



ISUZU
TRUCK

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BODY BUILDER'S GUIDE

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Body Builders Guide

Body Builders Guide

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

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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 anytime without prior notice, any parts, material, colors, special equipment, specifications, designs and models.

Made and printed in the USA.

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*Note: 2002 FSR, FTR and FVR

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 completed 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/W Gas, NPR/W Diesel, NQR/W Diesel, NPR HD/NQR/W Diesel Crew Cab and FRR/WT Series Chassis Cab and Janesville assembled FSR, FTR and FVR 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 following chart.

FMVSS Chart

FMVSS	TITLE	NPR/NPR HD W3500/W4500	NQR W5500	FRR WT5500	FSR	FTR/FVR
101	Controls and Displays	A+	A+	A+	A	A
102	Transmission Shift Lever Sequence Starter Interlock, and Transmission Braking Effect.	A+	A+	A+	A+	A+
103	Windshield Defrosting and Defogging Systems	A+	A+	A+	A	A
104	Windshield Wiping and Washing Systems	A+	A+	A+	A	A
105	Hydraulic Brake Systems	A+	A+	B	A+	A+
106	Brake Hoses	A+	A+	A+	A+	A+
107	Reflecting Surfaces	-	-	-	A	A
108	Lamps, Reflective Devices, and Associated Equipment	A+	A+	A+	A	A
111	Rear view Mirrors	A+	A+	A+	A	A
112	Headlamp Concealment Devices ³	A	A	A	A	A
113	Hood Latch System	A	A	A	A+	A+
115	Vehicle Identification Number ³	A	A	A	A+	A+
116	Motor Vehicle Brake Fluids	A+	A+	A+	A+	A+
118	Power Operated Window System ⁵	A	A	A	A+	A+
120	Tire Selection and Rims	A+	A+	A+	A+	A+
121	Air Brake Systems	B	B	A	A+	A+
124	Accelerator Control Systems	A+	A+	A+	A+	A+
205	Glazing Materials	A+	A+	A+	A	A
206	Door Locks and Door Retention Components	A+	A+	A+	A	A
207	Seating Systems	A+	A+	A+	A	A
208	Occupant Crash Protection	A+	A+	A+	A	A
209	Seat Belt Assemblies	A+	A+	A+	A	A
210	Seat Belt Assembly Anchorages	A+	A+	A+	A	A
211	Wheel Nuts, Wheel Discs, and Hub Caps ^{4,3}	A	A	A	-	-
213	Child Restraint Systems	A	A	A	-	-
302	Flammability of Interior Materials	A+	A+	A+	A	A

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

Chart Legend:

- A** Incomplete vehicle; when completed will conform providing no alterations have been made affecting items covered by FMVSS regulations and "Document for Incomplete Vehicle.
- B** Incomplete vehicle; when completed by the final manufacturer will conform providing it is completed in compliance with FMVSS regulations and "Document for Incomplete Vehicle."
- +** Meets Canadian Motor Vehicle Safety Standards bearing same FMVSS number.
- 3** Canadian MVSS only.
- 4** Not applicable to truck or bus.
- 5** Not applicable to trucks with a GVWR greater than 10,000 LBS.

EPA Requirements

NPR/W Gas, NPR/W Diesel, NQR/W Diesel, NPR HD/NQR/W Diesel Crew Cab and FRR/WT 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 | 2) GASOLINE VEHICLES |
| Injection Pump | Vehicle Control Module (VCM) |
| Injector and High Pressure Lines | Fuel Management System |
| Turbocharger | Air Induction System |
| Charge Air Cooler and Charge | Ignition System |
| Air Cooler Hoses | Catalytic Converter System |
| Engine Control Module (ECM) | Positive Crankcase Ventilation System |
| Engine Speed Sensor | Exhaust Gas Recirculation System |
| Engine Coolant Temperature Sensor | Evaporative Emission Control System |
| Intake Manifold | Miscellaneous Items Used in Above Systems |
| Catalytic converter and its location | |
| Variable swirl system | |
| Exhaust Gas Recirculation System | |

ADDITIONAL CANADA MOTOR VEHICLE SAFETY STANDARD

- CMVSS NO. 1101-EMISSION DEVICE
- CMVSS NO. 1102-CRANKCASE EMISSION (GASOLINE ENGINE ONLY)
- CMVSS NO. 1103-EXHAUST EMISSIONS
- CMVSS NO. 1104-OPACITY (DIESEL ENGINE ONLY)
- CMVSS NO. 1105- EVAPORATIVE EMISSION (GASOLINE ENGINE ONLY)

[B] NOISE

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

This incomplete vehicle, when completed, will conform to the above standards except 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
 - Exhaust emission control system
 - P.C.V. system (if equipped)
- * Intake system
- * Exhaust system
 - Fuel system (if equipped)
- * Transmission assembly
- * Axle
- * Tires
- * Fan and drive
 - Diesel fuel injection controls (if equipped)
 - Turbocharger and associated controls (if equipped)
- * Catalytic converter and its location
- Variable swirl system (if equipped)

Conformity with CMVSS 1106 is not determined solely by the design of the incomplete vehicle. When completed, it should conform to CMVSS 1106 providing no alterations are made to the noise attenuation components identified thus * in the above list.

[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

FSR, FTR & FVR

U.S. ENVIRONMENTAL PROTECTION AGENCY AND STATE OF CALIFORNIA EMISSION REQUIREMENTS

To assure that EPA and California Emission Certificate 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. Labels

[D] EXHAUST EMISSION RELATED COMPONENTS

Compliance of this vehicle with EPA and California Certification 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 (6HE1-TC only)
- Intake Manifold
- Catalytic converter and its location (6HE1-TC only)
- Air cylinder for variable swirl system (6HE1-TCS only)

[E] 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.

CANADIAN MOTOR VEHICLE SAFETY STANDARDS

CMVSS NO. 1101-EMISSION DEVICE
CMVSS NO. 1103-EXHAUST EMISSIONS
CMVSS NO. 1104-OPACITY
CMVSS NO. 1106-NOISE

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

Engine assembly*
Exhaust emission control system
P.C.V. system
Intake system*
Exhaust system*
Fuel system
Transmission assembly*
Axle*
Tires*
Fan and drive*
Diesel fuel injection controls
Turbocharger and associated controls
Catalytic converter and its location (6HE1-TC only) *
Air cylinder for variable swirl system (6HE1- TCS only)

Conformity with CMVSS 1106 is not determined solely by the design of the incomplete vehicle. When completed, it should conform to CMVSS 1106 providing no alterations are made to the noise attenuation components identified thus * in the above list.

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

Air Inlet System
Diesel Fuel Injection Controls
Engine Assembly with all Components of Exhaust Emission Control System
Exhaust System
Fuel System
Turbocharger and Associated Controls

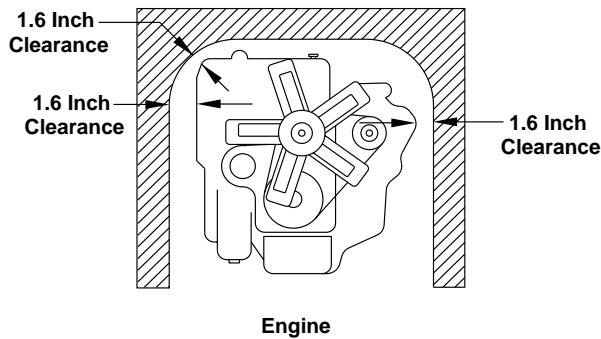
Installation of Body & Special Equipment

Installation of Body & Special Equipment

Clearances

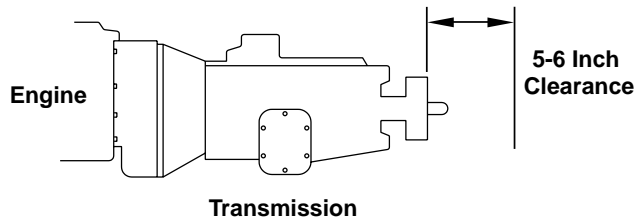
Engine

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

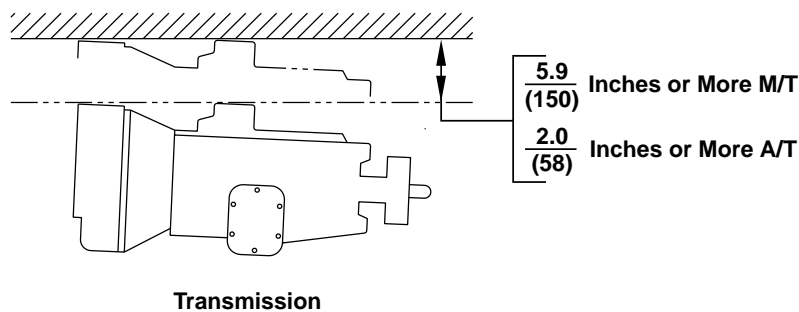


Transmission

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 unrestricted movement of the transmission assembly. In addition, provide at least 2 inches clearance around the control lever on the side of the transmission to allow free movement without any binding.

