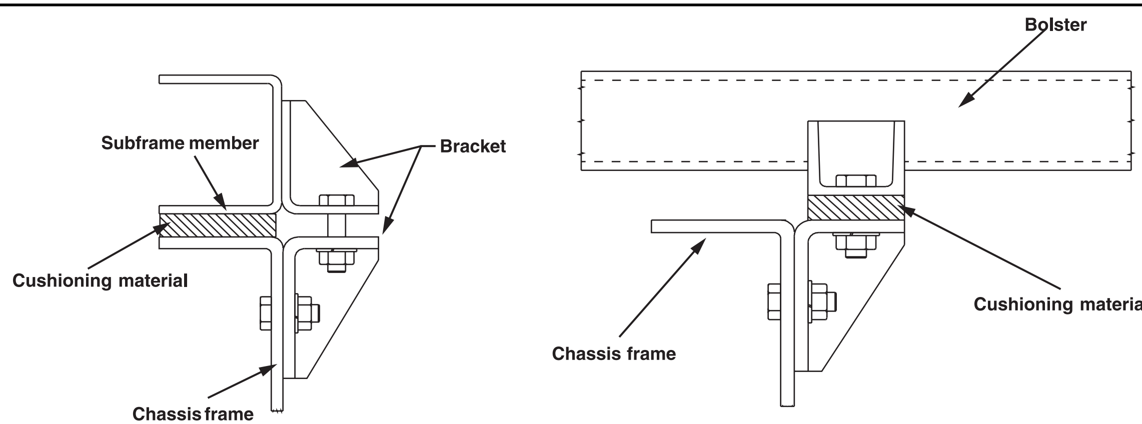
2. Within 8 inches of bends in the chassis frame or the attachment points of any crossmembers.



Subframe Mounting

Bracket Installation

Mounting brackets should be clamped to the chassis frame using bolts. For proper positions in which to install the bolts, refer to the preceding section and the section "Modifications to the Chassis Frame."



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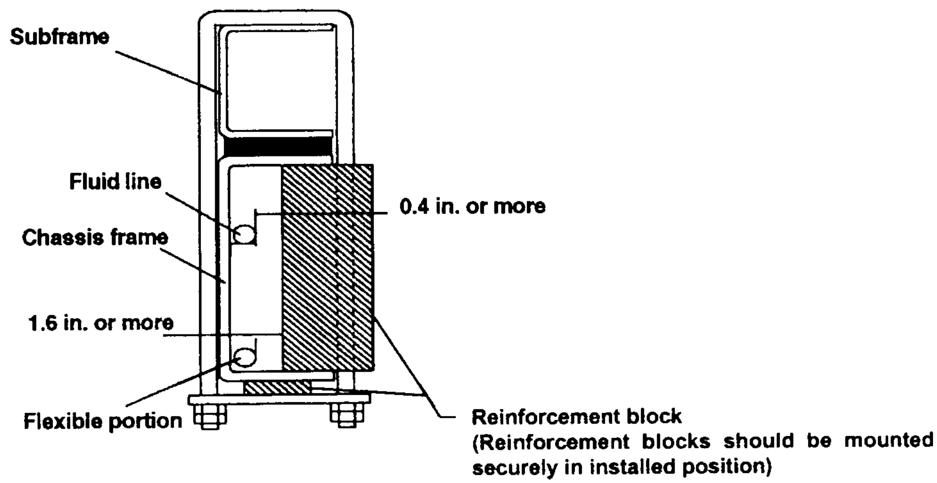
U-bolt Installation

When U-bolts are used to retain the subframe, reinforcement blocks must be installed in the frame members. This will prevent distortion of the frame flange as they are tightened. The drawing indicates the correct placement of reinforcement blocks. If you use wood blocks, be sure that there is sufficient clearance between them and any parts of the exhaust system.

If any fluid lines or electric cables are located near the reinforcement blocks, you must provide at least 0.4 inches of clearance between rigid or stationary portions, and at least 1.6 inches between moveable or flexible portions of the lines.



For the installation positions of the U-bolts, refer to "Prohibited Attachment Areas."

Crew Cab Body/Frame Requirement

The Crew Cab NPR HD/W4500 and NQR/W5500 will be available in two wheelbases, 150 and 176 inches. Effective CA will be 84.7 and 110.7 inches. On this model chassis, General Motors Isuzu Commercial Truck, LLC (GMICT) and American Isuzu Motors Inc. will require that the body installed on the chassis have an understructure manufactured with any of the following structural steel "C" channels:

4" x 1-5/8", 7.25 lbs./ft. = ok
5" x 1-3/4", 6.7 or 9.0 lbs./ft. = ok
6" x 2", 8.2, 10.5 or 13.0 lbs./ft. = ok

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Modification of the Frame

Modifications of the chassis frame should be held to an absolute minimum. Modification work should be performed according to the instructions in the following paragraphs.

When modification is complete, chassis frame members should be carefully inspected to eliminate the possibility of any safety-related defects.

NOTE: PLEASE REFER TO NOTES ON CHASSIS FRAME MODIFICATION WITH ANTILOCK BRAKES.

Working on Chassis frame

The chassis frame is designed and built with consideration for proper load distribution. Sufficient physical strength is provided when the load is evenly distributed. Installation of special equipment on the chassis frame can cause variations in load distribution. If even distribution of load is not kept in mind when the equipment is installed, localization of stresses on specific areas of the frame could cause cracking of the chassis frame members or other problems, even if the total weight of the equipment is within the design limit.

The chassis frame is designed as an integral unit. Therefore, **we do not recommend cutting the chassis frame under any circumstances.**

Drilling and Welding

IMPORTANT NOTE: For vehicles equipped with electronic engines and or electronic or hydra-matic transmissions, electric arc welding must be done with the negative battery cable disconnected.

1. Do not drill or weld in the shaded portions of the chassis frame members. Do not weld within 0.8 inches from the edges of any existing holes.
2. Hold the length of any welding beads within 1.2-2.0 inches. Allow at least 1.6 inches between adjacent welding beads.
3. All holes must be drilled. Do not use a torch to make any holes.
4. All riveting must be done with cold rivets. Do not use hot rivets.
5. The flange of the chassis frame must not be cut under any circumstances.
6. The subframe must be attached to the chassis frame with bolts. Do not weld.

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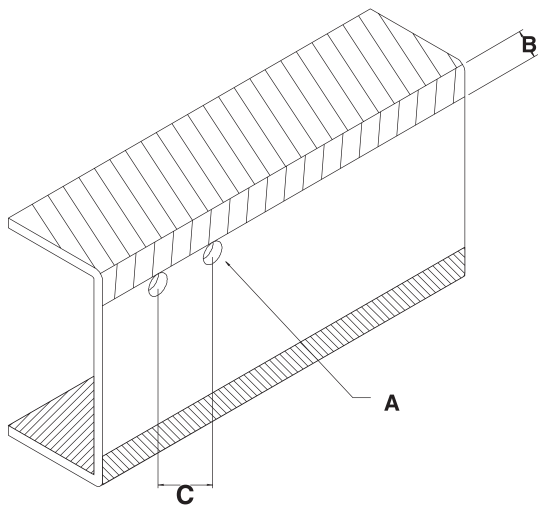

Dimensions:

- **A -** not more than 0.51 in. in diameter
- **B -** must be more than 0.8 in.
- **C -** must be more than 1.0 in.

Reinforcement of Chassis Frame

Reinforcements must be installed to prevent the considerable variation in the section modulus. They must be welded so as to avoid localized stresses.

The frame of the N and W Series gas and diesel is made of SAPH440 mild steel.

The drawing on the following page illustrates correct and incorrect methods of frame reinforcement.

Welding

1. Keep reinforcement plates and chassis frame free from moisture and water.
2. Avoid cooling with water after welding.
3. Use a suitable means to protect pipes, wires, rubber parts, leaf springs, etc. against heat and effect of sputtering.
4. Remove fuel tank assembly when welding portions near the fuel tank.
5. Remove coat of paint completely when welding painted areas.

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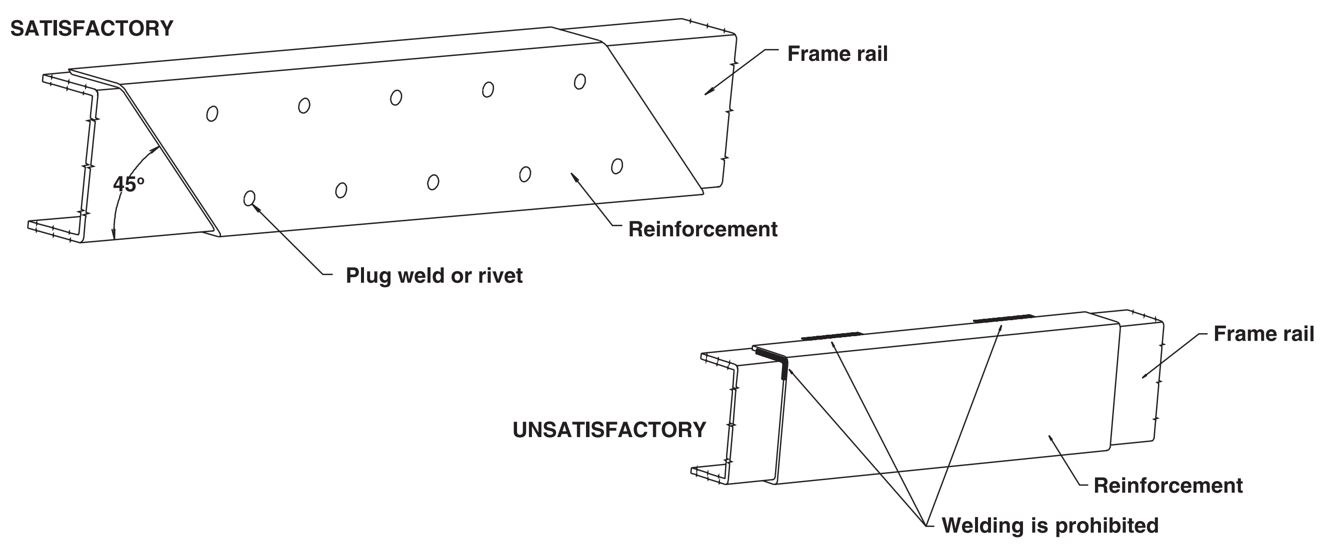

Fluid Lines

Do not disturb the layout of any brake lines or fuel lines unless absolutely necessary. When modification is needed, follow the instructions below carefully to ensure safety. Brake fluid lines must not be cut and spliced under any circumstances. We do not recommend the cutting or splicing of any fuel lines, but if it is absolutely necessary, be sure that the correct fitting and tools are used to form the joint, and then pressure test the joint. Steel lines are metric sizes.

Preparation of Additional Lines

1. Where possible, use only genuine GM/Isuzu lines as supplied by authorized GM/Isuzu dealers.
2. Use the correct metric flaring and bending tools to form the lines.
3. Avoid repeated bending. Do not use heat for flaring and bending the lines. Before and after forming the new lines, examine them carefully for scratches, distortion, dents and the presence of any foreign matter.

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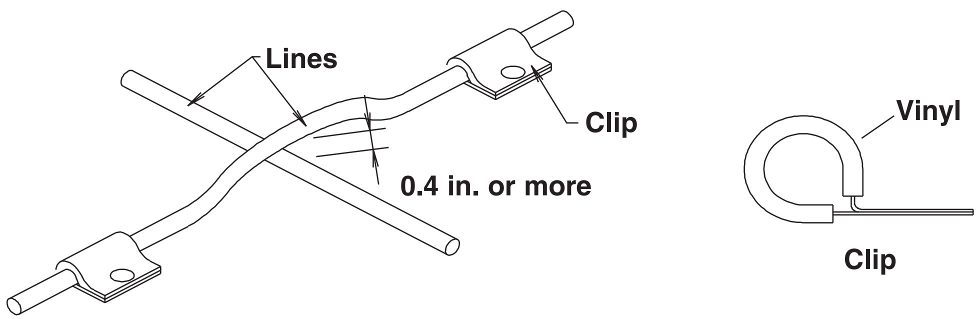
Installation of Additional Lines

Install new lines away from adjacent parts and away from any sources of heat.

1. A minimum clearance of 0.4 inches must be maintained between lines. Where necessary, clip the lines into position in order to maintain this minimum clearance.
2. Minimize any crossing between lines. If a crossing is unavoidable, use the following procedure:
   a. At least 0.4 inches of clearance should be maintained between lines at the crossing point.
   b. If the 0.4 inches of clearance cannot be maintained, or if the lines are subject to vibration, clip them securely.
3. Plan the bends and clipping points of the lines to minimize vibration and the resulting fatigue.
4. Use rust-proofed clips and apply vinyl coating to the portions of the lines to be clipped.
5. Install new lines in positions where they are protected against water, dirt, grit, sand, rocks and other foreign matter that can come from above or below, or can be flung up by the wheels.



Electrical Wiring and Harnessing

To increase the reliability of the wiring, all frame harnesses are covered with corrugated vinyl tubing. The following instructions apply to extending or modifying these harnesses. See the Electrical Section for information on commonly used circuits in the NPR, NPR HD, NQR, NRR and W-series.

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Wiring

1. Most wiring connections on GM/Isuzu vehicles are made with terminals. We recommend the use of terminals when splicing cables and wires.
2. When splicing, use new wire of the same gauge, and do not make splices inside the corrugated tubing.
3. When making connections to the end of the harness, make sure the connections are electrically perfect. Use insulating tape as needed to prevent the entry of water, which results in short circuits and/or corrosion.
4. When making new circuits, or modifying circuits already installed, make the cables only just taut enough to remove any slack. Use clips or grommets where required to protect cables from heat or sharp edges. When cables must run near the exhaust system, see the instructions in the “Exhaust System” section.
5. Always use rustproof clips, and apply vinyl coating to that portion of the clips in direct contact with the harnesses. No scotch clips or connectors.
6. To minimize the vibration of the harness, clipping points should be set up according to the table.

Harness Diameter	Clip Distance
less than 0.2 in.	less than 11.8 in.
0.2 in. ~ 0.4 in.	approx. 15.7 in.
0.4 in. ~ 0.8 in.	approx. 19.7 in.

7. When changing the length of the battery cable, do not cut or splice the existing cable. Make up a new cable of the correct length and wire gauge for the load and distance, without splices.
8. When using connectors, use a socket (female) connector on the electrical source side and a plug (male) connector on the electrical load side to lower the possibility of a short circuit when disconnected.
9. When connecting cables to moving or vibrating parts such as the engine or transmission, be sure to maintain sufficient slack in the wiring to absorb the vibration. Follow the example of existing cables connected by GM/Isuzu. Keep flexible cables clear of other parts.
10. Do not use vinyl tape in the engine compartment. The heat will tend to make it peel off. Use plated steel clips coated with rubber or vinyl.

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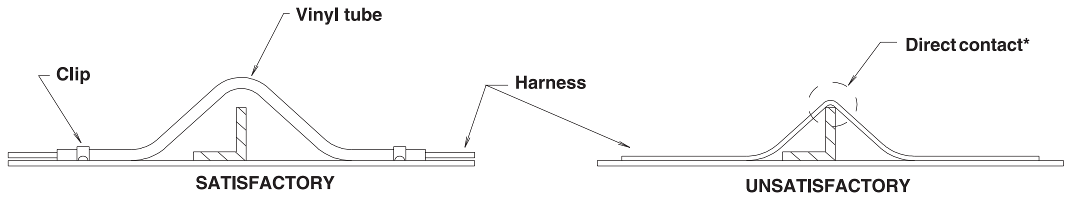
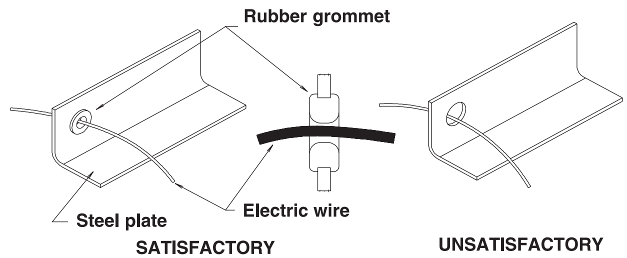
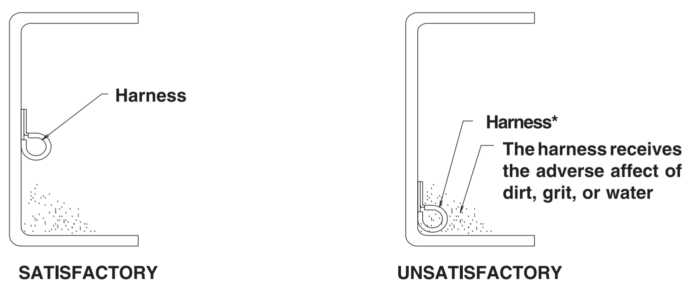


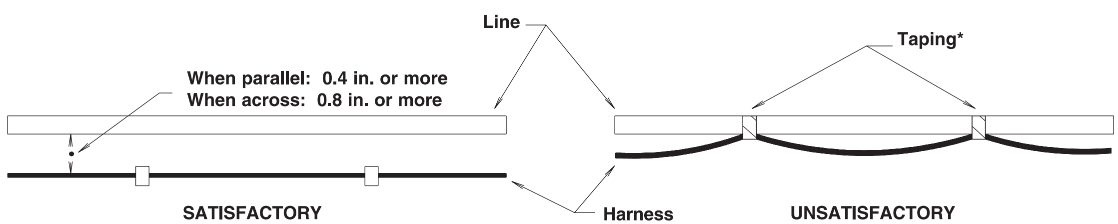


* Cables should not be in contact with sharp edges or pierced holes.



* Harnesses should not be installed on inside lower face of the chassis frame.

* Harnesses should not be taped to fuel lines or other lines. A sufficient clearance should be maintained between harness and pipe lines.



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Wire Color Code

The electrical circuits of the N/W and W Series Chassis Cab are connected with low-voltage stranded wire for automotive applications. The color coding standards are as follows for the N/W Series Chassis Cab:

(1)	Black	B	Starter circuits and grounds	(5)	Yellow	Y	Instrument circuit
(2)	White	W	Generator (alternator) circuit	(6)	Brown	Br	Accessory circuit
(3)	Red	R	Lighting circuit	(7)	Light Green	Lg	Other circuit
(4)	Green	G	Signal circuit	(8)	Blue	L	Windshield wiper motor circuit

Maximum Allowable Current

Harness Design Diameter (mm)	AWG Equivalent	No. of Wires/Wire Diameter (mm)	Cross Sectional Area (mm^2)	Maximum Allowable Current (Amps)
100	00	217/0.80	109.1	363
85	0	169/0.80	84.96	305
60	1	127/0.80	63.84	248
50	1	108/0.80	54.29	223
40	1	85/0.80	42.73	191
30	2	70/0.80	35.19	171
20	4	41/0.80	20.61	123
15	6	84/0.45	13.36	93
8	8	50/0.45	7.952	68
5	8	65/0.32	5.228	51
3	12	41/0.32	3.297	39
2	14	26/0.32	2.091	29
1.25	16	16/0.32	1.287	21
0.85	18	11/0.32	0.8846	17
0.5	20	7/0.32	0.5629	13

Reference: The values given in the "maximum allowable current" column are based on the ambient temperature condition of 104ºF with temperature increase of 104ºF.

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Electrical System Modifications

Modifications/add-on wiring must be carefully reviewed to ensure compatibility with the base vehicle wiring by reviewing system schematics, wire routing paths, harness connections, etc. Due to the wide range of modifications that may be required for vocational needs, it is not feasible for the O.E.M. to take into account all potential revisions. For this reason, any person modifying existing vehicle wiring must assume responsibility that the revisions have not degraded the electrical system performance. Any add-on wiring needs to be properly fused and routed to prevent cut, pinch, and chafe problems, as well as avoid exposure to excessive heat. Care must be exercised that existing vehicle interfaces do not have their current load capabilities exceeded, and that the respective control devices are not overloaded. Added wire size should be at least as large as the wire to which it is attaching in order for fuse protection to be maintained

A Packard electric wiring repair kit is available through Kent-Moore (P/N J38125-B) (Phone # 1-800-345-2233). This kit contains instructions, tools and components for making repairs to wiring harness components. This kit would also greatly assist in accomplishing necessary add-on wiring such as body marker lamps, so that system reliability/durability is maintained.

Electrical wiring components can be obtained through your authorized GM/Isuzu dealers. Packard Electric components are also available through Pioneer Standard Company (1-800-PACKARD). Pioneer may also be able to assist in making necessary wiring additions by providing custom wiring stubs or jumpers to your specifications.

Exhaust System

Modification of the exhaust system should be avoided. If modifications are absolutely necessary, the following points should be maintained.

1. Maintain the clearance specified in the “Exhaust System” table between all parts of the exhaust system and any fuel lines, brake lines, brake hoses, electrical cables, etc. The exhaust outlet should not point toward any of these parts.

	Clearance
Brake lines	2.4 in. or more. (If the combined section of a group of parallel brake lines is more than 7.8 in., a clearance of 7 in. or more should be provided.)
Flexible brake hoses	3.9 in. or more. (The temperature of flexible brake hoses should not exceed 158ºF. If the highest temperature is not measurable, a clearance of more than 15.7 in. should be maintained between the hoses and the exhaust system.)
Wiring harnesses and cables	3.9 in. or more.
Steel fuel lines	3.1 in. or more.
Rubber or vinyl fuel hoses	5.9 in. or more.

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2. If a tool box is installed, it should preferably be made from steel. If a wooden tool box is installed, at least 7.8 inches of clearance should be maintained between the tool box and any parts of the exhaust system.
3. If the exhaust system is modified, it is the responsibility of those making the modification to ensure that the noise level meets appropriate standards.
4. If the exhaust system is modified it is the responsibility of those making the modification to ensure that the emission levels meet appropriate standards.

Fuel System

Relocation of the fuel tank, or installation of additional fuel tanks, is not recommended. If modifications to the fuel system are unavoidable, follow these recommendations:

1. Maintain adequate clearance between the fuel tank and any other device or structure.
2. Do not connect any additional fuel hose.

Rear Lighting

Brackets installed are temporary. Please do not use these brackets for body installation.

Serviceability

No matter what other modifications or changes are made, access to components requiring daily preventive maintenance or other routine service must not be obstructed. This includes:

1. Inspection, filling and draining of engine oil and cooling water.
2. Inspection, filling and draining of transmission fluid.
3. Adjustment, removal and installation of the fan belts.
4. Inspection, filling and removal of the battery and battery cover.
5. Inspection and filling of brake fluid.
6. Inspection and bleeding of the brake system and servo unit.
7. Maintenance of clearance for tightening of check bolt on brake safety cylinder.
8. Operation of the spare tire carrier, including mounting and dismounting of the spare tire.
9. Adjustment, removal and installation of distributor and/or cover.

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Wheelbase Alteration

With certain applications, it may become necessary to alter the wheelbase of the chassis. The next two sections provide the suggested guidelines for accomplishing either shortening or lengthening of the wheelbase.

Shortening/Lengthening the Wheelbase Without Altering the Frame

Since the frame is an integral part of the chassis, it is recommended that the frame not be cut if it is possible to avoid it. When shortening/ lengthening the wheelbase on some models, it is possible to do so without cutting the frame. This is possible on models which have a straight frame rail. If the chassis does not have a straight frame rail, it may still be necessary to cut the frame. For instructions on shortening/ lengthening these chassis, refer to the "Altering the Wheelbase by Altering the Frame" section of this book. Otherwise, the wheelbase may be shortened/lengthened by removing the rear suspension, drilling new suspension mounting holes at the appropriate spot in the frame, and sliding the rear suspension, suspension liner, and suspension crossmembers forward or aft. The suspension and suspension crossmembers' rivet holes left in the frame rail flange must be filled with GRADE 8 bolts and hardened steel washers at <u>both</u> the bolt head and nut, HUC bolts or GRADE 8 flanged bolts and hardened steel washers at the nut. When shortening/lengthening the wheelbase in this manner, the following guidelines must be adhered to:

1. All frame drilling must comply with the DRILLING AND WELDING section of this book.
2. All rivet holes left in the frame rail flange from the suspension and suspension crossmembers must be either filled with GRADE 8 bolts and hardened steel washers at <u>both</u> the bolt head and nut, HUC bolts or GRADE 8 flanged bolts and hardened steel washers at the nut.
3. The components required to be slid forward or aft are the suspension and suspension hangers, suspension crossmembers and suspension frame liner.

Altering the Wheelbase by Altering the Frame

Even on a straight frame rail, it may be desirable to cut the frame and lengthen or shorten the wheelbase rather than simply sliding the rear suspension back or forward. The following section offers some guidelines and suggestions for cutting and lengthening or shortening the frame.

Glossary of Terms – Chassis Wheelbase Alteration

CA – Length from back-of-cab to rear axle centerline in inches.

AL – Added length (in case of a lengthened wheelbase). Difference between WB (new) and WB (old).

SL – Shortened length (in case of shortened wheelbase). Difference between WB (old) and WB (new).

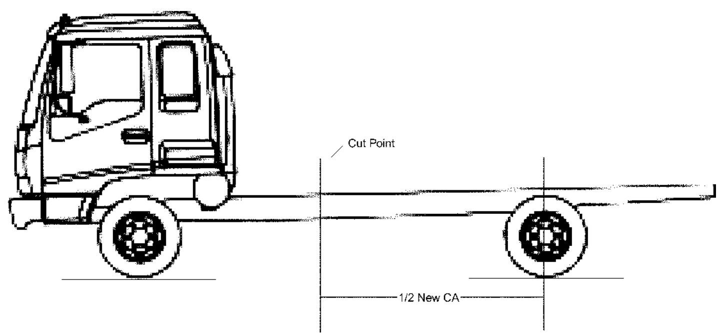
(Installation of Body and Special Equipment Section – continued on next page)

(Installation of Body and Special Equipment Section – continued from previous page)

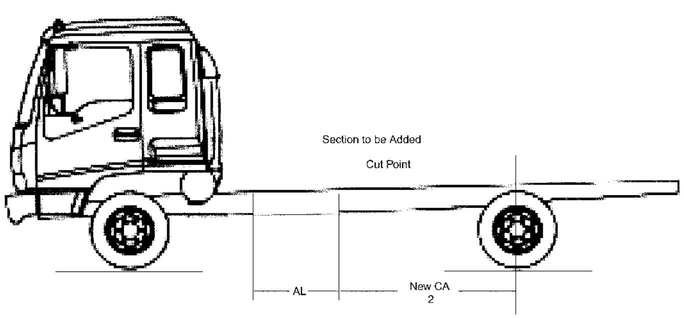
1. Determine the added length (AL) or shortened length (SL) required to lengthen or shorten chassis. (For added wheelbase: New CA = CA + AL; For shortened wheelbase: New CA = CA – SL.)

2. Obtain the material to be used as the insert for the lengthened wheelbase in the correct length (AL). The insert must have the same cross sectional dimensions and yield strength as the original frame rail.

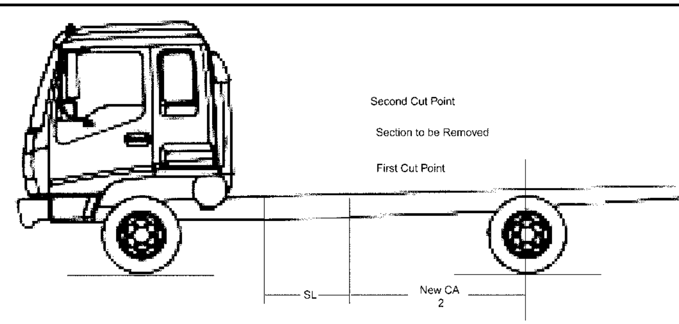
3. Divide the new CA by two (2). Measure (new CA)/2 from the center of the rear axle forward and mark this point on the chassis frame (see figure below).



4. Cut the chassis frame at this point. If the wheelbase is to be lengthened, addition of the previously obtained insert (of length AL determined in step 1) will be made at this time. If the wheelbase is to be shortened, measure the distance (SL) forward of this cut and remove a length (SL) section from the chassis frame (see figure below). Insure that an adequate area on the frame remains for the required addition of the necessary reinforcements. These are the only suggested places for cutting the frame and reinforcements but may be changed upon the advice of General Motors Isuzu Commercial Truck, LLC (GMICT) and American Isuzu Motors Inc. Application Engineering.



Lengthening the Wheelbase



Shortening the Wheelbase

(Installation of Body and Special Equipment Section – continued on next page)

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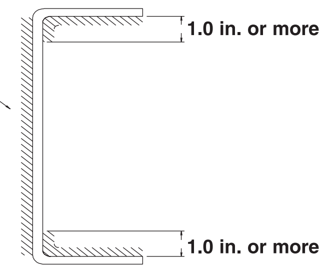
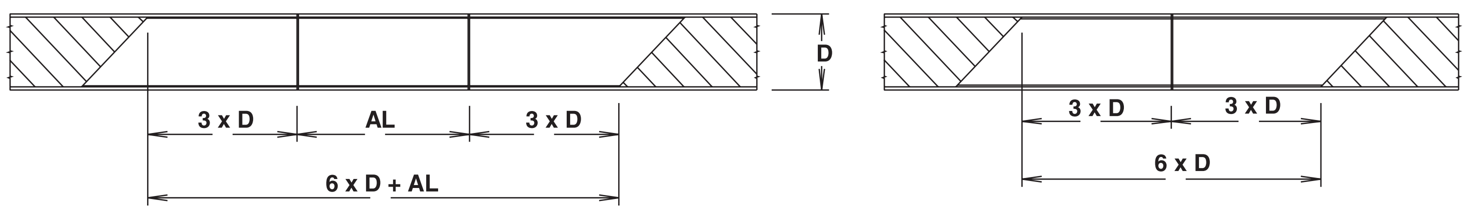
5. When welding the insert (length AL for wheelbase lengthening) to the original frame rail, a continuous butt weld must be used at the splices. When shortening the wheelbase, weld the ends of the chassis frame together with a continuous butt weld over the junction of the frame ends. Weld both the inside and outside of the frame rails using welding techniques prescribed by established welding standards (ref. SAE J1147) and in accordance with this guide. An example of this weld is shown below.



6. Determine the appropriate additional internal reinforcements which are required using this equation:

   Reinforcement Length = AL + 6 x (original frame rail web depth).

   The figure below shows how this reinforcement is to be placed over the extended or shortened section of the frame rail.



Lengthened Wheelbase

Shortened Wheelbase

D = Original frame rail web depth

The suggested cross section of this reinforcement is a snug fit inner channel. If the new wheelbase exceeds the upper limit of the optional wheelbases of this model, i.e.; a "long bridge", it may be necessary to use an "inverted L" reinforcement in addition to the snug fit channel reinforcement (see figures on next page). Application Engineering should be consulted for approval of such cases. It should be noted that these methods of reinforcements, and any other methods which may be used, require a 45° angled cut at both ends to avoid stress concentrations in the frame (note the figures under item 7).

(Installation of Body and Special Equipment Section – continued on next page)

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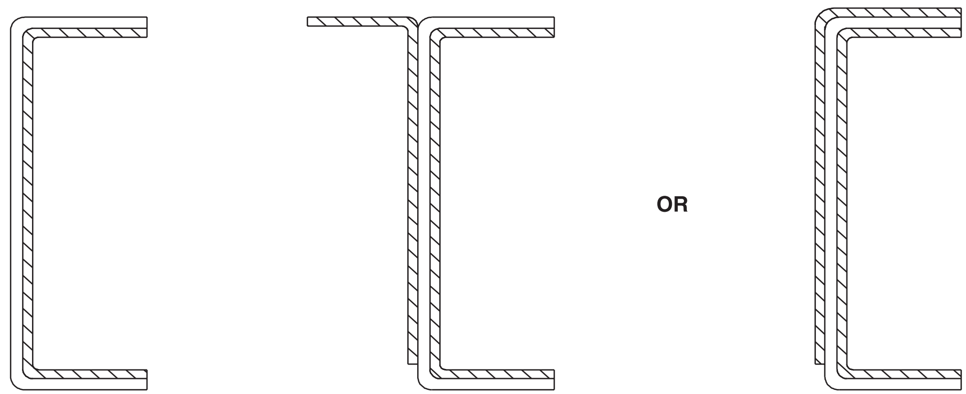
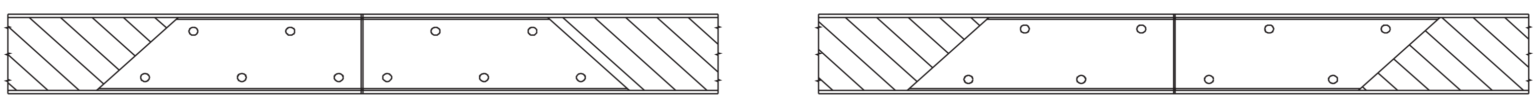


Snug fit inner channel

Snug fit inner channel with "Inverted L" for "Long Bridge" wheelbases

7. The reinforcements must be fastened securely to only the web of the original chassis frame rail. The reinforcement must be held rigidly in place using either HUC bolts, GRADE 8 bolts and hardened steel washers at both the bolt head and nut, or GRADE 8 flanged bolts and hardened steel washers at the nut. Below are some suggested bolt patterns. It should be noted that these bolt patterns must not align the bolts vertically, i.e.: the bolt pattern must be staggered.



8. Lengthening the frame will also require extending the brake lines, basic chassis electrical harness, excluding ABS wiring harness. It is recommended that the original brake lines be removed and replaced with brake lines of the same diameter as the original lines and of the appropriate length. The electrical harness must be extended in accordance with the ELECTRICAL WIRING AND HARNESSING section of this book.

9. The propeller shafts' overall length will also need to be lengthened or shortened. If the extension is within the limits of the optional wheelbases of the respective model, the exact propeller shaft lengths and angles are given on or about Page 12 of the respective sections of this book. If the modified wheelbase exceeds the optional wheelbases of the respective model, the following guidelines must be adhered to:

(Installation of Body and Special Equipment Section – continued on next page)

(Installation of Body and Special Equipment Section – continued from previous page)

a. Propeller Shaft Length

The maximum propeller shaft lengths (pin to pin) for the respective models are shown in the table below.

	NPR/W3500, W4500 Diesel	NPR/W3500, W4500 Gas	NQR/W5500	NRR/W5500-HD
Propeller Shaft Diameter (in.)	3.25	3.0	3.0	3.0
Maximum Propeller Shaft Length (in.)	50.8	50.8	50.8	50.8

b. Propeller Shaft Angles

The maximum propeller shaft angles, with respect to the previous shaft, are shown in the table below.

	NPR/W3500, W4500 Diesel	NPR/W3500, W4500 Gas	NQR/W5500	NRR/W5500-HD
Maximum Propeller Shaft Angle	5.7º	5.1º	5.7º	5.7º

c. The propeller shaft angles must be designed such that the angles will cancel to avoid propeller shaft whip.

d. The propeller shaft yokes must be assembled such that the propeller shaft yokes are “in phase.” “In phase” means that the yokes at either end of a given propeller shaft assembly are in the same plane.

10. Extending the frame will also require relocation and/or addition of crossmembers. If the extension is within the limits of the optional wheelbases of the respective model, the exact crossmember locations and dimensions are given in the respective model sections of this book. If the modified wheelbase exceeds the optional wheelbases of the respective model, the following guidelines must be adhered to:

a. The crossmember location will largely be determined by the propeller shaft lengths and where the center carrier bearing locations are for the propeller shaft assembly.

b. A crossmember must be located at the front and rear spring hangers of the rear suspension (refer to the appropriate section of this book to see where these suspension crossmembers are to be located).

c. The crossmember must be constructed such that it supports both the upper and lower flange on each frame rail (see drawing on next page). A crossmember such as the one on the next page may be constructed, or GM/Isuzu crossmembers may be obtained from your GM/Isuzu parts dealer.

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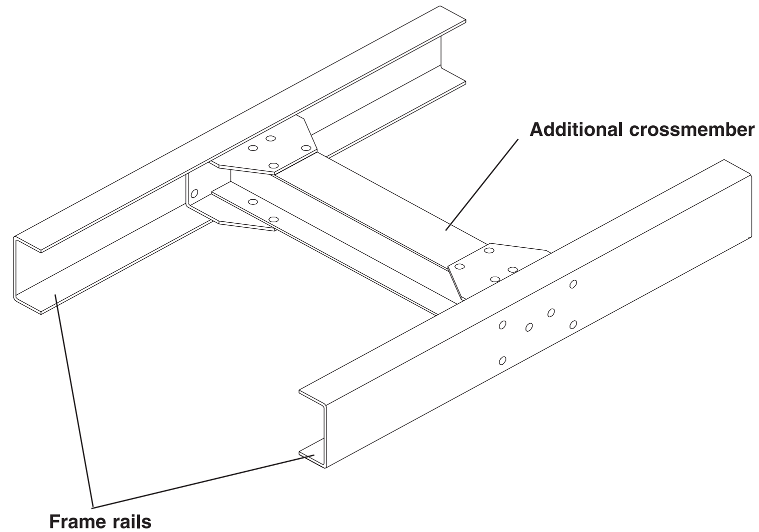
(Installation of Body and Special Equipment Section – continued from previous page)



d. The maximum distance between crossmembers for the respective models is given in the table below.

	NPR/W3500, W4500 Diesel	NPR/W3500, W4500 Gas	NQR/W5500	NRR/W5500-HD
Maximum Distance Between Crossmembers (in.)	35.7	35.7	35.7	35.7

e. The drilling for any additional holes in the frame rails must comply with the DRILLING AND WELDING section of this book.

11. All other aspects of lengthening or shortening the wheelbase must comply with the applicable section of this Body Builder's Guide. For special applications and longer than recommended body lengths, GMICT Application Engineering must be consulted for approval. In the West Coast call 1-562-229-5314 and in the East Coast call 1-404-257-3013.

12. Please contact applications engineering for guidelines on N/W SERIES CHASSIS frame modifications when the vehicle is equipped with an Antilock Brake System.

(Installation of Body and Special Equipment Section – continued on next page)

BODY APPLICATION SUMMARY CHART

2005 Gas and 2005 Diesel Model Year Body Application Summary Chart

Model/GVWR	WB	BOC	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.		
NPR/W3500 Gas 12,000 lbs.	109	9.25	X	X						
	132.5	9.25			X					
	150	9.25				X	X			
	176	9.25						X[1]		
NPR HD/W4500 Gas 14,500 lbs.	109	9.25	X	X						
	132.5	9.25			X					
	150	9.25				X	X			
	176	9.25						X[1]		
NPR/W3500 Diesel 12,000 lbs.	109	9.25		X						
	132.5	9.25			X					
	150	9.25				X	X			
	176	9.25						X[1]		
NPR HD/W4500 Diesel 14,500 lbs.	109	9.25		X						
	132.5	9.25			X					
	150	9.25				X	X			
	176	9.25						X[1]		
NPR HD/W4500 Crew Cab Diesel 14,500 lbs.	150	4.2		X[2]						
	176	4.2				X[3]				
NQR/W5500 Diesel 17,950 lbs.	109	9.25		X						
	132.5	9.25			X					
	150	9.25				X	X			
	176	9.25						X		

(2004 Model Year Body Application Summary Chart continued on next page)

1 = NPR/W3500, NPR HD/W4500 and Diesel 20-foot body requires GM/Isuzu Application Engineering Department approval.
2 = 16' Dovetail landscape (12' deck plus 4' dovetail).
3 = 18' Dovetail landscape (14' deck plus 4' dovetail).

IMPORTANT: Body selection recommendations are based on water-level weight distribution and no accessories, liftgate or refrigeration units. This table is intended for reference and does not preclude the necessity for an accurate weight distribution calculation.

(Body Application Summary Chart Section – continued on next page)

(Body Application Summary Chart Section – continued from previous page)

2005 Gas and 2005 Diesel Model Year Body Application Summary Chart *(Chart continued from previous page)*

Model/GVWR	WB	BOC	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.		
NQR/W5500 Crew Cab Diesel 17,950 lbs.	150	4.2		X[2]						
	176	4.2				X[3]				
NRR/W5500-HD Diesel 19,500 lbs.	109	9.25	X							
	132.5	9.25		X	X					
	150	9.25				X				
	176	9.25					X	X		

1 = NPR/W3500, NPR HD/W4500 and Diesel 20-foot body requires GM/Isuzu Application Engineering Department approval.
2 = 16' Dovetail landscape (12' deck plus 4' dovetail).
3 = 18' Dovetail landscape (14' deck plus 4' dovetail).

IMPORTANT: Body selection recommendations are based on water-level weight distribution and no accessories, liftgate or refrigeration units. This table is intended for reference and does not preclude the necessity for an accurate weight distribution calculation.

2005 Model Year – Body & Payload Weight Distribution (% Front/% Rear) – Manual/Automatic Transmission

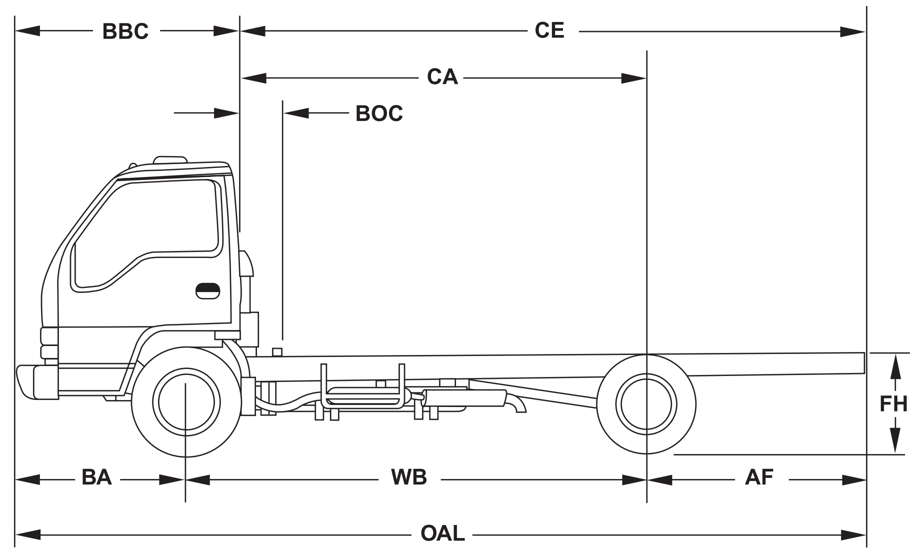
Model	GVWR	WB	CA	CE	OAL	BOC	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.
NRR/W5500-HD Diesel	19,500	109	88.4	131.5	199.5	9.25	18/82					
NRR/W5500-HD Diesel	19,500	132.5	111.9	155	223	9.25		23/77	14/86			
NRR/W5500-HD Diesel	19,500	150	129.4	172.5	240.5	9.25				16/84		
NRR/W5500-HD Diesel	19,500	176	155.4	198.5	266.3	9.25					22/78	15/85

IMPORTANT: Weight distribution percentages listed do not include added accessories, liftgate or refrigeration units. Percentages based on water-level distribution of body and payload weight which is determined by subtracting chassis wet weight (including 200 lb. driver) from GVWR. These tables are intended for reference and do not preclude the necessity for an accurate weight distribution calculation.

(Body Application Summary Chart Section – continued on next page)

(Body Application Summary Chart Section – continued from previous page)

NPR/W3500, NPR HD/W4500 Gas



2005 Model Year – Body & Payload Weight Distribution (% Front/% Rear) – Automatic Transmission

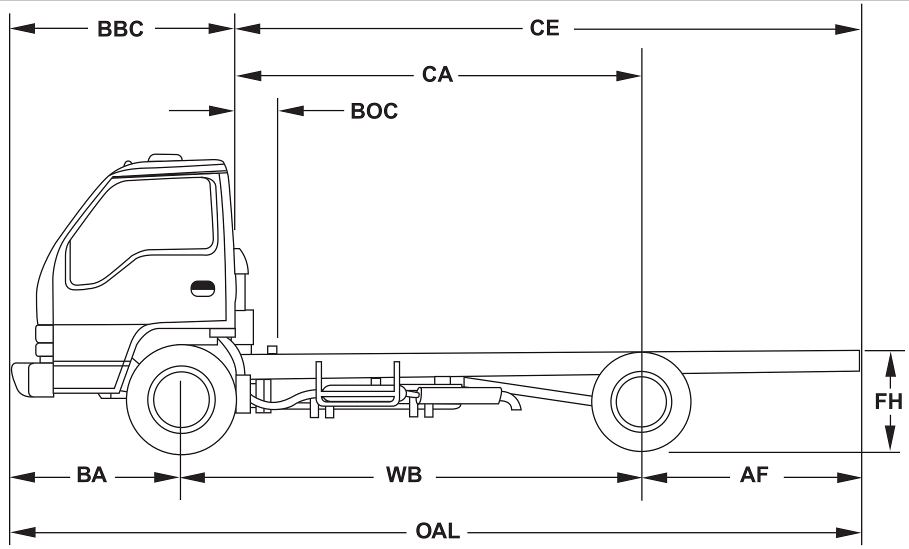
Model	GVWR	WB	CA	CE	OAL	BOC	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.
NPR/W3500 Gas	12,000	109	88.4	131.5	199.5	9.25	18/82	7/93				
NPR HD/W4500 Gas	14,500	109	88.4	131.5	199.5	9.25	18/82	7/93				
NPR/W3500 Gas	12,000	132.5	111.9	155	223	9.25			14/86			
NPR HD/W4500 Gas	14,500	132.5	111.9	155	223	9.25			14/86			
NPR/W3500 Gas	12,000	150	129.4	172.5	240.5	9.25				16/84	8/92	
NPR HD/W4500 Gas	14,500	150	129.4	172.5	240.5	9.25				16/84	8/92	
NPR/W3500 Gas	12,000	176	155.4	198.5	266.3	9.25						15/85*
NPR HD/W4500 Gas	14,500	176	155.4	198.5	266.3	9.25						15/85*

*NPR/W3500, NPR HD/W4500 Gas and Diesel 20-foot body requires GM/Isuzu Application Engineering Department approval.

(Body Application Summary Chart Section – continued on next page)

(Body Application Summary Chart – continued from previous page)

NPR/W3500, NPR HD/W4500 Diesel



2005 Model Year – Body & Payload Weight Distribution (% Front/% Rear) – Manual/Automatic Transmission

Model	GVWR	WB	CA	CE	OAL	BOC	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.
NPR/W3500 Diesel	12,000	109	88.4	131.5	199.5	9.25		7/93				
NPR HD/W4500 Diesel	14,500	109	88.4	131.5	199.5	9.25		7/93				
NPR/W3500 Diesel	12,000	132.5	111.9	155	223	9.25			14/86			
NPR HD/W4500 Diesel	14,500	132.5	111.9	155	223	9.25			14/86			
NPR/W3500 Diesel	12,000	150	129.4	172.5	240.5	9.25				16/84	8/92	
NPR HD/W4500 Diesel	14,500	150	129.4	172.5	240.5	9.25				16/84	8/92	
NPR/W3500 Diesel	12,000	176	155.4	198.5	266.3	9.25						15/85*
NPR HD/W4500 Diesel	14,500	176	155.4	198.5	266.3	9.25						15/85*

*NPR/W3500, NPR HD/W4500 Gas and Diesel 20-foot body requires GM/Isuzu Application Engineering Department approval.

(Body Application Summary Chart Section – continued on next page)

(Body Application Summary Chart Section – continued from previous page)

NQR/W5500 Diesel

2005 Model Year – Body & Payload Weight Distribution (% Front/% Rear) – Manual/Automatic Transmission

Model	GVWR	WB	CA	CE	OAL	BOC	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.	
NQR/W5500 Diesel	17,950	109	88.4	131.5	199.5	9.25	18/82						
NQR/W5500 Diesel	17,950	132.5	111.9	155	223	9.25		23/77	14/86				
NQR/W5500 Diesel	17,950	150	129.4	172.5	240.5	9.25				16/84			
NQR/W5500 Diesel	17,950	176	155.4	198.5	266.3	9.25					22/78	15/85	

IMPORTANT: Weight distribution percentages listed do not include added accessories, liftgate or refrigeration units. Percentages based on water-level distribution of body and payload weight which is determined by subtracting chassis wet weight (including 200 lb. driver) from GVWR. These tables are intended for reference and do not preclude the necessity for an accurate weight distribution calculation.

NRR/W5500 HD Diesel

2005 Model Year – Body & Payload Weight Distribution (% Front/% Rear) – Manual/Automatic Transmission

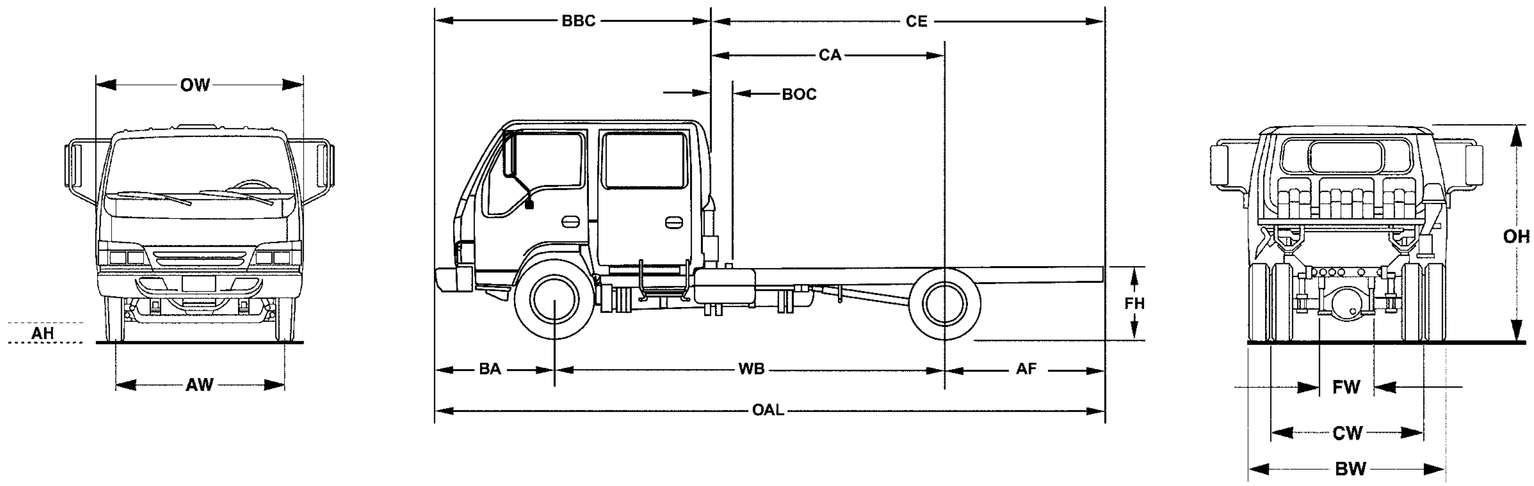
Model	GVWR	WB	CA	CE	OAL	BOC	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.	
NRR/W5500-HD Diesel	19,500	109	88.4	131.5	199.5	9.25	18/82						
NRR/W5500-HD Diesel	19,500	132.5	111.9	155	223	9.25		23/77	14/86				
NRR/W5500-HD Diesel	19,500	150	129.4	172.5	240.5	9.25				16/84			
NRR/W5500-HD Diesel	19,500	176	155.4	198.5	266.3	9.25					22/78	15/85	

IMPORTANT: Weight distribution percentages listed do not include added accessories, liftgate or refrigeration units. Percentages based on water-level distribution of body and payload weight which is determined by subtracting chassis wet weight (including 200 lb. driver) from GVWR. These tables are intended for reference and do not preclude the necessity for an accurate weight distribution calculation.

(Body Application Summary Chart Section – continued on next page)

(Body Application Summary Chart – continued from previous page)

NPR HD/W4500, NQR/W5500 Crew Cab Diesel



2005 Model Year – Diesel Crew Cab Body & Payload Weight Distribution (% Front/% Rear)

Model	GVWR	WB	CA	CE	OAL	BOC	10 ft.	12 ft.	14 ft.	16 ft.
NPR HD/W4500 Crew Cab Diesel	14,500	150	88.9	132	240.5	4.2		8/92		
NPR HD/W4500 Crew Cab Diesel	14,500	176	114.9	158	266.5	4.2			15/85	
NQR/W5500 Crew Cab Diesel	17,850	150	88.9	132	240.5	4.2	16/84	8/92		
NQR/W5500 Crew Cab Diesel	17,850	176	114.9	158	266.5	4.2			15/85	8/92

IMPORTANT: Weight distribution percentages listed do not include added accessories, liftgate or refrigeration units. Percentages based on water-level distribution of body and payload weight which is determined by subtracting chassis wet weight (including 200 lb. driver and a crew of 6 @ 200 lbs. each) from GVWR. These tables are intended for reference and do not preclude the necessity for an accurate weight distribution calculation.

(Body Application Summary Chart Section – continued on next page)

MECHANICAL AND CAB SPECIFICATIONS

Engine Horsepower and Torque Chart

The following table presents Net versus Gross Horsepower and Torque ratings for 2004 Isuzu/W-Series Truck Product Engines:

Engine Model	Application	Net Hp[1] hp/rpm	Net Torque[1] lbs.-ft./rpm	Gross Hp[1] hp/rpm	Gross Torque[1] lbs.-ft./rpm
GMPT 6.0L-V8	NPR/W3500, NPR HD/W4500 Gas	N/A	N/A	300/4400	358/2800
Isuzu 4HK1-TC Manual Transmission	NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel	183/2600	369/1500	190/2600	387/1500
Isuzu 4HK1-TC Automatic Transmission	NPR/W3500, NPR HD/W4500, NQR/W5500 Diesel NRR/W5500-HD Diesel	183/2600	369/1500	190/2600	387/1500

NOTE: [1] Horsepower and Torque Ratings measured under SAE J1349 standards.

GVW/GCW Ratings

The following table presents GVW ratings and corresponding GCW ratings for each model truck:

Truck Model	Transmission	GVWR (lbs.)	GCWR (lbs.)[1]	Truck Model	Transmission	GVWR (lbs.)	GCWR (lbs.)[1]
NPR/W3500 Gas	Automatic	12,000	18,000	NPR HD/W4500 Diesel	Manual	14,500	20,500
NPR HD/W4500 Gas	Automatic	14,500	20,500	NQR/W5500 Diesel	Automatic	17,950	19,500[2]
NPR/W3500 Diesel	Automatic	12,000	18,000	NQR/W5500 Diesel	Manual	17,950	22,500
NPR/W3500 Diesel	Manual	12,000	18,000	NRR/W5500-HD Diesel	Automatic	19,500	21,000
NPR HD/W4500 Diesel	Automatic	14,500	19,500	NRR/W5500-HD Diesel	Manual	19,500	24,000

[1] The NPR, NPR HD, NQR, NRR/W3500, W4500, W5500, W5500-HD are not approved for Hot Shot applications.
[2] GCWR 20,950 with addition of optional Isuzu Transmission Oil Cooler.

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Rear Frame Height Chart

The following table provides the rear frame height for each model/GVWR with standard tires:

Model	GVWR (lbs.)	Standard Tire	Frame HT (in.) FH Std. Tires
NPR/W3500 Gas	12,000	215/85R-16E	31.4
NPR HD/W4500 Gas	14,500	225/70R-19.5F	32.3
NPR/W3500 Diesel	12,000	215/85R-16E	32
NPR HD/W4500 Diesel	14,500	215/85R-16E	32
NQR/W5500 Diesel	17,950	225/70R-19.5F	32.8
NRR/W5500-HD Diesel	19,500	225/70R-19.5F	32.9

Clutch Engagement Torque

The following table provides the engagement torque of the engines currently is use in GM/Isuzu medium duty trucks:

Engine	Torque (lbs.-ft.)	at (RPM)
Isuzu 4HK1-TC (190 HP)	265	1,000

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Paint Code Chart

GM/ISUZU OPTION CODE	GM/ISUZU PAINT COLOR NAME	GM/ISUZU PAINT CODE
	1985 KS22	
N/A	Calm White	0133-P1
	1986-95 NPR/W3500, W4500 Diesel	
844	Glacier White	0172-P1
	1993-94 NPR/W3500, W4500 EFI	
844	Glacier White	0172-P1
	1995.5-05 NPR, NQR, NRR/W3500, W4500, W5500, W5500-HD DIESEL	
729	Arc White	W301-P801-0
730	Adriatic Blue Solid (1999 Model Only)	B302-P801-0
845	Polar Silver (NPR only)	N507-P901-0
989	Sunbelt Green	G021-P801-0
	1995.5-05 NPR/W3500, W4500 GAS	
729	Arc White	W301-P801-0
N/A	Accuride White (Wheels Only)	301-W-30102
845	Polar Silver	N507-P901-0
989	Sunbelt Green	G021-P801-0
	1989-94 NRR/W5500-HD	
844	Glacier White	0172-P1
	1995-03 FRR/WT5500	
844	Glacier White	0172-P1
989	Sunbelt Green	G021-P801-0

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CV Chart 2

GM/ISUZU PAINT CODE	GM/ISUZU OPTION CODE	GM/ISUZU COLOR NAME	AKZO NOBEL CODE	BASF R-M CODE	BASF GLASS CODE
301-W-30102	N/A	Accuride White	FLNA40154	RM25319	IS-25319
B302-P801-0	730	Adriatic Blue (Solid)	FLNA50274	730	730
W301-P801-0	729	Arc White	FLNA40156	RM25318	IS-25318
WE8774	N/A	*Bright Red	FLNA30252	27427	IS-27427
0133-P1	N/A	Calm White	FLNA40252	HS14391	IS-820
WE5398	N/A	*Dark Green Gray	FLNA90856	27425	IS-27425
U715-P801-0	809	Doeskin Tan	FLNA80050	27406	IS-U715
0172-P1	844	Glacier White	FLNA40155	RM15602	IS-844
WE9907	N/A	*Medium Adriatic Blue	FLNA90857	27426	IS-27426
B721-P801-0	801	Medium Blue	FLNA50172	27403	IS-B721
N507-P901-0	845	Polar Silver	FLNA91205	23664	845
R725-P801-0	810	Red Orange	FLNA20079	27407	IS-R725
WE9885	N/A	*Rose Black	FLNA90858	27428	IS-27428
G021-P801-0	989	Sunbelt Green	FLNA60290	605301	989
U716-P801-0	815	Tangier Orange	FLNA20080	27409	IS-U716
Y719-P801-0	812	Wheatland Yellow	FLNA10182	27408	IS-Y719
G705-P801-0	807	Woodland Green	FLNA60181	27404	IS-G705

* GM-based colors. No Isuzu Option Code.

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CV Chart 2 (Continued)

DUPONT CODE	AUTO COLOR	PPG CODE	SHERWIN WILLIAMS/ MARTIN SENOUR	SPIES HECKER CODE	STANDOX
F2499	8AR8	91513	51548	15593	301-W-30102
W9775	2NV9B	19320	57541	50287	730
W9774	2NV8	91512	51400	10280	729
C8508	TC78B	75057	34983	34169	WE8774
G8477	KK27	91522	34657	16222	0133-P1
B9329	2NP9B	36575	47155	65071	WE5398
B8462	KPL5B	28613	56203	21882	809
H8620	ND92	90330	35478	10281	844
B9321	2NY4B	190401	46829	56120	WE9907
B8041	KPL2B	190217	56143	55934	801
F2193	EPW3B	36658	56991	73192	845
B8250	KPL4B	61784	56202	21881	810
B9218	1AB2B	95057	45738	74223	WE9885
M6682	WMK4	401420	61559	67847	989
B9043	KPL6B	61785	56204	21883	815
B9042	KPL7B	83931	56144	21884	812
B8046	KPL3B	48339	56201	64962	807

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N/W Series Towing Procedure

NOTE: When towing, disconnect the propeller shaft at the rear axle to ensure the automatic transmission is not damaged.

Proper equipment must be used to prevent damage to vehicles during any towing. State and local laws which apply to vehicles in tow must be followed. Vehicles should not be towed at speeds in excess of 55 mph (90 km/h). Connect to the main structural parts of the vehicle. DO NOT attach to bumpers, tow hooks or brackets. Use only equipment designed for this purpose. Follow the instructions of the wrecker manufacturer. A safety chain system must be used. The procedures below must be followed when towing to prevent possible damage.

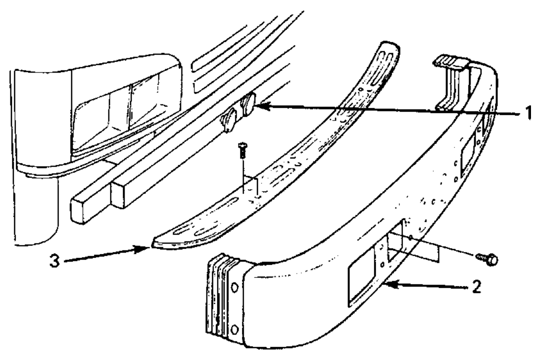
Front End Towing (Front Wheels Off the Ground)

To prepare a disabled vehicle for front end towing with front wheels raised off the ground, the following steps are necessary:

- Block the rear wheels of the disabled vehicle.
- Disconnect the propeller shafts at the rear axle. Secure the propeller shafts to the frame or crossmember.
- If there is damage or suspected damage to the rear axle, remove the axle shafts.
- Cover the hub openings to prevent the loss of lubricant or entry of dirt or foreign objects.
- Place 4" x 4" wood beam against the towing guide behind the bumper. (If no 4" x 4" is available, then remove the bumper.) Ensure the towing chains do not contact the horns or the bumper.

Legend:

1. Horns
2. Bumper (removed for towing)
3. Filler



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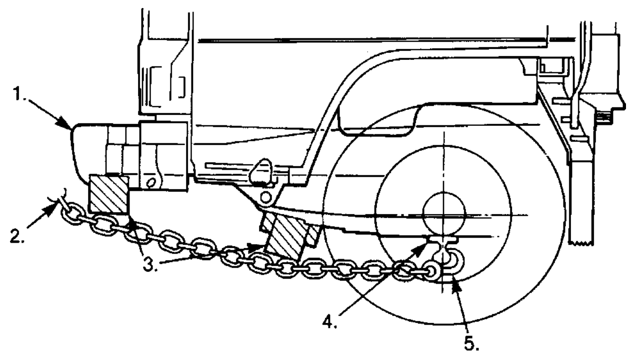
After Towing
After towing the vehicle, block the rear wheels and install axle shafts or propeller shaft. Apply the parking brake before disconnecting from the towing vehicle.

Front End Towing (All Wheels On the Ground)

Your vehicle may be towed on all wheels provided the steering is operable. Remember that power steering and brakes will not have power assist. There must be a tow bar installed between the towing vehicle and the disabled vehicle.

Legend:
1. Bumper
2. Towing Chain
3. Towing Guide
4. Front Axle
5. Tow Hook



To prepare a disabled vehicle for front end towing with all wheels on the ground, the following steps are necessary:

- Block the wheels of the disabled vehicle.
- Disconnect the propeller shafts at the rear axle. Secure the propeller shafts to the frame or crossmember.
- Provide wood blocking to prevent towing chains and bar from contacting the bumper.
- If there is damage or suspected damage to the rear axle, remove the axle shafts.
- Cover the hub openings to prevent the loss of lubricant or entry of dirt or foreign objects.

After Towing
After towing the vehicle, block the rear wheels and install axle shafts or propeller shaft. Apply the parking brake before disconnecting from the towing vehicle. Check and fill rear axle with oil if required.

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Rear End Towing (Rear Wheels Off the Ground)

When towing a vehicle with rear wheels raised, secure the steering wheel to maintain straight-ahead position. Make certain that the front axle is not loaded above the front axle Gross Axle Weight Rating (GAWR) as indicated on the vehicle's VIN and Weight Rating plate.

Special Towing Instructions:

1. All state and local laws regarding such items as warning signals, night illumination, speed, etc., must be followed.
2. Safety chains must be used.
3. No vehicle should ever be towed over 55 mph (90 km/h).
4. Loose or protruding parts of damaged vehicles should be secured prior to moving.
5. A safety chain system completely independent of the primary lifting and towing attachment must be used.
6. Operators should refrain from going under a vehicle which is being lifted by the towing equipment unless the vehicle is adequately supported by safety stands.
7. No towing operation which for any reason jeopardizes the safety of the wrecker operator or any bystanders or other motorists should be attempted.

(Mechanical and Cab Specifications Section – continued on next page)

WEIGHT DISTRIBUTION CONCEPTS

Weight Restrictions

The Gross Vehicle Weight Rating (GVWR) and the Gross Axle Weight Rating (GAWR) of each Incomplete Vehicle are specified on the cover of its Incomplete Vehicle Document in conformance to the requirements of Part 568.4 of the Federal Motor Vehicle Safety Regulations. The final stage manufacturer is responsible under Part 567.5 to place the GVWR and the GAWR of each axle on the Final Vehicle Certification Label. The regulation states that the appropriate rating “shall not be less than the sum of the unloaded vehicle weight, rated cargo load, and 150 pounds times the vehicle’s designated seating capacity.”

Unloaded vehicle weight means the weight of a vehicle with maximum capacity of all fluids necessary for operation of the vehicle, but without cargo or occupants.

During completion of this vehicle, GVWR and GAWR may be affected in various ways, including but not limited to the following:

1. The installation of a body or equipment that exceeds the rated capacities of this Incomplete Vehicle.
2. The addition of designated seating positions which exceeds the rated capacities of this Incomplete Vehicle.
3. Alterations or substitution of any components such as axles, springs, tires, wheels, frame, steering and brake systems that may affect the rated capacities of this Incomplete Vehicle.

Use the following chart to assure compliance with the regulations. Chassis curb weight and GVW rating is located on Page 2 in each vehicle section. Always verify the results by weighing the completed vehicle on a certified scale.

Curb Weight of Chassis (lbs.)		____________ (From required vehicle section)
PLUS weight of added body components, accessories or other permanently attached components.	+	____________ (Body, liftgate, reefer, etc.)
PLUS total weight of passengers, air conditioning and all load or cargo.	+	____________ (Driver, passengers, accessories and load)
EQUALS Gross Vehicle Weight (lbs.) (GVW) of completed vehicle.	=	____________ (Should equal GVWR from required vehicle section)

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Gross Axle Weight Rating

The Gross Vehicle Weight is further restricted by the Gross Axle Weight Rating (GAWR). The maximum GAWR for both front and rear axles is listed in each Vehicle Section. Weight distribution calculations must be performed to ensure GAWR is not exceeded. Always verify the results by weighing the completed vehicle on a certified scale.

NOTE: Although the Front Gross Axle Weight Rating (FGAWR) plus the Rear Gross Axle Weight Rating (RGAWR) may exceed the Gross Vehicle Weight Rating (GVWR), the total GVW may not exceed the respective maximum GVWR.

The variation in the GAWRs allow the second stage manufacturer some flexibility in the design of the weight distribution of the attached unit.

Weighing the Vehicle

Front and rear GAWRs and total GVWR should be verified by weighing a completed loaded vehicle. Weigh the front and rear of the vehicle separately and combine the weights for the total GVWR. All three weights must be less than the respective maximum shown in the vehicle sections.

Tire Inflation

Tire inflation must be compatible with GAWR and GVWR as specified on the cover of the Incomplete Vehicle Document for each vehicle.

Center of Gravity

The design of the truck body should be such that the center of gravity of the added load does not exceed the guidelines as listed in each Vehicle Section. If the body is mounted in such a way that the center of gravity height exceeds the maximum height of the center of gravity designated for each model, the directional stability at braking and roll stability at cornering will be adversely affected. A vertical and/or horizontal center of gravity calculation must be performed if a question in stability arises to ensure the designed maximum height of the center of gravity is not violated.

(Weight Distribution Concepts Section – continued on next page)

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Weight Distribution

A truck as a commercial vehicle has but one purpose. That purpose is to haul some commodity from one place to another. A short distance or a long distance, the weight to be hauled, more than any other factor, determines the size of the truck. A small weight requires only a small truck; a large weight requires a large truck. A simple principle, but it can easily be misapplied. In any case, selecting the right size truck for the load to be hauled will ensure that the job will be done and that it will be able to be done with some degree of reliability and within the legal limitations of total gross weight and axle gross weights.

Not only must a truck be selected that will handle the total load, but the weight must also be properly distributed between the axles. This is of extreme importance from both a functional and economic aspect. If a truck consistently hauls less than its capacity, the owner is not realizing full return on his investment and his operating costs will be higher than they should be. If the truck is improperly loaded or overloaded, profits will be reduced due to increased maintenance costs and potential fines resulting from overloading beyond legal limitations. Careful consideration must be given to distribution of the load weight in order to determine how much of the total, including chassis, cab, body and payload, will be carried on the front axle and how much will be carried on the rear axle, on the trailer axles and the total. Moving a load a few inches forward or backward on the chassis can mean the difference between acceptable weight distribution for the truck or an application that will not do the job satisfactorily.

Every truck has a specific capacity and should be loaded so that the load distribution is kept within Gross Axle Weight Ratings (GAWR) and the truck's Gross Vehicle Weight Rating (GVWR) or Gross Combination Weight Rating (GCWR) for a tractor/trailer and the weight laws and regulations under which the truck will operate. Improper weight distribution will cause problems in many areas:

1. Excessive front end wear and failure
   a. Tie-rod and kingpin wear
   b. Front axle failure
   c. Overloading of front suspension
   d. Wheel bearing failure
2. Rapid tire wear
   a. When the weight on a tire exceeds its rating capacity, accelerated wear will result and could result in tire failure.

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

3. Rough, erratic ride

   a. If the center of the payload is directly over or slightly behind the rear axle, the lack of sufficient weight on the front axle will create a bobbing effect, very rough ride, and erratic steering. This condition will be magnified when the truck is going uphill.

4. Hard steering

   a. When loads beyond the capacity of the front axle are imposed upon it, the steering mechanism is also overloaded and hard steering will result.

   b. Excessive overloading could result in steering component damage or failure.

5. Unsafe operating and conditions

   a. Poor traction on the steering axle effects the safety of the driver and equipment, particularly on wet, icy and slippery surfaces. Experience indicates that approximately 30% of the total weight at the ground on a truck or tractor should be on the front axle with a low cab forward vehicle.

   b. When a truck is overloaded, a dangerous situation may exist because minimum speeds cannot always be maintained, directional control may not be precise and insufficient braking capacity can cause longer than normal braking distances.

6. High maintenance costs

   a. Improper weight distribution and overloading cause excessive wear and premature failure of parts. Additional stresses imposed on the frame by the misapplication of wheelbases may be instrumental in causing the frame to crack or break.

7. Noncompliance with weight laws and regulations

   a. When there is the possibility that axle loads will exceed existing weight laws and regulations, careful weight distribution is necessary to provide a correct balance between front and rear axle loads and total load within legal limitations.

In this way, maximum payloads may be carried without exceeding legal limits. If the body is too long for a wheelbase, the center of the body and payload is placed directly over the rear axle. This places all the payload on the rear axles, resulting in overloading the rear tires, rear axle springs and wheel bearings and potentially exceeding the rear axle legal weight limit. The front axle is then carrying no part of the payload and is easily lifted off the ground when going over rough terrain, creating a very rough ride and temporary loss of steering control. If the body is too short for the wheelbase used, frame stress may be increased and may result in excessive loads on the front axle. Excessive front axle loads increase wear on the kingpins and bushings, wheel bearings and steering gear. Excessive front axle loads also overstress the front axle, springs, tires and wheels. All of these contribute directly to higher maintenance costs and hard steering, both of which are undesirable.

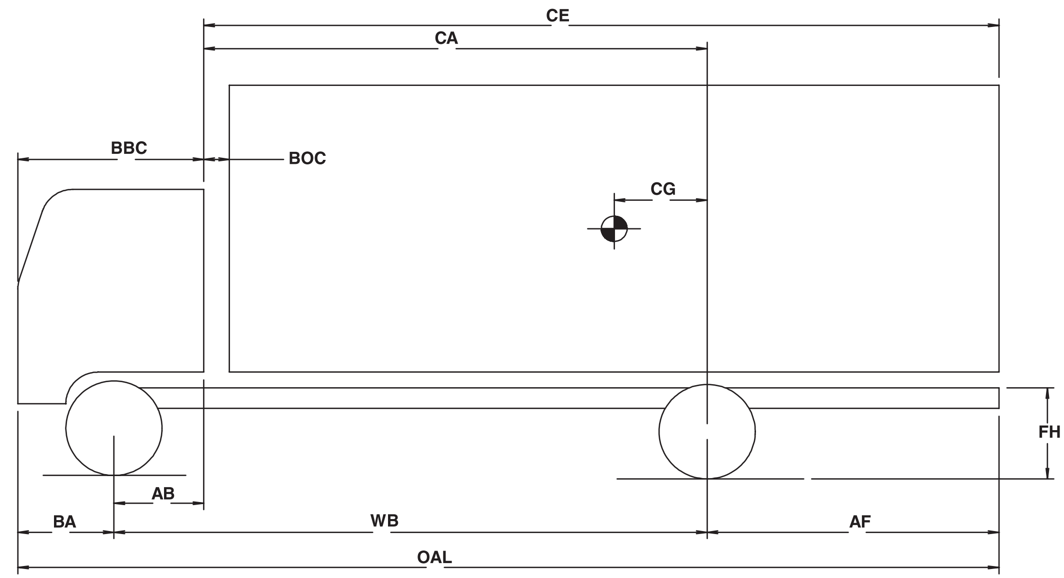
(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Weight distribution analysis involves the application of basic mathematical principles to determine the proper positioning of the payload and body weight in relation to the wheelbase of the truck chassis.

It is much less expensive to work all of this out on paper, make mistakes on paper and correct them there than to set up the truck incorrectly and either have it fail to do the job or, much worse, fail completely.

It is important to become familiar with the dimensions of the truck, as these will be needed to perform the necessary calculations.



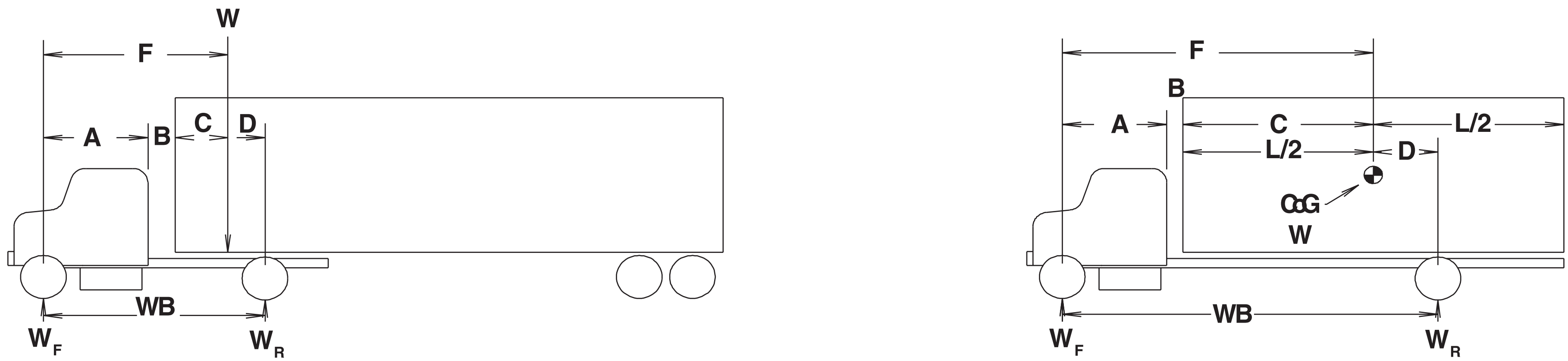
Glossary of Dimensions

BBC – Bumper to back of cab
BA – Bumper to axle
CA – Cab to axle
AB – Axle to back of cab
BOC – Back of cab clearance
CE – Cab to end of frame
CG – Center of gravity of body and payload from axle
WB – Wheelbase
OAL – Overall length
AF – Axle to end of frame
FH – Frame height

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Weight Distribution Formulas



A – Front axle to back of cab

B – Distance between cab and body or trailer

C – Front of body to C.G. or front of trailer to kingpin

D – Distance C.G. of body or fifth wheel is ahead of rear axle

F – (A + B + C) or distance C.G. of weight of fifth wheel is behind front axle

WB – Wheelbase

W – Weight of body plus payload, or kingpin load

W_f – Portion of W transferred to front axle

W_r – Portion of W transferred to rear axle

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Basic Formulas

(a) $W \times D = W_f \times WB$ **or** **(c)** $WB = (A + B + C + D) = (F + D)$

(b) $W \times F = W_r \times WB$ **(d)** $W = W_f \times W_r$

1. $W_f = \dfrac{W \times D}{WB}$

2. $D = \dfrac{W_f \times WB}{W}$

3. $WB = \dfrac{W \times D}{W_f}$

4. $W = \dfrac{W_f \times WB}{D}$

5. $W_r = \dfrac{W \times F}{WB}$

6. $F = \dfrac{W_r \times WB}{W}$

7. $WB = \dfrac{W \times F}{W_r}$

8. $W = \dfrac{W_r \times WB}{F}$

Weight Distribution Formulas in Words

To find:

1. Weight transferred to front axle = $\dfrac{\text{(Total weight) x (Distance C.G. is ahead of the rear axle)}}{\text{(Wheelbase)}}$

2. Distance C.G. must be placed ahead of rear axle = $\dfrac{\text{(Weight transferred to the front axle) x (Wheelbase)}}{\text{(Total weight)}}$

3. Wheelbase = $\dfrac{\text{(Total weight) x (Distance C.G. is ahead of the rear axle)}}{\text{(Weight to be transferred to the front axle)}}$

4. Total Weight = $\dfrac{\text{(Weight to be transferred to the front axle) x (Wheelbase)}}{\text{(Distance C.G. is ahead of the rear axle)}}$

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

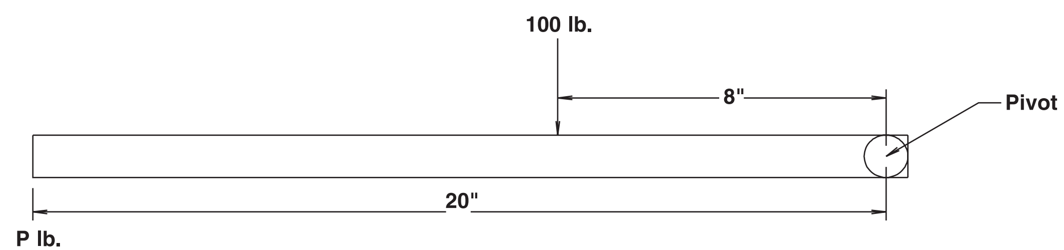
5. Weight transferred to the rear axle = (Total weight) x (Distance C.G. is behind the front axle) / (Wheelbase)

6. Distance C.G. must be placed behind the front axle = (Weight transferred to the rear axle) x (Wheelbase) / (Total weight)

7. Wheelbase = (Total weight) x (Distance C.G. is behind the front axle) / (Weight to be transferred to the rear axle)

8. Total weight = (Weight to be transferred to the rear axle) x (Wheelbase) / (Distance C.G. is behind the front axle)

9. Remember = Total weight must always equal weight transferred to the rear axle plus the weight transferred to the front axle



To find the value of “P”, the leverages must be equal for balance.

Example: 100 lbs. x 8 in. = “P” x 20 in.

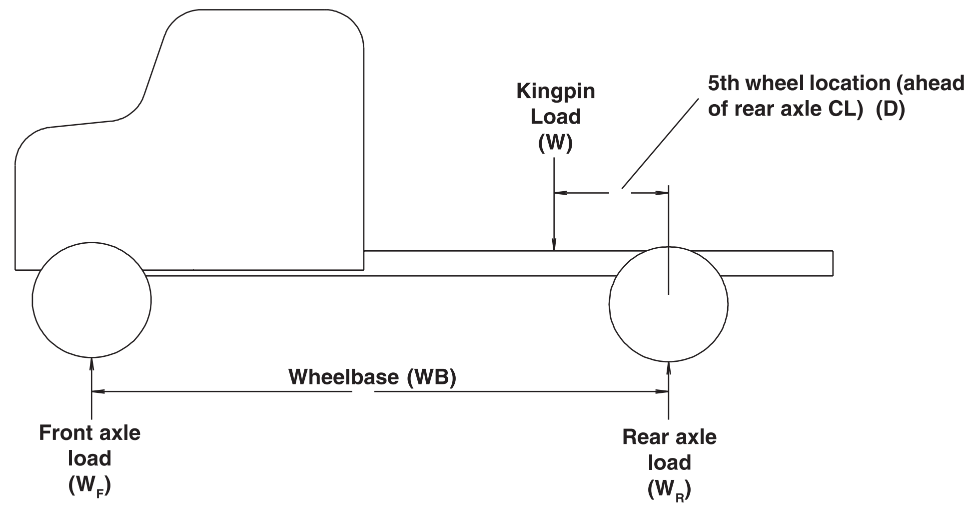
or “P” = 100 lbs. x 8 in. / 20 in.

Therefore: “P” = 40 lbs.

This same approach is used to determine axle loadings on a tractor or truck chassis. Assuming the rear axle serves as a pivot point, the front axle load can be determined by applying the lever principle.

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)



Front Axle Load: = Kingpin Load x 5th Wheel Location / Wheelbase

Rear Axle Load: = Kingpin Load – Front Axle Load

Example: (4) A tractor has a wheelbase of 150 inches. If the kingpin load is 20,000 lbs. and the fifth wheel location is 15 inches, find the total weight on the front and rear axles. The tare weight of the tractor is 7,000 lbs. on the front axle and 4,400 lbs. on the rear axle.

Front Axle = Load
20,000 x 15 / 150 = 2,000 lbs.
WB

Rear Axle Load = 20,000 – 2,000 lbs. = 18,000 lbs.

Therefore:
Total Front Axle Weight = 2,000 + 9,000 lbs. = 11,000 lbs.
Total Rear Axle Weight = 4,400 + 18,000 lbs. = 22,400 lbs.

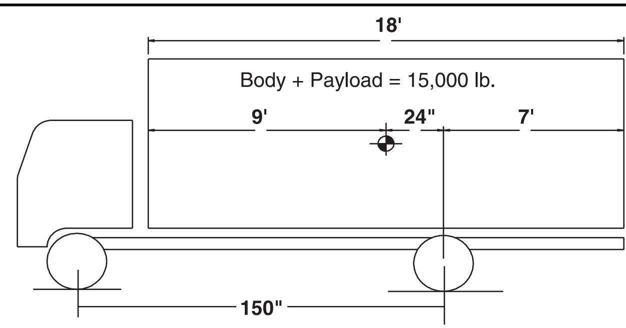
(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

In calculating the weight distribution for a truck, the same lever principle is applied; however, there is one change in the initial consideration of the method of loading the truck body. Instead of the trailer kingpin location ahead of the rear axle centerline, we must determine the position of the center of gravity of the payload and body weight in relation to the rear axle centerline.

For our calculations, we assume that the payload is distributed in the truck body so that the load is supported evenly over the truck body floor (water-level distribution). The weight of the body itself is also considered to be evenly distributed along the truck frame. In this manner, we can add the payload and body weights together and calculate the distribution on the vehicle chassis as an evenly distributed load on the truck frame rails.

So that we can make the necessary calculation in a simple manner, the total body and payload weight is considered to act at the center of gravity which will be at the center of the body length.



Example:

Front Axle Load =

$$\frac{\text{(Body Weight + Payload) x C of G location}}{\text{Wheelbase}}$$

Rear Axle Load =
(Body Weight + Payload) – Front Axle Load

Therefore, Front Axle Load =

$$\frac{15{,}000 \times 24}{150} = 2{,}400 \text{ lbs.}$$

Rear Axle Load = 15,000 – 2,400 = 12,600 lbs.

(Weight Distribution Concepts Section – continued on next page)

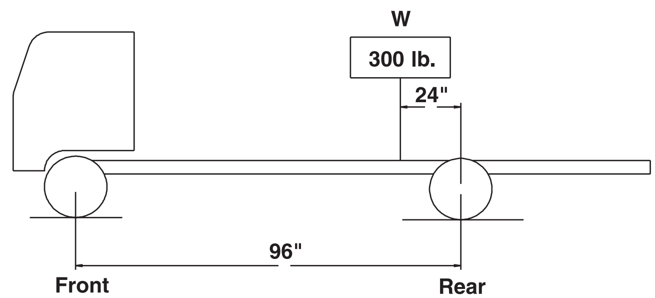
(Weight Distribution Concepts Section – continued from previous page)

If the truck tare weight without the body is 5,000 lbs. on the front axle and 2,400 lbs. on the rear axle, then
Total Front Axle Weight = 5,000 + 2,400 = 7,400 lbs. and
Total Rear Axle Weight = 2,400 + 12,600 = 15,000 lbs.

This same lever principle is applied in all calculations of weight distribution, whether we are dealing with concentrated loads as with a kingpin load acting on a fifth wheel or if it be with an evenly distributed load as with a truck body. The same approach is made in calculating an evenly distributed load on a trailer.

In the case of a tractor/trailer or a tractor with a set of double or triple trailers, each unit is handled as a separated unit and then combined to determine the total.

This simple example illustrates how the principles are applied. Using the formulas, find the weight distributed to each axle.



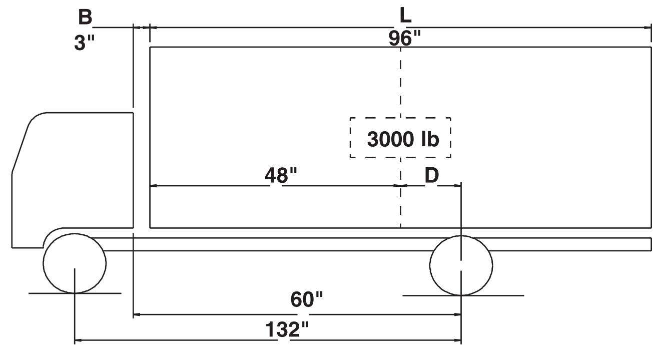
Front Weight	**Rear Weight**
A. $W_f = \frac{W \times D}{WB}$	A. Total Weight –
B. $\frac{300 \times 24}{96}$	B. 300 – 75
C. = 75 lbs.	C. = 225 lbs.

The body manufacturer can provide the body length and weight, or actual measurements of the body may be taken with a tape. Generally, (D) is unknown. This you must find logically, or with a tape measure.

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Find (D) and then solve for W_f and W_r.



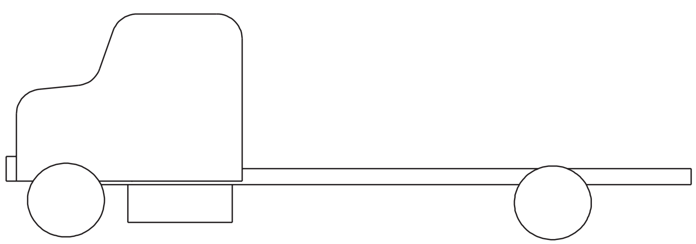
D = $\underline{60-3-48}$ = 9 in.

W_f = $\underline{205}$

W_r = $\underline{2,795}$

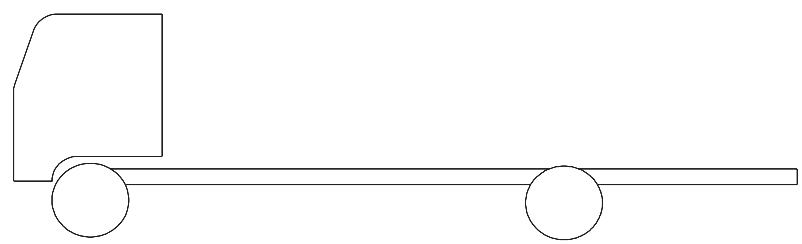
Recommended Weight Distribution % of Gross Vehicle Weight by Axle

Conventional (2 Axle)



Front Axle		Rear Axle
25%	Desired	75%
20-30%	Permissible	70-80%

COE (2 Axle)

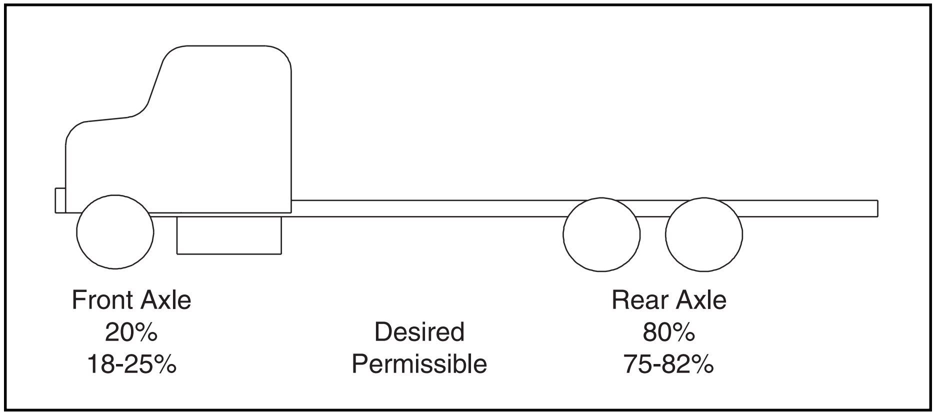


Front Axle		Rear Axle
33 1/3%	Desired	66 2/3%
30-35%	Permissible	65-70%

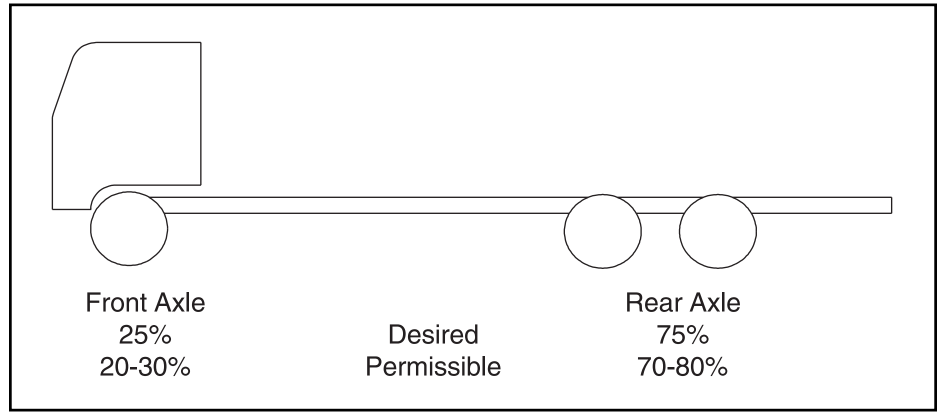
(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

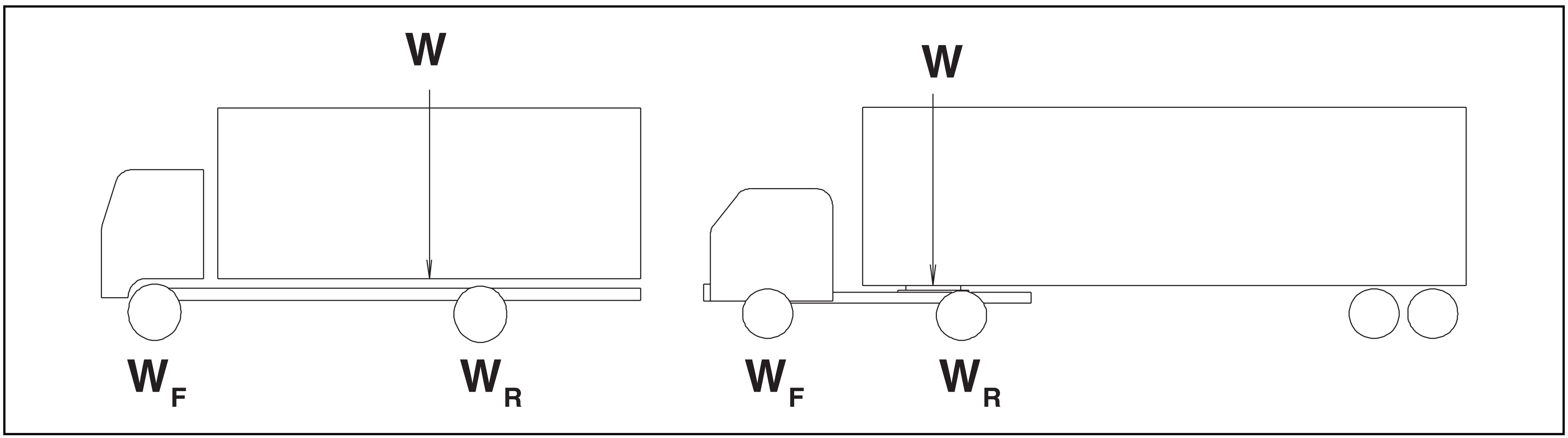
Conventional (3 Axle)



COE (3 Axle)



Calculating tractor/trailer weight distribution can be thought of in the same terms as calculating full trucks.