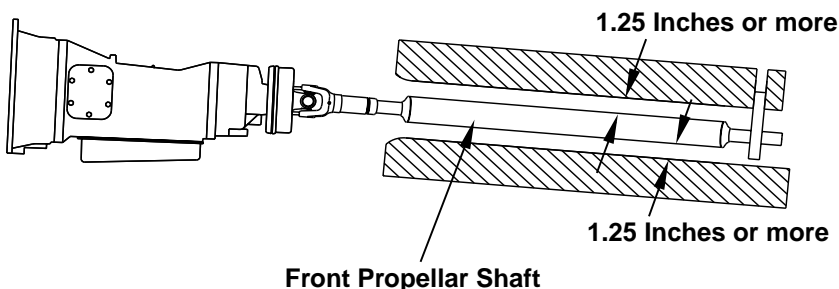


At least 6 inches clearance should be maintained above the transmission to allow easy removal of the upper cover for manual transmissions. At least 2 inches clearance should be maintained above the automatic transmission to allow for transmission removal.



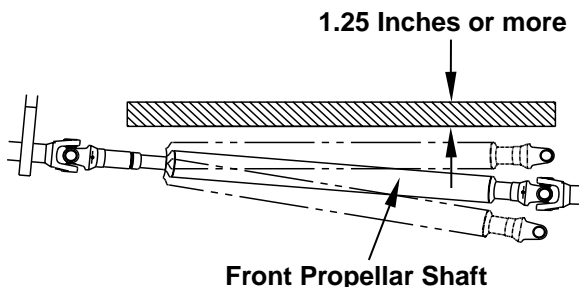
Front and Center Propeller Shafts

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



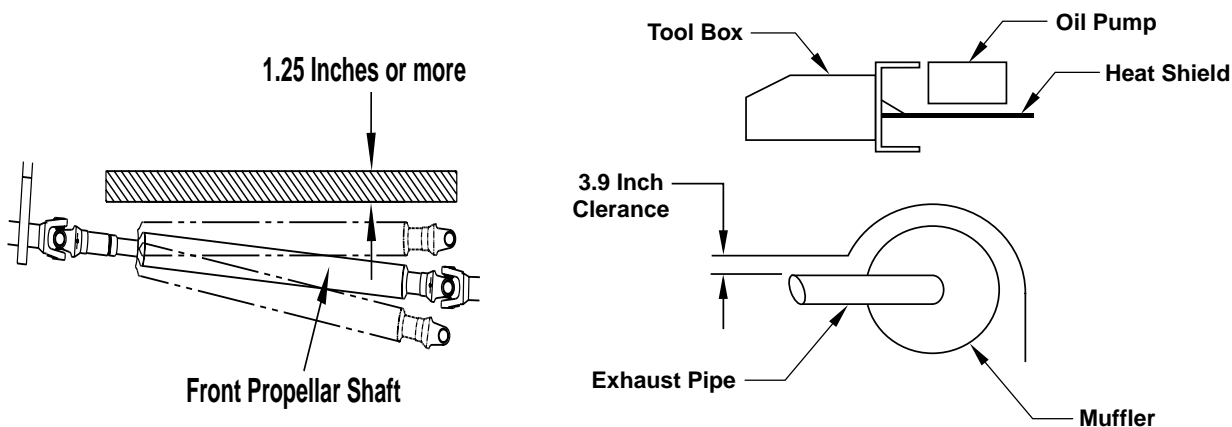
Rear Propeller Shaft

With the rear springs at maximum deflection, at least 1.25 inch 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 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.

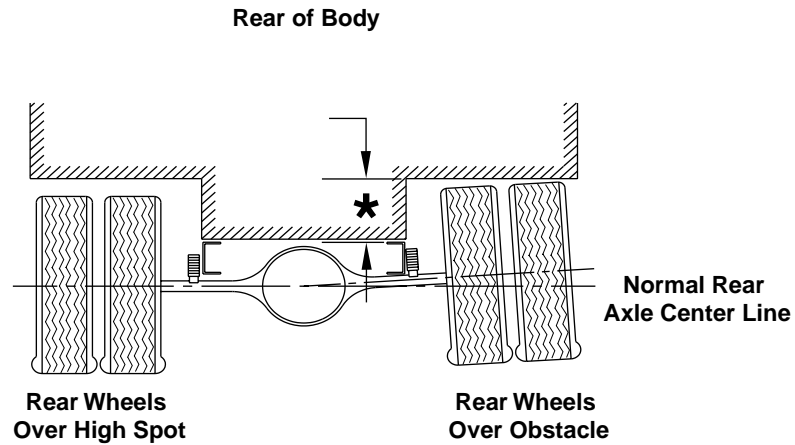


Installation of Body & Special Equipment

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

Transmission control cable may be broken if it is bent by or interferes with the body and its fixtures. To prevent this, 1 inch minimum clearance should be provided. When cable is detached for 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.	Axle side
	1.6 in.	Frame side
Parking Brake Cable	1.2 in.	-----
Fuel Hose	1.6 in.	-----
Shock Absorber	2.4 in.	Axle Side
	1.2 in.	Frame Side

Body Installation

Chassis

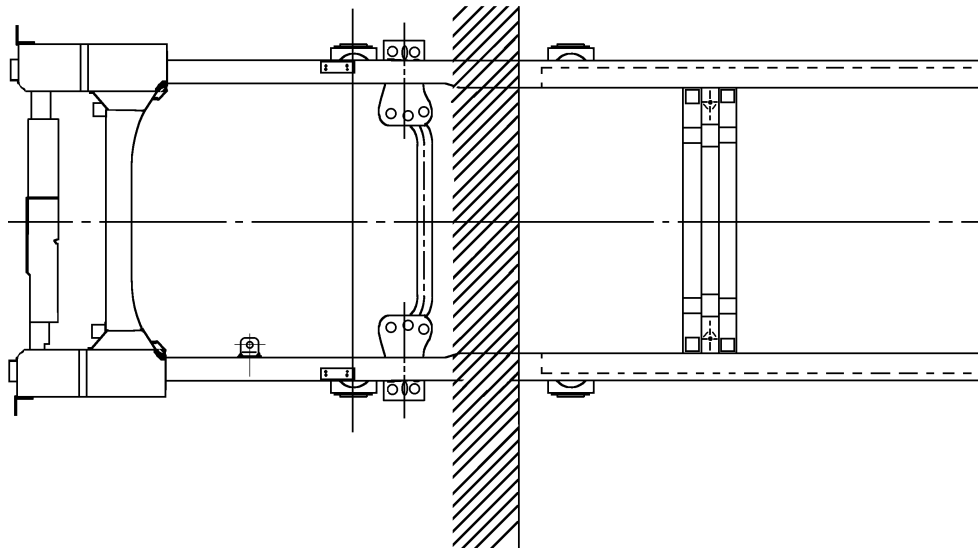
To maintain the performance of the truck chassis, either a side member or subframe should always be used for body mounting. Body mounting with low rigidity will often adversely affect riding comfort.

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.