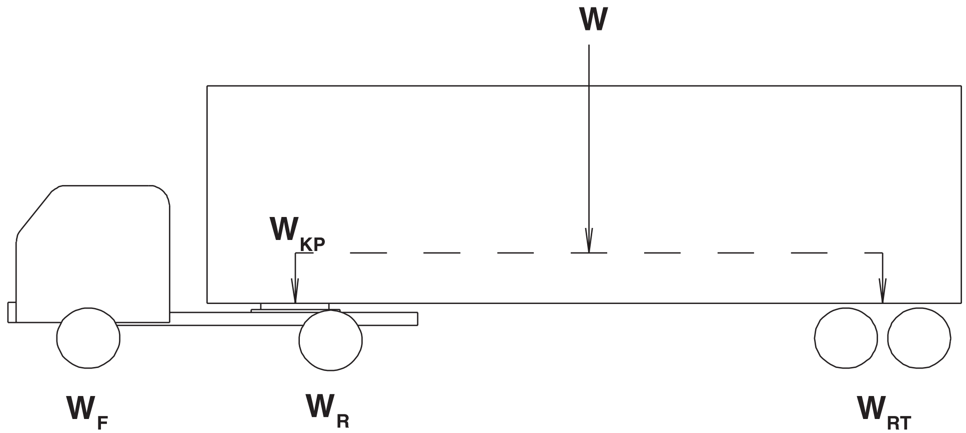


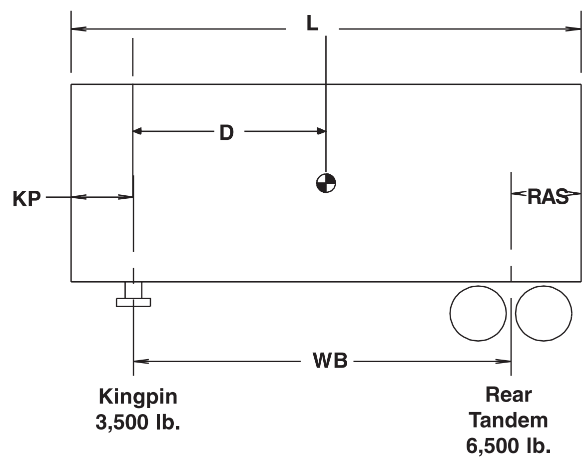
The weight at the center of the body and the load when applied is the same as the single point load of the kingpin on the fifth wheel.

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

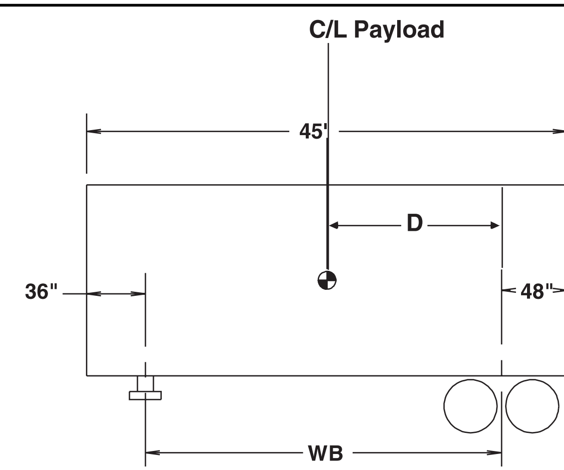
Trailer Weight





Fill in:

L	=	40 feet
RAS	=	48 inches
KP	=	36 inches
WB	=	? 396
D	=	? 204



In the following example, a 50,000-pound payload at water-level loading. Calculate the payload (PL) weight transfer to kingpin and the rear axle.

NOTE: Apply the same principles used with truck chassis.

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Payload at Kingpin

$$\mathbf{PL_{kp} = \frac{W \times D}{WB}}$$

Calculate the "D" dimension.

OAL/2 – AF = D
45 feet/2 – 48 inches – 36 inches = 186 inches

$$PL_{kp} = \frac{50{,}000 \text{ lbs.} \times 186 \text{ in.}}{456 \text{ in.}} = 20{,}394 \text{ lbs.}$$

$\mathbf{PL_{kp} =}$ **<u>20,394 lbs.</u>**

Payload at Rear Tandem

$\mathbf{PL_{rt} = W - PL_{kp}}$

PL_{rt} = 50,000 lbs. – 20,394 lbs. = 29,606 lbs.

$\mathbf{PL_{rt} =}$ **<u>29,606 lbs.</u>**

Once the weight on the kingpin is determined, it can then be treated on the tractor the same as a weight on a straight truck.

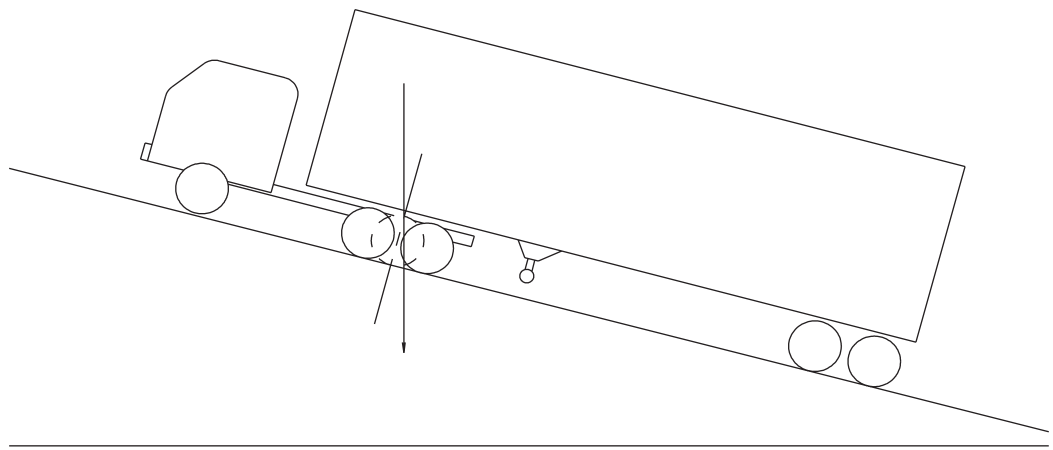
Due to the variations in hauling and wheelbase requirements from one truck application to another, there is no one specific fifth wheel setting that will apply in all cases.

A "rule of thumb" which has proven satisfactory in many cases sets the fifth wheel one inch ahead of the rear axle for every 10 inches of wheelbase. In the case of tandem axles, the wheelbase is measured from the center line of the front axle to the midpoint between the tandem rear axles. The location of the fifth wheel fixes the load distribution between the front and rear axles. Too far forward and the front axle is overloaded. If too far back, the front axle may be too lightly loaded and cause an unsafe steering and braking control situation at the front axle.

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

A tractor on a hill with the fifth wheel set at the axle center line or too close to it will result in an unsafe handling situation by transferring too much weight to the rear axle and actually unloading the front axle.



Performance Calculations

The following calculations have been included to help you determine the performance characteristics required by your customers and to select the appropriate model vehicle:

1. Speed Formula

This formula can be used to determine:

1. Top speed of the vehicle.
2. Speed in a given gear.
3. Final ratio required for a given speed.

$$\textbf{MPH @ Governed Speed} = \frac{\textbf{(60) x (RPM)}}{\textbf{(Rev/Mile) x (Gear Ratio)}}$$

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Definitions in formula:

RPM	=	Revolutions per minute of the engine at Governed Speed
Rev/Mile	=	Tire revolutions per mile
Gear Ratio	=	The product of the axle ratio times the transmission ratio
60	=	Time Constant

Example: NPR/W3500 12,000 GVWR automatic transmission.

RPM	=	3,000
Rev/Mile	=	674
Gear Ratio	=	.703 x 5.375

$$\textbf{MPH @ Governed Speed} = \frac{\textbf{(60) x (3,000)}}{\textbf{(674) x (.703 x 5.375)}}$$

MPH @ Governed Speed = 70 MPH

2. *Grade Horsepower Formula*

This formula can be used to determine horsepower required for a given grade and speed.

$$\textbf{Horsepower Req'd. for a given grade} = \frac{\textbf{GVWR x Grade x Speed}}{\textbf{37,500 x Efficiency Factor}} + \textbf{AHP}$$

Definitions in formula:

GVWR	=	Gross Vehicle Weight Rating
Grade	=	Grade anticipated in percent
Speed	=	Speed in miles per hour
37,500	=	Constant
Efficiency Factor	=	Factor for losses in drivetrain due to friction (use 0.9 for a 90% efficient driveline)
AHP Resistance	=	Horsepower required to overcome wind force

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Example: NPR/W3500 11,050 GVWR automatic transmission with a van body.

GVWR	=	12,000 lbs.
Grade	=	1 percent
Speed	=	55 MPH
37,500	=	Constant
Efficiency Factor	=	0.9
AHP Resistance	=	53.6 HP (see the following formula for calculation)

$$\textbf{HP Required for Grade} = \frac{\textbf{12,000 x 1 x 55}}{\textbf{37,500 x 0.9}} + \textbf{53.67}$$

HP Required for Grade = 73.22

3. Air Resistance Horsepower Formula

This formula is used to determine the horsepower required to overcome air resistance at a given speed.

$$\textbf{Air Resistance Horsepower} = \frac{\textbf{FA x Cd x (MPH)}^3}{\textbf{156,000}}$$

Definitions in formula:

FA	=	Frontal area of vehicle in square feet
Cd	=	Aerodynamic Drag Coefficient
MPH	=	Speed of vehicle in miles per hour
156,000	=	Constant

Frontal area is calculated by multiplying the height of the vehicle by the width of the vehicle and subtracting the open area under the vehicle from the total.

Aerodynamic Drag Coefficients *(Source Material: Motor Truck Engineering Handbook):*

0.70	for most trucks, semitrailer combinations with tanks or van bodies
0.77	for double and triple trailers and flatbeds with loads
1.00	car and boat haulers

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Example: NPR/W3500 12,000 GVWR van body with 96" wide, 115" high (84" body height + 31" frame height).

$$\mathbf{FA} = \frac{\mathbf{(96) \times (115)}}{\mathbf{(12) \times (12)}} - \mathbf{3.2}$$

FA = 73.47 ft.^{2}
Cd = 0.70
Speed = 55 mph

$$\text{Air Resistance HP} = \frac{73.47 \times 0.70 \times (55)^3}{156{,}000}$$

$$\text{Air Resistance HP} = 54.85$$

4. Engine Horsepower Formula

This formula can be used to derive the output at a given RPM and torque.

$$\textbf{Horsepower} = \frac{\textbf{Torque x RPM}}{\textbf{5,252}}$$

Definitions in formula:

Torque = Twisting output of engine given in lbs.-ft.
RPM = Revolutions per minute of engine
5,252 = Constant

Example: NPR/W3500 12,000 GVWR automatic transmission.

Torque = 347 lbs.-ft.
RPM = 2,000

$$132 \text{ HP} = \frac{(347) \times (2{,}000)}{5{,}252}$$

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

5. ***Gradeability Formula***

This formula can be used to determine how large of a grade a vehicle can climb.

$$\textbf{Percent Grade} = \frac{\textbf{1,200 x (T) x (E) x (C) x (R)}}{\textbf{GVWR x r}} - \textbf{RR}$$

Definitions in formula:

1,200	=	Constant
T	=	Maximum Torque of Engine
E	=	Engine Efficiency (0.9)
C	=	Driveline Efficiency (0.9)
R	=	Transmission Ration x Axle Ratio
RR	=	Rolling Resistance (see following chart)
GVWR	=	Gross Vehicle Weight Rating
r	=	Loaded radius of tire

Example: NPR/W3500 12,000 GVWR automatic transmission on concrete highway.

T	=	347 lbs.-ft.
E	=	0.9
C	=	0.9
R	=	.703 x 5.375 (in overdrive)
RR	=	1.0
GVWR	=	12,000
r	=	14.1 in.

$$\textbf{Percent Grade} = \frac{\textbf{1,200 x (347) x (0.9) x (0.9) x (.703) x (5.375)}}{\textbf{12,000 x 14.1}} - \textbf{1.0}$$

Percent Grade = 6.53 – 1

Gradeability = 5.53%

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Road Rolling Resistance			
Road Rolling Resistance – Expressed in Percent Grade			
Road Surface	**Grade**	**Road Surface**	**Grade**
Concrete, excellent	1.0	Cobbles, ordinary	5.5
Concrete, good	1.5	Cobbles, poor	8.5
Concrete, poor	2.0	Snow, 2 inches	2.5
Asphalt, good	1.25	Snow, 4 inches	3.75
Asphalt, fair	1.75	Dirt, smooth	2.5
Asphalt, poor	2.25	Dirt, sandy	3.75
Macadam, good	1.5	Mud	3.75 to 15.0
Macadam, fair	2.25	Sand, level soft	6.0 to 15.0
Macadam, poor	3.75	Sand, dune	16.0 to 30.0

6. *Startability Formula*

This formula is used to determine what type of a grade a vehicle can be started on.

$$\textbf{Startability} = \frac{(1{,}200) \times (CET) \times (E) \times (C) \times (R)}{(GVWR \times r)} - 10\%$$

Definitions in formula:

1,200	=	Constant
CET	=	Clutch Engagement Torque
E	=	0.9
C	=	0.9
R	=	Transmission x Axle Ratio
10%	=	Average break away resistance and static inertia constant
GVWR	=	Gross Vehicle Weight Rating
r	=	Loaded radius of tire

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Example: NPR/W3500 12,000 GVWR manual transmission.

CET	=	260 lbs.-ft.
R	=	6.02 x 4.10
GVWR	=	12,000 lbs.
r	=	14.1 in.

$$\text{Startability} = \frac{(1{,}200) \times (260) \times (0.9) \times (0.9) \times (6.02 \times 4.10)}{(12{,}000 \times 14.1)} - 10\%$$

Startability = 26.86%

7. Vertical Center of Gravity Formula

These formulas are used to estimate the vertical center of gravity of a completed vehicle in order to determine whether maximum allowable limits have been exceeded. This formula should be used when encountering high center of gravity loads.

7.1 Wv x (Vv) = Mv

7.2 Wb x (Vb) = Mb

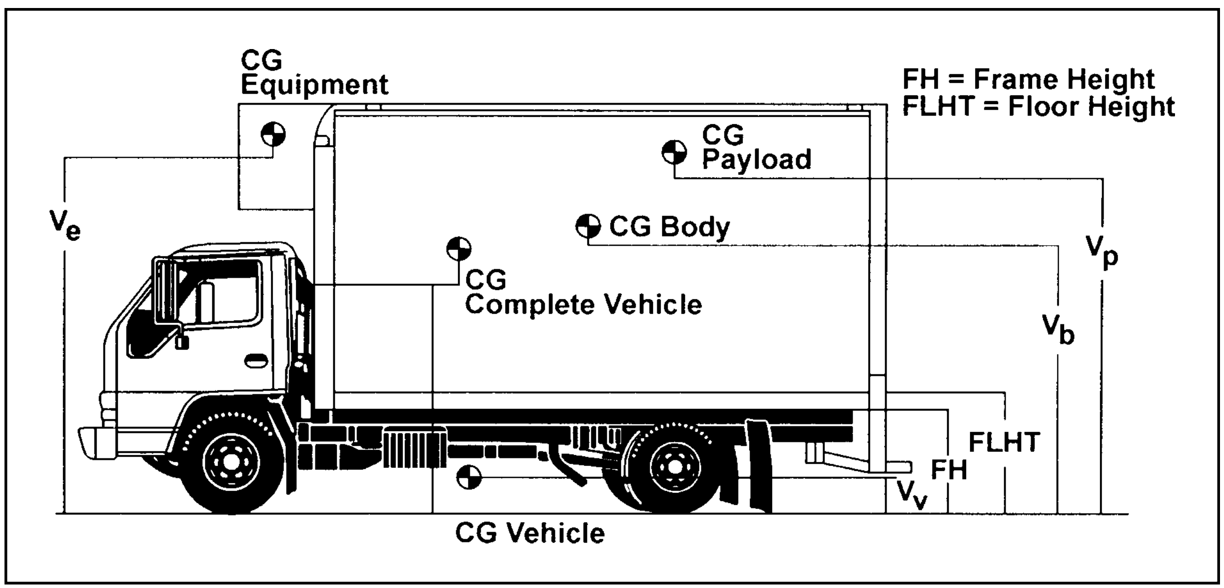
7.3 Wp x (Vp) = Mp

7.4 We x (Ve) = Me

7.5 $$\mathbf{VCg} = \frac{\mathbf{(Mv + Mb + Mp + Me)}}{\mathbf{(Wv + Wb + Wp + We)}}$$

Definitions in formula:

VCg	=	The total average vertical center of gravity of the completed vehicle (vehicle, body, payload and equipment)
Wv	=	Weight of vehicle
Wb	=	Weight of body
Wp	=	Weight of payload
We	=	Weight of equipment



(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Definitions in formula *(continued)*:

Vv	=	Distance from ground to center of gravity of the vehicle
Vb	=	Distance from ground to center of gravity of the body
Vp	=	Distance from ground to center of gravity of the payload
Ve	=	Distance from ground to center of gravity of the equipment
Mv	=	Moment of vehicle
Mb	=	Moment of body
Mp	=	Moment of payload
Me	=	Moment of equipment

Example: NPR/W3500 12,000 GVWR automatic transmission, 132" WB, 14' body length, 84" high body, full payload of boxes stacked to a maximum height of 48" above the flooring.

Wv	=	5,291 lbs.	*(from vehicle specifications)*
Wb	=	2,100 lbs.	*(from body manufacturer)*
Wp	=	4,609 lbs.	*(GVWR – (Wv + Wb + We))*
Vv	=	24.9 in.	*(from Body Builder's Guide, NPR Section)*
Vb	=	80 in.	*(from body manufacturer)*
Vp	=	62 in.	*(1/2 of payload height + frame height + height from frame to flooring)*
Mv	=	5,291 x 24.9 = 131,746 lbs.-in.	*(from 7.1)*
Mb	=	2,100 x 80 = 168,000 lbs.-in.	*(from 7.2)*
Mp	=	4,609 x 62 = 285,758 lbs.-in.	*(from 7.3)*

We, Ve, Me = None in this example

$$VCg = \frac{(131{,}746 + 168{,}000 + 285{,}758)}{(5{,}291 + 2{,}100 + 4{,}609)}$$

$$VCg = \frac{(528{,}504)}{(12{,}000)} = 48.8 \text{ inches}$$

48.8 < 54.0 inches (54 inches is maximum allowable VCg per mfg. specifications from Body Builder's Guide, NPR/W3500 section)

Since maximum VCg for this truck is not exceeded, 48" stack height above flooring is acceptable.

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

8. Horizontal Center of Gravity Formula

These formulas are used to estimate the horizontal center of gravity of a completed vehicle in order to determine whether it exists between the centerlines of the front and rear axles. This formula should be used when a load and/or permanent equipment (liftgate, reefer unit, snowplow, etc.) is installed on either extreme along the completed vehicle's overall length.

8.1 Wv x (Hv) = Mv

8.2 Wb x (Hb) = Mb

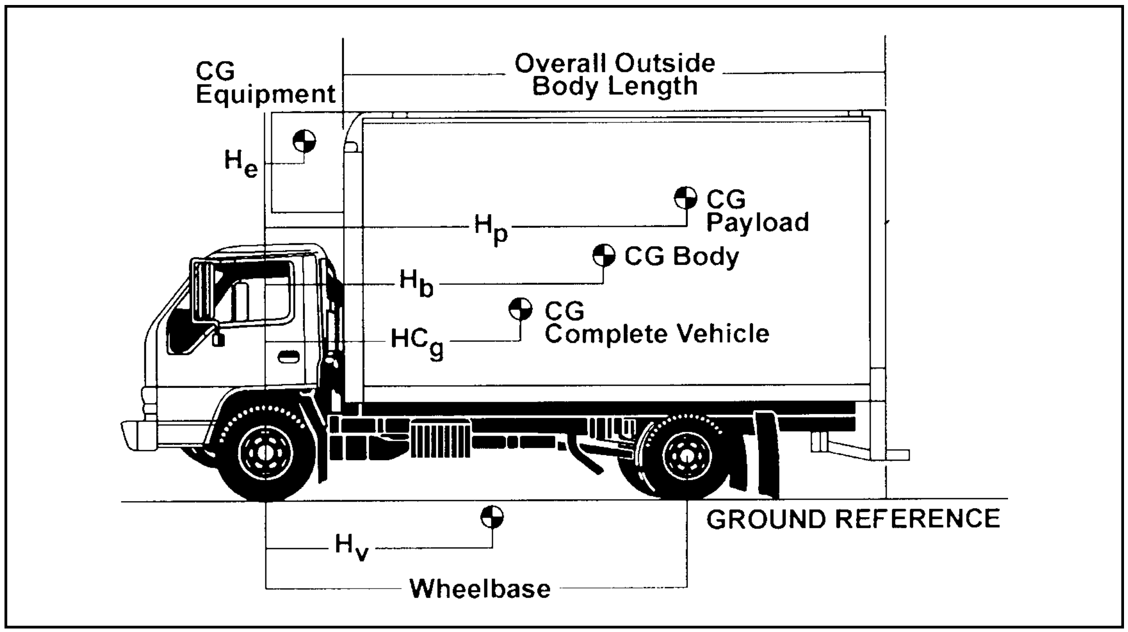
8.3 Wp x (Hp) = Mp

8.4 We x (He) = Me

8.5 **HCg** = $\frac{\mathbf{(Mv + Mb + Mp + Me)}}{\mathbf{(Wv + Wb + Wp + We)}}$

Definitions in formula:

HCg	=	The total average horizontal center of gravity of the completed vehicle (vehicle, body, payload and equipment)
Wv	=	Weight of vehicle
Wb	=	Weight of body
Wp	=	Weight of payload
We	=	Weight of equipment
Hv	=	Distance from front axle to center of gravity of the vehicle
Hb	=	Distance from front axle to center of gravity of the body
Hp	=	Distance from front axle to center of gravity of the payload
He	=	Distance from front axle to center of gravity of the equipment
Mv	=	Moment of vehicle
Mb	=	Moment of body
Mp	=	Moment of payload
Me	=	Moment of equipment



(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Example: NPR/W3500 Diesel 12,000 GVWR automatic transmission, 132" WB, 14' body length, full payload of boxes stacked and distributed evenly throughout the flooring, 1,000 lb. reefer unit attached in front of body.

Wv	=	5,291 lbs.	*(from vehicle specifications)*
Wb	=	2,100 lbs.	*(from body manufacturer)*
Wp	=	3,609 lbs.	*(GVWR – (Wv + Wb + We))*
We	=	1,000 lbs.	*(from equipment manufacturer)*
Hv	=	42.4 in.	*(from Body Builder's Guide, NPR Section)*
Hb	=	107.5 in.	*(from body manufacturer)*
Hp*	=	107.5 in.	*(1/2 of payload length + distance from front axle to front of body)*
He	=	17.5 in.	*(from equipment manufacturer)*
Mv	=	5,291 x 42.4 = 224,338 lbs.-in.	*(from 8.1)*
Mb	=	2,100 x 107.5 = 225,750 lbs.-in.	*(from 8.2)*
Mp	=	3,609 x 107.5 = 387,967 lbs.-in.	*(from 8.3)*
Me	=	1,000 x 17.5 = 17,500 lbs.-in.	*(from 8.4)*

$$HCg = \frac{(224{,}338 + 225{,}750 + 387{,}967 + 17{,}500)}{(5{,}291 + 2{,}100 + 3{,}609 + 1{,}000)}$$

$$HCg = \frac{(855{,}555)}{(12{,}000)} = 71.3 \text{ inches}$$

71.3 < 132 inches (132 inches is the wheelbase dimension)

Since HCg for this truck is not greater than the WB or negative (–) (denotes HCg forward of front axle centerline), it exists between the centerlines of the front and rear axles.

NOTE: Hp and Hb dimensions are the same in this example because CG of body and payload happen to be at the same point.

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Highway System Limits

The Federal Government established the Federal Bridge Gross Weight Formula to provide a standard to control the spacing of truck axles on trucks that use highway bridges. This is intended to space loads out over a distance to avoid too high a concentration in one area that could cause damage. The truck's gross weights, axle weight and axle spacings are set in order to keep axle loads and gross weight loads within the limits set by the Federal Government. The Bridge Formula Table is used to check trucks to make sure that Federal weight limit requirements are met and that the allowable gross and axle weights are in the correct relationship with the spacing of axles to prevent high load concentrations on highway bridges.

The Federal Government has established the following formula to be used to determine the allowable weight limits and axle spacings for trucks.

$$W = 500\left(\frac{LN}{N-1} + 12N = 36\right)$$

Where:

W = The total gross weight that may be carried on any group of two or more consecutive axles to the nearest 500 lbs.

L = The distance (spacing) in feet between the outer axles of any group of two or more consecutive axles.

N = The number of axles in the group under consideration; except that two consecutive sets of tandem axles may carry a gross load of 34,000 lbs. each provided the overall distance between the first and last axles of such consecutive sets of axles is 36 feet or more.

Bridge Formula Definitions

The following definitions are used for bridge formula calculations.

Gross Weight

The total weight of a truck (and/or trailer) combined with the weight of the load being hauled. The Federal gross weight limits on interstate highways and federal-aid highways and reasonable access is 80,000 lbs.

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Single Axle Weight

The total weight at the ground by all wheels of an axle whose centers may be included between parallel transverse planes 40 inches apart, extending across the width of the truck. The Federal single axle weight limit on the interstate system and reasonable access is 20,000 lbs.

Tandem Axle Weight

The total weight at the ground of two or more consecutive axles whose centers may be included between parallel vertical planes spaced more than 40 inches but not more than 96 inches apart, extending across the full width of the truck. The Federal tandem axle weight limit on the interstate system and reasonable access is 34,000 lbs.

Consecutive Axle Weight

The Federal law states that any two or more consecutive axles may not exceed the weight as computed by the formula even though the single axles, tandem axles, and gross weights are within the legal requirements.

Exception to the Bridge Formula

There is one exception to the use of the Federal Bridge Formula: two consecutive sets of tandem axles may carry a gross load of 34,000 lbs. each, providing the overall distance between the first and last axles of such consecutive sets of tandem axles is 36 feet or more.

Other Federal Provisions

Maximum Width: 102 inches overall

Length: States cannot set overall length limits on tractor, semitrailer or tractor-semitrailer, trailer combinations. States must allow tractors with double trailers. States must allow semitrailers of up to 48 feet in length for doubles combinations. There is also not a limitation on overall length for semitrailer or doubles combinations.

These width and length dimensions apply to trucks operating on interstate highways and federal-aid highways designed by the Federal Highway Administration. This also provides for reasonable access to the interstate highways.

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Federal Bridge Formula Table

Distance in feet between the extremes of any group of 2 or more consecutive axles	Maximum Load in Pounds on Any Group of 2 or More Consecutive Axles							
	2 Axles	3 Axles	4 Axles	5 Axles	6 Axles	7 Axles	8 Axles	9 Axles
4	34,000*							
5	34,000*							
6	34,000*							
7	34,000*							
8 and less	34,000*	34,000						
8 and more	38,000	42,000						
9	39,000	42,500						
10	40,000	43,500						
11		44,000						
12		45,000	50,000					
13		45,500	50,500					
14		46,500	51,500					
15		47,000	52,000					
16		48,000	52,500	58,000				
17		48,500	53,500	58,500				
18		49,500	54,000	59,000				
19		50,000	54,500	60,000				
20		51,000	55,500	60,500	66,000			
21		51,500	56,000	61,000	66,500			
22		52,500	56,500	61,500	67,000			

* Tandem Axle by Definition.
+ Exception to Federal Bridge Formula Table and Law. See Text for Explanation.

NOTE: All permissible load calculations are to the nearest 500 lbs. Maximum load on any single axle, 20,000 lbs. Weights over 80,000 lbs. are in excess of the Federal GVW on the National Highway Network.

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Federal Bridge Formula Table (Continued)

Distance in feet between the extremes of any group of 2 or more consecutive axles	Maximum Load in Pounds on Any Group of 2 or More Consecutive Axles							
	2 Axles	3 Axles	4 Axles	5 Axles	6 Axles	7 Axles	8 Axles	9 Axles
23		53,000	57,500	62,500	68,000			
24		54,000	58,000	63,000	68,500	74,000		
25		54,500	58,500	63,500	69,000	74,500		
26		55,500	59,500	64,000	69,500	75,000		
27		56,000	60,000	65,000	70,000	75,500		
28		57,000	60,500	65,500	71,000	76,500	82,000	
29		57,500	61,500	66,000	71,500	77,000	82,500	
30		58,500	62,000	66,500	72,000	77,500	83,000	
31		59,000	62,500	67,500	72,500	78,000	83,500	90,000
32		60,000	63,500	68,000	73,000	78,500	84,500	90,500
33			64,000	68,500	74,000	79,000	85,000	91,000
34			64,500	69,000	74,500	80,000	85,500	91,500
35			65,500	70,000	75,000	80,500	86,000	92,000
36			66,000+	70,500	75,500	81,000	86,500	93,000
37			66,500+	71,000	76,000	81,500	87,000	93,500
38			67,500+	72,000	77,000	82,000	87,500	94,000
39			68,000	72,500	77,500	82,500	88,500	94,500
40			68,500	73,000	78,000	83,500	89,000	94,500
41			69,500	73,500	78,500	84,000	89,500	95,000
42			70,000	74,000	79,000	84,500	90,000	95,500

* Tandem Axle by Definition.
+ Exception to Federal Bridge Formula Table and Law. See Text for Explanation.

NOTE: All permissible load calculations are to the nearest 500 lbs. Maximum load on any single axle, 20,000 lbs. Weights over 80,000 lbs. are in excess of the Federal GVW on the National Highway Network.

(Weight Distribution Concepts Section – continued on next page)

(Weight Distribution Concepts Section – continued from previous page)

Federal Bridge Formula Table (Continued)

Distance in feet between the extremes of any group of 2 or more consecutive axles	Maximum Load in Pounds on Any Group of 2 or More Consecutive Axles							
	2 Axles	3 Axles	4 Axles	5 Axles	6 Axles	7 Axles	8 Axles	9 Axles
43			70,500	75,000	80,000	85,000	90,500	96,000
44			71,500	75,500	80,500	85,500	91,000	96,500
45			72,000	76,000	81,000	86,000	91,500	97,500
46			72,500	76,500	81,500	87,000	92,500	98,000
47			73,500	77,500	82,000	87,500	93,000	98,500
48			74,000	78,000	83,000	88,000	93,500	99,000
49			74,500	78,500	83,500	88,500	94,000	99,500
50			75,500	79,000	84,000	89,000	94,500	100,000
51			76,000	80,000	84,500	89,500	95,000	100,500
52			76,500	80,500	85,000	90,500	95,500	101,000
53			77,500	81,000	86,000	91,000	96,500	102,000
54			78,000	81,500	86,500	91,500	97,000	102,500
55			78,500	82,500	87,000	92,000	97,500	103,000
56			79,500	83,000	87,500	92,500	98,000	103,500
57			80,000	83,500	88,000	93,000	98,500	104,000
58				84,000	89,000	94,000	99,000	104,500
59				85,000	89,500	94,500	99,500	105,000
60				85,500	90,000	95,000	100,500	105,500

* Tandem Axle by Definition.
+ Exception to Federal Bridge Formula Table and Law. See Text for Explanation.

NOTE: All permissible load calculations are to the nearest 500 lbs. Maximum load on any single axle, 20,000 lbs. Weights over 80,000 lbs. are in excess of the Federal GVW on the National Highway Network.

COMMODITY AND MATERIAL WEIGHTS

Approximate Weights of Commodities and Materials

Product		Size of Container	Lbs. Per Cu. Ft.	No. of Lbs. / Per
Acetone		–––	50	6.6 / gallon
Alcohol,	Commercial	–––	51	6.8 / gallon
	Proof spirits	–––	57	7.6 / gallon
Alfalfa seed		bushel	––	60 / bushel
Aluminum,	Pure (cast)	–––	165	4,450 / cu. yard
Apples,	Fresh	basket-bushel	––	48 / bushel
	Western, box	11.5" x 12" x 20"	––	50 / box
	New England, box	11.25" x 14.5" x 17.5"	––	56 / box
	Standard barrel	17" head, 28.5" stave	––	160 / barrel
	Dried	bushel	––	24 / bushel
Apricots,	Fresh	bushel	––	48 / bushel
	Western, box	5.5" x 12" x 20"	––	23 / box
Artichokes,	Box	10" x 11.5" x 22"	––	44 / box
Asbestos		–––	153	4,130 / cu. yard
Asparagus, crate,	Loose	11.5" high x 9.75" top	––	38 / crate
	Bunches	11" bottom x 19.38" long	––	31 / crate
Avocados,	Box	5.75" x 11.25" x 17.5"	––	16 / box
Bananas,	Single stem	bunch	––	45-65 / bunch
Barley		bushel	––	48 / bushel
Barytes,	Mineral	–––	280	7,560 / cu. yard
Basalt,	Rock	–––	185	5,000 / cu. yard
Beans, dry,	Lima	bushel	––	56 / bushel
	White	bushel	––	60 / bushel
	Castor	bushel	––	46 / bushel
Beans, fresh,	Lima	bushel	––	39 / bushel
	String	bushel	––	36 / bushel
		hamper, 5 peck	––	45 / hamper

Product		Size of Container	Lbs. Per Cu. Ft.	No. of Lbs. / Per
Beef,	Slack barrel	21" x 30" stave (200 lbs. net)	––	254 / barrel
Beer,	Wood barrel	.5 barrel (16 gal.)	––	205 / barrel
	Wood barrel	.25 barrel (8 gal.)	––	105 / barrel
	Steel barrel	.5 barrel (16 gal.)	––	190 / barrel
	Steel barrel	.25 barrel (8 gal.)	––	95 / barrel
	Dutchman	.13 barrel (4 gal.)	––	51 / barrel
Case carton,*	Regular bottles	17.25" x 11.5" x 9.88"	––	45 / case
24, 12 oz.	Steinie bottles	18.38" x 12.13" x 7.38"	––	40 / case
	Tin cans	16.13" x 11" x 5.13"	––	28 / case
Wooden case,*	Regular bottles	21" x 13.5" x 10"	––	35 / case
24, 12 oz.	Steinie bottles	22" x 13.75" x 7.5"	––	46 / case
Beets		bushel	––	50-60 / bushel
	Small crate	9.75" x 13.75" x 24"	––	50 / crate
	Western crate	14" x 19" x 24.5"	––	95 / crate
Berries, crate,	24 pint	9.75" x 9.97" x 20"	––	25 / crate
	24 quart	11.75" x 11.75" x 24"	––	48 / crate
	32 quart	15.5" x 11.75" x 24"	––	63 / crate
Bluegrass seed		bushel	––	44 / bushel
Bluestone		–––	120	3,240 / cu. yard
Bone		–––	115	3,110 / cu. yard
Borax		–––	110	2,970 / cu. yard
Bran		bushel	––	20 / bushel
Brick,	Soft	2.25" x 4" x 8.25"	––	4,320 / thousand
	Common	2.25" x 4" x 8.25"	––	5,400 / thousand
	Hard	2.25" x 4.25" x 8.5"	––	6,480 / thousand
	Pressed	2.38" x 4" x 8.38"	––	7,500 / thousand
	Paving	2.25" x 4" x 8.5"	––	6,750 / thousand
	Paving block	3.5" x 4" x 8.5"	––	8,750 / thousand
	Fire	2.5" x 4.5" x 9"	––	7,000 / thousand

* **Note:** Beer cases vary as to size and shape. Suggest checking with local source.

Product		Size of Container	Lbs. Per Cu. Ft.	No. of Lbs. / Per
Broccoli,	Bushel crate	12.75" x 12.75" x 17"	––	30 / bushel
Brussels sprouts,	Crate	7.75" x 10.5" x 21.38"	––	26 / crate
Buckwheat		bushel	––	49 / bushel
Butter, tub,	Small	15" dia. x 5.75"	––	25 / tub
	Standard	15" dia. x 15"	––	70 / tub
Butter, case,	30 – 1-lb. bricks	10.75" x 8.75" x 10.5"	––	32 / case
	9-lb. pail	pail	––	10 / pail
Cabbage		bushel	––	38 / bushel
	Hamper	1.5 bushel	––	58 / hamper
	Crate	12.75" x 18.5" x 19"	––	60 / crate
	Western crate	14" x 19" x 24.5"	––	85 / crate
	Barrel crate	12.75" x 18.75" x 37.38"	––	110 / crate
Calf,	Live (average)	per head	––	140-160 / head
Cantaloupe, crate,	Pony	11.75" x 11.75" x 23.5"	––	58 / crate
	Standard	12.75" x 12.75" x 23.5"	––	68 / crate
	Jumbo	13.75" x 13.75" x 23.5"	––	78 / crate
	Pony flat	4.75" x 12.75" x 23.5"	––	26 / crate
	Standard flat	5.25" x 14.25" x 23.5"	––	28 / crate
	Jumbo flat	5.75" x 15.25" x 23.5"	––	32 / crate
	Honeydew (Casaba)	6.38" x 15.13" x 23.5"	––	35 / crate
Carbolic acid		–––	60	8.0 / gallon
Carrots,	Topped	bushel	––	55 / bushel
	With tops	bushel	––	40 / bushel
	Crate	11.75" x 14.13" x 24"	––	60 / crate
Castor oil		–––	61	8.1 / gallon
Cauliflower		bushel	––	30 / bushel
	Crate	9.38" x 19" x 24"	––	50 / crate
Cedar*	(lumber)	–––	30	2,500 / M. Bd. ft.
Celery,	Standard crate	11.63" x 22" x 22.63"	––	70 / crate
	Half crate	10.75" x 13" x 20.38"	––	35 / crate
	Northern crate	16.5" x 21.25" x 22"	––	85 / crate

*Kiln dried lumber averages 10% to 15% lighter, and green lumber 40% to 50% heavier, than air dried.

Product		Size of Container	Lbs. Per Cu. Ft.	No. of Lbs. / Per
Cement,	Block	8" x 8" x 16"	––	42 / each
	Block	8" x 12" x 16"	––	58 / each
	Portland	sack	––	94 / sack
	Portland	barrel (4 sacks per)	––	376 / barrel
Chalk		–––	137	3,700 / cu. yard
Charcoal,	Oak	–––	33	890 / cu. yard
	Pine	–––	23	620 / cu. yard
Cheese,	Small box	15" dia. x 5.25"	––	25 / box
	Medium box	15" dia. x 7.5"	––	35 / box
	Large box	15" dia. x 15"	––	70 / box
Cherries,	Unstemmed	bushel	––	56 / bushel
	Stemmed	bushel	––	64 / bushel
	Lug box	5.63" x 11.88" x 19.75"	––	17 / box
Chestnut*	(lumber)	–––	37	3,080 / M. Bd. ft.
Chestnuts		bushel	––	50 / bushel
Chickens,	Live, broilers (20 avg.)	standard crate	––	58 / crate
	Fowl (12 avg.)	standard crate	––	78 / crate
	Standard crate, empty	24" x 35" x 13"	––	18 / crate
Cinder blocks		8" x 8" x 16"	––	35 / each
		8" x 12" x 16"	––	45 / each
Cinders		–––	50	1,350 / cu. yard
Clay,	Dry lumps	–––	85	2,300 / cu. yard
	Wet lumps	–––	110	2,970 / cu. yard
	Wet packed	–––	135	3,650 / cu. yard
	Fire	–––	125	3,375 / cu. yard
Cork		–––	15	405 / cu. yard
Corn,	Ear	bushel	––	35 / bushel
	Shelled	bushel	––	56 / bushel
	Sweet corn (green)	bushel	––	43 / bushel
	Crate	12.88" x 12.88" x 24"	––	60 / crate
Corn meal		bushel	––	44 / bushel

Product		Size of Container	Lbs. Per Cu. Ft.	No. of Lbs. / Per
Corn oil		– – –	58	7.8 / gallon
Corn syrup		– – –	86	11.5 / gallon
Cotton,	Gin bale	30" x 48" x 54"	– –	515 / bale
	Standard bale	24" x 28" x 56"	– –	515 / bale
	Comp. bale	20" x 24" x 56"	– –	515 / bale
Cotton seed		bushel	– –	32 / bushel
Cottonseed oil		– – –	58	7.8 / gallon
Cottonwood*	(lumber)	– – –	37	3,080 / M. Bd. ft.
Cow,	Live-Feeder (average)	per head	– –	600 / head
	Butcher (average)	per head	– –	800 / head
	Butcher steer (average)	per head	– –	1100 / head
Cranberries,	1/4 barrel box	9.5" x 11" x 14"	– –	28 / box
	1/2 barrel box	12.25" x 14.75" x 22"	– –	60 / box
Cream		– – –	64	8.5 / gallon
Creosote		– – –	68	9.2 / gallon
Crude oil		– – –	56	7.5 / gallon
Cucumbers		bushel	– –	55 / bushel
	Crate	9.75" x 13.75" x 24"	– –	75 / crate
	Case	5" x 13.25" x 19"	– –	26 / case
Earth,	Loose, dry loam	– – –	76	2,050 / cu. yard
	Packed	– – –	95	2,565 / cu. yard
	Wet	– – –	125	3,375 / cu. yard
Eggplant,	Hamper	bushel	– –	40 / bushel
	Crate	14" x 11.75" x 24"	– –	54 / crate
Eggs,	30 dozen crate	12" x 12" x 26"	– –	55 / crate
Elm,*	Soft	– – –	38	3,170 / M. Bd. ft.
	Rock	– – –	45	3,750 / M. Bd. ft.
Fertilizer,	Commercial	burlap bag	– –	100-200 / bag
Fir,*	Douglas	– – –	32	2,670 / M. Bd. ft.
	Eastern	– – –	25	2,080 / M. Bd. ft.

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Product		Size of Container	Lbs. Per Cu. Ft.	No. of Lbs. / Per
Fish, fresh,	Barrel	19" head, 29" stave	– –	300 / barrel
	1/2 Barrel	18.5" head, 23.5" stave	– –	160 / 1/2 barrel
Flour,	Barrel	19.13" head, 30" stave	– –	215 / barrel
Fuel oil,	Furnace grade	– – –	56	7.5 / gallon
	Diesel engine	– – –	52	7.0 / gallon
Furniture,	Household	– – –	7	1,915 / cu. yard
Garbage,	Dry, paper wrapped	– – –	15-30	405-810 / cu. yard
	Wet	– – –	50	1,240 / cu. yard
Gasoline		– – –	45	6.0 / gallon
Glass,	Common window	– – –	– –	162 / cu. foot
	Plate or crown	– – –	– –	161 / cu. foot
	1/4" plate	– – –	– –	3.3 / sq. foot
Glue		– – –	80	2,160 / cu. yard
Glycerine		– – –	79	10.5 / gallon
Grapefruit,	Western box	11.5" x 11.5" x 24"	– –	68 / box
	Southern box	12.75" x 12.75" x 27"	– –	90 / box
Grapes,	Basket	bushel	– –	48 / box
	Lug box	5.63" x 16.38" x 17.5"	– –	30 / box
	Western keg	15.5" dia. x 14"	– –	45 / keg
	Basket	12 quart	– –	18 / basket
Gravel,	Dry	– – –	95	2,565 / cu. yard
	Wet	– – –	125	3,375 / cu. yard
Greens		bushel	– –	25 / bushel
Groceries,	Misc. assorted	– – –	30	810 / cu. yard
Hay,	Bale	26" x 30" x 46"	– –	210 / bale
	Bale	17" x 22" x 43"	– –	115 / bale
	Bale	14" x 16" x 43"	– –	85 / bale
Hog,	Live (average)	per head	– –	225-250 / head
Honey		– – –	90	12.0 / gallon
Horse,	Live (average)	per head	– –	1,200-1,500 / head

Product		Size of Container	Lbs. Per Cu. Ft.	No. of Lbs. / Per
Horseradish roots		bushel	––	35 / bushel
Ice		–––	57	1,540 / cu. yard
Ice (mfg.),	Block Block Block	11" x 22" x 32" 14" x 14" x 40" 11" x 22" x 56"	–– –– ––	250 / block 255 / block 440 / block
Ice Cream,	2.5 gallon can, Full Empty 5 gallon can, Full Empty	9" dia. x 11" ––– 9" dia. x 21" –––	–– –– –– ––	18 / can 6 / can 35 / can 11 / can
Kale		bushel	––	25 / bushel
Kerosene		–––	50	6.6 / gallon
Lamb,	Live (average)	per head	––	75-85 / head
Lard,	Barrel	18" head, 30" stave	––	425 / barrel
Lath,	Standard length 29"	Packed in bundles of 50 Average bundle, dia. 9"	––	25 / bundle
Leather,	Dry Wet	––– –––	55 65	1,485 / cu. yard 1,755 / cu. yard
Lemons,	Western box Southern box	10" x 13" x 25" 12.75" x 12.75" x 27"	–– ––	80 / box 90 / box
Lentils		bushel	––	60 / bushel
Lettuce,	Hamper Hamper Basket Crate 1/2 crate	bushel 1.5 bushel 8.5" x 11.75" x 21.38" 18.75" x 17.5" x 24.5" 9.5" x 13.5" x 24.5"	–– –– –– –– ––	25 / bushel 38 / hamper 17 / basket 75 / crate 40 / 1/2 crate
Lime,	Hydrated Barrel (small) Barrel (large)	bushel 16.5" head, 27.5" stave	–– 62 62	30 / bushel 210 / barrel 320 / barrel
Limes,	Western box Southern box	10" x 13" x 25" 12.75" x 12.75" x 27"	–– ––	80 / box 90 / box

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Product		Size of Container	Lbs. Per Cu. Ft.	No. of Lbs. / Per
Linseed oil		–––	59	7.9 / gallon
Lubricating oil		–––	52	7.0 / gallon
Malt,	Barley Rye Brewer's grain	bushel bushel bushel	–– –– ––	28 / bushel 32 / bushel 40 / bushel
Maple syrup		gallon	82	11.0 / gallon
Maple,*	Hard (lumber) Soft	––– –––	44 34	3,670 / M. Bd. ft. 2,830 / M. Bd. ft.
Meal-corn		bushel	––	44 / bushel
Milk,	Bulk 5 gallon can 10 gallon can Crate, 20.5 pt. bottles 20 pt. bottles	––– 10.25" dia. x 19" 13" dia. x 23" 8.5" x 12.75" x 16.75" 8.5" x 12.75" x 16.75"	64 –– –– –– ––	8.6 / gallon 62 / can 115 / can 33 / crate 54 / crate
Millet		bushel	––	50 / bushel
Molasses	 Barrel	––– 20.25" head, 34" stave	90 ––	12.0 / gallon 675 / barrel
Mortar,	Lime	–––	110	2,970 / cu. yard
Mud,	Flowing Packed	––– –––	106 125	2,860 / cu. yard 3,375 / cu. yard
Muriatic acid,	40%	–––	40	10.0 / gallon
Naptha,	Petroleum	–––	42	5.6 / gallon
Nitric acid,	91%	–––	94	12.5 / gallon
Oak-red,*	Black White	––– –––	42 48	3,500 / M. Bd. ft. 4,080 / M. Bd. ft.
Oats		bushel	––	32 / bushel
Okra,	Hamper Hamper	1/2 bushel bushel	–– ––	18 / hamper 34 / bushel
Oleomargarine,	(mfg.-tub) Cases	21" head, 34" stave –––	–– ––	70 / tub 15-65 / case

Product		Size of Container	Lbs. Per Cu. Ft.	No. of Lbs. / Per
Olive oil		–––	58	7.7 / gallon
Onions, dry,	Basket	bushel	––	55 / bushel
	Bag	17" x 32"	––	50 / bag
	Crate	20.5" x 11.5" x 10.5"	––	58 / crate
	Green (with tops)	bushel	––	32 / bushel
Oranges,	Western box	11.5" x 11.5" x 24"	––	80 / box
	Southern box	12.75" x 12.75" x 27"	––	90 / box
	Bushel box	10.75" x 10.75" x 23.5"	––	65 / box
Oysters (shucked or meats)				
	Crate with 5.1 gal. cans	18" x 12" x 24"	(11.5 lbs. per gal.)	67 / crate
	With shells (bags)	bushel	––	75 / bushel
Paint,	Lead and oil	–––	127	17 / gallon
Paper,	Average solid	–––	58	1,565 / cu. yard
	Newspaper rolls	34.25" x 35" dia.	––	500 / roll
		51.5" x 35" dia.	––	1,000 / roll
		64.25" x 35" dia.	––	1,300 / roll
Paraffin		–––	56	1,510 / cu. yard
Parsley,	Bushel crate	12.75" x 12.75" x 17"	––	30 / crate
Parsnips		bushel	––	50 / bushel
Peaches,	Basket	bushel	––	48 / bushel
	1/2 bushel	–––	––	25 / basket
	Crate	10.5" x 11.25" x 24"	––	50 / crate
	Western box	5.5" x 12.25" x 19.75"	––	22 / box
Peanuts,	Unshelled	bushel	––	22 / bushel
	Bag	–––	––	100 / bag
Peanut oil		–––	57	7.6 / gallon
Pears,	Basket	bushel	––	50 / bushel
	Western box	9.63" x 12.13" x 19.75"	––	51 / box
Peas,	Dry	bushel	––	60 / bushel
	Fresh hamper	bushel	––	35 / hamper
	Hamper	40 quarts	––	45 / hamper

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Product		Size of Container	Lbs. Per Cu. Ft.	No. of Lbs. / Per
Pecans,	Large bag	–––	––	100 / bag
	Small bag	–––	––	50 / bag
Peppers,	Basket	bushel	––	25 / basket
	Crate	14.13" x 11.75" x 24"	––	45 / crate
Petroleum		–––	56	7.5 / gallon
Phosphate rock		–––	200	5,400 / cu. yard
Pine,*	Long leaf	–––	44	3,670 / M. Bd. ft.
	North Carolina	–––	36	3,000 / M. Bd. ft.
	Oregon	–––	32	2,670 / M. Bd. ft.
	Red	–––	30	2,500 / M. Bd. ft.
	White	–––	26	2,170 / M. Bd. ft.
	Yellow, long leaf	–––	44	3,670 / M. Bd. ft.
	Short leaf	–––	38	3,170 / M. Bd. ft.
Pineapples,	Crate	11" x 12.5" x 36"	––	85 / crate
Pitch		–––	70	1,900 / cu. yard
Plums,	Basket	bushel	––	56 / bushel
	Western box	5.63" x 16.38" x 17.5"	––	25 / box
Pomegranates,	Box	6.5" x 12" x 24.63"	––	30 / box
Popcorn,	Ear	bushel	––	70 / bushel
	Shelled	bushel	––	56 / bushel
Poplar*		–––	27	2,250 / M. Bd. ft.
Porcelain		–––	150	4,050 / cu. yard
Pork (dressed),	Barrel (200 lbs. net)	18" head, 29" stave	––	240 / barrel
Potatoes,	Sweet	bushel	––	55 / bushel
	White or Irish	bushel	––	60 / bushel
	Bag	1.67 bushel	––	102 / bag
	Barrel	17.13" head, 28.5" stave	––	185 / barrel
Prunes,	Box	5.63" x 16.38" x 19.75"	––	25 / box
	Box	5.63" x 11.88" x 19.75"	––	22 / box
Quinces		bushel	––	50 / bushel

Product		Size of Container	Lbs. Per Cu. Ft.	No. of Lbs. / Per
Radishes,	Basket Crate	bushel 9.75" x 13.75" x 24"	– – – –	34 / bushel 40 / crate
Redwood*		– – –	30	2,500 / M. Bd. ft.
Resin		– – –	68	1,835 / cu. yard
Rhubarb (pie plant)	 Box	bushel 5.25" x 11.5" x 22"	– – – –	50 / bushel 24 / box
Rice,	Unhulled	bushel	– –	43 / bushel
Rock,	Crushed (average)	– – –	100	2,700 / cu. yard
Romaine,	Crate Crate	13.88" x 18.88" x 24.5" 12.25" x 13" x 15.25"	– – – –	64 / crate 27 / crate
Rubber goods		– – –	94	2,540 / cu. yard
Rutabagas		bushel	– –	56 / bushel
Rye		bushel	– –	56 / bushel
Salt, rock,	Solid Coarse Fine Barrel (average)	– – – – – – – – – – – –	136 45 50 – –	3,670 / cu. yard 1,215 / cu. yard 1,350 / cu. yard 280 / barrel
Sand, fine, Sand, coarse, Sand,	Dry Wet Dry Wet Mixed	– – – – – – – – – – – – – – –	110 125 95 120 115	2,970 / cu. yard 3,375 / cu. yard 2,565 / cu. yard 3,240 / cu. yard 3,100 / cu. yard
Sandstone,	Solid Crushed	– – – – – –	147 86	3,970 / cu. yard 2,325 / cu. yard
Shale,	Solid Crushed	– – – – – –	172 92	4,645 / cu. yard 2,485 / cu. yard
Sheep,	Live (average)	per head	– –	125-150 / head
Shingles,	Bundle	Pkg. in bndls. of 200-250 Size (avg.) 24" x 20" x 10"	– –	50 / bundle
Snow,	Moist-packed	– – –	50	1,350 / cu. yard

*Kiln dried lumber averages 10% to 15% lighter, and green lumber 40% to 50% heavier, than air dried.

Product		Size of Container	Lbs. Per Cu. Ft.	No. of Lbs. / Per
Soft drinks,	Half depth bottle box 24-6 to 8 oz. bottles Full depth bottle box 12-24 to 32 oz. bottles	 12.25" x 18.75" x 8.5" 13.38" x 18.5" x 12.25"	 – – – –	 39 / box 60 / box
Sorghum syrup		– – –	86	11.5 / gallon
Soybeans		bushel	– –	60 / bushel
Soybean oil		– – –	58	7.7 / gallon
Spinach,	Hamper Basket	bushel bushel	– – – –	20 / bushel 27 / bushel
Spruce*		– – –	28	2,330 / M. Bd. ft.
Squash		bushel	– –	46 / bushel
Starch		– – –	96	2,590 / cu. yard
Stone,	Crushed, (average) Rip-rap	– – – – – –	100 65	2,700 / cu. yard 1,755 / cu. yard
Straw,	Bale Bale	17" x 22" x 42" 26" x 30" x 46"	– – – –	110 / bale 180 / bale
Street sweepings		– – –	32	865 / cu. yard
Sugar		– – –	100	2,700 / cu. yard
Sugar,	Bag Barrel (22 lbs. empty) Case Case	(100 lbs. net) 19.13" head, 30" stave 24 – 5-lb. cartons 60 – 2-lb. cartons	– – – – – – – –	101 / bag 345 / barrel 135 / case 135 / case
Sugar cane syrup		– – –	85	11.3 / gallon
Sulphur		– – –	125	3,375 / cu. yard
Sulfuric acid,	87%	– – –	112	15 / gallon
Sweet corn,	Basket Crate	bushel 13" x 13" x 24"	– – – –	45 / bushel 60 / crate
Sycamore*		– – –	37	3,080 / M. Bd. ft.
Tallow		– – –	60	1,620 / cu. yard

Product		Size of Container	Lbs. Per Cu. Ft.	No. of Lbs. / Per
Tanks, Acetylene,	102 cu. foot	empty	--	70 / tank
		filled	--	75 / tank
	310 cu. foot	empty	--	200 / tank
		filled	--	220 / tank
Tanks, Oxygen,	150 cu. foot	empty	--	80 / tank
		filled	--	92 / tank
	300 cu. foot	empty	--	133 / tank
		filled	--	153 / tank
Tar		---	65	1755 / cu. yard
Tile,	Solid	---	115	3,100 / cu. yard
	Partition (construction)	---	40	1,080 / cu. yard
Tomatoes,	Basket	bushel	--	55 / bushel
	Lug box	7.25" x 14" x 17.5"	--	35 / box
	Crate	10.5" x 11.25" x 24"	--	48 / crate
	Basket	8.5" x 8.75" x 20"	--	18 / basket
	Basket (paper)	4.25" x 8.5" x 16.25"	--	9 / basket
	Basket (wood)	5.5" x 7.25" x 16.5"	--	10 / basket
Turpentine		---	54	7.2 / gallon
Turnips,	Basket	bushel	--	54 / bushel
Vetch seed		bushel	--	60 / bushel
Vinegar		---	64	8.5 / gallon
Walnuts,	Bulk	bushel	--	50 / bushel
	Bag	2 bushel	--	100 / bag
Water,	Fresh	---	63	8.4 / gallon
Wheat,	Bulk	bushel	--	60 / bushel
	Bag	1.5 bushel	--	90 / bag
Wool,	Pressed	---	82	2,215 / cu. yard

*Kiln dried lumber averages 10% to 15% lighter, and green lumber 40% to 50% heavier, than air dried.

VEHICLE SPECIFICATIONS INDEX

NPR/W3500, NPR HD/W4500 GAS

Specifications

Model	NPR/W3500 Gas	NPR HD/W4500 Gas
GVWR	12,000 lbs.	14,500 lbs.
WB	109 in., 132.5 in., 150 in., 176 in.	
Engine	GMPT 8-cylinder, V Block 4-cycle, OHV, water-cooled, Sequential Port Fuel Injection	
Model/Displacement	GMPT-V8/365 CID (6.0 liters)	
HP (Gross)	300 HP @ 4,400 RPM	
Torque (Gross)	358 lbs.-ft. torque @ 4,000 RPM	
Equipment	Sequential Port Fuel Injection (SFI), mass air flow meter, powertrain control module (PCM), onboard diagnostics, oxygen sensors, catalytic convertor, map sensor, with external oil cooler.	
Transmission	4L80-E Hydra-Matic 4-speed automatic w/lock-up converter and overdrive	
Steering	Integral power steering 18.8-20.9:1 ratio. Tilt and telescoping steering column.	
Front Axle	Reverse Elliot “I”-Beam rated at 6,830 lbs.	
Suspension	Semi-elliptical steel alloy tapered leaf springs with stabilizer bar and shock absorbers.	
GAWR	4,700 lbs.	5,360 lbs.
Rear Axle	Full-floating single speed with hypoid gearing rated at 11,020 lbs.	
Suspension	Semi-elliptical steel alloy multi-leaf springs and shock absorbers.	
GAWR	7,950 lbs.	9,880 lbs.
Wheels	16 x 6.0 6-hole disc wheels, painted white.	19.5 x 6.0 6-hole disc wheels, painted white.
Tires	215/85R 16-E (10 pr) tubeless steel-belted radials, all-season tread front and rear.	225/70R-19.5F (12 ply) tubeless steel-belted radials, all-season tread front and rear.
Brakes	Dual-circuit, vacuum-assisted hydraulic service brakes with load sensing proportioning valve in rear brake circuit and a metering valve between the master cylinder and 6-way joint on the front brake lines. Disc front and self-adjusting outboard mounted drum rear. The parking brake is a mechanical, cable-actuated, internal expanding drum type, transmission mounted. Four-channel antilock brake system.	
Fuel Tank	30-gallon rectangular steel fuel tank. Mounted between the frame rails with electric type fuel pump (mounted in tank). Through the rail fuel fill.	

NOTE: These selected specifications are subject to change without notice.

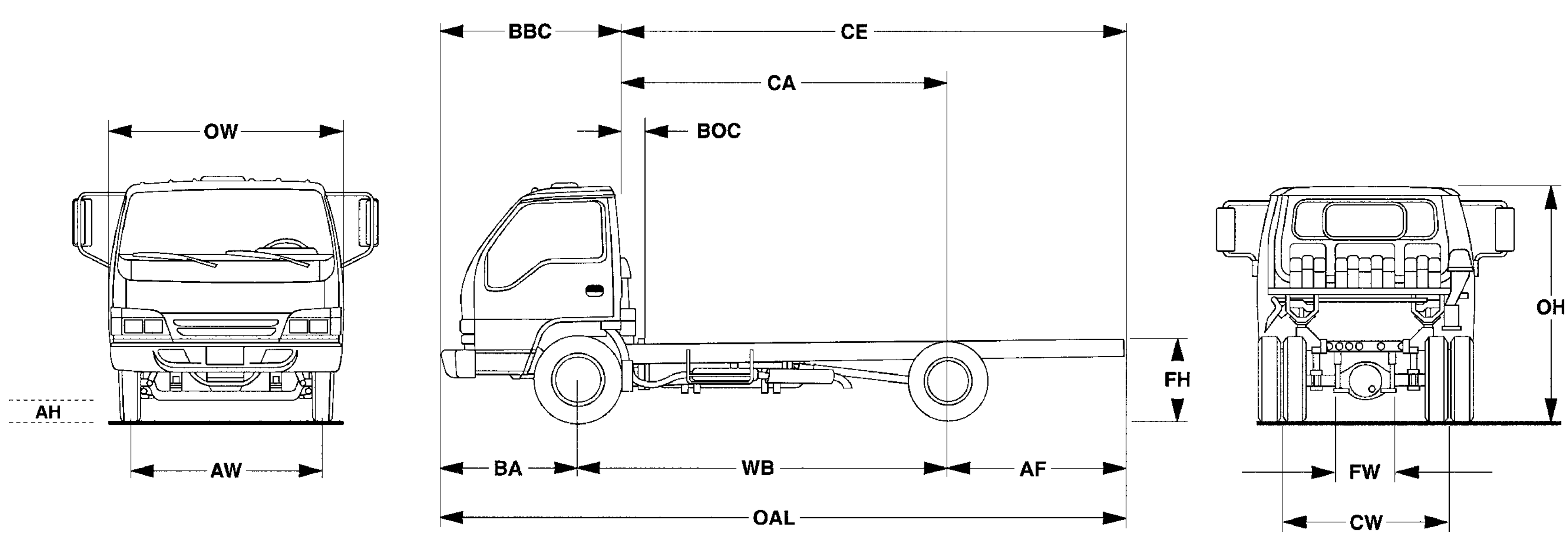
(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas – continued from previous page)

Model	NPR/W3500 Gas	NPR HD/W4500 Gas
Frame	Ladder type channel section straight frame rail 33.5 in. wide through the total length of the frame. Yield strength 44,000 psi section modulus 7.20 $in.^3$, RBM 316,800 lbs.-ft./in. per rail.	
Cab	All-steel, low cab forward, BBC 68.0 in., 45° mechanical tilt with torsion assist.	
Equipment	Jersey knit covered high back driver's seat with two-occupant passenger seat. Two-way roof ventilator, dual cab-mounted exterior mirrors. Tilt and telescoping steering column. Tinted glass, air conditioning.	
Electrical	12-volt, negative ground, Delco maintenance-free battery located on frame, 750 CCA each, 145-amp alternator with integral regulator.	
Options	AM/FM cassette stereo radio; spare wheel; 6" stainless steel mirrors. Power windows and door locks, wheel simulators and air deflector.	

NOTE: These selected specifications are subject to change without notice.

Vehicle Weights, Dimensions and Ratings



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Variable Chassis Dimensions					
Unit	**WB**	**CA***	**CE***	**OAL**	**AF**
Inch	109.0	88.4	131.5	199.5	43.1
Inch	132.5	111.9	155.0	223.0	43.1
Inch	150.0	129.4	172.5	240.5	43.1
Inch	176.0	155.4	198.5	266.3	43.1

* Effective CA & CE are CA or CE less BOC.

Dimension Constants: 12,000 GVW					
Code	**Inches**	**Code**	**Inches**	**Code**	**Inches**
AH	7.9	BW	83.3	FH	31.4
AW	65.6	CW	65.0		
BA	47.4	FW	33.5		
BBC	68.0	OH	87.4		
BOC	9.25	OW	78.5		

12,000-lb. GVWR with 4L80-E Hydra-Matic Transmission California, New York, Maine, Massachusetts, Vermont, California Emission System Chassis Cab and Maximum Payload Weights						
Model	**WB**	**Unit**	**Front**	**Rear**	**Total**	**Payload**
DB1	109.0 in.	lb.	3,119	1,819	4,938	7,062
DB2	132.5 in.	lb.	3,164	1,841	5,005	6,995
DB3	150.0 in.	lb.	3,186	1,863	5,049	6,951
DB4	176.0 in.	lb.	3,230	1,885	5,115	6,885

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas – continued from previous page)

12,000-lb. GVWR with 4L80-E Hydra-Matic Transmission Federal Emission System Except CA, NY, MA, ME, VT Chassis Cab and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
EB1	109.0 in.	lb.	3,119	1,819	4,938	7,062
EB2	132.5 in.	lb.	3,164	1,841	5,005	6,995
EB3	150.0 in.	lb.	3,186	1,863	5,049	6,951
EB4	176.0 in.	lb.	3,230	1,885	5,115	6,885

Dimension Constants: 14,500 GVW					
Code	Inches	Code	Inches	Code	Inches
AH	8.6	BW	84.0	FH	32.3
AW	65.6	CW	65.0		
BA	47.4	FW	33.5		
BBC	68.0	OH	88.1		
BOC	9.25	OW	78.5		

14,500-lb. GVWR with 4L30-E Hydra-Matic Transmission Model California/Federal/Federal CCFV 50 State Emission System Chassis Cab and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
FE1	109.0 in.	lb.	3,219	1,984	5,203	9,297
FE2	132.0 in.	lb.	3,263	2,006	5,269	9,231
FE3	150.0 in.	lb.	3,285	2,028	5,313	9,187
FE4	176.0 in.	lb.	3,329	2,050	5,379	9,121

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas – continued from previous page)

Vehicle Weight Limits:

GVWR		
Designed Maximum	12,000 lbs.	14,500 lbs.
GAWR, Front	4,700 lbs.	5,360 lbs.
GAWR, Rear	7,950 lbs.	9,880 lbs.

Technical Notes:

Chassis Curb Weight reflects standard equipment and fuel but no driver or payload.

Maximum Payload Weight is the allowed maximum for equipment, body, payload and driver and is calculated by subtracting chassis curb weight from the GVWR.

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas – continued on next page)

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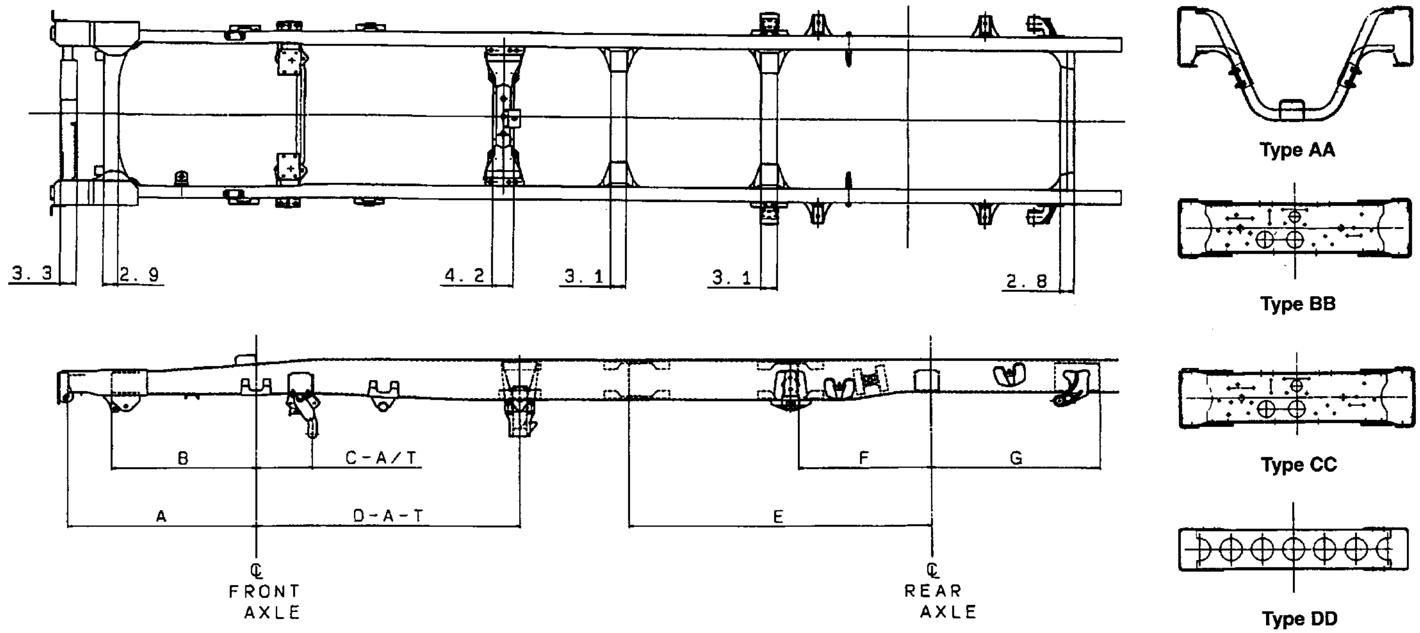
Frame and Crossmember Specifications



Wheelbase	Frame Thick	Crossmember Type/Location						
		A	B	C-A/T	D-A/T	E	F	G
109.0	0.24	37.0	28.3	10.6	AA 50.6	–	CC 25.4	DD 33.5
132.5	0.24	37.0	28.3	10.6	AA 50.6	BB 58.9	CC 25.4	DD 33.5
150.0	0.24	37.0	28.3	10.6	AA 50.6	BB 58.9	CC 25.4	DD 33.5
176.0	0.24	37.0	28.3	10.6	AA 50.6	BB 58.9	CC 25.4	DD 33.5

A/T = Automatic Transmission

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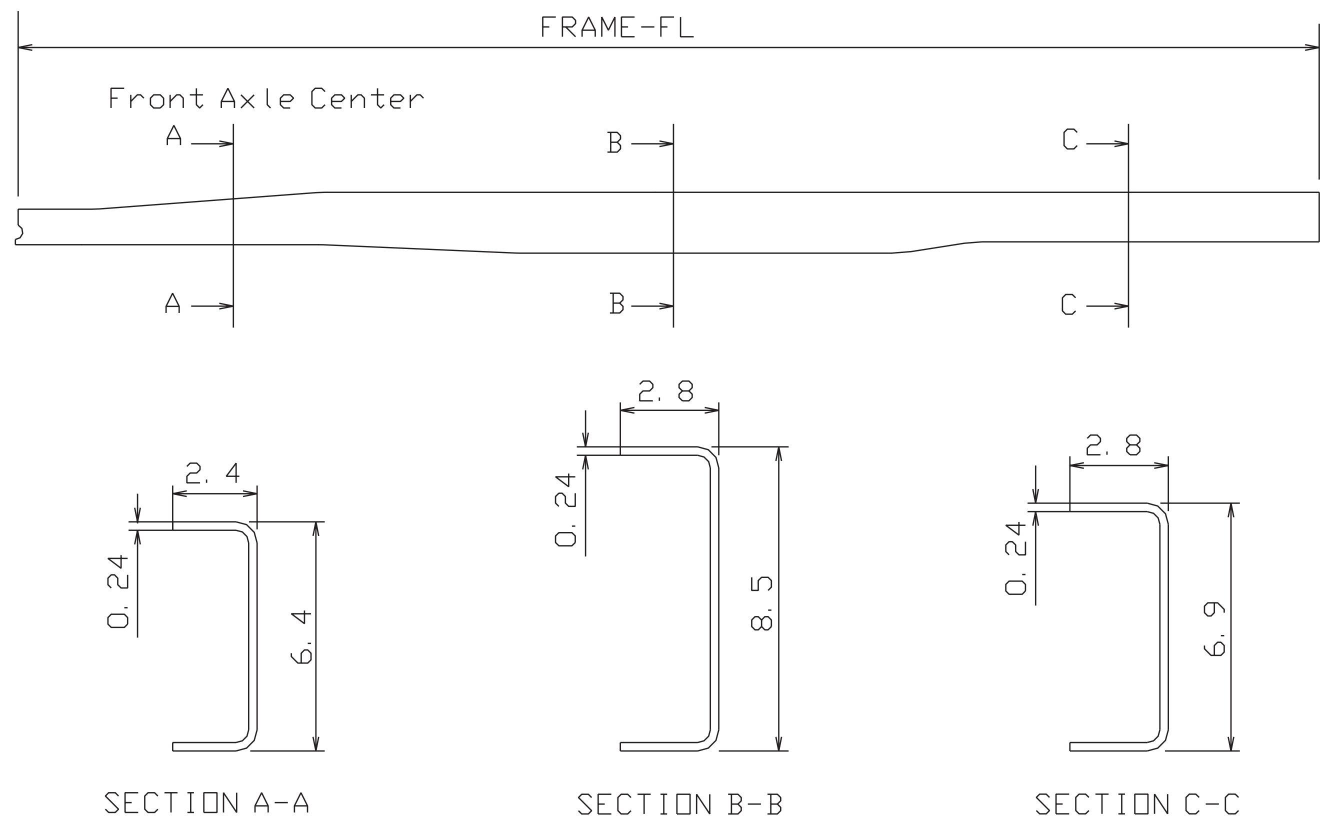
Frame Chart



Wheelbase	Frame FL	Frame Thickness
109.0	186.0	0.24
132.5	209.6	0.24
150.0	227.4	0.24
176.0	253.4	0.24

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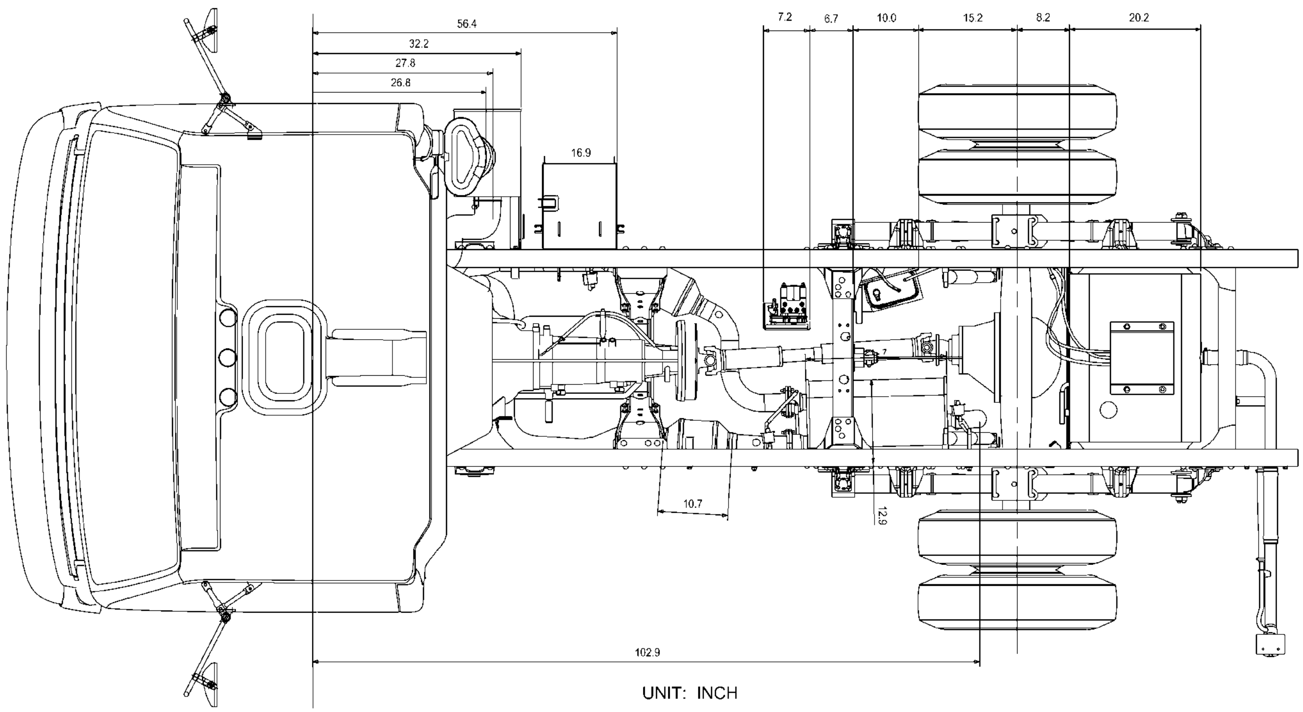
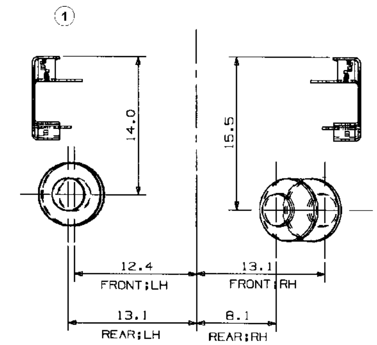
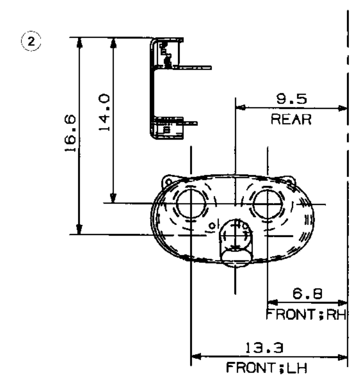
Auxiliary Views

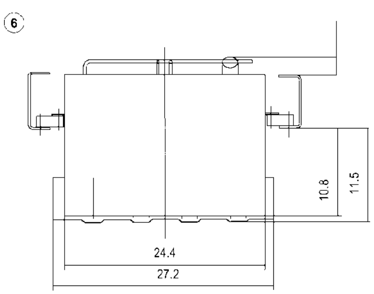




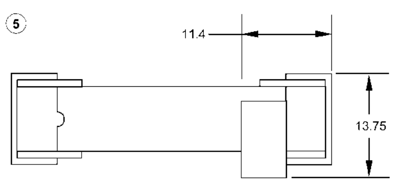
Rear View
Catalitic Converters



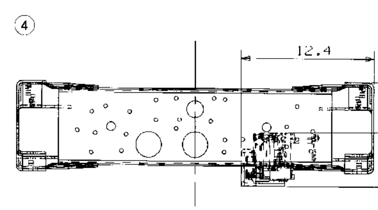
Rear View
Muffler



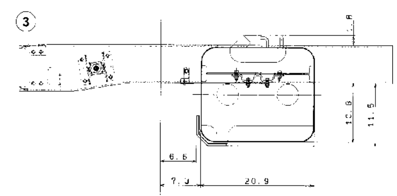
Side View
In Frame Tank



Rear View
Emission Canister



Rear View
ABS Controller



Side Veiw
In Frame Tank

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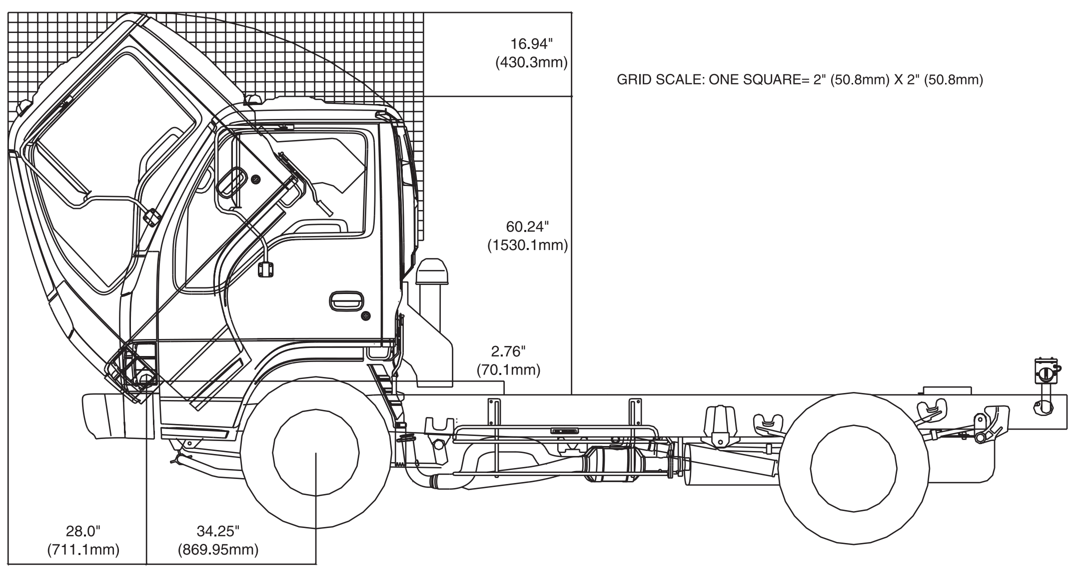
Body Builder Weight Information Chart

GVWR	Axle	Wheelbase				Unsprung Weight
		109 in.	132.5 in.	150 in.	176 in.	
		Auto. Trans.	Auto. Trans.	Auto. Trans.	Auto. Trans.	
12,000	Front	3,119	3,164	3,186	3,230	573
	Rear	1,819	1,841	1,863	1,885	871
	Total	4,938	4,961	5,049	5,115	1,444
14,500	Front	3,219	3,263	3,285	3,329	705
	Rear	1,984	2,006	2,028	2,050	1,135
	Total	5,203	5,269	5,313	5,379	1,840

Cab Tilt



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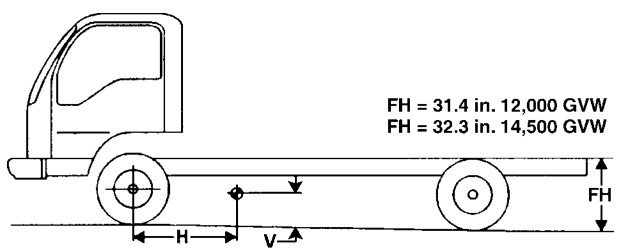
Center of Gravity

The center of gravity of the chassis cab.

GVWR	WB	V	H Auto. Trans.
12,000	109	21.7	38.8
	132.5	20.1	47.1
	150	19.7	53.5
	176	18.1	62.8
14,500	109	21.7	40.0
	132.5	20.0	48.6
	150	19.7	55.2
	176	18.1	64.7



V = Vertical Center of Gravity
H = Horizontal Center of Gravity

The center of gravity of the completed vehicle with a full load should not exceed 54 inches above ground level for the 12,000 lb. GVWR, 58 inches above ground level for the 14,500 lb. GVWR, and must be located horizontally between the centerlines of the front and rear axles.

NOTE: The maximum dimensions for a body installed on the NPR/W3500, NPR HD/W4500 are 96 inches wide (outside) by 90 inches high (inside). Any larger body applications must be approved by GM/Isuzu Application Engineering. In the West Coast call 1-562-699-0500 and in the East Coast call 1-770-475-9195, extension 353.

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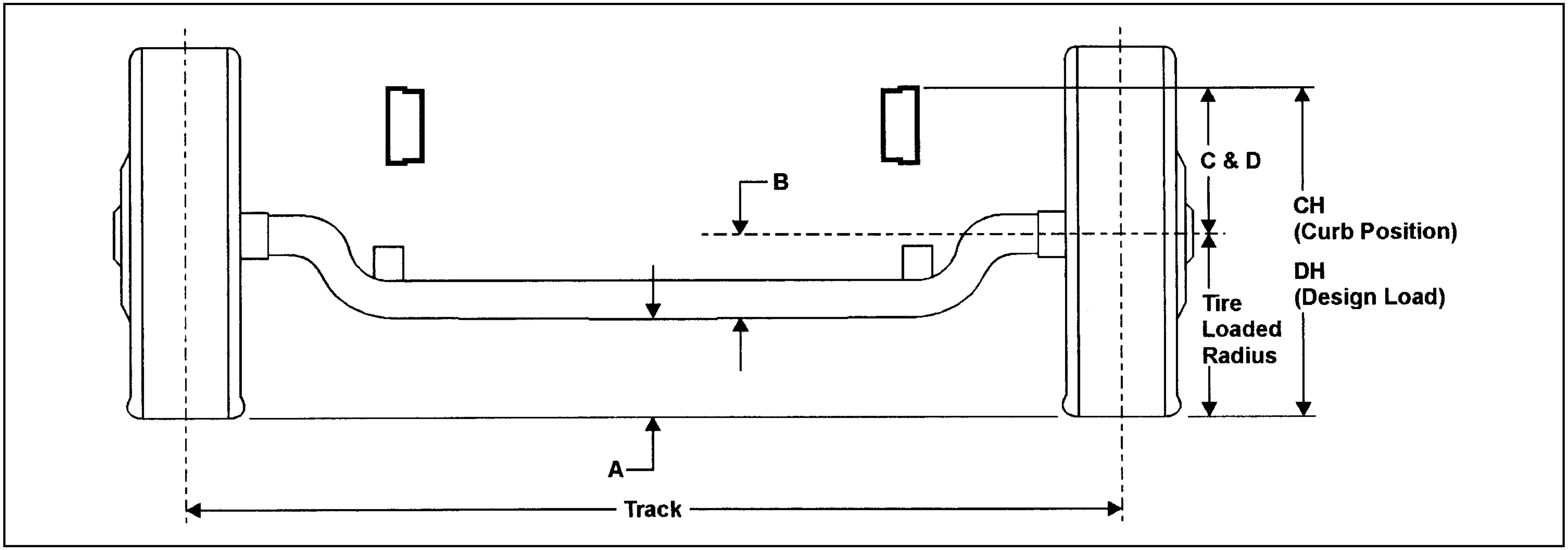
Front Axle Chart



Formulas for calculating height dimensions:

A = Tire Loaded Radius – B
C = Centerline of Axle to Top of Frame Rail at Curb Position
D = Centerline of Axle to Top of Frame Rail at Design Load
CH = C + Tire Unloaded Radius
DH = D + Tire Loaded Radius

Tire	GVWR	GAWR	A	B	C	D	CH	DH	Track	Tire Radius	
										Unload	Load
215/85R 16-E	12,000 lbs.	4,700 lbs.	8.1	6.4	13.0	12.4	27.5	26.9	66.2	14.5	14.5
225/70R 19.5	14,500 lbs.	5,360 lbs.	8.1	6.4	13.0	12.2	28.3	27.6	66.2	15.2	15.2

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas – continued on next page)

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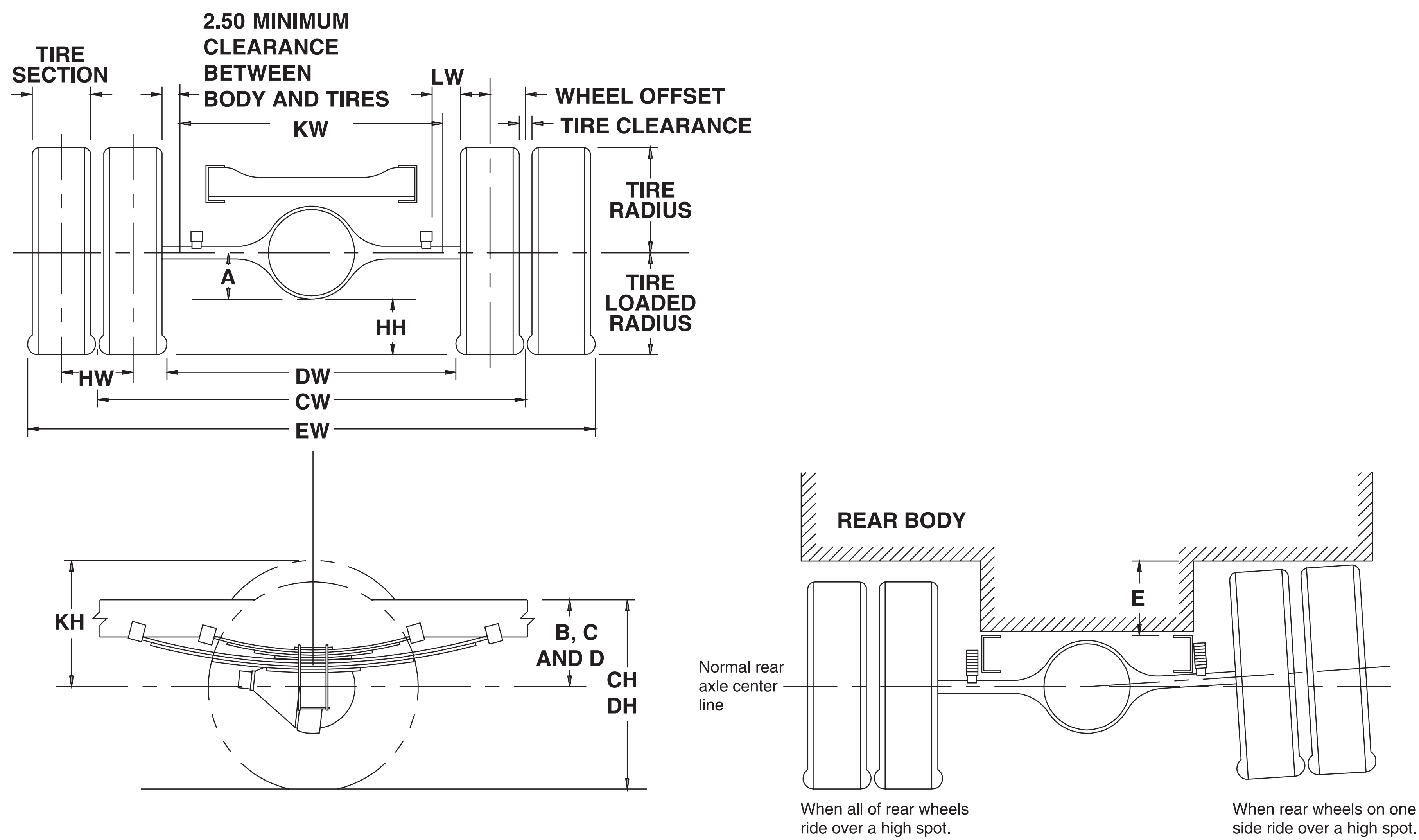
Rear Axle Chart



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(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas – continued from previous page)

Definitions			
A	Centerline of axle to bottom of axle bowl.	DW	Minimum distance between the inner surfaces of the rear tires.
B	Centerline of axle to top of frame rail at metal-to-metal position.	EW	Maximum Rear Width: Overall width of the vehicle measured at the outermost surface of the rear tires.
C	Centerline of axle to top of frame rail at curb position.		
D	Centerline of axle to top of frame rail at design load.	HH	Rear Tire Clearance: Minimum clearance between the rear axle and the ground-line.
E	Rear Tire Clearance: Minimum clearance required for tires and chain measured from the top of the frame at the vertical centerline of the rear axle, when rear wheels on one side ride over a high spot.	HW	Dual Tire Spacing: Distance between the centerlines of the tires in a set of dual tires.
CH	Rear Frame Height: Vertical distance between the normal top of frame rail and the ground-line through the centerline of the rear axle at curb position.	KH	Tire Bounce Clearance: Minimum distance required for tire bounce as measured from the centerline of the rear axle and the top of the rear tire when one wheel rides over a high spot.
DH	Rear Frame Height: Vertical distance between the normal top of frame rail and the ground-line through the centerline of the rear axle at design load.	CW	Track Dual Rear Wheel Vehicles: Distance between the centerlines of the dual wheels measured at the ground-line.
	Tire Section, Tire Radius, Tire Loaded Radius, Tire Clearance		See Tire Chart for Values

Formulas for Calculating Rear Width and Height Dimensions			
CW	= Track	HH	= Tire loaded radius – A
CH	= Tire loaded radius + C	JH	= KH – B
DH	= Tire loaded radius + D	KH	= Tire radius + 3.00 inches
DW	= Track + 2 tire sections – tire clearance	KW	= DW – 5.00 inches
EW	= Track + 2 tire sections + tire clearance	LW	= 1.00-inch minimum clearance between tires and springs

NOTE: Track and overall width may vary with optional equipment.