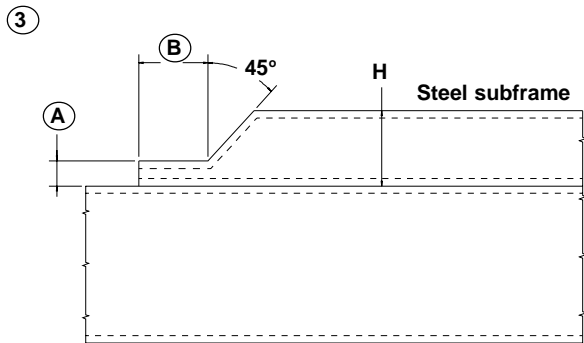
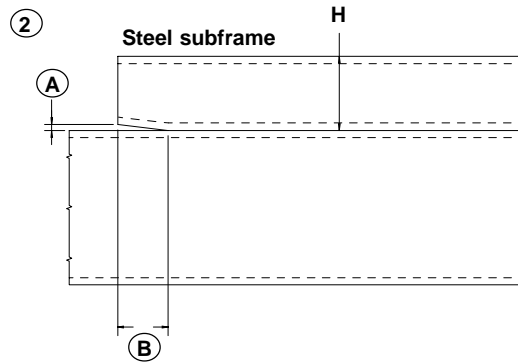
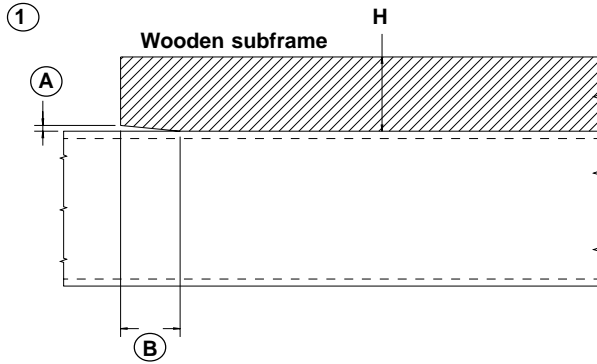


Rear End of the Cab

Installation of Body & Special Equipment

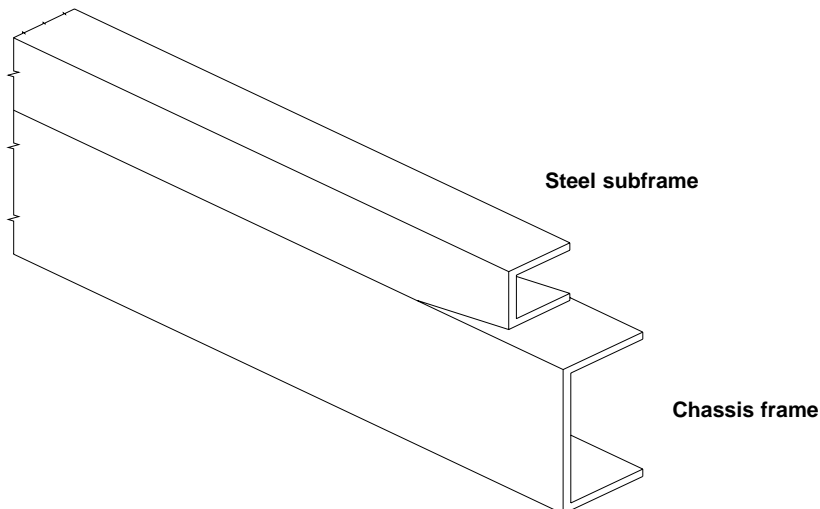
Subframe Contour

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

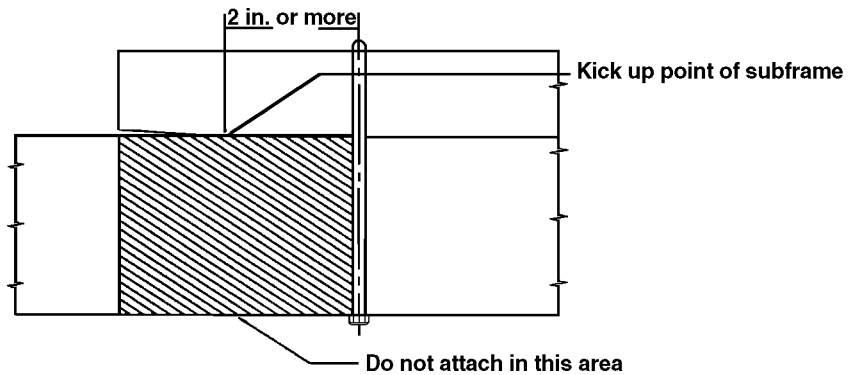
When using a steel subframe, do not close the end of the subframe.



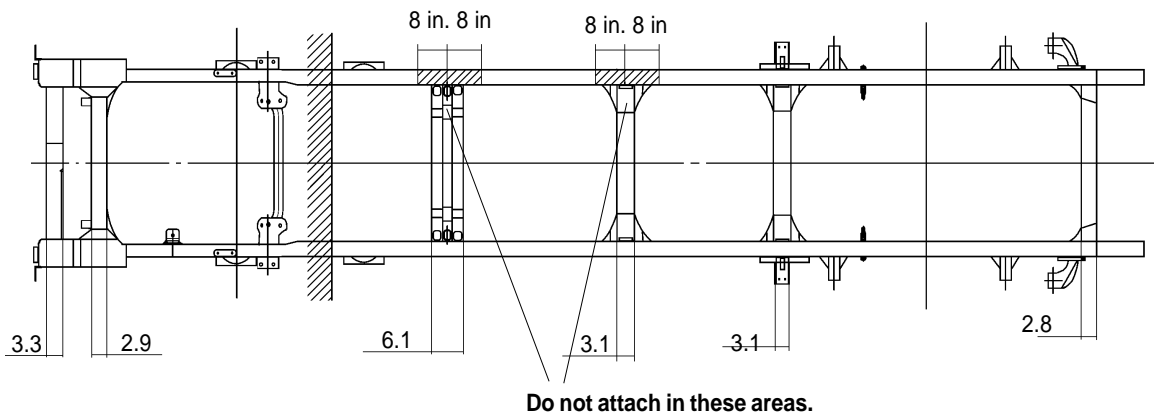
Prohibited Attachment Areas

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.