Tire	GAWR	Track CW	A	B	C	D	E
215/85R 16-E	7,950/8,760 lbs.	65.0	6.5	9.0	15.3	13.1	7.8
225/70R 19.5-F	9,880 lbs.	65.0	6.5	9.0	15.4	12.9	8.4

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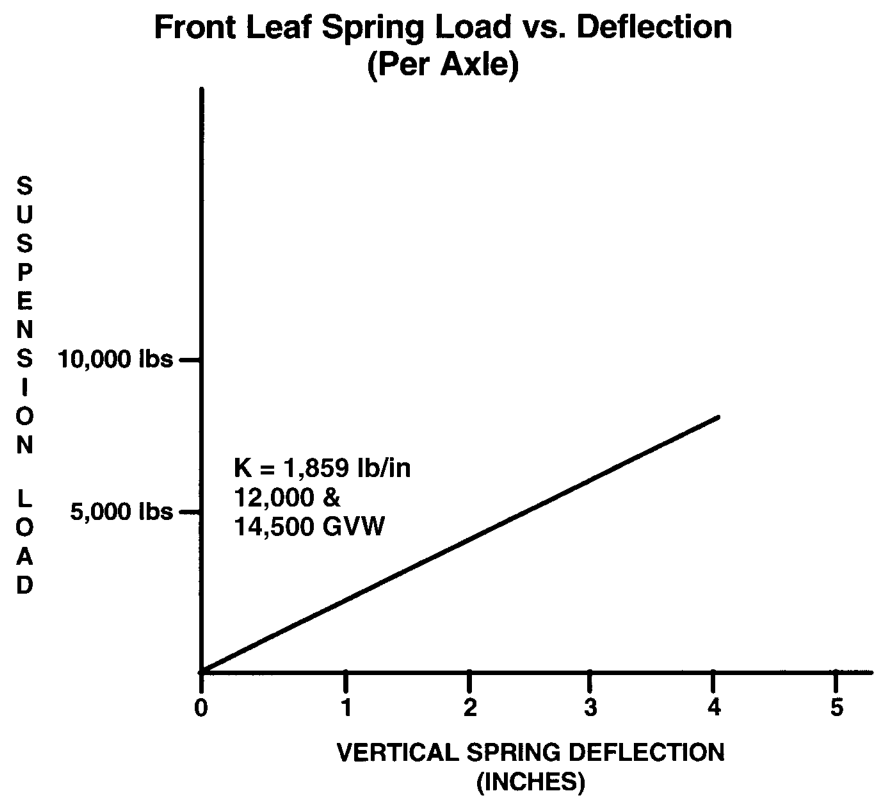
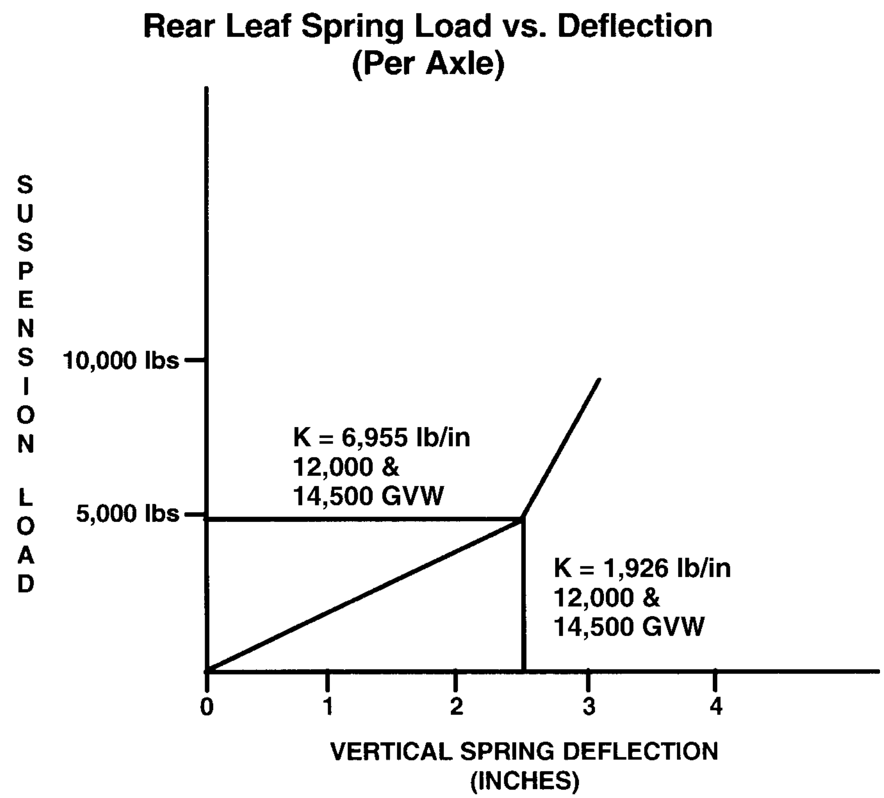
Suspension Deflection Charts – NPR/W3500 Gas, NPR HD/W4500 Gas





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Tire and Disc Wheel Chart – NPR/W3500

Tire

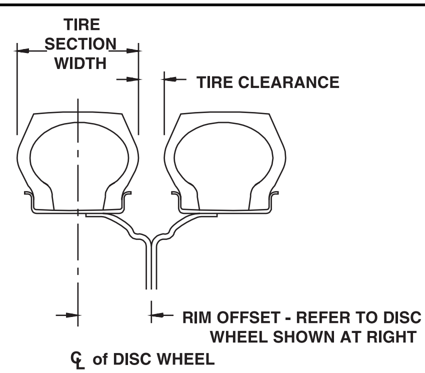
Tire Size	Tire Load Limit and Cold Inflation Pressures				Maximum Tire Load Limits		GVWR (Lb.)
	Single		Dual		Front	Rear	
	Lb.	PSI	Lb.	PSI	2 Single	4 Dual	
215/85R 16-E	2,430	70	2,210	70	4,860	8,840	12,000

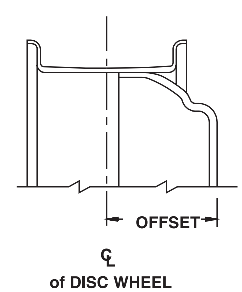
Tire Size	GVWR (Lb.)	Tire Radius				Tire Section Width	Tire Clearance	Design Rim Width
		Loaded		Unloaded				
		Front	Rear	Front	Rear			
215/85R 16-E	12,000	14.05	14.05	15.21	15.21	8.54	1.46	6.0

Disc Wheel

Wheel Size	Bolt Holes	Bolt Circle Dia.	Ft./Rr. Nut Size*	Rear Stud Size*	Nut/Stud Torque Specs.	Inner Circle	Outside Offset	Disc Thickness	Rim Type	Material Mfg.
16 x 6 K	6 JIS	8.75	1.6142 (41 mm) BUD HEX	0.8268 (21 mm) SQUARE	325 ft.-lb. (440 N•m)	6.46	5.0	0.35	5º DC	Steel TOPY

* O.D. Wrench Sizes





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Tire and Disc Wheel Chart – NPR HD/W4500

Tire

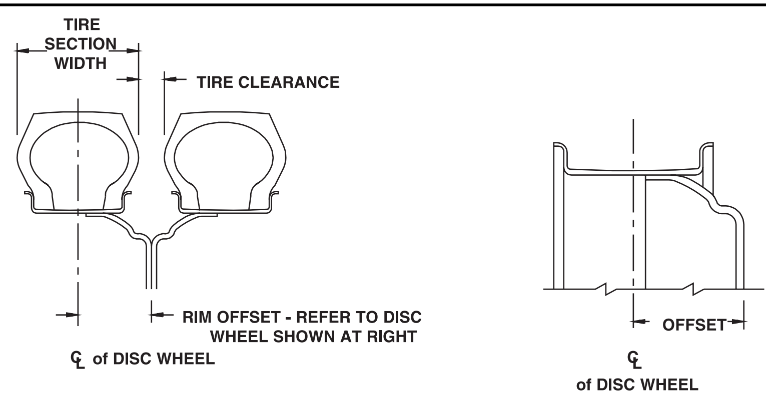
Tire Size	Tire Load Limit and Cold Inflation Pressures				Maximum Tire Load Limits		GVWR (Lb.)
	Single		Dual		Front	Rear	
	Lb.	PSI	Lb.	PSI	2 Single	4 Dual	
225/70R 19.5-F	3,315	85	3,115	85	6,630	12,460	14,500

Tire Size	GVWR (Lb.)	Tire Radius				Tire Section Width	Tire Clearance	Design Rim Width
		Loaded		Unloaded				
		Front	Rear	Front	Rear			
225/70R 19.5-F	14,500	15.24	15.28	16.10	16.10	8.9	1.1	6.0

Disc Wheel

Wheel Size	Bolt Holes	Bolt Circle Dia.	Ft./Rr. Nut Size*	Rear Stud Size*	Nut/Stud Torque Specs.	Inner Circle	Outside Offset	Disc Thickness	Rim Type	Material Mfg.
19.5 x 6.00 RW	6 JIS	8.75	1.6142 (41 mm) BUD HEX	0.8268 (21 mm) SQUARE	325 ft.-lb. (440 N•m)	6.46	5.0	0.37	15º DC	Steel ACCURIDE

* O.D. Wrench Sizes



(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas – continued on next page)

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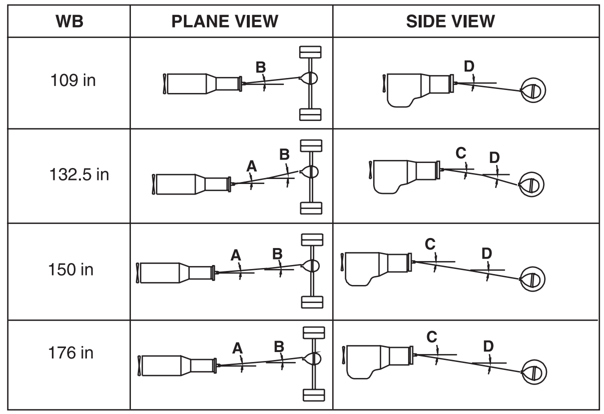
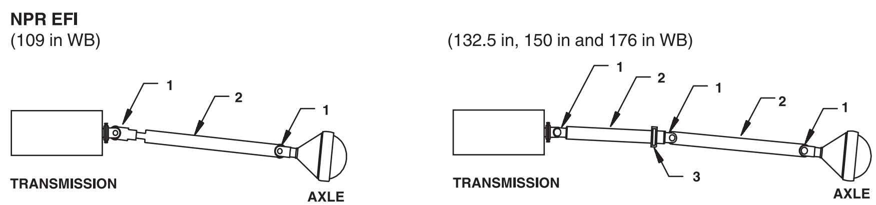
Propeller Shaft



TYPICAL INSTALLATIONS SHOWING YOKES "IN PHASE." "IN PHASE" MEANS THAT THE YOKES AT EITHER END OF A GIVEN PROPELLER SHAFT ASSEMBLY ARE IN THE SAME PLANE.



1. UNIVERSAL JOINT
2. PROPELLER SHAFT
3. CENTER CARRIER BEARING

Wheelbase	Plane View		Side View	
	A Auto. Trans.	B Auto. Trans.	C Auto. Trans.	D Auto. Trans.
109 in.	–	3.5°	–	6.4°
132.5 in.	2.1°	0°	1.5°	2.4°
150 in.	0°	2.7°	0.7°	5.3°
176 in.	0°	1.8°	4.0°	6.0°

NOTE: All driveline angles are at unloaded condition (curb position with typical cargo body).

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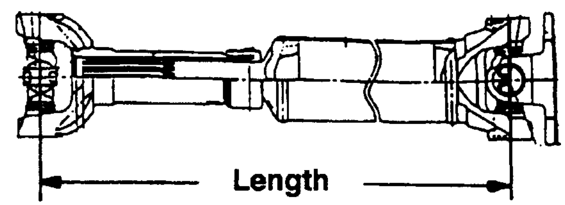
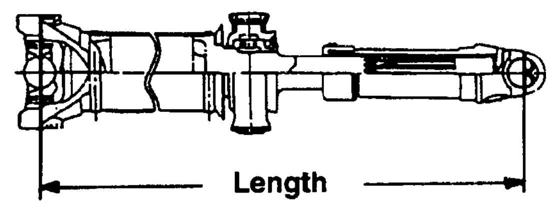
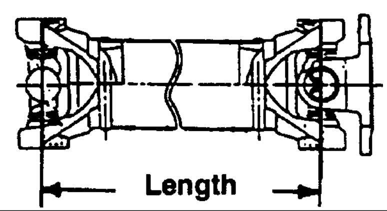
Wheelbase	109	132.5	150	176
No. of Shafts	1	2	2	2
Trans. Type	Automatic Transmission	Automatic Transmission	Automatic Transmission	Automatic Transmission
Shaft #1 O.D.	3.0			
Thickness	0.083			
Length	34.05	24.10	41.85	52.1
Type	A	B	B	B
Shaft #2 O.D.	3.0			3.5
Thickness	0.083			
Length	N/A	33.46	33.46	49.2
Type	N/A	C	C	C

Type	Description	Illustration
Type **A**	1st shaft in 1-piece driveline	
Type **B**	1st shaft in 2-piece driveline	
Type **C**	2nd shaft in 2-piece driveline	

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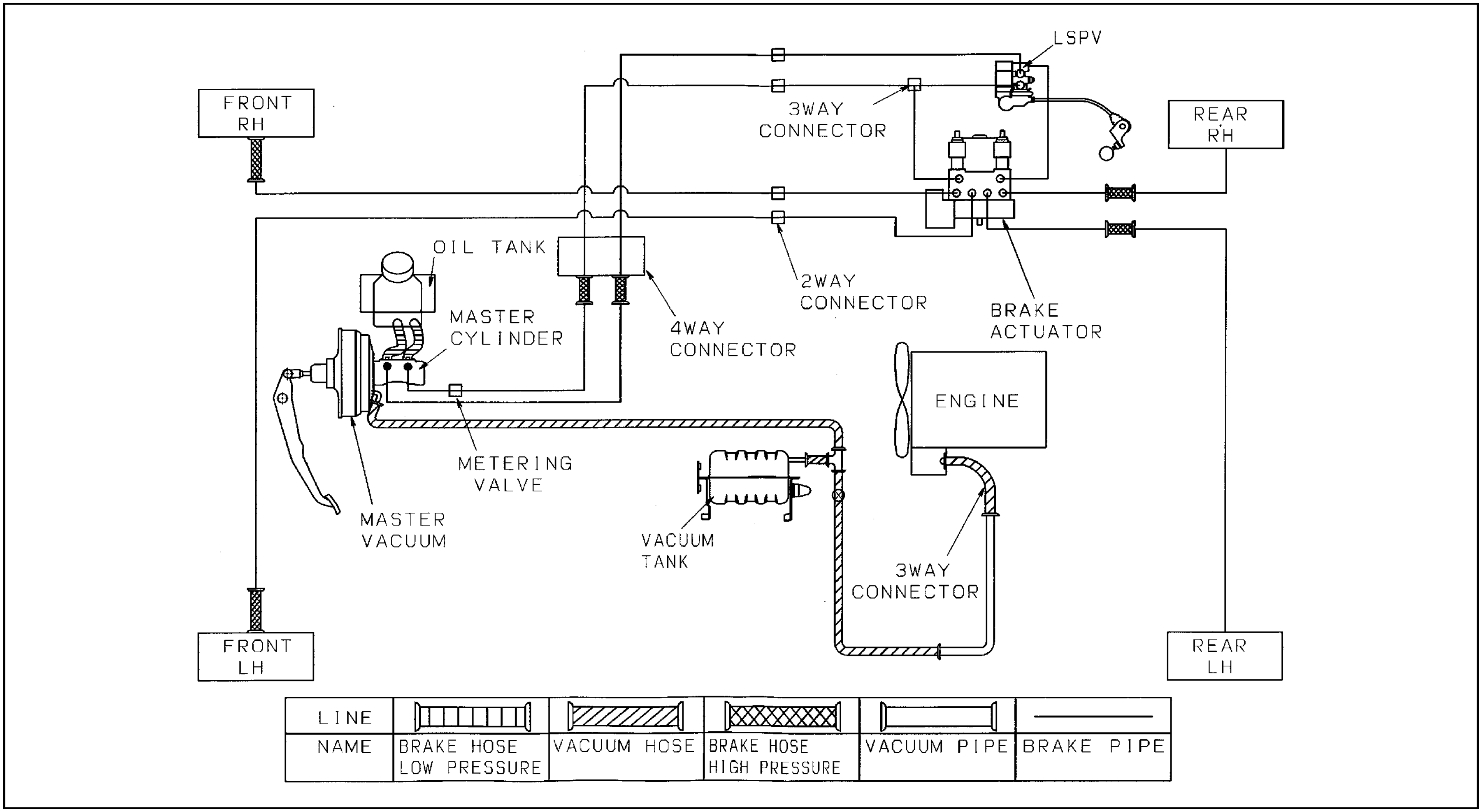
Brake System Diagram, 12,000 GVW

Vacuum Over Hydraulic

Please refer to Introduction Section of book for antilock system cautions and wheelbase modification requirements.



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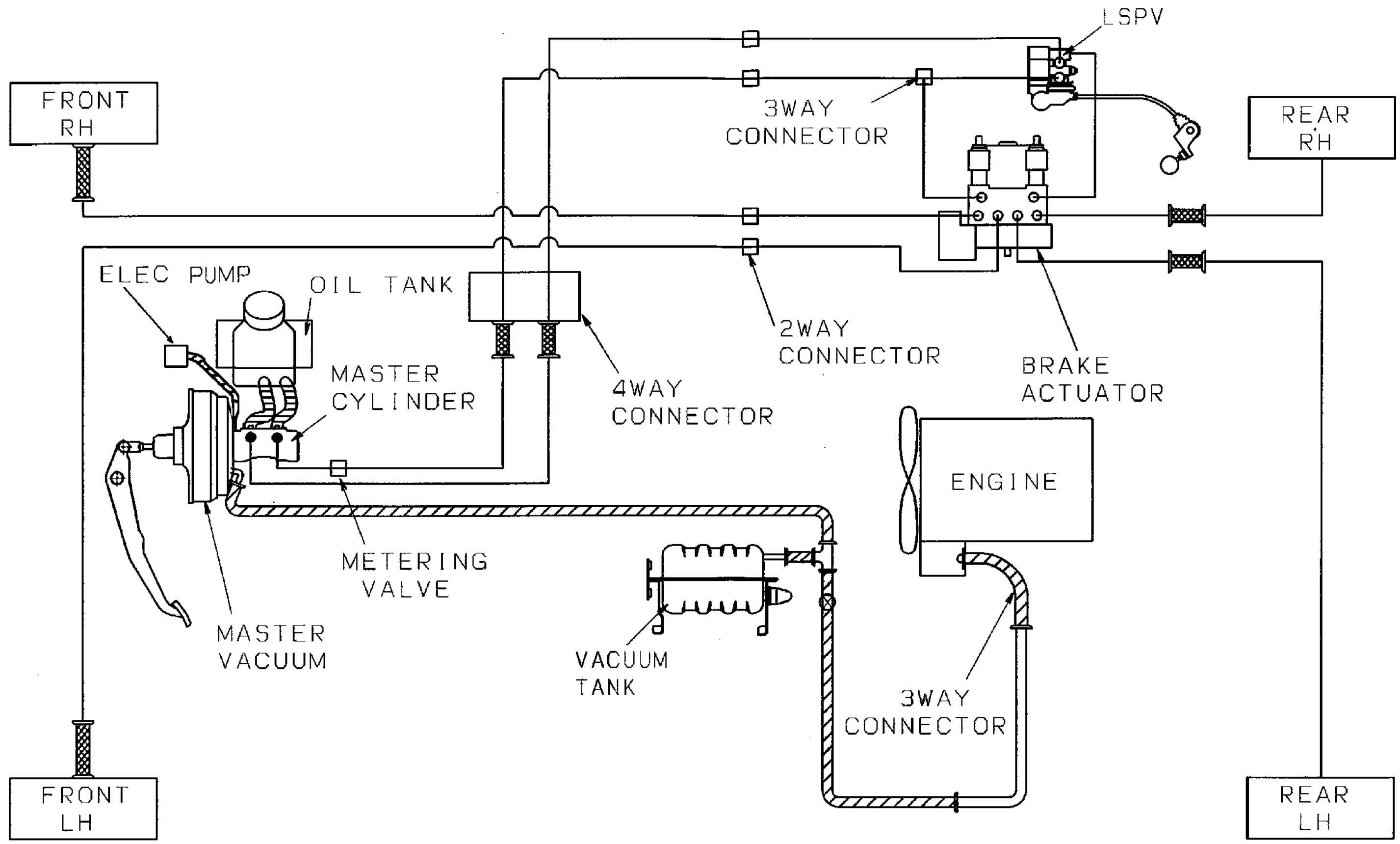
(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas – continued from previous page)

Brake System Diagram, 14,500 GVW

Vacuum Over Hydraulic

Please refer to Introduction Section of book for antilock system cautions and wheelbase modification requirements.



LINE					
NAME	BRAKE HOSE LOW PRESSURE	VACUUM HOSE	BRAKE HOSE HIGH PRESSURE	VACUUM PIPE	BRAKE PIPE

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas – continued on next page)

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Through the Rail Fuel Fill

Installation Instructions

1. Disconnect battery.
2. Loosen hose from the tie downs.
3. Remove shipping plate from chassis.
4. Extend hose out from the driver's side of the rail to body rail.
5. The filler neck must be mounted to allow the fill plate bracket to be parallel to the frame horizontal (see figure 1).
6. Filler hose is set for 96 inches outside width body.
7. Filler neck (Dimension A) must be between 6.85 inches and 8.5 inches above frame.
8. Secure the filler plate to the bottom of the body and check for leaks.
9. Ensure that fill hose does not sag, creating an area where the fuel could pool in the fill hose.
10. Reconnect battery.

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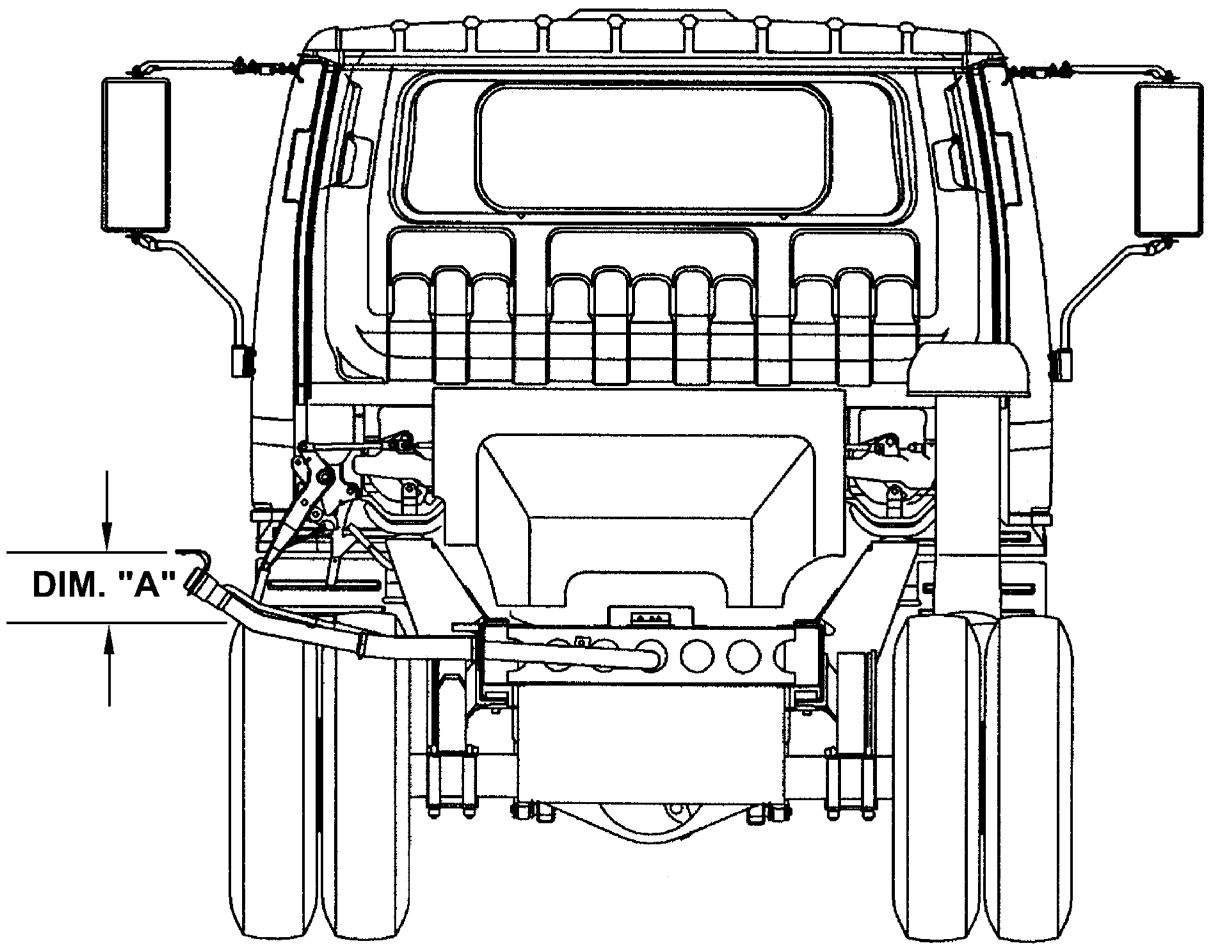
Rear View Fuel Fill



Dimension A = 6.85-8.5 inches (174-216 mm)

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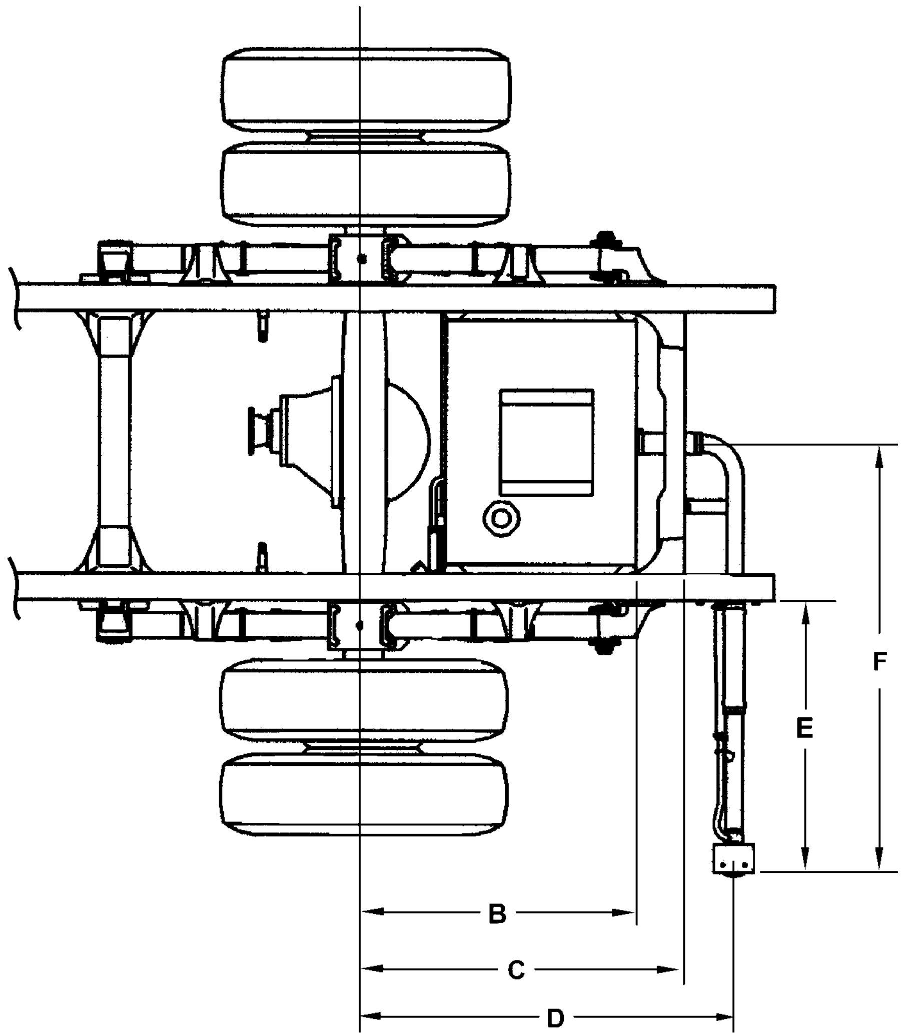
Top View Fuel Fill



Dimensions:
B = 28.85 inches (733 mm)
C = 34.00 inches (863 mm)
D = 39.29 inches (998 mm)
E = 46.61 inches (1,184 mm)
F = 48.00 inches (1,219 mm)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas – continued on next page)

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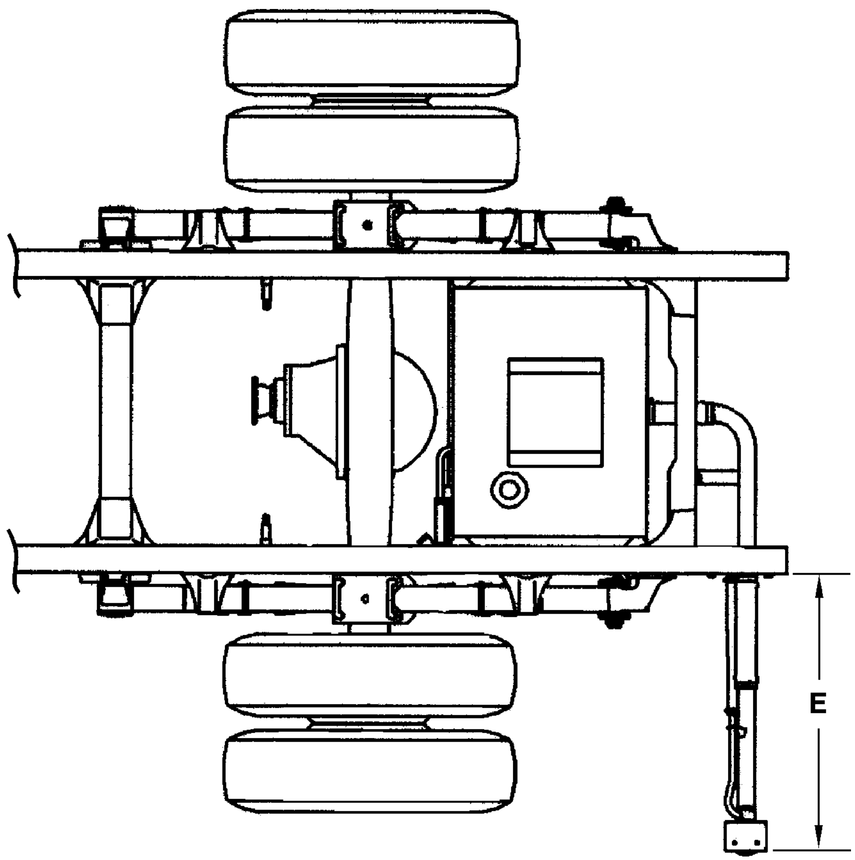
Top View



Body Width Adjustment:
90-inch Body Dim E = 682.8 mm
86-inch Body Dim E = 632.0 mm
80-inch Body Dim E = 555.8 mm

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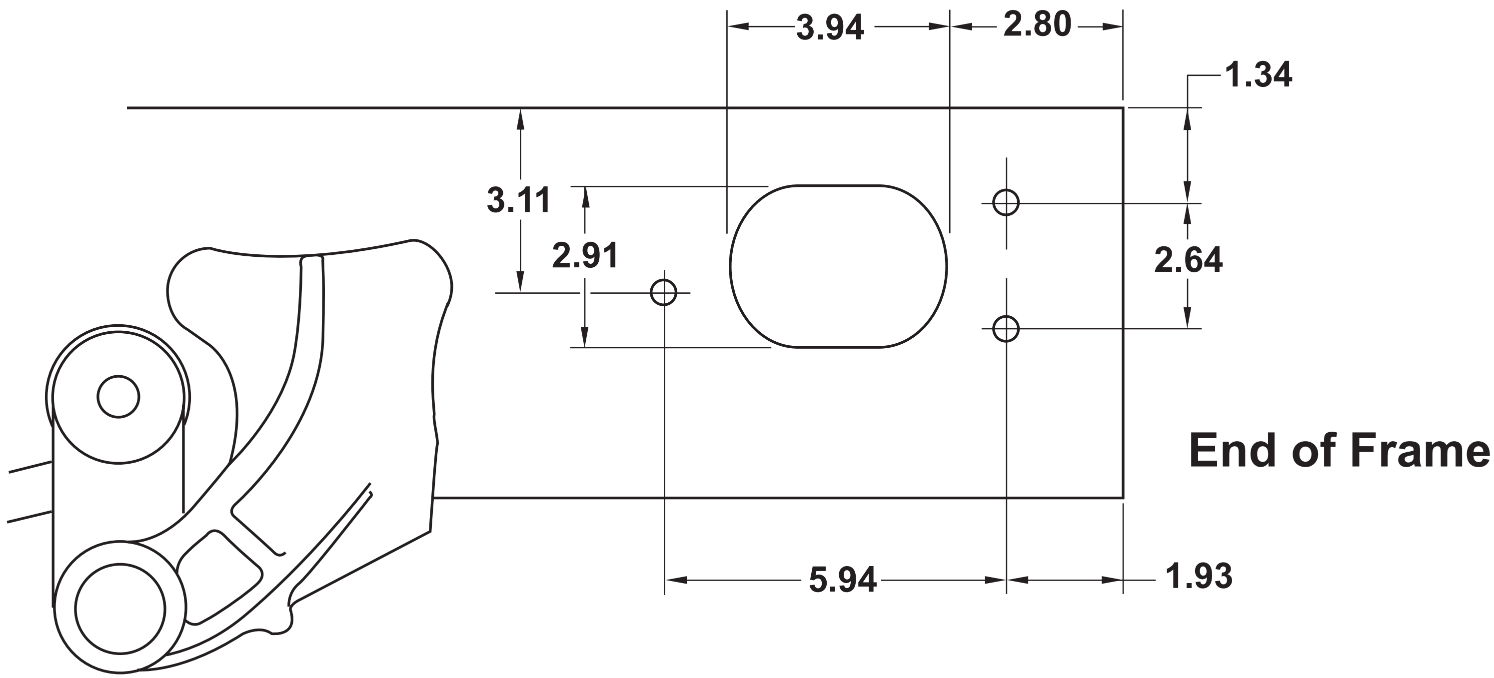
Through the Rail Fuel Fill Frame Hole



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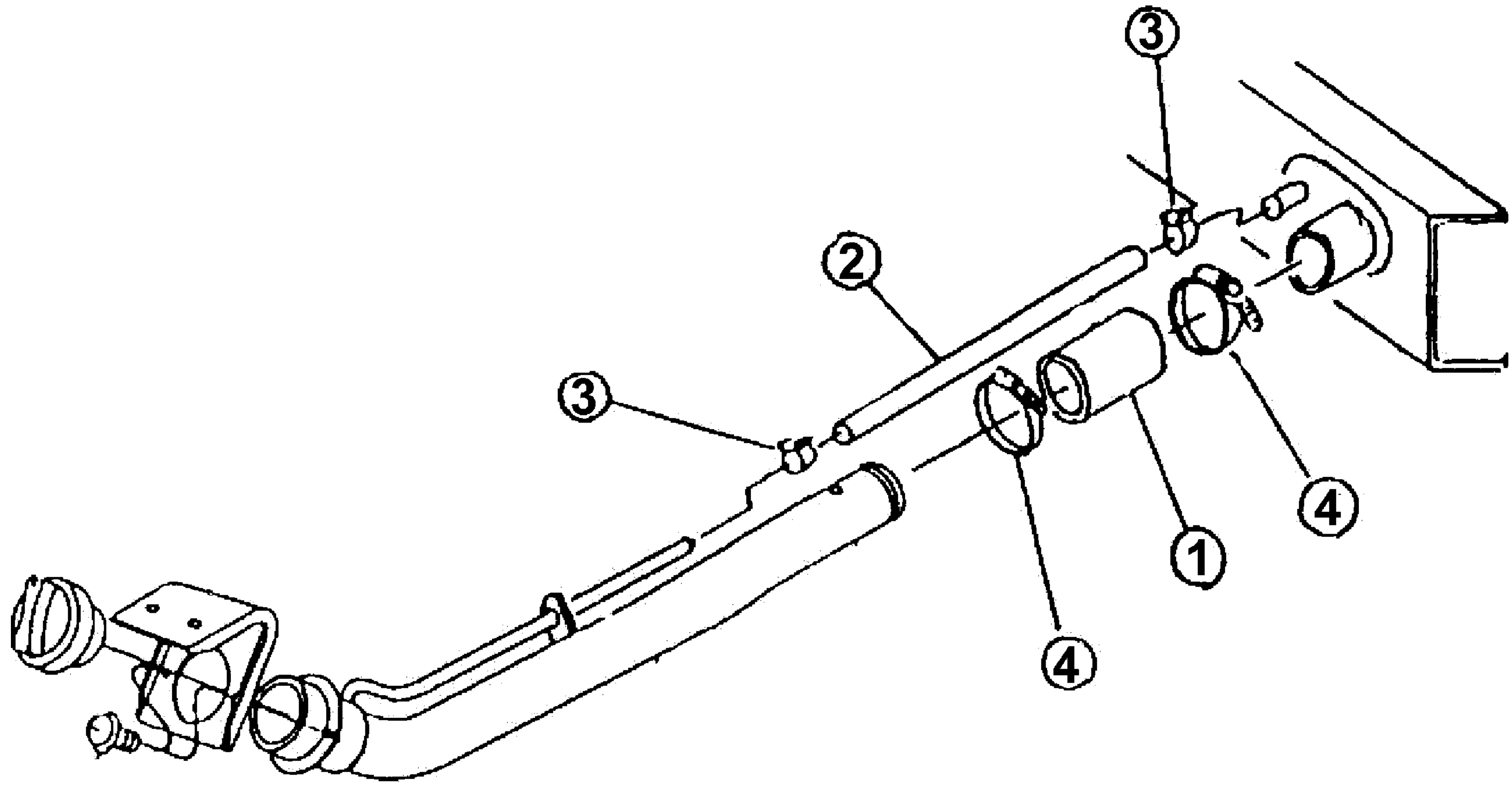
Fuel Fill Parts Illustration



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Fuel Fill Parts List

Number	Description	Part Number – Isuzu	Part Number – GM	Quantity
		FEDERAL PARTS		
1	Hose, Fuel Filler	897213-6540	897213-6540	1
2	Hose, Breather	897214-2710	897214-2710	1
3	Clip, Rubber Hose	897177-5810	897177-5810	2
4	Clip, Filler Hose	802465-8140	802465-8140	2
		CALIFORNIA PARTS		
1	Hose, Fuel Filler	897213-6540	897213-6540	1
2	Hose, Breather	897229-9180	897229-9180	1
3	Clip, Rubber Hose	815699-8250	815699-8250	2
4	Clip, Filler Hose	802465-8140	802465-8140	2

NPR/W3500, NPR HD/W4500 Diesel

Specifications

Model	NPR/W3500 Diesel	NPR HD/W4500 Diesel
GVWR	12,000 lbs.	14,500 lbs.
WB	109 in., 132.5 in., 150 in., 176 in.	
Engine	Isuzu 4-cylinder, in-line 4-cycle, turbocharged, intercooled, direct injection diesel	
Model/Displacement	4HK1-TC/190 CID (5.19 liters)	
HP (Gross)	190 HP @ 2,600 RPM	
Torque (Gross)	387 lbs.-ft. torque @ 1,500 RPM	
Equipment	Dry element air cleaner with vertical intake; 2 rows 569 in.^{2} radiator; 7-blade 20.1 in. diameter fan with viscous drive. Cold weather starting device and an oil cooler. Engine oil level check switch and light. Engine cruise control and idle up function.	
Clutch	Single, dry plate, 11.8 in. dia., actuated by self-adjusting hydraulic master/slave cylinder.	
Transmission*	MZZ 6-speed manual, all forward gears synchronized. Sixth gear is overdirect. Available Optional Transmission: Aisin 450-43 LE 4-speed overdrive automatic transmission with lock-up capability in 2nd, 3rd and 4th and PTO capability.	
Steering	Integral power steering 18.8-20.9:1 ratio. Tilt and telescoping steering column.	
Front Axle	Reverse Elliot "I"-Beam rated at 6,380 lbs.	
Suspension	Semi-elliptical steel alloy tapered leaf springs with stabilizer bar and shock absorbers.	
GAWR	4,700 lbs.	5,360 lbs.
Rear Axle	Full-floating single speed with hypoid gearing rated at 11,020 lbs.	
Suspension	Semi-elliptical steel alloy multi-leaf springs and shock absorbers.	
GAWR	7,950 lbs.	9,880 lbs.
Wheels	16 x 6.0-K 6-hole disc wheels, painted white.	
Tires	215/85R 16-E (10 pr) tubeless steel-belted radials, all-season front and rear.	
Brakes	Dual-circuit, vacuum-assisted hydraulic service brakes with load-sensing proportioning valve in rear brake circuit and a metering valve between the master cylinder and 6-way joint on the front brake lines. Disc front and self-adjusting outboard mounted drum rear. The parking brake is a mechanical, cable-actuated, internal expanding drum type, transmission mounted. The exhaust brake is standard and is vacuum-operated. Four channel antilock brake system	

NOTE: These selected specifications are subject to change without notice. *All Transmissions have a PTO gear in all wheelbases.

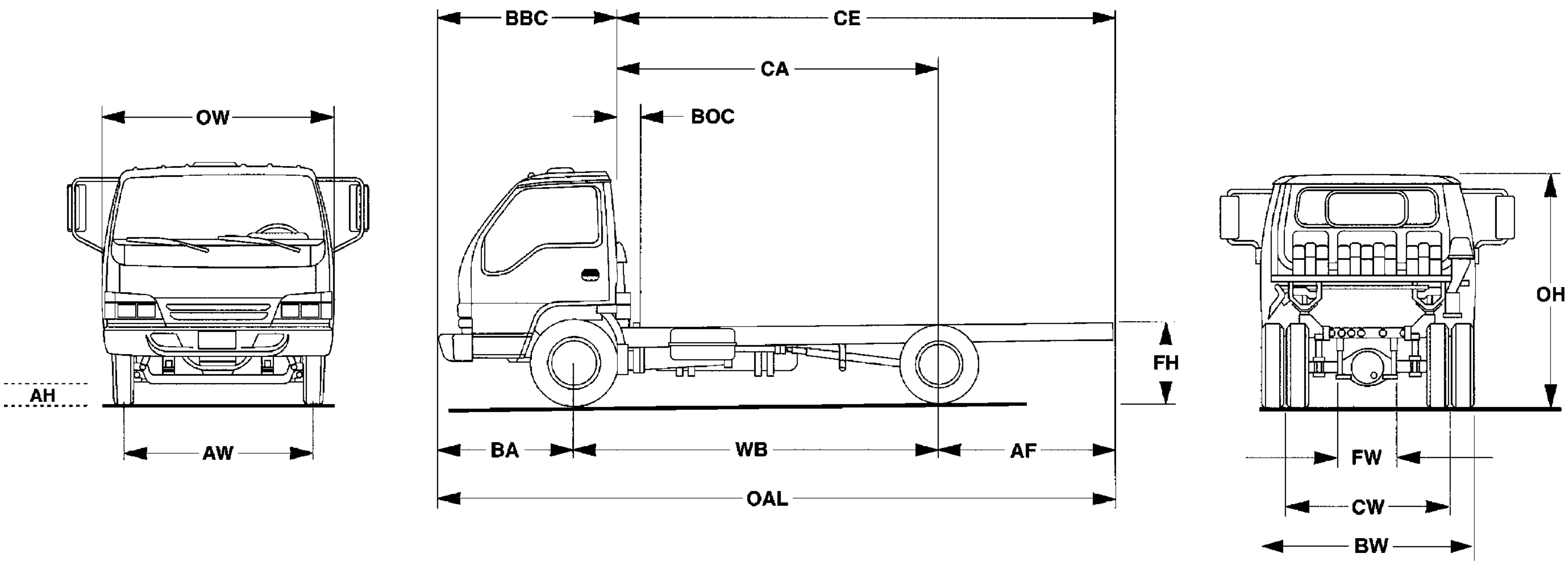
(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Diesel – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Diesel – continued from previous page)

Model	NPR/W3500 Diesel	NPR HD/W4500 Diesel
Fuel Tank	30-gallon rectangular steel fuel tank mounted in frame rail behind rear axle. Heated fuel/water separator mounted on rail with dash mounted indicator light.	
Frame	Ladder type channel section straight frame rail 33.5 in. wide through the total length of the frame. Yield strength 44,000 psi section modulus 7.20 in.^{3}, RBM 316,800 lbs.-ft./in. per rail.	
Cab	All-steel, low cab forward, BBC 68.0 in., 45° mechanical tilt with torsion assist.	
Equipment	Jersey knit covered high back driver's seat with two-occupant passenger seat. Two-way roof ventilator, dual cab mounted exterior mirrors. Tilt and telescoping steering column. Tinted glass.	
Electrical	12-volt, negative ground, dual Delco maintenance free batteries, 750 CCA each, 110-amp alternator with integral regulator.	
Options	Air conditioning; AM/FM CD stereo radio, engine block heater; engine oil pan heater; fuel tank mounted on right hand rail (33 gallon); spare wheel; 6" stainless steel convex mirrors. Power windows and door locks, wheel simulators, engine shutdown system, engine shutdown system with hourmeter, auxilary transmission oil cooler.	

NOTE: These selected specifications are subject to change without notice.

Vehicle Weights, Dimensions and Ratings



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Variable Chassis Dimensions					
Unit	**WB**	**CA***	**CE***	**OAL**	**AF**
Inch	109.0	88.4	131.5	199.5	43.1
Inch	132.5	111.9	155.0	223.0	43.1
Inch	150.0	129.4	172.5	240.5	43.1
Inch	176.0	155.4	198.5	266.3	43.1

* Effective CA & CE are CA or CE less BOC.

Dimension Constants					
Code	**Inches**	**Code**	**Inches**	**Code**	**Inches**
AH	7.9	BW	83.3	FH	32.0
AW	65.6	CW	65.0		
BA	47.4	FW	33.5		
BBC	68.0	OH	87.4		
BOC	9.25	OW	78.5		

In-Frame Tank 12,000-lb. GVWR Manual Transmission Model Chassis Cab and Maximum Payload Weights						
Model	**WB**	**Unit**	**Front**	**Rear**	**Total**	**Payload**
NA1	109.0 in.	lb.	3,451	1,918	5,369	6,631
NA2	132.5 in.	lb.	3,495	1,940	5,435	6,565
NA3	150.0 in.	lb.	3,539	1,973	5,512	6,488
NA4	176.0 in.	lb.	3,583	1,995	5,578	6,422

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(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Diesel – continued from previous page)

In-Frame Tank 14,500-lb. GVWR Manual Transmission Model Chassis Cab and Maximum Payload Weights						
Model	**WB**	**Unit**	**Front**	**Rear**	**Total**	**Payload**
NE1	109.0 in.	lb.	3,462	1,918	5,380	9,120
NE2	132.5 in.	lb.	3,506	1,940	5,446	9,054
NE3	150.0 in.	lb.	3,550	1,973	5,523	8,977
NE4	176.0 in.	lb.	3,594	1,995	5,589	8,911

In-Frame Tank 12,000-lb. GVWR Automatic Transmission Model Chassis Cab and Maximum Payload Weights						
Model	**WB**	**Unit**	**Front**	**Rear**	**Total**	**Payload**
NB1	109.0 in.	lb.	3,484	1,907	5,391	6,609
NB2	132.5 in.	lb.	3,528	1,929	5,457	6,543
NB3	150.0 in.	lb.	3,572	1,962	5,534	6,466
NB4	176.0 in.	lb.	3,616	1,984	5,600	6,400

In-Frame Tank 14,500-lb. GVWR Automatic Transmission Model Chassis Cab and Maximum Payload Weights						
Model	**WB**	**Unit**	**Front**	**Rear**	**Total**	**Payload**
NF1	109.0 in.	lb.	3,495	1,907	5,402	9,098
NF2	132.5 in.	lb.	3,539	1,929	5,468	9,032
NF3	150.0 in.	lb.	3,583	1,962	5,545	8,955
NF4	176.0 in.	lb.	3,627	1,984	5,611	8,889

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Diesel – continued on next page)

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Side-Mounted Tank 12,000-lb. GVWR Manual Transmission Model Chassis Cab and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NA1	109.0 in.	lb.	3,638	1,653	5,291	6,709
NA2	132.5 in.	lb.	3,682	1,675	5,357	6,643
NA3	150.0 in.	lb.	3,726	1,708	5,434	6,566
NA4	176.0 in.	lb.	3,770	1,730	5,500	6,500

Side-Mounted Tank 14,500-lb. GVWR Manual Transmission Model Chassis Cab and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NE1	109.0 in.	lb.	3,649	1,653	5,302	9,198
NE2	132.5 in.	lb.	3,693	1,675	5,368	9,132
NE3	150.0 in.	lb.	3,737	1,708	5,445	9,055
NE4	176.0 in.	lb.	3,781	1,730	5,511	8,989

Side-Mounted Tank 12,000-lb. GVWR Automatic Transmission Model Chassis Cab and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NB1	109.0 in.	lb.	3,671	1,642	5,313	6,687
NB2	132.5 in.	lb.	3,715	1,665	5,380	6,620
NB3	150.0 in.	lb.	3,759	1,698	5,457	6,543
NB4	176.0 in.	lb.	3,803	1,720	5,523	6,477

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Side-Mounted Tank 14,500-lb. GVWR Automatic Transmission Model Chassis Cab and Maximum Payload Weights						
Model	**WB**	**Unit**	**Front**	**Rear**	**Total**	**Payload**
NF1	109.0 in.	lb.	3,682	1,642	5,324	9,176
NF2	132.5 in.	lb.	3,726	1,665	5,391	9,109
NF3	150.0 in.	lb.	3,770	1,698	5,468	9,032
NF4	176.0 in.	lb.	3,814	1,720	5,534	8,966

Vehicle Weight Limits:

GVWR		
Designed Maximum	12,000 lbs.	14,500 lbs.
GAWR, Front	4,700 lbs.	5,360 lbs.
GAWR, Rear	7,950 lbs.	9,880 lbs.

Technical Notes:

Chassis Curb Weight reflects standard equipment and fuel but no driver or payload.

Maximum Payload Weight is the allowed maximum for equipment, body, payload and driver and is calculated by subtracting chassis curb weight from the GVWR.

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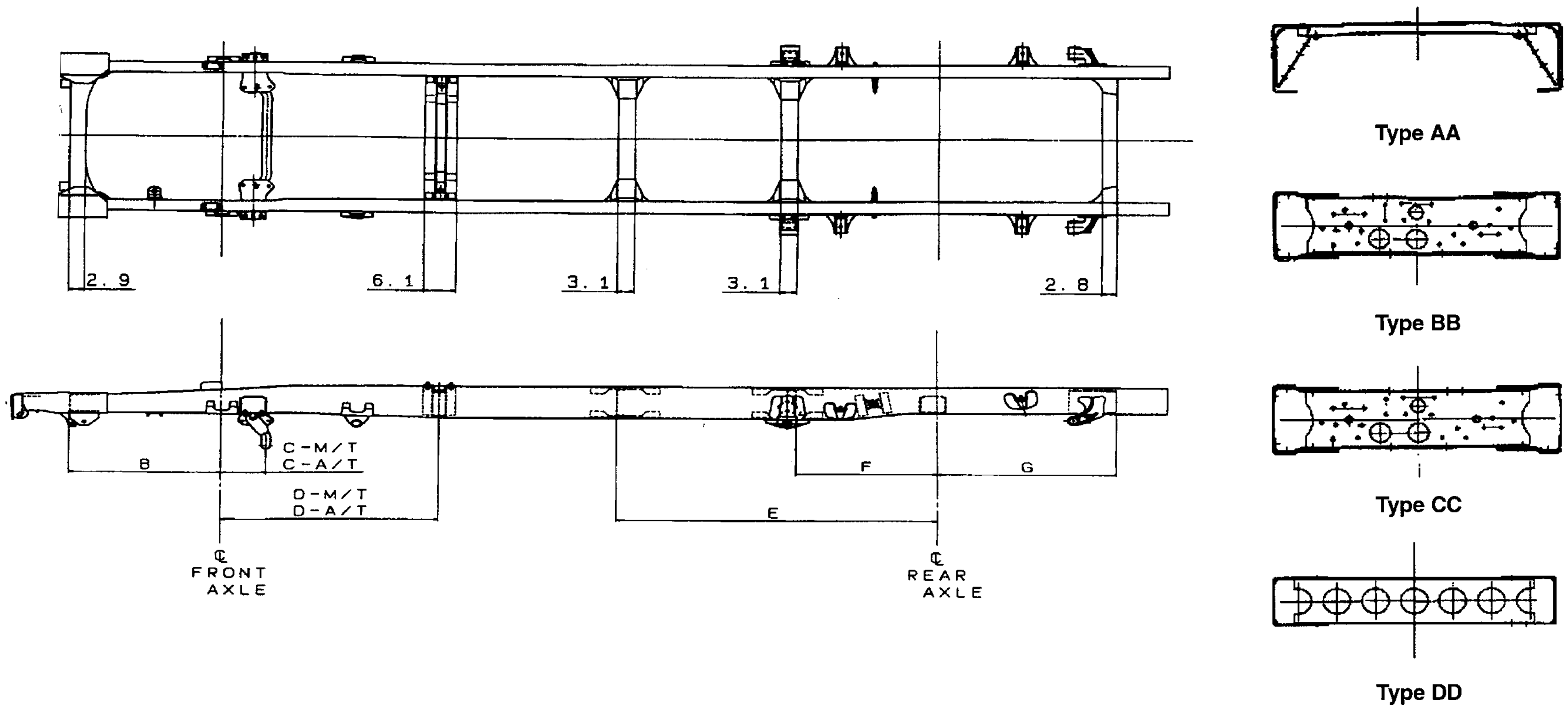
Frame and Crossmember Specifications



Wheelbase	Frame Thick	Crossmember Type/Location								
			B	C-M/T	C-A/T	D-M/T	D-A/T	E	F	G
109.0	0.24		28.3	8.4	8.4	AA 44.7	AA 44.7	–	CC 26.0	DD 33.0
132.5	0.24		28.3	8.4	8.4	AA 44.7	AA 44.7	BB 59.4	CC 26.0	DD 33.0
150.0	0.24		28.3	8.4	8.4	AA 44.7	AA 44.7	BB 59.4	CC 26.0	DD 33.0
176.0	0.24		28.3	8.4	8.4	AA 44.7	AA 44.7	BB 59.4	CC 26.0	DD 33.0

M/T = Manual Transmission A/T = Automatic Transmission

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Diesel – continued on next page)

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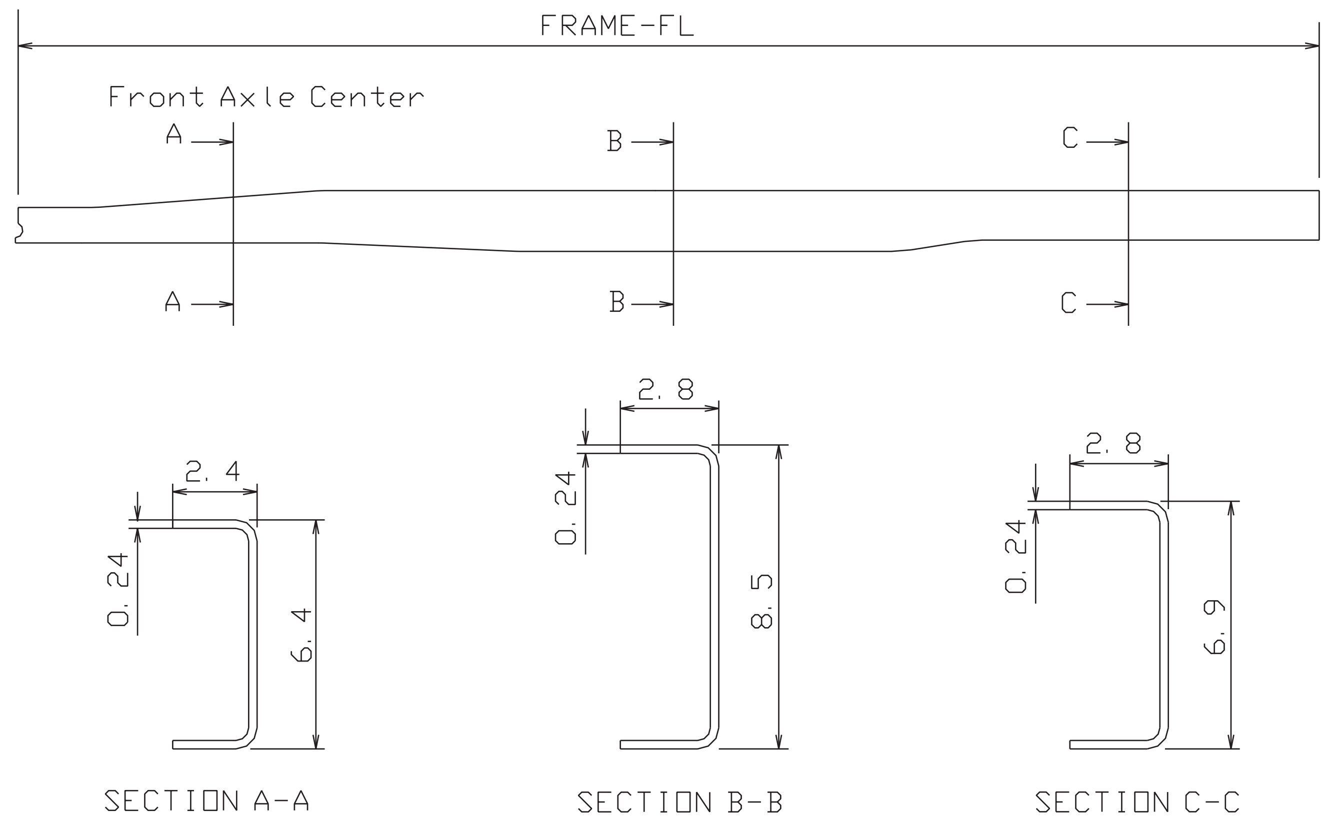
Frame Chart



Wheelbase	Frame FL	Frame Thickness
109.0	186.0	0.24
132.5	209.6	0.24
150.0	227.4	0.24
176.0	253.4	0.24

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Diesel – continued on next page)

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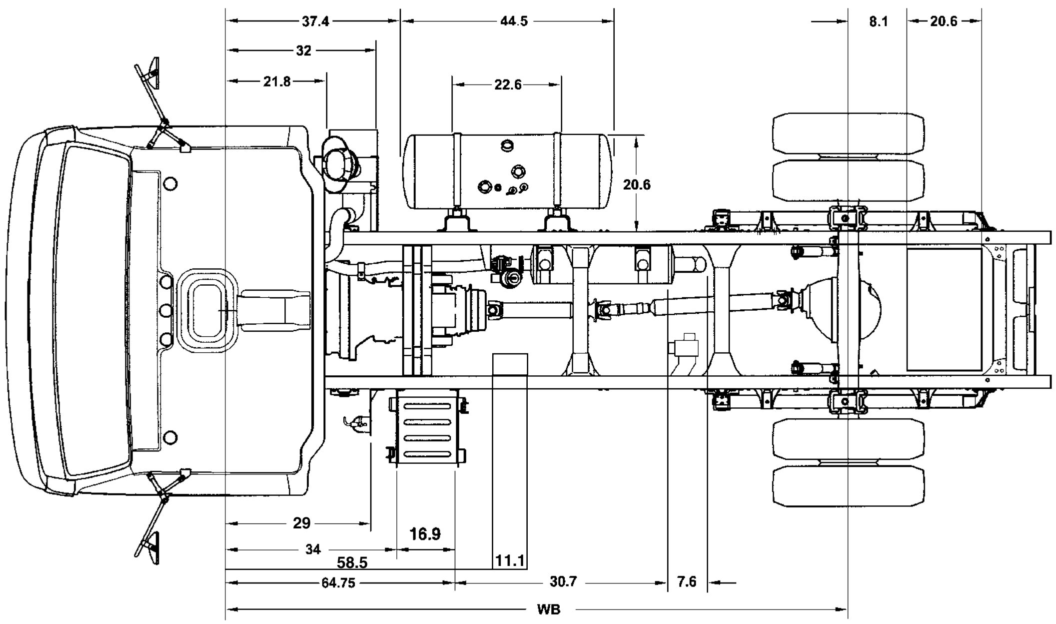
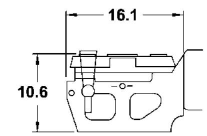
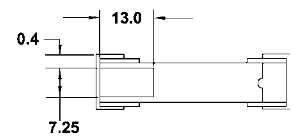
Auxiliary Views

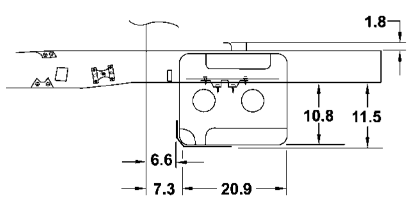




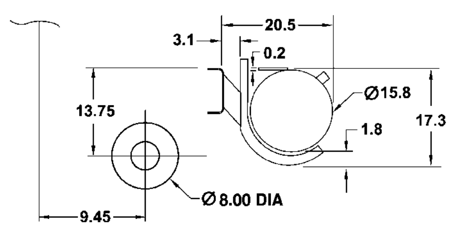
Side View Battery Box



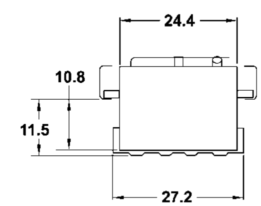
Rear View ABS Controller



Side View In Frame Tank



Side View Fuel Tank



Side View In Frame Tank

NOTE: Frame-mounted fuel tank available on 109", 132.5", 150" and 176" WB as an option replacing the In-Frame Tank.

* Allow 3" additional for battery box opening clearance.

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Diesel – continued on next page)

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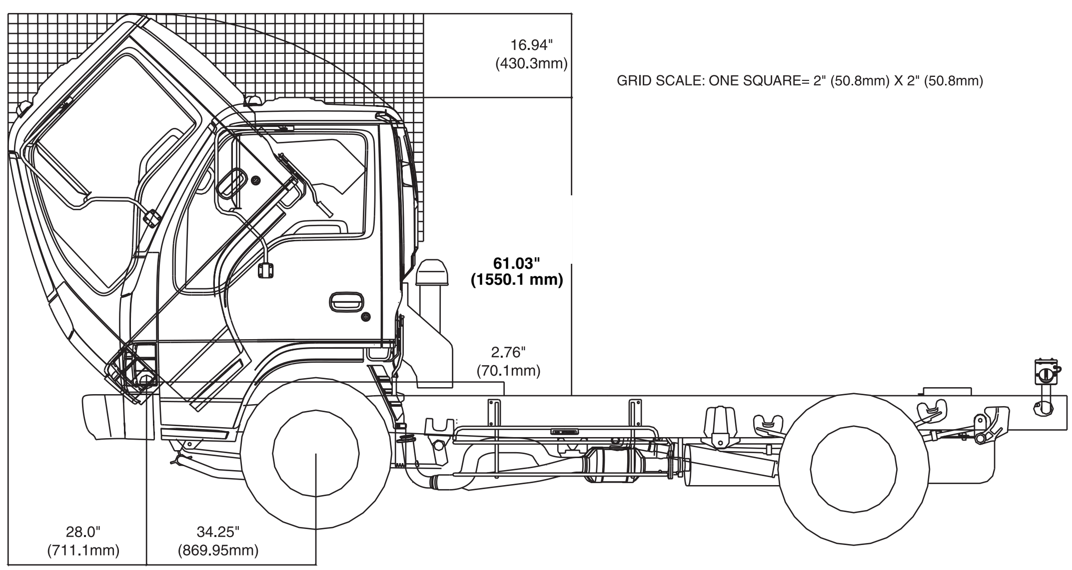
Body Builder Weight Information Chart

GVWR	Axle	Wheelbase								Unsprung Weight
		109 in.		132.5 in.		150 in.		176 in.		
		Man. Trans.	Auto. Trans.	Man. Trans.	Auto. Trans.	Man. Trans.	Auto. Trans.	Man. Trans.	Auto. Trans.	
12,000	Front	3,451	3,484	3,495	3,528	3,539	3,572	3,583	3,616	573
	Rear	1,918	1,907	1,940	1,929	1,973	1,962	1,995	1,984	871
	Total	5,369	5,391	5,435	5,457	5,512	5,534	5,578	5,600	1,444
14,500	Front	3,462	3,495	3,506	3,539	3,550	3,583	3,594	3,627	573
	Rear	1,918	1,907	1,940	1,929	1,973	1,962	1,995	1,984	904
	Total	5,380	5,402	5,446	5,468	5,523	5,545	5,589	5,611	1,477

Cab Tilt



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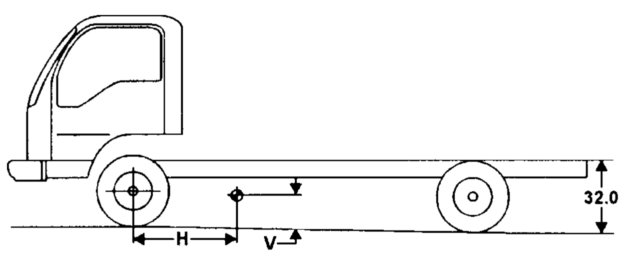
Center of Gravity

The center of gravity of the chassis cab.

GVWR	WB	V	H	
			Manual Trans.	Auto. Trans.
12,000	109	22.1	33.1	33.3
	132.5	20.6	40.3	40.6
	150	20.5	45.7	46.5
	176	18.9	53.6	54.0
14,500	109	22.1	33.0	33.3
	132.5	20.6	40.2	40.5
	150	20.5	45.6	45.9
	176	18.9	53.5	53.6



V = Vertical Center of Gravity
H = Horizontal Center of Gravity

The center of gravity of the completed vehicle with a full load should not exceed 54 inches above ground level for the 12,000 lb. GVWR, 58 inches above ground level for the 14,500 GVWR, and must be located horizontally between the centerlines of the front and rear axles.

NOTE: The maximum dimensions for a body installed on the N/W Series are 96 inches wide (outside) by 90 inches high (inside). Any larger body applications must be approved by GMICT Application Engineering. In the West Coast call 1-562-229-5314 and in the East Coast call 1-404-257-3013.

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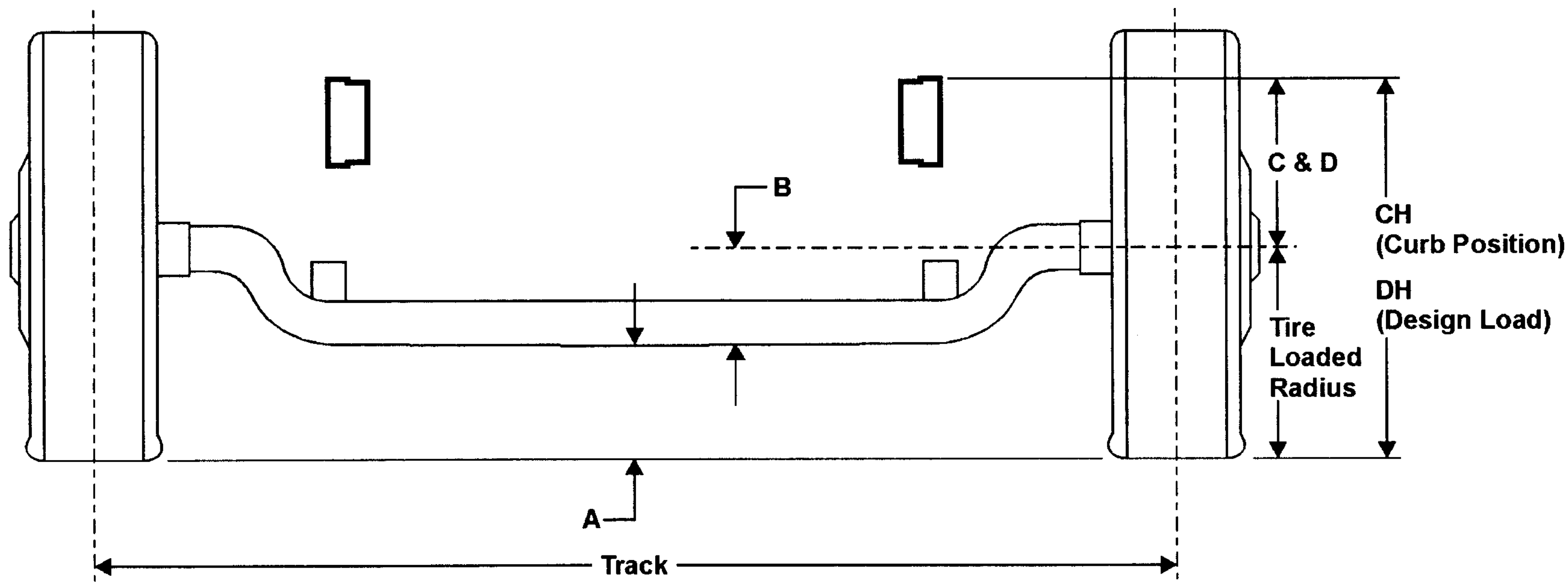
Front Axle Chart



Formulas for calculating height dimensions:

A	=	Tire Loaded Radius – B
C	=	Centerline of Axle to Top of Frame Rail at Curb Position
D	=	Centerline of Axle to Top of Frame Rail at Design Load
CH	=	C + Tire Unloaded Radius
DH	=	D + Tire Loaded Radius

Tire	GVWR	GAWR	A	B	C	D	CH	DH	Track	Tire Radius	
										Unload	Load
215/85R 16-E	12,000 lbs.	4,700 lbs.	8	6.4	12.6	12.1	27.1	26.5	65.5	14.5	14.4
	14,500 lbs.	5,360 lbs.	8	6.4	12.6	12.1	27.1	26.5	65.5	14.5	14.4

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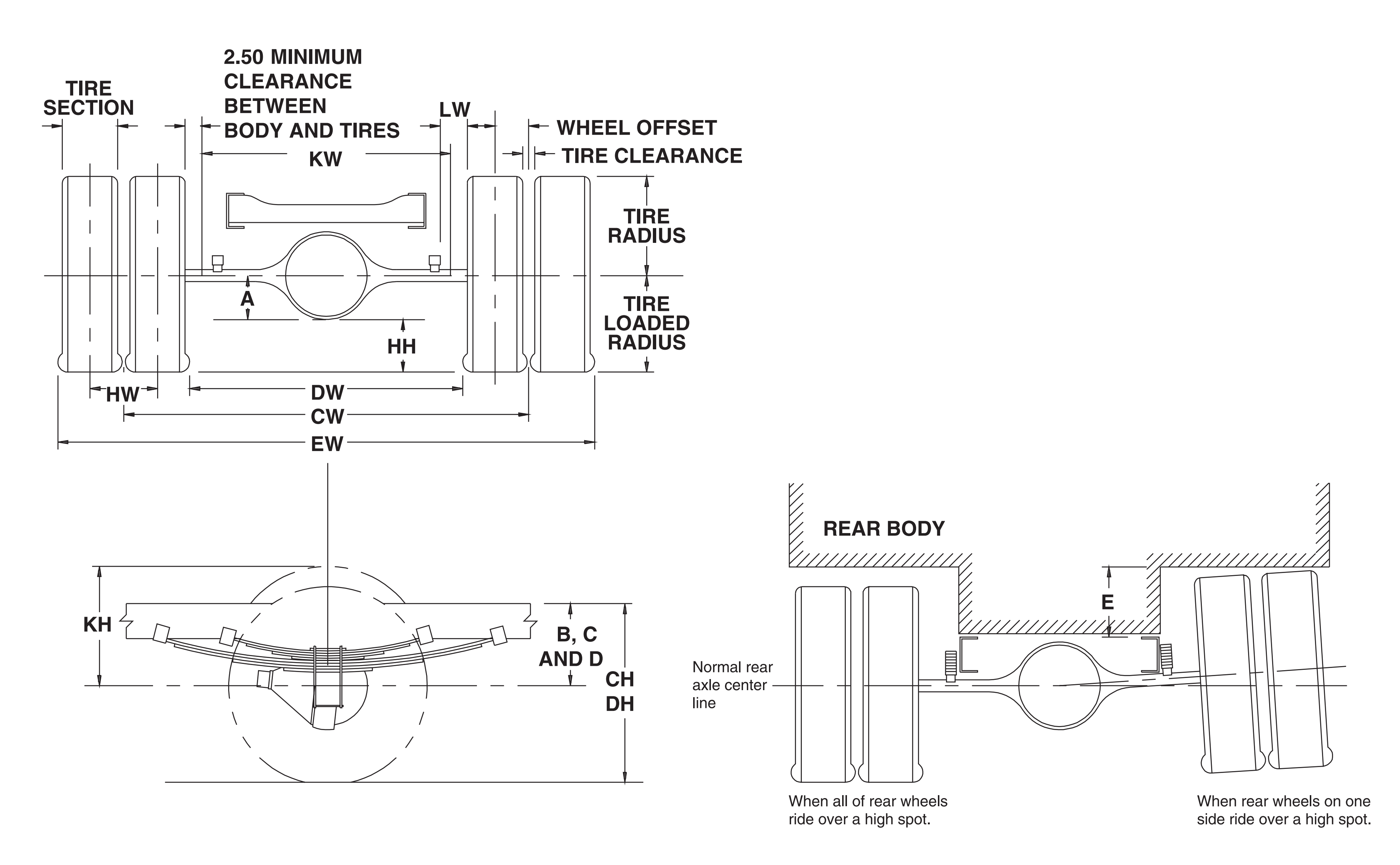
Rear Axle Chart



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Definitions			
A	Centerline of axle to bottom of axle bowl.	DW	Minimum distance between the inner surfaces of the rear tires.
B	Centerline of axle to top of frame rail at metal-to-metal position.	EW	Maximum Rear Width: Overall width of the vehicle measured at the outermost surface of the rear tires.
C	Centerline of axle to top of frame rail at curb position.		
D	Centerline of axle to top of frame rail at design load.	HH	Rear Tire Clearance: Minimum clearance between the rear axle and the ground-line.
E	Rear Tire Clearance: Minimum clearance required for tires and chain measured from the top of the frame at the vertical centerline of the rear axle, when rear wheels on one side ride over a high spot.	HW	Dual Tire Spacing: Distance between the centerlines of the minimum distance required for tire bounce as measured from the centerline of the rear axle and the top of the rear tire when one wheel rides over a high spot.
CH	Rear Frame Height: Vertical distance between the normal top of frame rail and the ground-line through the centerline of the rear axle at curb position.	CW	Track Dual Rear Wheel Vehicles: Distance between the centerlines of the dual wheels measured at the ground-line.
DH	Rear Frame Height: Vertical distance between the normal top of frame rail and the ground-line through the centerline of the rear axle at design load.		
Tire Section, Tire Radius, Tire Loaded Radius, Tire Clearance		See Tire Chart for Values	

Formulas for Calculating Rear Width and Height Dimensions			
CW	= Track	HH	= Tire loaded radius – A
CH	= Tire loaded radius + C	JH	= KH – B
DH	= Tire loaded radius + D	KH	= Tire radius + 3.00 inches
DW	= Track + 2 tire sections – tire clearance	KW	= DW – 5.00 inches
EW	= Track + 2 tire sections + tire clearance	LW	= 1.00-inch minimum clearance between tires and springs

NOTE: Track and overall width may vary with optional equipment.

Tire	GAWR	Track CW	A	B	C	D	E
215/85R 16-E	7,950/9,880 lbs.	65.0	10.6	10.6	14.9	13.3	7.8

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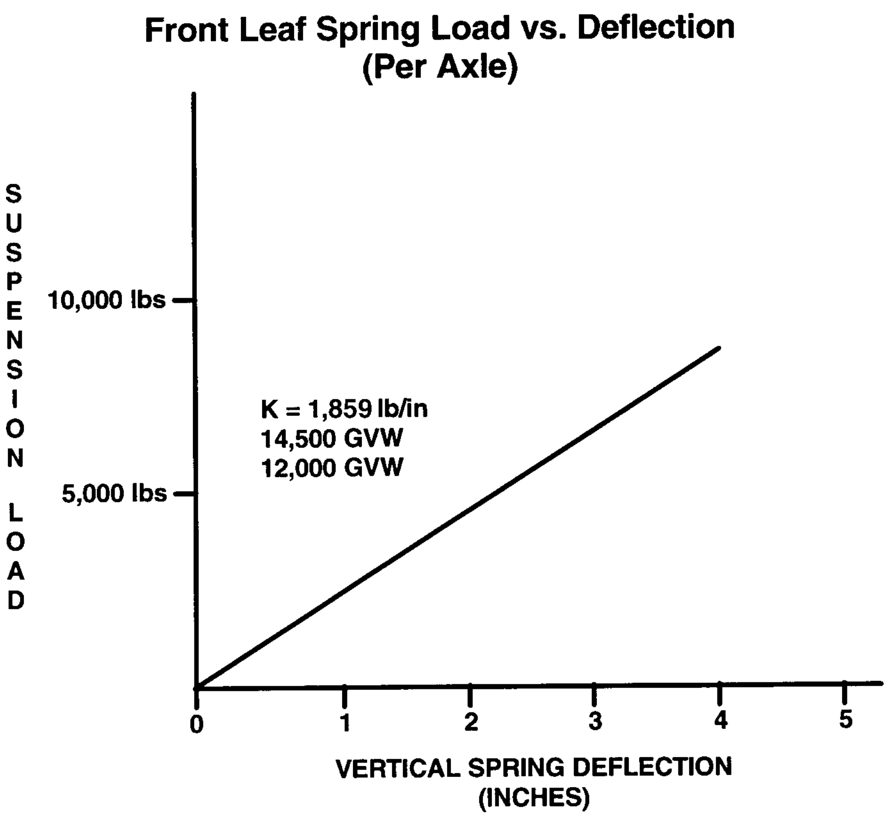
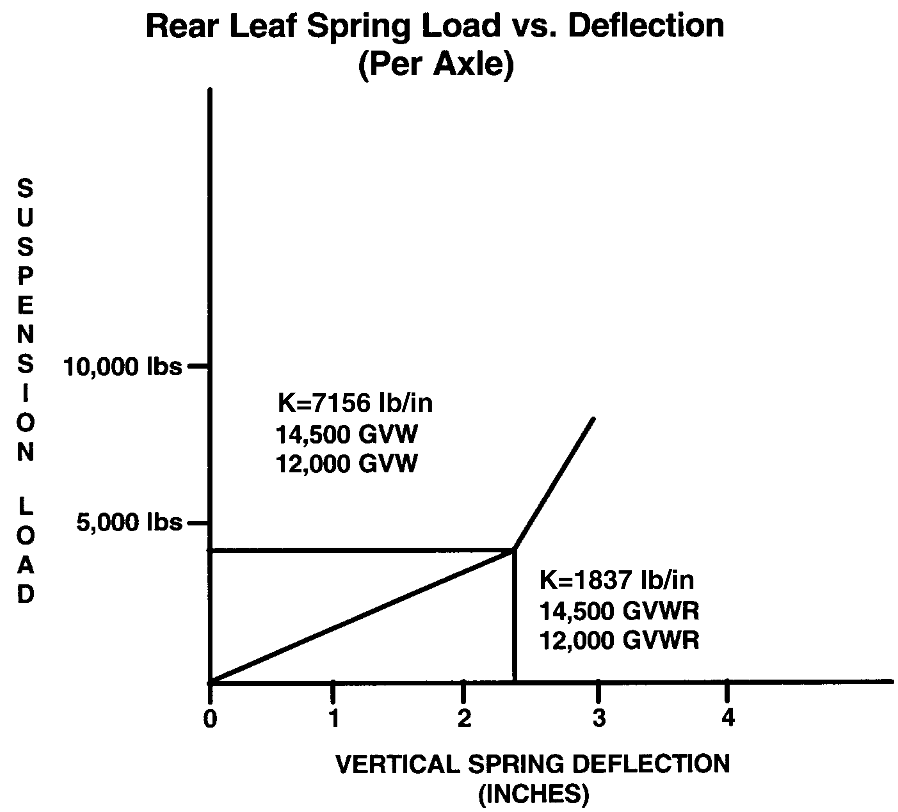
Suspension Deflection Charts





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Tire and Disc Wheel Chart

Tire

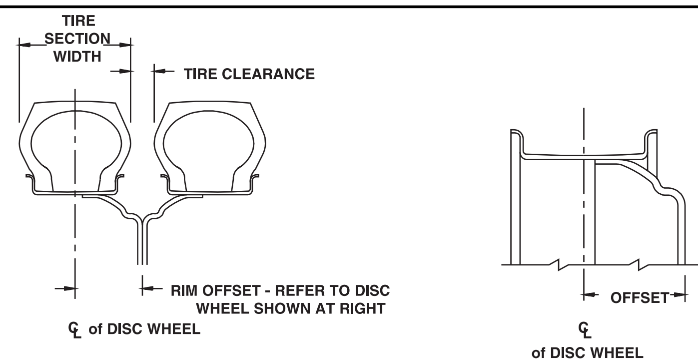
Tire Size	Tire Load Limit and Cold Inflation Pressures				Maximum Tire Load Limits		GVWR (Lb.)
	Single		Dual		Front	Rear	
	Lb.	PSI	Lb.	PSI	2 Single	4 Dual	
215/85R 16-E	2,430	70	2,210	70	4,860	8,840	12,000
215/85R 16-E	2,680	80	2,470	80	5,360	9,880	14,500

Tire Size	GVWR (Lb.)	Tire Radius				Tire Section Width	Tire Clearance	Design Rim Width
		Loaded		Unloaded				
		Front	Rear	Front	Rear			
215/85R 16-E	12,000	14.1	14.1	14.3	14.7	8.2	1.8	6.0
215/85R 16-E	14,500	14.1	14.1	14.3	14.7	8.2	1.8	6.0

Disc Wheel

Wheel Size	Bolt Holes	Bolt Circle Dia.	Ft./Rr. Nut Size*	Rear Stud Size*	Nut/Stud Torque Specs.	Inner Circle	Outside Offset	Disc Thickness	Rim Type	Material Mfg.
16 x 6 K	6 JIS	8.75	1.6142 (41 mm) BUD HEX	0.8268 (21 mm) SQUARE	325 ft.-lb. (440 N•m)	6.46	5.0	0.35	5º DC	Steel TOPY

* O.D. Wrench Sizes



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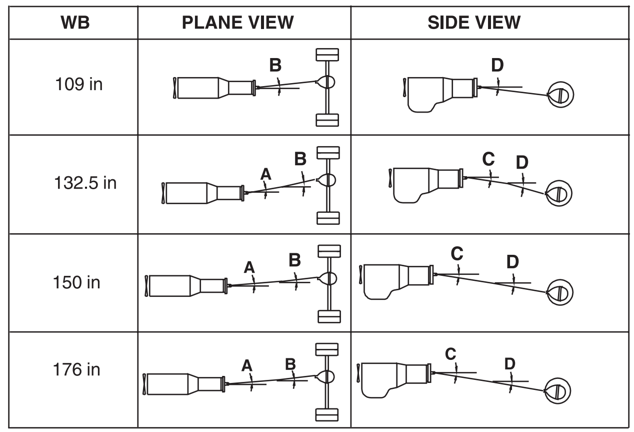
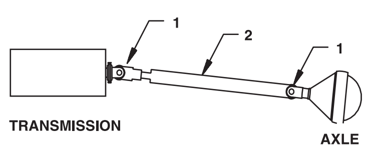
Propeller Shaft

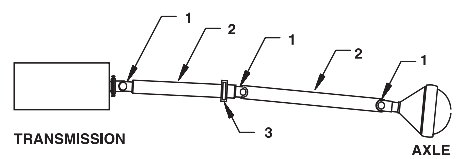


TYPICAL INSTALLATIONS SHOWING YOKES "IN PHASE". "IN PHASE" MEANS THAT THE YOKES AT EITHER END OF A GIVEN PROPELLER SHAFT ASSEMBLY ARE IN THE SAME PLANE.

(109 in WB)



(132.5 in, 150 and 176 in WB)



1. UNIVERSAL JOINT
2. PROPELLER SHAFT
3. CENTER CARRIER BEARING

Wheelbase	Plane View				Side View			
	A Manual Trans.	A Auto. Trans.	B Manual Trans.	B Auto. Trans.	C Manual Trans.	C Auto. Trans.	D Manual Trans.	D Auto. Trans.
109 in.	–	–	3.1°	2.3°	–	–	7.3°	7.1°
132.5 in.	0°	0°	3.1°	2.3°	2.5°	2.5°	1.8°	1.7°
150 in.	0°	0°	3.1°	2.3°	0.0°	0.0°	4.5°	4.4°
176 in.	0°	0°	2.3°	1.7°	0.3°	0.3°	1.4°	1.4°

NOTE: All driveline angles are at unloaded condition (curb position with typical cargo body).

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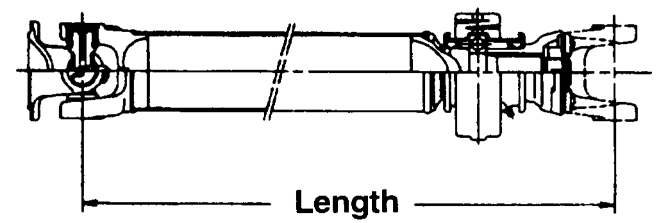
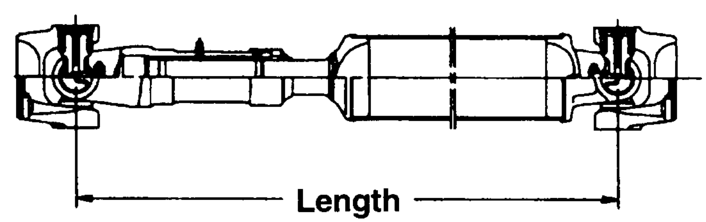
Wheelbase	109		132.5		150		176	
No. of Shafts	1		2		2		2	
Trans. Type	6 Manual Trans.	4 Auto. Trans.	6 Manual Trans.	4 Auto. Trans.	6 Manual Trans.	4 Auto. Trans.	6 Manual Trans.	4 Auto. Trans.
Shaft #1 O.D.	3.54	3.25	3.54	3.25	3.54	3.25	3.54.	3.25
Thickness	0.126	0.091	0.126	0.091	0.126	0.091	0.126	0.091
Length	38.2	39.5	23.9	23.9	41.7	41.6	53.5	53.4
Type	B	B	A	A	A	A	A	A
Shaft #2 O.D.	N/A	N/A	3.54	3.25	3.54	3.25	3.54.	3.25
Thickness	N/A	N/A	0.126	0.091	0.126	0.091	0.126	0.091
Length	N/A	N/A	37.6	38.9	37.6	38.4	51.6	53
Type	N/A	N/A	B	B	B	B	B	B

Type	Description	Illustration
Type **A**	1st shaft in 2-piece driveline	
Type **B**	1st shaft in 1-piece driveline 2nd shaft in 2-piece driveline	

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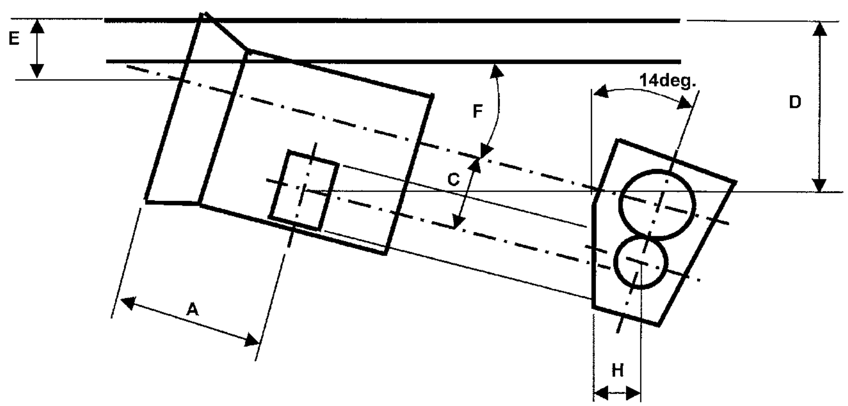
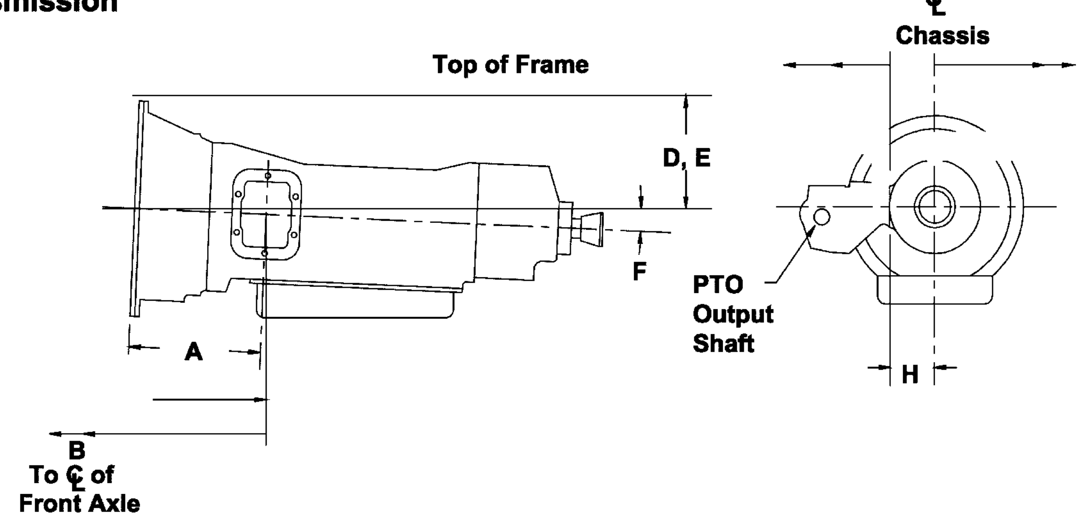
PTO Location, Drive Gear and Opening Information

Manual Transmission



Automatic Transmission



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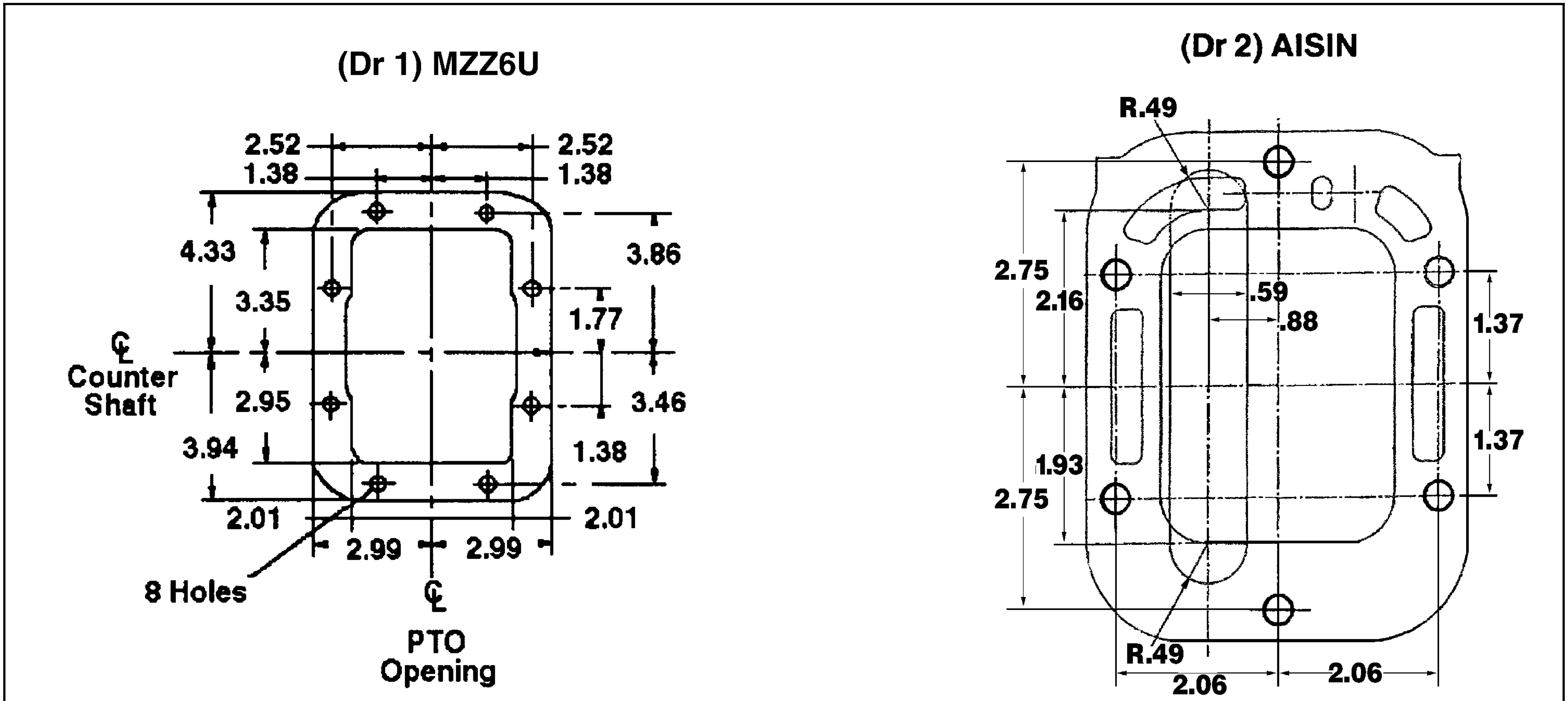
Trans.	Opening Location	Bolt Pattern	A	B	C	D	E	F	H	PTO Drive Gear Location	Ratio of PTO Drv. Gear Spd. to Eng. Spd.	No. of Teeth	Pitch	Helix Angle	Max. Output Torque
MXA 5C	Left	(Dr 1)	13.2	39	3.4	11.2	7.1	2.5°	4.1	2nd Gear Trans. Countershaft	25/49 = .51	20	3.175	15°	145 lbs.-ft. @ 1,000 RPM
Aisin[1)]	Left	(Dr 2)	12.6	38.59	0	8	7.5	2.5°	4.48	PTO Gear	1:1 with turbine	58	N/A	0	134 lbs.-ft. @ 1,000 RPM

1) No PTO gear in the 150" WB models.

Opening Diagram



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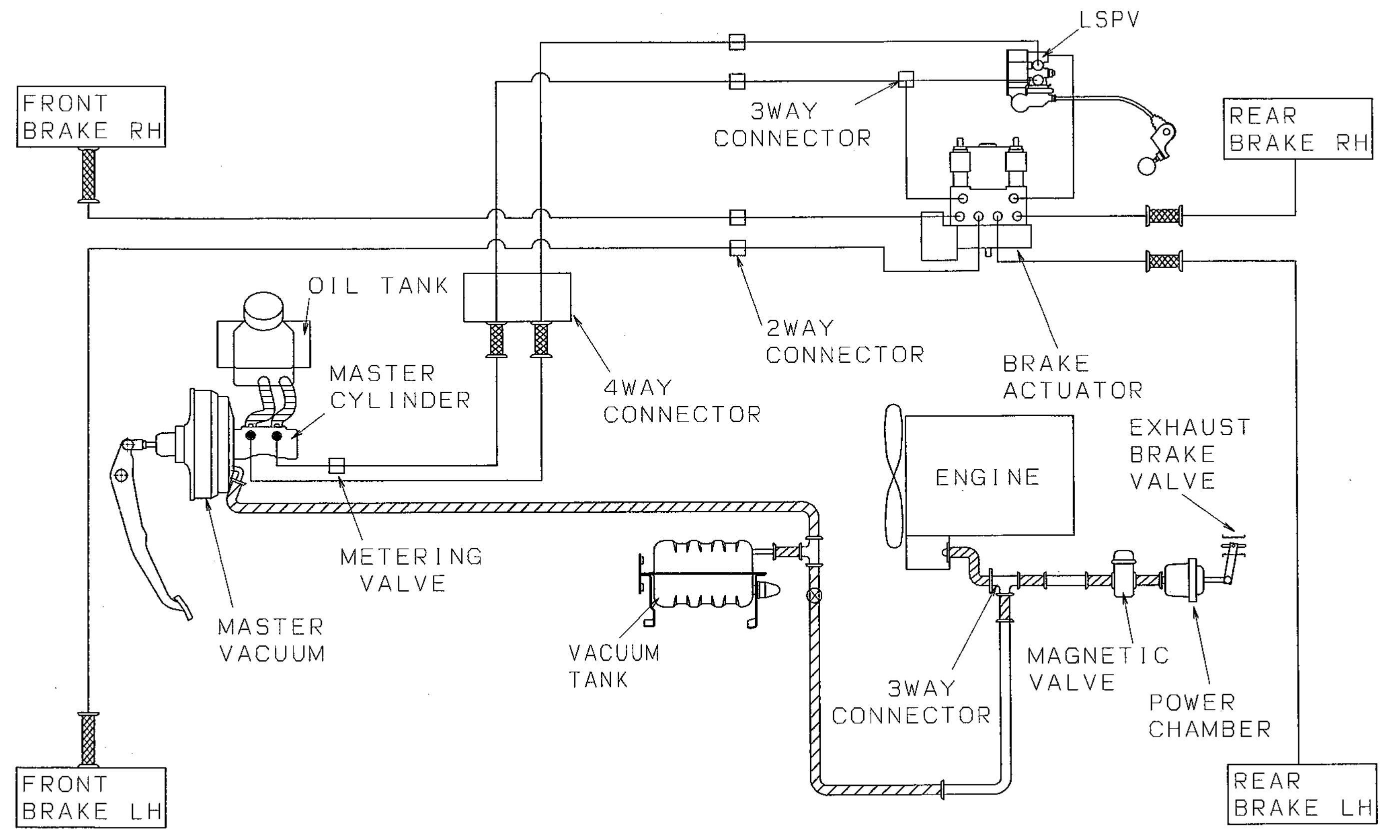
Brake System Diagram, 12,000 GVW

Vacuum Over Hydraulic

Please refer to Introduction Section of book for antilock system cautions and wheelbase modification requirements.



LINE					
NAME	BRAKE HOSE LOW PRESSURE	VACUUM HOSE	BRAKE HOSE HIGHT PRESSURE	VACUUM PIPE	BRAKE PIPE

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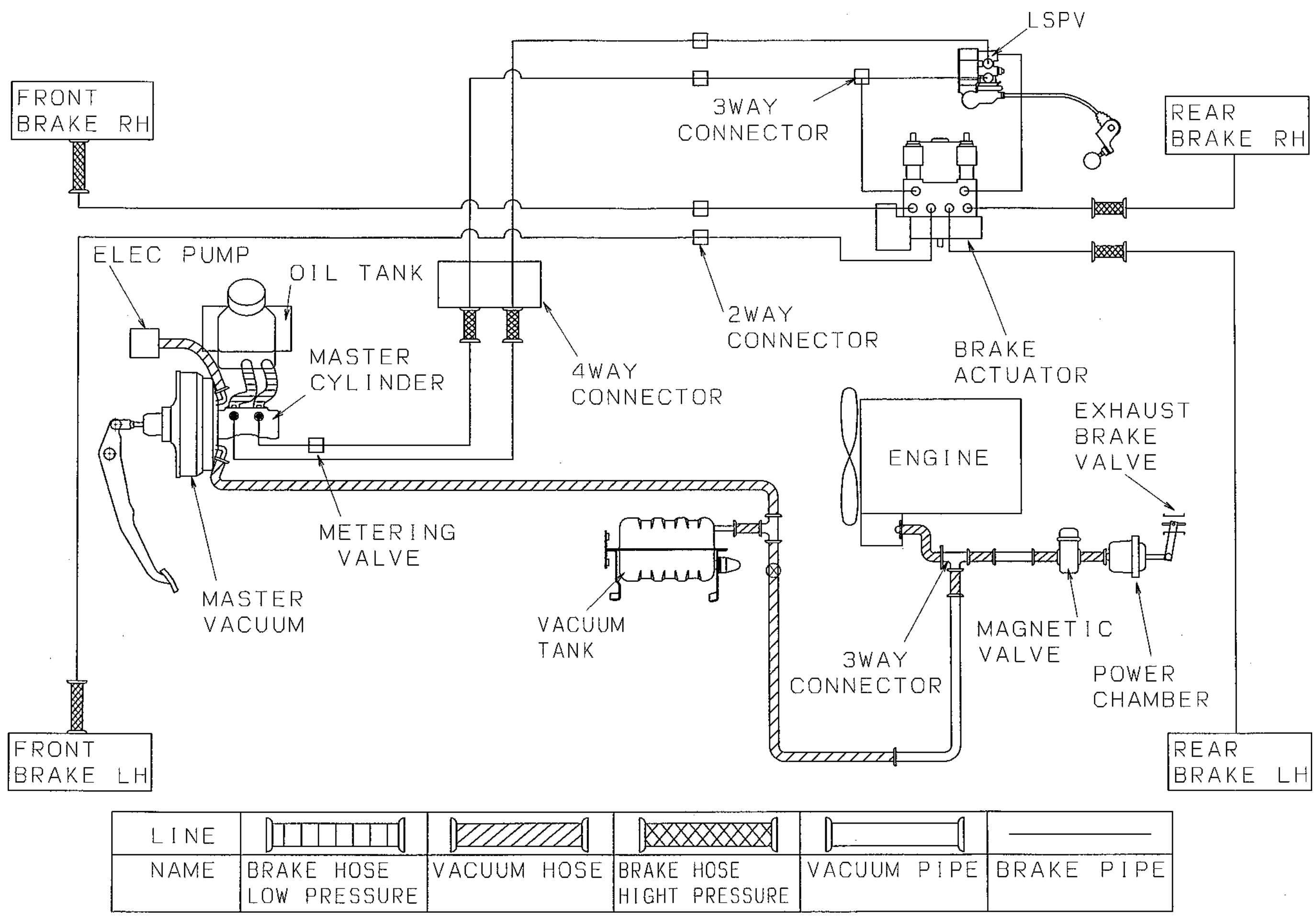
Brake System Diagram, 14,500 GVW

Vacuum Over Hydraulic

Please refer to Introduction Section of book for antilock system cautions and wheelbase modification requirements.



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In-Frame Diesel Fuel Fill

Installation Instructions

1. Disconnect battery.
2. Loosen hose from the tie downs. Remove caps from plate on rail.
3. Install hoses onto the plate.
4. Extend hose out from the driver side of the rail to body rail.
5. The filler neck must be mounted to allow the fill plate bracket to be parallel to the frame horizontal (see figure 4).
6. Cover with protector wrap and secure with tie wraps.
7. Filler hose is set for 96 inches outside width body.
8. Filler neck (dimension A) must be between 6.85 inches and 8.5 inches above frame.
9. Secure the filler plate to the bottom of the body and check for leaks.
10. Ensure that fill hose does not sag, creating an area where the fuel could pool in the fill hose.
11. Reconnect battery.

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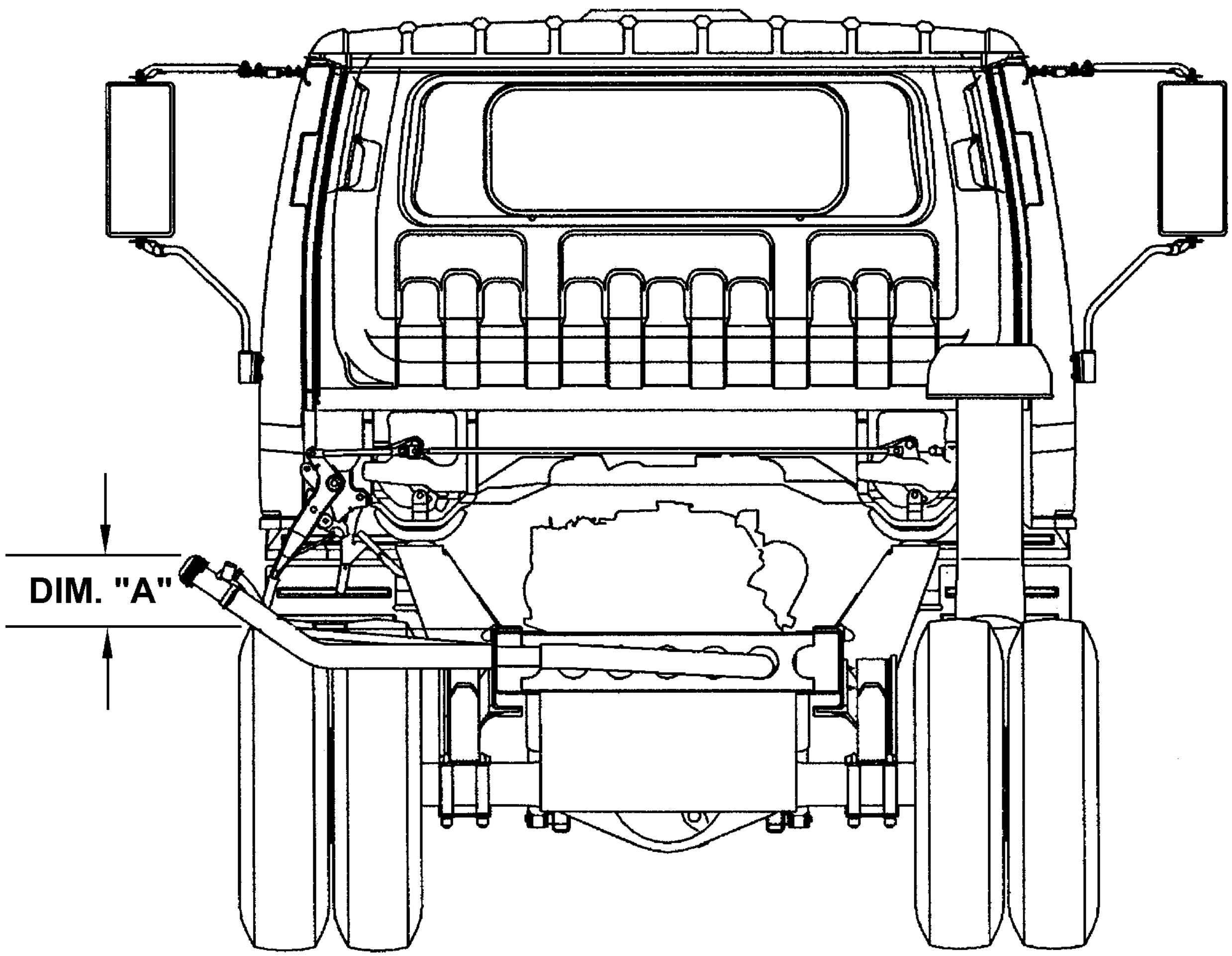
Rear View Fuel Fill



Dimension A = 6.85-8.5 inches (174-216 mm)

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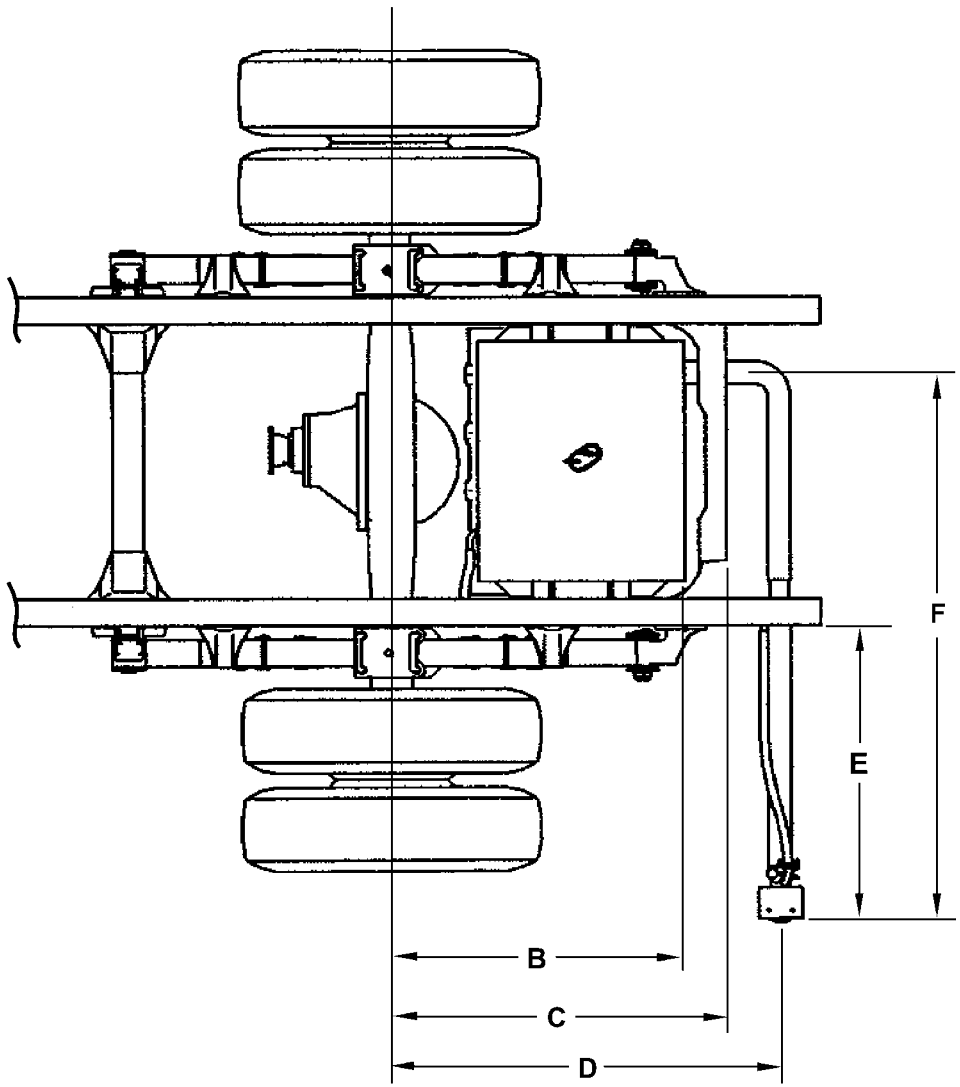
Top View Fuel Fill



Dimensions:
B = 29.75 inches (756 mm)
C = 34.00 inches (863 mm)
D = 39.29 inches (998 mm)
E = 30.86 inches (784 mm)
F = 56.60 inches (1,438 mm)

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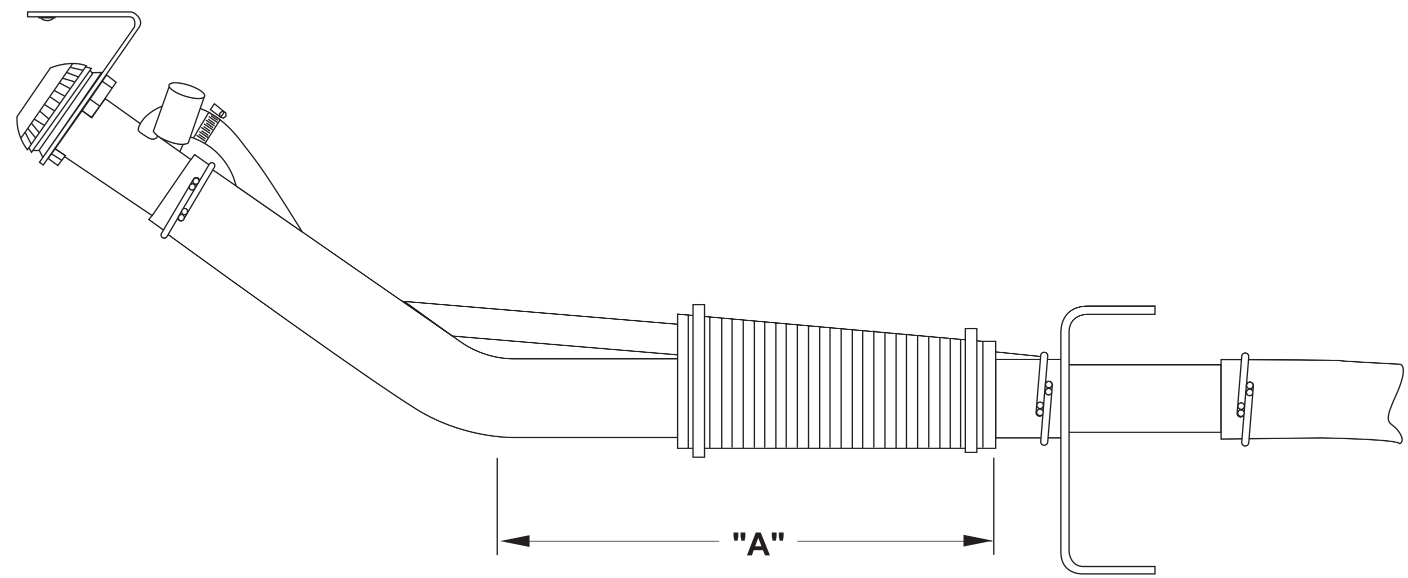
Hose Modification for Various Width Bodies



NOTE: Shorten Hose at "A" Area only.

96 remove 0 inches
90 remove 3 inches
86 remove 5 inches
80 remove 8 inches

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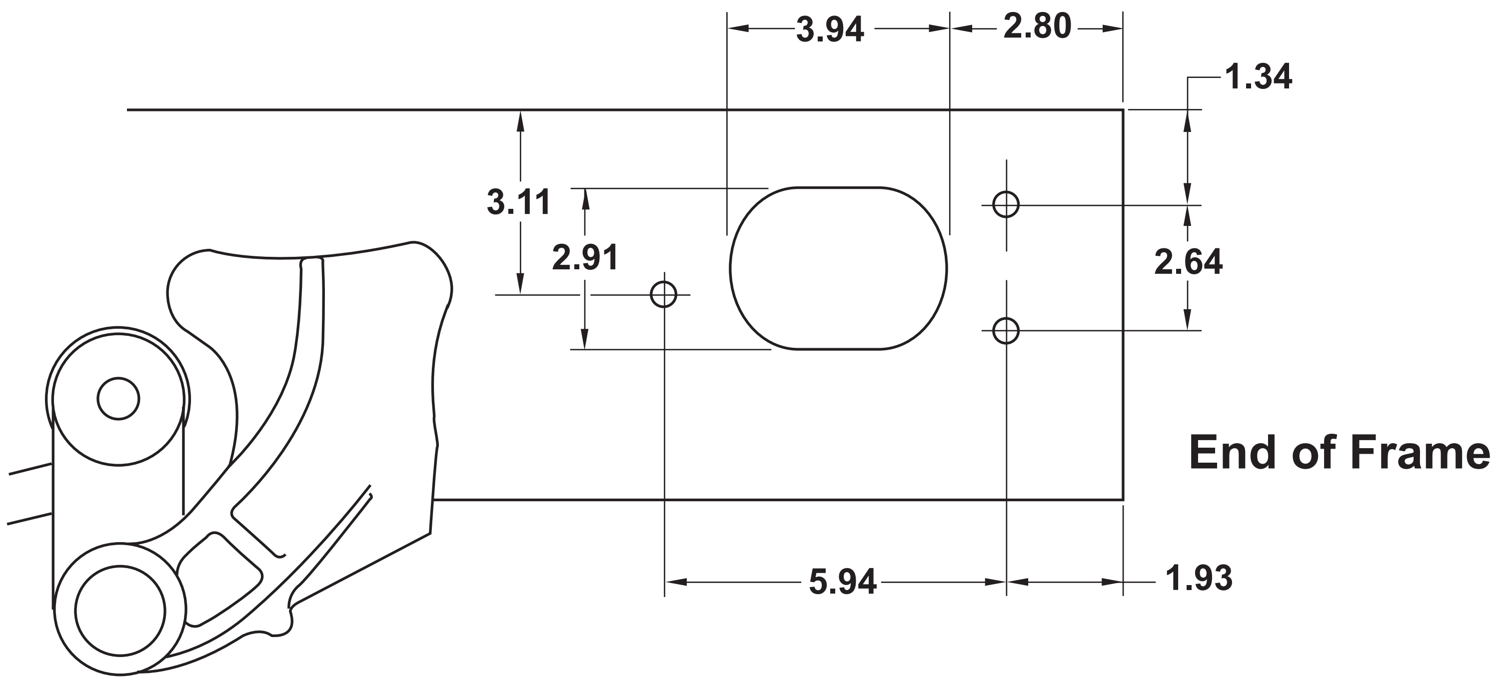
Through the Rail Fuel Fill Frame Hole



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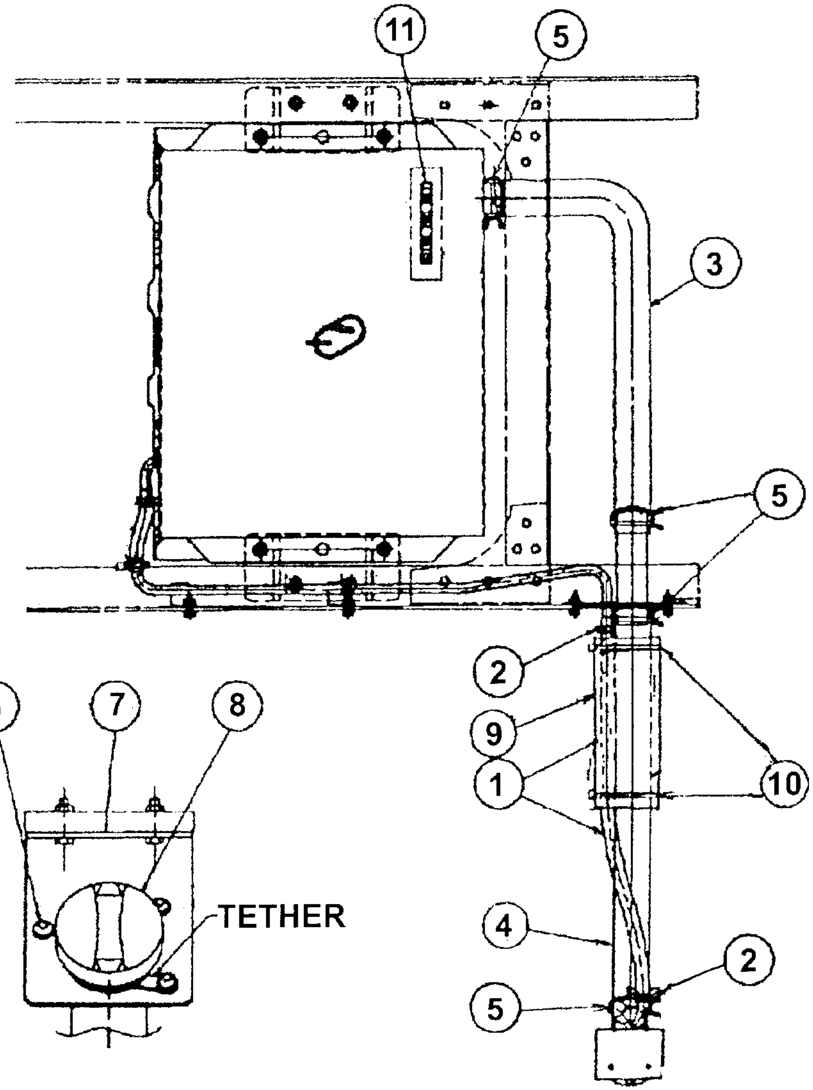
Fuel Fill Parts Illustration



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Fuel Fill Parts List

Number	Part Name	Isuzu Part Number	GM Part Number	Quantity
1	Breather Hose	894152-0030	N/A	1
2	Clip, Rubber Hose	894242-0340	94242034	2
3	Hose, Fuel Filler	897187-8750	97187875	1
4	Hose, Fuel Filler	897253-1400	97253140	1
5	Clip, Filler Hose	894435-8760	97724373	4
6	Screw, Filler Hose	894384-6460	N/A	3
7	Bracket, Filler Neck	897116-621Y	97116621	1
8	Cap, Filler	897218-7020	N/A	1
9	Protector	897114-0630	97114063	1
10	Clip	109707-1070	94062296	2
11	Caution Plate	897135-6050	97130605	1

NQR/W5500 Diesel
Specifications

Model	NQR/W5500
GVWR	17,950 lbs.
WB	109 in., 132.5 in., 150 in., 176 in.
Engine	Isuzu 4-cylinder, in-line 4-cycle, turbocharged, intercooled, direct injection diesel.
Model/Displacement	4HK1-TC/317CID (5.19 liters)
HP (Gross)	190 HP @ 2,600 RPM
Torque (Gross)	387 lbs.-ft. torque @ 1,500 RPM
Equipment	Dry element air cleaner with vertical intake; 2 rows 569 in.^{2} radiator; 7-blade 20.1 in. diameter fan with viscous drive. Cold weather starting device and an oil cooler. Engine oil level check switch and light. Engine cruise control and idle up function.
Clutch	Single, dry plate, 12.8 in. dia. ceramic, actuated by self-adjusting hydraulic master/slave cylinder.
Transmission	MZZ 6-speed manual, all forward gears synchronized. Sixth gear is overdrive. Available Optional Transmission: Aisin 450-43 LE 4-speed overdrive automatic transmission with lock-up capability in 2nd, 3rd and 4th. PTO capability all chassis and wheelbases.
Steering	Integral power steering 18.8-20.9:1 ratio. Tilt and telescoping steering column.
Front Axle	Reverse Elliot “I”-Beam rated at 6,830 lbs.
Suspension	Semi-elliptical steel alloy tapered leaf springs with stabilizer bar and shock absorbers.
GAWR	6,830 lbs.
Rear Axle	Full-floating, single speed with hypoid gearing rated at 14,550 lbs.
Suspension	Semi-elliptical steel alloy multi-leaf springs and shock absorbers.
GAWR	12,980 lbs.
Wheels	19.5 x 6.0 6-hole disc wheels, painted white.
Tires	225/70R 19.5F (12 pr) tubeless steel-belted radials, all season tread front and rear.
Brakes	Dual-circuit, power-assisted hydraulic service brakes with load-sensing proportioning valve in rear brake circuit. Disc front and self-adjusting outboard mounted drum rear. The parking brake is a mechanical, cable-actuated, internal expanding drum type, transmission mounted. The exhaust brake is standard and is vacuum-operated. Four channel antilock brake system.
Fuel Tank	30-gallon rectangular steel fuel tank mounted in frame rail behind rear axle. Heated fuel/water separator mounted on rail with dash mounted indicator light.

NOTE: These selected specifications are subject to change without notice.

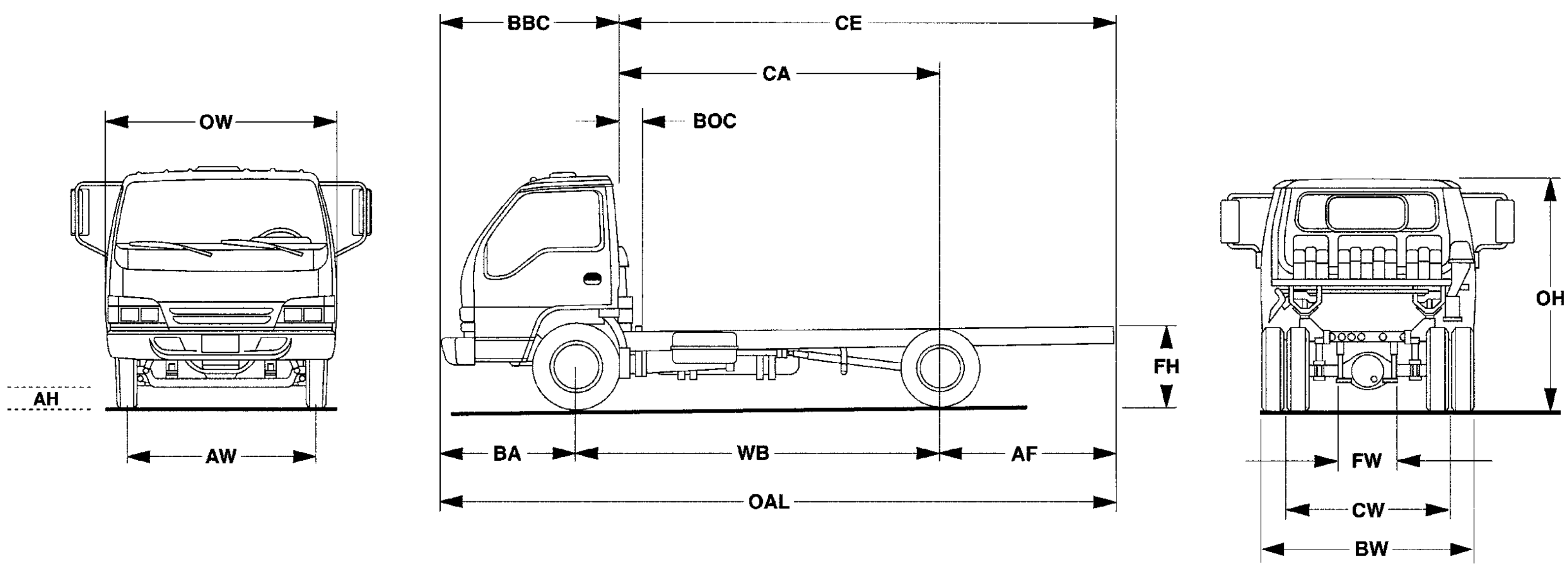
(Vehicle Specifications Index Section – NQR/W5500 Diesel – continued on next page)

(Vehicle Specifications Index Section – NQR/W5500 Diesel – continued from previous page)

Model	NQR/W5500
Frame	Ladder type channel section straight frame rail 33.5 in. wide through the total length of the frame. Yield strength 44,000 psi section modulus 7.20 in.^{3}, RBM 316,800 lbs.-ft./in. per rail.
Cab	All-steel, low cab forward, BBC 68.0 in., 45° mechanical tilt with torsion assist.
Equipment	Jersey knit covered high back driver's seat with two-occupant passenger seat. Two-way roof ventilator, dual cab mounted exterior mirrors. Tilt and telescoping steering column. Tinted glass.
Electrical	12-volt, negative ground, dual Delco maintenance free batteries, 750 CCA each, 110-amp alternator with integral regulator.
Options	Air conditioning, AM/FM CD stereo radio, PTO, engine block heater, engine oil pan heater, spare wheel, 6' stainless steel convex mirrors. Auxilliary transmission oil cooler, mandatory for 20,950 GCWR. Power windows and door locks. 33-gallon fuel tank mounted on right hand rail, in place of 30-gallon in frame tank, wheel simulators, engine shutdown system, engine shutdown system with hourmeter, cruise control, auxilary Transmission oil cooler.

NOTE: These selected specifications are subject to change without notice.

Vehicle Weights, Dimensions and Ratings



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Variable Chassis Dimensions					
Unit	**WB**	**CA***	**CE***	**OAL**	**AF**
Inch	109.0	88.4	131.5	199.5	43.1
Inch	132.5	111.9	155.0	223.0	43.1
Inch	150.0	129.4	172.5	240.5	43.1
Inch	176.0	155.4	198.5	266.3	43.1

* Effective CA & CE are CA or CE less BOC.

Dimension Constants					
Code	**Inches**	**Code**	**Inches**	**Code**	**Inches**
AH	8.6	BW	83.3	FH	32.8
AW	65.6	CW	65.0		
BA	47.4	FW	33.5		
BBC	68.0	OH	88.9		
BOC	9.25	OW	78.5		

In-Frame Tank 17,950-lb. GVWR Manual Transmission Model Chassis Cab and Maximum Payload Weights						
Model	**WB**	**Unit**	**Front**	**Rear**	**Total**	**Payload**
NQ1	109.0 in.	lb.	3,649	2,282	5,931	12,019
NQ2	132.5 in.	lb.	3,693	2,304	5,997	11,953
NQ3	150.0 in.	lb.	3,726	2,348	6,074	11,876
NQ4	176.0 in.	lb.	3,770	2,370	6,140	11,810

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In-Frame Tank 17,950-lb. GVWR Automatic Transmission Model Chassis Cab and Maximum Payload Weights						
Model	**WB**	**Unit**	**Front**	**Rear**	**Total**	**Payload**
NR1	109.0 in.	lb.	3,682	2,304	5,986	11,964
NR2	132.5 in.	lb.	3,726	2,326	6,052	11,898
NR3	150.0 in.	lb.	3,770	2,359	6,129	11,821
NR4	176.0 in.	lb.	3,814	2,381	6,195	11,755

Side-Mounted Tank 17,950-lb. GVWR Manual Transmission Model Chassis Cab and Maximum Payload Weights						
Model	**WB**	**Unit**	**Front**	**Rear**	**Total**	**Payload**
NQ1	109.0 in.	lb.	3,836	2,017	5,853	12,097
NQ2	132.5 in.	lb.	3,880	2,039	5,919	12,031
NQ3	150.0 in.	lb.	3,913	2,083	5,996	11,954
NQ4	176.0 in.	lb.	3,957	2,105	6,062	11,888

Side-Mounted Tank 17,950-lb. GVWR Automatic Transmission Model Chassis Cab and Maximum Payload Weights						
Model	**WB**	**Unit**	**Front**	**Rear**	**Total**	**Payload**
NR1	109.0 in.	lb.	3,869	2,039	5,908	12,042
NR2	132.5 in.	lb.	3,913	2,061	5,974	11,976
NR3	150.0 in.	lb.	3,957	2,094	6,051	11,899
NR4	176.0 in.	lb.	4,001	2,116	6,117	11,833

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Vehicle Weight Limits:

GVWR	
Designed Maximum	17,950 lbs.
GAWR, Front	6,830 lbs.
GAWR, Rear	12,980 lbs.

Technical Notes:

Chassis Curb Weight reflects standard equipment and fuel but no driver or payload.

Maximum Payload Weight is the allowed maximum for equipment, body, payload and driver and is calculated by subtracting chassis curb weight from the GVWR.

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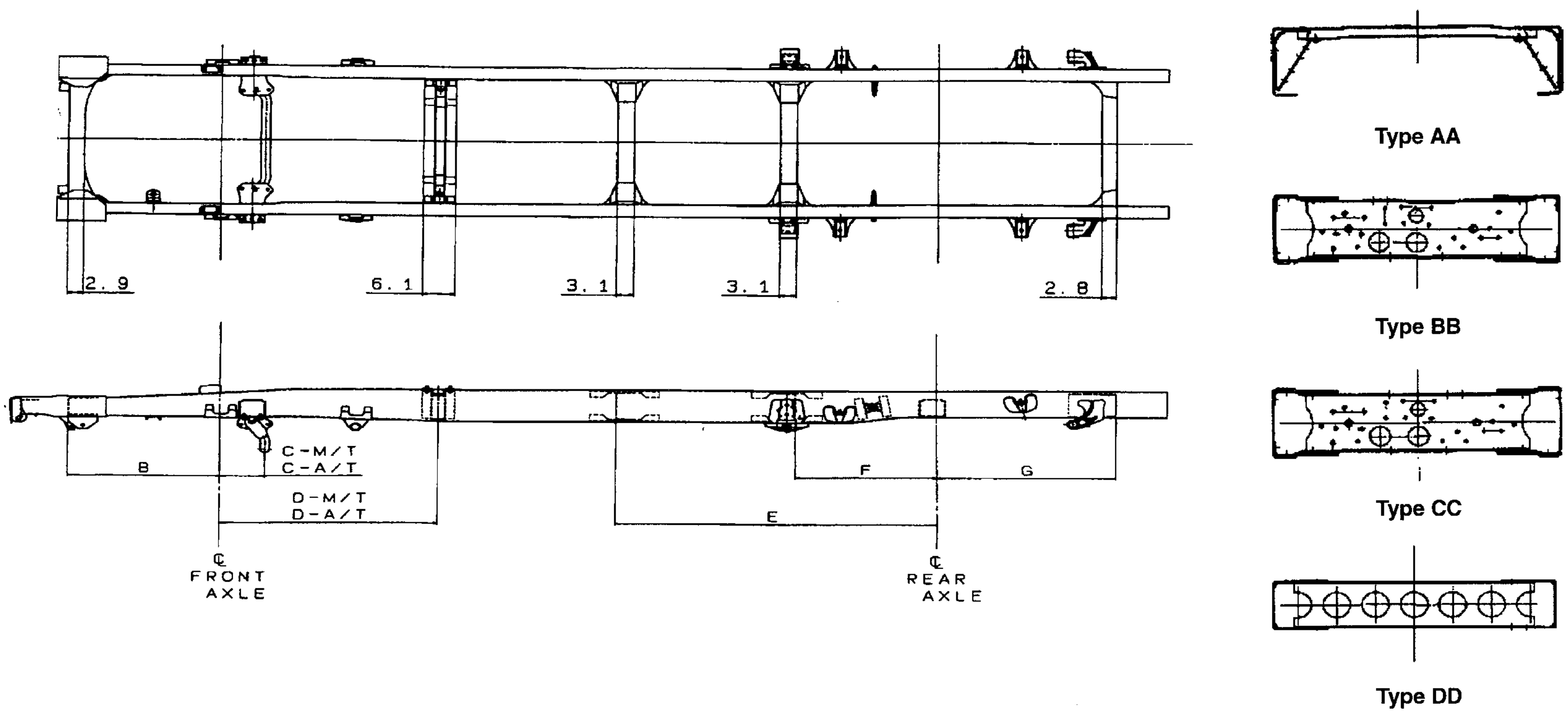
Frame and Crossmember Specifications



Wheelbase	Frame Thick	Crossmember Type/Location								
		A	B	C-M/T	C-A/T	D-M/T	D-A/T	E	F	G
109.0	0.24		28.3	8.4	8.4	AA 44.7	AA 44.7	–	CC 26.0	DD 33.0
132.5	0.24		28.3	8.4	8.4	AA 44.7	AA 44.7	BB 59.4	CC 26.0	DD 33.0
150.0	0.24		28.3	8.4	8.4	AA 44.7	AA 44.7	BB 59.4	CC 26.0	DD 33.0
176.0	0.24		28.3	8.4	8.4	AA 44.7	AA 44.7	BB 59.4	CC 26.0	DD 33.0

M/T = Manual Transmission A/T = Automatic Transmission

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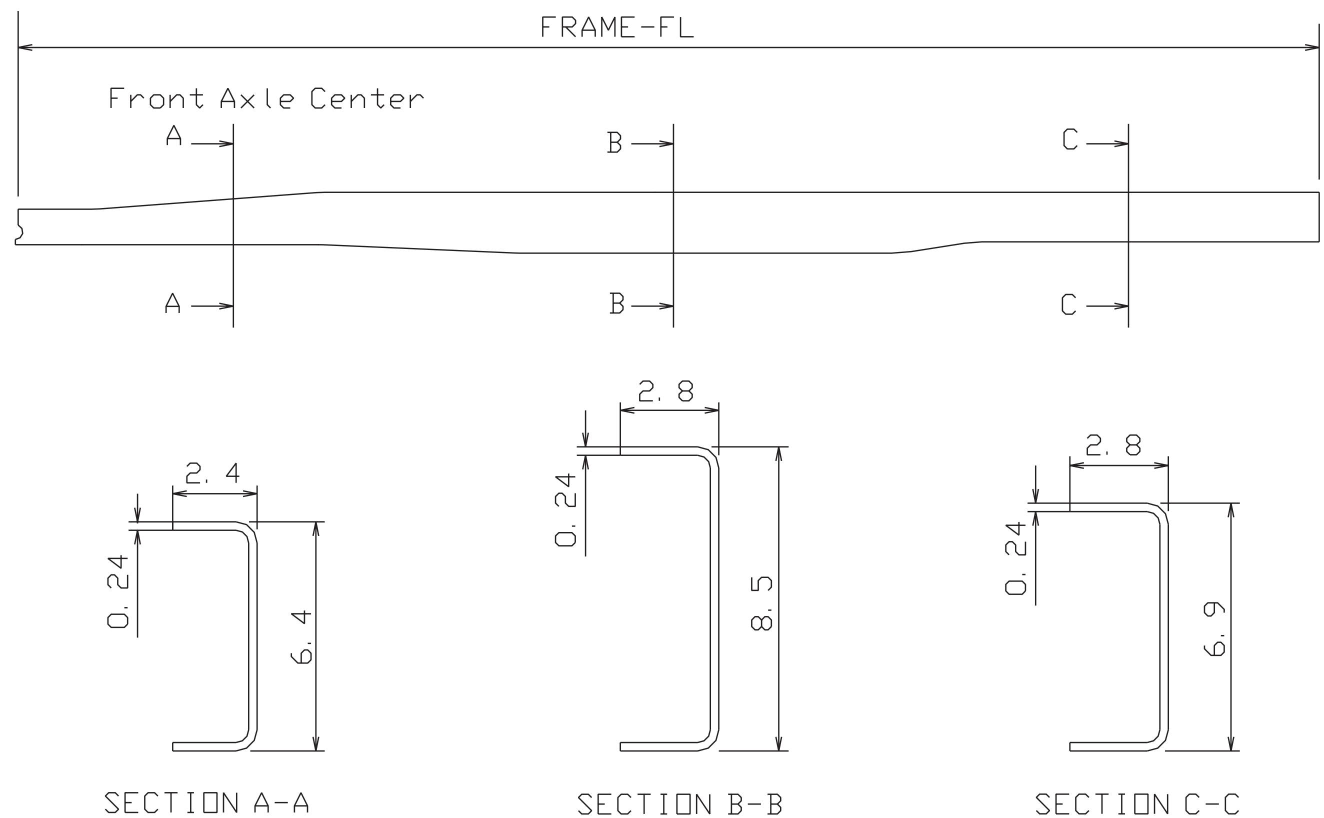
Frame Chart



Wheelbase	Frame FL	Frame Thickness
109.0	186.0	0.24
132.5	209.6	0.24
150.0	227.4	0.24
176.0	253.4	0.24

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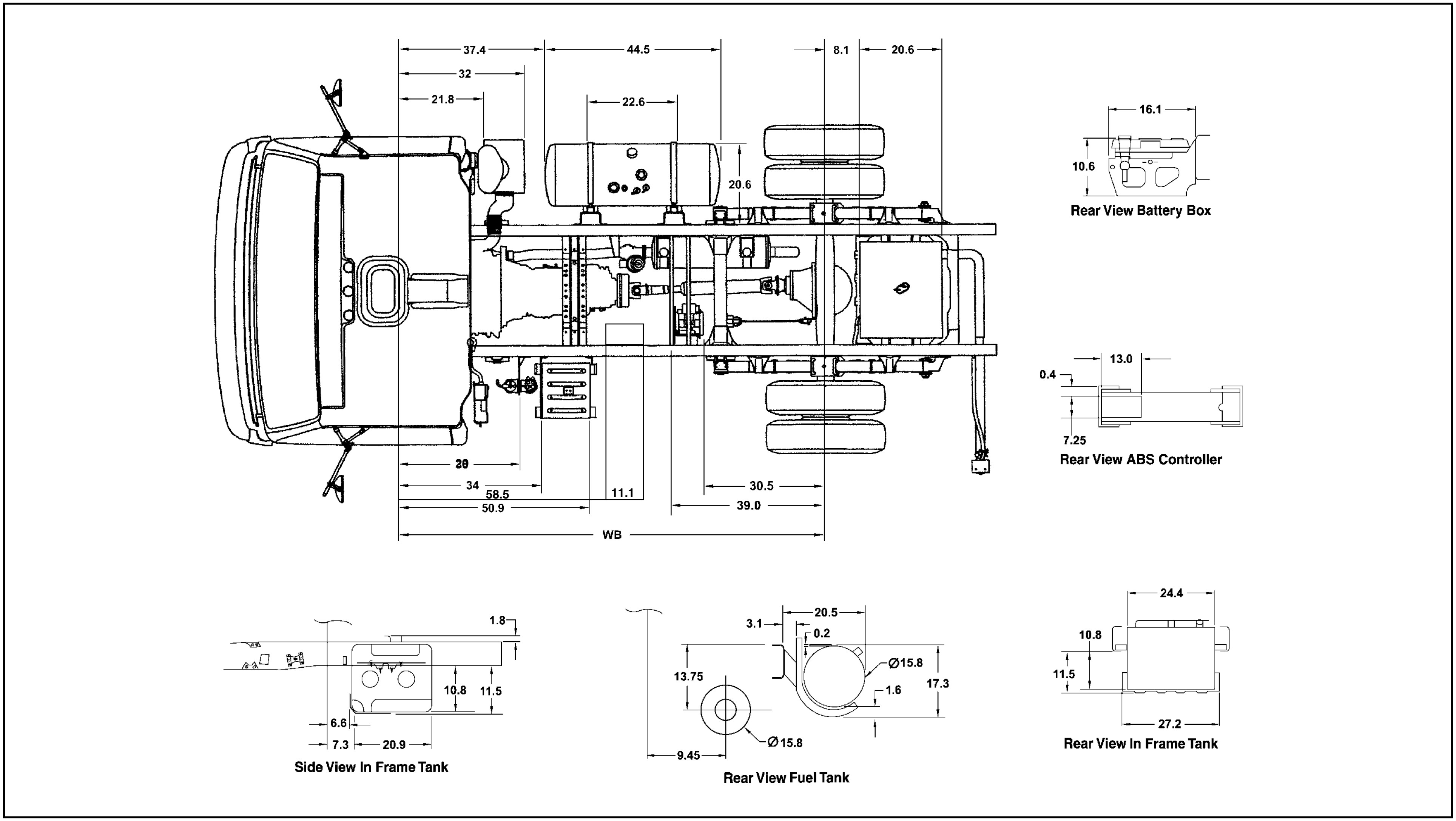
Auxiliary Views



NOTE: Frame-mounted fuel tank available on 109", 132.5", 150" and 176" WB as an option. Allow 3" additional for battery box opening clearance.

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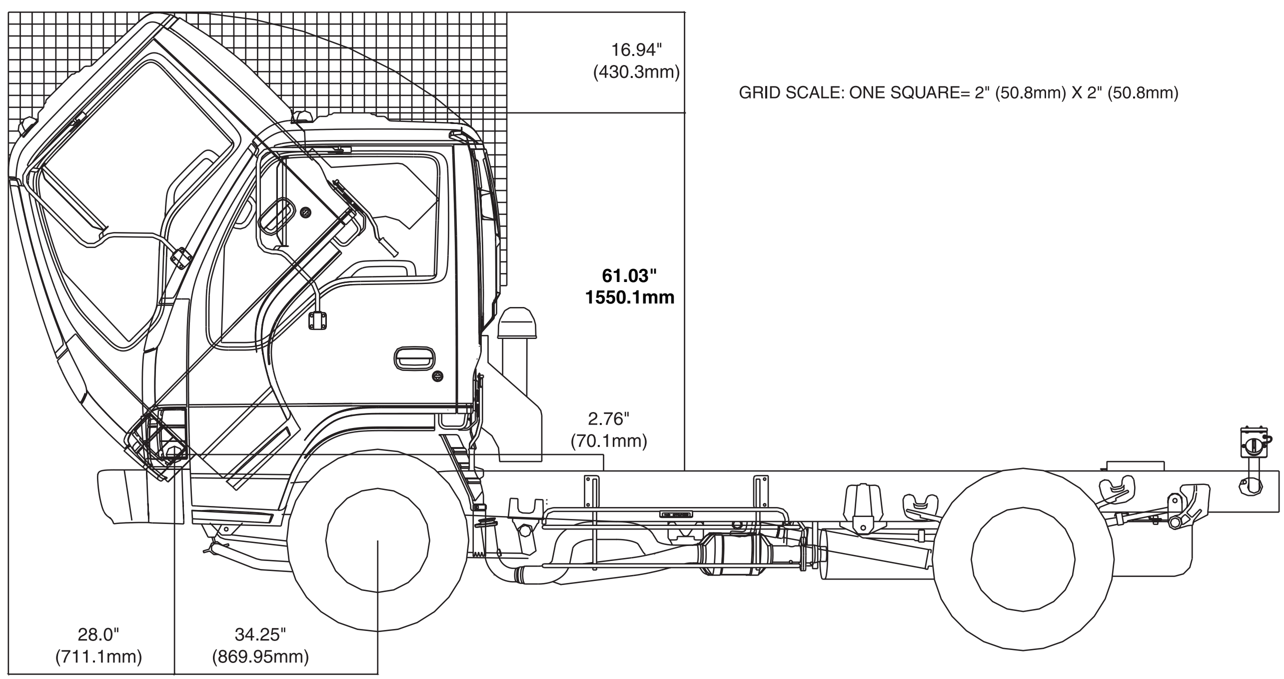
Body Builder Weight Information Chart

GVWR	Axle	Wheelbase 109 in. Man. Trans.	109 in. Auto. Trans.	132.5 in. Man. Trans.	132.5 in. Auto. Trans.	150 in. Man. Trans.	150 in. Auto. Trans.	176 in. Man. Trans.	176 in. Auto. Trans.	Unsprung Weight
17,950	Front	3,649	3,682	3,693	3,726	3,726	3,770	3,770	3,814	573
	Rear	2,282	2,304	2,304	2,326	2,348	2,359	2,370	2,381	871
	Total	5,931	5,986	5,997	6,052	6,074	6,129	6,140	6,195	1,444

Cab Tilt



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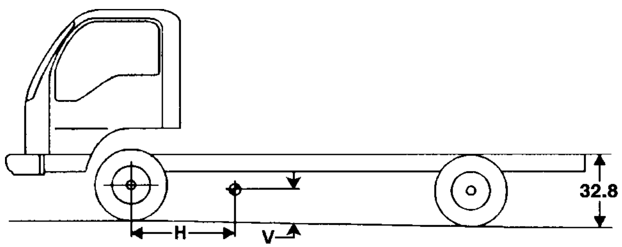
Center of Gravity

The center of gravity of the chassis cab.

GVWR	WB	V	H	
			Manual Trans.	Auto. Trans.
17,950	109	22.1	36.8	37.4
	132.5	20.6	44.7	44.8
	150	20.4	50.6	50.7
	176	18.9	59.4	59.5



V = Vertical Center of Gravity
H = Horizontal Center of Gravity

The center of gravity of the completed vehicle with a full load should not exceed 63 inches above ground level for the 17,950 lb. GVWR, and must be located horizontally between the centerlines of the front and rear axles.

NOTE: The maximum dimensions for a body installed on the NQR/W5500 are 96 inches wide (outside) by 90 inches high (inside). Any larger body applications must be approved by GM/Isuzu Application Engineering. In the West Coast call 1-562-229-5314 and in the East Coast call 1-404-257-3013.

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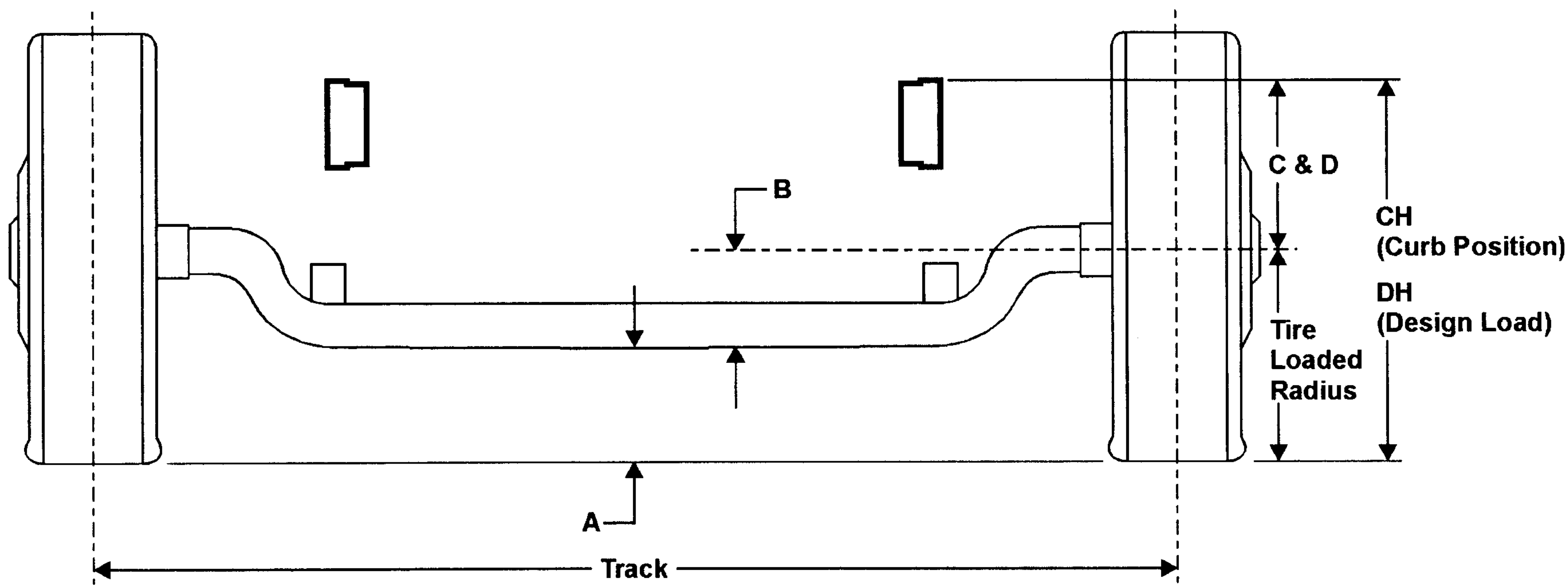
Front Axle Chart



Formulas for calculating height dimensions:

A = Tire Loaded Radius – B
C = Centerline of Axle to Top of Frame Rail at Curb Position
D = Centerline of Axle to Top of Frame Rail at Design Load
CH = C + Tire Unloaded Radius
DH = D + Tire Loaded Radius

Tire	GVWR	GAWR	A	B	C	D	CH	DH	Track	Tire Radius	
										Unload	Load
225/70R 19.5F	17,950 lbs.	6,830 lbs.	8.7	6.4	12.6	11.8	27.8	26.9	65.5	15.2	15.1

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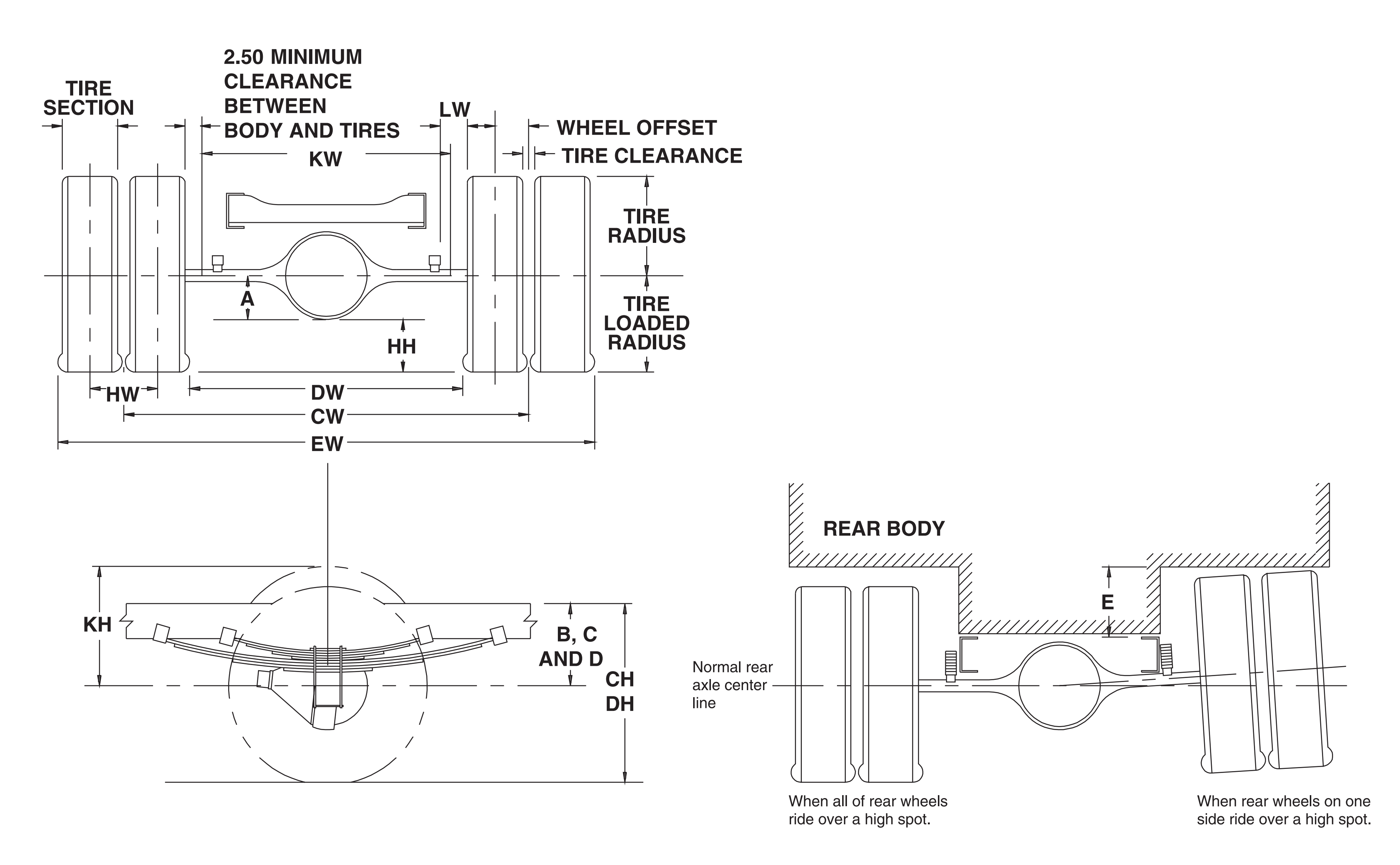
Rear Axle Chart



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Definitions			
A	Centerline of axle to bottom of axle bowl.	DH	Rear Frame Height: Vertical distance between the normal top of frame rail and the ground-line through the centerline of the rear axle at design load.
B	Centerline of axle to top of frame rail at metal-to-metal position.	DW	Minimum distance between the inner surfaces of the rear tires.
C	Centerline of axle to top of frame rail at curb position.	EW	Maximum Rear Width: Overall width of the vehicle measured at the outermost surface of the rear tires.
D	Centerline of axle to top of frame rail at design load.	HH	Rear Tire Clearance: Minimum clearance between the rear axle and the ground-line.
E	Rear Tire Clearance: Minimum clearance required for tires and chain measured from the top of the frame at the vertical centerline of the rear axle, when rear wheels on one side ride over a high spot.	HW	Dual Tire Spacing: Distance between the centerlines of the minimum distance required for tire bounce as measured from the centerline of the rear axle and the top of the rear tire when one wheel rides over a high spot.
CH	Rear Frame Height: Vertical distance between the normal top of frame rail and the ground-line through the centerline of the rear axle at curb position.	CW	Track Dual Rear Wheel Vehicles: Distance between the centerlines of the dual wheels measured at the ground-line.
	Tire Section, Tire Radius, Tire Loaded Radius, Tire Clearance		See Tire Chart for Values

Formulas for Calculating Rear Width and Height Dimensions			
CW	= Track	HH	= Tire loaded radius – A
CH	= Tire loaded radius + C	JH	= KH – B
DH	= Tire loaded radius + D	KH	= Tire radius + 3.00 inches
DW	= Track + 2 tire sections – tire clearance	KW	= DW – 5.00 inches
EW	= Track + 2 tire sections + tire clearance	LW	= 1.00-inch minimum clearance between tires and springs

NOTE: Track and overall width may vary with optional equipment.

Tire	GAWR	Track CW	A	B	C	D	E
225/70R 19.5F	12,980 lbs.	65.8	7.7	9.3	15.3	13.4	8.4

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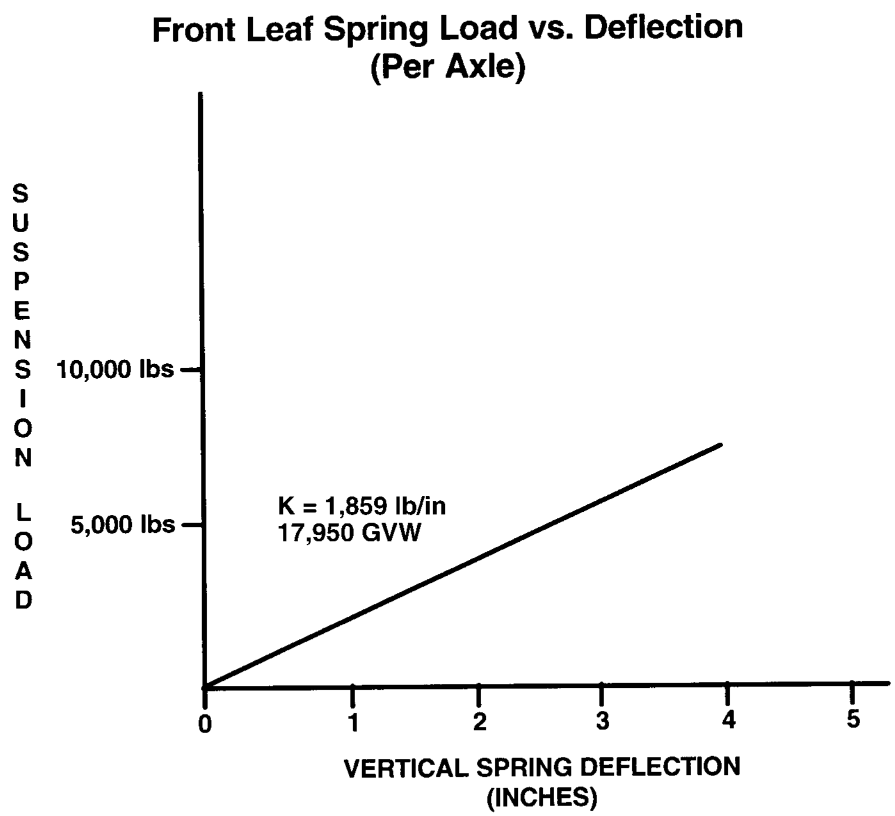
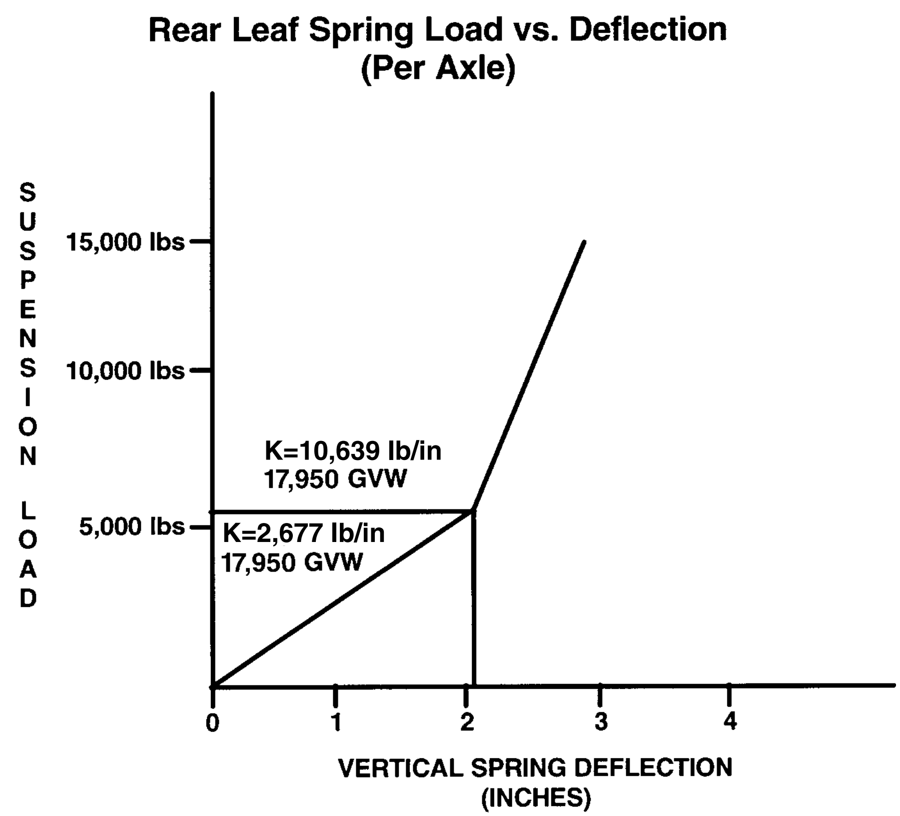
Suspension Deflection Charts





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Tire and Disc Wheel Chart

Tire

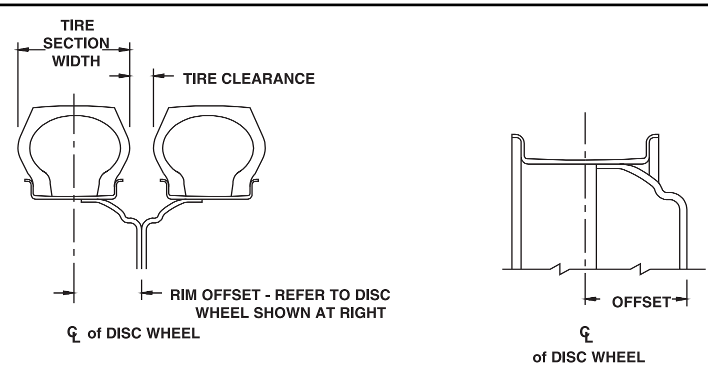
Tire Size	Tire Load Limit and Cold Inflation Pressures				Maximum Tire Load Limits		GVWR (Lb.)
	Single		Dual		Front	Rear	
	Lb.	PSI	Lb.	PSI	2 Single	4 Dual	
225/70R 19.5F	3,450	90	3,245	90	6,900	12,980	17,950

Tire Size	GVWR (Lb.)	Tire Radius				Tire Section Width	Tire Clearance	Design Rim Width
		Loaded		Unloaded				
		Front	Rear	Front	Rear			
225/70R 19.5F	17,950	14.93	14.98	16.00	16.00	8.7	1.3	6.0

Disc Wheel

Wheel Size	Bolt Holes	Bolt Circle Dia.	Ft./Rr. Nut Size*	Rear Stud Size*	Nut/Stud Torque Specs.	Inner Circle	Outside Offset	Disc Thickness	Rim Type	Material Mfg.
19.5 x 6.00 RW	6 JIS	8.75	1.6142 (41 mm) BUD HEX	0.8268 (21 mm) SQUARE	325 ft.-lb. (440 N•m)	6.46	5.0	0.35	15º DC	Steel TOPY

* O.D. Wrench Sizes



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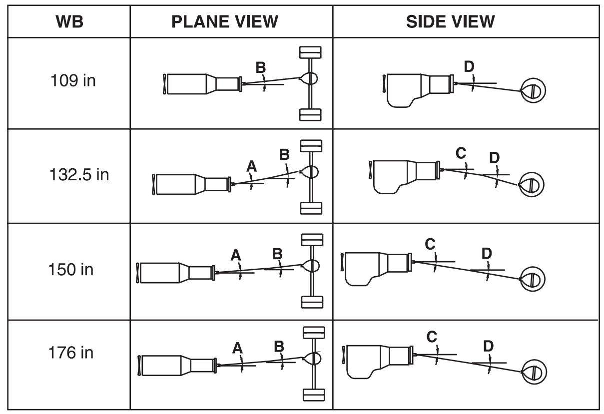
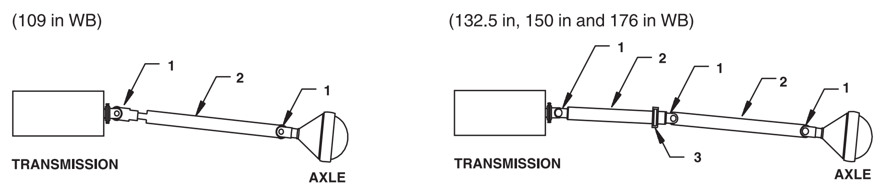
Propeller Shaft



TYPICAL INSTALLATIONS SHOWING YOKES "IN PHASE." "IN PHASE" MEANS THAT THE YOKES AT EITHER END OF A GIVEN PROPELLER SHAFT ASSEMBLY ARE IN THE SAME PLANE.



1. UNIVERSAL JOINT
2. PROPELLER SHAFT
3. CENTER CARRIER BEARING

Wheelbase	Plane View				Side View			
	A Manual Trans.	A Auto. Trans.	B Manual Trans.	B Auto. Trans.	C Manual Trans.	C Auto. Trans.	D Manual Trans.	D Auto. Trans.
109 in.	–	–	3.1°	3.0°	–	–	8.1°	7.9°
132.5 in.	0°	0°	3.1°	3.1°	2.5°	2.5°	2.5°	2.4°
150 in.	0°	0°	3.1°	3.1°	0°	0°	5.3°	5.2°
176 in.	0°	0°	2.3°	2.2°	0.3°	0.3°	2.0°	2.0°

NOTE: All driveline angles are at unloaded condition (curb position with typical cargo body).

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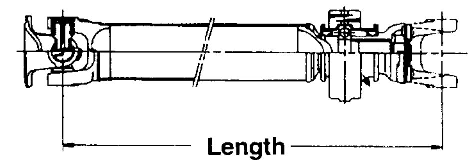
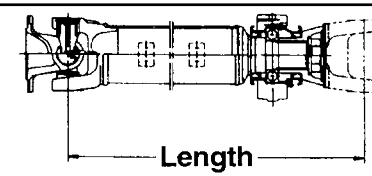
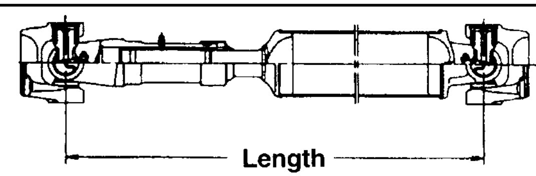
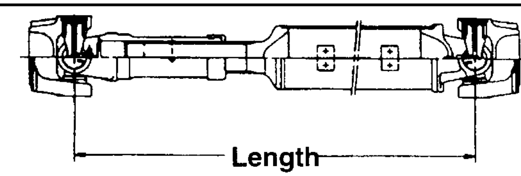
Wheelbase	109		132.5		150		176	
No. of Shafts	1		2		2		2	
Trans. Type	6 Manual Trans.	4 Auto. Trans.	6 Manual Trans.	4 Auto. Trans.	6 Manual Trans.	4 Auto. Trans.	6 Manual Trans.	4 Auto. Trans.
Shaft #1 O.D.	3.54	3.25	3.54	3.25	3.54	3.25	3.54	3.25
Thickness	0.126	0.091	0.126	0.091	0.126	0.091	0.126	0.091
Length	38.2	39.5	23.9	23.9	41.7	41.6	53.5	53.4
Type	B	B	A	A	A	A	A	A
Shaft #2 O.D.	N/A	N/A	3.54	3.25	3.54	3.25	3.54	3.25
Thickness	N/A	N/A	0.126	0.091	0.126	0.091	0.126	0.091
Length	N/A	N/A	37.6	38.9	37.6	38.4	51.6	53
Type	N/A	N/A	B	B	B	B	B	B

Type	Description	Model	Illustration
Type **A**	1st shaft in 2-piece driveline	P20	
Type **B**		P30	
Type **C**	1st shaft in 1-piece driveline 2nd shaft in 2-piece driveline	P20	
Type **D**		P30	

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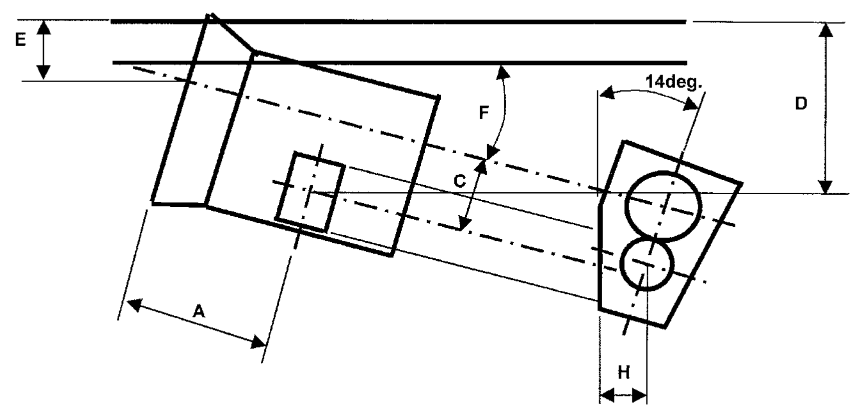
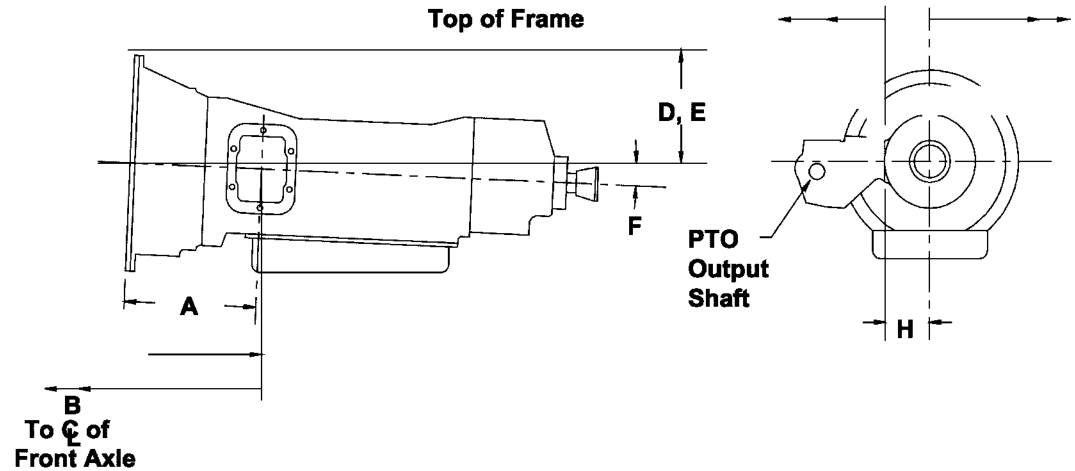
PTO Location, Drive Gear and Opening Information

Manual Transmission



Automatic Transmission



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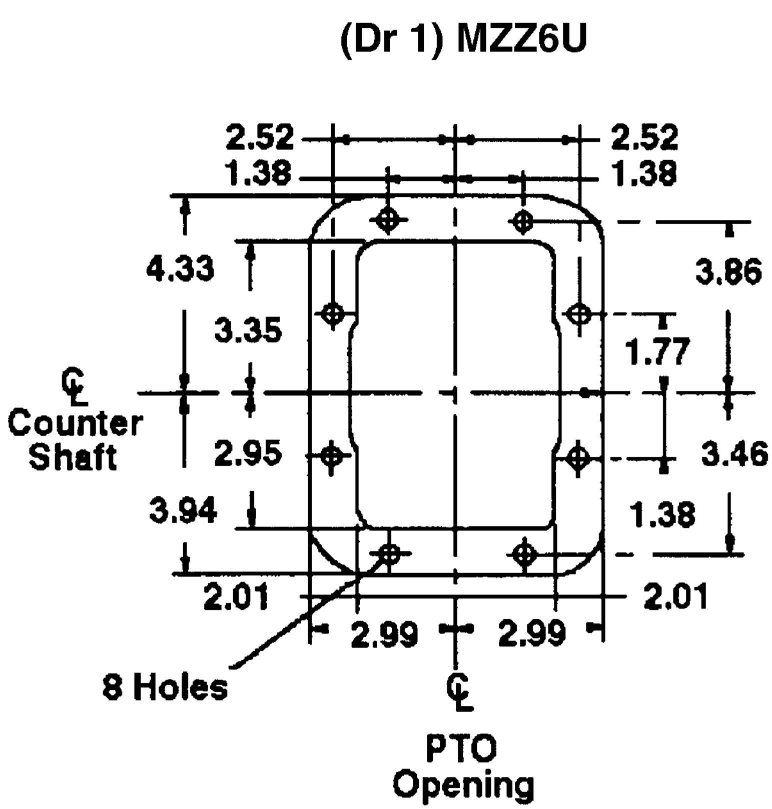
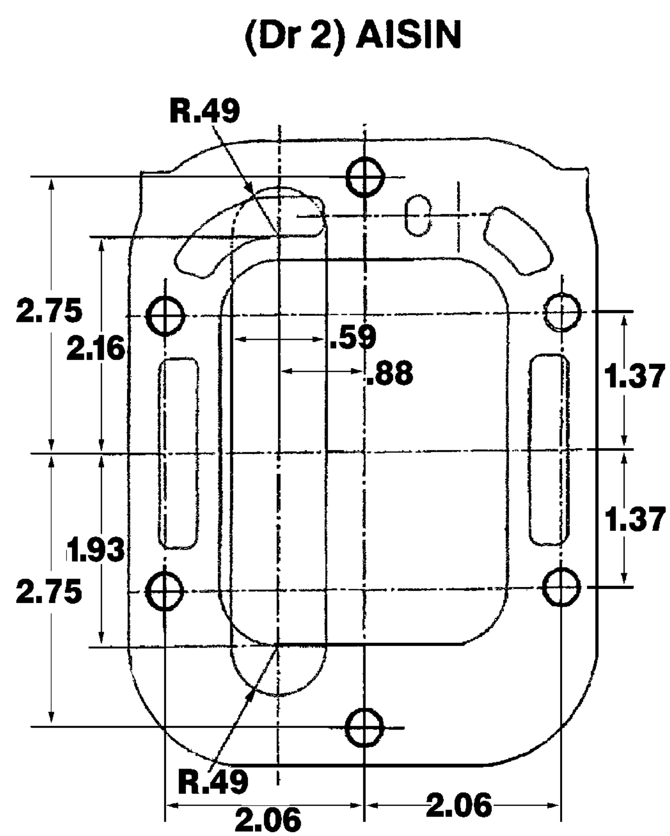
Trans.	Opening Location	Bolt Pattern	A	B	C	D	E	F	H	PTO Drive Gear Location	Ratio of PTO Drv. Gear Spd. to Eng. Spd.	No. of Teeth	Pitch	Helix Angle	Max. Output Torque
MZZ 6U	Left	(Dr 1)	11.6	37.57	5.2	12.8	7.7	2.5°	3.7 w/ 14° angle	4th Gear Trans. Countershaft	25/46 = 0.543	37	3°	25° RH	180 lbs.-ft. @ 1,000 RPM
Aisin[1)]	Left	(Dr 2)	12.6	38.59	0	8	7.5	2.5°	4.48	PTO Gear	1:1 with turbine	58	N/A	0°	134 lbs.-ft. @ 1,000 RPM

Opening Diagram





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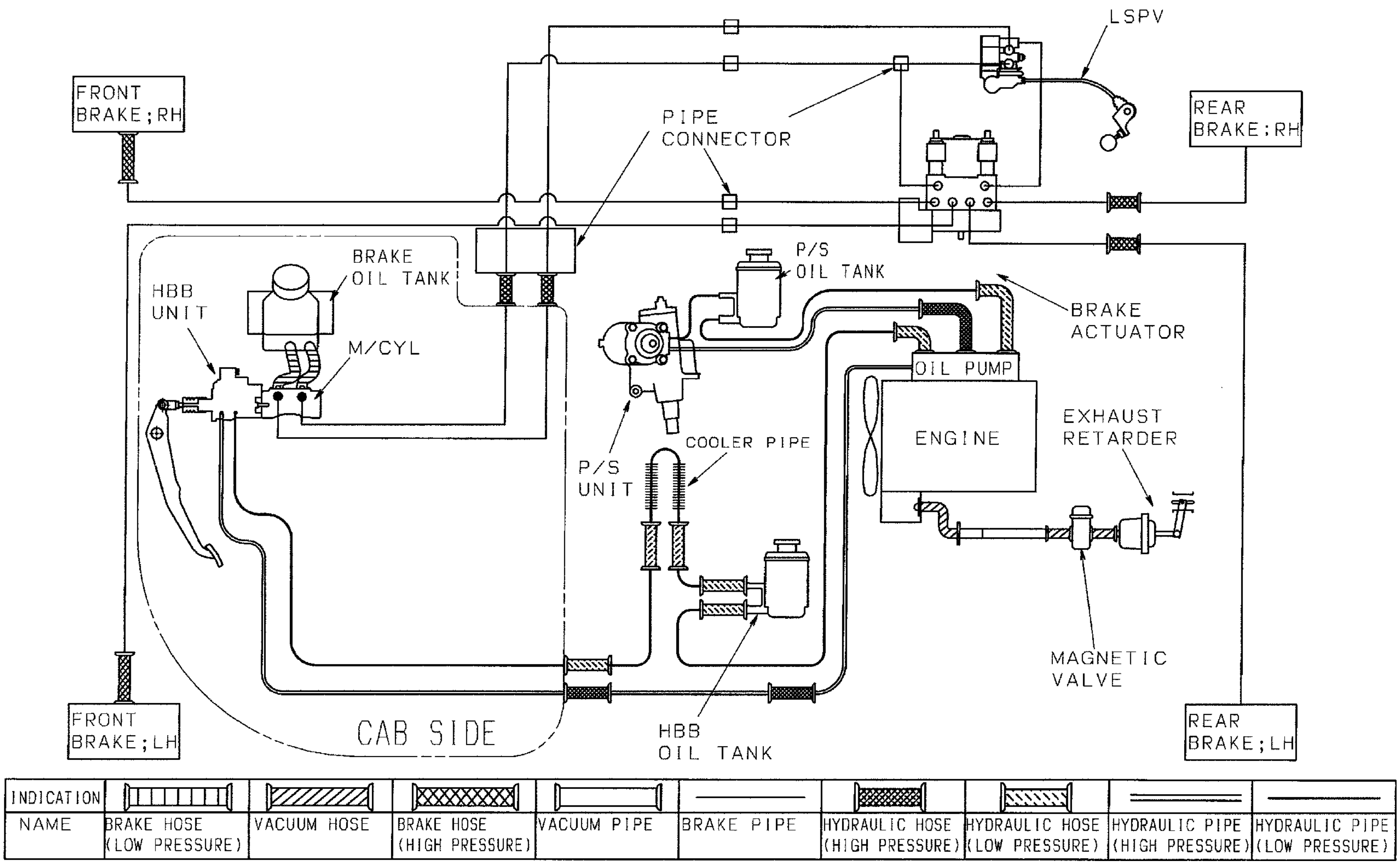
Brake System Diagram, Hydraulic Brake Booster

Please refer to introduction section of book for antilock system cautions and wheelbase modification requirements.



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Diesel Fuel Fill

Installation Instructions

1. Disconnect battery.
2. Loosen hose from the tie downs. Remove caps from plate on rail.
3. Install hoses onto the plate.
4. Extend hose out from the driver's side of the rail to body rail.
5. The filler neck must be mounted to allow the fill plate bracket to be parallel to the frame horizontal (see figure 4).
6. Cover with protector wrap and secure with tie wraps.
7. Filler hose is set for 96 inches outside width body.
8. Filler neck (dimension A) must be between 6.85 inches and 8.5 inches above frame.
9. Secure the filler plate to the bottom of the body and check for leaks.
10. Ensure that fill hose does not sag, creating an area where the fuel could pool in the fill hose.
11. Reconnect battery.