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

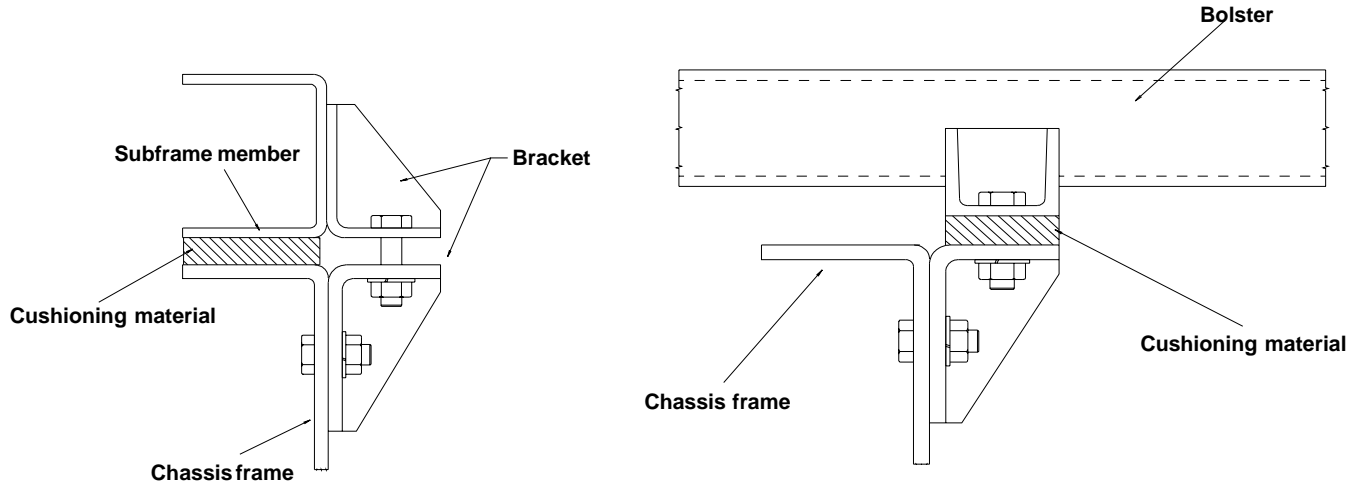


Installation of Body & Special Equipment

Subframe Mounting

Bracket Installation

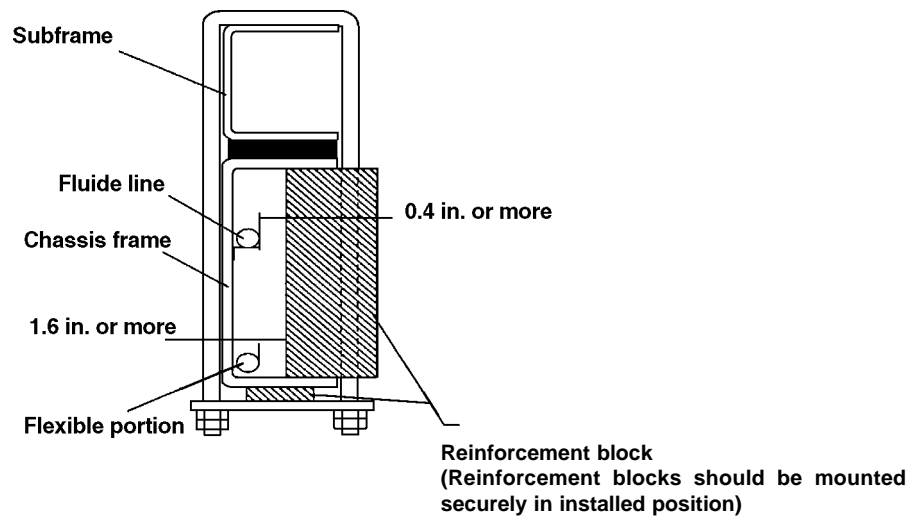
Mounting brackets should be clamped to the chassis frame using bolts. For proper positions in which to install the bolts, refer to the preceding section and the section "Modifications to the Chassis Frame."



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 inch clearance between rigid or stationary portions, and at least 1.6 inch 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"x1-5/8", 7.25 lbs/ft = ok

5"x1-3/4", 6.7 or 9.0 lbs/ft = ok

6"x2", 8.2, 10.5 or 13.0 lbs/ft = ok

Modification of the Frame

Modification of chassis frame should be kept 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 ON PAGES 27 AND 28

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.

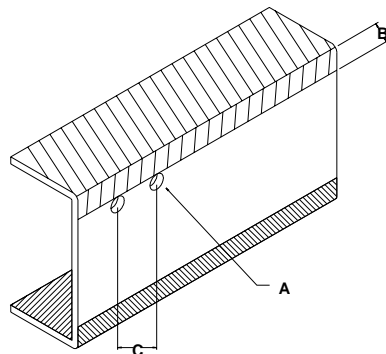
The chassis frame is designed as an integral unit. Therefore, **we do not recommend cutting the chassis frame under any circumstances.**

Drilling and Welding

IMPORTANT NOTE

For vehicles equipped with electronic or hydro-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 inch from the edges of any existing holes.
2. Hold the length of any welding beads within 1.2-2.0 inch. Allow at least 1.6 inch 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.



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.

Installation of Body & Special Equipment

Reinforcement of Chassis Frame

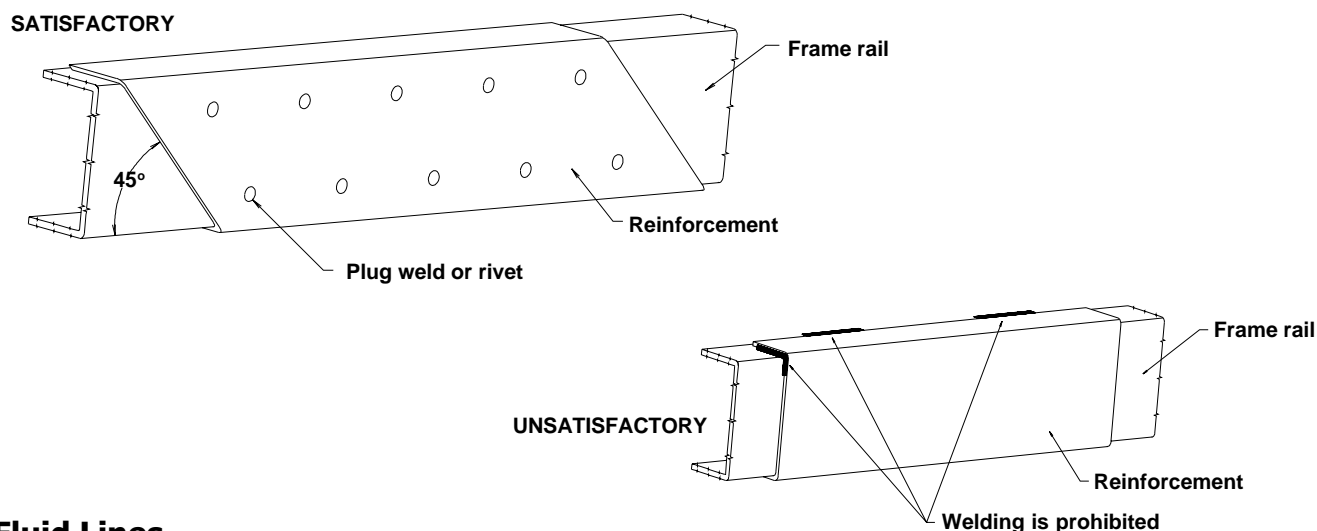
Reinforcements must be installed to prevent the considerable variation in the section modulus. They must be welded so as to avoid localized stresses.

The frame of the NPR/W3500, NPR GAS/W4500 and NQR/W5500 is made of SAPH440 mild steel. The frame of the FRR is made of HT540A. See the FSR, FTR and FVR section for frame material specifications.

The drawings below 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 affect of sputtering.
4. Remove fuel tank assembly when welding portions near the fuel tank.
5. Remove coat of paint completely when welding painted areas.



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.

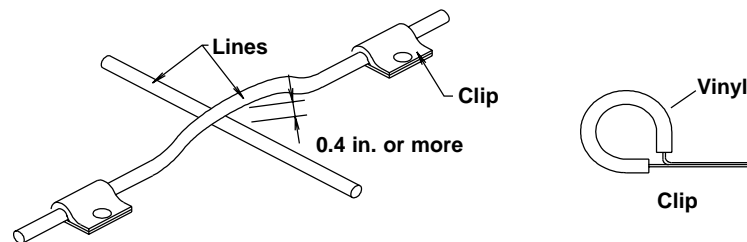
Preparation of Additional Lines

1. Where possible, use only genuine Isuzu lines as supplied by authorized 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.

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 inch 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 inch clearance should be maintained between lines at the crossing point.
 - b. If the 0.4 inch 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, NQR, FRR and W-Series. The FSR, FTR and FVR wiring information can be found in the service manuals.

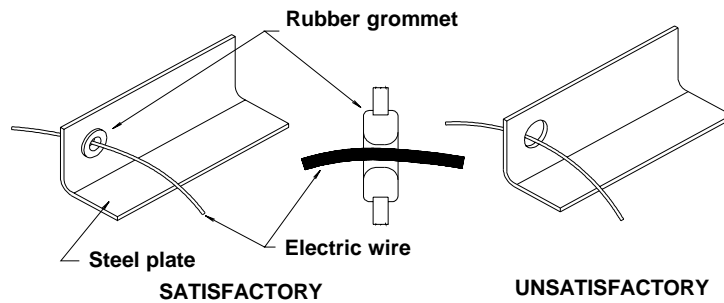
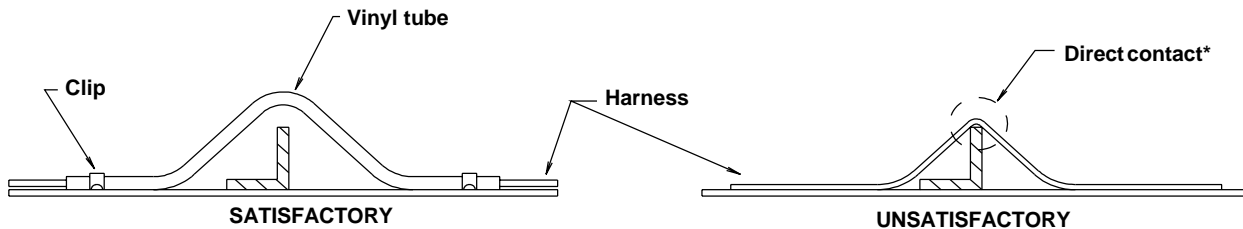
Wiring

1. Most wiring connections on 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.

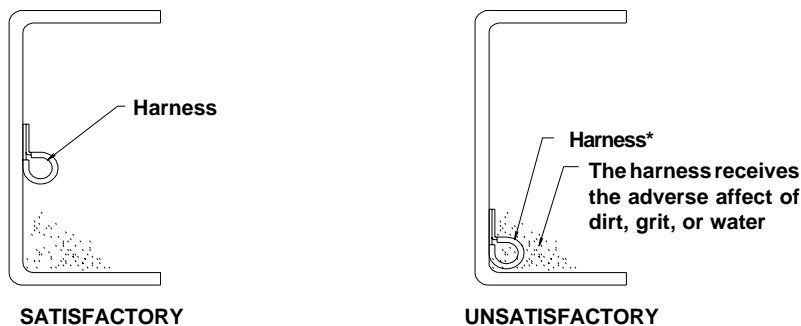
Harness Diameter	Clip Distance
less than 0.2 in.	less than 11.8 in.
0.2 in. ~ 0.4 in.	approx. 15.7 in.
0.4 in. ~ 0.8 in.	approx. 19.7 in.