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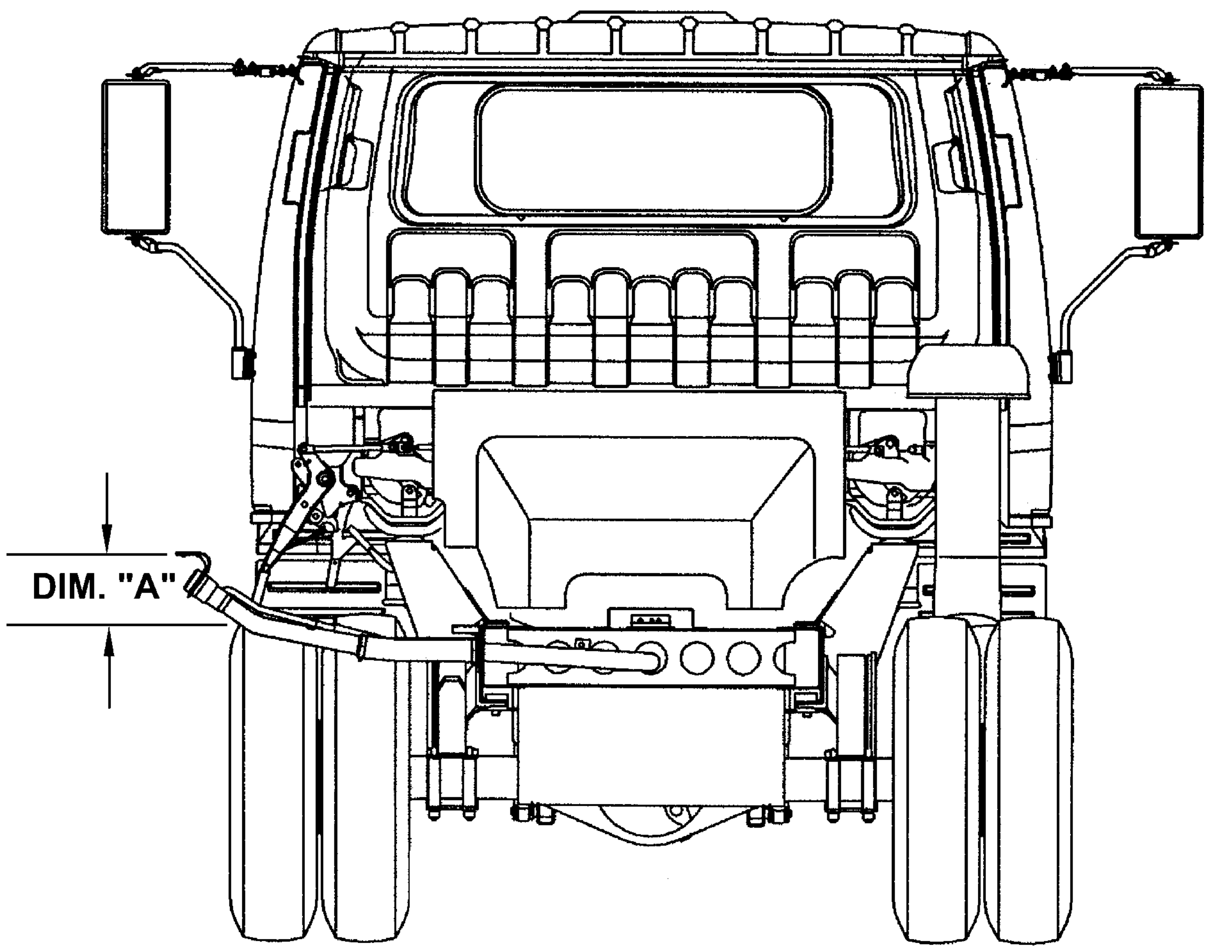
Rear View Fuel Fill



Dimension A = 6.85-8.5 inches (174-216 mm)

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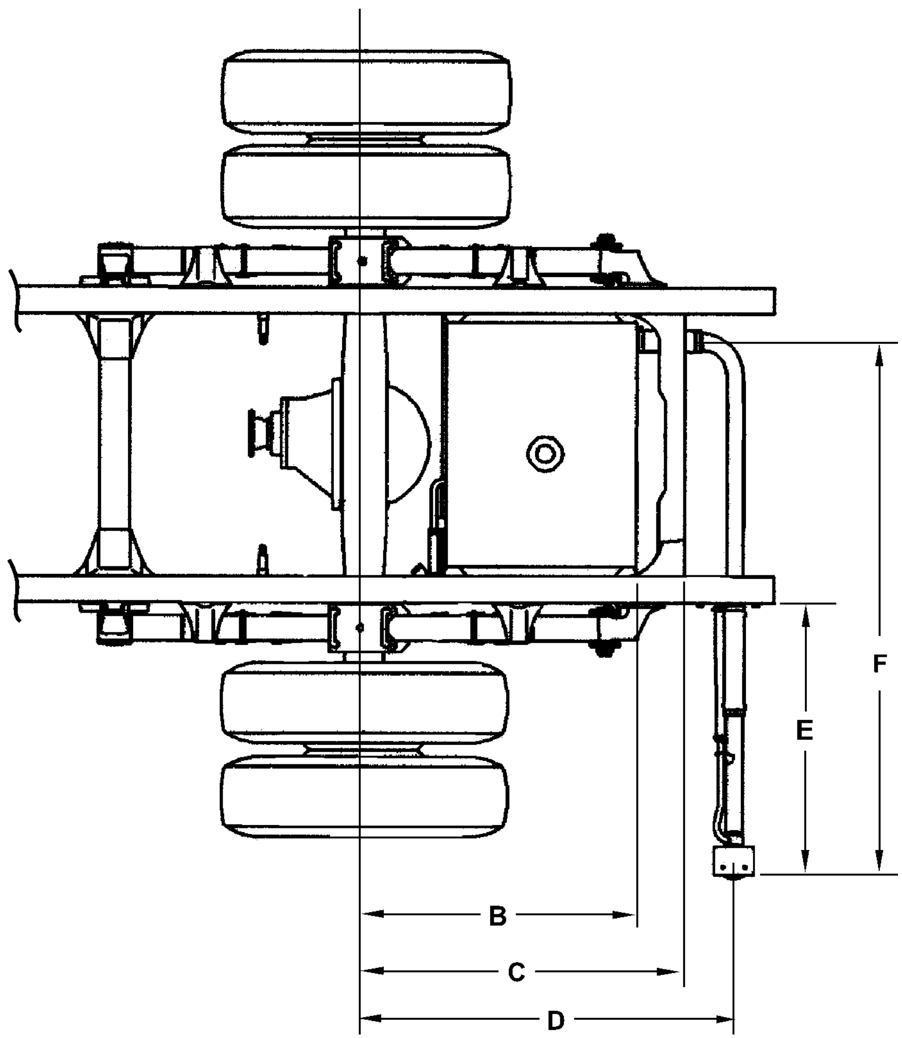
Top View Fuel Fill



Dimensions:
B = 29.75 inches (756 mm)
C = 34.00 inches (863 mm)
D = 39.29 inches (998 mm)
E = 30.86 inches (784 mm)
F = 56.60 inches (1,438 mm)

(Vehicle Specifications Index Section – NQR/W5500 Diesel – continued on next page)

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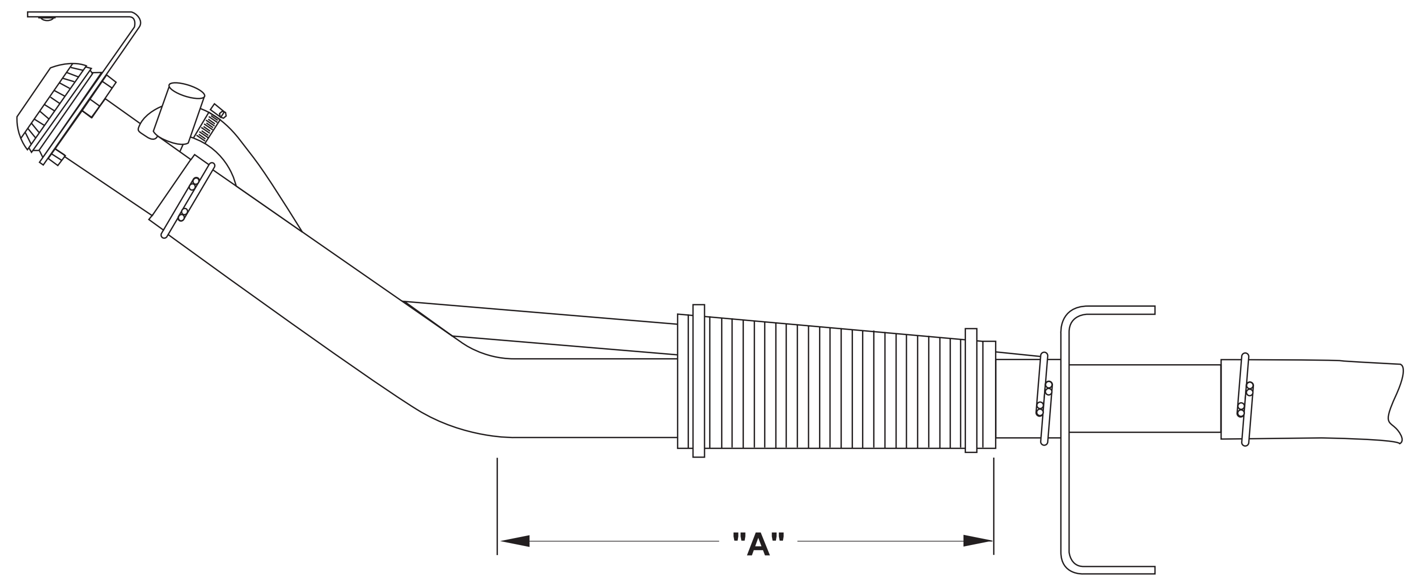
Hose Modification for Various Width Bodies



NOTE: Shorten Hose at "A" Area only.

96 remove 0 inches
90 remove 3 inches
86 remove 5 inches
80 remove 8 inches

(Vehicle Specifications Index Section – NQR/W5500 Diesel – continued on next page)

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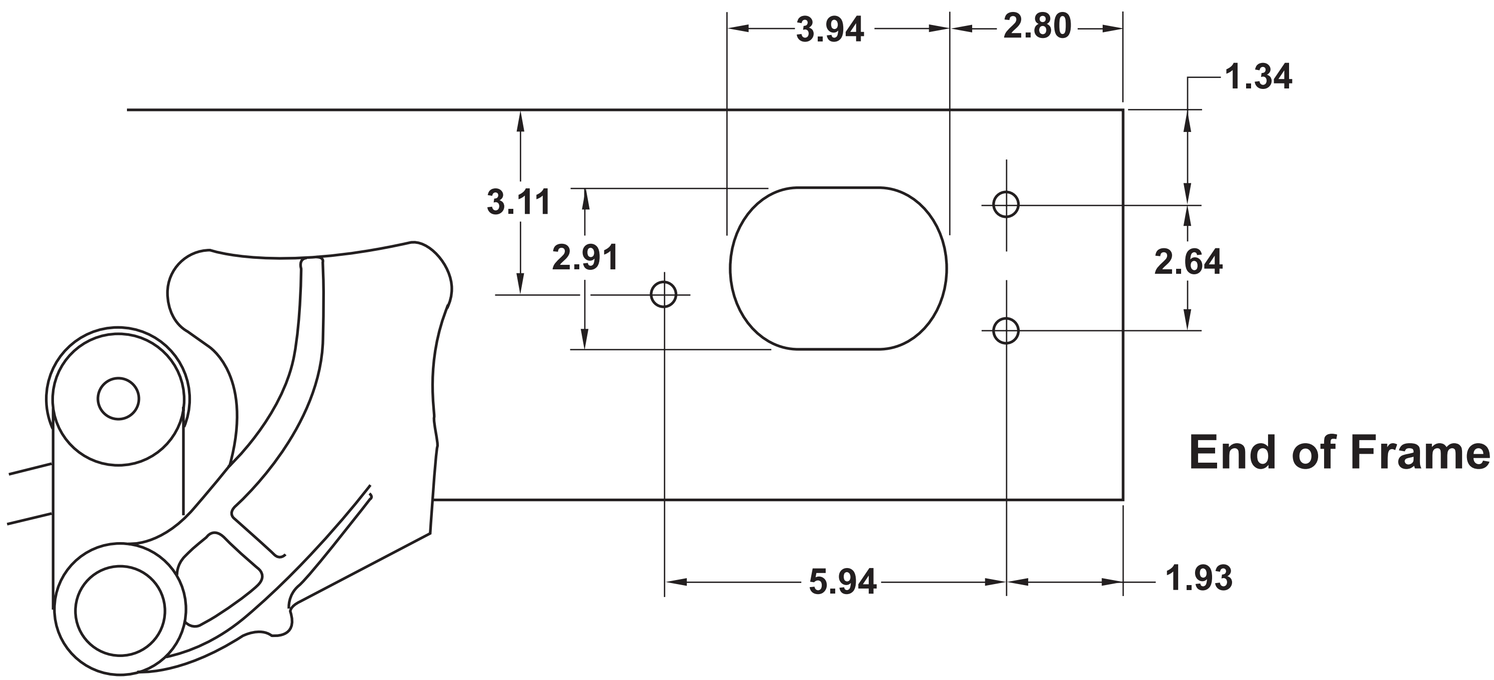
Through the Rail Fuel Fill Frame Hole



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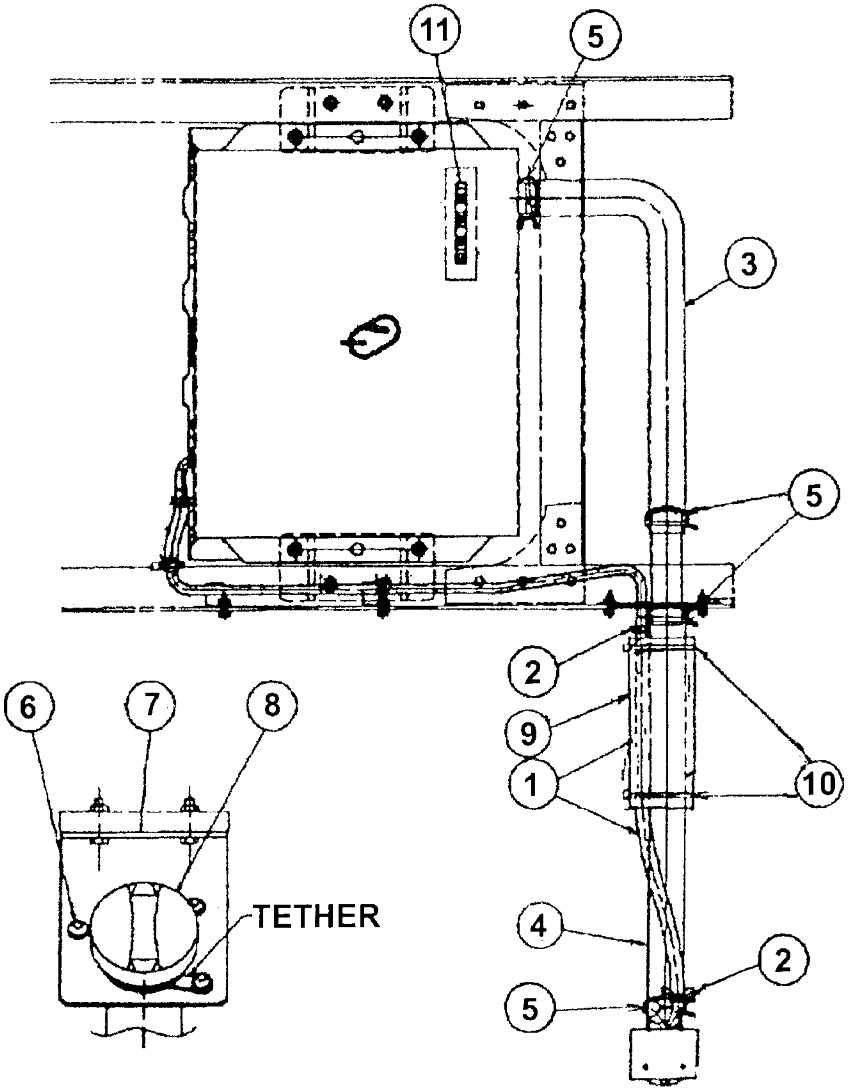
NQR/W5500 Diesel Fuel Fill Parts Illustration



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NQR/W5500 Diesel Fuel Fill Parts List

Number	Part Name	Isuzu Part Number	GM Part Number	Quantity
1	Breather Hose	894152-0030	N/A	1
2	Clip, Rubber Hose	894242-0340	94242034	2
3	Hose, Fuel Filler	897187-8750	97187875	1
4	Hose, Fuel Filler	897253-1400	97253140	1
5	Clip, Filler Hose	894435-8760	97724373	4
6	Screw, Filler Hose	894384-6460	N/A	3
7	Bracket, Filler Neck	897116-621Y	97116621	1
8	Cap, Filler	897218-7020	N/A	1
9	Protector	897114-0630	97114063	1
10	Clip	109707-1071	94062296	2
11	Caution Plate	897135-6050	97135605	1

NPR HD/W4500, NQR/W5500 Crew Cab Diesel

Specifications

Model	NPR HD/W4500 Crew Cab Diesel	NQR/W5500 Crew Cab Diesel
GVWR	14,500 lbs.	17,950 lbs.
WB	150 in., 176 in.	
Engine	Isuzu 4-cylinder, in-line 4-cycle, turbocharged, intercooled, direct injection diesel.	
Model/Displacement	4HK1-TC/317 CID (5.19 liters)	
HP (Gross)	190 HP @ 2,600 RPM	
Torque (Gross)	387 lbs.-ft. torque @ 1,500 RPM	
Equipment	Dry element air cleaner with vertical intake; 2 rows 569 in.^{2} radiator; 7-blade 20.1 in. diameter fan with viscous drive. Cold weather starting device and an oil cooler. Engine oil level check switch and light. Engine cruise control and idle up function.	
Transmission*	Aisin 450-43 LE 4-speed overdrive automatic transmission with lock-up capability in 2nd, 3rd and 4th. PTO capability.	
Steering	Integral power steering 18.8-20.9:1 ratio. Tilt & telescoping steering column.	Integral power steering 18.8-20.9:1 ratio. Tilt & telescoping steering column.
Front Axle	Reverse Elliot "I"-Beam rated at 6,830 lbs.	
Suspension	Semi-elliptical steel alloy tapered leaf springs with stabilizer bar and shock absorbers.	Semi-elliptical steel alloy leaf springs with stabilizer bar and shock absorbers.
GAWR	5,360 lbs.	6,830 lbs.
Rear Axle	Full-floating single-speed with hypoid gearing rated at 11,020 lbs.	Full-floating single-speed with hypoid gearing rated at 14,550 lbs.
Suspension	Semi-elliptical steel alloy multi-leaf springs and shock absorbers.	Semi-elliptical steel alloy leaf springs and shock absorbers.
GAWR	9,880 lbs.	12,980 lbs.
Wheels	16 x 6.0k 6-hole disc wheels, painted white.	19.5 x 6.00 6-hole disc wheels, painted white.
Tires	215/85R 16E (10 pr) tubeless steel-belted radials, all-season front/rear.	225/70R 19.5F (12 pr) tubeless steel-belted radials, all-season front/rear.
Brakes	Dual-circuit, vacuum-assisted hydraulic service brakes with load-sensing proportioning valve in rear brake circuit and a metering valve between the master cylinder and 4-way joint on the front brake lines.	Dual-circuit, power-assisted hydraulic service brakes with load sensing proportioning valve in rear brake circuit.
	Disc front and self-adjusting outboard mounted rear drum. The parking brake is a mechanical, cable-actuated, internal expanding drum type, transmission mounted. The exhaust brake is standard and is vacuum-operated. Four channel antilock brake system.	

NOTE: These selected specifications are subject to change without notice. *All Transmissions have a PTO gear in all wheelbases.

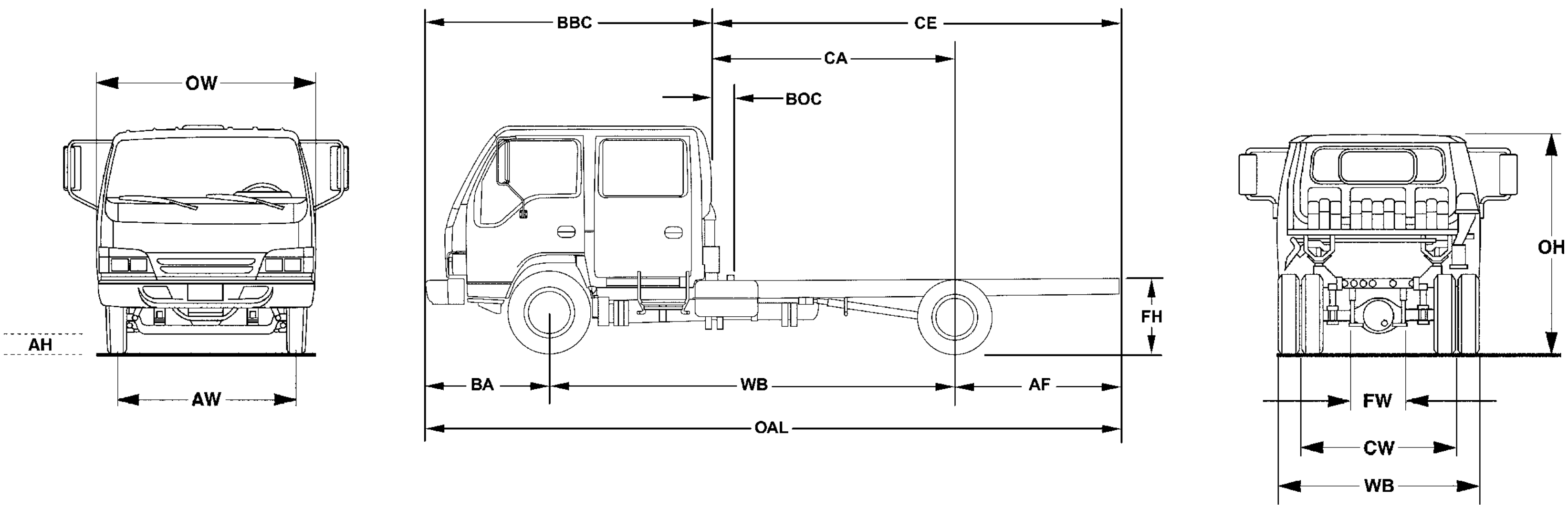
(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Diesel – continued on next page)

(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Diesel – continued from previous page)

Model	NPR HD/W4500 Crew Cab Diesel	NQR/W5500 Crew Cab Diesel
Fuel Tank	30-gallon rectangular steel fuel tank mounted in frame rail behind rear axle. Heated fuel/water separator mounted on rail with dash mounted indicator light.	
Frame	Ladder type channel section straight frame rail 33.5 in. wide through the total length of the frame. Yield strength 44,000 psi section modulus 11.89 in.^{3}, RBM 523,160 lbs.-ft./in. per rail.	
Cab	All-steel, 7-passenger, low cab forward, BBC 108.6 in.	
Equipment	Jersey knit covered high back driver's seat with two-occupant passenger seat. Four passenger rear bench seat. Two-way roof ventilator, dual cab mounted exterior mirrors. Tilt and telescoping steering column. Tinted glass.	
Electrical	12-volt, negative ground, dual Delco maintenance-free batteries, 750 CCA each, 110-amp alternator with integral regulator.	
Options	Air Conditioning, AM/FM CD stereo radio, PTO, engine block heater, engine oil pan heater, 6" stainless steel convex mirrors. Front power window and front/rear power door locks. 33-gallon fuel tank mounted on right-hand rail, spare wheel. Auxiliary transmission cooler, engine shutdown system, engine shutdown system with hourmeter.	
	Rear cab heater and wheel simulators.	Rear cab heater and wheel simulators.

NOTE: These selected specifications are subject to change without notice.

Vehicle Weights, Dimensions and Ratings



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NPR HD/W4500 Variable Chassis Dimensions					
Unit	WB	CA*	CE*	OAL	AF
Inch	150.0	88.9	132.0	240.5	43.1
Inch	176.0	114.9	158.0	266.5	43.1

* Effective CA & CE are CA or CE less BOC.

NPR HD/W4500 Dimension Constants					
Code	Inches	Code	Inches	Code	Inches
AH	8.6	BW	83.3	FH	32.0
AW	65.6	CW	65.0		
BA	47.4	FW	33.5		
BBC	108.6	OH	88.9		
BOC	4.2	OW	78.5		

NPR HD/W4500 In-Frame Tank 14,500-lb. GVWR Automatic Transmission Model Chassis Cab and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NG3	150.0 in.	lb.	3,924	2,150	6,074	8,426
NG4	176.0 in.	lb.	4,002	2,138	6,140	8,360

NPR HD/W4500 Side-Mounted Tank 14,500-lb. GVWR Automatic Transmission Model Chassis Cab and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NG3	150.0 in.	lb.	4,112	1,885	5,997	8,503
NG4	176.0 in.	lb.	4,189	1,874	6,063	8,437

(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Diesel – continued on next page)

(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Diesel – continued from previous page)

NQR/W5500 Variable Chassis Dimensions					
Unit	WB	CA*	CE*	OAL	AF
Inch	150.0	88.9	132.0	240.5	43.1
Inch	176.0	114.9	158.0	266.5	43.1

* Effective CA & CE are CA or CE less BOC.

NQR/W5500 Dimension Constants					
Code	Inches	Code	Inches	Code	Inches
AH	8.6	BW	83.3	FH	32.8
AW	65.6	CW	65.0		
BA	47.4	FW	33.5		
BBC	108.6	OH	88.9		
BOC	4.2	OW	78.5		

NQR/W5500 In-Frame Tank 17,950-lb. GVWR Automatic Transmission Model Chassis Cab and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NS3	150.0 in.	lb.	4,112	2,546	6,658	11,292
NS4	176.0 in.	lb.	4,189	2,535	6,724	11,226

NQR/W5500 Side-Mounted Tank 17,950-lb. GVWR Automatic Transmission Model Chassis Cab and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NS3	150.0 in.	lb.	4,299	2,282	6,581	11,369
NS4	176.0 in.	lb.	4,376	2,271	6,647	11,303

(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Diesel – continued on next page)

(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Diesel – continued from previous page)

Vehicle Weight Limits:

	NPR HD/W4500	NQR/W5500
GVWR Designed Maximum	14,500 lbs.	17,950 lbs.
GAWR, Front	5,360 lbs.	6,830 lbs.
GAWR, Rear	9,880 lbs.	12,980 lbs.

Technical Notes:

Chassis Curb Weight includes standard equipment and fuel. Does not include driver, passenger, payload, body or special equipment.

Maximum Payload Weight is the allowed maximum for equipment, body, payload, driver and passengers and is calculated by subtracting chassis curb weight from the GVWR.

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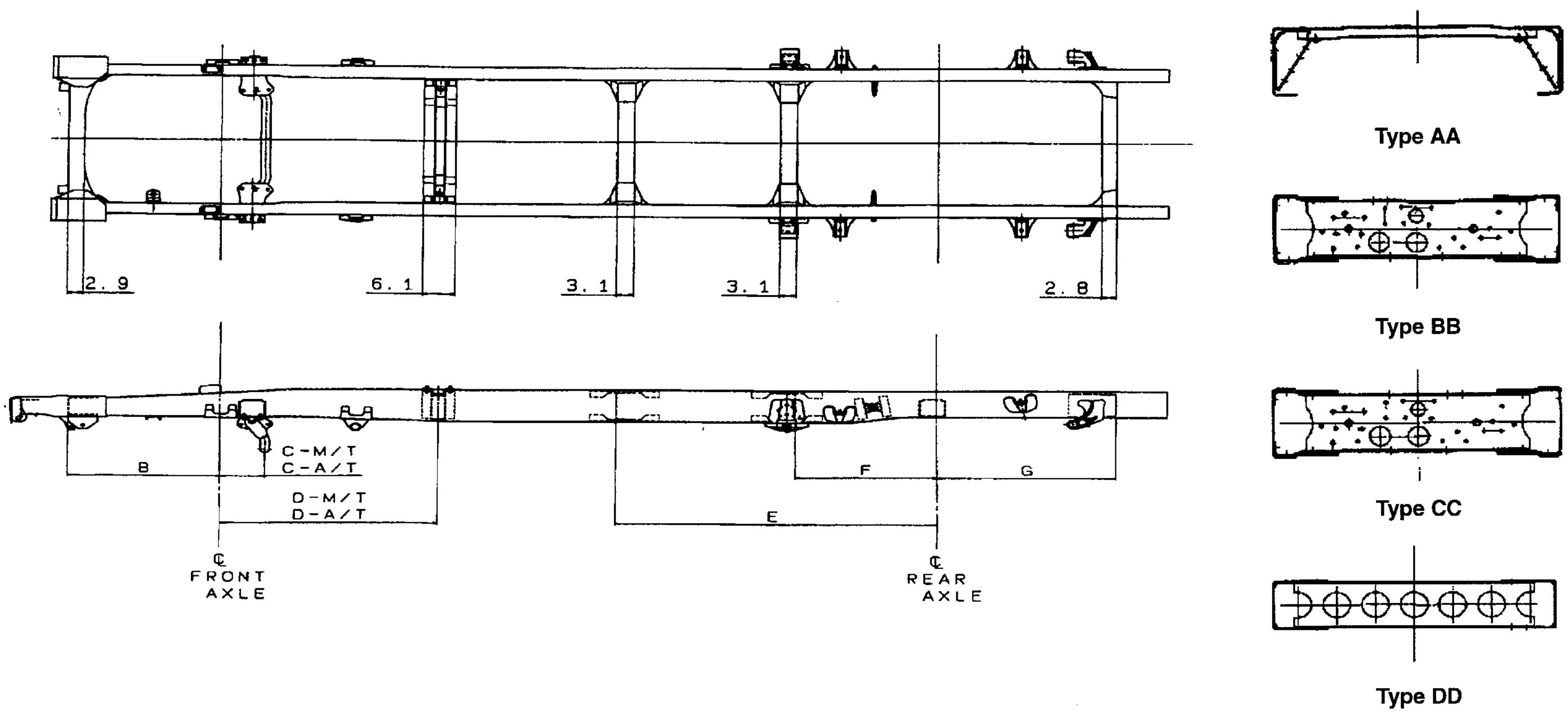
Frame and Crossmember Specifications



Wheelbase	Frame Thick	Crossmember Type/Location								
		A	B	C-M/T	C-A/T	D-M/T	D-A/T	E	F	G
150.0	0.24		28.3	8.4	8.4	AA 44.7	AA 44.7	BB 59.4	CC 26.0	DD 33.0
176.0	0.24		28.3	8.4	8.4	AA 44.7	AA 44.7	BB 59.4	CC 26.0	DD 33.0

M/T = Manual Transmission A/T = Automatic Transmission

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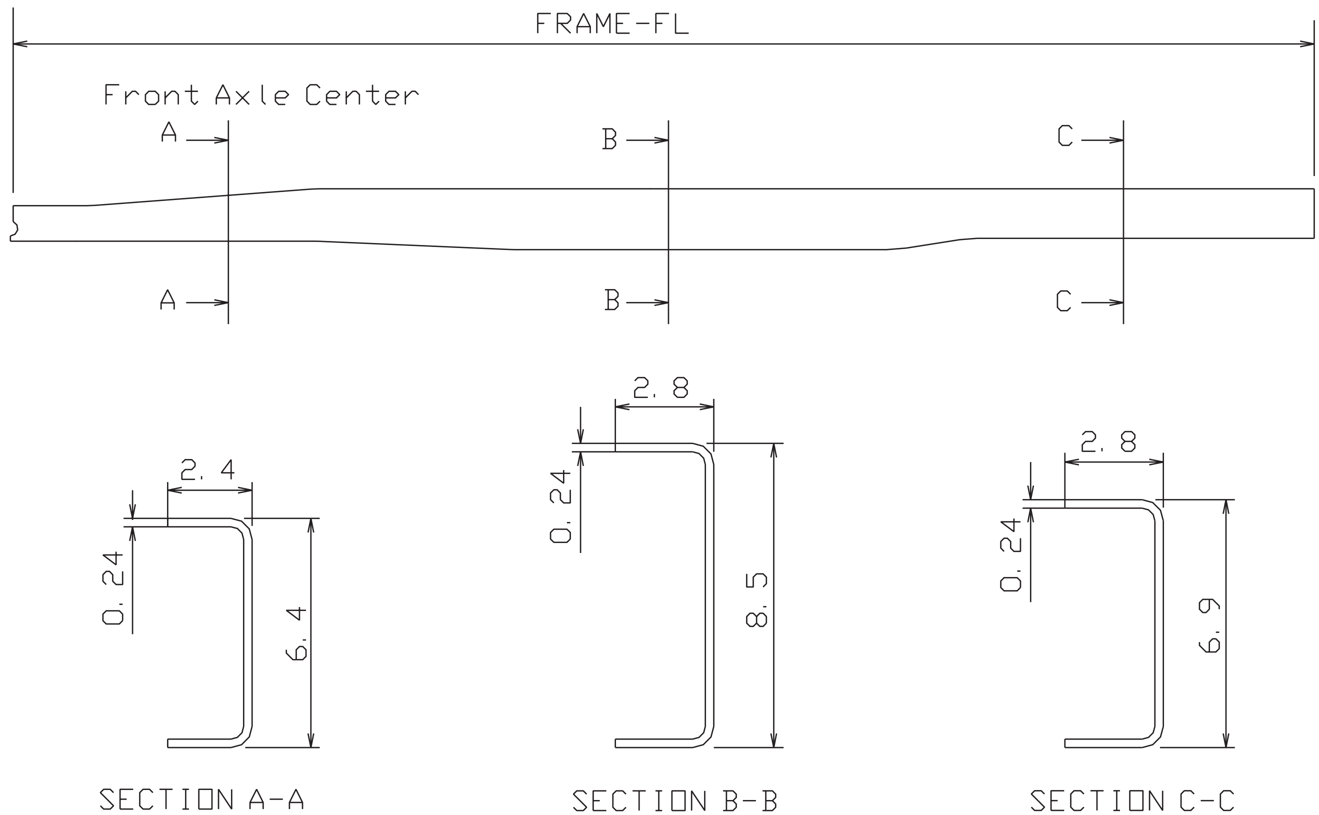
Frame Chart



Wheelbase	Frame FL	Frame Thickness
150.0	227.4	0.24 + 0.18
176.0	253.4	0.24 + 0.18

Note: On this model chassis, GMICT will require that the body installed on the chassis have an understructure manufactured with any of the following structural steel “C” channels: 4" x 1-5/8", 7.5 lb./ft.; 5" x 1-3/4", 6, 7 or 9.0 lb./ft.; 6" x 2", 8.2, 10.5 or 13 lb./ft.

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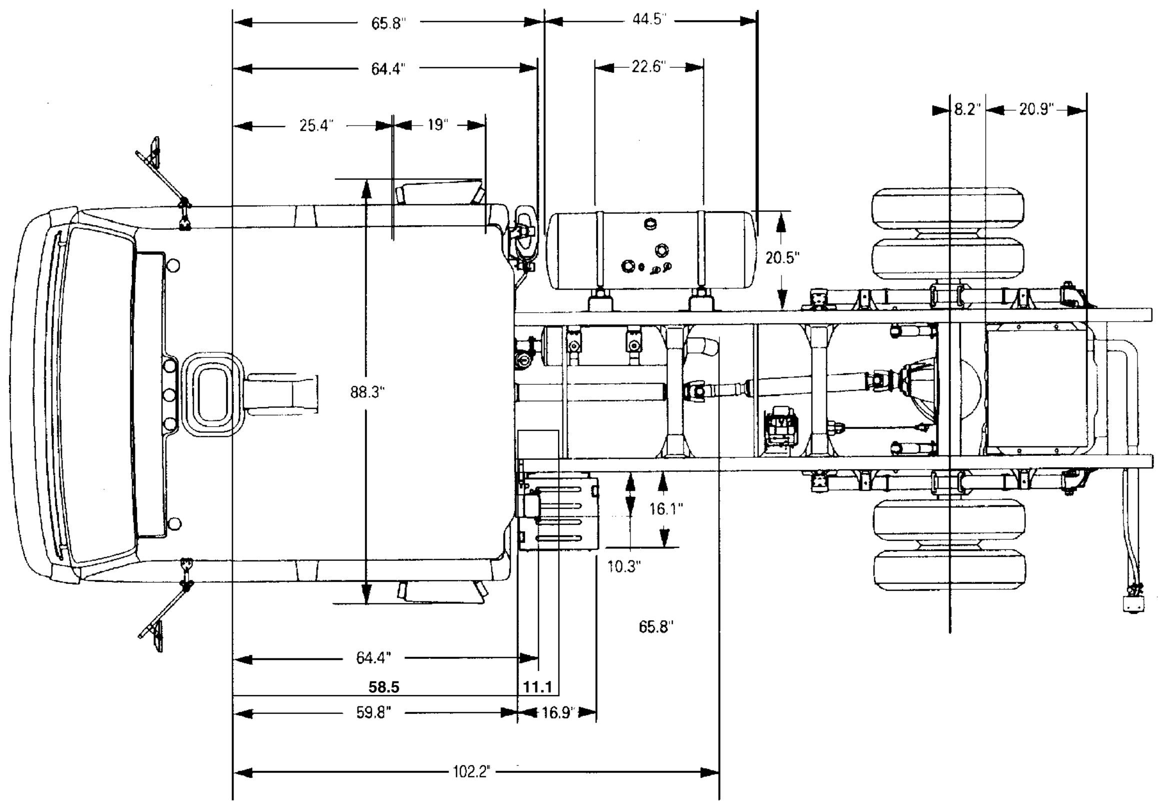
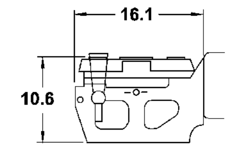
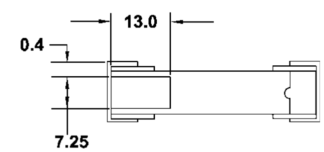
Auxiliary Views

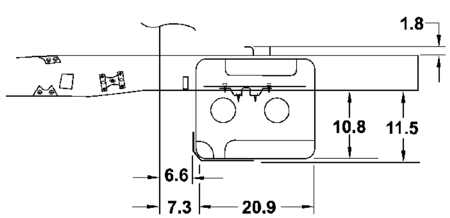




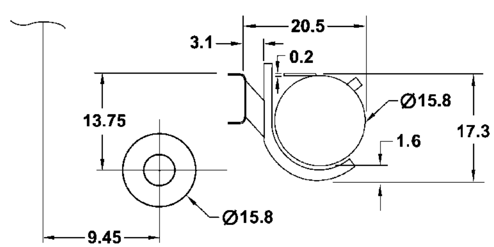
Rear View Battery Box



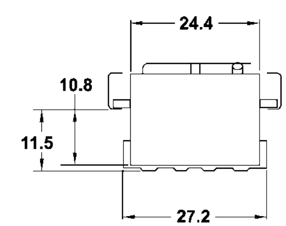
Rear View ABS Controller



Side View In Frame Tank



Rear View Fuel Tank



Rear View In Frame Tank

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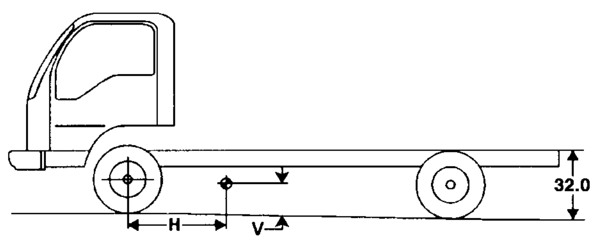
Body Builder Weight Information Chart

NPR/W4500 Series

GVWR	Axle	Wheelbase		Unsprung Weight
		150 in. – Automatic Trans.	176 in. – Automatic Trans.	
14,500	Front	3,924	4,002	573
	Rear	2,150	2,138	904
	Total	6,074	6,140	1,477

Center of Gravity

GVWR	WB	V	H
			Automatic Transmission
14,500	150	21.4	52.8
	176	20.0	60.9



V = Vertical Center of Gravity
H = Horizontal Center of Gravity

The center of gravity of the completed vehicle with a full load should not exceed **58** inches above ground level for the **14,500** lb. GVWR, and must be located horizontally between the centerlines of the front and rear axles.

NOTE: The maximum dimensions for a body installed on the NQR/W5500 are 96 inches wide (outside) by 90 inches high (inside). Any larger body applications must be approved by GM/Isuzu Application Engineering. In the West Coast call 1-562-229-5314 and in the East Coast call 1-404-257-3013.

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(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Diesel – continued from previous page)

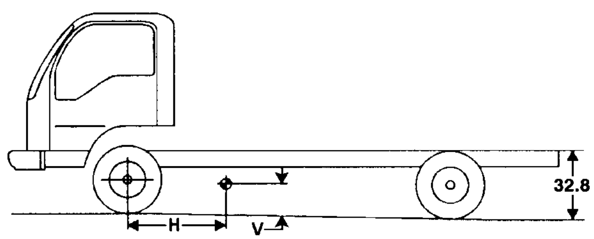
NQR/W5500 Series

GVWR	Axle	Wheelbase		Unsprung Weight
		150 in. – Automatic Trans.	176 in. – Automatic Trans.	
17,950	Front	4,112	4,189	705
	Rear	2,546	2,535	1,366
	Total	6,658	6,724	2,071

Center of Gravity

The center of gravity of the chassis-cab.

GVWR	WB	V	H
			Automatic Transmission
17,950	150	21.3	57.0
	176	19.9	66.0



V = Vertical Center of Gravity
H = Horizontal Center of Gravity

The center of gravity of the completed vehicle with a full load should not exceed 63 inches above ground level for the **17,950** lb. GVWR, and must be located horizontally between the centerlines of the front and rear axles.

NOTE: The maximum dimensions for a body installed on the NQR/W5500 are 96 inches wide (outside) by 90 inches high (inside). Any larger body applications must be approved by GM/Isuzu Application Engineering. In the West Coast call 1-562-229-5314 and in the East Coast call 1-404-257-3013.

(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Diesel – continued on next page)

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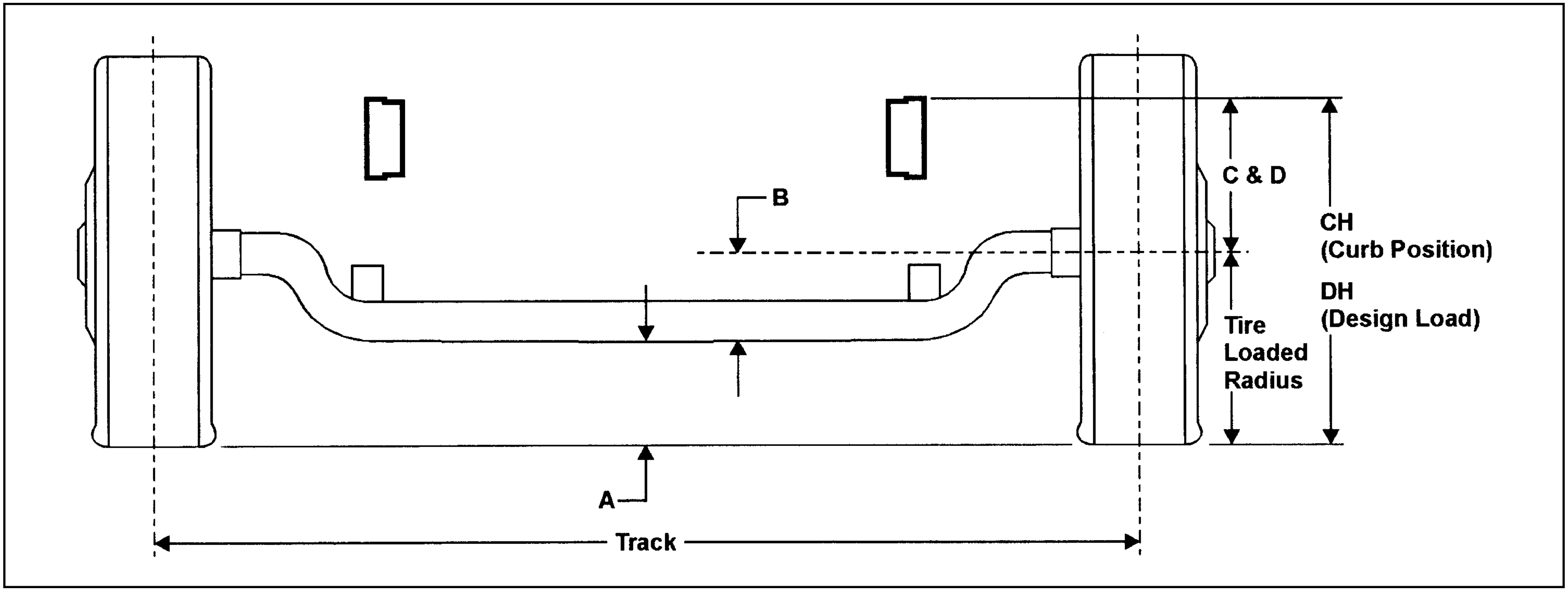
Front Axle Chart NPR HD/W4500



Formulas for calculating height dimensions:

A = Tire Loaded Radius – B
C = Centerline of Axle to Top of Frame Rail at Curb Position
D = Centerline of Axle to Top of Frame Rail at Design Load
CH = C + Tire Unloaded Radius
DH = D + Tire Loaded Radius

Tire	GVWR	GAWR	A	B	C	D	CH	DH	Track	Tire Radius	
										Unload	Load
215/85R 16E	14,500 lbs.	5,360 lbs.	8	6.4	12.6	12.1	27.1	26.5	65.5	14.5	14.4

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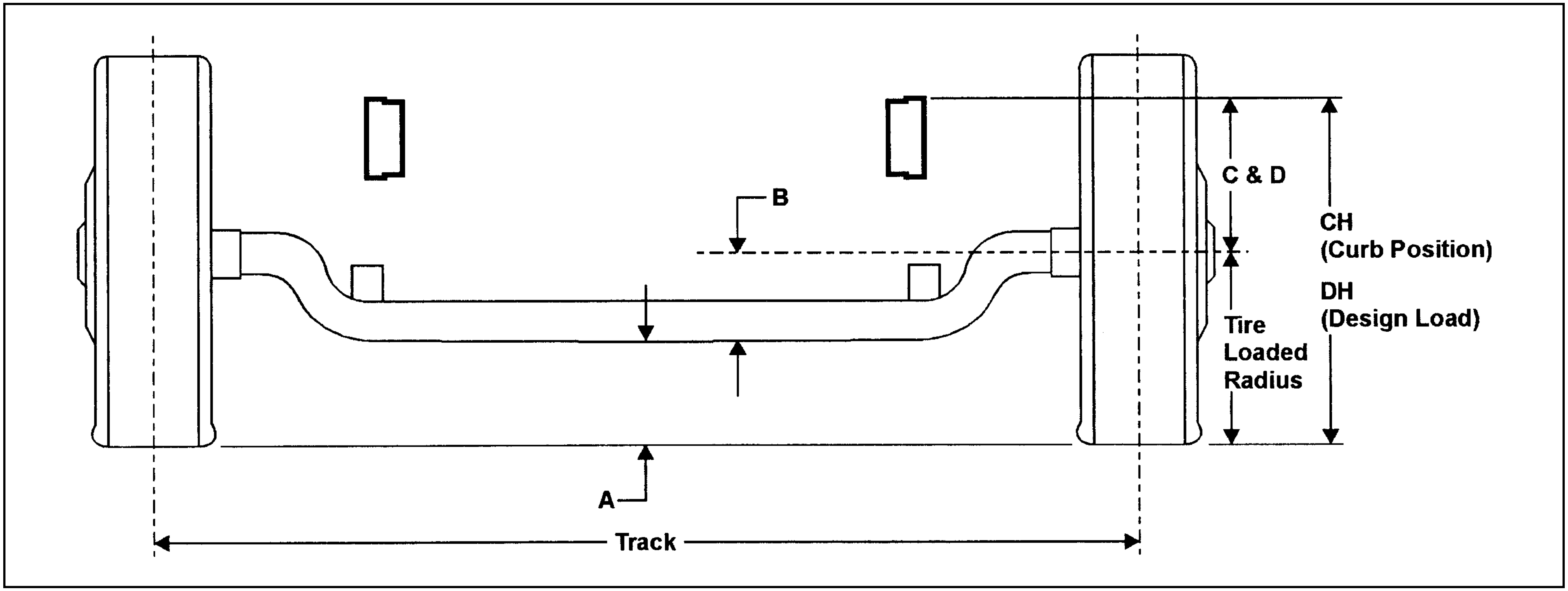
Front Axle Chart NQR/W5500



Formulas for calculating height dimensions:

A	=	Tire Loaded Radius – B
C	=	Centerline of Axle to Top of Frame Rail at Curb Position
D	=	Centerline of Axle to Top of Frame Rail at Design Load
CH	=	C + Tire Unloaded Radius
DH	=	D + Tire Loaded Radius

Tire	GVWR	GAWR	A	B	C	D	CH	DH	Track	Tire Radius	
										Unload	Load
225/70R 19.5F	17,950 lbs.	6,830 lbs.	8.7	6.4	12.6	11.8	27.8	26.9	65.5	14.5	15.1

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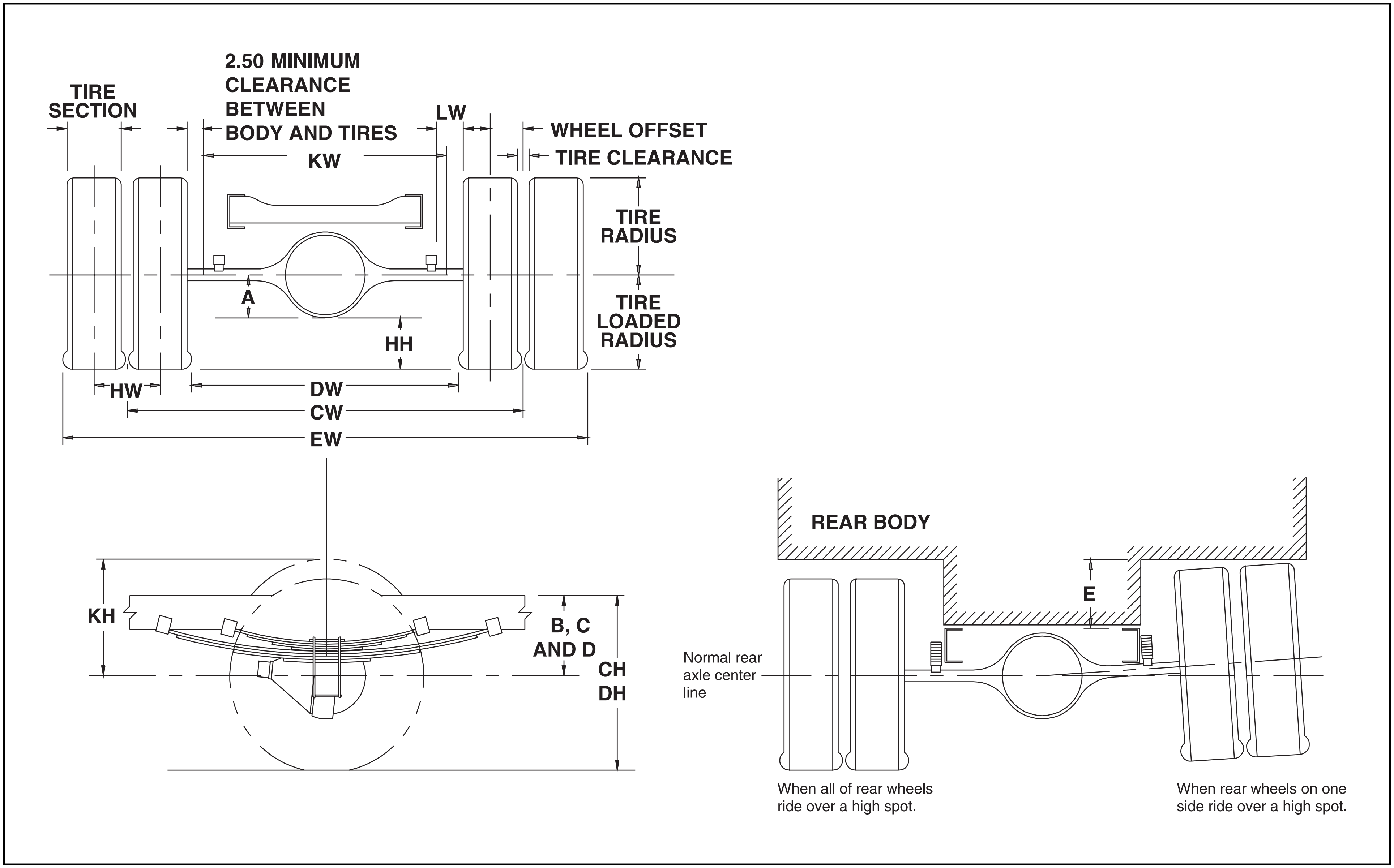
Rear Axle Chart NPR HD/W4500



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Definitions			
A	Centerline of axle to bottom of axle bowl.	DH	Rear Frame Height: Vertical distance between the normal top of frame rail and the ground-line through the centerline of the rear axle at design load.
B	Centerline of axle to top of frame rail at metal-to-metal position.	DW	Minimum distance between the inner surfaces of the rear tires.
C	Centerline of axle to top of frame rail at curb position.	EW	Maximum Rear Width: Overall width of the vehicle measured at the outermost surface of the rear tires.
D	Centerline of axle to top of frame rail at design load.	HH	Rear Tire Clearance: Minimum clearance between the rear axle and the ground-line.
E	Rear Tire Clearance: Minimum clearance required for tires and chain measured from the top of the frame at the vertical centerline of the rear axle, when rear wheels on one side ride over a high spot.	HW	Dual Tire Spacing: Distance between the centerlines of the minimum distance required for tire bounce as measured from the centerline of the rear axle and the top of the rear tire when one wheel rides over a high spot.
CH	Rear Frame Height: Vertical distance between the normal top of frame rail and the ground-line through the centerline of the rear axle at curb position.	CW	Track Dual Rear Wheel Vehicles: Distance between the centerlines of the dual wheels measured at the ground-line.
	Tire Section, Tire Radius, Tire Loaded Radius, Tire Clearance		See Tire Chart for Values

Formulas for Calculating Rear Width and Height Dimensions			
CW	= Track	HH	= Tire loaded radius – A
CH	= Tire loaded radius + C	JH	= KH – B
DH	= Tire loaded radius + D	KH	= Tire radius + 3.00 inches
DW	= Track + 2 tire sections – tire clearance	KW	= DW – 5.00 inches
EW	= Track + 2 tire sections + tire clearance	LW	= 1.00-inch minimum clearance between tires and springs

NOTE: Track and overall width may vary with optional equipment.

Tire	GAWR	Track CW	A	B	C	D	E
215/85R 16E	9,880 lbs.	65.0	6.5	9.1	15	12.8	7.8

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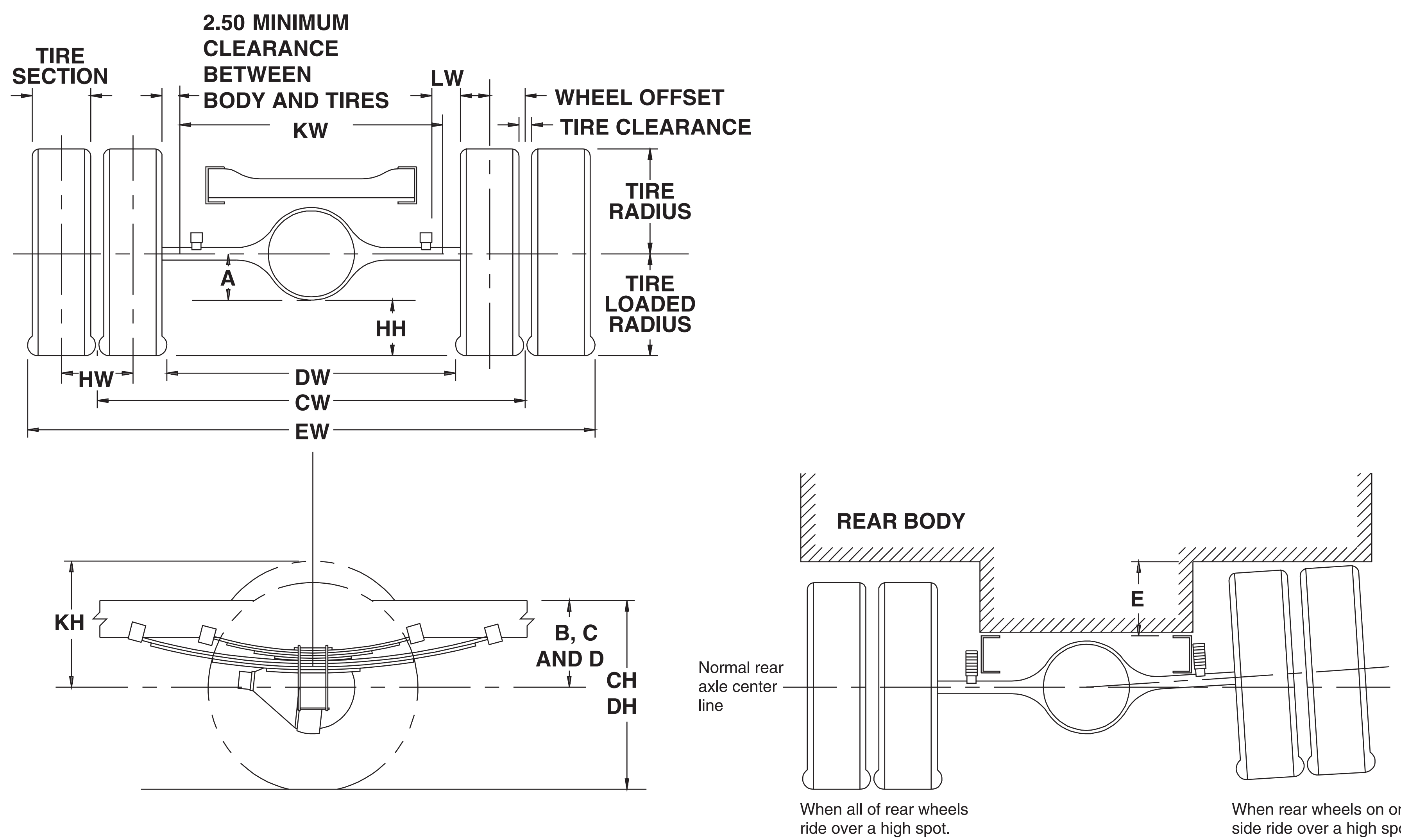
Rear Axle Chart NQR/W5500



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(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Diesel – continued from previous page)

Definitions			
A	Centerline of axle to bottom of axle bowl.	DH	Rear Frame Height: Vertical distance between the normal top of frame rail and the ground-line through the centerline of the rear axle at design load.
B	Centerline of axle to top of frame rail at metal-to-metal position.	DW	Minimum distance between the inner surfaces of the rear tires.
C	Centerline of axle to top of frame rail at curb position.	EW	Maximum Rear Width: Overall width of the vehicle measured at the outermost surface of the rear tires.
D	Centerline of axle to top of frame rail at design load.	HH	Rear Tire Clearance: Minimum clearance between the rear axle and the ground-line.
E	Rear Tire Clearance: Minimum clearance required for tires and chain measured from the top of the frame at the vertical centerline of the rear axle, when rear wheels on one side ride over a high spot.	HW	Dual Tire Spacing: Distance between the centerlines of the minimum distance required for tire bounce as measured from the centerline of the rear axle and the top of the rear tire when one wheel rides over a high spot.
CH	Rear Frame Height: Vertical distance between the normal top of frame rail and the ground-line through the centerline of the rear axle at curb position.	CW	Track Dual Rear Wheel Vehicles: Distance between the centerlines of the dual wheels measured at the ground-line.
	Tire Section, Tire Radius, Tire Loaded Radius, Tire Clearance		See Tire Chart for Values

Formulas for Calculating Rear Width and Height Dimensions			
CW	= Track	HH	= Tire loaded radius – A
CH	= Tire loaded radius + C	JH	= KH – B
DH	= Tire loaded radius + D	KH	= Tire radius + 3.00 inches
DW	= Track + 2 tire sections – tire clearance	KW	= DW – 5.00 inches
EW	= Track + 2 tire sections + tire clearance	LW	= 1.00-inch minimum clearance between tires and springs

NOTE: Track and overall width may vary with optional equipment.

Tire	GAWR	Track CW	A	B	C	D	E
225/70R 19.5F	12,980 lbs.	65.0	7.7	9.2	15.3	13.4	8.4

(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Diesel – continued on next page)

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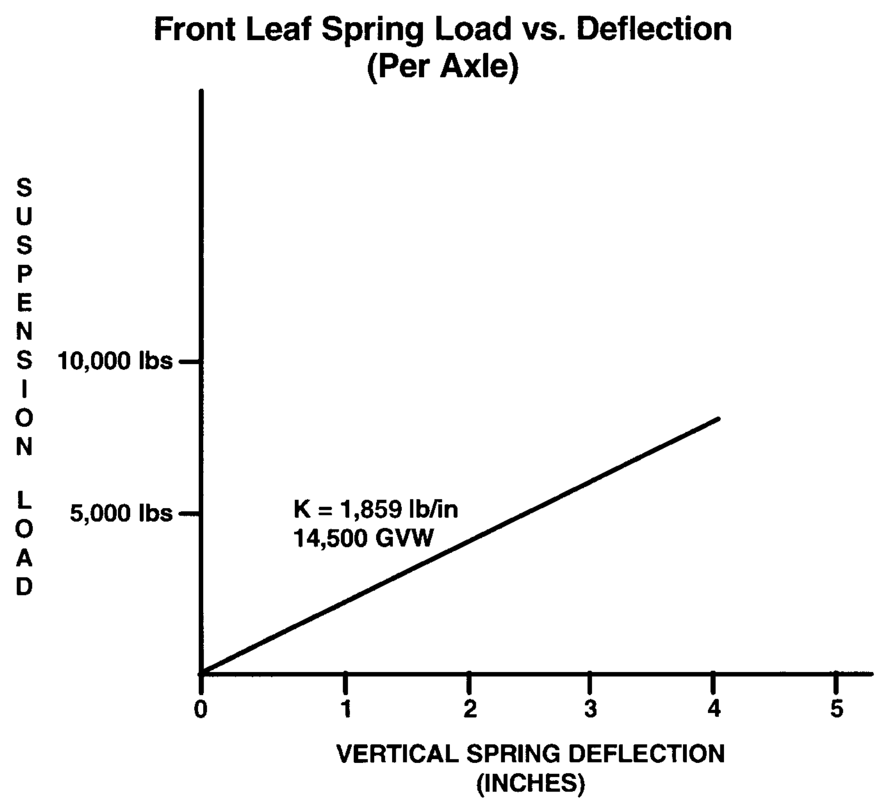
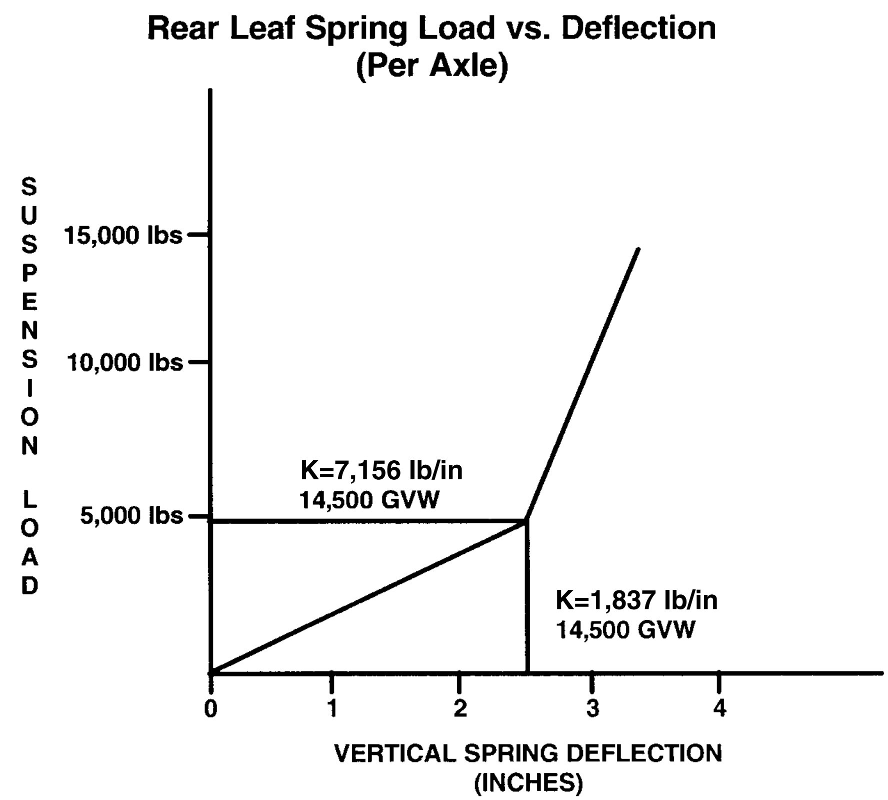
Suspension Deflection Charts NPR HD/W4500





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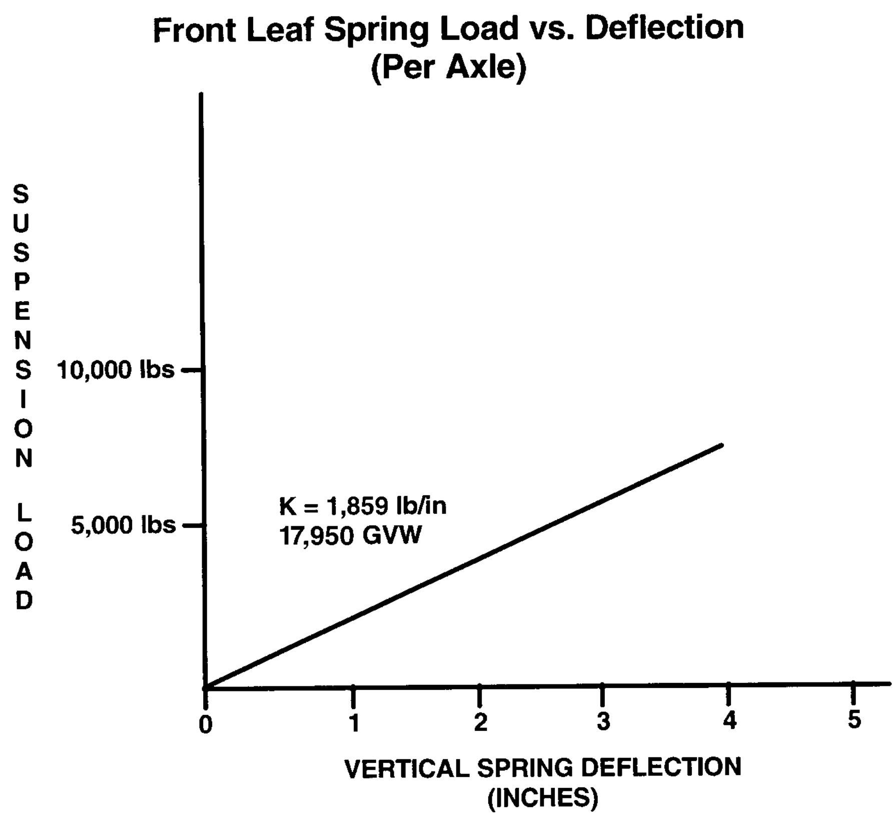
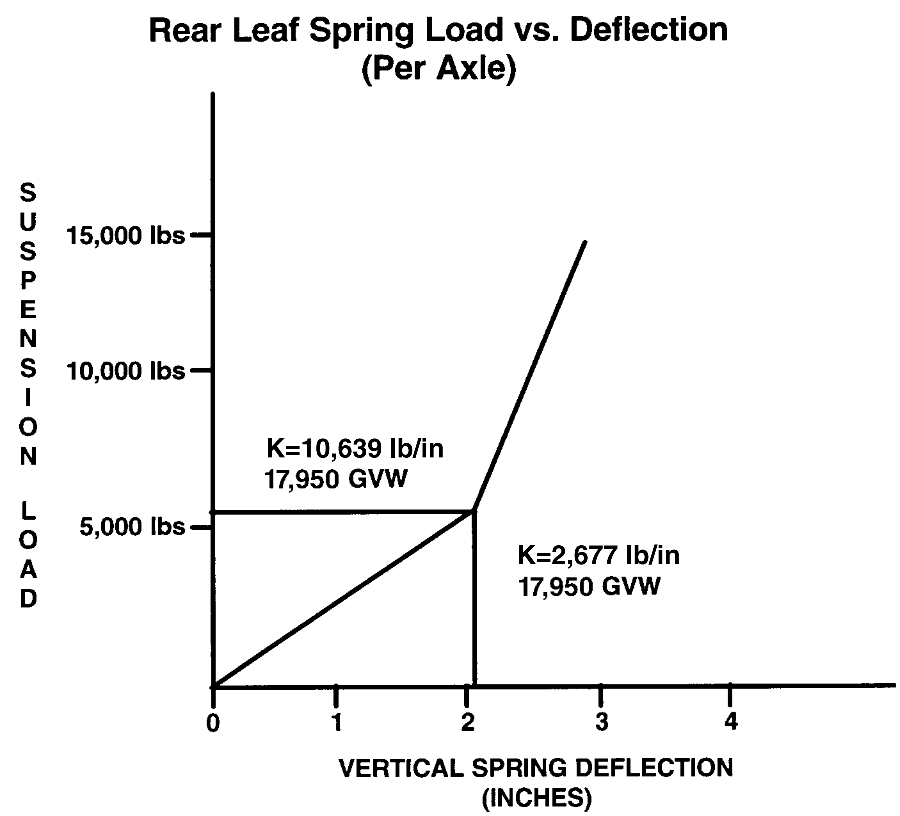
Suspension Deflection Charts NQR/W5500





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Tire and Disc Wheel Chart NPR HD/W4500

Tire

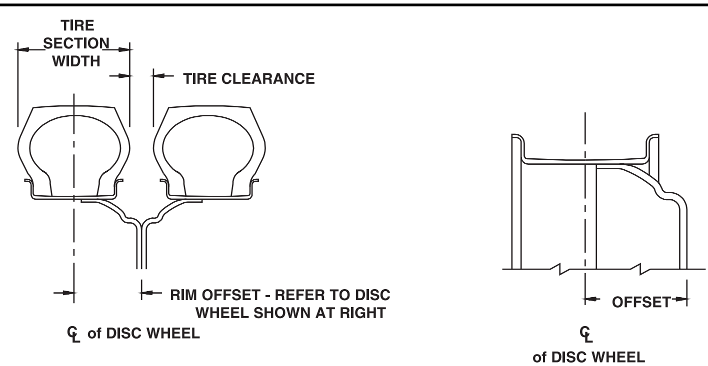
Tire Size	Tire Load Limit and Cold Inflation Pressures				Maximum Tire Load Limits		GVWR (Lb.)
	Single		Dual		Front	Rear	
	Lb.	PSI	Lb.	PSI	2 Single	4 Dual	
215/85R 16E	2,680	80	2,470	80	5,360	9,880	14,500

Tire Size	GVWR (Lb.)	Tire Radius				Tire Section Width	Tire Clearance	Design Rim Width
		Loaded		Unloaded				
		Front	Rear	Front	Rear			
215/85R 16E	14,500	14.1	14.1	14.3	14.7	8.2	18	6.0

Disc Wheel

Wheel Size	Bolt Holes	Bolt Circle Dia.	Ft./Rr. Nut Size*	Rear Stud Size*	Nut/Stud Torque Specs.	Inner Circle	Outside Offset	Disc Thickness	Rim Type	Material Mfg.
16.6 x 6 K	6 JIS	8.75	1.6142 (41 mm) BUD HEX	0.8268 (21 mm) SQUARE	289 ft.-lb. (392 N•m)	6.46	5.0	0.39	5º DC	Steel TOPY

* O.D. Wrench Sizes



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Tire and Disc Wheel Chart NQR/W5500

Tire

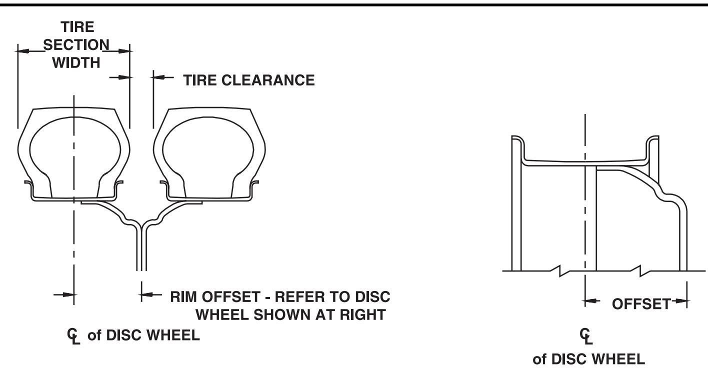
Tire Size	Tire Load Limit and Cold Inflation Pressures				Maximum Tire Load Limits		GVWR (Lb.)
	Single		Dual		Front	Rear	
	Lb.	PSI	Lb.	PSI	2 Single	4 Dual	
225/70R 19.5F	3,450	90	3,245	90	6,900	12,980	17,950

Tire Size	GVWR (Lb.)	Tire Radius				Tire Section Width	Tire Clearance	Design Rim Width
		Loaded		Unloaded				
		Front	Rear	Front	Rear			
225/70R 19.5F	17,950	14.93	14.98	16	16	8.7	1.3	6.0

Disc Wheel

Wheel Size	Bolt Holes	Bolt Circle Dia.	Ft./Rr. Nut Size*	Rear Stud Size*	Nut/Stud Torque Specs.	Inner Circle	Outside Offset	Disc Thickness	Rim Type	Material Mfg.
19.5 x 6.00	6 JIS	8.75	1.6142 (41 mm) BUD HEX	0.8268 (21 mm) SQUARE	325 ft.-lb. (440 N•m)	6.46	5.0	0.35	15º DC	Steel TOPY

* O.D. Wrench Sizes



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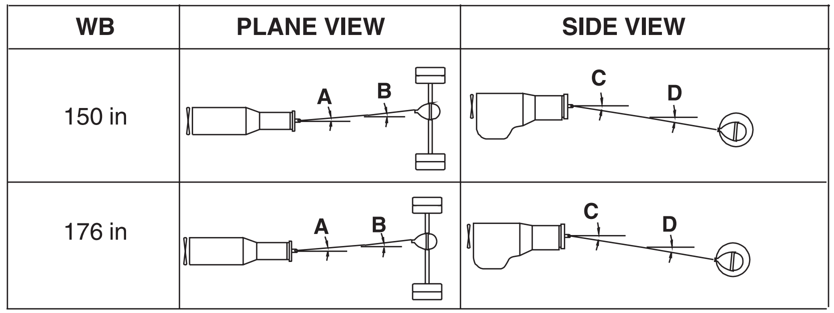
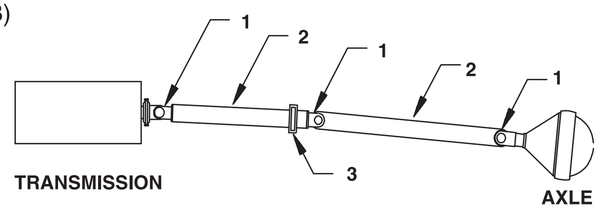
Propeller Shaft NPR HD/W4500



TYPICAL INSTALLATIONS SHOWING YOKES "IN PHASE". "IN PHASE" MEANS THAT THE YOKES AT EITHER END OF A GIVEN PROPELLER SHAFT ASSEMBLY ARE IN THE SAME PLANE.

(150 and 176 in WB)



1. UNIVERSAL JOINT
2. PROPELLER SHAFT
3. CENTER CARRIER BEARING

Wheelbase	Plane View		Side View	
	A Automatic Transmission	B Automatic Transmission	C Automatic Transmission	D Automatic Transmission
150 in.	0º	3.1º	0.0º	5.2º
176 in.	0º	2.2º	0.3º	2.0º

NOTE: All driveline angles are at unloaded condition (curb position with typical cargo body).

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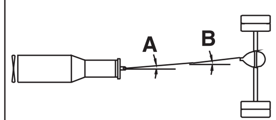
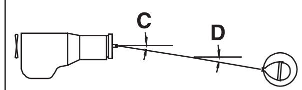
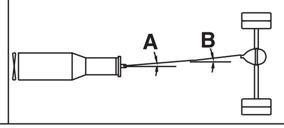
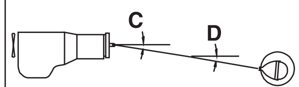
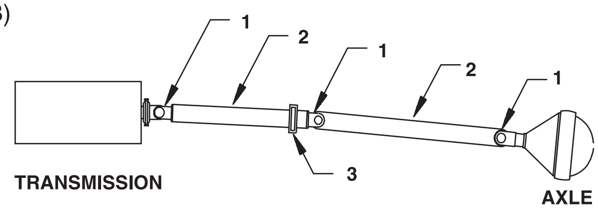
Propeller Shaft NQR/W5500

WB	PLANE VIEW	SIDE VIEW
150 in		
176 in		

TYPICAL INSTALLATIONS SHOWING YOKES "IN PHASE". "IN PHASE" MEANS THAT THE YOKES AT EITHER END OF A GIVEN PROPELLER SHAFT ASSEMBLY ARE IN THE SAME PLANE.

(150 and 176 in WB)



1. UNIVERSAL JOINT
2. PROPELLER SHAFT
3. CENTER CARRIER BEARING

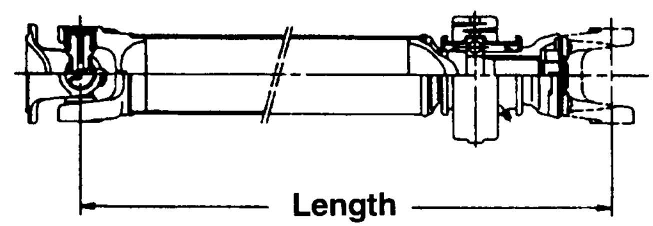
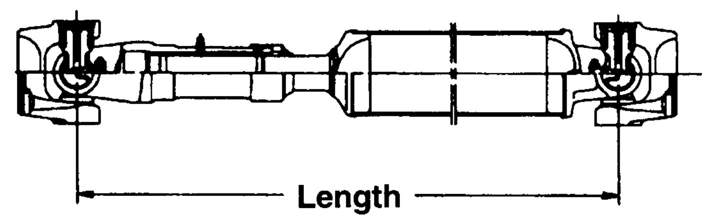
Wheelbase	Plane View		Side View	
	A Automatic Transmission	B Automatic Transmission	C Automatic Transmission	D Automatic Transmission
150 in.	0º	3.1º	0.0º	5.2º
176 in.	0º	2.2º	0.3º	2.0º

NOTE: All driveline angles are at unloaded condition (curb position with typical cargo body).

(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Diesel – continued on next page)

(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Diesel – continued from previous page)

Wheelbase	150	176
Number of Shafts	2	2
Transmission Type	4 A/T	4 Automatic Transmission
Shaft #1 O.D.	3.25	3.25
Thickness	0.091	0.091
Length	41.6	53.4
Type	A	A
Shaft #2 O.D.	3.25	3.25
Thickness	0.091	0.091
Length	39	53.0
Type	C	C

Type	Description	Model	Illustration
Type **A**	1st shaft in 2-piece driveline	P20	
Type **C**	2nd shaft in 2-piece driveline	P20	

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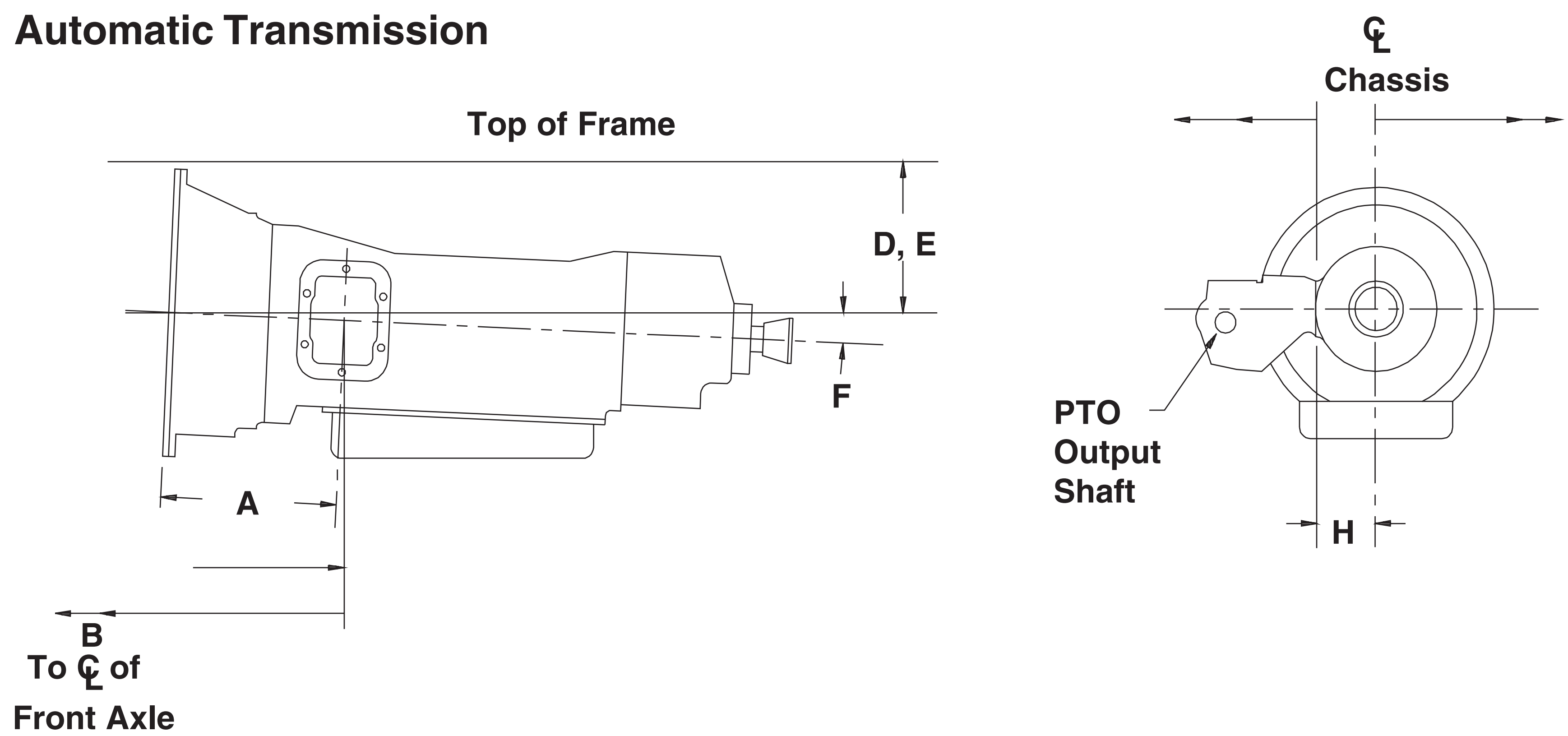
PTO Location, Drive Gear and Opening Information



Trans.	Opening Location	Bolt Pattern	A	B	C	D	E	F	H	PTO Drive Gear Location	Ratio of PTO Drv. Gear Spd. to Eng. Spd.	No. of Teeth	Pitch	Helix Angle	Max. Output Torque
Aisin[1)]	Left	(Dr 2)	12.6	38.59	0	8	7.5	2.5º	4.48	PTO Gear	1:1 with turbine	58	N/A	0º	134 lbs.-ft. @ 1,000 RPM

1) No PTO gear in the 150” WB models

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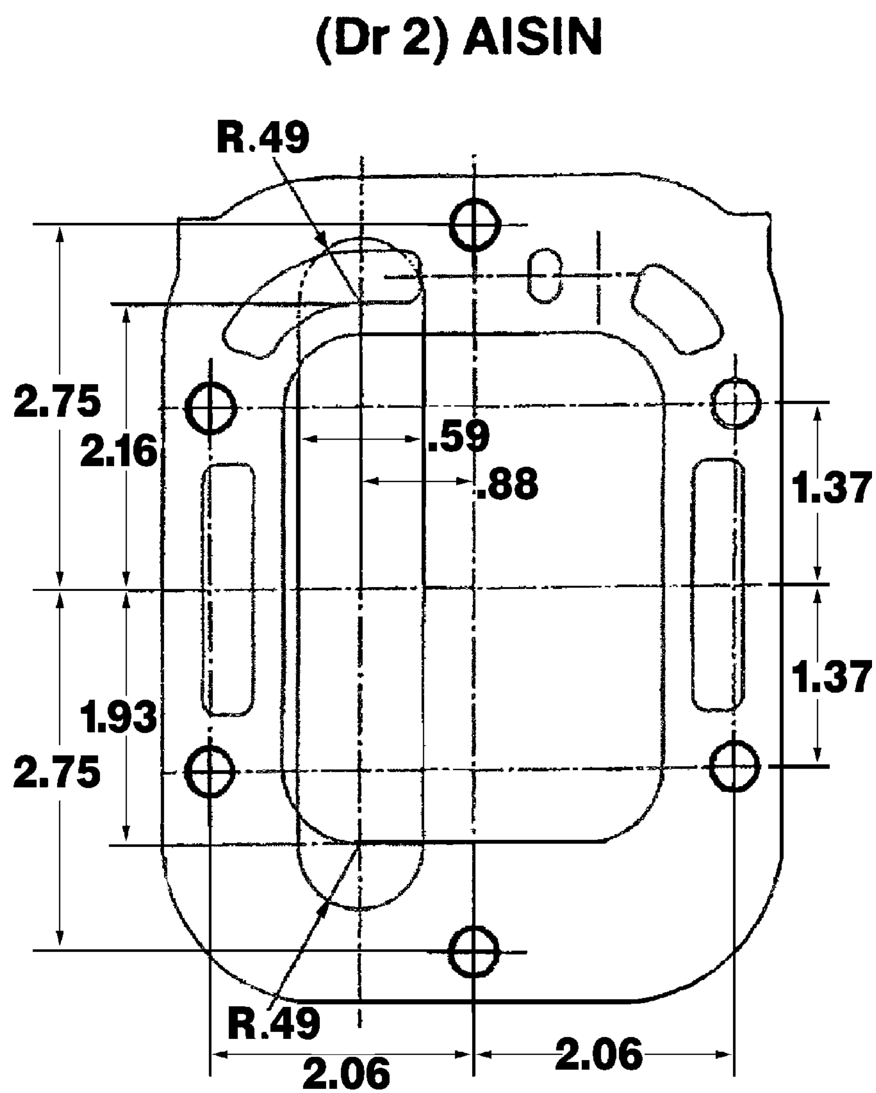
Opening Diagram



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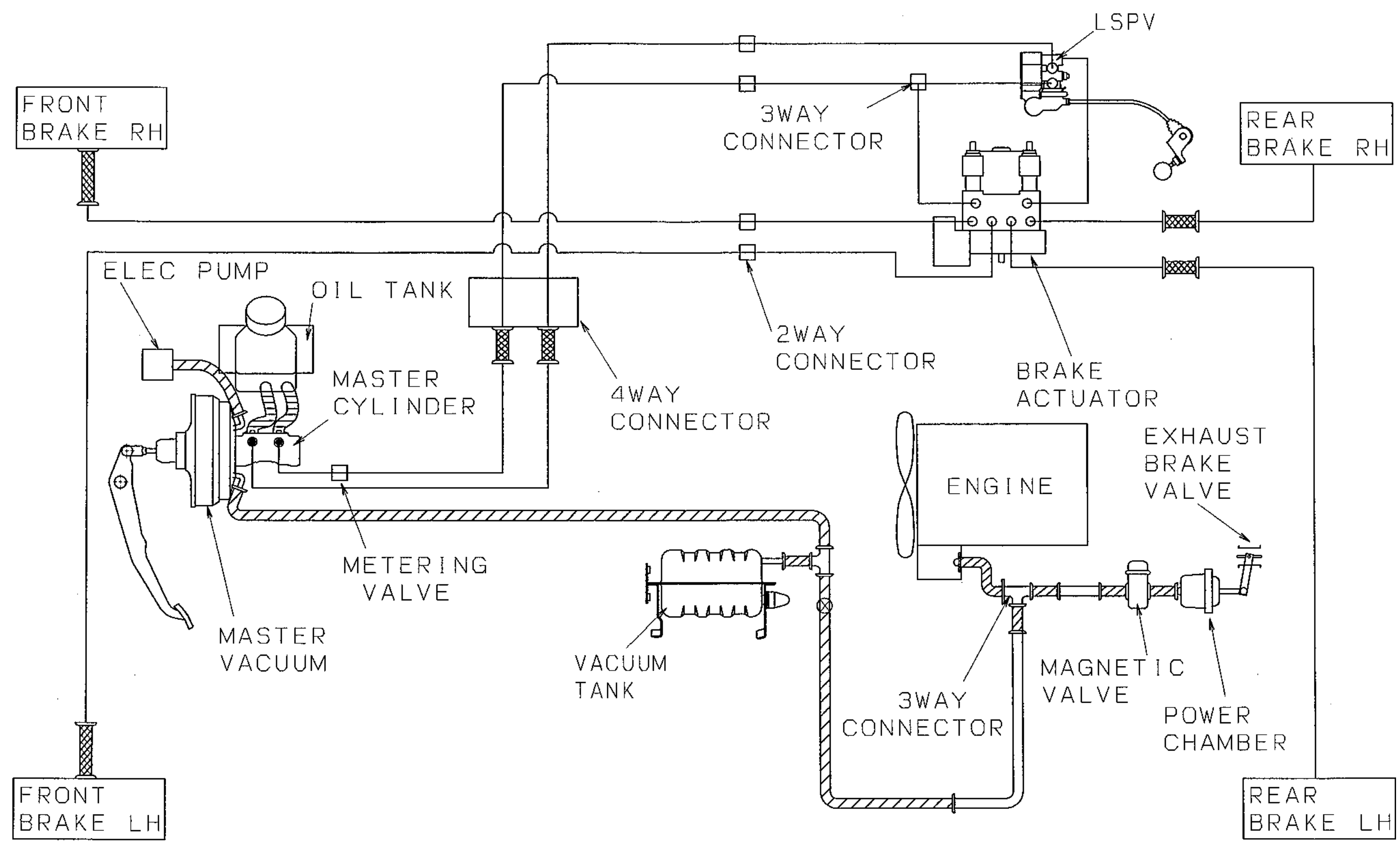
Brake System Diagram 14,500 GVW

Vacuum Over Hydraulic

Please refer to introduction section of book for antilock system cautions and wheelbase modification requirements.



LINE					
NAME	BRAKE HOSE LOW PRESSURE	VACUUM HOSE	BRAKE HOSE HIGHT PRESSURE	VACUUM PIPE	BRAKE PIPE

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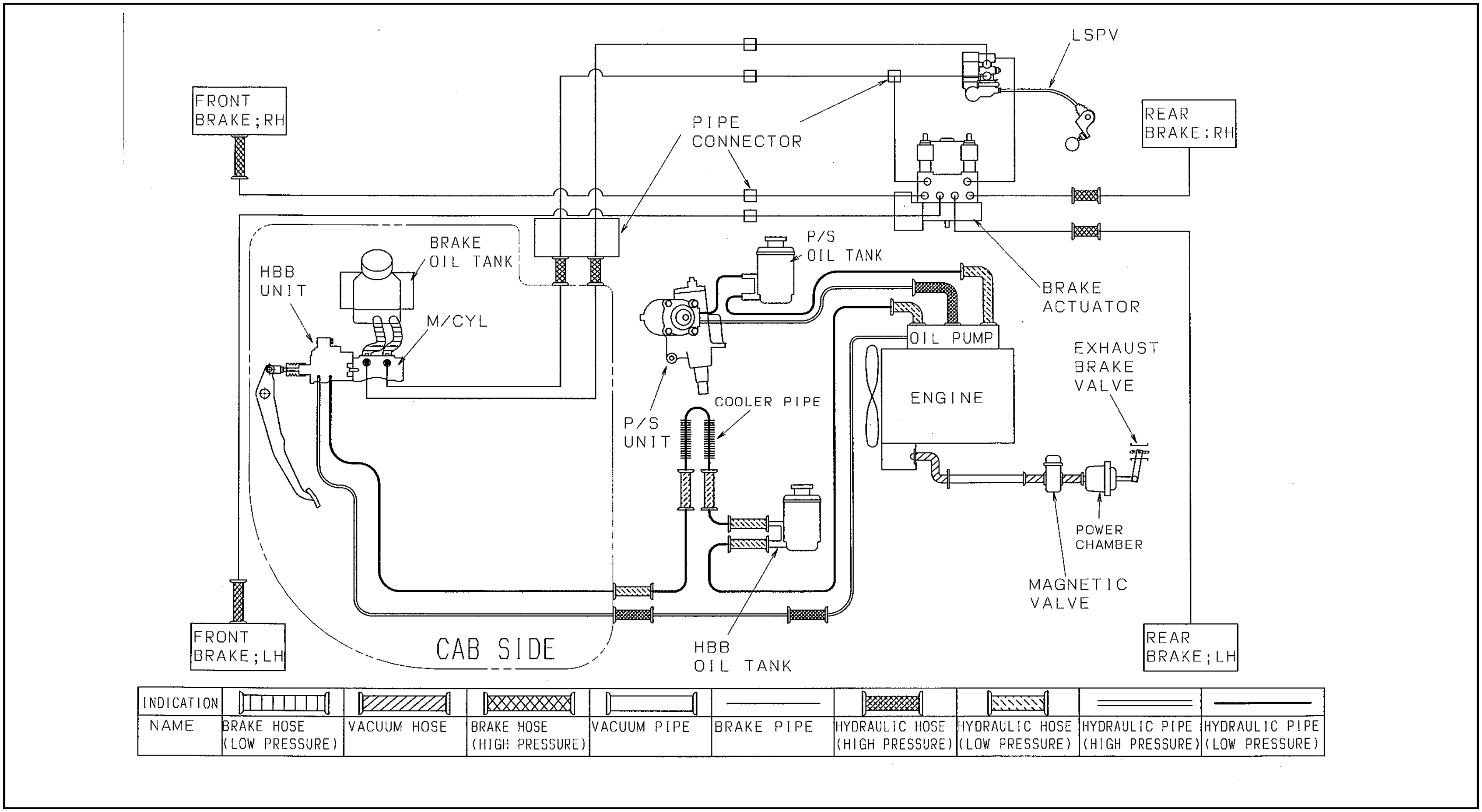
Brake System Diagram 17,950 GVW

Vacuum Over Hydraulic

Please refer to introduction section of book for antilock system cautions and wheelbase modification requirements.