Installation of Body & Special Equipment

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 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.

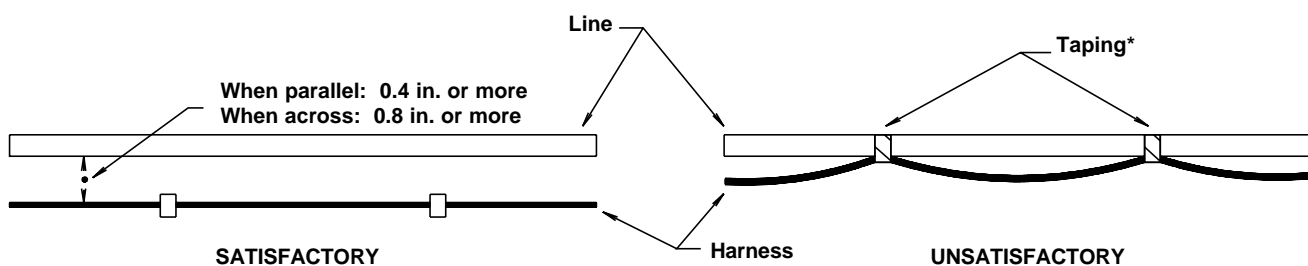


* Cables should not be in contact with sharp edges or pierced holes.



* 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.



Wire Color Code

The electrical circuits of the N/W and FRR/WT Series Chassis Cab are connected with low-voltage stranded wire for automotive applications. The color coding standards are as follows for the N/W and FRR/WT Series Chassis Cab. Refer to FSR, FTR and FVR service manual for those vehicle wiring color codes.

(1) Black	B	Starter circuits and grounds
(2) White	W	Generator (alternator) circuit
(3) Red	R	Lighting circuit
(4) Green	G	Signal circuit
(5) Yellow	Y	Instrument circuit
(6) Brown	Br	Accessory circuit
(7) Light Green	Lg	Other 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 104° F with temperature increase of 104° F.

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

Installation of Body & Special Equipment

reliability/durability is maintained.

Electrical wiring components can be obtained through your authorized Isuzu/GM dealers. Packard Electric components are also available through Pioneer Standard Company (1-00-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 table on the next page 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 158° F. 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.

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 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.

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 an 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.

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 both 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 both 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

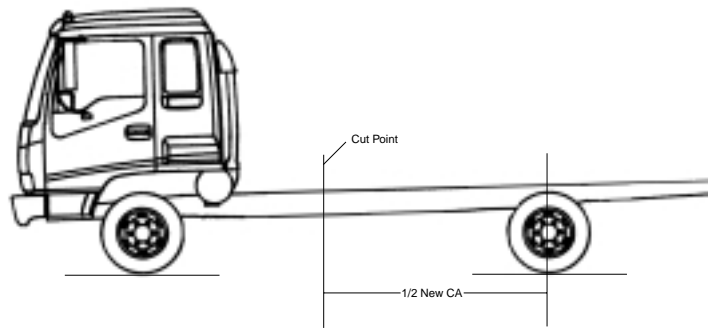
CA - Length from back-of-cab to rear axle center line in inches.

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

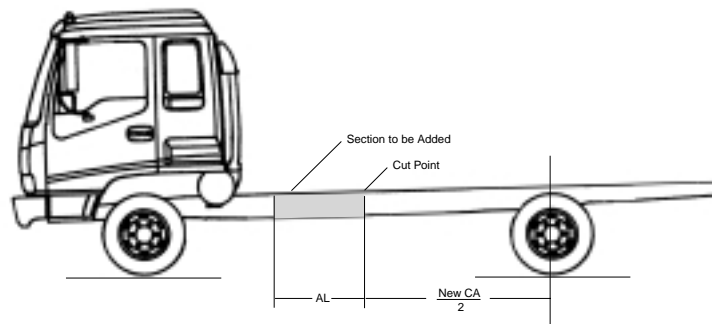
SL - Shortened length (in case of shortened wheelbase). Difference between WB (old) and WB (new).

Installation of Body & Special Equipment

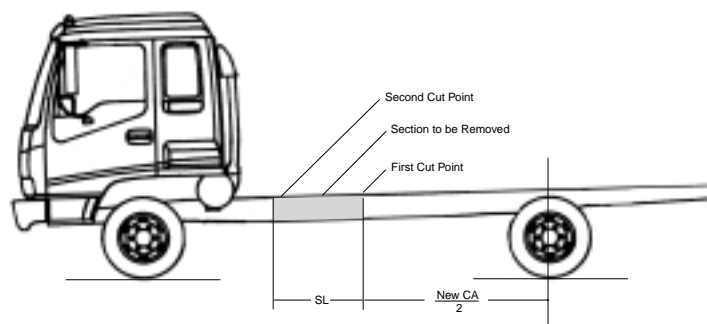
1. Determine the added length (AL) or shortened length (SL) required to lengthen or shorten chassis. (For added wheelbase: $\text{New CA} = \text{CA} + \text{AL}$; For shortened wheelbase: $\text{New CA} = \text{CA} - \text{SL}$)
2. Obtain the material to be used as the insert for the lengthened wheelbase 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.



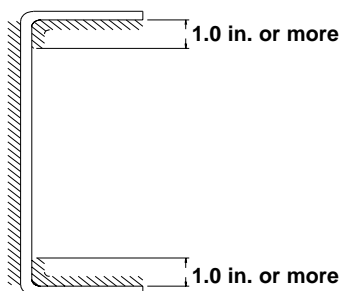
Lengthening the Wheelbase



Shortening the Wheelbase

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.

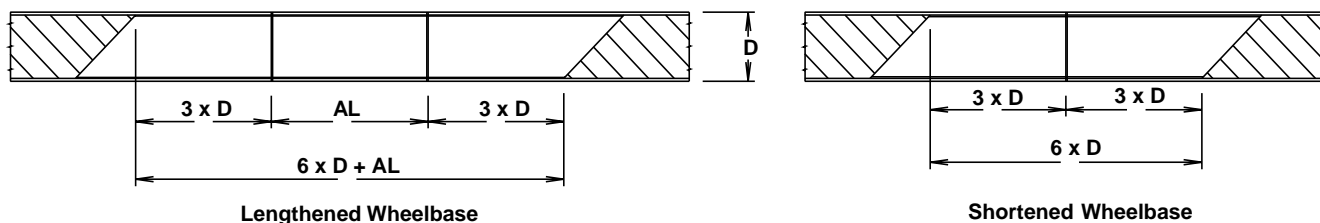
BUTT WELD 100% - Weld can be inside or outside of member or, as shown, a combination of both



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

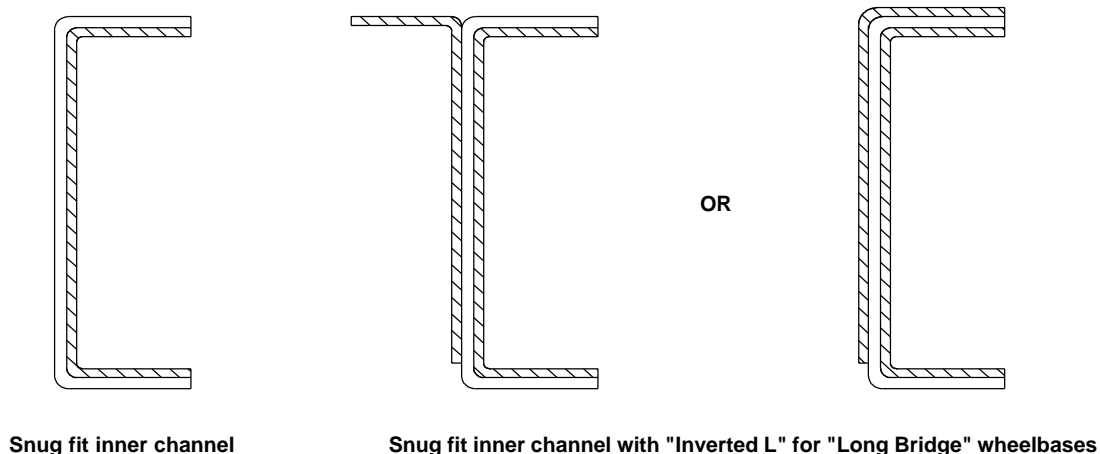
$$\text{Reinforcement Length} = AL + 6 \times (\text{original frame rail web depth}).$$

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



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 below). 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 degree angled cut at both ends to avoid stress concentrations in the frame (note the figures under item 7).



Installation of Body & Special Equipment

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 harnesses, 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:

A. Propeller Shaft Length

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

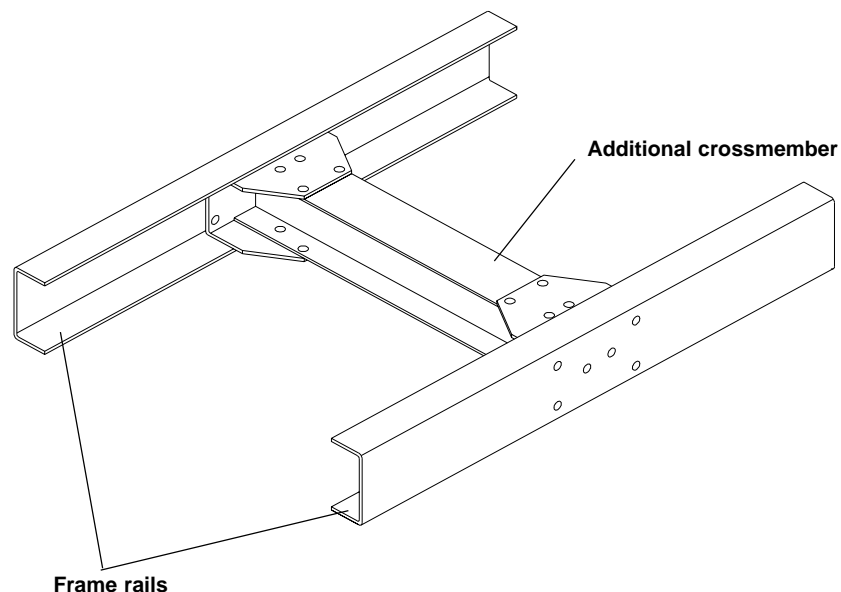
	NPR	NPR GAS	NQR	FRR
Propeller Shaft Diameter (in)	3.25	3.0	3.0	4.0
Maximum Propeller Shaft Length (in)	50.8	50.8	50.8	62.0

B. Propeller Shaft Angles

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

	NPR/W	NPR/W GAS	NQR/W	FRR/WT
Maximum Propeller Shaft Angle	5.7°	5.1°	5.7°	5.5°

- 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 cross member 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 cross member 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 cross member 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 cross members are to be located).
 - C. The cross member must be constructed such that it supports both the upper and lower flange on each frame rail (see drawing below). A cross member such as the one below may be constructed, or Isuzu cross members may be obtained from your Isuzu parts dealer.



Installation of Body & Special Equipment

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

	NPR/W	NPR/W GAS	NQR/W	FRR/WT
Maximum Distance Between Cross Members (in)	35.7	35.7	35.7	49.8

E. The drilling for any additional holes in the frame rails must comply to 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.

FRR SERIES CHASSIS

Please contact applications engineering for guidelines on FRR SERIES CHASSIS frame modifications when the vehicle is equipped with an Antilock Brake System

FSR FTR FVR

WHEN MAKING WHEELBASE MODIFICATIONS TO THE 1997, MODEL YEAR AND ABOVE FSR, FTR, AND FVR HYDRAULIC BRAKE CHASSIS AND AIR BRAKE CHASSIS THE FOLLOWING SHOULD BE STRICTLY OBSERVED.

13. 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 Trucks will require that the body installed on the chassis have an understructure manufactured with any of the following structural steel "C" channels:

4"x1-5/8", 7.25 lbs/ft = ok
5"x1-3/4", 6.7 or 9.0 lbs/ft = ok
6"x2", 8.2, 10.5 or 13.0 lbs/ft = ok

HYDRAULIC BRAKE SYSTEM

1. BEFORE WORK BEGINS

As with any electrical work on the chassis the battery should be disconnected before electrical work is started.

2. ABS PROGRAM

The antilock brake system (ABS) computer will hold its codes when disconnected and reprogramming as a result of battery disconnection will not be necessary. If the wheelbase is changed the trim level of the ABS system must be readjusted per the instructions in the service manual. An Authorized Isuzu dealer should do this reprogramming using appropriate tools.

For your reference and to help you determine if the system needs to be reprogrammed the following provisions apply to all ABS systems with hydraulic brakes. The ABS module has four (4) programs: A, B, C, and D. These programs are tied to the wheelbase and axle combination of the chassis. (The axle and wheel base codes can be found on the passenger's visor.)

A is for the FL1 axle and covers wheelbase from 140 (FQT), 158 (EG5), 170 (EH8) inches.

B is for the FL2 axle and covers wheelbase from 140 (FQT), 158 (EG5), 170 (EH8), 188 (EK8), 200 (EM2) inches.

C is for the FL1 axle and covers wheelbase from 188 (EK8), 200 (EM2), 218 (FPL), 233 (EQ8), 248 (ES5) inches.

D is for the FL2 axle and covers wheelbase from 218 (FPL), 233 (EQ8), 248 (ES5) inches.

Moving between program/ wheelbase groups A, B, C or D **will** require that the system be reprogrammed. Moving wheelbase within a program group **will not** require reprogramming.

3. ABS COMPUTER LOCATION

- a. The ABS computer is located under the cab on the front crossmember and is an integral part of the brake fluid modulation system. These components can not be relocated.

4. ABS ELECTRICAL HARNESSSES

- a. The harness can not be cut and spliced
- b. The only approved way to make the harness longer is to purchase the appropriate wheelbase harness from the Isuzu parts department
- c. Extra wire resulting from a frame shortening can be coiled and secured to the frame.

5. HYDRAULIC BRAKE LINES

- a. Hydraulic brake lines should be shortened or lengthened using appropriate fittings and steel lines.

AIR BRAKE SYSTEM

1. BEFORE WORK BEGINS

- a. As with any electrical work on the chassis the battery should be disconnected before electrical work is started.

2. ABS PROGRAM

The antilock brake system (ABS) computer will hold its codes when disconnected and reprogramming as a result of battery disconnection will not be necessary. If the front axle is changed the trim level of the ABS system must be readjusted per the instructions in the service manual. An Authorized Isuzu dealer using the appropriate tools should do this reprogramming.

3. ABS COMPUTER LOCATION

- a. The ABS computer is located back of cab on the power steering bracket. This component can not be relocated.

15. ABS ELECTRICAL HARNESSSES

- a. The harness can not be cut and spliced
- b. The only approved way to make the harness longer is to purchase the appropriate wheelbase harness from the Isuzu parts department.
- c. Extra wire resulting from a frame shortening can be coiled and secured to the frame.

8 AIR BRAKE LINES

- a. Air brake lines should be shortened or lengthened using appropriate fittings and hose material.