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Diesel Fuel Fill

Installation Instructions

1. Disconnect battery.
2. Loosen hose from the tie downs. Remove caps from plate on rail.
3. Install hoses onto the plate.
4. Extend hose out from the driver's side of the rail to body rail.
5. The filler neck must be mounted to allow the fill plate bracket to be parallel to the frame horizontal (see figure 4).
6. Cover with protector wrap and secure with tie wraps.
7. Filler hose is set for 96 inches outside width body.
8. Filler neck (dimension A) must be between 6.85 inches and 8.5 inches above frame.
9. Secure the filler plate to the bottom of the body and check for leaks.
10. Ensure that fill hose does not sag, creating an area where the fuel could pool in the fill hose.
11. Reconnect battery.

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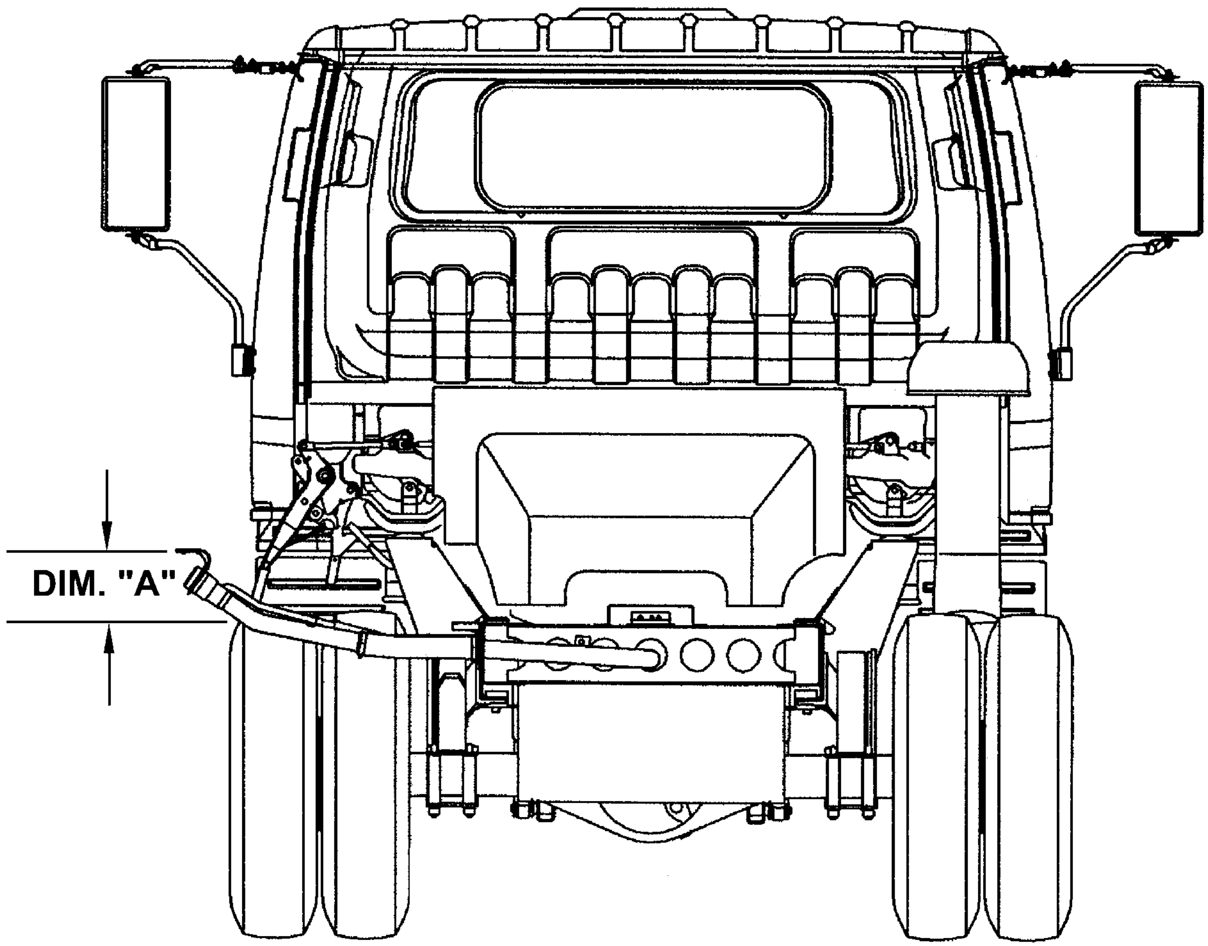
Rear View Fuel Fill



Dimension A = 6.85-8.5 inches (174-216 mm)

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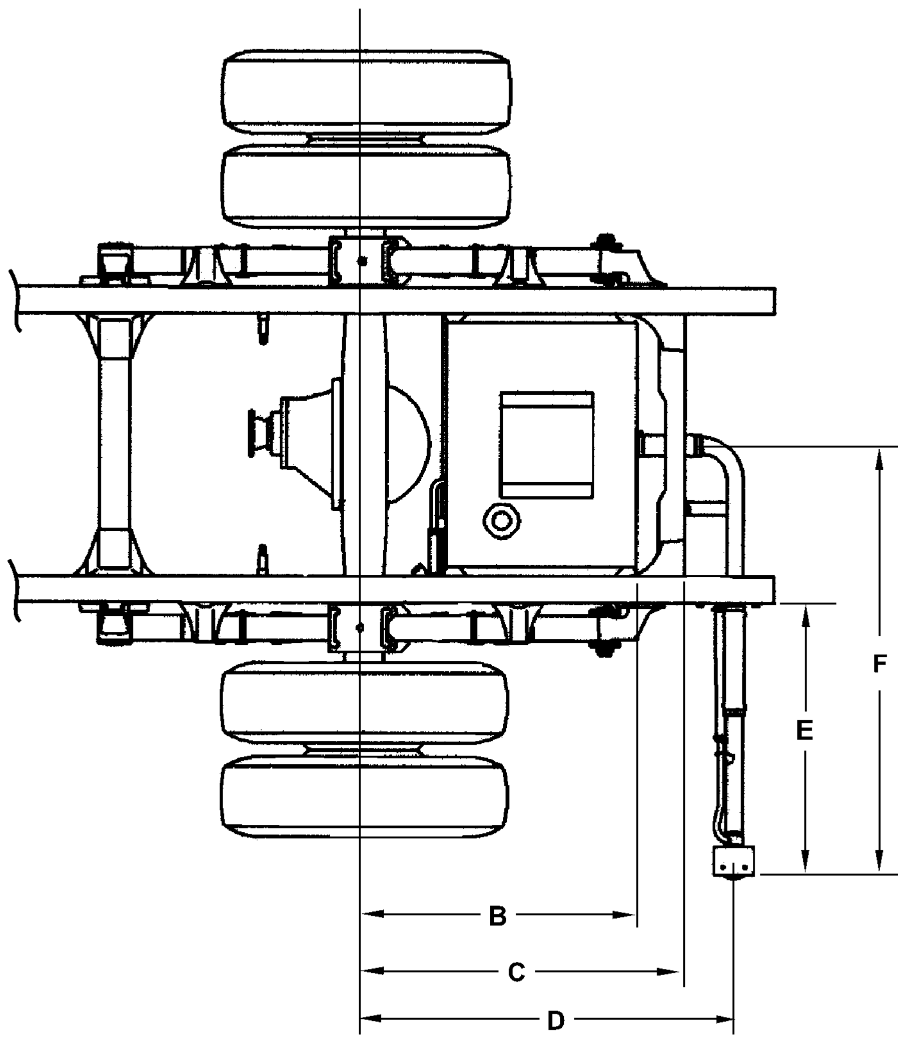
Top View Fuel Fill



Dimensions:
B = 29.75 inches (756 mm)
C = 34.00 inches (863 mm)
D = 39.29 inches (998 mm)
E = 30.86 inches (784 mm)
F = 56.60 inches (1,438 mm)

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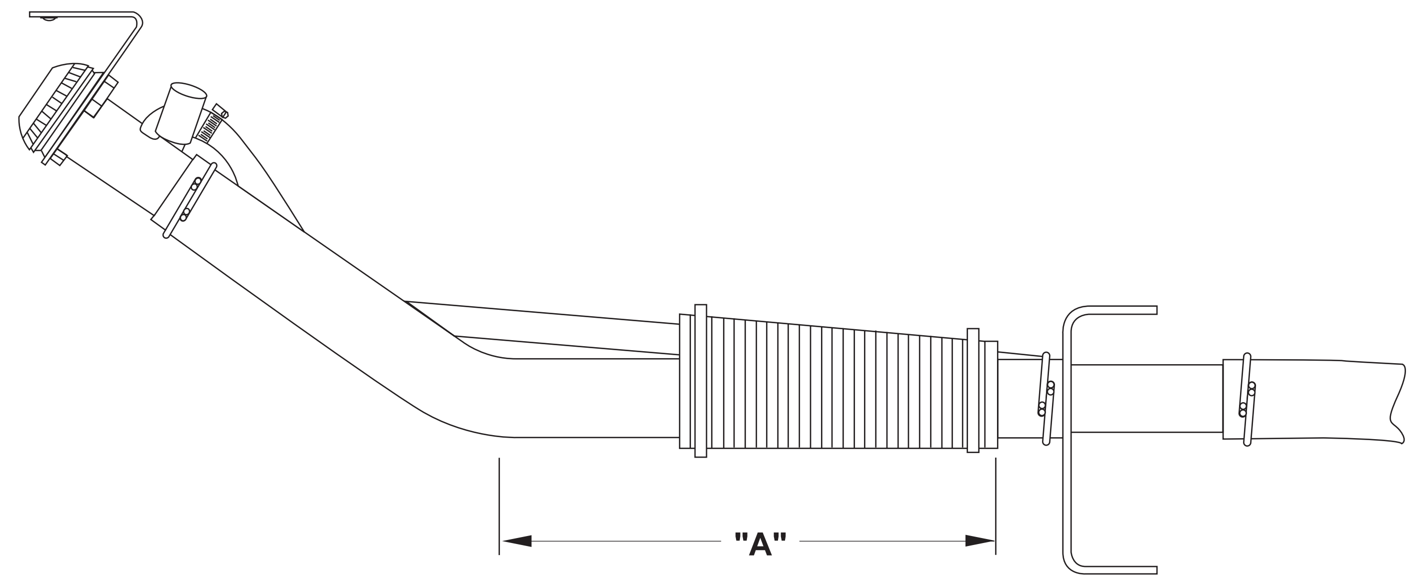
Hose Modification for Various Width Bodies



NOTE: Shorten Hose at "A" Area only.

96 remove 0 inches
90 remove 3 inches
86 remove 5 inches
80 remove 8 inches

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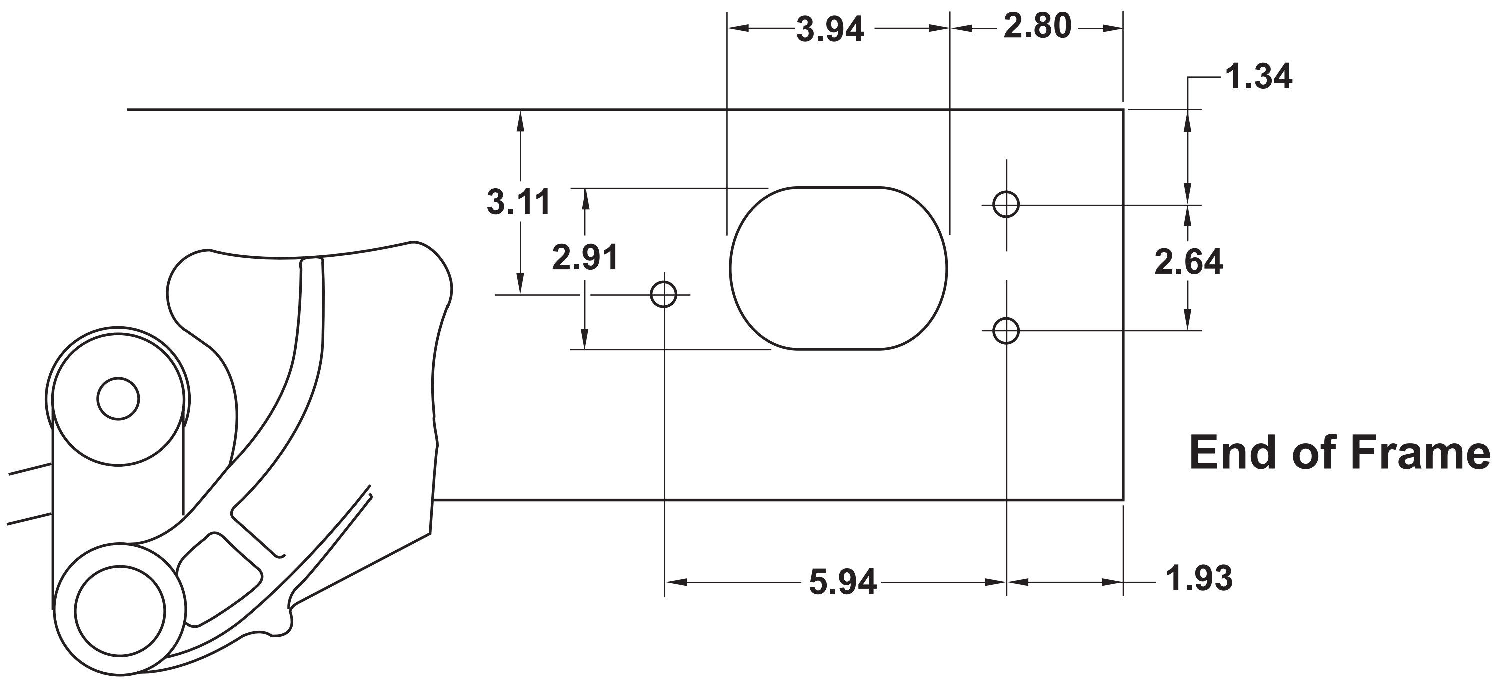
Through the Rail Fuel Fill Frame Hole



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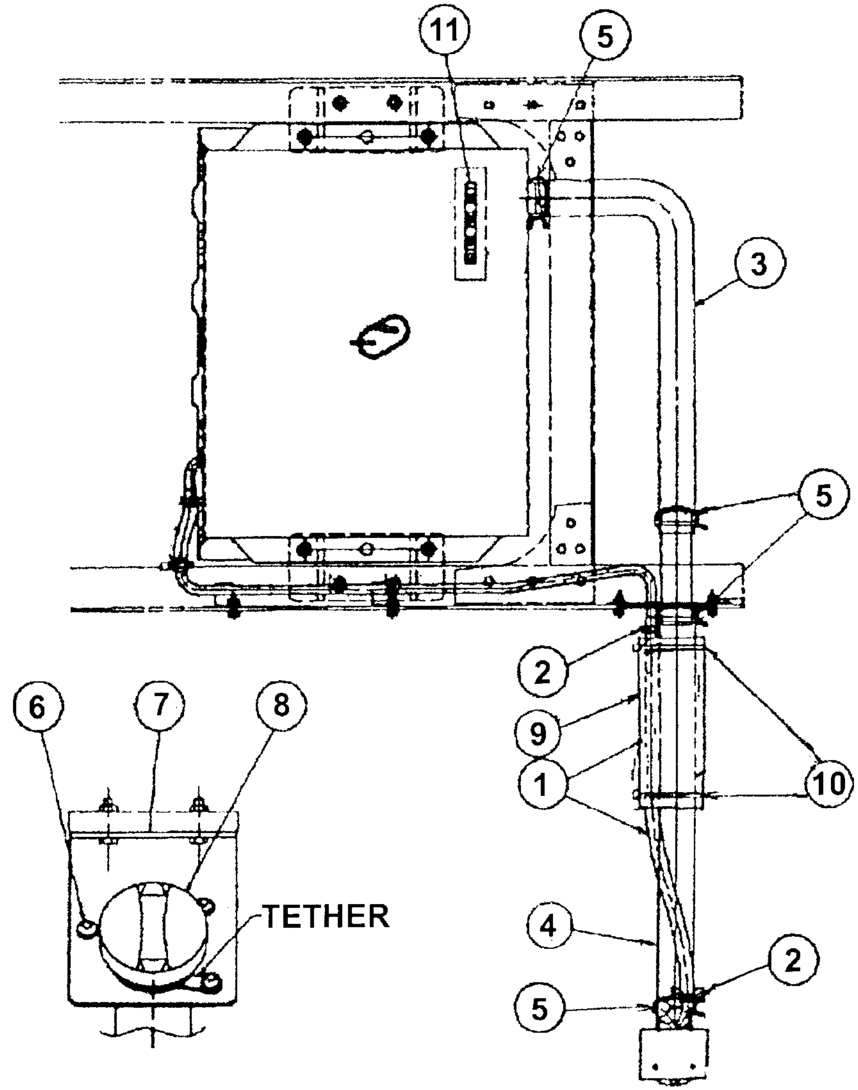
Fuel Fill Parts Illustration



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Fuel Fill Parts List

Number	Part Name	Isuzu Part Number	GM Part Number	Quantity
1	Breather Hose	894152-0030	N/A	1
2	Clip, Rubber Hose	894242-0340	94242034	2
3	Hose, Fuel Filler	897187-8750	97187875	1
4	Hose, Fuel Filler	897253-1400	97253140	1
5	Clip, Filler Hose	894435-8760	97724373	4
6	Screw, Filler Hose	894384-6460	N/A	3
7	Bracket, Filler Neck	897116-621Y	97116621	1
8	Cap, Filler	897218-7020	N/A	1
9	Protector	897114-0630	97114063	1
10	Clip	109707-1070	94062296	2
11	Caution Plate	897135-6050	97135605	1

NRR/W5500-HD

Specifications

Model	NRR/W5500-HD
GVWR/GCWR	19,500 lbs.
WB	109 in., 132.5 in., 150 in., 176 in.
Engine	Isuzu 4-cylinder, in-line 4-cycle, turbocharged, intercooled, direct injection diesel.
Model/Displacement	4HK1-TC/317CID (5.19 liters)
HP (Gross)	190 HP @ 2,600 RPM
Torque (Gross)	387 lbs.-ft. torque @ 1,500 RPM
Equipment	Dry element air cleaner with vertical intake; 2 rows 569 in.^{2} radiator; 7-blade 20.1 in. diameter fan with viscous drive. Cold weather starting device and an oil cooler. Engine oil level check switch and light. Engine cruise control and idle up function.
Clutch	Single, dry plate, 12.8 in. dia. ceramic, actuated by self-adjusting hydraulic master/slave cylinder.
Transmission	MZZ 6-speed manual, all forward gears synchronized. Sixth gear is overdrive. Available Optional Transmission: Aisin 450-43 LE 4-speed overdrive automatic transmission with lock-up capability in 2nd, 3rd and 4th. PTO capability all chassis and wheelbases.
Steering	Integral power steering 18.8-20.9:1 ratio. Tilt and telescoping steering column.
Front Axle	Reverse Elliot “I”-Beam rated at 6,830 lbs.
Suspension	Semi-elliptical steel alloy tapered leaf springs with stabilizer bar and shock absorbers.
GAWR	6,830 lbs.
Rear Axle	Full-floating, single speed with hypoid gearing rated at 14,550 lbs.
Suspension	Semi-elliptical steel alloy multi-leaf springs and shock absorbers.
GAWR	13,660 lbs.
Wheels	19.5 x 6.0 6-hole disc wheels, painted white.
Tires	225/70R 19.5F (12 pr) tubeless steel-belted radials, all season tread front and rear.
Brakes	Dual-circuit, power-assisted hydraulic service brakes with load-sensing proportioning valve in rear brake circuit. Disc front and self-adjusting outboard mounted drum rear. The parking brake is a mechanical, cable-actuated, internal expanding drum type, transmission mounted. The exhaust brake is standard and is vacuum-operated. Four channel antilock brake system.
Fuel Tank	30-gallon rectangular steel fuel tank mounted in frame rail behind rear axle. Heated fuel/water separator mounted on rail with dash mounted indicator light.

NOTE: These selected specifications are subject to change without notice.

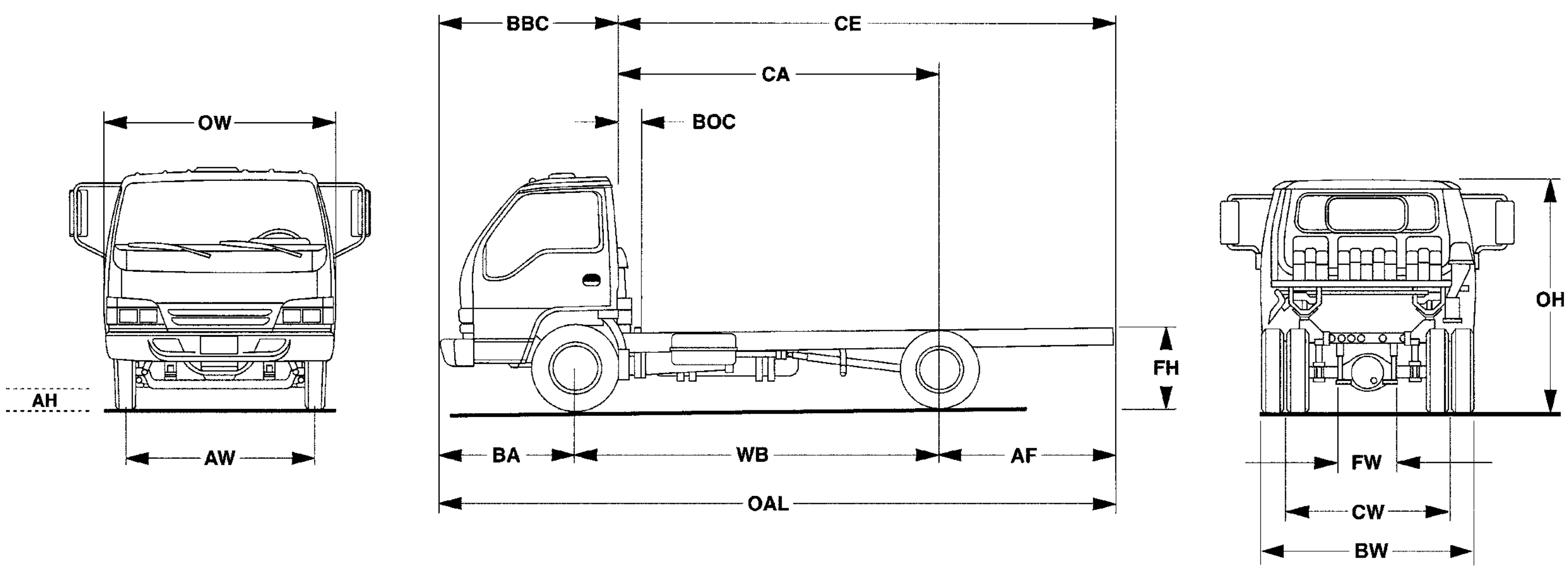
(Vehicle Specifications Index Section – NRR/W5500-HD – continued on next page)

(Vehicle Specifications Index Section – NRR/W5500-HD – continued from previous page)

Model	NRR/W5500-HD
Frame	Ladder type channel section straight frame rail 33.5 in. wide through the total length of the frame. Yield strength 44,000 psi section modulus 7.20 in.^{3}, RBM 316,800 lbs.-ft./in. per rail.
Cab	All-steel, low cab forward, BBC 68.0 in., 45° mechanical tilt with torsion assist.
Equipment	Jersey knit covered high back driver's seat with two-occupant passenger seat. Two-way roof ventilator, dual cab mounted exterior mirrors. Tilt and telescoping steering column. Tinted glass.
Electrical	12-volt, negative ground, dual Delco maintenance free batteries, 750 CCA each, 110-amp alternator with integral regulator.
Options	Air conditioning, AM/FM CD stereo radio, PTO, engine block heater, engine oil pan heater, spare wheel, 6' stainless steel convex mirrors. Auxilliary transmission oil cooler, mandatory for 20,950 GCWR. Power windows and door locks. 33-gallon fuel tank mounted on right hand rail, in place of 30-gallon in frame tank, wheel simulators, engine shutdown system, engine shutdown system with hourmeter.

NOTE: These selected specifications are subject to change without notice.

Vehicle Weights, Dimensions and Ratings



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Variable Chassis Dimensions					
Unit	WB+	CA*	CE*	OAL	AF
Inch	109.0	88.4	131.5	199.5	43.1
Inch	132.5	111.9	155.0	223.0	43.1
Inch	150.0	129.4	172.5	240.5	43.1
Inch	176.0	155.4	198.5	266.3	43.1

* Effective CA & CE are 7.5 inches less for MT. Effective CA & CE are 10 inches less for AT.

Dimension Constants					
Code	Inches	Code	Inches	Code	Inches
AH	8.6	BW	83.3	FH	32.8
AW	65.6	CW	65.8		
BA	47.4	FW	33.5		
BBC	68.0	OH	88.9		
BOC	9.25	OW	78.5		

In-Frame Tank 19,500-lb. GVWR Manual Transmission Model Chassis Curb and Maximum Payload Weights						
Model	WB+	Unit	Front	Rear	Total	Payload
NT1	109 in.	lb.	3,649	2,359	6,008	13,492
NT2	132.5 in.	lb.	3,693	2,381	6,074	13,426
NT3	150 in.	lb.	3,726	2,425	6,151	13,349
NT4	176 in.	lb.	3,770	2,447	6,217	13,283

(Vehicle Specifications Index Section – NRR/W5500-HD – continued on next page)

(Vehicle Specifications Index Section – NRR/W5500-HD Diesel – continued from previous page)

In-Frame Tank 19,500-lb. GVWR Automatic Transmission Model Chassis Cab and Maximum Payload Weights						
Model	**WB+**	**Unit**	**Front**	**Rear**	**Total**	**Payload**
NU1	109 in.	lb.	3,682	2,381	6,063	13,437
NU2	132.5 in.	lb.	3,726	2,403	6,129	13,371
NU3	150 in.	lb.	3,770	2,436	6,206	13,294
NU4	176 in.	lb.	3,814	2,458	6,272	13,228

Side Mounted Tank 19,500-lb. GVWR Manual Transmission Model Chassis Cab and Maximum Payload Weights						
Model	**WB+**	**Unit**	**Front**	**Rear**	**Total**	**Payload**
NT1	109 in.	lb.	3,836	2,091	5,930	13,570
NT2	132.5 in.	lb.	3,880	2,116	5,996	13,504
NT3	150 in.	lb.	3,913	2,160	6,073	13,427
NT4	176 in.	lb.	3,957	2,182	6,139	13,361

Side Mounted Tank 19,500-lb. GVWR Manual Transmission Model Chassis Cab and Maximum Payload Weights						
Model	**WB+**	**Unit**	**Front**	**Rear**	**Total**	**Payload**
NU1	109 in.	lb.	3,869	2,116	5,985	13,515
NU2	132.5 in.	lb.	3,913	2,138	6,051	13,449
NU3	150 in.	lb.	3,957	2,171	6,128	13,372
NU4	176 in.	lb.	4,001	2,193	6,194	13,306

(Vehicle Specifications Index Section – NRR/W5500-HD – continued on next page)

(Vehicle Specifications Index Section – NRR/W5500-HD Diesel – continued from previous page)

Truck Weight Limits:

GVWR Designed Maximum	19,500 lbs.
GAWR, Front	6,830 lbs.
GAWR, Rear	13,660 lbs.

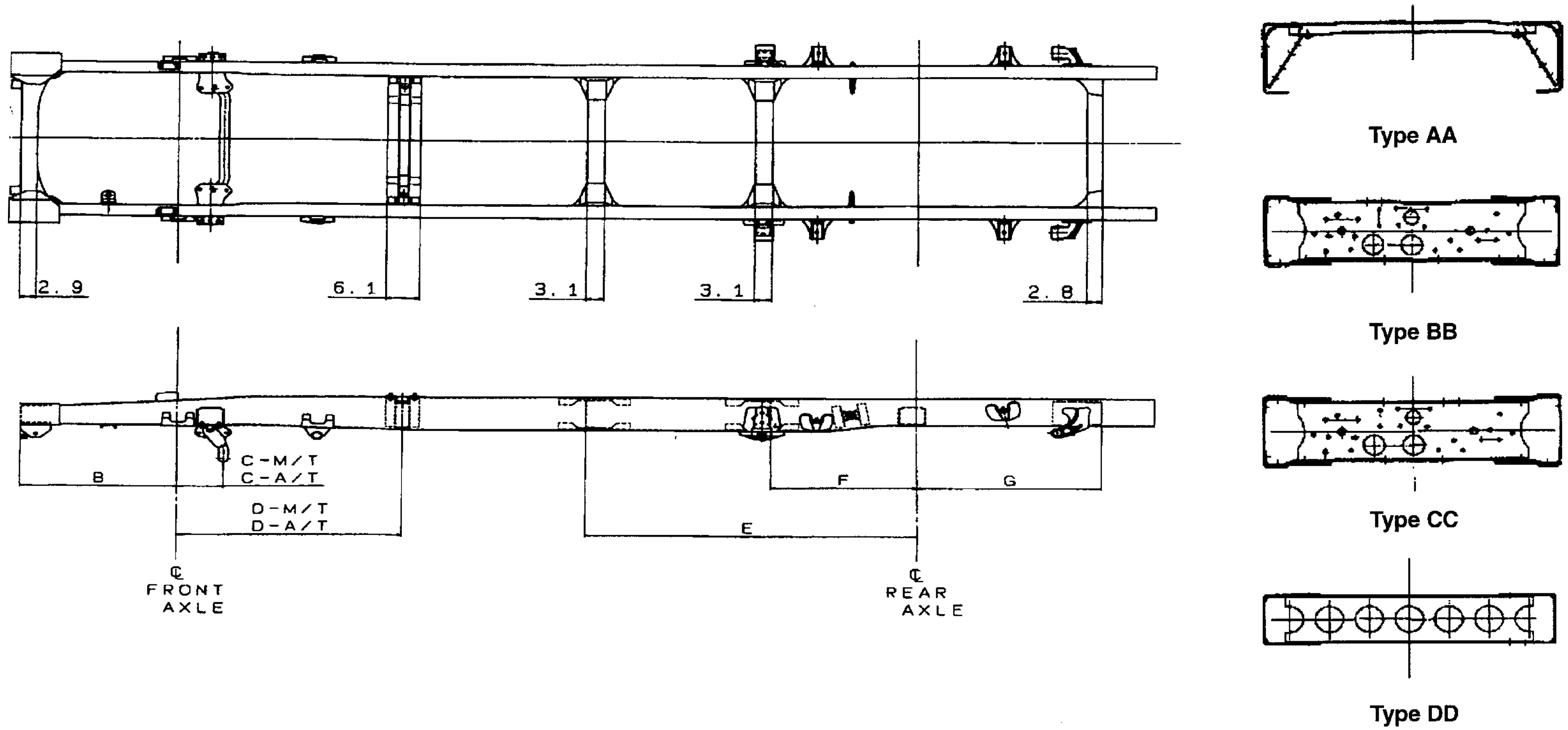
Technical Notes:

Chassis Curb Weight reflects standard equipment and fuel, but no driver or payload.

Maximum Payload Weight is the allowed maximum for equipment, body, payload and driver and is calculated by subtracting chassis curb weight from the GVWR.

(Vehicle Specifications Index Section – NRR/W5500-HD – continued on next page)

Frame and Crossmember Specifications



Wheelbase	Frame Thick	Crossmember Type/Location								
			B	C-M/T	C-A/T	D-M/T	D-A/T	E	F	G
109.0	0.24		28.3	8.4	8.4	AA 44.7	AA 44.7	–	CC 26.0	DD 33.0
132.5	0.24		28.3	8.4	8.4	AA 44.7	AA 44.7	BB 59.4	CC 26.0	DD 33.0
150.0	0.24		28.3	8.4	8.4	AA 44.7	AA 44.7	BB 59.4	CC 26.0	DD 33.0
176.0	0.24		28.3	8.4	8.4	AA 44.7	AA 44.7	BB 59.4	CC 26.0	DD 33.0

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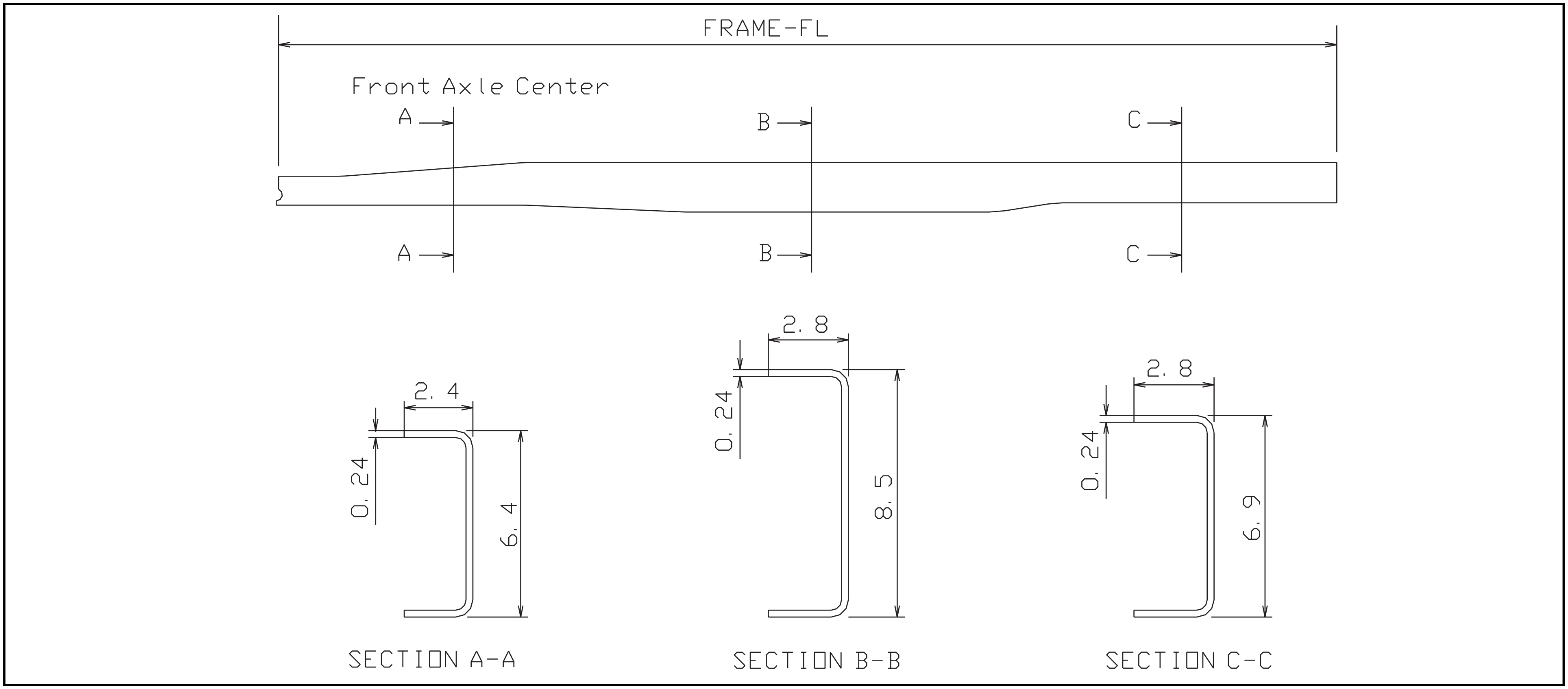
(Vehicle Specifications Index Section – NRR/W5500-HD – continued from previous page)

Frame Chart



Wheelbase	Frame FL	Frame Thickness
109.0	186.0	0.24
132.5	209.6	0.24
150.0	227.4	0.24
176.0	253.4	0.24

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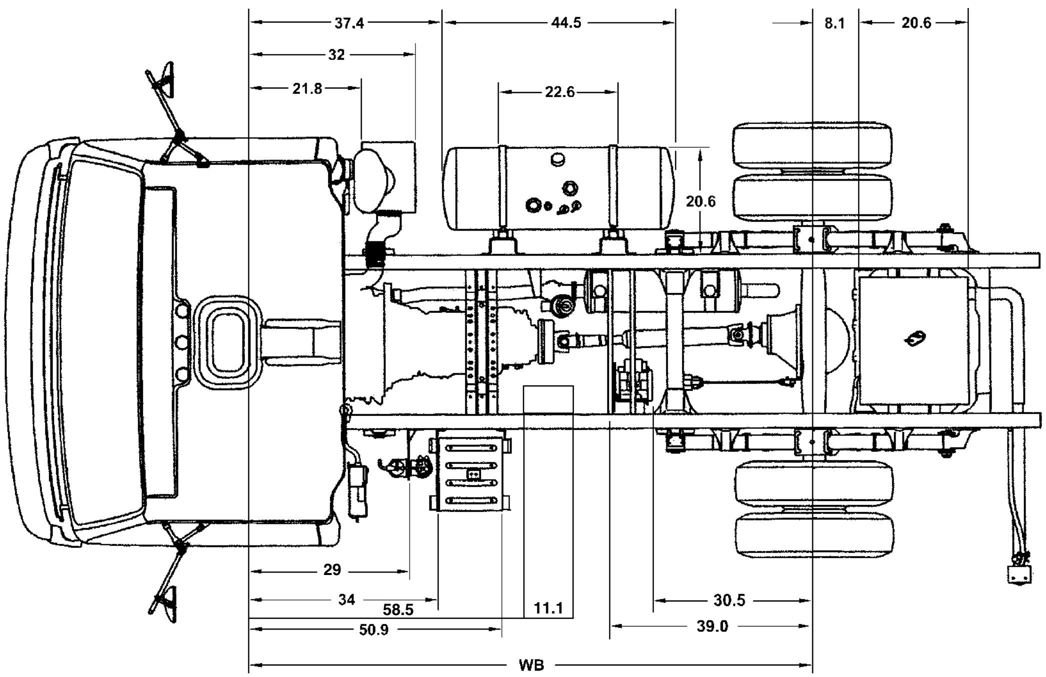
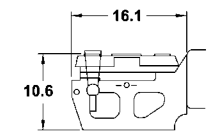
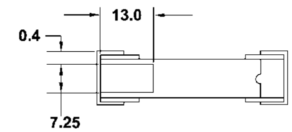
Auxiliary Views

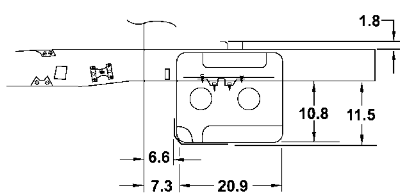




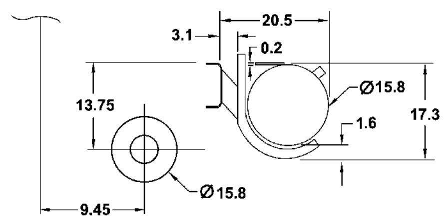
Rear View Battery Box



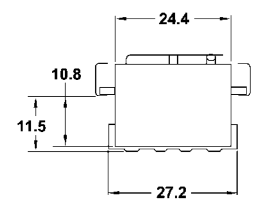
Rear View ABS Controller



Side View In Frame Tank



Rear View Fuel Tank



Rear View In Frame Tank

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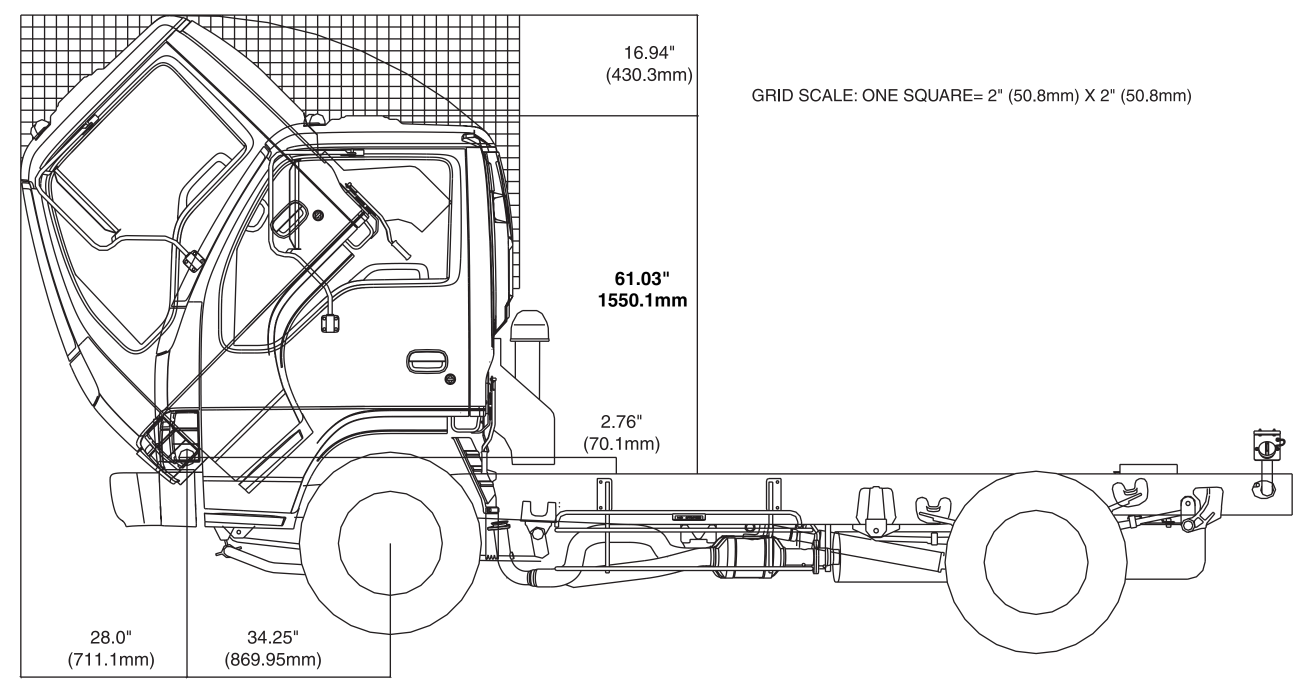
Body Builder Weight Information Chart

GVWR	Axle	Wheelbase								Unsprung Weight
		109 in.		132.5 in.		150 in.		176 in.		
		Man. Trans.	Auto. Trans.	Man. Trans.	Auto. Trans.	Man. Trans.	Auto. Trans.	Man. Trans.	Auto. Trans.	
19,500	Front	3,649	3,682	3,693	3,726	3,726	3,770	3,770	3,814	573
	Rear	2,359	2,381	2,381	2,403	2,425	2,436	2,447	2,458	871
	Total	6,008	6,063	6,074	6,129	6,151	6,206	6,217	6,272	1,444

Cab Tilt



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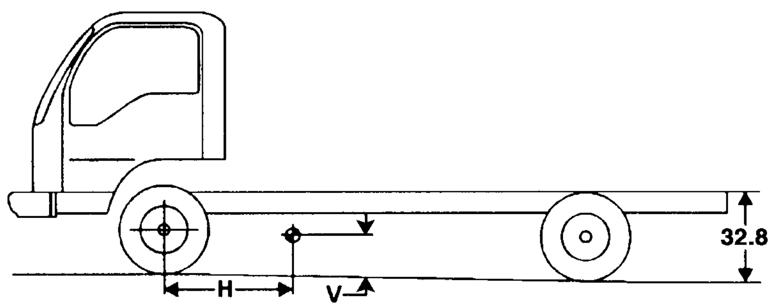
Center of Gravity

The center of gravity of the chassis cab.

GVWR	WB	V	H	
			Manual Trans.	Auto. Trans.
19,500	109	22.1	36.8	37.4
	132.5	20.6	44.7	44.8
	150	20.4	50.6	50.7
	176	18.9	59.4	59.5



V = Vertical Center of Gravity
H = Horizontal Center of Gravity

The center of gravity of the completed vehicle with a full load should not exceed 63 inches above ground level for the **19,500 lb.** GVWR, and must be located horizontally between the centerlines of the front and rear axles.

NOTE: The maximum dimensions for a body installed on the NRR/W5500-HD are 96 inches wide (outside) by 90 inches high (inside). Any larger body applications must be approved by GM/Isuzu Application Engineering. In the West Coast call 1-562-229-5314 and in the East Coast call 1-404-257-3013.

(Vehicle Specifications Index Section – NRR/W5500-HD – continued on next page)

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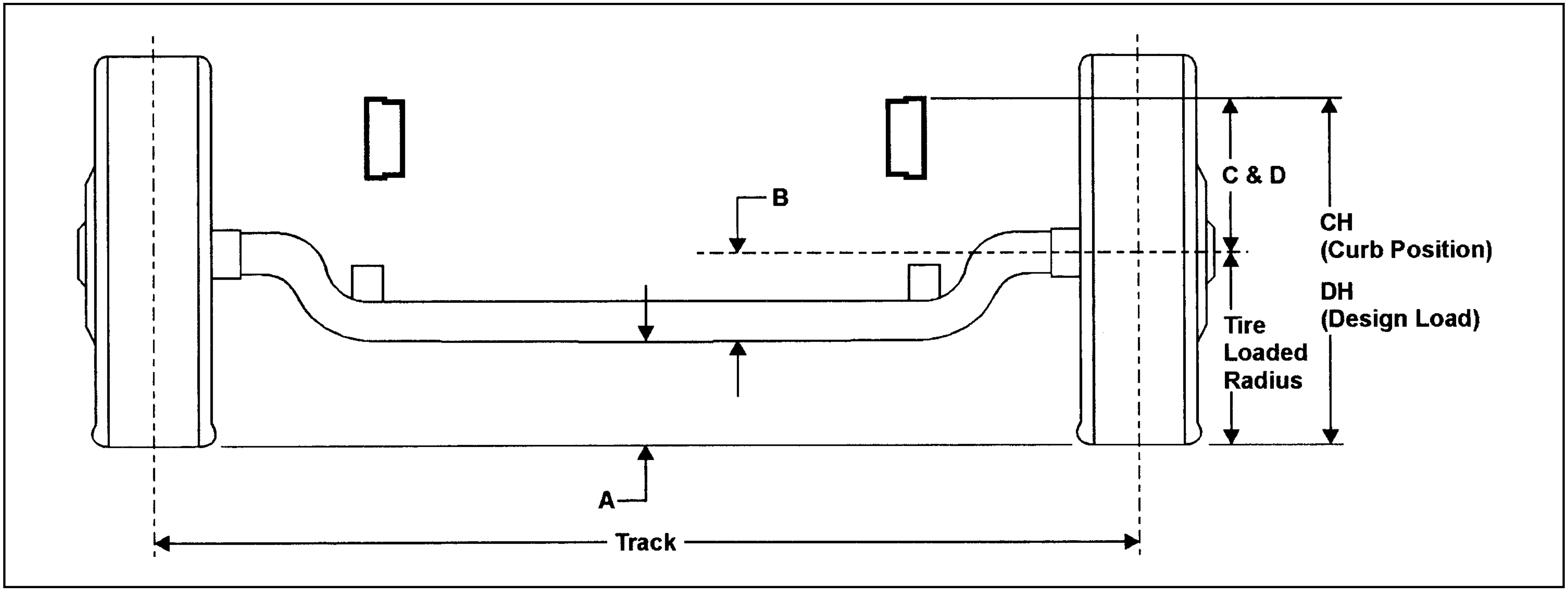
Front Axle Chart



Formulas for calculating height dimensions:

A	=	Tire Loaded Radius – B
C	=	Centerline of Axle to Top of Frame Rail at Curb Position
D	=	Centerline of Axle to Top of Frame Rail at Design Load
CH	=	C + Tire Unloaded Radius
DH	=	D + Tire Loaded Radius

Tire	GVWR	GAWR	A	B	C	D	CH	DH	Track	Tire Radius	
										Unload	Load
225/70R 19.5F	19,500 lbs.	6,830 lbs.	8.7	6.4	12.6	12	28.4	27.1	65.5	15.4	15.1

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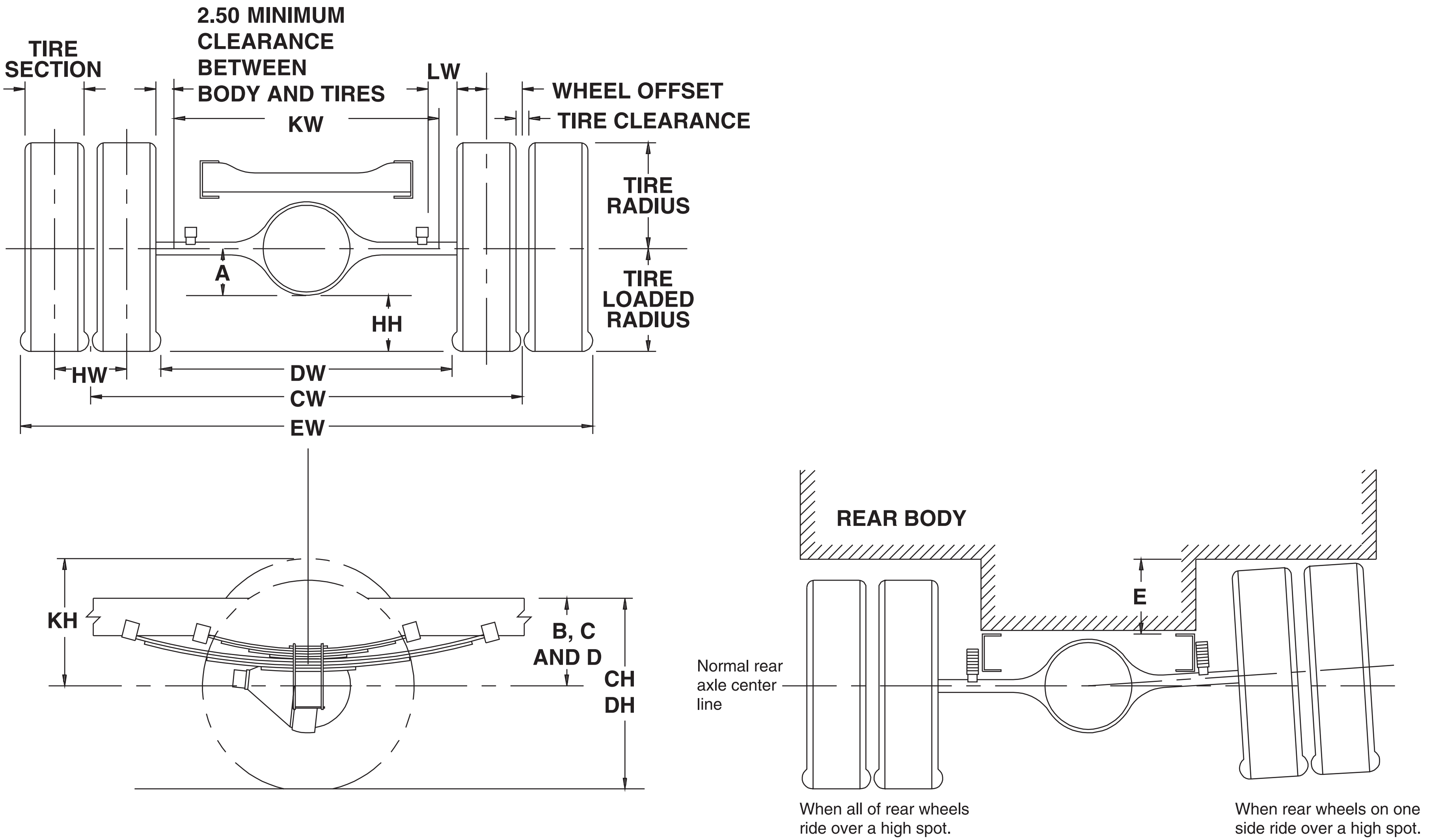
(Vehicle Specifications Index Section – NRR/W5500-HD – continued from previous page)

Rear Axle Chart



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Definitions			
A	Centerline of axle to bottom of axle bowl.	DH	Rear Frame Height: Vertical distance between the normal top of frame rail and the ground-line through the centerline of the rear axle at design load.
B	Centerline of axle to top of frame rail at metal-to-metal position.	DW	Minimum distance between the inner surfaces of the rear tires.
C	Centerline of axle to top of frame rail at curb position.	EW	Maximum Rear Width: Overall width of the vehicle measured at the outermost surface of the rear tires.
D	Centerline of axle to top of frame rail at design load.	HH	Rear Tire Clearance: Minimum clearance between the rear axle and the ground-line.
E	Rear Tire Clearance: Minimum clearance required for tires and chain measured from the top of the frame at the vertical centerline of the rear axle, when rear wheels on one side ride over a high spot.	HW	Dual Tire Spacing: Distance between the centerlines of the tires in a set of dual tires.
		KH	Tire Bounce Clearance: Minimum distance required for tire bounce as measured from the centerline of the rear axle and the top of the rear tire when one wheel rides over a high spot.
CH	Rear Frame Height: Vertical distance between the normal top of frame rail and the ground-line through the centerline of the rear axle at curb position.	CW	Track Dual Rear Wheel Vehicles: Distance between the centerlines of the dual wheels measured at the ground-line.
	Tire Section, Tire Radius, Tire Loaded Radius, Tire Clearance		See Tire Chart for Values

Formulas for Calculating Rear Width and Height Dimensions			
CW	= Track	HH	= Tire loaded radius – A
CH	= Tire loaded radius + C	JH	= KH – B
DH	= Tire loaded radius + D	KH	= Tire radius + 3.00 inches
DW	= Track + 2 tire sections – tire clearance	KW	= DW – 5.00 inches
EW	= Track + 2 tire sections + tire clearance	LW	= 1.00-inch minimum clearance between tires and springs

NOTE: Track and overall width may vary with optional equipment.

Tire	GAWR	Track CW	A	B	C	D	E
225/70R 19.5F	12,980 lbs.	65.8	7.7	9.3	15.3	13.3	8.4

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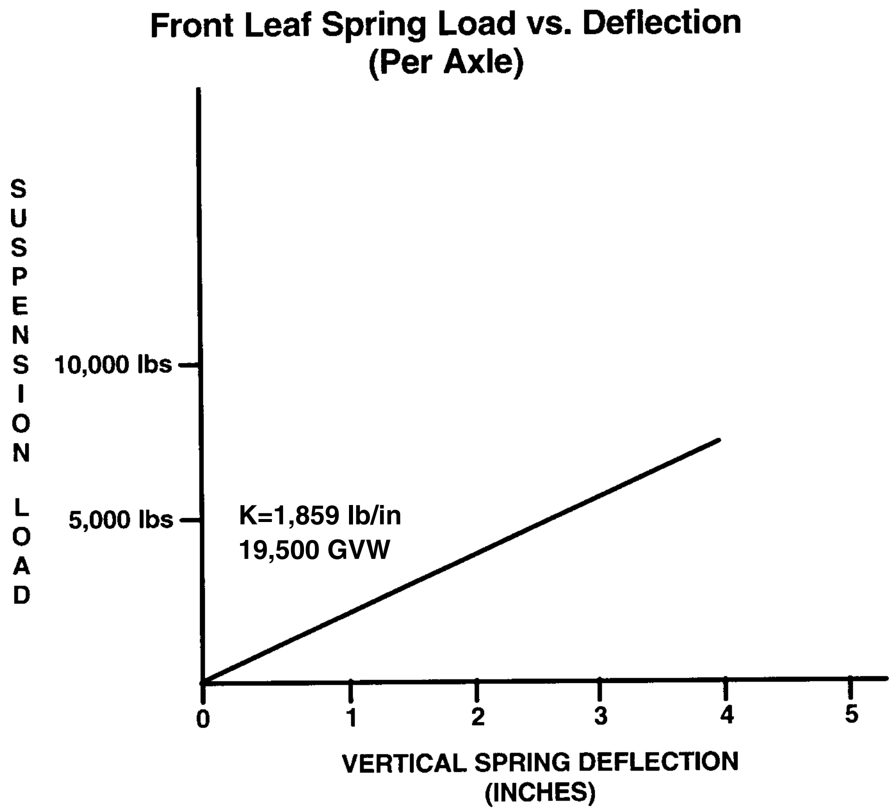
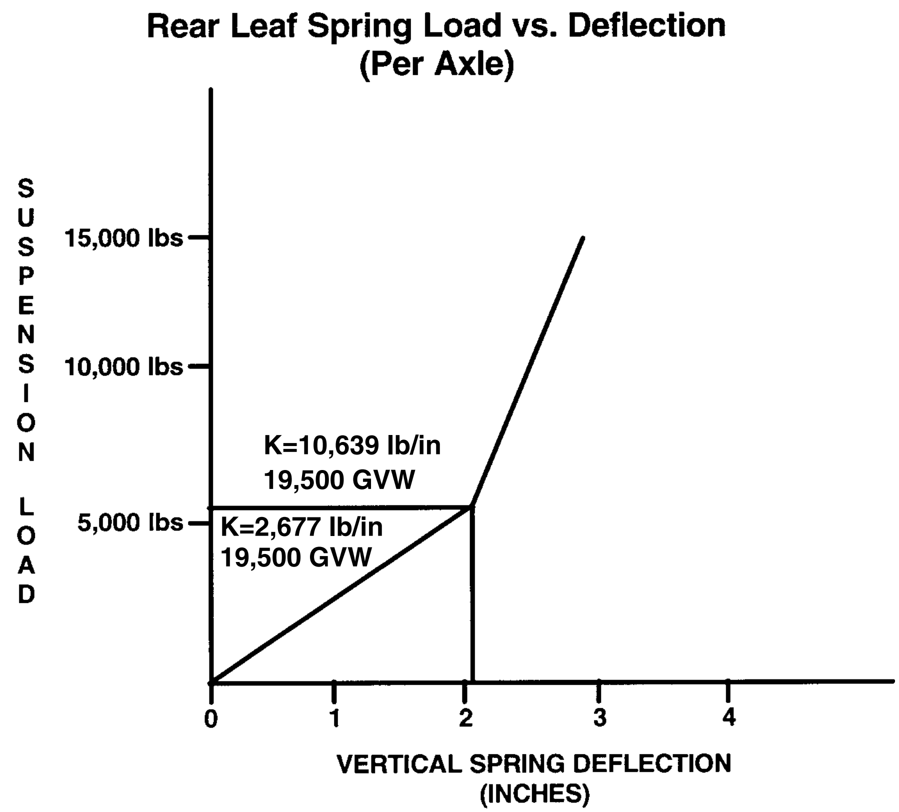
Suspension Deflection Charts





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Tire and Disc Wheel Chart

Tire

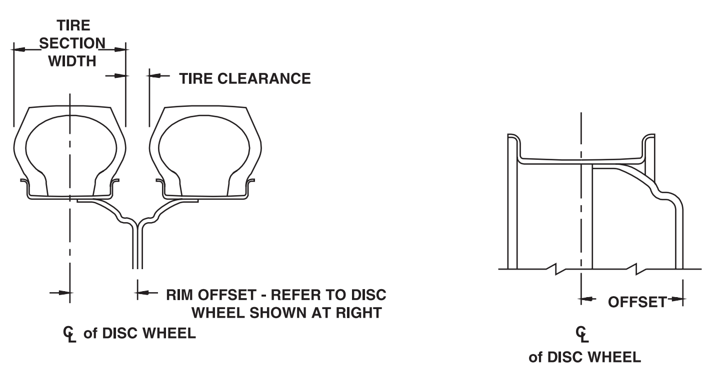
Tire Size	Tire Load Limit and Cold Inflation Pressures				Maximum Tire Load Limits		GVWR (Lb.)
	Single		Dual		Front	Rear	
	Lb.	PSI	Lb.	PSI	2 Single	4 Dual	
225/70R 19.5F	3,640	95	3,415	95	7,280	13,660	19,500

Tire Size	GVWR (Lb.)	Tire Radius				Tire Section Width	Tire Clearance	Design Rim Width
		Loaded		Unloaded				
		Front	Rear	Front	Rear			
225/70R 19.5F	19,500	14.91	14.96	16.00	16.00	8.7	1.3	6.0

Disc Wheel

Wheel Size	Bolt Holes	Bolt Circle Dia.	Ft./Rr. Nut Size*	Rear Stud Size*	Nut/Stud Torque Specs.	Inner Circle	Outside Offset	Disc Thickness	Rim Type	Material Mfg.
19.5 x 6.00 RW	6 JIS	8.75	1.6142 (41 mm) BUD HEX	0.8268 (21 mm) SQUARE	325 ft.-lb. (440 N•m)	6.46	5.0	0.35	15º DC	Steel TOPY

* O.D. Wrench Sizes



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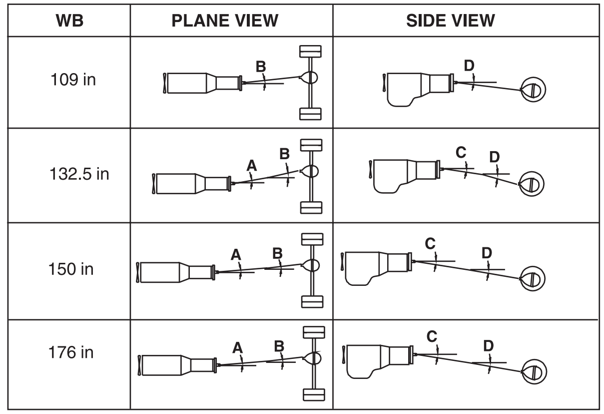
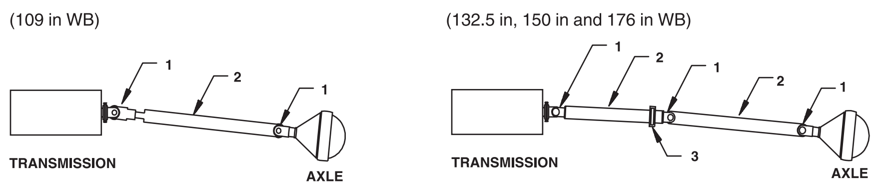
Propeller Shaft



TYPICAL INSTALLATIONS SHOWING YOKES "IN PHASE." "IN PHASE" MEANS THAT THE YOKES AT EITHER END OF A GIVEN PROPELLER SHAFT ASSEMBLY ARE IN THE SAME PLANE.



1. UNIVERSAL JOINT
2. PROPELLER SHAFT
3. CENTER CARRIER BEARING

Wheelbase	Plane View				Side View			
	A Manual Trans.	A Auto. Trans.	B Manual Trans.	B Auto. Trans.	C Manual Trans.	C Auto. Trans.	D Manual Trans.	D Auto. Trans.
109 in.	–	–	3.1º	3.0º	–	–	8.1º	7.9º
132.5 in.	0º	0º	3.1º	3.1º	2.5º	2.5º	2.5º	2.4º
150 in.	0º	0º	3.1º	3.1º	0º	0º	5.3º	5.2º
176 in.	0º	0º	2.3º	2.2º	0.3º	0.3º	2.0º	2.0º

NOTE: All driveline angles are at unloaded condition (curb position with typical cargo body)

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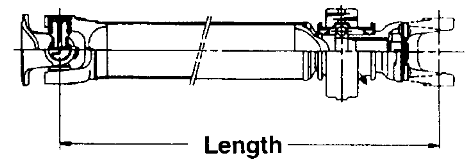
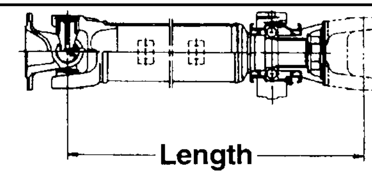
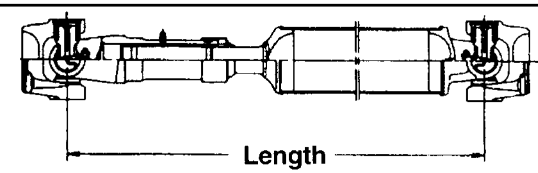
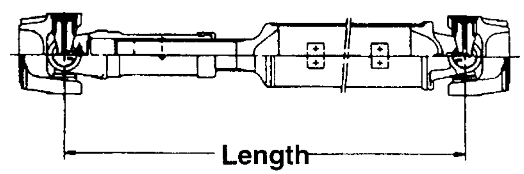
Wheelbase	109		132.5		150		176	
No. of Shafts	1		2		2		2	
Trans. Type	6 Manual Trans.	4 Auto. Trans.	6 Manual Trans.	4 Auto. Trans.	6 Manual Trans.	4 Auto. Trans.	6 Manual Trans.	4 Auto. Trans.
Shaft #1 O.D.	3.54	3.25	3.54	3.25	3.54	3.25	3.54	3.25
Thickness	0.126	0.091	0.126	0.091	0.126	0.091	0.126	0.091
Length	38.2	39.5	23.9	23.9	41.6	41.6	53.5	53.4
Type	D	C	B	A	B	A	B	A
Shaft #2 O.D.	N/A	N/A	3.54	3.25	3.54	3.25	3.54	3.25
Thickness	N/A	N/A	0.126	0.091	0.126	0.091	0.126	0.091
Length	N/A	N/A	37.6	38.9	37.6	38.4	51.6	53.0
Type	N/A	N/A	D	C	D	C	D	C

Type	Description	Model	Illustration
Type **A**	1st shaft in 2-piece driveline	P20	
Type **B**		P30	
Type **C**	1st shaft in 1-piece driveline 2nd shaft in 2-piece driveline	P20	
Type **D**		P30	

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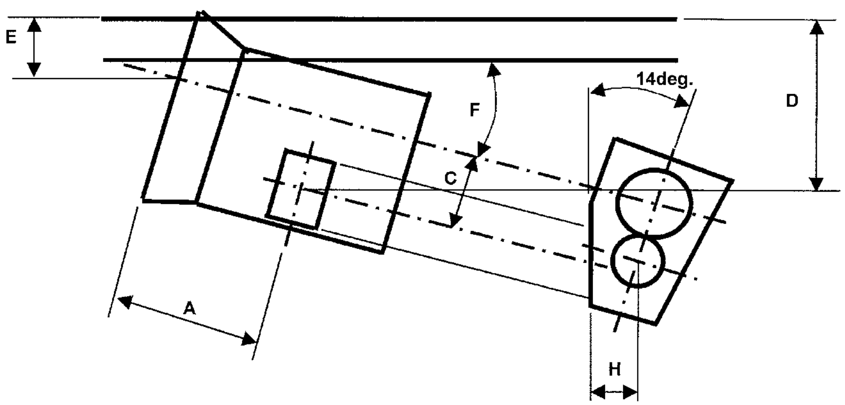
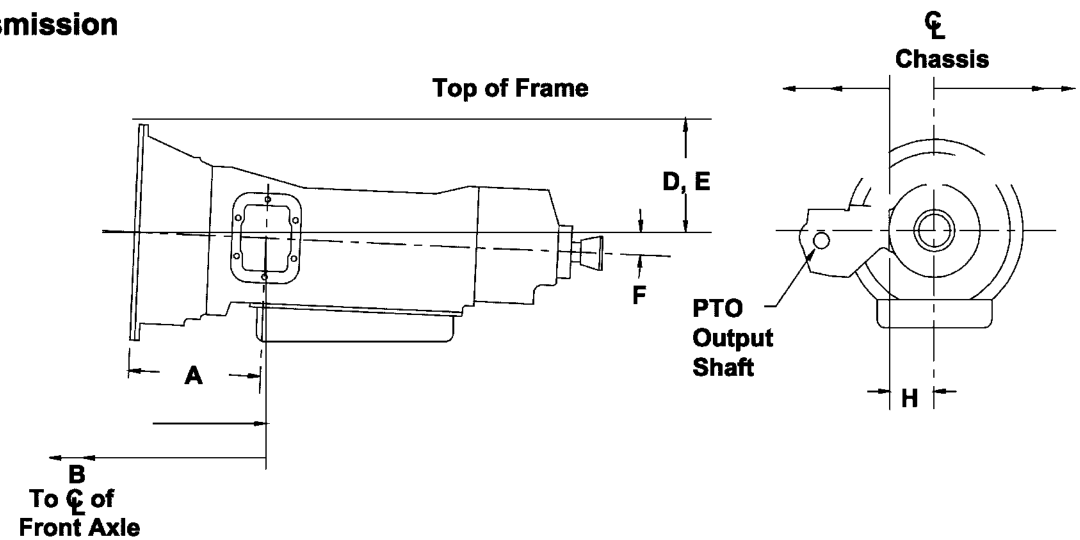
PTO Location, Drive Gear and Opening Information

Manual Transmission



Automatic Transmission



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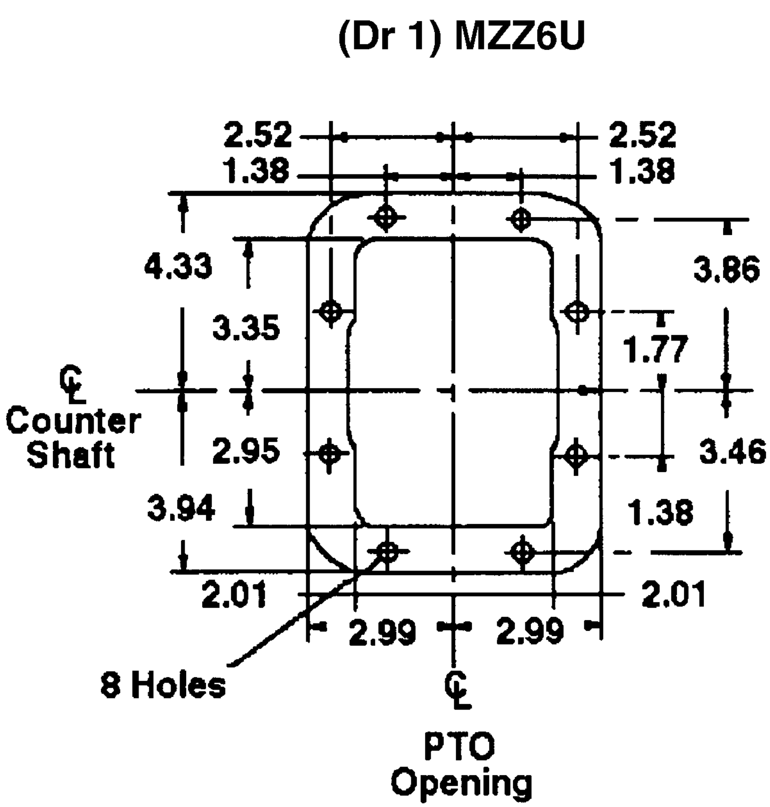
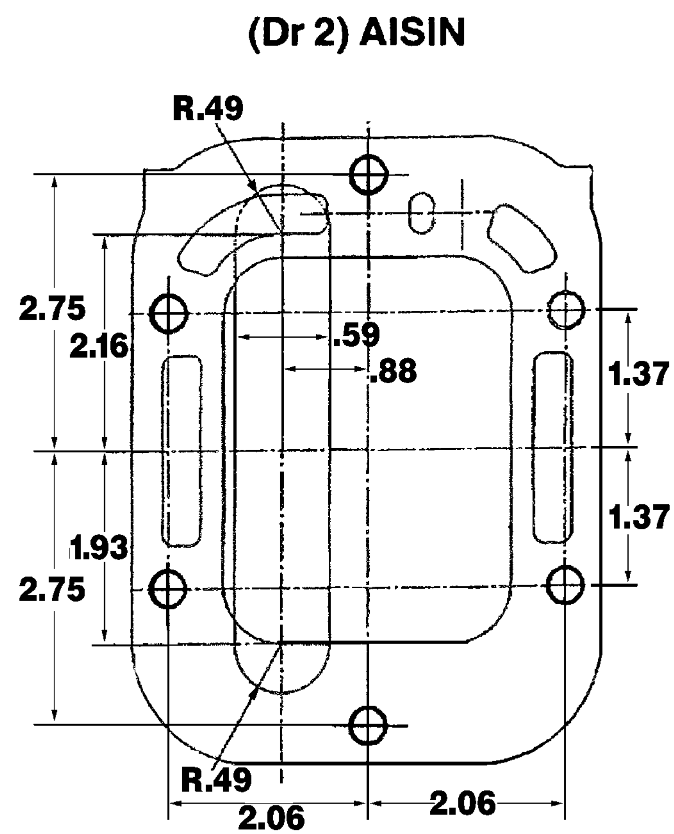
Trans.	Opening Location	Bolt Pattern	A	B	C	D	E	F	H	PTO Drive Gear Location	Ratio of PTO Drv. Gear Spd. to Eng. Spd.	No. of Teeth	Pitch	Helix Angle	Max. Output Torque
MZZ 6U	Left	(Dr 1)	11.6	37.57	5.2	12.8	7.7	2.5°	3.7 w/ 14° angle	4th Gear Trans. Countershaft	25/46 = 0.543	37	3°	25° RH	180 lbs.-ft. @ 1,000 RPM
Aisin[1)]	Left	(Dr 2)	12.6	38.59	0	8	7.5	2.5°	4.48	PTO Gear	1:1 with turbine	58	N/A	0°	134 lbs.-ft. @ 1,000 RPM

Opening Diagram





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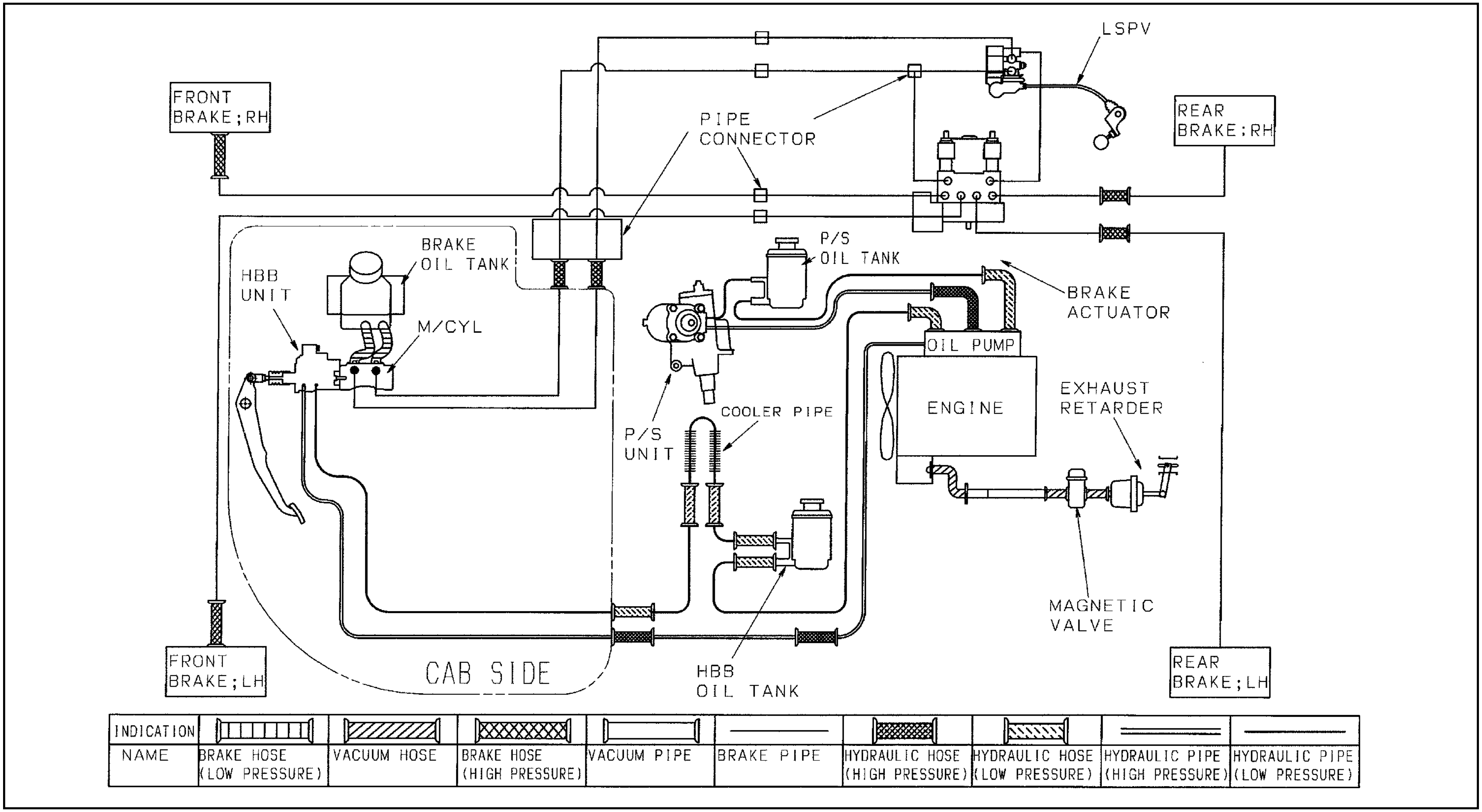
Brake System Diagram, Hydraulic Brake Booster

Please refer to Introduction Section of book for antilock system cautions and wheelbase modification requirements.



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Diesel Fuel Fill

Installation Instructions

1. Disconnect battery.
2. Loosen hose from the tie downs. Remove caps from plate on rail.
3. Install hoses onto the plate.
4. Extend hose out from the driver's side of the rail to body rail.
5. The filler neck must be mounted to allow the fill plate bracket to be parallel to the frame horizontal (see figure 4).
6. Cover with protector wrap and secure with tie wraps.
7. Filler hose is set for 96 inches outside width body.
8. Filler neck (dimension A) must be between 6.85 inches and 8.5 inches above frame.
9. Secure the filler plate to the bottom of the body and check for leaks.
10. Ensure that fill hose does not sag, creating an area where the fuel could pool in the fill hose.
11. Reconnect battery.

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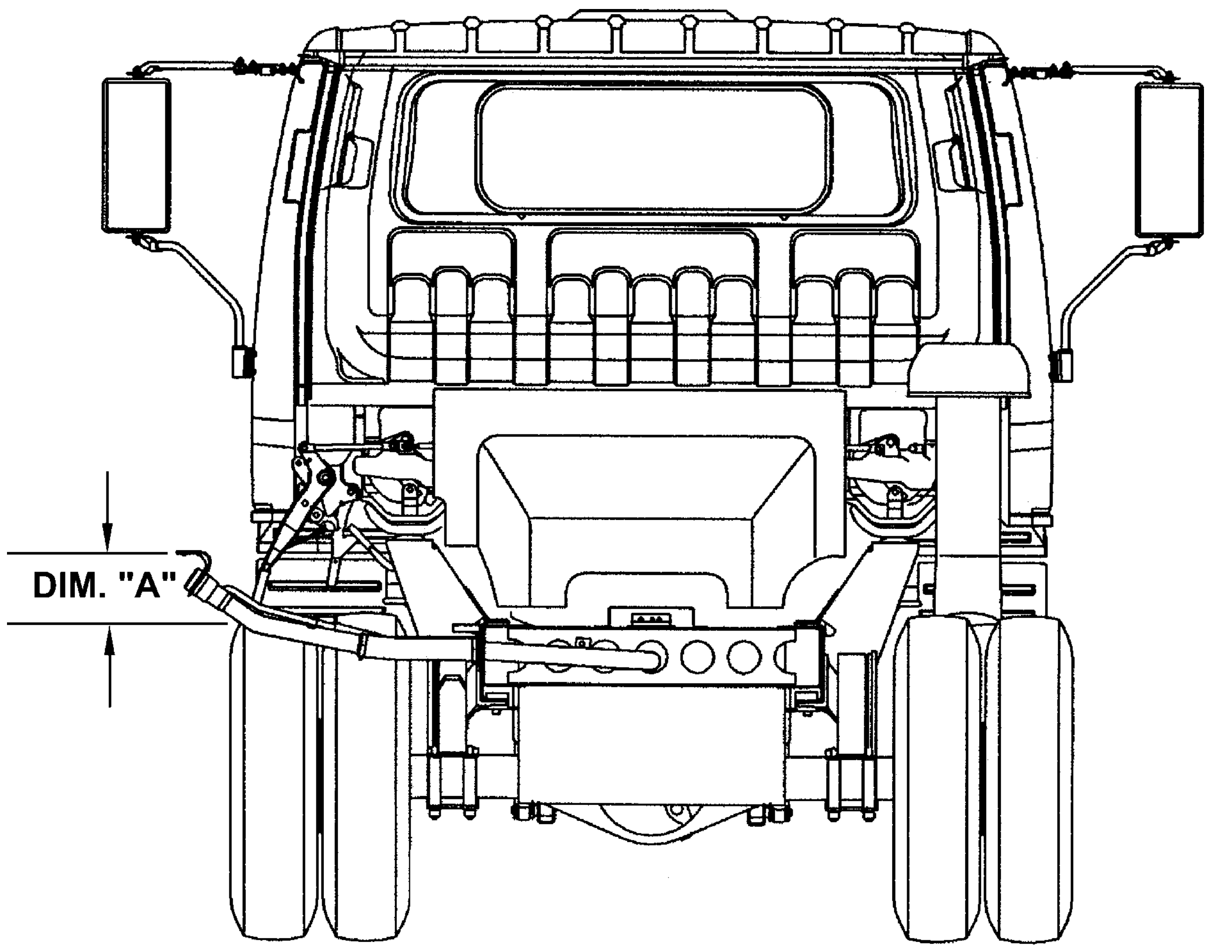
Rear View Fuel Fill



Dimension A = 6.85-8.5 inches (174-216 mm)

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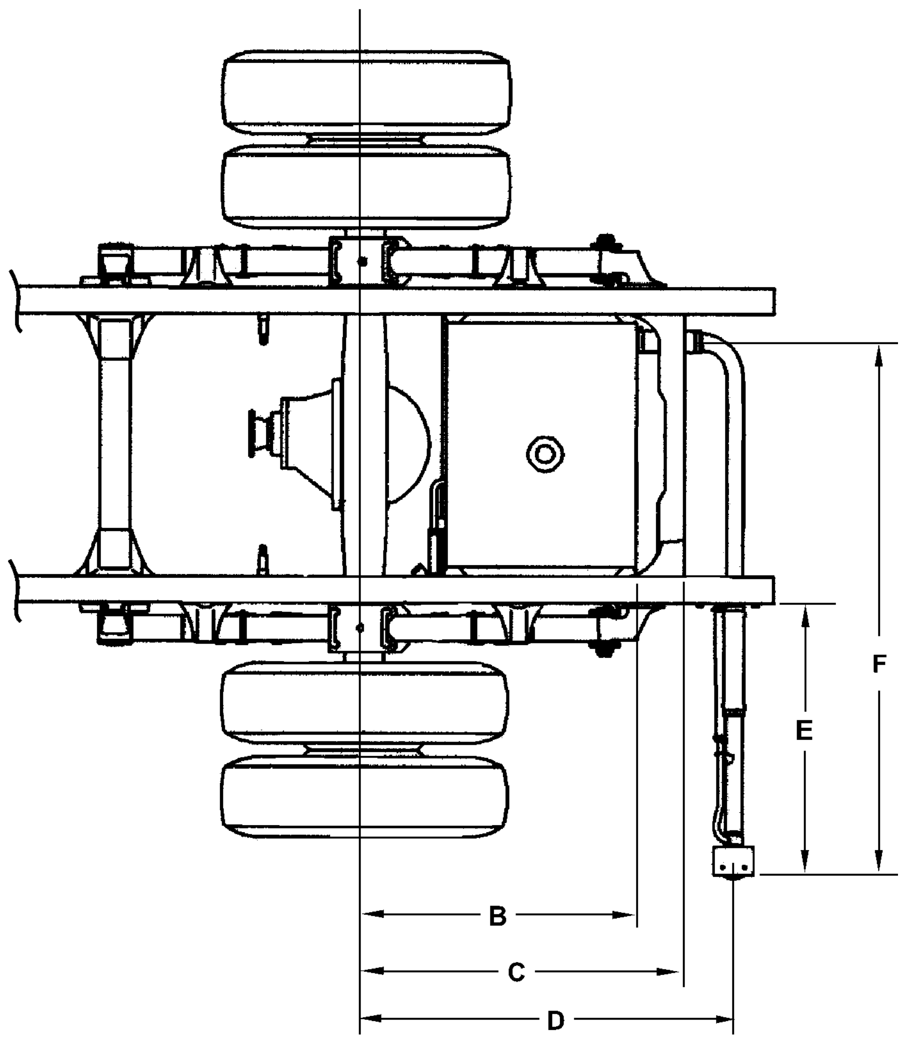
Top View Fuel Fill



Dimensions:
B = 29.75 inches (756 mm)
C = 34.00 inches (863 mm)
D = 39.29 inches (998 mm)
E = 30.86 inches (784 mm)
F = 56.60 inches (1,438 mm)

(Vehicle Specifications Index Section – NRR/W5500-HD Diesel – continued on next page)

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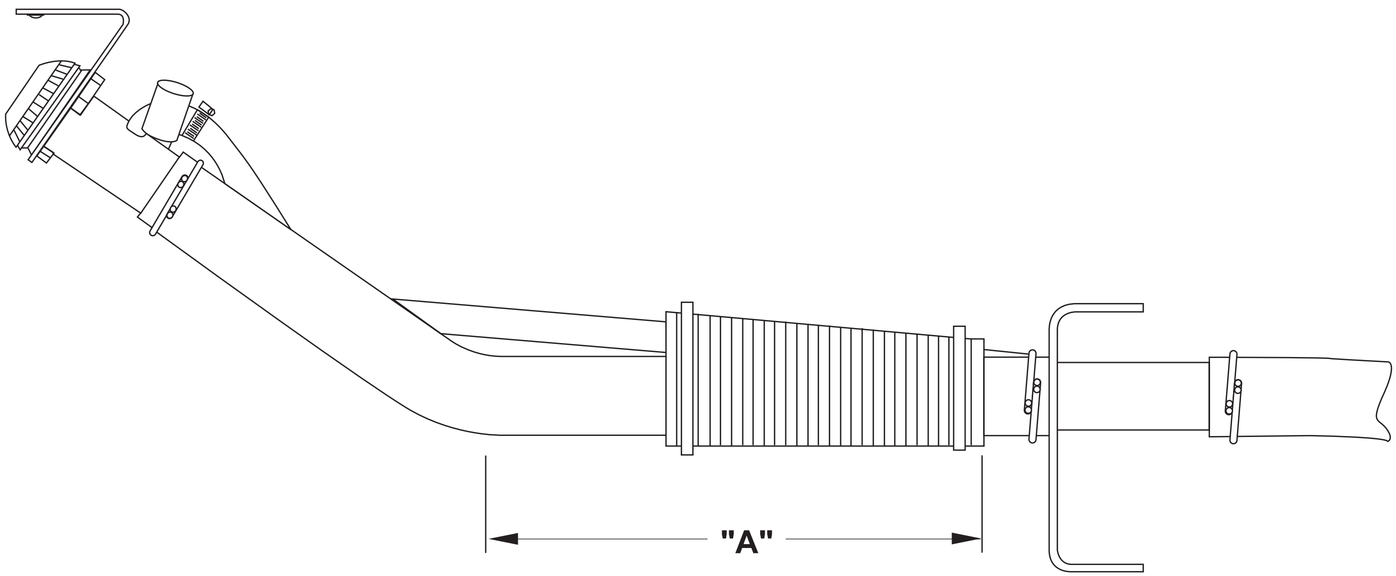
Hose Modification for Various Width Bodies



NOTE: Shorten Hose at "A" Area only.