Body Application Summary Chart

Body Application Summary Chart

2002 GAS & 2003 DIESEL MODEL YEAR BODY APPLICATION SUMMARY CHART

MODEL/GVWR	WB	BOC	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.	22 ft.	24 ft.
NPR/W3500 GAS 12,000 lbs	109 132.5 150 176	9.25 9.25 9.25 9.25	X	X	X	X	X	X ⁽¹⁾		
NPR HD/W4500 GAS 14,050 lbs	109 132.5 150 176	9.25 9.25 9.25 9.25	X	X	X	X	X	X ⁽¹⁾		
NPR/W3500 DSL 12,000 lbs	109 132.5 150 176	9.25 9.25 9.25 9.25		X	X	X	X	X ⁽¹⁾		
NPR HD/W4500 DSL 14,500 lbs	109 132.5 150 176	9.25 9.25 9.25 9.25		X	X	X	X	X ⁽¹⁾		
NPR HD/W4500 CREW CAB DSL 14,500 lbs	150 176	4.2 4.2		X ⁽³⁾		X ⁽⁴⁾				
NQR/W5500 DSL 17,950 lbs	109 132.5 150 176	9.25 9.25 9.25 9.25		X	X	X	X	X		
NQR/W5500 CREW CAB DSL 17,950 lbs	150 176	4.2 4.2		X ⁽³⁾		X ⁽⁴⁾				
FRR/WT5500 DSL 18000/19,500	148 167 179 191 218	MT/AT 7.5/10 7.5/10 7.5/10 7.5/10 10.0/10			X ⁽²⁾	X	X	X	X	X

UNIT: INCH

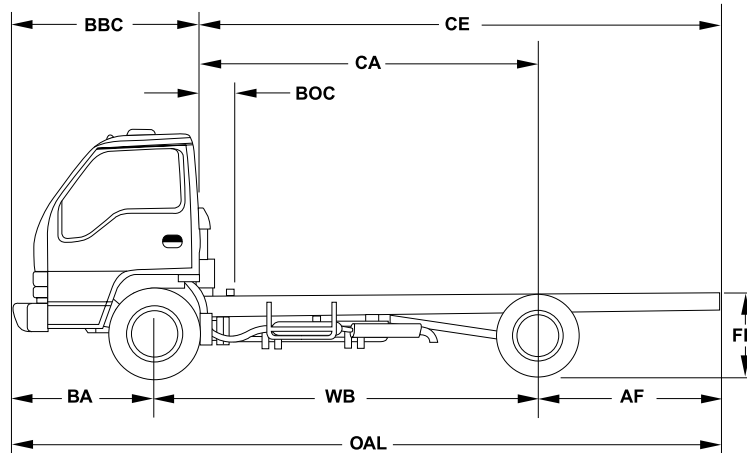
Notes:

1. NPR, NPR HD/W3500 W4500 Diesel 20' ft. body requires Isuzu/GM Application Engineering Department approval.
2. BOC 10.0 inches. For MT
3. 16' Dovetail landscape (12' deck plus 4' dovetail).
4. 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 Applicaton Summary Chart



2002 GAS & 2003 DIESEL MODEL YEAR*
BODY & PAYLOAD WEIGHT DISTRIBUTION
(% FRONT/% REAR)

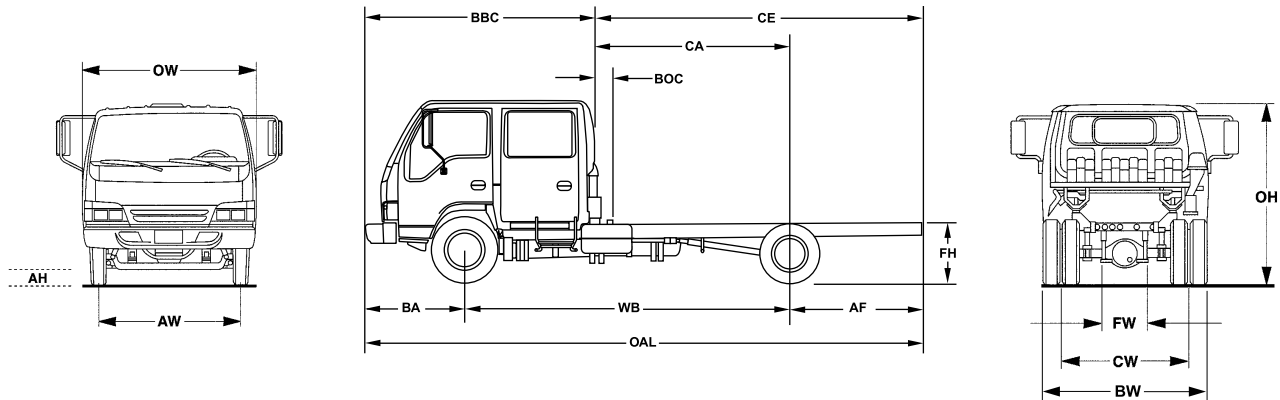
MODEL	GVWR	WB	CA	CE	OAL	BOC	10	12	14	16	18	20
AUTOMATIC TRANSMISSION												
NPR/W3500 GAS	12,000	109	88.4	131.5	199.5	9.25	18/82	7/93				
NPR HD/W4500 GAS	14,050	109	88.4	131.5	199.5	9.25	18/82	7/93				
NPR/W3500 GAS	12,000	132.5	111.9	155	223	9.25			14/86			
NPR HD/W4500 GAS	14,050	132.5	111.9	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	14,050	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	14,050	176	155.4	198.5	266.3	9.25						15/85
MANUAL/AUTOMATIC TRANSMISSION												
NPR/W3500 DSL	12,000	109	88.4	131.5	199.5	9.25		7/93				
NPR HD/W4500 DSL	14,500	109	88.4	131.5	199.5	9.25		7/93				
NPR/W3500 DSL	12,000	132.5	111.9	155	223	9.25			14/86			
NPR HD/W4500 DSL	14,500	132.5	111.9	155	223	9.25			14/86			
NPR/W3500 DSL	12,000	150	129.4	172.5	240.5	9.25				16/84	8/92	
NPR HD/W4500 DSL	14,500	150	129.4	172.5	240.5	9.25				16/84	8/92	
NPR/W3500 DSL	12,000	176	155.4	198.5	266.3	9.25						15/85
NPR HD/W4500 DSL	14,500	176	155.4	198.5	266.3	9.25						15/85
MANUAL/AUTOMATIC TRANSMISSION												
NQR/W5500 DSL	17,950	109	88.4	131.5	199.5	9.25		7/93				
NQR/W5500 DSL	17,950	132.5	111.9	155	223	9.25			14/86			
NQR/W5500 DSL	17,950	150	129.4	172.5	240.5	9.25				16.84	8/92	
NQR/W5500 DSL	17,950	176	155.4	198.5	266.3	9.25						15/85 8/92

*NPR, NPR HD/W3500, W4500 GAS and DIESEL 20 foot body requires Isuzu/GM Application Engineering Department approval.

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

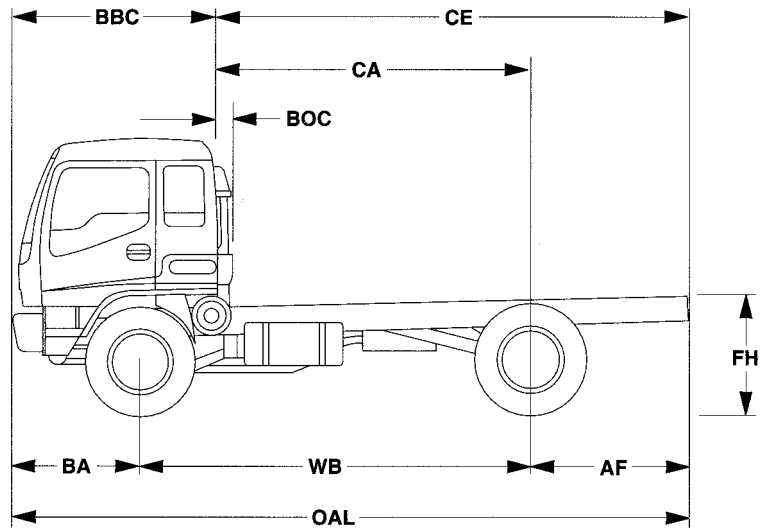


2003 MODEL YEAR DIESEL CREW CAB BODY & PAYLOAD WEIGHT DISTRIBUTION (% FRONT/% REAR)

MODEL	GVWR	WB	CA	CE	OAL	BOC	10	12	14	16
NPR HD/W4500 CREW CAB DSL	14,500	150	88.9	132	240.5	4.2		8/92		
NPR HD/W4500 CREW CAB DSL	14,500	176	114.9	158	266.5	4.2			15/85	
MODEL	GVWR	WB	CA	CE	OAL	BOC	10	12	14	16
NQR HD/W5500 CREW CAB DSL	17,850	150	88.9	132	240.5	4.2	16/84	8/92		
NQR HD/W5500 CREW CAB DSL	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.