96 remove 0 inches
90 remove 3 inches
86 remove 5 inches
80 remove 8 inches

(Vehicle Specifications Index Section – NRR/W5500-HD Diesel – continued on next page)

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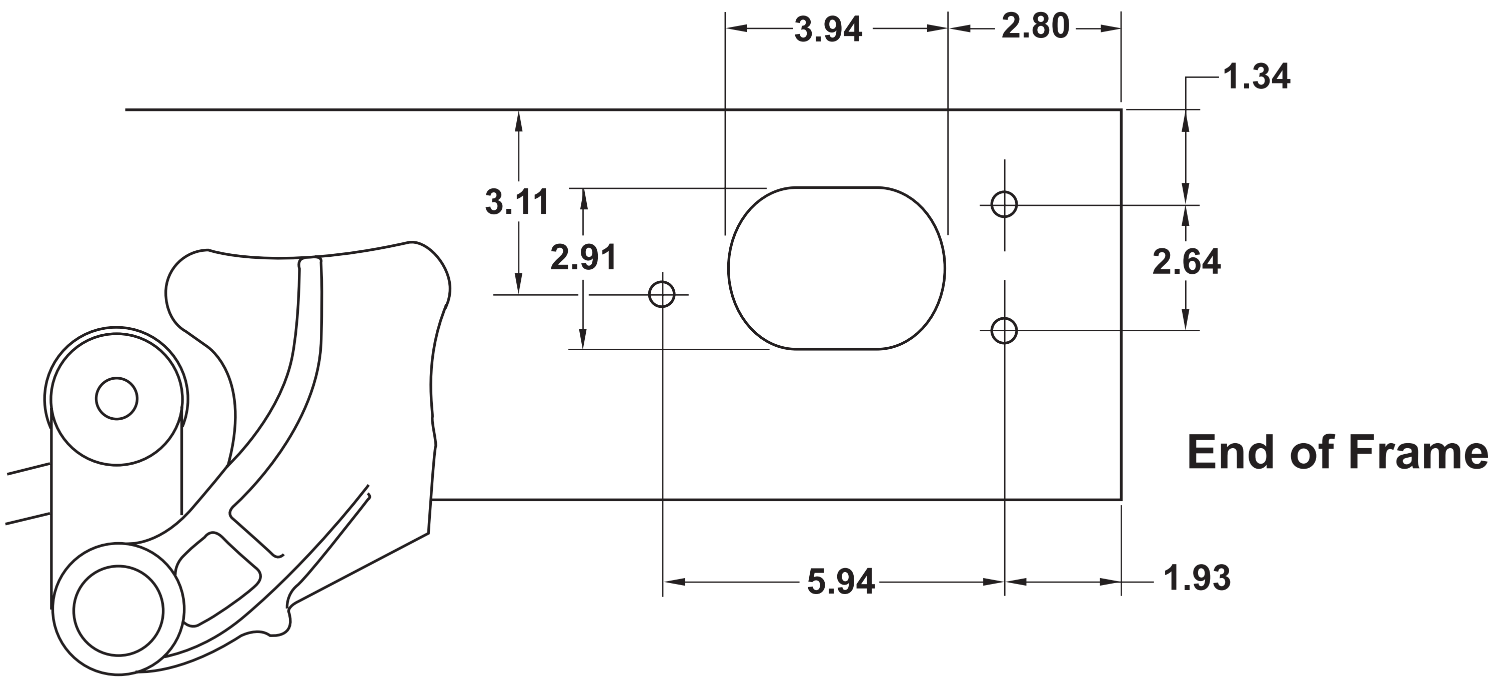
Through the Rail Fuel Fill Frame Hole



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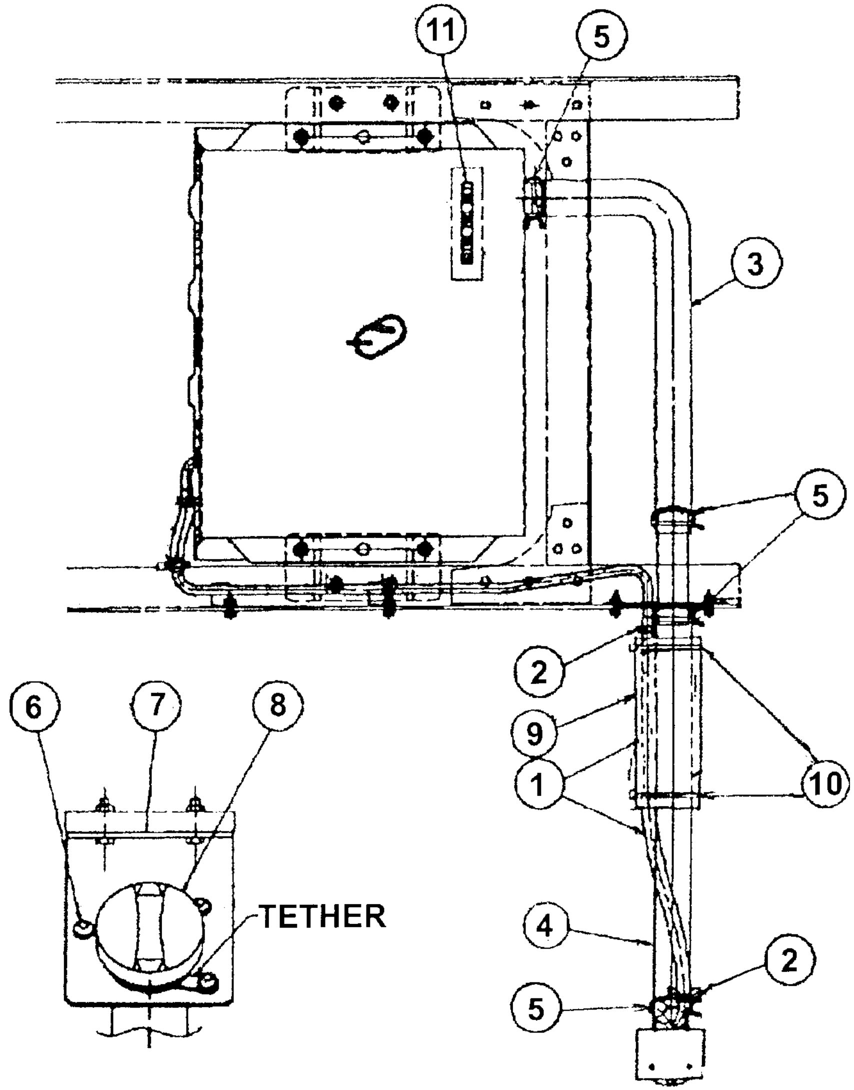
NRR/W5500-HD Diesel Fuel Fill Parts Illustration



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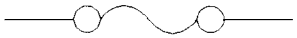
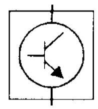
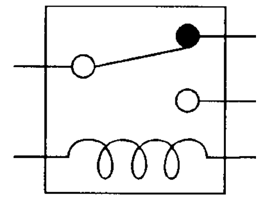
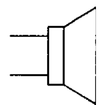
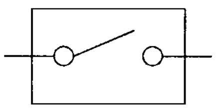
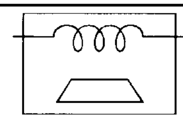
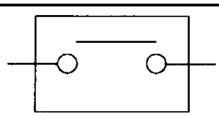
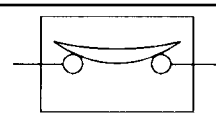
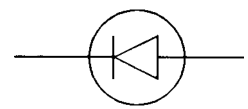
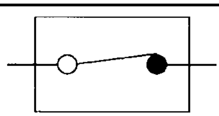
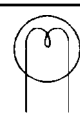
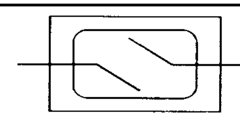
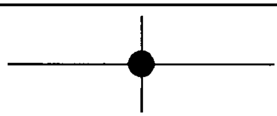
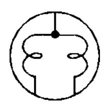
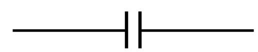
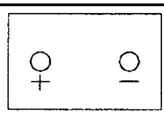
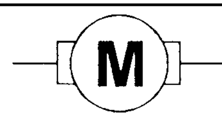
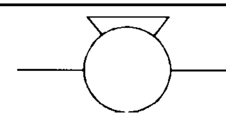
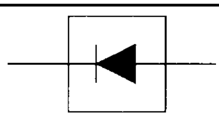
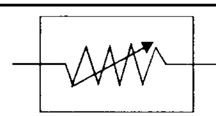
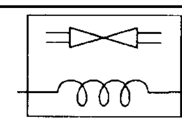
(Vehicle Specifications Index Section – NRR/W5500-HD Diesel – continued from previous page)

NRR/W5500-HD Diesel Fuel Fill Parts List

Number	Part Name	Isuzu Part Number	GM Part Number	Quantity
1	Breather Hose	894152-0030	N/A	1
2	Clip, Rubber Hose	894242-0340	94242034	2
3	Hose, Fuel Filler	897187-8750	97187875	1
4	Hose, Fuel Filler	897253-1400	97253140	1
5	Clip, Filler Hose	894435-8760	97724373	4
6	Screw, Filler Hose	894384-6460	N/A	3
7	Bracket, Filler Neck	897116-621Y	97116621	1
8	Cap, Filler	897218-7020	N/A	1
9	Protector	897114-0630	97114063	1
10	Clip	109707-1071	94062296	2
11	Caution Plate	897135-6050	97135605	1

2005 NPR/W3500, NPR HD/W4500 Gas Electrical

Symbols

Symbol	Meaning	Symbol	Meaning	Symbol	Meaning
	Fuse		Electronic Parts		Coil (Inductor), Solenoid Magnetic Valve
	Fusible Link		Resistor		Relay
	Fusible Link Wire		Speaker		
	Switch		Buzzer		Connector
	Switch		Circuit Breaker		Light-Emitting Diode
	Switch (Normal Close Type)		Bulb		Reed Switch
	Contact Wiring		Double-Filament Bulb		Condenser
	Battery		Motor		Horn
	Diode		Variable Resistor Rheostat		Vacuum Switching Valve

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Abbreviations

Abbreviation	Definition	Abbreviation	Definition
A	Ampere (S)	kW	Kilowatt
ABS	Anti-lock Brake System	LH	Left Hand
ASM	Assembly	LWB	Long Wheelbase
AC	Alternating Current	M/T	Manual Transmission
A/C	Air Conditioner	OD	Overdrive
ACC	Accessories	OPT	Option
A/T	Automatic Transmission	QOS	Quick on Start
C/B	Circuit Breaker	RH	Right Hand
CSD	Cold Start Device	RR	Rear
DIS	Direct Ignition System	RWAL	Rear Wheel Anti-lock Brake System
EBCM	Electronic Brake Control Module	ST	Start
ECGI	Electronic Control Gasoline Injection	STD	Standard
ECM	Electronic Control Module	SW	Switch
ECU	Electronic Control Unit	SWB	Short Wheelbase
EFE	Early Fuel Evaporation	TCM	Transmission Control Module
4 A/T	4-Speed Automatic Transmission	3 A/T	3-Speed Automatic Transmission
4 X 4	Four-Wheel Drive	V	Volt
FL	Fusible Link	VSV	Vacuum Switching Valve
FRT	Front	W	Watt (S)
H/L	Headlight	WOT	Wide Open Throttle
IC	Integrated Circuit	W/	With
IG	Ignition	W/O	Without

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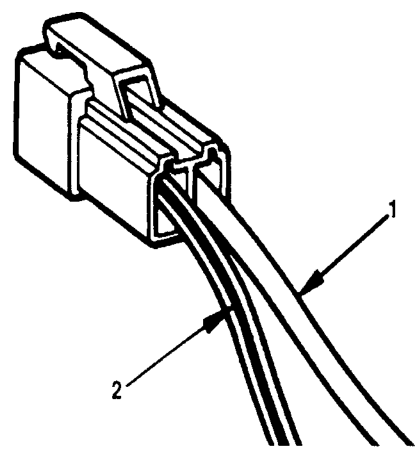
Wiring

Wire Color

All wires have color-coded insulation. Wires belonging to a system's main harness will have a single color. Wires belonging to a system's sub-circuits will have a colored stripe. Striped wires use the following code to show wire size and colors.

Example: 0.5 G / R

- R — Red (Stripe Color)
- G — Green (Base Color)
- 0.5 — Wire Size (0.5 mm^2)



1. Single Color Wire
2. Colored Stripe Wire

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Abbreviations are used to indicate wire color within a circuit diagram. Refer to the following table.

Color-Coding	Meaning	Color-Coding	Meaning
B	Black	BR	Brown
W	White	LG	Light Green
R	Red	GR	Grey
G	Green	P	Pink
Y	Yellow	LB	Light Blue
L	Blue	V	Violet
O	Orange		

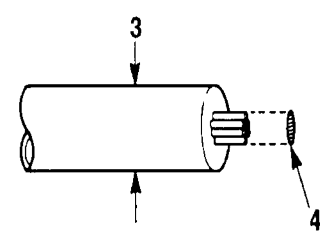
Distinction of Circuit by Wire Base Color

Base Color	Circuits	Base Color	Circuits
B	Starter Circuit	Y	Instrument Circuit
W	Charging Circuit	L, O, BR, LG, GR, P, LB, V	Other Circuits
R	Lighting Circuit		
G	Signal Circuits		

Wire Size

The size of wire used in a circuit is determined by the amount of current (amperage), the length of the circuit, and the voltage drop allowed. The following wire size and load capacity are specified by AWG (American Wire Gauge). (Nominal size means approximate cross sectional area.)

3. Outside Diameter
4. Cross Sectional Area



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Nominal Size	Cross Sectional Area (mm^2)	Outside Diameter (mm)	Allowable Current (A)	AWG Size (Cross reference)
0.3	0.372	1.8	9	22
0.5	0.563	2.0	12	20
0.85	0.885	2.2	16	18
1.25	1.287	2.5	21	16
2	2.091	2.9	28	14
3	3.296	3.6	37.5	12
5	5.227	4.4	53	10
8	7.952	5.5	67	8
15	13.36	7.0	75	6
20	20.61	8.2	97	4

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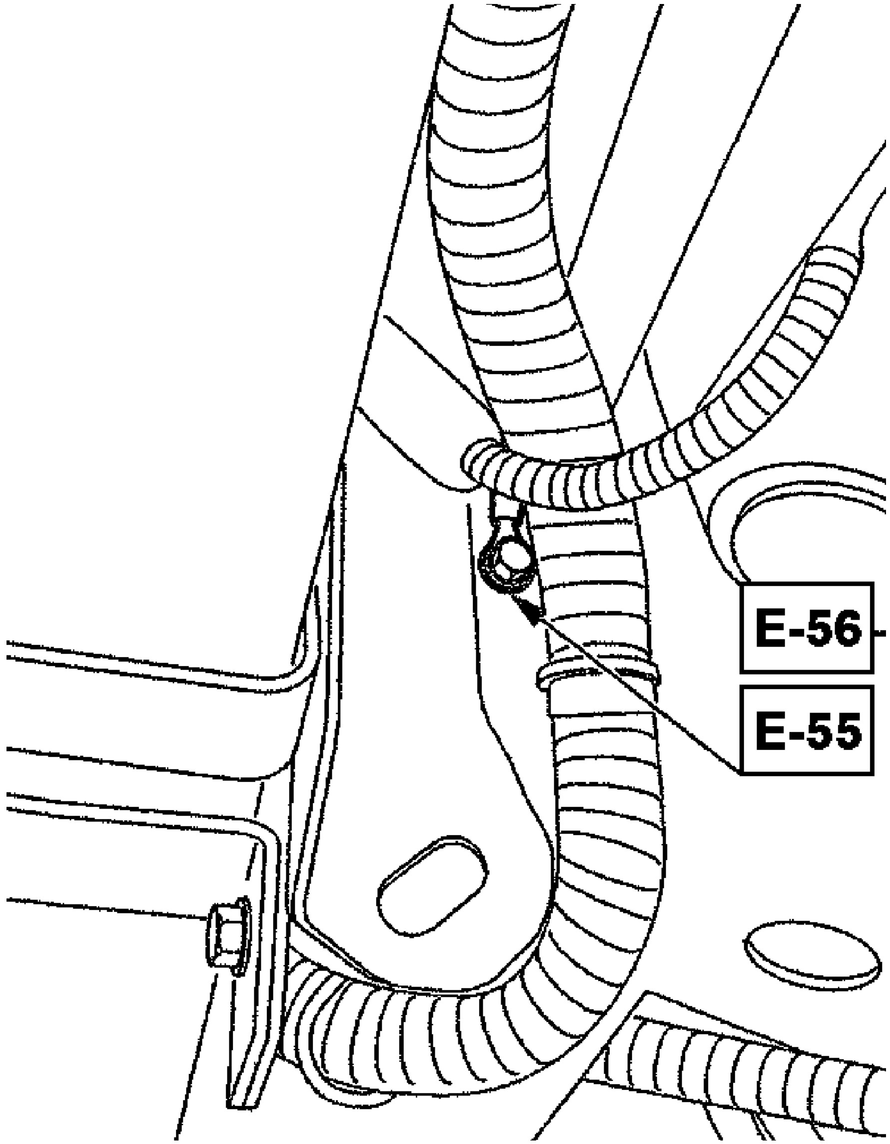
Grounding Point Location (E-55, E-56)



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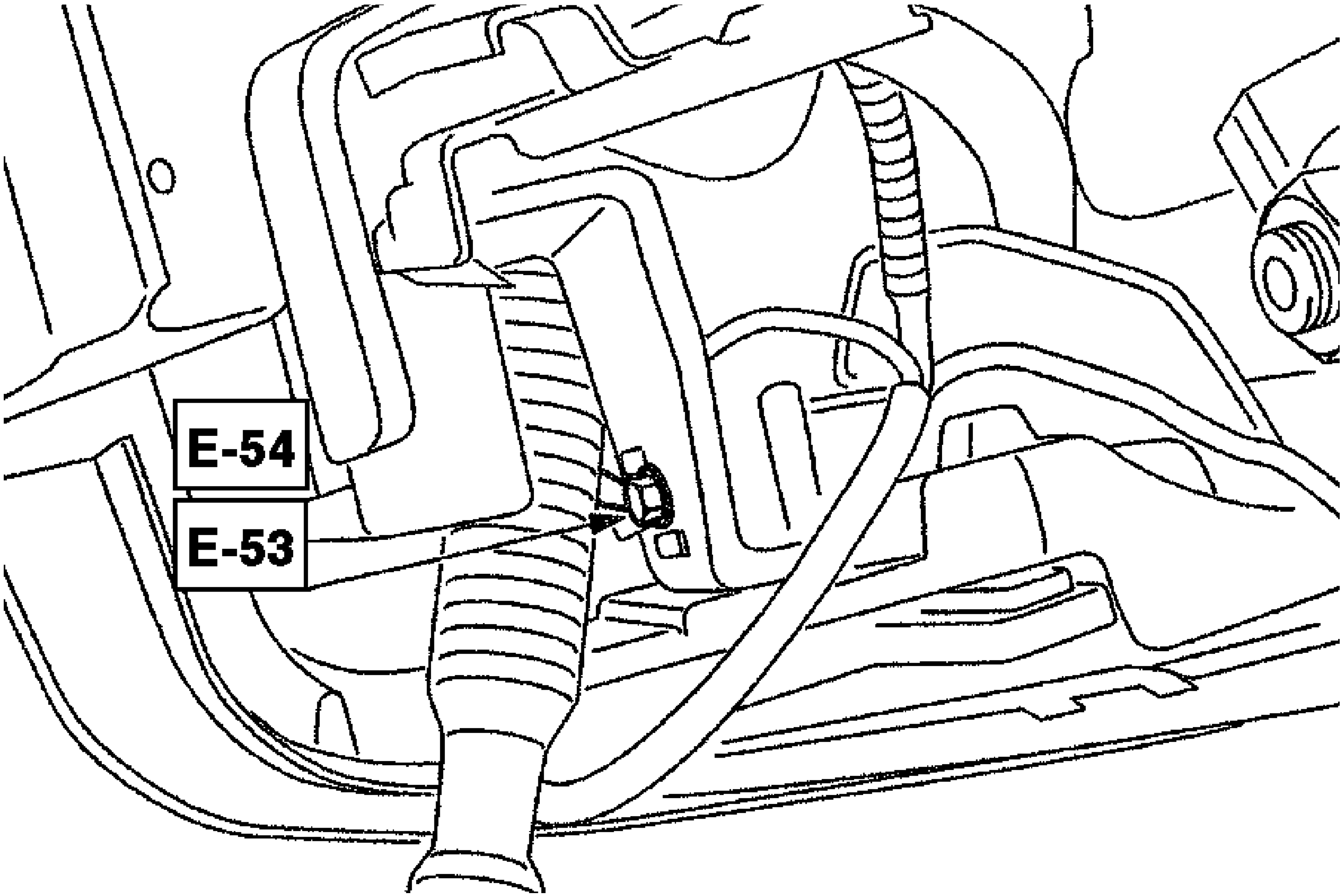
Grounding Point Location (E-53, E-54)



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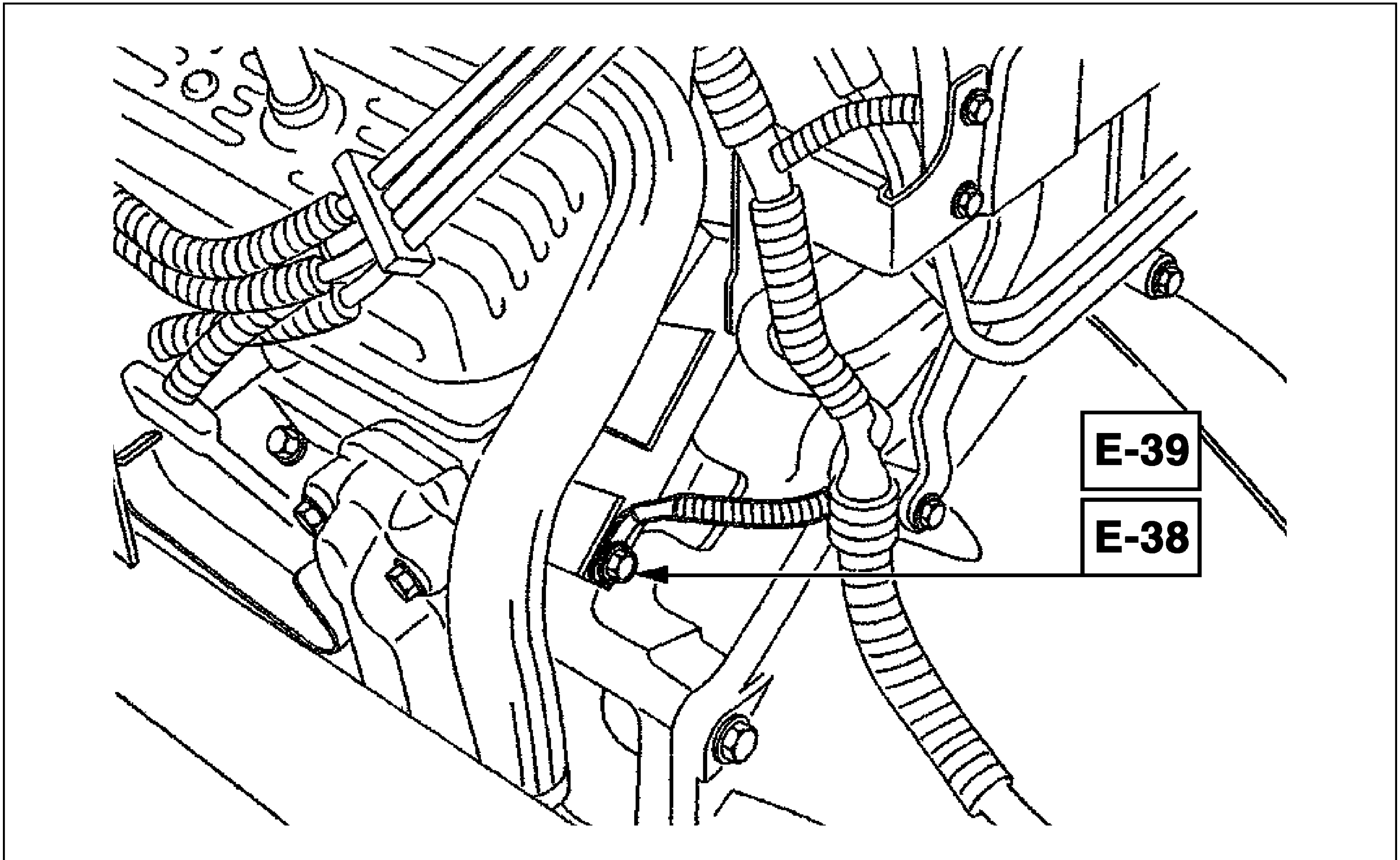
Grounding Point Location (E-38, E-39)



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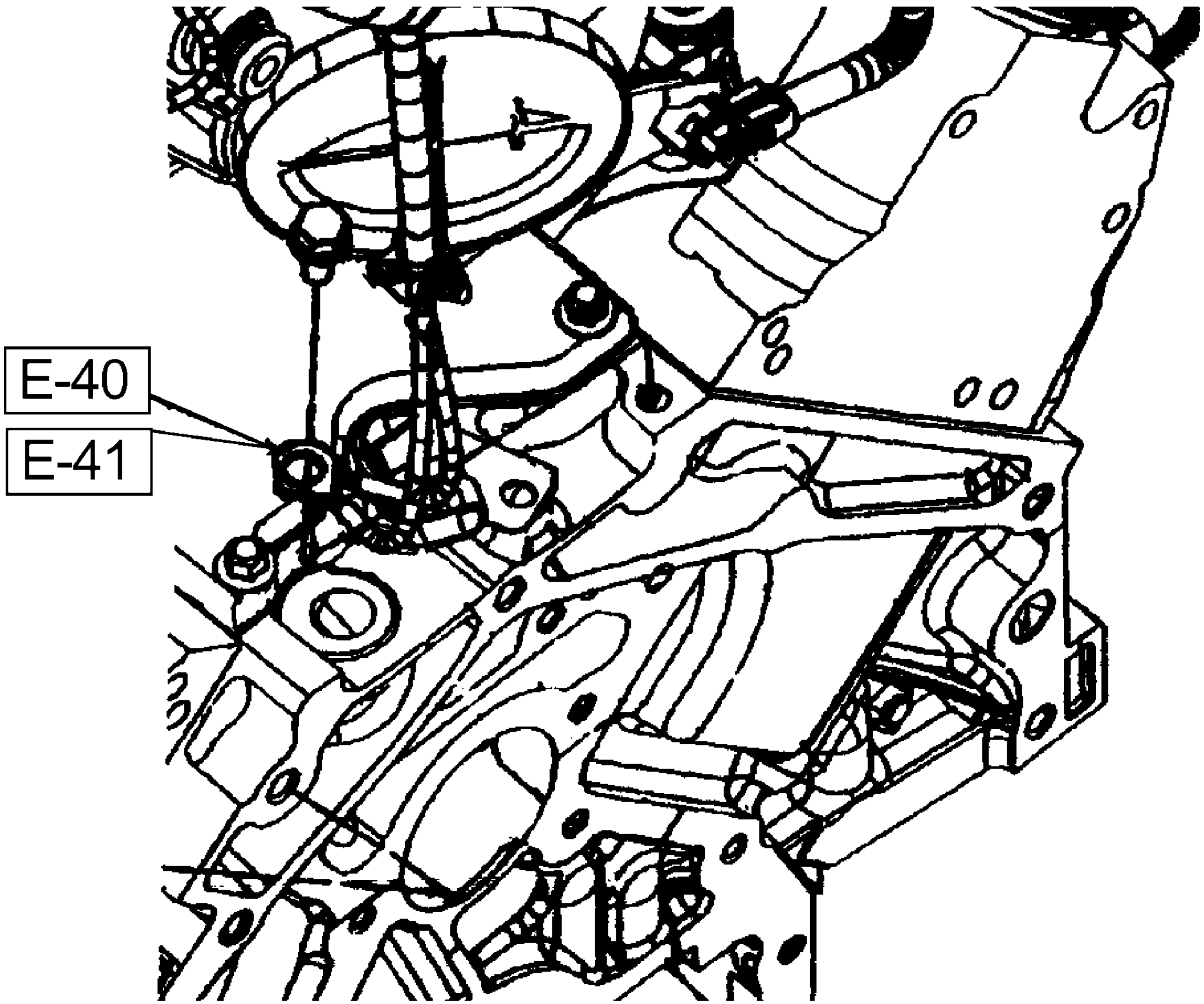
Grounding Point Location (E-40, E-41)



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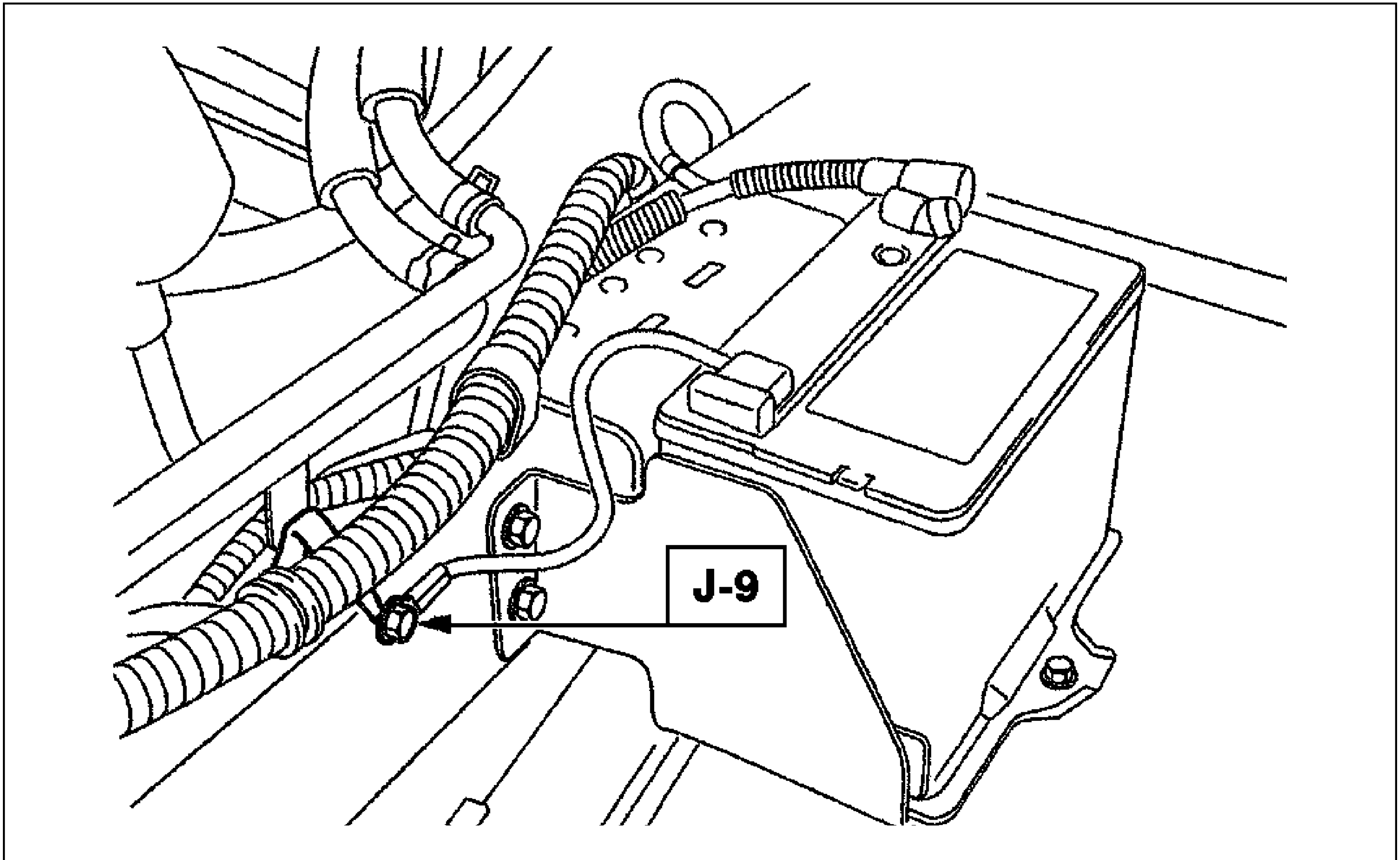
Grounding Point Location (J-9)



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Reference Table of Grounding Point

NOTICE: Abnormal phenomena of electrical components are considered resulted from defective grounding. In repair, be sure to inspect grounding points and to tighten all fastening parts surrounding the grounding points.

Connector No.	Cable Harness Name	Location	Main Parts (Load)
E-55	Engine harness	Frame-LH (FRT)	Turn signal indicator light, Meter, High beam indicator light.
E-56			
E-53		Headlight bracket-LH	Charge relay, Dome light switch, Meter, Meter starter relay, Inhibitor switch, Lighting switch, Ignition relay, Front turn signal light, Brake fluid switch, Tail relay, Cornering light switch, Cornering light, Cornering light relay, Dimmer relay, Wiper motor, Washer motor, Intermittent relay, Heater and A/C relay, Radio and clock, Cigar lighter, Fan switch, Blower resistor, A/C switch, Blower motor, Electronic thermostat, Cab interior switch, Flasher unit, Clearance light, I.D. light, Illumination, Power source relay, Hazard warning switch, Turn signal light switch, Roof marker light, Illumination controller.
E-38		Engine-LH (RR)	Mass air flow sensor, Diagnostics connector, Coil driver, Powertrain control module.
E-39			Powertrain control module.
E-40		Engine-RH (RR)	Powertrain control module.
E-41			Powertrain control module.
J-9	Frame front harness	Frame-RH (FRT)	Fuel pump relay, I.D. light relay, Oxygen sensor (LH, RH), Fuel pump, License plate light, Taillight, Rear turn signal light, Stoplight, Backup light.

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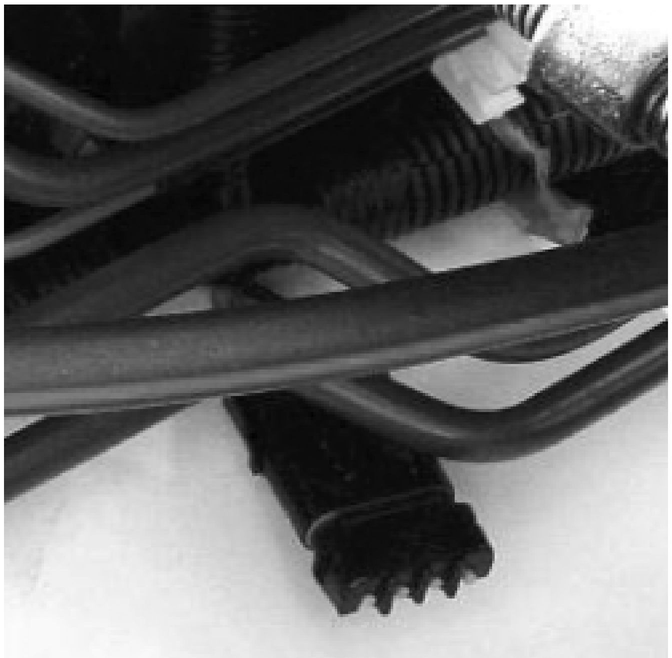
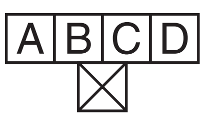
NPR/W3500 Body Room Light, I.D. and Marker Lamp, and Back-Up Lamp Connector Location

NPR/W3500 Body Connectors LH Frame



- **Packard Body Plug**
- **4-Pin Weather Seal Connector with Mating Plug**
- **Location:**
  Inside left-hand frame rail 28 to 31 inches BOC
- **Circuits:**
  Rear Dome = A
  Hot Wire = B
  Marker Lamp = C
  Ground = D



Packard Body Plug Connector Parts

	NPR/NQR
Chassis Housing ASM	1201-0974
Terminal	1208-9040
Terminal	1212-4587
Seal	1208-9679
Seal	1201-5193
Body Housing ASM	1201-5797
Housing	1201-5787
Connector Seal	1201-0492
Dummy Seal	1201-0300

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NPR/W3500 Body Room Light, I.D. and Marker Lamp, and Back-Up Lamp Connector Location (continued)

NPR/W3500 Body Connectors EOF

- **Packard Body Plug**
- **4-Pin Weather Seal Connector with Mating Plug**
- **Location:**
  Center of Crossmember
- **Circuits:**
  Rear Dome = A
  Hot Wire = B
  Marker Lamp = C
  Ground = D

A	B	C	D

Packard Body Plug Connector Parts

	NPR/NQR
Chassis Housing ASM	1201-0974
Terminal	1208-9040
Terminal	1212-4587
Seal	1208-9679
Seal	1201-5193
Body Housing ASM	1201-5797
Housing	1201-5787
Connector Seal	1201-0492
Dummy Seal	1201-0300

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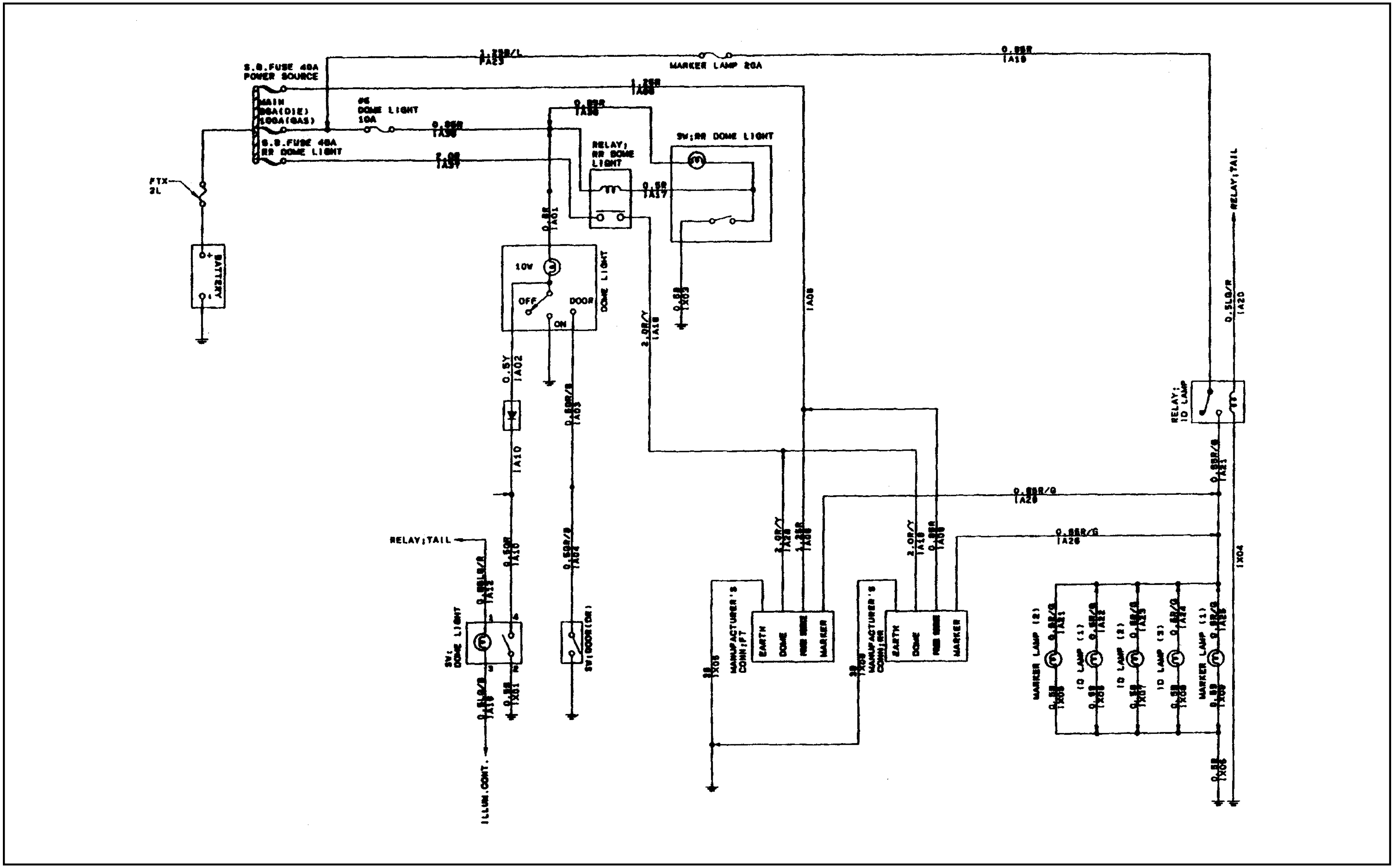
Dome Interior and Marker Lights Circuit Diagram



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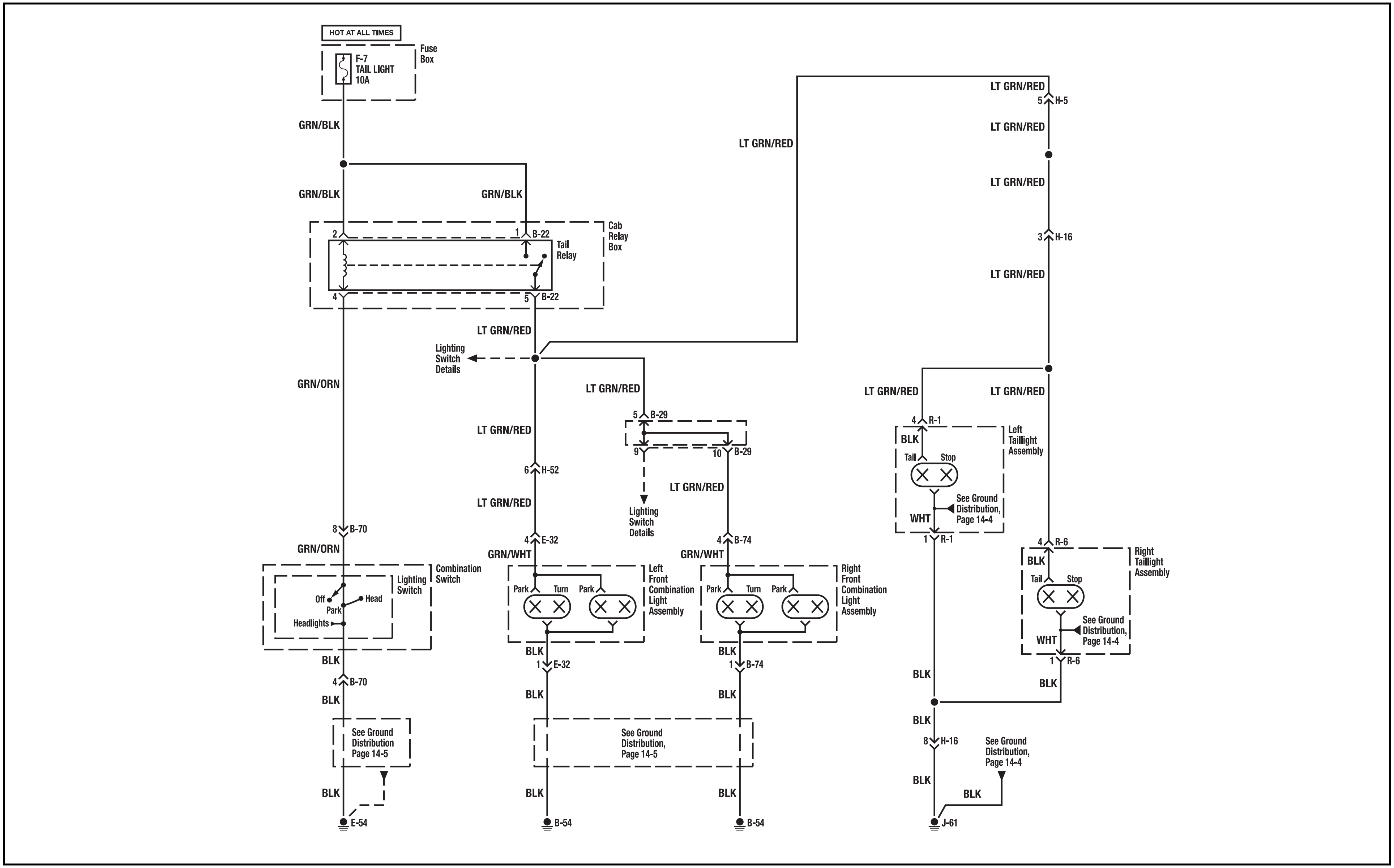
Park, Tail Lights Circuit Diagram



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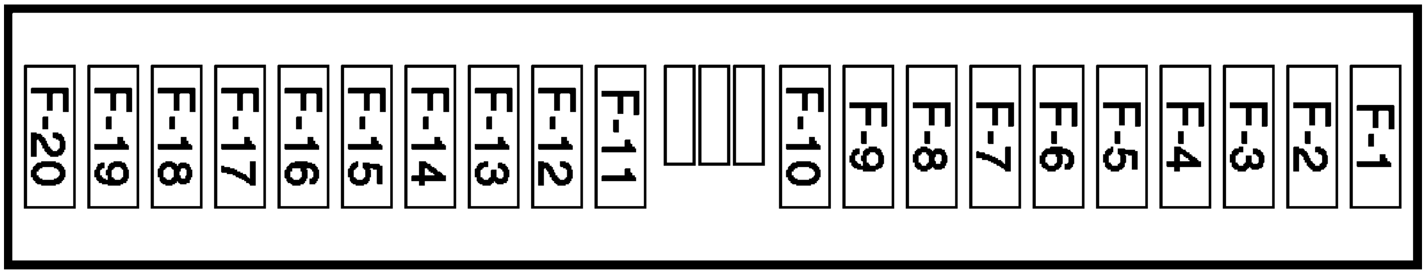
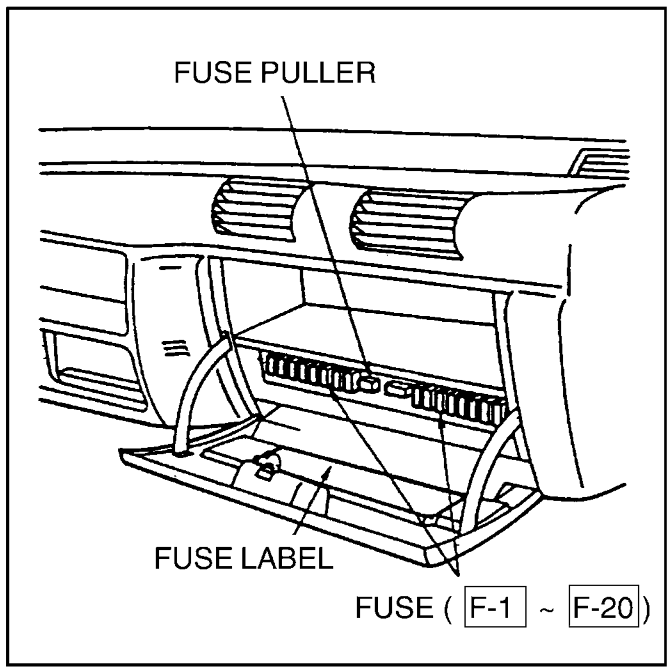
Fuse Location





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Fuse Box

Fuse No.	Fuse Name	Amps	Circuit Protected
F-1	HEATER	25A	Heater
F-2	AIR CON	10A	Compressor controls
F-3	EXHAUST BRAKE (Diesel)	10A	Exhaust brake system (Diesel)
	PCM (IGN 1) (Gas)		Engine controls (Gas)
F-4	D.R.L. (Diesel)	10A	Headlights (Diesel)
	PCM (IGN) (Gas)		Engine controls (Gas)
F-5	ECU (BAT) (Diesel)	10A	Engine controls (Diesel)
	A/T SOLENOID (Gas)		Automatic transmission controls (Gas)
F-6	DOME LIGHT	10A	Interior lights, Exterior lights
F-7	TAIL LIGHT	10A	Dash lights, Exterior lights
F-8	STOP LIGHT	10A	Brake lights
F-9	HEAD LIGHT (RH)	20A	Headlights
F-10	HEAD LIGHT (LH)	20A	Headlights
F-11	WIPER, WASHER	20A	Windshield wiper/washer
F-12	GENERATOR	20A	Charging system
F-13	TURN SIGNAL LIGHT	10A	Turn lights
F-14	ECU (IGN) (Diesel)	10A	Engine controls
	PCM (ACC) (Gas)		
F-15	AUDIO, CIGAR LIGHTER	20A	Cigarette lighter, Engine controls, Sound system
F-16	POWER SOURCE	20A	Engine controls
F-17	ENGINE STOP (Diesel)	10A	Engine stop system (Diesel)
	FUEL PUMP (Gas)		Engine controls (Gas)
F-18	HAZARD, HORN	20A	Horn, Hazard lights
F-19	AUDIO (Gas)	10A	Audio
F-20	STARTER	10A	Starting system

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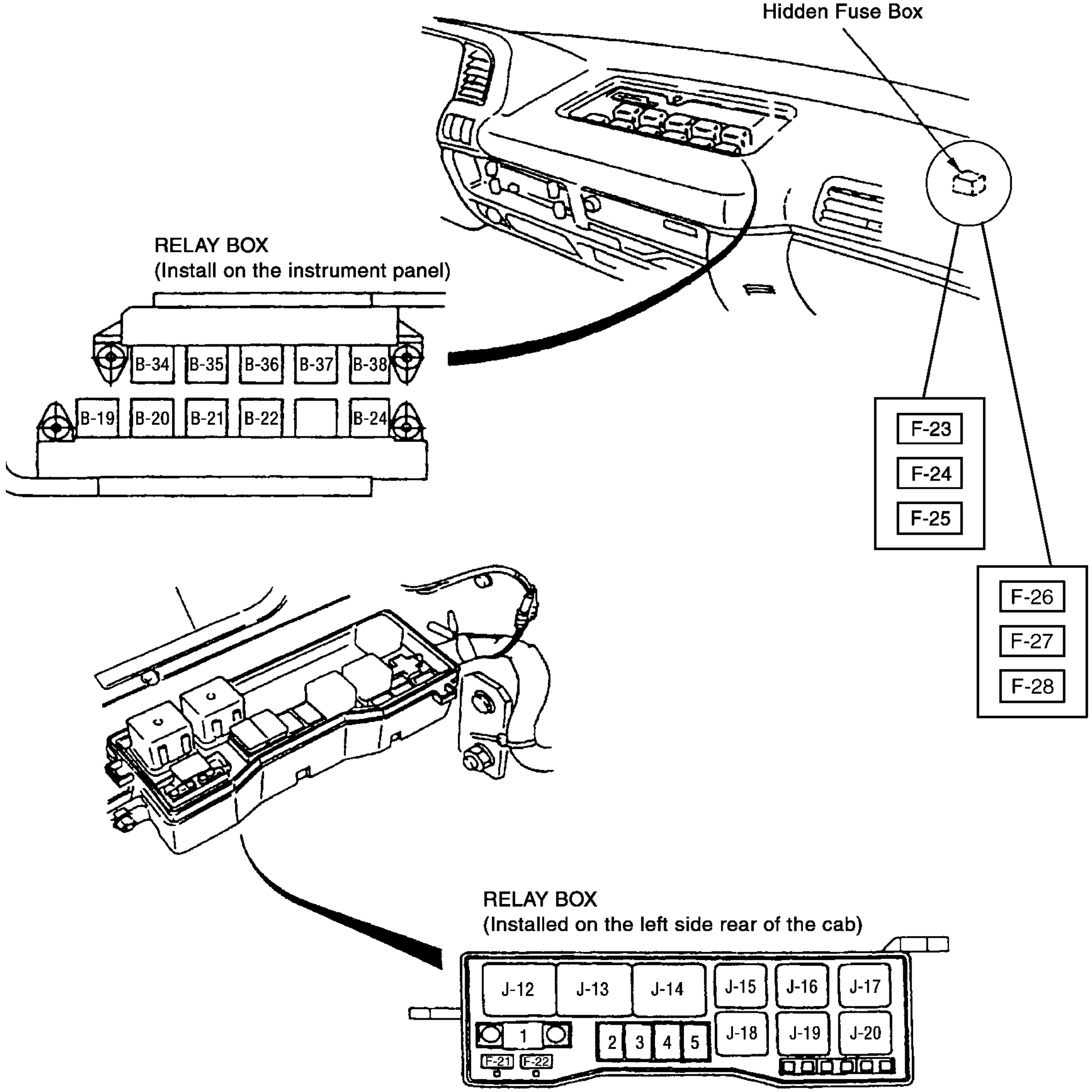
Relay Location



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Cab Relay

Diode Number	Circuits Protected	Diode Number	Circuits Protected
B-17	Brake warning system	B-25	Compressor controls
B-18	– –	B-26	Exhaust brake system (Diesel)

Relay Number	Relay	Relay Number	Relay
B-19	Charge relay	B-35	Cornering
B-20	Headlight	B-36	Exhaust brake cut (Diesel)
B-21	Heater and A/C		Vacuum pump (Gas)
B-22	Tail	B-37	A/C thermo
B-23	Buzzer control	B-38	Exhaust brake (Diesel)
B-24	Horn		Ignition (Gas)
B-34	Power source		

Fuse Box

Fuse No.	Fuse Name	Amps	Circuit Protected
F-23	ABS-1	15A	ABS
F-24	ABS-2	10A	ABS
F-25	GAUGE, BACK	10A	ABS, Back-up lights (Diesel), Brake warning system, Compressor controls, Engine controls, Exhaust brake system (Diesel), Exterior lights, Starting system, Transmission controls (Diesel)
F-26	TAC	15A	TAC
F-27	TAC	15A	IGN COIL (Gas)
F-28	TAC SPARE	15A	SPARE

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Relay Box Outside Cab

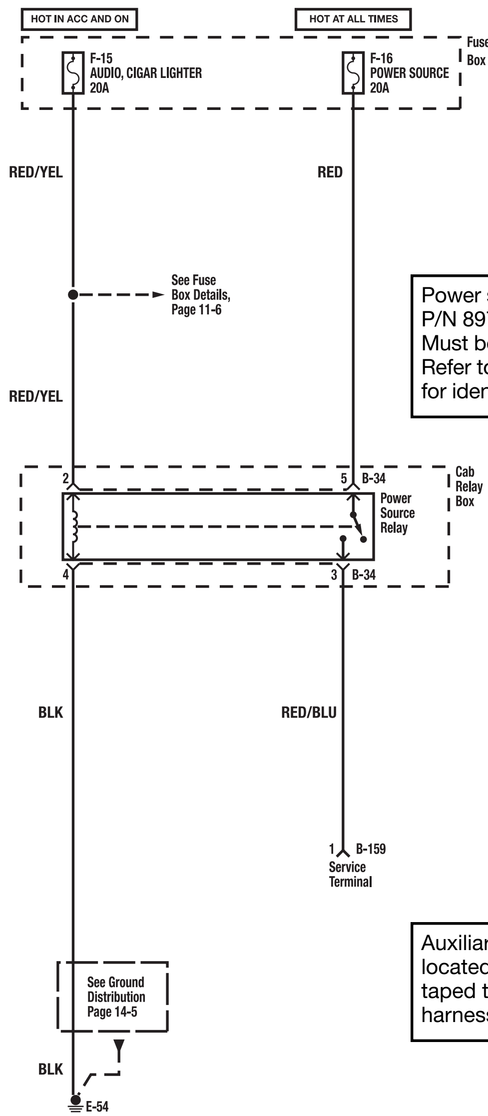
Fuse No.	Fuse Name	Amps	Circuit Protected
1	MAIN	80A (D) 100A (G)	Power Distribution
2	KEY	50A	Power Distribution
3	ABS (Gas)	60A	ABS (Gas), Engine Controls (Diesel)
	GLOW (Diesel)		
4	ABS (Diesel)	60A (D)	ABS (Diesel)
	RR DOME LIGHT (Gas)	40A (G)	RR Dome Light (Gas)
5	CAB HEATER (Diesel)	60A	Ceramic Heater (Diesel)
	POWER SOURCE (Gas)		Power Source (Gas)
F-21	MARKER LAMPS (Gas)	20A	Marker Lamps
F-22	CONDENSER FAN (Diesel)	15A	Condenser Fan (Diesel)

Relay Number	Relay	Relay Number	Relay
J-12	Starter	J-17	Condenser (Diesel)
J-13	Glow-1 (Diesel)	J-18	Exhaust brake control (Diesel)
J-14	C/Heater (Diesel/MT)	J-19	Engine warm cut 2 (Diesel/AT)
J-15	Warm cut 1 (Diesel)		Rear dome light (Gas)
	A/C enable (Gas)	J-20	I.D. light relay
J-16	Fuel pump (Gas)		

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas Electrical – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas Electrical – continued from previous page)

Auxiliary Power Source Circuit Diagram



Power source relay
P/N 8970609260.
Must be installed in dash relay box.
Refer to page 244, relay B-34
for identification.

Auxiliary power source wire
located on left side underdash
taped to body room light switch
harness with green tape.

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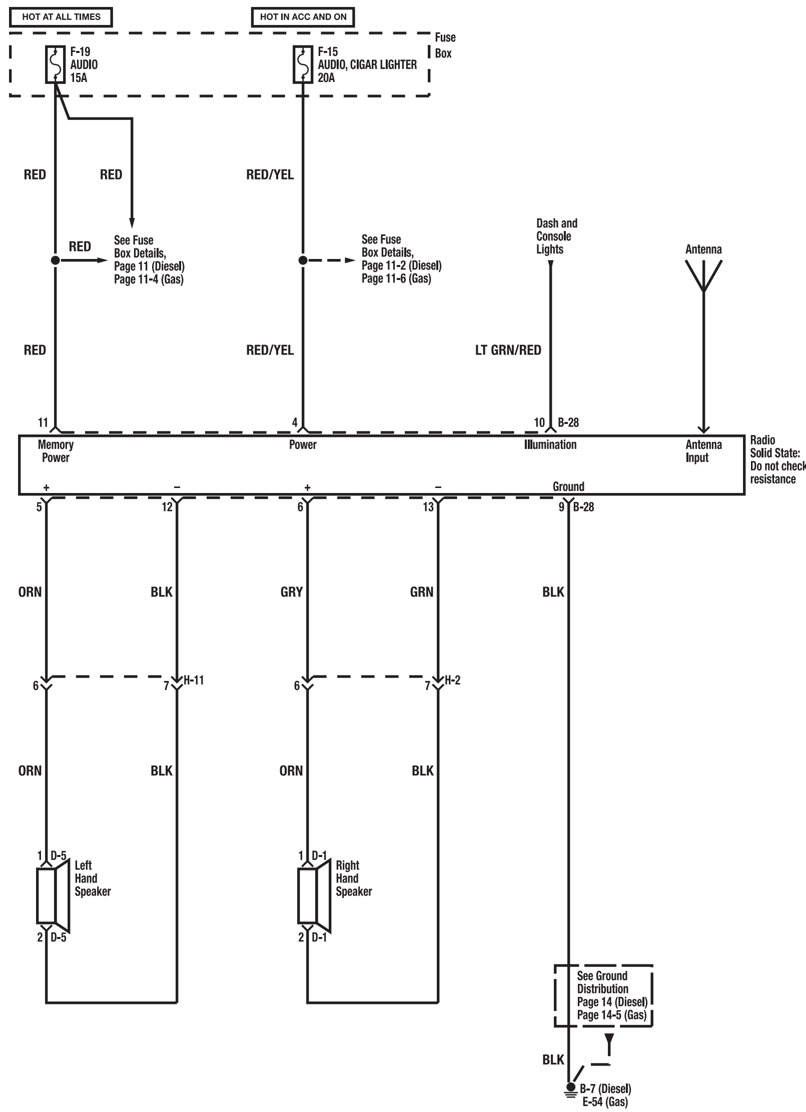
(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas Electrical – continued from previous page)

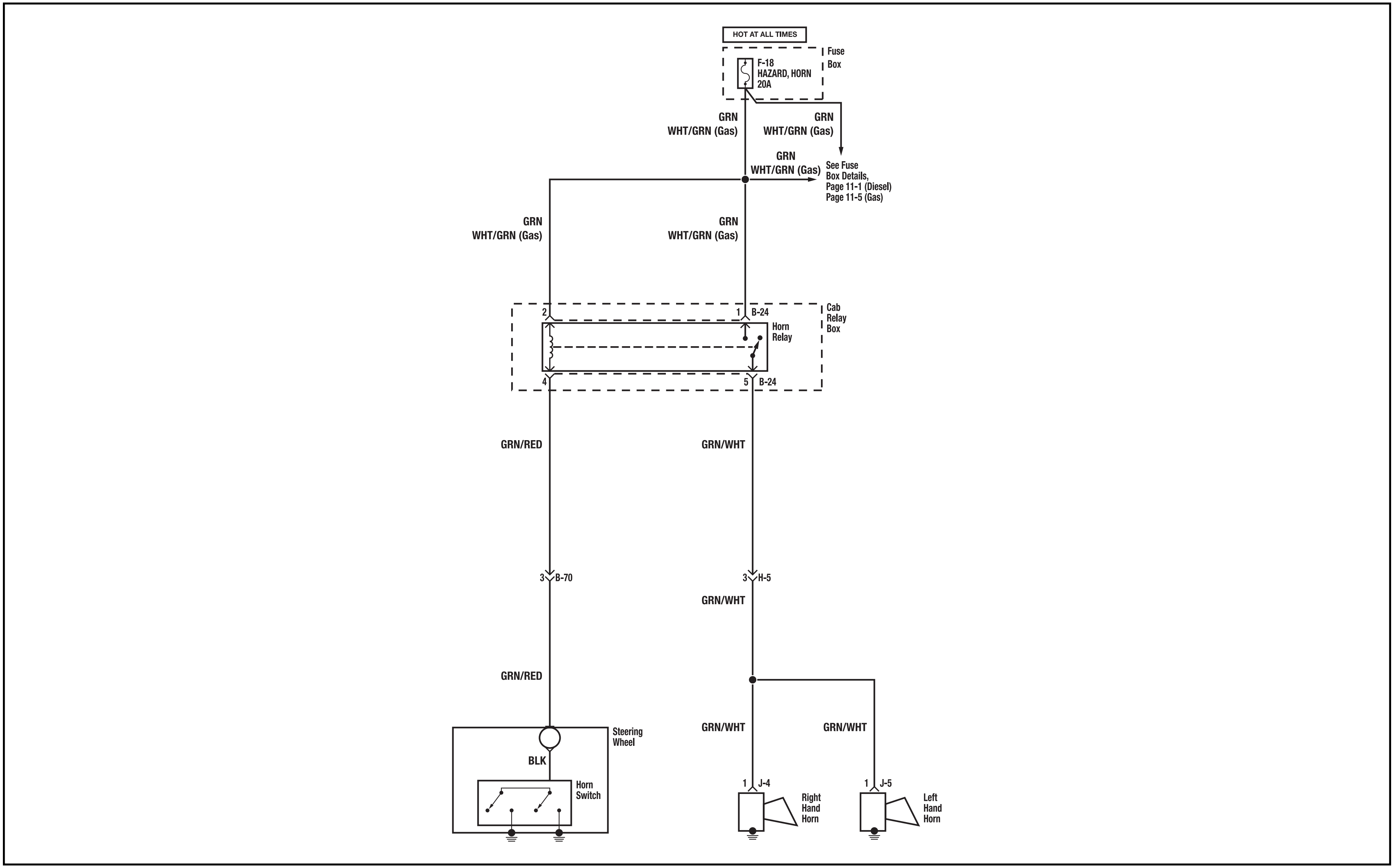
Sound System Circuit Diagram



(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas Electrical – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas Electrical – continued from previous page)

Horn Circuit Diagram



(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas Electrical – continued on next page)

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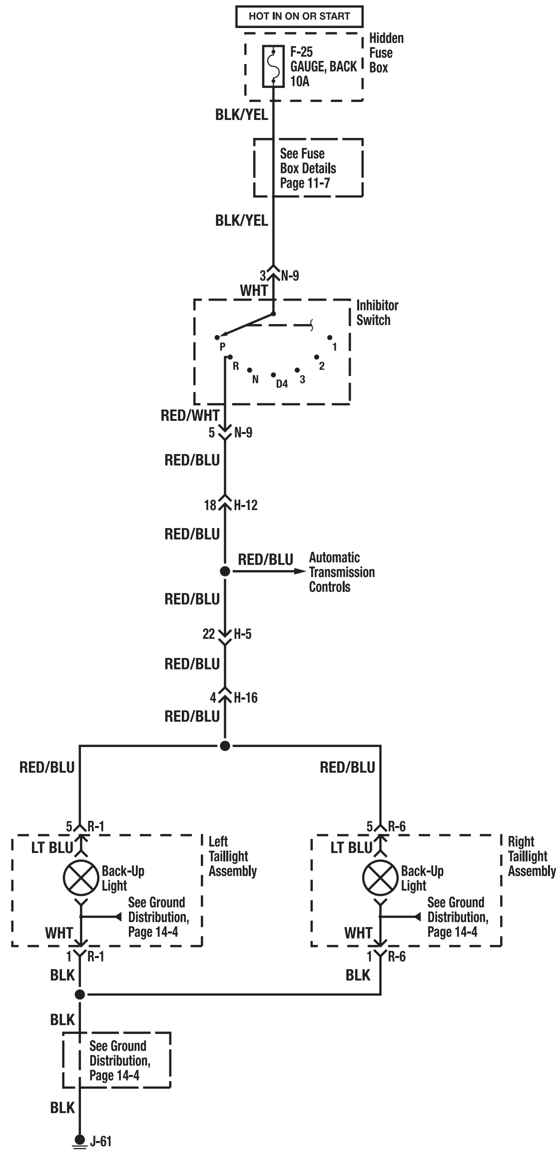
Back-Up Lights Circuit Diagram



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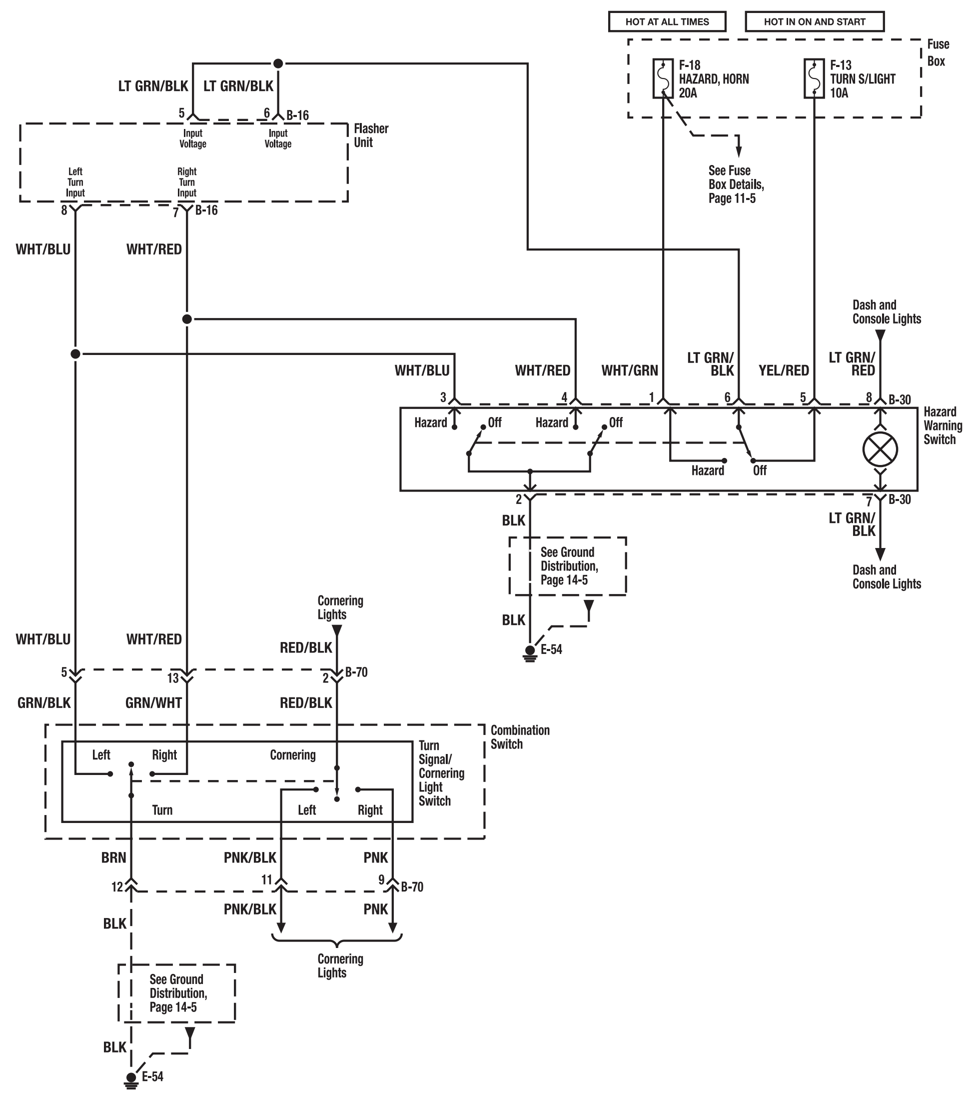
(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas Electrical – continued from previous page)

Turn and Hazard Lights Circuit Diagram



(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas Electrical – continued on next page)

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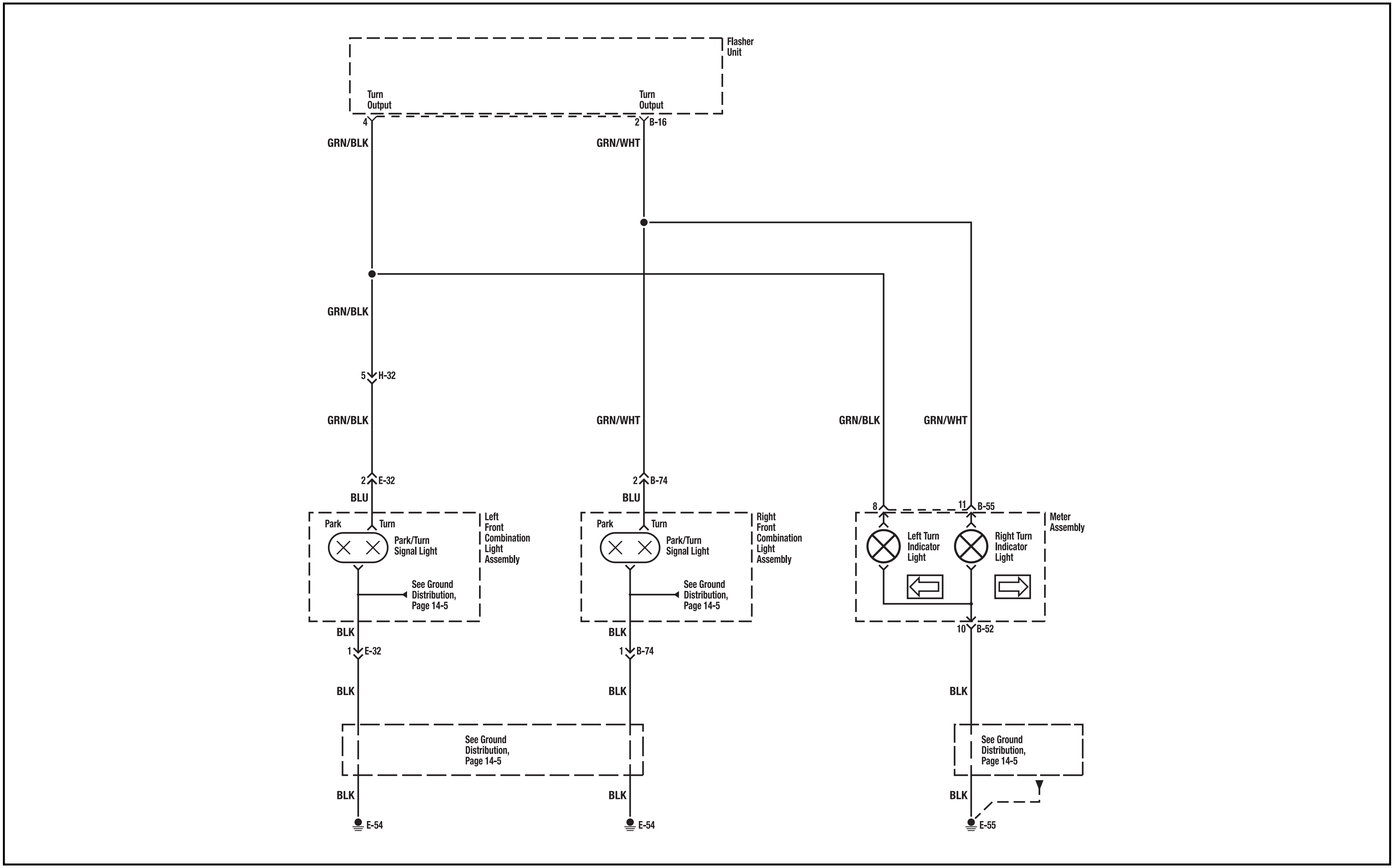
Turn and Hazard Lights Circuit Diagram

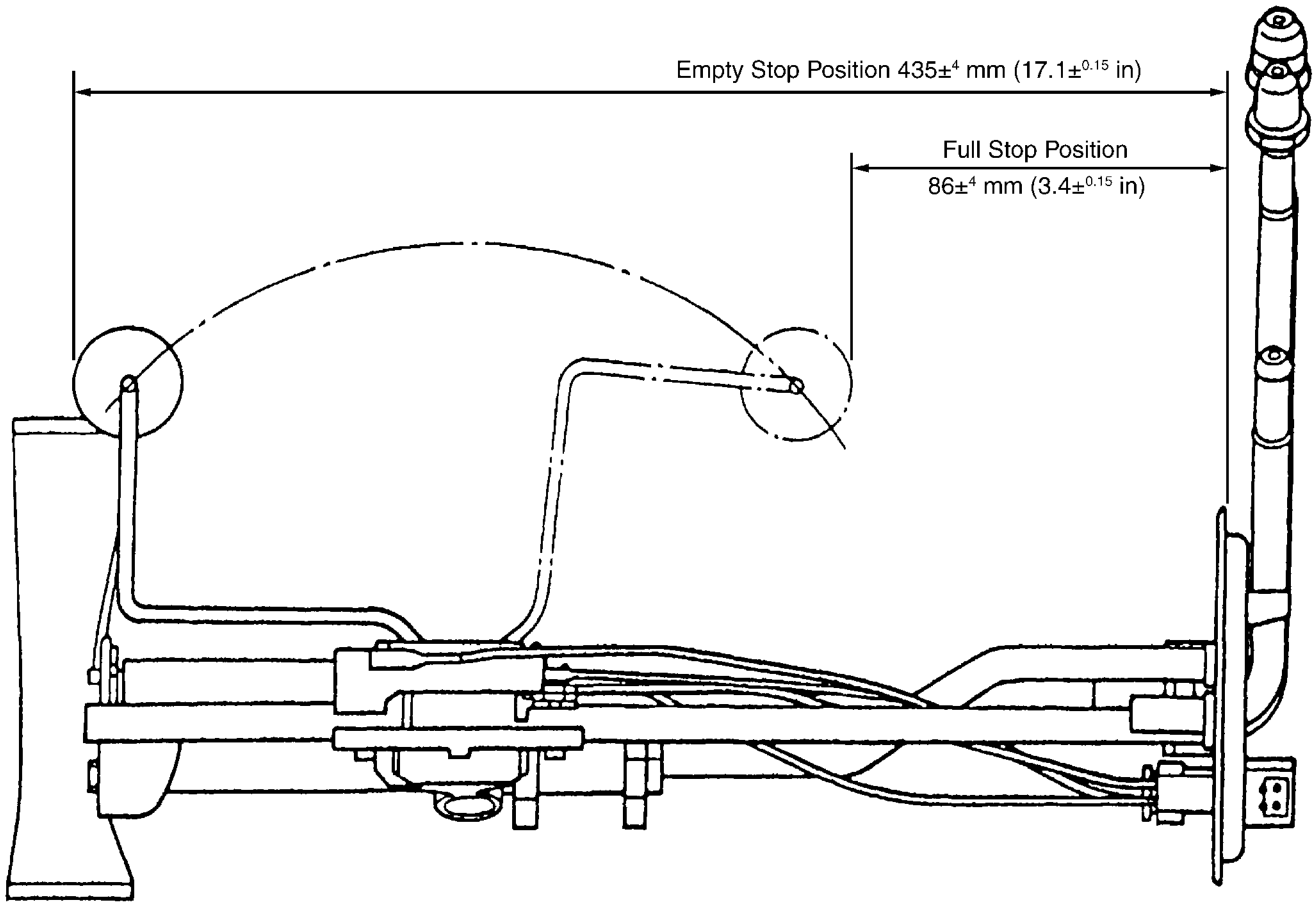


(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas Electrical – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas Electrical – continued from previous page)

03 Model Year Fuel Tank Sending Unit Resistance Values

Float Position	Standard Resistance (Ω)
Empty Stop	248.5
Full Stop	40

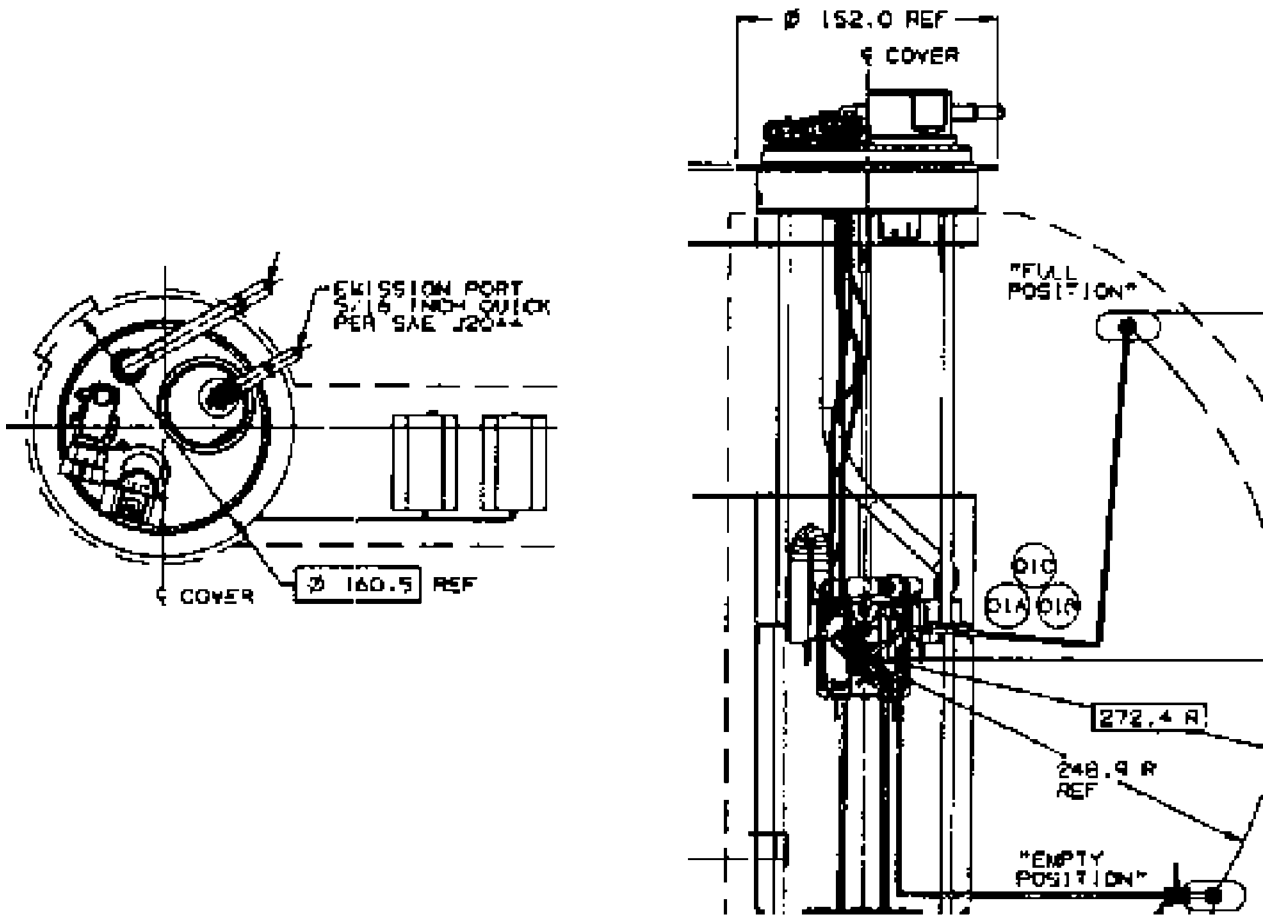


(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas Electrical – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500 Gas Electrical – continued from previous page)

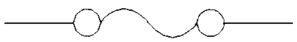
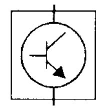
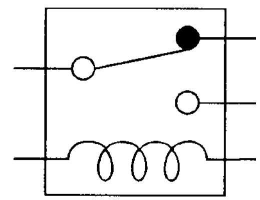
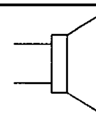
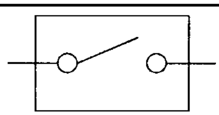
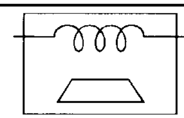
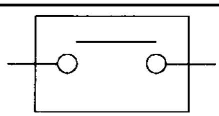
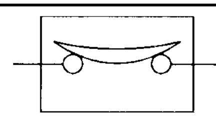
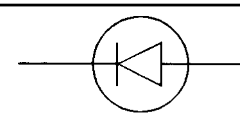
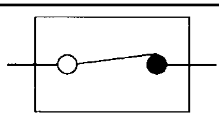
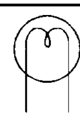
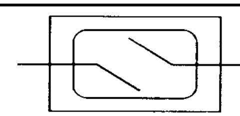
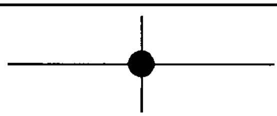
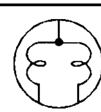
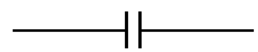
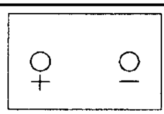
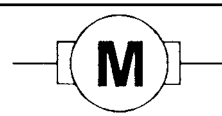
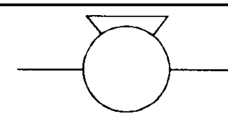
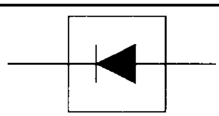
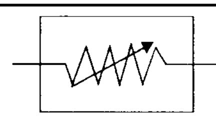
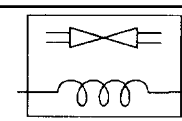
04i Model Year Fuel Tank Sending Unit Resistance Values

Float Position	Standard Resistance (Ω)
Empty Stop	248.5
Full Stop	40



NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical

Symbols

Symbol	Meaning	Symbol	Meaning	Symbol	Meaning
	Fuse		Electronic Parts		Coil (Inductor), Solenoid Magnetic Valve
	Fusible Link		Resistor		Relay
	Fusible Link Wire		Speaker		
	Switch		Buzzer		Connector
	Switch		Circuit Breaker		Light-Emitting Diode
	Switch (Normal Close Type)		Bulb		Reed Switch
	Contact Wiring		Double-Filament Bulb		Condenser
	Battery		Motor		Horn
	Diode		Variable Resistor Rheostat		Vacuum Switching Valve

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(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

Abbreviations

Abbreviation	Definition	Abbreviation	Definition
A	Ampere (S)	IG	Ignition
ABS	Anti-lock Brake System	kW	Kilowatt
ASM	Assembly	LH	Left Hand
AC	Alternating Current	LWB	Long Wheelbase
A/C	Air Conditioner	M/T	Manual Transmission
ACC	Accessories	OD	Overdrive
A/T	Automatic Transmission	OPT	Option
C/B	Circuit Breaker	QOS	Quick on Start
CSD	Cold Start Device	RH	Right Hand
DIS	Direct Ignition System	RR	Rear
DRL	Daytime Running Lights	RWAL	Rear Wheel Anti-lock Brake System
EBCM	Electronic Brake Control Module	ST	Start
ECGI	Electronic Control Gasoline Injection	STD	Standard
ECM	Electronic Control Module	SW	Switch
ECU	Electronic Control Unit	SWB	Short Wheelbase
EFE	Early Fuel Evaporation	TCM	Transmission Control Module
4 A/T	4-Speed Automatic Transmission	3 A/T	3-Speed Automatic Transmission
4 X 4	Four-Wheel Drive	V	Volt
FL	Fusible Link	VSV	Vacuum Switching Valve
FRT	Front	W	Watt (S)
HBB	Hydro Brake Booster	WOT	Wide-open Throttle
H/L	Headlight	W/	With
IC	Integrated Circuit	W/O	Without

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

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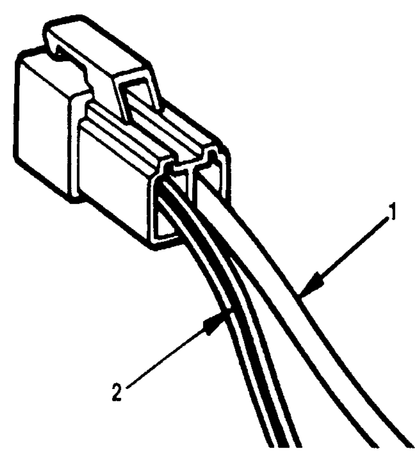
Wiring

Wire Color

All wires have color-coded insulation. Wires belonging to a system's main harness will have a single color. Wires belonging to a system's sub-circuits will have a colored stripe. Striped wires use the following code to show wire size and colors.

Example: 0.5 G / R

- R — Red (Stripe Color)
- G — Green (Base Color)
- 0.5 — Wire Size (0.5 mm^2)



1. Single Color Wire
2. Colored Stripe Wire

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Abbreviations are used to indicate wire color within a circuit diagram. Refer to the following table.

Color-Coding	Meaning	Color-Coding	Meaning
B	Black	BR	Brown
W	White	LG	Light Green
R	Red	GR	Grey
G	Green	P	Pink
Y	Yellow	LB	Light Blue
L	Blue	V	Violet
O	Orange		

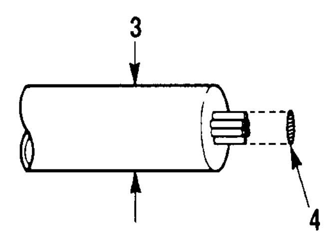
Distinction of Circuit by Wire Base Color

Base Color	Circuits	Base Color	Circuits
B	Starter Circuit	Y	Instrument Circuit
W	Charging Circuit	L, O, BR, LG, GR, P, LB, V	Other Circuits
R	Lighting Circuit		
G	Signal Circuits		

Wire Size

The size of wire used in a circuit is determined by the amount of current (amperage), the length of the circuit, and the voltage drop allowed. The following wire size and load capacity are specified by AWG (American Wire Gauge). (Nominal size means approximate cross sectional area.)

3. Outside Diameter
4. Cross Sectional Area



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Nominal Size	Cross Sectional Area (mm^2)	Outside Diameter (mm)	Allowable Current (A)	AWG Size (Cross reference)
0.3	0.372	1.8	9	22
0.5	0.563	2.0	12	20
0.85	0.885	2.2	16	18
1.25	1.287	2.5	21	16
2	2.091	2.9	28	14
3	3.296	3.6	37.5	12
5	5.227	4.4	53	10
8	7.952	5.5	67	8
15	13.36	7.0	75	6
20	20.61	8.2	97	4

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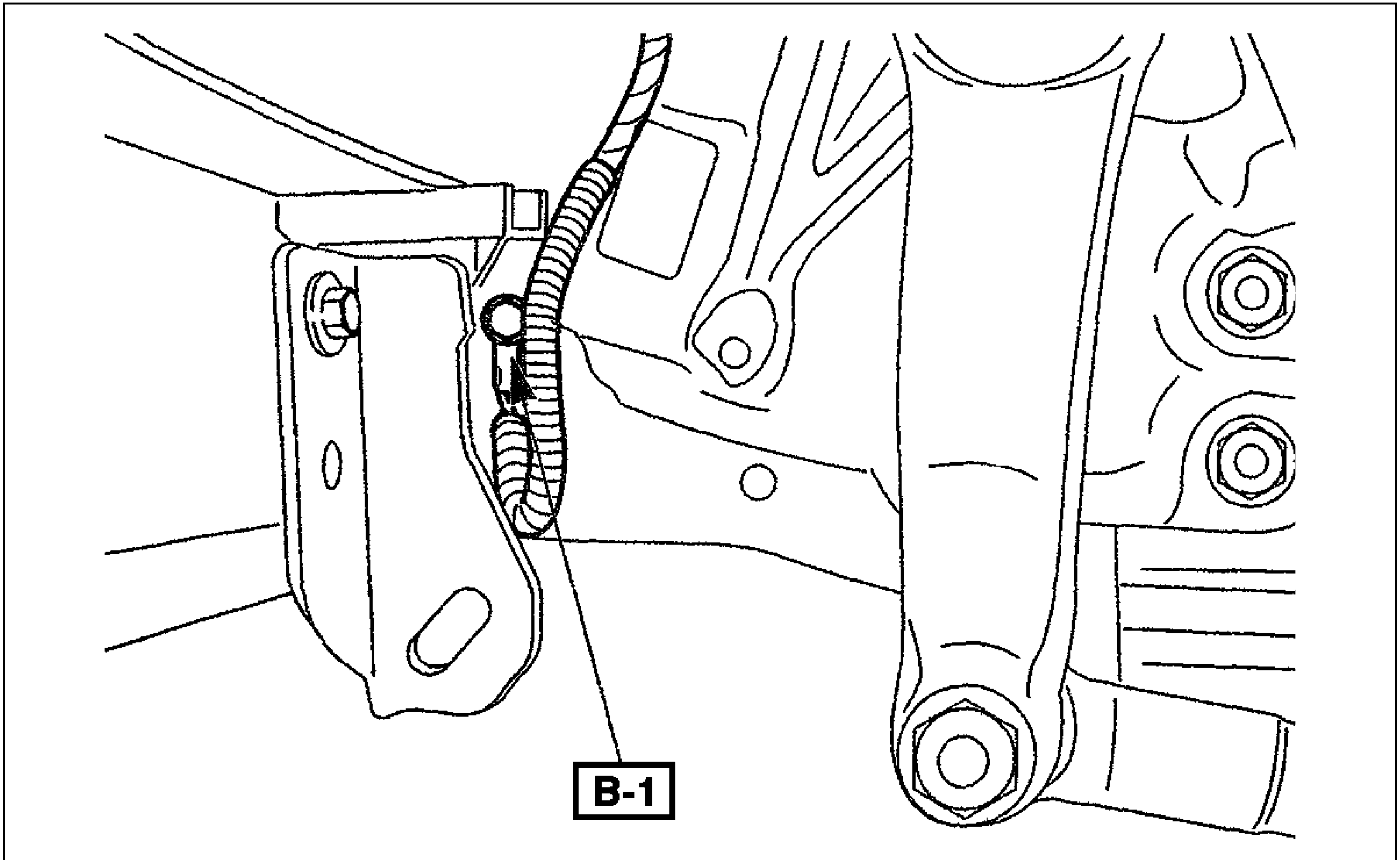
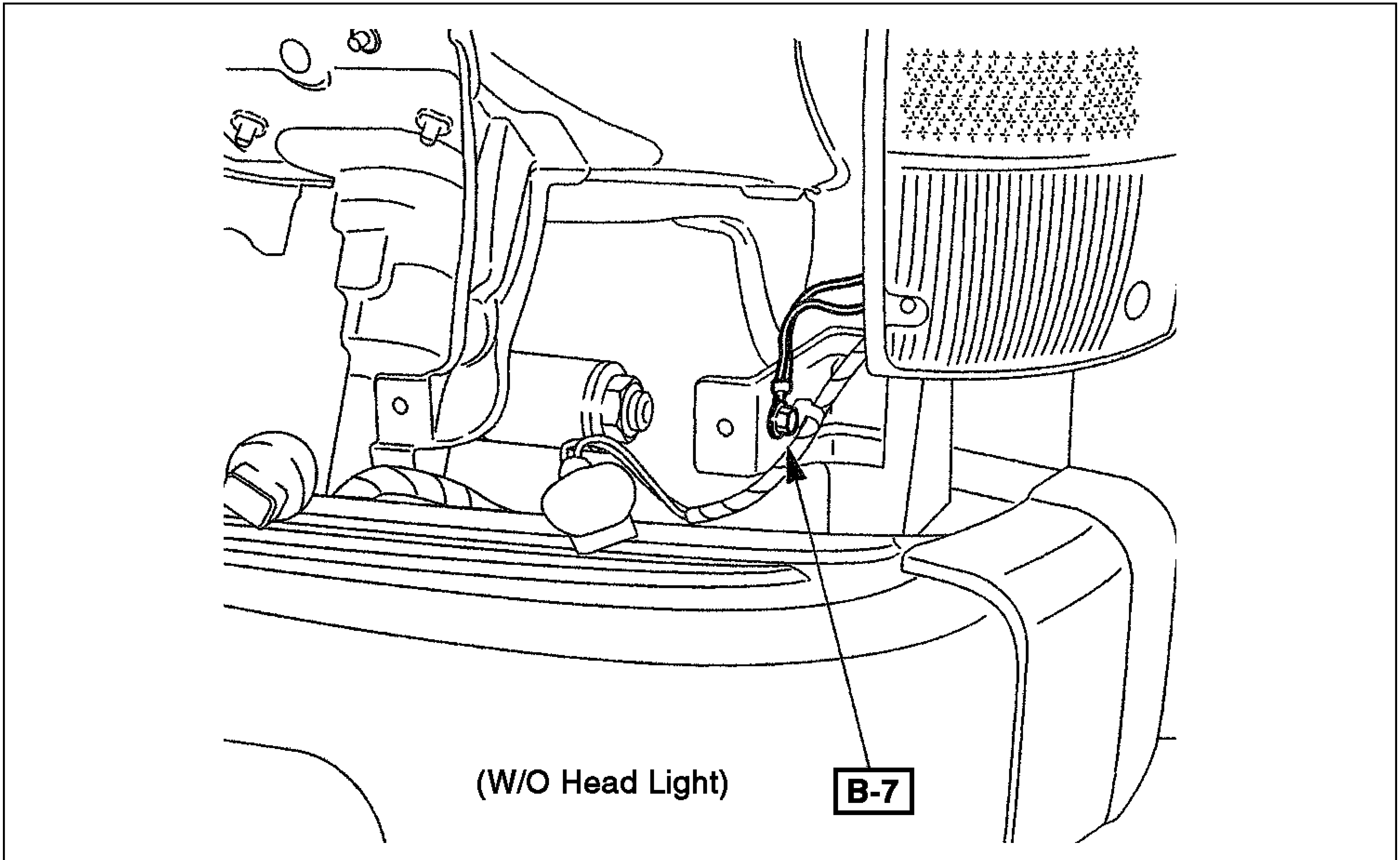
Grounding Point Location (B-1)



(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

Grounding Point Location (B-7)



(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

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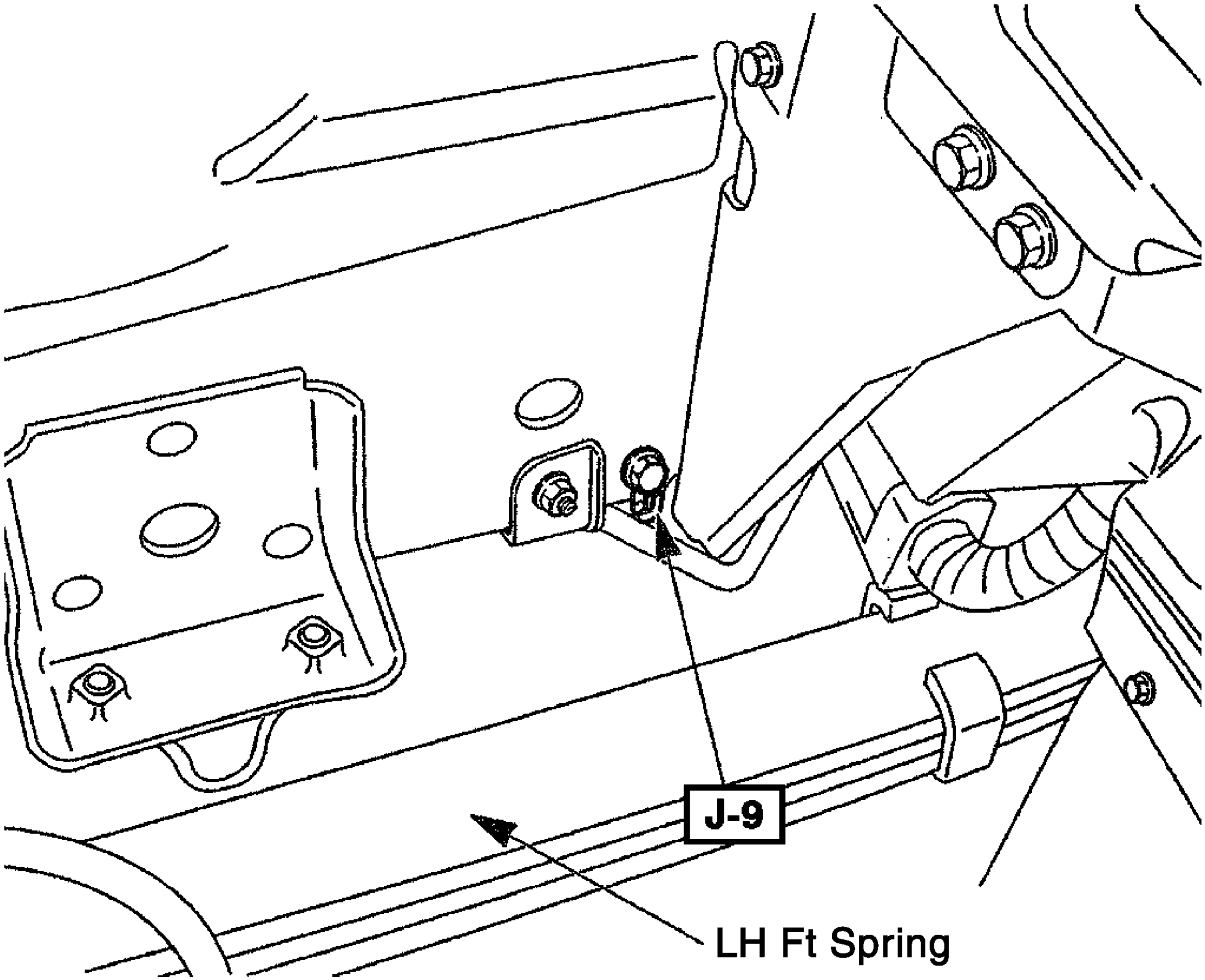
Grounding Point Location (J-9)



(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

((Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

Reference Table of Grounding Point

NOTICE: Abnormal phenomena of electrical components are considered resulted from defective grounding. In repair, be sure to inspect grounding points and to tighten all fastening parts surrounding the grounding points.

Connector No.	Cable Harness Name	Location	Main Parts (Load)
B-1	Body harness	Frame-LH (FRT)	Vehicle speed sensor, Turn signal indicator light, Meter, High beam indicator light.
B-7	Body harness	Headlight bracket-LH	Charge relay, Exhaust brake relay, D.R.L. unit, Dome light, Meter, Brake fluid level switch, Tail relay, Cornering light, Cornering light relay, Wiper motor, Washer motor intermittent relay, Heater and A/C relay, Radio and clock, Cigar lighter, Fan switch, Blower resistor, A/C switch, Blower motor, Electronic thermostat, Accel switch, Cab interior switch, Flasher unit, Clearance light, I.D. light, Illumination control, Electronic vacuum pump, Power source relay.
J-9	Frame front harness	Frame-LH (CRT)	Fuel tank unit, Starter relay, Neutral switch, Exhaust brake control relay, Exhaust brake magnetic valve, Accel switch, Clutch switch, Inhibitor switch, Engine warming cut relay, I.D. relay, Condenser fan relay, Condenser fan, License plate light, Taillight, Rear turn signal light, Stoplight, Back-up light, Air magnetic valve, VSV 2 EXH (FULL), ECM, TCM, Engine shutdown switch, Antilock brake system, Fuel heater, Fuel sedimeter, Back up buzzer, Power take-off.

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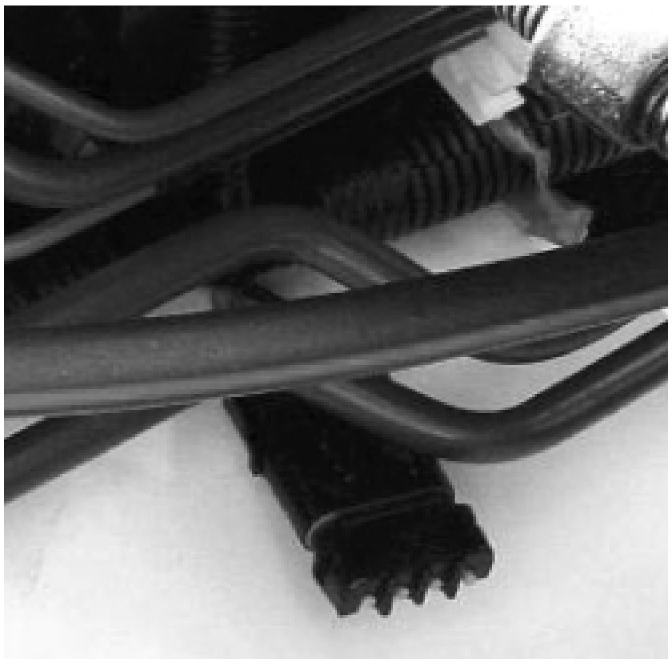
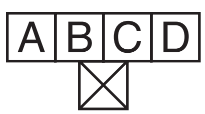
NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Body Room Light, I.D. and Marker Lamp, and Hot Wire and Ground Connector Location

NPR/W3500, NPR HD/W4500 NQR/W5500, NRR/W5500 HD Body Connectors LH Frame



- **Packard Body Plug**
- **4-Pin Weather Seal Connector with Mating Plug**
- **Location:**
  Inside left-hand frame rail 28 to 31 inches BOC
- **Circuits:**
  Rear Dome = A
  Hot Wire = B
  Marker Lamp = C
  Ground = D



Packard Body Plug Connector Parts

	NPR/NQR/NRR
Chassis Housing ASM	1201-0974
Terminal	1208-9040
Terminal	1212-4587
Seal	1208-9679
Seal	1201-5193
Body Housing ASM	1201-5797
Housing	1201-5787
Connector Seal	1201-0492
Dummy Seal	1201-0300

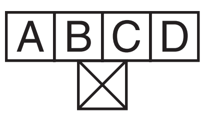
(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Body Room Light, I.D. and Marker Lamp, Hot Wire and Ground Connector Location (continued)

NPR/W3500, NPR HD/W4500 NQR/W5500, NRR/W5500 HD Body Connectors LH Frame

- **Packard Body Plug**
- **4-Pin Weather Seal Connector with Mating Plug**
- **Location:**
  Center of Crossmember
- **Circuits:**
  Rear Dome = A
  Hot Wire = B
  Marker Lamp = C
  Ground = D



Packard Body Plug Connector Parts

	NPR/NQR/NRR
Chassis Housing ASM	1201-0974
Terminal	1208-9040
Terminal	1212-4587
Seal	1208-9679
Seal	1201-5193
Body Housing ASM	1201-5797
Housing	1201-5787
Connector Seal	1201-0492
Dummy Seal	1201-0300

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

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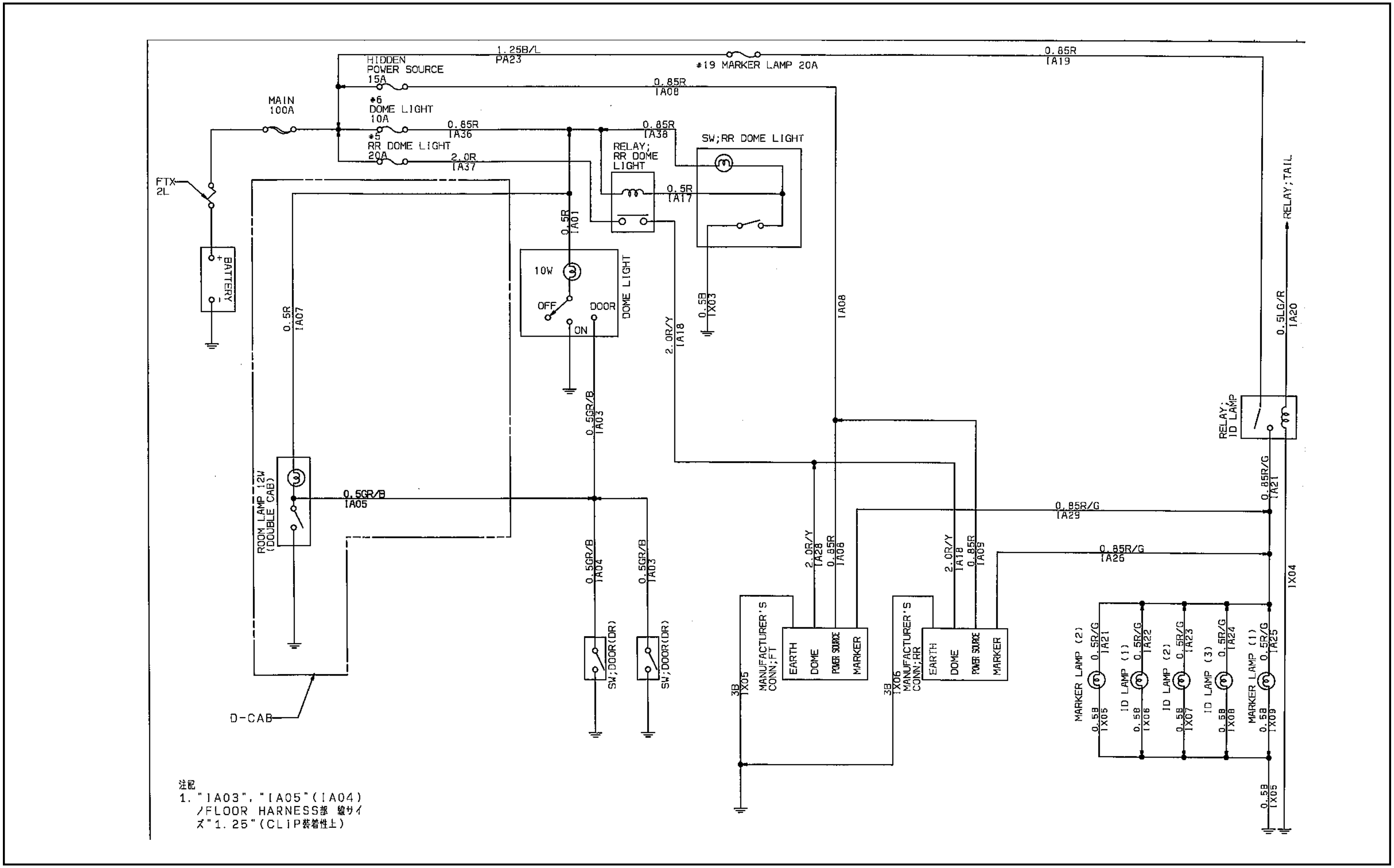
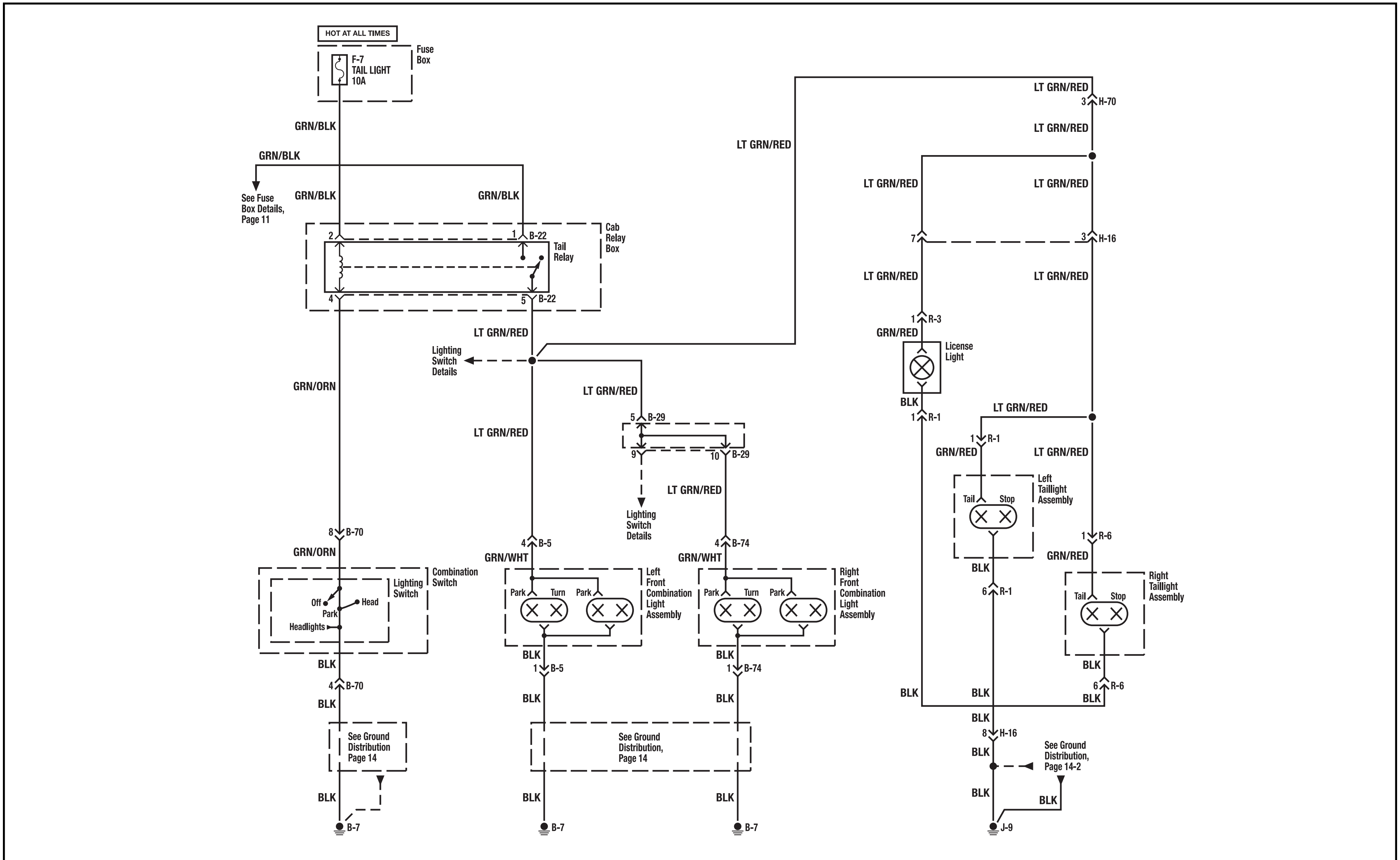
Dome, Interior Body and I.D. Lights Circuit Diagram



(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

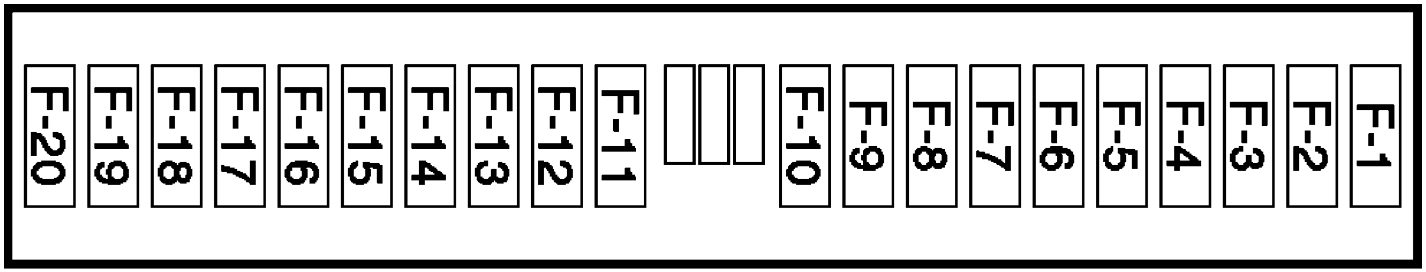
Park, Tail and License Lights Circuit Diagram

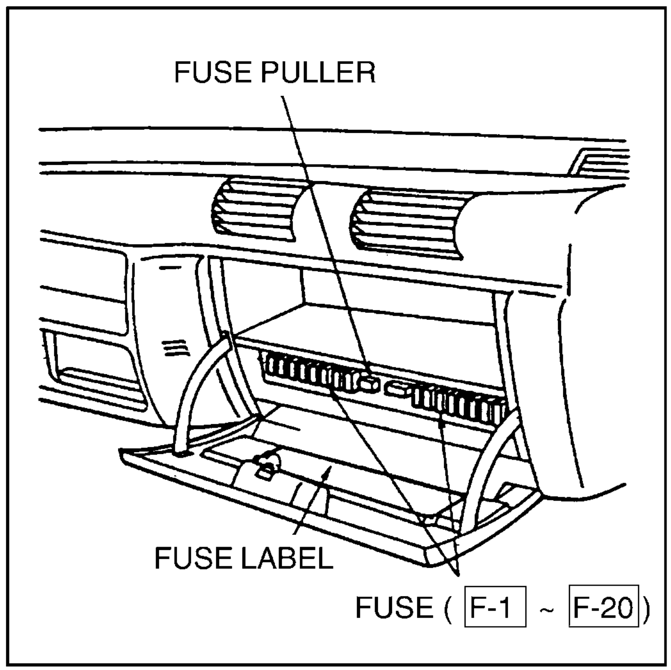


(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

Fuse Location





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(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

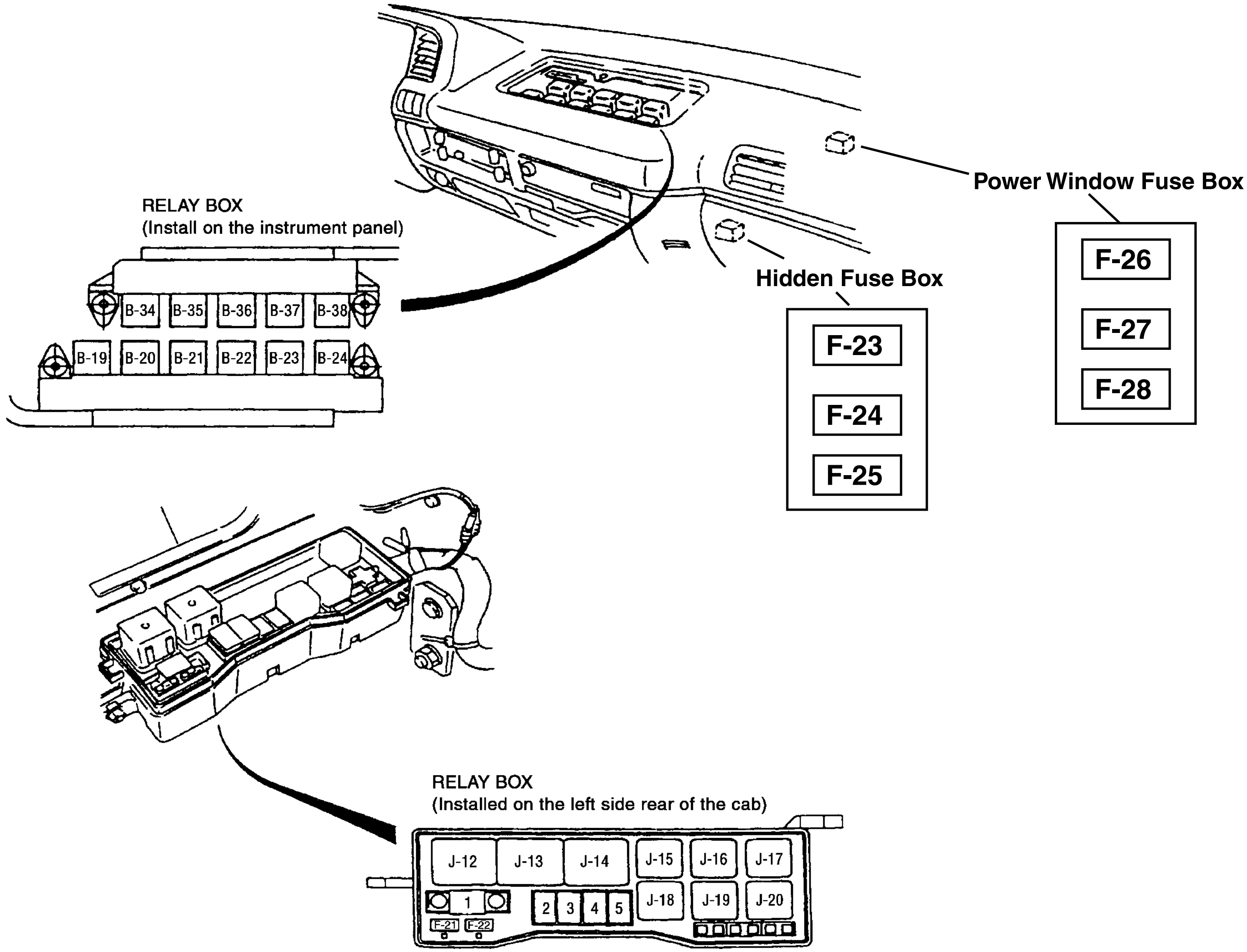
Fuse Box

Fuse No.	Fuse Name	Amps	Circuit Protected
F-1	HEATER	25A	Heater
F-2	AIR CON	10A	Compressor controls
F-3	EXHAUST BRAKE (Diesel)	10A	Exhaust brake system (Diesel)
	PCM (IGN) (Gas)		Engine controls (Gas)
F-4	D.R.L. (Diesel)	10A	Headlights (Diesel)
	PCM (IGN) (Gas)		Engine controls (Gas)
F-5	RR DOME LIGHT (Diesel)	20A 10A	RR Dome Light (Diesel)
	A/T SOLENOID (Gas)		Automatic transmission controls (Gas)
F-6	DOME LIGHT	15A	Interior lights, Exterior lights
F-7	TAIL LIGHT	10A	Dash lights, Exterior lights
F-8	STOP LIGHT	10A	Brake lights
F-9	HEAD LIGHT (RH)	20A	Headlights
F-10	HEAD LIGHT (LH)	20A	Headlights
F-11	WIPER, WASHER	20A	Windshield wiper/washer
F-12	GENERATOR	20A	Charging system
F-13	TURN SIGNAL LIGHT	10A	Turn lights
F-14	ECU (IGN) (Diesel)	10A	Engine controls
	PCM (ACC) (Gas)		
F-15	AUDIO, CIGAR LIGHTER	20A	Cigarette lighter, Engine controls, Sound system
F-16	POWER SOURCE		Fuel Heater (Diesel) 15A/Engine Controls (Gas) 20A
F-17	POWER SOURCE (Diesel)	10A	Engine Controls (Diesel)
	FUEL PUMP (Gas)		Engine controls (Gas)
F-18	HAZARD, HORN	20A	Horn, Hazard lights
F-19	MARKER LIGHT (Diesel)	20A	ID Light
F-20	STARTER	10A	Starting system

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

Relay Location



(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

Cab Relay

Diode Number	Circuits Protected	Diode Number	Circuits Protected
B-17	Brake warning system	B-25	Compressor controls
B-18	– –	B-26	Exhaust brake system (Diesel)

Relay Number	Relay	Relay Number	Relay
B-19	Charge relay	B-35	Cornering
B-20	Headlight	B-36	
B-21	Heater and A/C		Vacuum pump
B-22	Tail	B-37	A/C thermo
B-23	Buzzer control	B-38	Exhaust brake (Diesel)
B-24	Horn		Ignition (Gas)
B-34	Power source		

Fuse Box

Fuse No.	Fuse Name	Amps	Circuit Protected
F-23	POWER SOURCE	15A	Body Connectors
F-24	NOT USED		
F-25	GAUGE, BACK	10A	ABS, Back-up lights (Diesel), Brake warning system, Compressor controls, Engine controls, Exhaust brake system (Diesel), Exterior lights, Starting system, Transmission controls (Diesel)

Fuse No.	Fuse Name	Amps	Circuit Protected
F-26	POWER WINDOW	25A	Power window
F-27	POWER DOOR LOCK	15A	Power door lock
F-28	REAR HEATER	15A	Rear heater

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

Relay Box Outside Cab

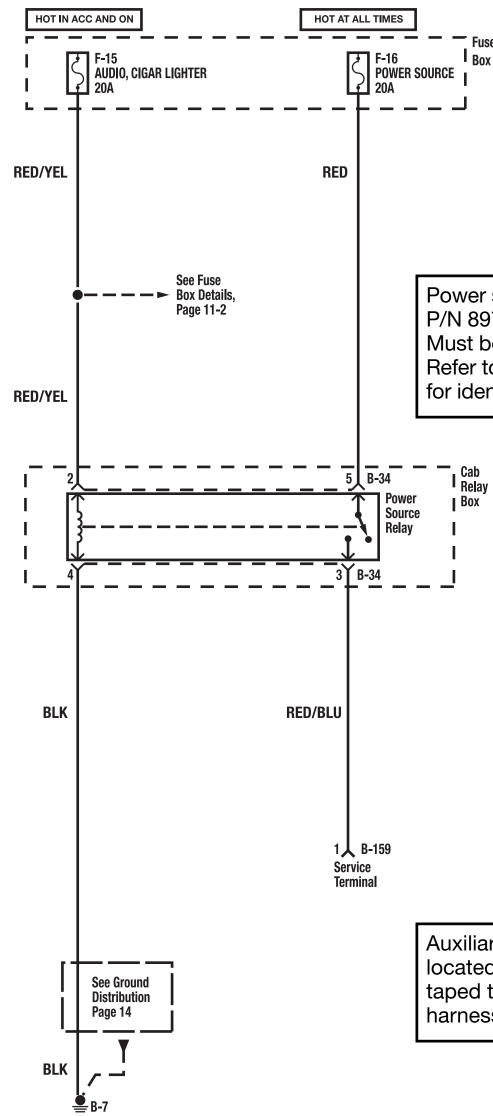
Fuse No.	Fuse Name	Amps	Circuit Protected
1	MAIN	100A	Power distribution
2	KEY	50A	Power distribution
3	ABS (Gas)	60A	ABS (Gas), Engine controls (Diesel)
	GLOW (Diesel)		
4	ABS (Diesel)	60A	ABS
5	C/HEATER (Diesel)	60A	Ceramic heater
F-21	ECU (Batt)	20A	ECU
F-22	CONDENSER FAN (Diesel)	15A	Condenser fan

Relay Number	Relay	Relay Number	Relay
J-12	Starter	J-16	Fuel pump (Gas), Starter cut (Diesel)
J-13	Glow-1 (Diesel)	J-17	Condenser (Diesel)
J-14	C/Heater (Diesel/MT)	J-18	Exhaust brake cut (Diesel)
J-15	ECU Main (Diesel)	J-19	Exhaust brake control (Diesel)
	A/C enable (Gas)	J-20	I.D. light relay

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

Auxiliary Power Source Circuit Diagram



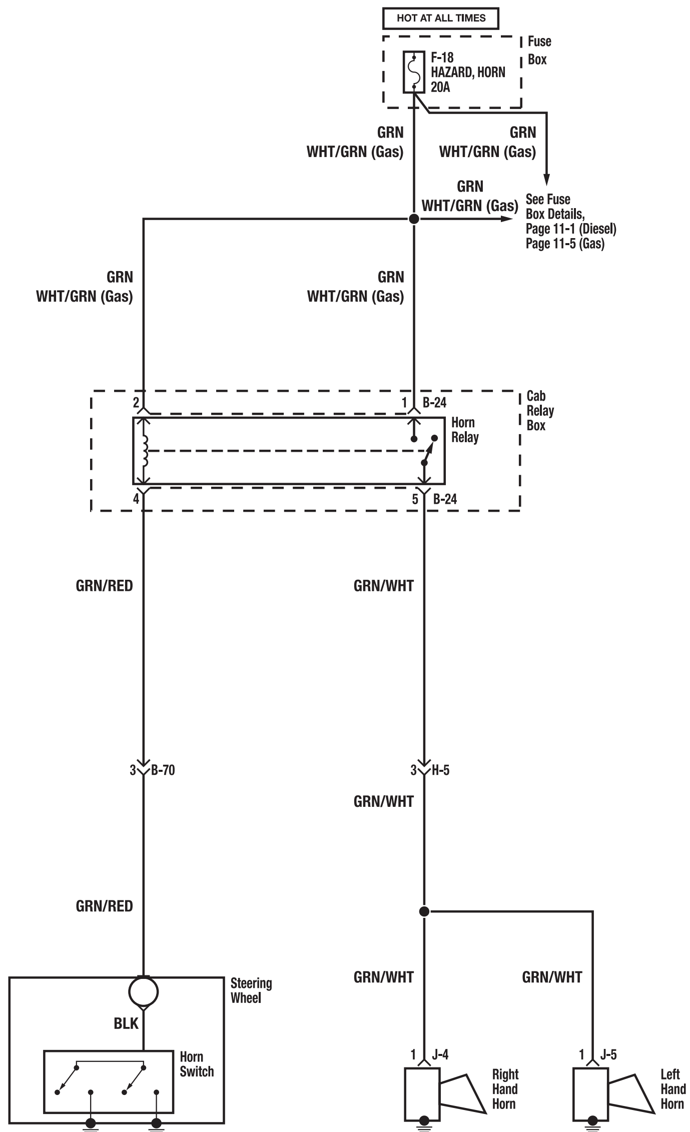
Power source relay
P/N 8970609260.
Must be installed in dash relay box.
Refer to page 271, relay B-34
for identification.

Auxiliary power source wire
located on left side underdash
taped to body room light switch
harness with green tape.

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

Horn Circuit Diagram



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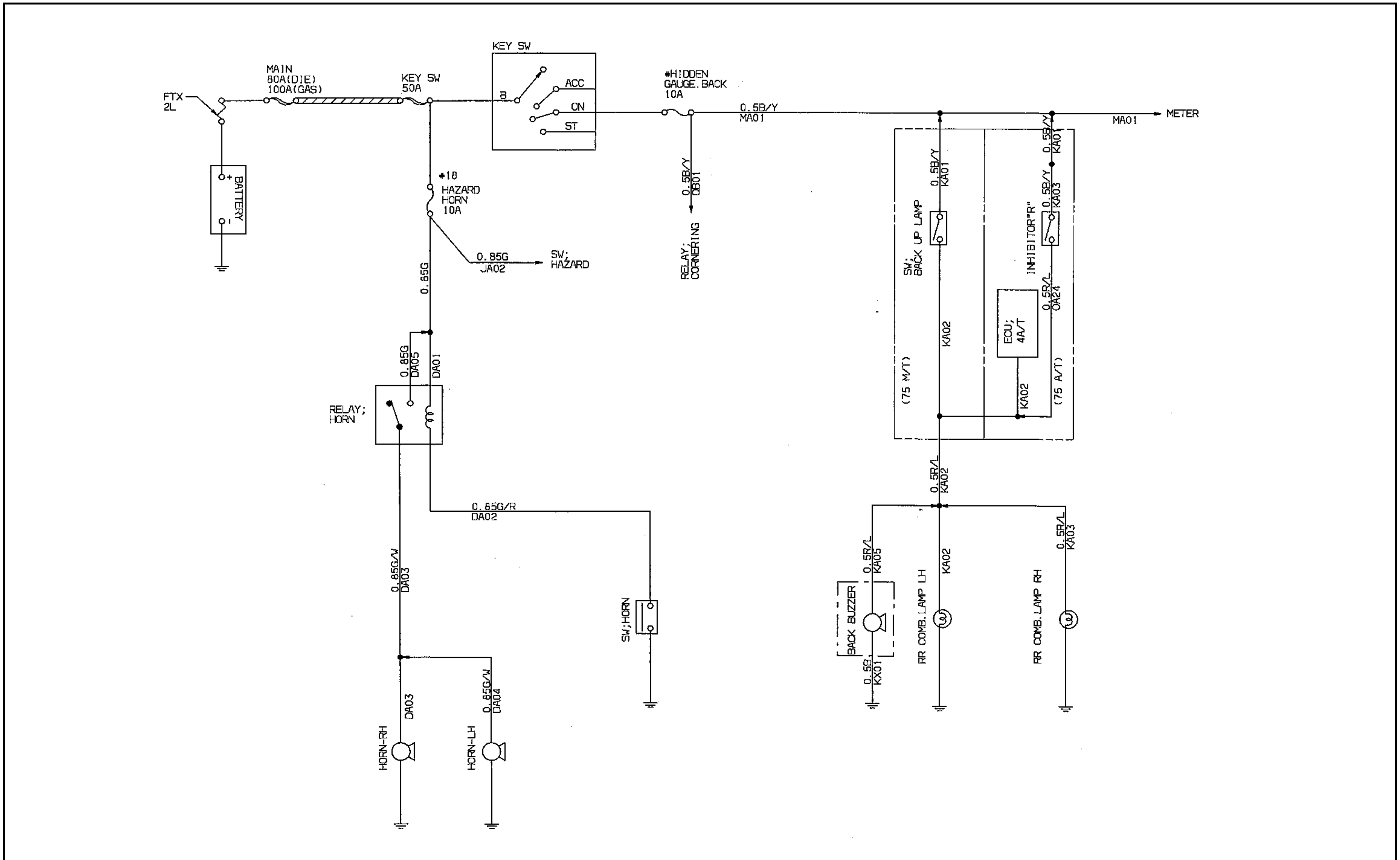
(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

Horn, Back-Up Lights, Back up Alarm Circuit Diagram



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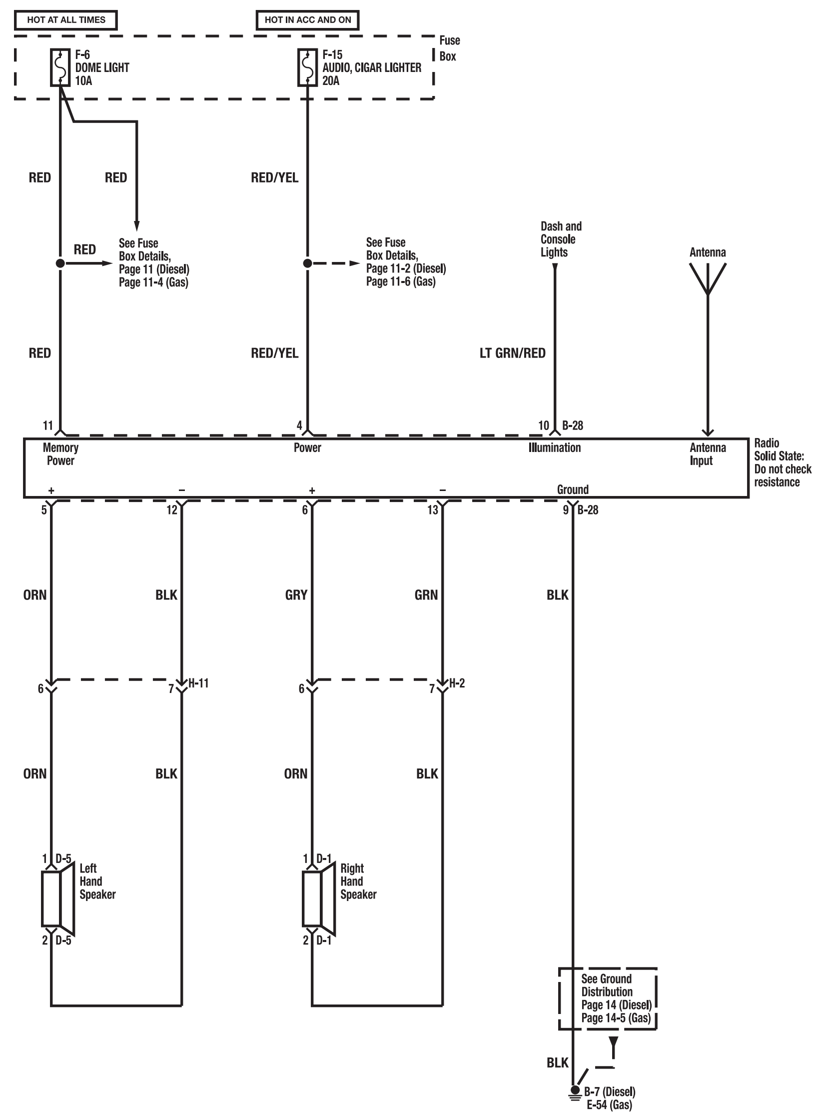
Sound System Circuit Diagram



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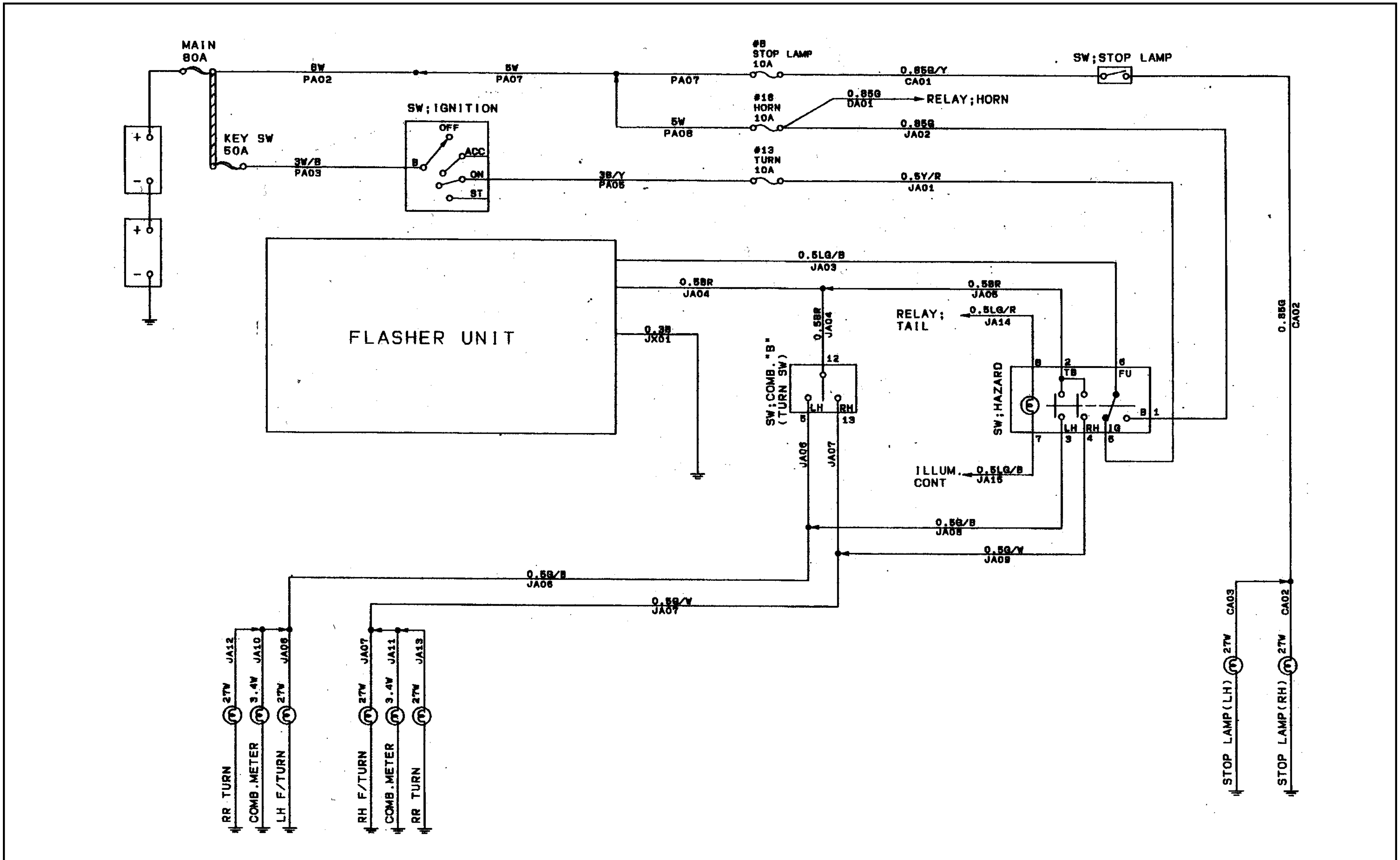
(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

Turn, Hazard and Stop Lights Circuit Diagram



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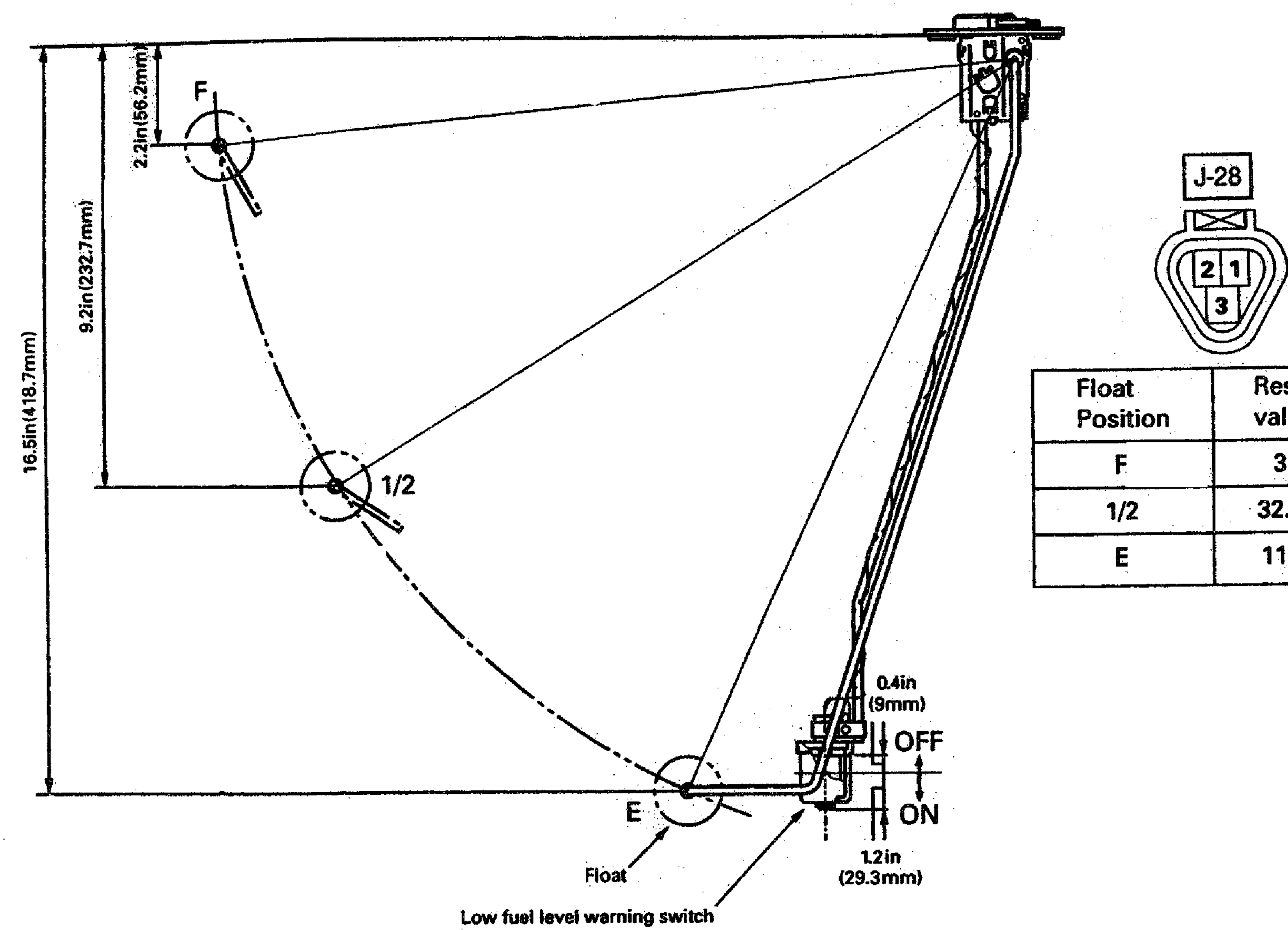
(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

Fuel Tank Sending Unit Resistance (In-Frame Tank)

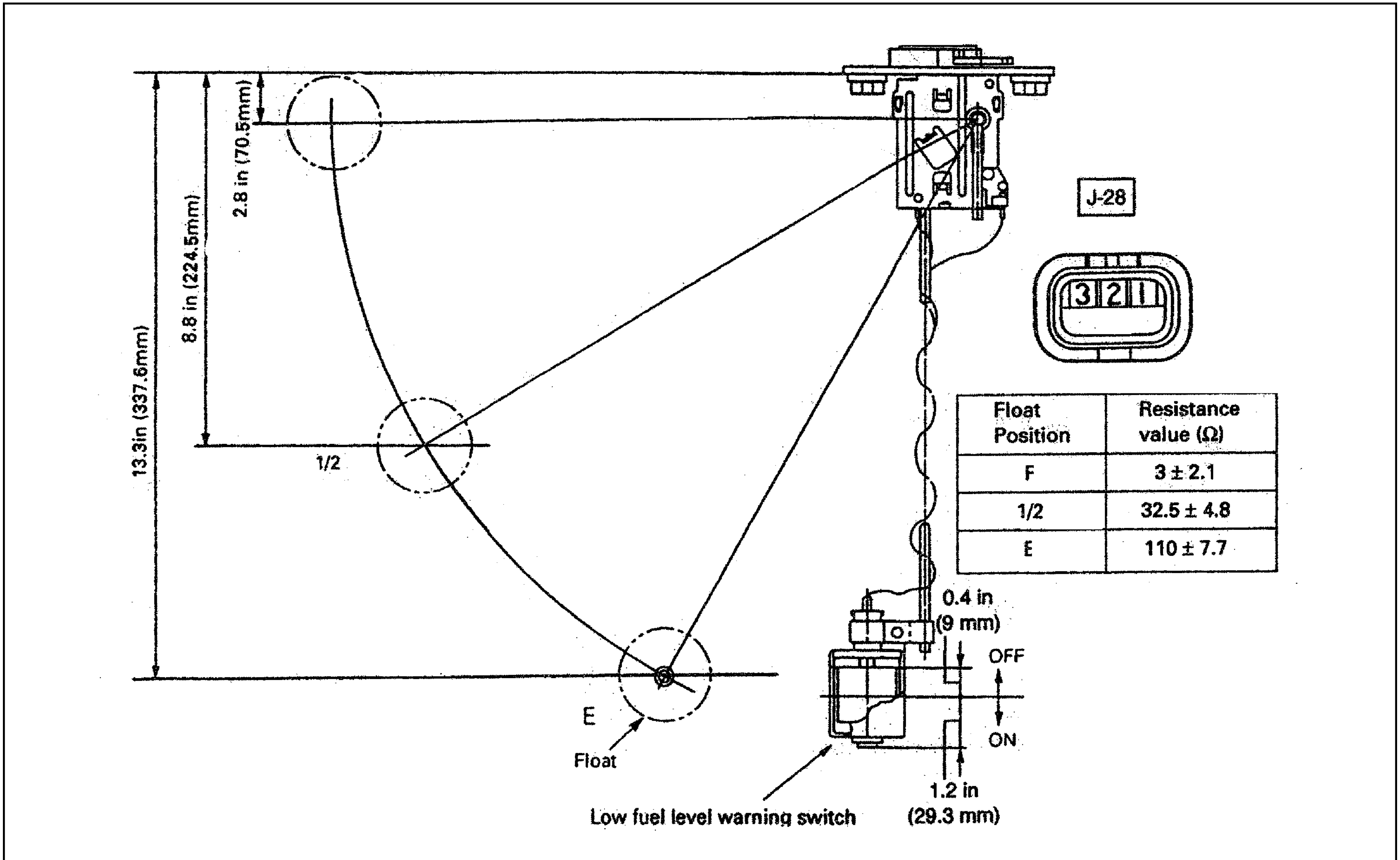


Float Position	Resistance value (Ω)
F	3 ± 2.1
1/2	32.5 ± 4.8
E	110 ± 7.7

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued from previous page)

Fuel Tank Sending Unit Resistance (Side-Mounted Tank)

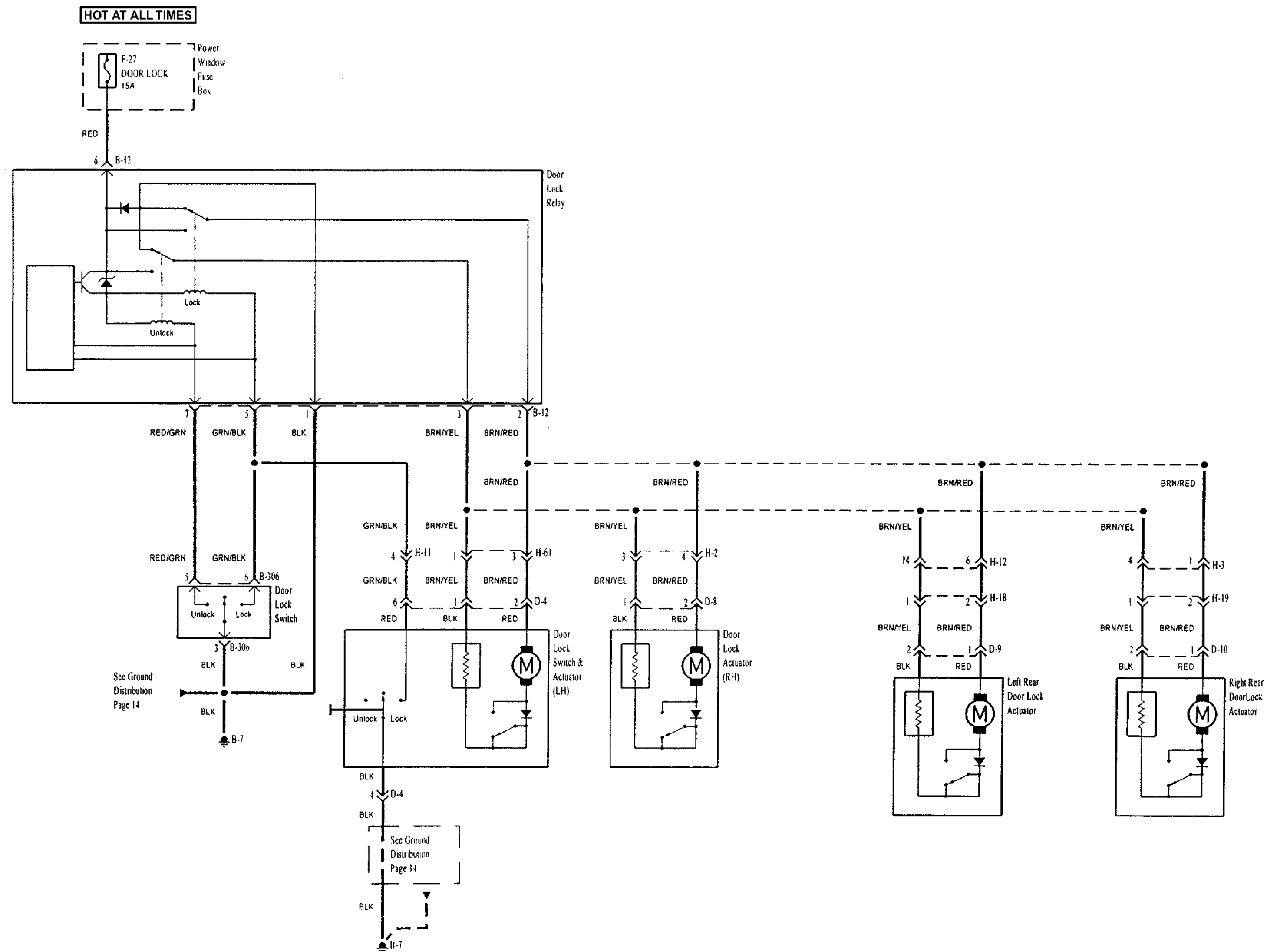


Float Position	Resistance value (Ω)
F	3 ± 2.1
1/2	32.5 ± 4.8
E	110 ± 7.7

(Vehicle Specifications Index Section – NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500-HD Diesel Electrical – continued on next page)

NPR HD/W4500, NQR/W5500 Crew Cab Electrical

Power Door Locks Circuit Diagram



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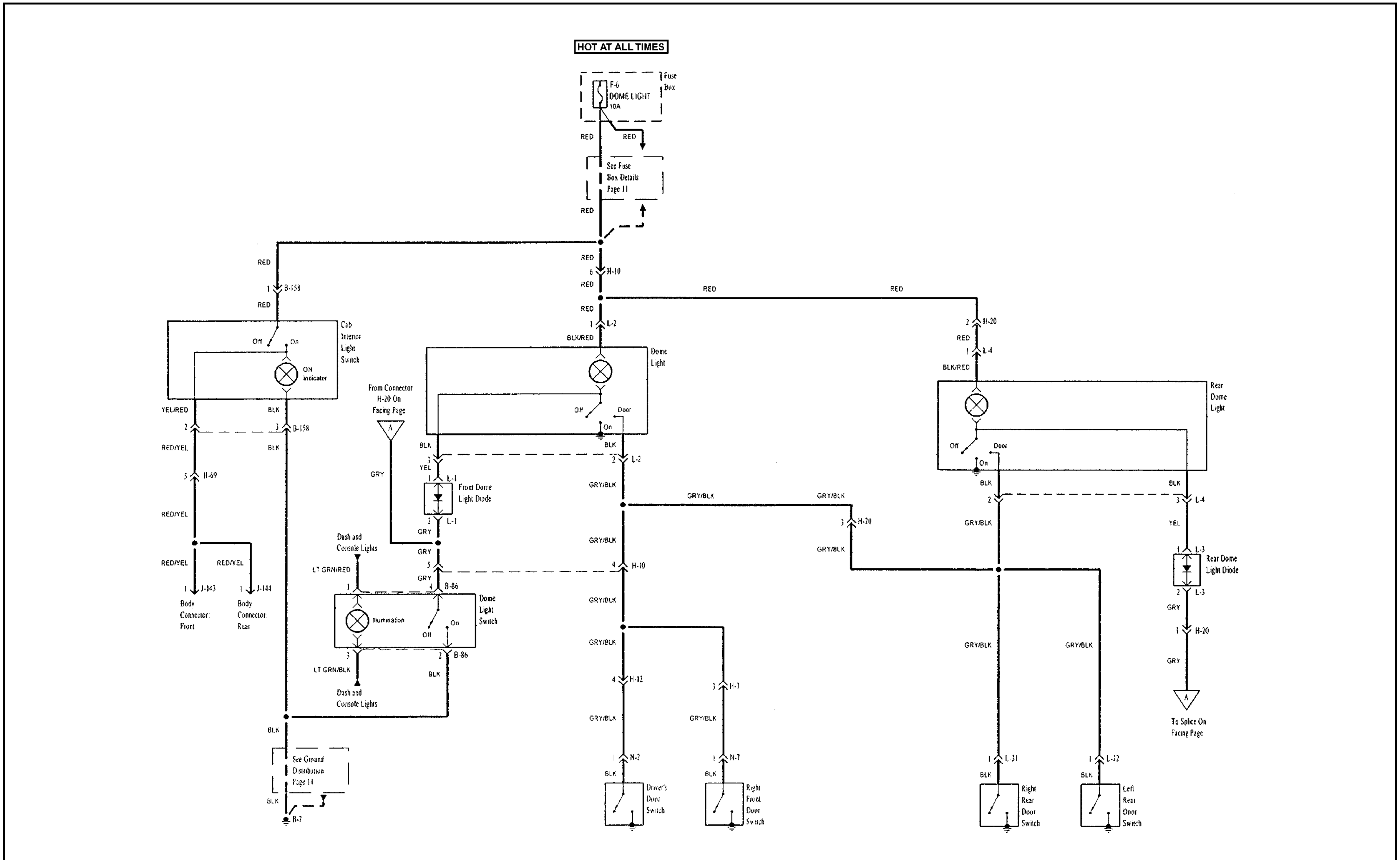
(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Electrical – continued from previous page)

Dome and Interior Lights Circuit Diagram



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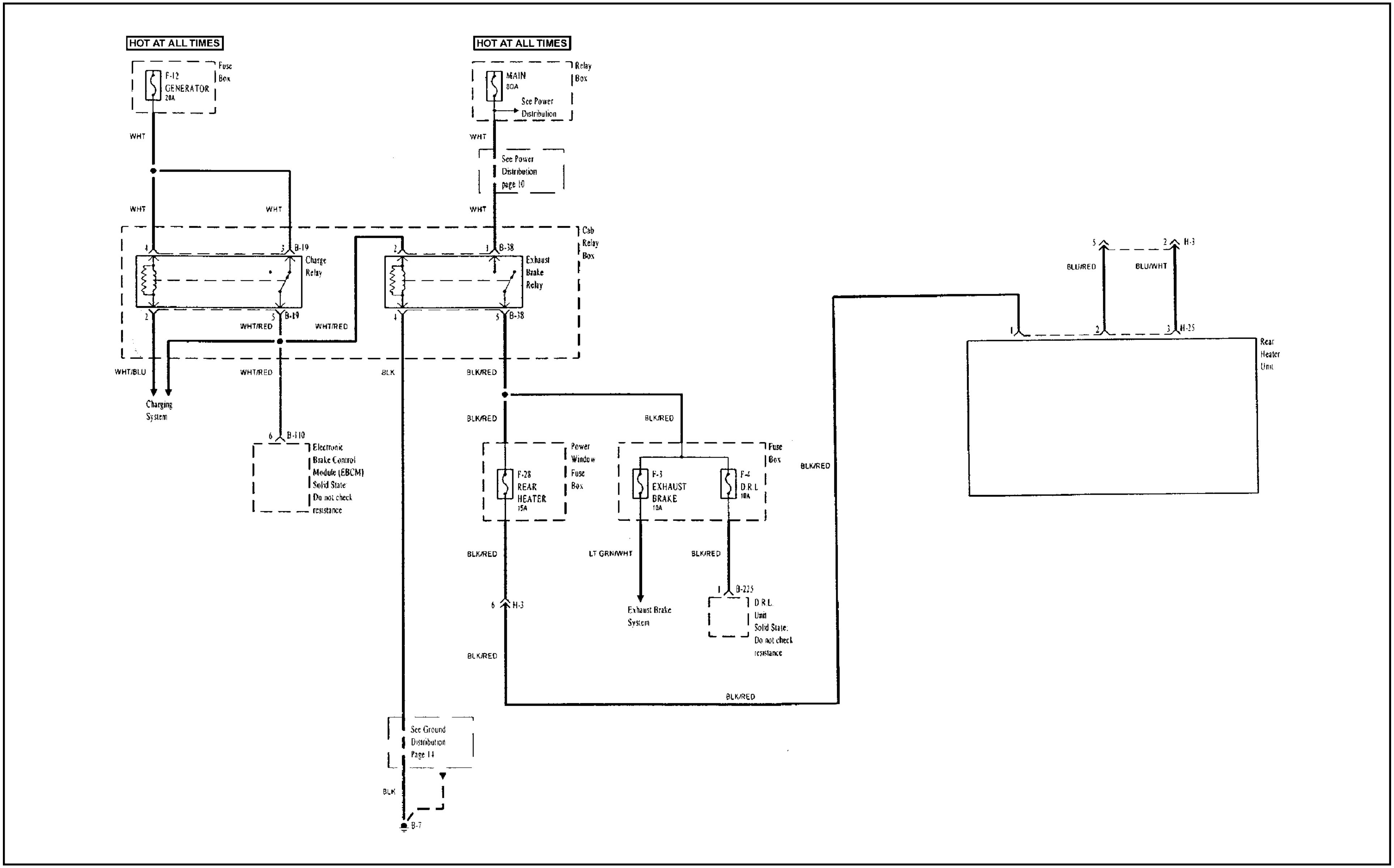
(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Electrical – continued from previous page)

Rear Heater Circuit Diagram



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(Vehicle Specifications Index Section – NPR HD/W4500, NQR/W5500 Crew Cab Electrical – continued from previous page)

NOTE:

For further Electrical Wiring Information please refer to the NPR/W3500, NPR HD/W4500, NQR/W5500, NRR/W5500 HD

2005 PTO SECTION FOR THE 4HK1-TC ENGINE (IL5)

System Operating Instructions
PTO – Power Take Off Option – Electrical Requirements

SECTION OUTLINE

OVERVIEW

A Power Take Off (PTO) is a gearbox or mechanical device used to transmit mechanical power from the power train, through gears or a transmission, to another mechanical or hydraulic device. Examples of PTO applications are: salt spreaders; refuse equipment, plows, pumps, drills, lifts, wrecker equipment, dump bodies, fire/rescue equipment.

PTO Advantages

- PTO's are inexpensive, convenient, safe and reliable.
- PTO's bolt on to the transmission, engine, transfer case or can be incorporated into the accessory belt drive system.
- PTO's eliminate the need for a complex array of levers, controllers, electric motors, which would be required to duplicate the operation of a PTO.

Scope
The Upfitter or Specialty Vehicle Assembler installs the PTO unit itself on the vehicle. The (PTO) option described here is the necessary electrical and electronic content to control the PTO unit. Responsibility for proper and safe operation remains with the Upfitter.

(PTO) Option (ILL#9)
The (PTO) option allows for increased engine speed for increased power to the PTO unit.

VOCATION/MODES

The primary difference in PTO operation is whether the vehicle is stationary or moving. Stationary operation can have either preset or variable PTO speeds. Some examples of modes and vocations are:

- Stationary Preset – Two preset high idle speeds – Refuse & Wrecker equipment, Fire truck pumpers
- Stationary Variable – Variable high idle speeds – Drills, Lifts
- Mobile Variable – Allows variable PTO speeds while the vehicle is moving – Salt Spreaders, Plows, Street Cleaners

Note: The ECM (ENGINE CONTROL MODULE) can be programmed to only one of these modes at any given time.

FACTORY INSTALLED EQUIPMENT

The factory PTO option includes the PTO Enable Switch, Cruise Control Switches, and upfitter connectors to allow optional upfitter installed switches, and wiring.

UPFITTER INSTALLED EQUIPMENT

Optional upfitter capabilities include: remote PTO enable switch, remote PTO set/coast switch, remote PTO resume /accel switch, PTO cab cruise switch disable, and PTO engine shutdown switch. All of these controls interface through the upfitter connectors.

ECM PROGRAMMABLE FUNCTIONS

Optional upfitter capabilities that can be activated by reprogramming the ECM at your authorized dealer. These include: Remote PTO Throttle, Remote PTO Set, Remote PTO Resume, Remote PTO Set Speed A Switch, Remote PTO Set Speed B Switch, PTO Engine Shutdown, PTO Load Engaged, and PTO Ignore Brake/Clutch

OPERATION

Description
The PTO controls allow the user to raise the engine speed through the use of designated switches and ECM programming.
The ECM can be programmed to one of the following three PTO modes:

- Stationary Preset mode – Two preset high idle speeds. Vehicle must be stationary. (Factory standard mode)
- Stationary Variable mode – Variable high idle speeds. Vehicle must be stationary.
- Mobile Variable mode – Allows variable PTO speeds while vehicle is moving.

These PTO modes are addressed separately and in detail in the following pages.
Please note the ECM can be programmed to only one of the three modes at any one time.

PTO Switches
Vehicles ordered with the PTO switch option (IL9) come with an instrument panel mounted switch, which allows the user to enable the PTO function. This PTO Switch is located on the left of the dash as shown in the illustration 1. An indicator in the switch illuminates to show PTO mode is active. The engine speed can then be changed with either the cruise control switches or upfitter installed remote PTO switches. Cruise Control Switches come standard with the 2005 GM/Isuzu W and N series chassis as shown in illustration 2.
The following chart illustrates switch operation.

PTO Switch Description

Switch	Stationary Preset	Stationary Variable	Mobile Variable
PTO Enable (Factory Option)	Enables PTO Mode	Enables PTO Mode	Enables PTO Mode
Remote PTO Enable	Enables PTO Mode	Enables PTO Mode	Enables PTO Mode
Cruise Set/Coast (Factory)	Allows for 1st Preset Speed	Decreases engine speed variably or incrementally	Decreases engine speed variably or incrementally
Cruise Resume/Accel (Factory)	Allows for 2nd Preset Speed	Increases engine speed variably or incrementally	Increases engine speed variably or incrementally
Remote PTO Set/Coast (Same ECM input as Cruise Set SW)	Allows for 1st Preset Speed	Decreases engine speed variably or incrementally	Decreases engine speed variably or incrementally
Remote PTO Resume/Accel (Same ECM input as Cruise Resume SW)	Allows for 2nd Preset Speed	Increases engine speed variably or incrementally	Increases engine speed variably or incrementally
PTO Cab Cruise Control Switches Disable	The cruise switch inputs are ignored when this switch is ON.	The cruise switch inputs are ignored when this switch is ON.	The cruise switch inputs are ignored when this switch is ON.
Accelerator Pedal (Factory)	Not Applicable	Increases engine speed variably	Increases engine speed variably
**Remote PTO Throttle	Not Applicable	Increases or decreases engine speed variably	Increases or decreases engine speed variably
**Remote PTO Set (Disables Cruise Switches)	Not Applicable	Decreases engine speed variably or incrementally	Decreases engine speed variably or incrementally
**Remote PTO Resume (Disables Cruise Switches)	Not Applicable	Increases engine speed variably	Increases engine speed variably
**Remote PTO Set Speed A Switch (Disables Cruise Switches)	Allows for 1st Preset Speed	Not Applicable	Not Applicable
**Remote PTO Set Speed B Switch (Disables Cruise Switches)	Allows for 2nd Preset Speed	Not Applicable	Not Applicable
**PTO Engine Shutdown	Allows for engine shutdown in PTO Mode	Allows for engine shutdown in PTO Mode	Allows for engine shutdown in PTO Mode
**PTO Load Engaged	Inhibits PTO mode until PTO relay and this switch is turned On.	Inhibits PTO mode until PTO relay and this switch is turned On.	Inhibits PTO mode until PTO relay and this switch is turned On.
**PTO Ignore Brake/Clutch	PTO Mode stays active with a brake or clutch switch input.	PTO Mode stays active with a brake or clutch switch input.	PTO Mode stays active with a brake or clutch switch input.

**Denotes the need for ECM reprogramming

STATIONARY PRESET MODE

Description
The Stationary Preset Mode allows the user to select from two high idle speeds that are programmed in the ECM. The user can toggle between 2 preset speeds using the SET/COAST or RESUME/ACCEL switches or the Remote PTO Switches.

How To Operate
Prior to enabling the Stationary Preset PTO Mode, the following conditions must be met:
1. Engine must be running.
2. Transmission must be in Park or Neutral.
3. Vehicle speed must be less than 5 mph.
4. Brake or Clutch must not be depressed.

When the above conditions are met, the operator can activate the Stationary Preset PTO mode by the following sequence:

1. Set the Park Brake.
2. Set PTO Enable Switch to On position.

Upon Completion of the above steps, the PTO Stationary Preset Mode will be enabled and the engine speed will increase to the PTO Standby speed. Toggling the SET/COAST and RESUME/ACCEL switches will cause the engine RPM to change from PTO standby speed to either the PTO Preset #1 or PTO Preset #2 speed depending on which switch is pressed first.

Any changes in the above conditions, including depressing the brake or clutch pedals or shifting an automatic transmission in gear, will disable the Stationary Preset Mode causing the engine to return to normal base idle speed.

Note:
4HK1-TC engine (IL5) will be governed to PTO Max engine speed with throttle activation. Engine speed will return to pre-activation value after the pedal is released.

The factory preset and minimum and maximum programmable speeds are shown in the table below for the 4HK1-TC engine (IL5):

STATIONARY PRESET MODE (Default)			
MAIN FUNCTIONS			
Parameter	**Units**	**Default setting**	**Allowable Range**
PTO MAX ENGINE SPEED	RPM	3050	750-3050
PTO STANDBY SPEED	RPM	800	750-1300
PTO SET SPEED	RPM	1300	750-3050
PTO RESUME SPEED	RPM	1700	750-3050
ADDITIONAL FUNCTIONS			
Parameter	**Units**	**Default setting**	**Allowable Range**
PTO ENGAGE RELAY	YES/NO	NO	———
PTO MAX ENGAGE SPEED	RPM	1050	750-1500
PTO FEEDBACK	YES/NO	NO	———
PTO ENGINE SHUTDOWN	YES/NO	NO	———
PTO SHUTDOWN TIME DELAY	SECONDS	NO	0-255
PTO BRAKE/CLUTCH OVERRIDE	YES/NO	NO	———
PTO REMOTE PRESET A/B SWITCH	YES/NO	OFF	———

Note: The values shown in the above chart are accurate at the time of publication, but may change in time for various reasons including running changes made to the ECM, ECM software calibrations, or Tech 2 software

Adjusting the Factory Preset Engine Speed
The above parameters can be reprogrammed with a Tech 2 Diagnostic tool or the service programming system.

STATIONARY VARIABLE MODE

Description
The Stationary Variable Mode allows the user to retain the engine speed at a desired value through the use of the accelerator pedal and the SET/COAST or RESUME/ACCEL switch. The engine speed must be greater than the PTO standby speed and lower than the maximum engine speed.

How To Operate
Prior to enabling the Stationary Variable PTO Mode, the following conditions must be met:
1. Engine must be running
2. Transmission must be in Park or Neutral
3. Vehicle speed must be less than 5 mph
4. Brake or Clutch must not be depressed.

When the above conditions are met, the operator can activate the Stationary Variable PTO Mode by the following sequence:

1. Set the Park Brake.
2. Set PTO Enable Switch to On position.
3. Depress the Accelerator pedal to obtain the desired high idle speed.
4. Press the SET/COAST button to hold engine at the desired high idle speed.

The SET/COAST and RESUME/ACCEL switches can then be used to adjust the engine speed within the Maximum and Minimum RPM values shown in the following table. The adjustment increments are 25 RPM. This function will also work with the remote switches.

Any changes in the above conditions, including depressing the brake or clutch pedals or shifting an automatic transmission in gear, will disable the Stationary Variable Mode causing the engine to return to normal base idle.

STATIONARY VARIABLE MODE (con't)

STATIONARY VARIABLE MODE			
MAIN FUNCTIONS			
Parameter	Units	Default setting	Allowable Range
PTO MAX ENGINE SPEED	RPM	3050	750-3050
PTO STANDBY SPEED	RPM	800	750-1300
ADDITIONAL FUNCTIONS			
Parameter	Units	Default setting	Allowable Range
PTO ENGAGE RELAY	YES/NO	NO	———
PTO MAX ENGAGE SPEED	RPM	1050	750-1500
PTO FEEDBACK	YES/NO	NO	———
PTO ENGINE SHUTDOWN	YES/NO	NO	———
PTO SHUTDOWN TIME DELAY	SECONDS	0	0-255
PTO BRAKE/CLUTCH OVERRIDE	YES/NO	NO	———
PTO TAP DOWN RATE	RPM	25	25-500
PTO TAP UP RATE	RPM	25	25-500
PTO ACCEL RATE	20 RPM/128ms	20	25-500
PTO REMOTE SET/RESUME SWITCH	YES/NO	NO	———
PTO REMOTE THROTTLE	YES/NO	NO	———
PTO REMOTE THROTTLE MAX ENGINE SPEED	RPM	2100	0-2300
PTO REMOTE THROTTLE 0%	VOLTS	0.85	0.25-4.75
PTO REMOTE THROTTLE 100%	VOLTS	3.75	0.25-4.75

Note: The values shown in the above chart are accurate at the time of publication, but may change in time for various reasons including running changes made to the ECM, ECM software calibrations, or Tech 2 software

Adjusting the Factory Preset Engine Speed
The above parameters can be reprogrammed with a Tech 2 Diagnostic tool or the service programming system.

MOBILE VARIABLE MODE

Description
The PTO Mobile Variable Mode allows the driver to maintain a desired engine speed (not vehicle speed) while the vehicle is moving. This feature is available with both manual and automatic transmissions. The engine speed must be greater than the PTO Standby Speed and lower than the PTO Maximum Engine Speed. The Vehicle speed must be less than the Maximum Vehicle Speed Value.

How To Operate
To engage the PTO Mobile Variable Mode, the following conditions must be met in the following order:
1. Engine must be running
2. Transmission must be in gear.
3. Vehicle speed must be less than the Maximum Vehicle Speed
4. Brake or Clutch must not be depressed.
5. PTO Enable Switch must be set to the On position

When the above conditions are met, the operator can activate the Mobile Variable mode by the following sequence:
7. Depress the Accelerator Pedal to obtain the desired engine speed.
8. Press the SET/COAST button to hold engine at the desired high idle speed.
The SET/COAST and RESUME/ACCEL switches can then be used to adjust the engine speed within the Maximum and Minimum RPM values shown in the Engine calibration table. The adjustment increments are 25 RPM

MOBILE VARIABLE MODE (con't)

MOBILE VARIABLE MODE			
MAIN FUNCTIONS			
Parameter	**Units**	**Default setting**	**Allowable Range**
PTO MAX ENGINE SPEED	RPM	3050	750-3050
PTO STANDBY SPEED	RPM	800	750-1300
ADDITIONAL FUNCTIONS			
Parameter	**Units**	**Default setting**	**Allowable Range**
PTO ENGAGE RELAY	YES/NO	NO	———
PTO MAX ENGAGE SPEED	RPM	1050	750-1500
PTO FEEDBACK	YES/NO	NO	———
PTO ENGINE SHUTDOWN	YES/NO	NO	———
PTO SHUTDOWN TIME DELAY	SECONDS	0	0-255
PTO BRAKE/CLUTCH OVERRIDE	YES/NO	NO	———
PTO TAP DOWN RATE	RPM	25	25-500
PTO TAP UP RATE	RPM	25	25-500
PTO ACCEL RATE	20 RPM/128ms	20	25-500
PTO REMOTE SET/RESUME SWITCH	YES/NO	NO	———
PTO REMOTE THROTTLE	YES/NO	NO	———
PTO REMOTE THROTTLE MAX ENGINE SPEED	RPM	2100	0-2300
PTO REMOTE THROTTLE 0%	VOLTS	0.85	0.25-4.75
PTO REMOTE THROTTLE 100%	VOLTS	3.75	0.25-4.75
PTO MAXIMUM VEHICLE SPEED	MPH	75	0-75

Note: The values shown in the above chart are accurate at the time of publication, but may change in time for various reasons including running changes made to the ECM, ECM software calibrations, or Tech 2 software

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Adjusting the Factory Preset Engine Speed

The above parameters can be reprogrammed with a Tech 2 Diagnostic tool or the service programming system.

PTO ENGINE SHUTDOWN

Description
The PTO option includes provisions for PTO engine shutdown. This feature allows the operator to stop the engine while in PTO mode with an aftermarket installed switch. If the truck is not in PTO mode, pressing the switch will have no effect on engine operation. The PTO Upfitter Connector (located on the left hand frame rail) has been provided for installation of remote PTO controls. The upfitter can access the PTO engine fault shutdown circuits through this connector. The upfitter must provide the mating connector, wiring, and remote switches. To install this feature see the upfitter provisions schematics. Important. If the PTO engine shutdown feature is to be used, it must be turned on in the ECM. If this feature is not turned on it will have no effect engine operation. The above parameters can be reprogrammed with a Tech 2 Diagnostic tool or the service programming system

REMOTE OPERATION

Description
The PTO Upfitter Connector (located on the left hand frame rail) has been provided for installation of remote PTO idle controls. The upfitter can access the PTO high idle circuits through this connector. The upfitter must provide the mating connector, wiring, and remote switches shown on the Upfitter (PTO) Connector. Two momentary switches are required to duplicate the operation of the SET/COAST and RESUME/ACCEL switches in the cab. The schematics showing the switches can be found on the following diagrams. The PTO UP switch duplicates the RESUME/ACCEL switch operation and the PTO Down switch duplicates the SET/COAST switch operation. Please note that the PTO high idle must still be enabled from the PTO enable switch in the cab or the remote PTO enable switch.

Location of PTO Switch and Indicator
Illustration #1

Location of Cruise Control Switches
Illustration #2

PTO Switch Connector and Harness
Illustration #3

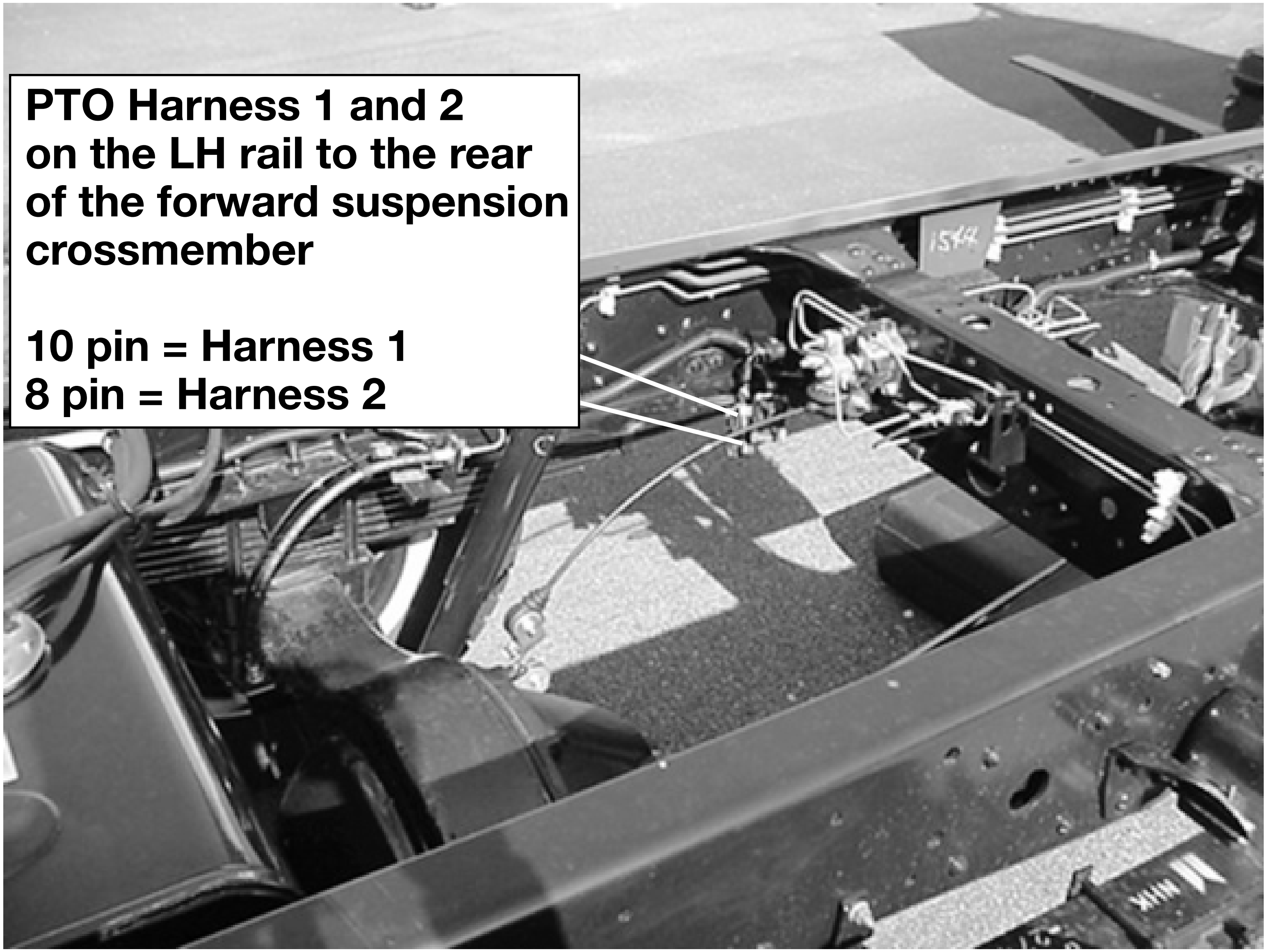
PTO Switch Harness Connector

Location: under dash behind switch panel

Illustration #4

TO BE ADVISED

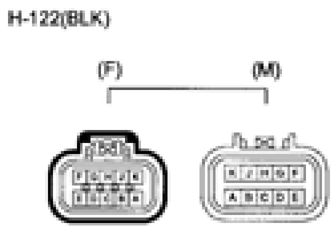
PTO Switch Harness 1 & 2
Illustration #5



PTO Harness Connector (10 pin)

Location: PTO Harnesses 1 and 2 on the LH rail to the rear of the forward suspension crossmember

Illustration #6



Terminal	Wire Color	Circuit description
A	-	Blank
B	Lt Grn/White	Ignore Brake Clutch Switch Input
C	Orn/Grn	Set Speed B Input Switch
D	Gry/Red	Set Speed A Input Switch
E	Brn	Cab Control Disable Switch
F	Red/Yel	PTO Kill Switch Input
G	White	Refrigerator Switch Input
H	-	Blank
J	Pink	Remote PTO Set Switch Input
K	Brn/Blk	Remote PTO Resume Switch Input

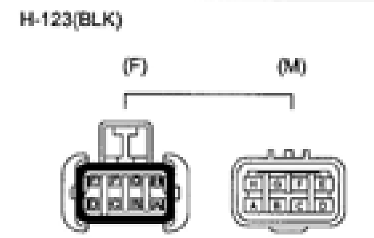
Harness end
Housing: 12065425
Terminal: 12084200
Cable Seal: 12048087
TPA: 12124264
CPA: 12020833

Plug Cap
Housing 12045808
Dummy Seal 12059168

PTO Harness Connector 2 (8 pin)

Location: PTO Harnesses 1 and 2 on the LH rail to the rear of the forward suspension crossmember

Illustration #7

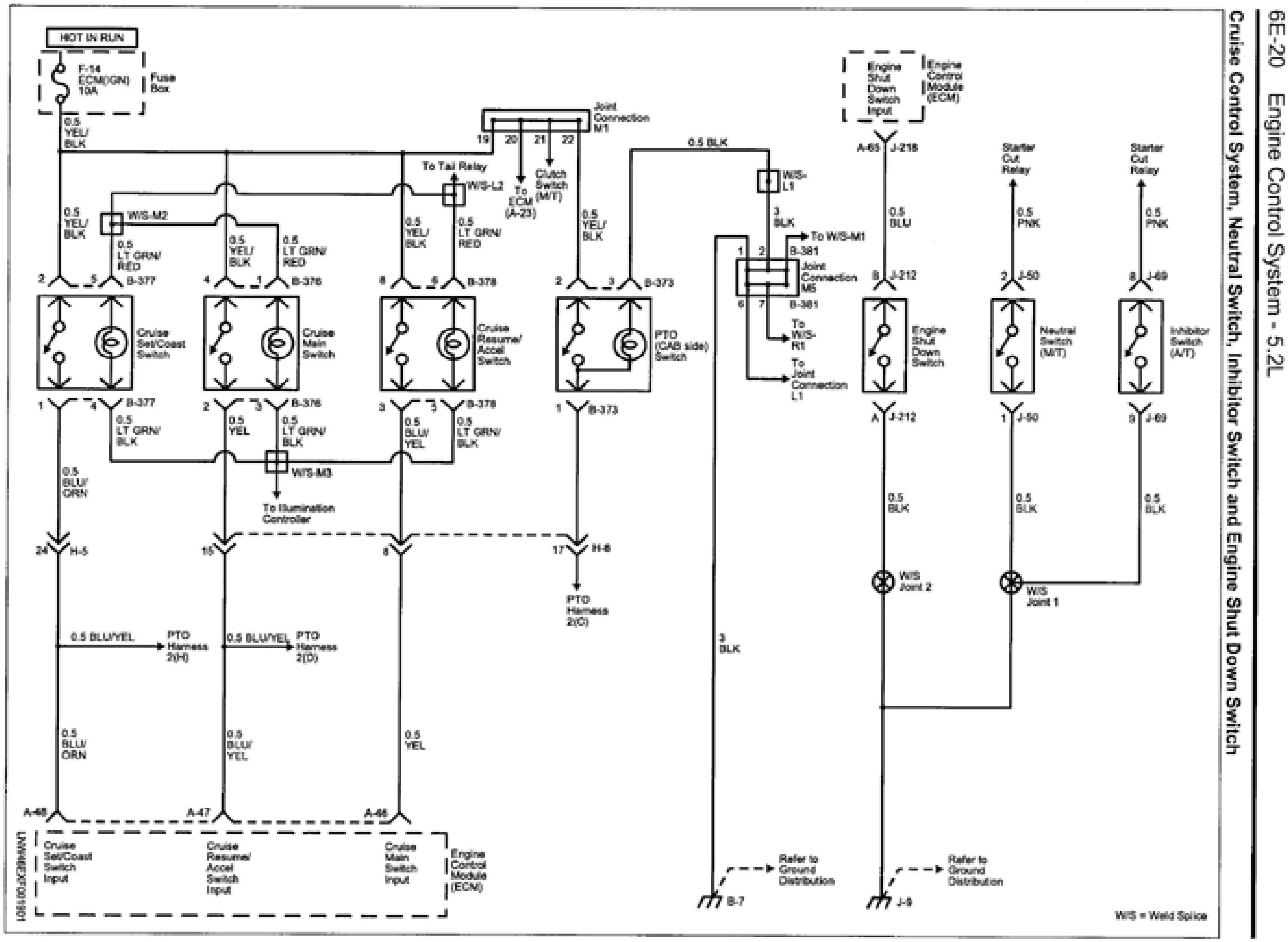


Terminal	Wire Color	Circuit description
A	Pnk/Grn	PTO Load Engaged Switch Input
B	Red	PTO Enable Relay Control
C	Blu	PTO Switch Input
D	Blu/Yel	Cruise Set/Coast Switch
E	Red/Blk	5 Volt Signal
F	Red/Grn	PTO Accel Sensor Signal
G	Brn	Ground in ECM
H	Blu/Brn	Cruise Resume Accel Switch

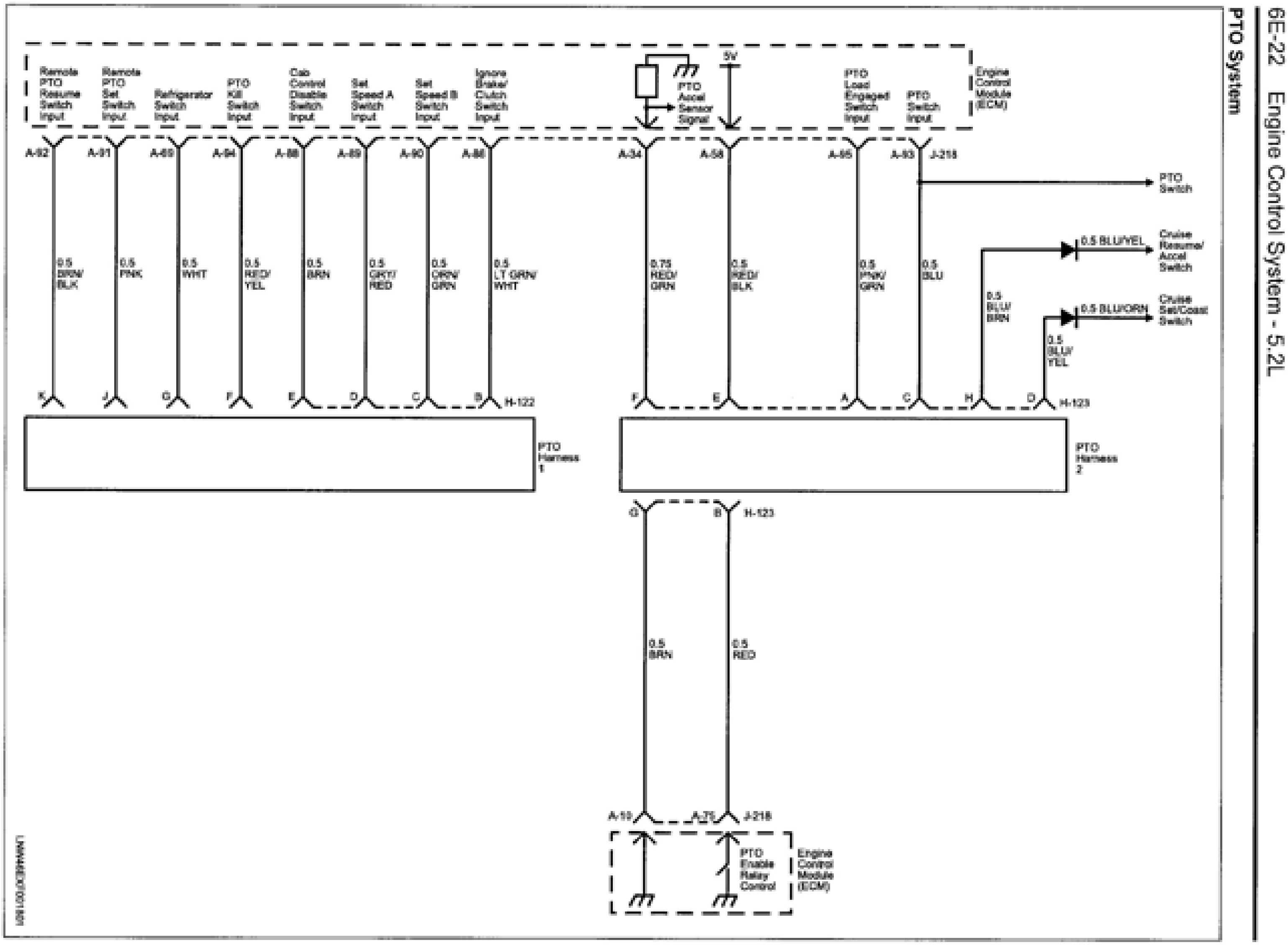
Harness end
Housing: 12047937
Terminal: 12084200
12048074
Cable Seal: 12048087
12089678
TPA: 12066304
CPA: 12020833

Plug Cap
Housing 12047931
Dummy Seal 12059168

PTO Switch Wiring Diagram
Illustration #8



PTO Harness 1 and 2 Diagram
Illustration #9



LOW SPEED APPLICATIONS FOR W AND N SERIES CHASSIS

Any low speed vehicle applications using the Aisin Transmission such as sweeper, highway striping and road side mowing airport service must adhere to the following guidelines in order to prevent the over heating of the automatic transmission fluid.

Factory Recommendation:
Select Range 1 for low speed operations under 13 mph.
Select Range 2 for low speed operation under 29 mph.

The body builder must confirm that the automatic transmission fluid temperature remains under the following limits while operated in the normal equipment application pattern. If the automatic transmission fluid temperature warning lamp goes on frequently the additional air-cooled automatic transmission filter cooler (RPO code IF7) must be installed to keep temperature under 140 Centigrade/284°Fahrenheit).

Reference information:
Automatic transmission fluid temperature warning lamp illuminates over 144 Centigrade/291°Fahrenheit.