**2003 MODEL YEAR
BODY & PAYLOAD WEIGHT DISTRIBUTION
(% FRONT/% REAR)**

Manual Transmission

MODEL	GVWR	WB	CA	CE	OAL	BOC	14	16	18	20	22	24
FRR/WT5500	18000/19500	148	117.1	180.6	259.3	7.5	16/84 ¹	10/90				
FRR/WT5500	18000/19500	167	136.2	206.5	285.2	7.5			12/88			
FRR/WT5500	18000/19500	179	148.0	226.2	304.9	7.5				11/89		
FRR/WT5500	18000/19500	191	159.8	243.9	322.2	7.5					11/89	
FRR/WT5500	18000/19500	218	187.4	283.3	362.0	10.0						15/85

Automatic Transmission

MODEL	GVWR	WB	CA	CE	OAL	BOC	14	16	18	20	22	24
FRR/WT5500	18000/19500	148	117.1	180.6	259.3	10	15/85	7/93				
FRR/WT5500	18000/19500	167	136.2	206.5	285.2	10			10/90			
FRR/WT5500	18000/19500	179	148.0	226.2	304.9	10			9/91			
FRR/WT5500	18000/19500	191	159.8	243.9	322.2	10				9/91		
FRR/WT5500	18000/19500	218	187.4	283.3	362.0	10					15/85	

NOTES:

1. BOC 10.0 Inches. For MT

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.

Mechanical & Cab Specifications

Mechanical & Cab Specifications

The following table presents Net versus Gross Horsepower and Torque ratings for 2003 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-5.7L-V8	NPR/W3500, NPR HD/W4500 GAS	N/A	N/A	250/4400	330/2800
ISUZU 4HE1-TC M/T	NPR/W3500, NPR HD/W4500 DIESEL	137/2800	268/1300	142/2800	275/1300
ISUZU 4HE1-TC A/T	NPR/W3500, NPR HD/W4500, NQR/W5500 DIESEL	169/2700	339/2000	175/2700	347/2000
ISUZU 4HE1-TC M/T	NQR/ W5500 DIESEL	169/2700	339/2000	175/2700	347/2000
ISUZU 6HK1-TC M/T	FRR/ WT5500 DIESEL	193/2400	426/1500	200/2400	441/1500
ISUZU 6HK1-TC A/T	FRR/ WT5500 DIESEL	193/2400	426/1500	200/2400	441/1500

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
NPR/W3500 GAS	AUTOMATIC	12,000	15,000
NPR HD/W4500 GAS	AUTOMATIC	14,050	17,050
NPR/W3500 DIESEL	AUTOMATIC	12,000	18,000
NPR/W3500 DIESEL	MANUAL	12,000	18,000
NPR HD/W4500 DIESEL	AUTOMATIC	14,500	19,500
NPR HD/W4500 DIESEL	MANUAL	14,500	20,500
NQR/W5500 DIESEL	AUTOMATIC	17,950	19,500 ²
NQR/W5500 DIESEL	MANUAL	17,950	22,500
FRR/WT5500 DIESEL	AUTOMATIC	18,000/19,500	26,000
FRR/WT5500 DIESEL	MANUAL	18,000/19,500	30,000

¹ The NPR/W3500, NPR HD/W4500 and NQR/W500 are note approved for Hot Shot applications.

² GCWR 20,950 with addition of optional Isuzu Transmission Oil Cooler.

Mechanical & Cab Specifications

The following chart 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	11,050	215/85R-16E	32
NPR HD/W4500 GAS	14,050	225/70R-19.5F	32.75
NPR/W3500 DIESEL	12,000	215/85R-16E	32
NPR HD/W4500 DIESEL	14,050	215/85R-16E	32
NQR/W5500 DIESEL	17,950	225/70R-19.5F	32.8
FRR/WT5500 DIESEL	18,000/19,500	225/70R-19.5F	35.3 (1)
FSR/FTR/FVR	(2)	(2)	(2)

(1) 191 and 218 WB have frame height of 37.3 inches

(2) Refer to FSR, FTR, and FVR section

CLUTCH ENGAGEMENT TORQUE CHART

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

Engine	Torque (lbs-ft)	at (RPM)
ISUZU 4HE1-TC (142 HP)	260	1,000
ISUZU 4HE1-TC (175 HP)	265	1,000
ISUZU 6HK1-TC (200 HP)	331	1,000
ISUZU 6HK1-TC (230 HP)	368	1,000

ISUZU OPTION CODE	ISUZU PAINT COLOR NAME	ISUZU PAINT CODE
1985 KS22		
N/A	Calm White	0133-P1
1986-95 NPR DIESEL		
844	Glacier White	0172-P1
1993-94 NPR EFI		
844	Glacier White	0172-P1
1995.5-03 NPR/NQR 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
1995.5-02 NPR 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		
844	Glacier White	0172-P1
1995-03 FRR		
844	Glacier White	0172-P1
989	Sunbelt Green	G021-P801-0

ISUZU OPTION CODE	ISUZU PAINT COLOR NAME	ISUZU PAINT CODE
1987-02 FSR		
844	Glacier White (1987-96)	0172-P1
729	Arc White (1997-01)	W301-P801-0
989	Sunbelt Green	G021-P801-0
1988-02 FTR		
844	Glacier White (1988-96)	0172-P1
729	Arc White (1997-01)	W301-P801-0
989	Sunbelt Green	G021-P801-0
1988-02 FVR		
844	Glacier White (1988-96)	0172-P1
729	Arc White (1997-01)	W301-P801-0
989	Sunbelt Green	G021-P801-0
1988-92 EVR		
844	Glacier White	0172-P1
NOTES		

CV CHART 2

ISUZU PAINT CODE	ISUZU OPTION CODE	ISUZU COLOR NAME	AKZO NOBEL CODE	BASF R-M CODE	BASF GLAS CODE	DUPONT CODE	ICI AUTO COLOR	PPG CODE	SHERWIN WILLIAMS/ MARTIN SENOUR	SPIES HECKER CODE	STANDOX
301-W-30102	N/A	Accuride White	FLNA40154	RM25319	IS-25319	F2499	8AR8	91513	51548	15593	301-W-30102
B302-P801-0	730	Adriatic Blue (Solid)	FLNA50274	730	730	W9775	2NV9B	19320	57541	50287	730
W301-P801-0	729	Arc White	FLNA40156	RM25318	IS-25318	W9774	2NV8	91512	51400	10280	729
WE8774	N/A	*Bright Red	FLNA30252	27427	IS-27427	C8508	TC78B	75057	34983	34169	N/A
0133-P1	N/A	Calm White	FLNA40252	HS14391	IS-820	G8477	KK27	91522	34657	16222	0133-P1
WE5398	N/A	*Dark Green Gray	FLNA90856	27425	IS-27425	B9329	2NP9B	36575	47155	65071	N/A
U715-P801-0	809	Doeskin Tan	FLNA80050	27406	IS-U715	B8462	KPL5B	28613	56203	21882	809
0172-P1	844	Glacier White	FLNA40155	RM15602	IS-844	H8620	ND92	90330	35478	10281	844
WE9907	N/A	*Medium Adriatic Blue	FLNA90857	27426	IS-27426	B9321	2NY4B	190401	46829	56120	N/A
B721-P801-0	801	Medium Blue	FLNA50172	27403	IS-B721	B8041	KPL2B	190217	56143	55934	801
N507-P901-0	845	Polar Silver	FLNA91205	23664	845	F2193	EPW3B	36658	56991	73192	845
R725-P801-0	810	Red Orange	FLNA20079	27407	IS-R725	B8250	KPL4B	61784	56202	21881	810
WE9885	N/A	*Rose Black	FLNA90858	27428	IS-27428	B9218	1AB2B	95057	45738	74223	N/A
G021-P801-0	989	Sunbelt Green	FLNA60290	605301	989	M6682	WMK4	401420	61559	67847	989
U716-P801-0	815	Tangier Orange	FLNA20080	27409	IS-U716	B9043	KPL6B	61785	56204	21883	815
Y719-P801-0	812	Wheatland Yellow	FLNA10182	27408	IS-Y719	B9042	KPL7B	83931	56144	21884	812
G705-P801-0	807	Woodland Green	FLNA60181	27404	IS-G705	B8046	KPL3B	48339	56201	64962	807

NOTES:

1. STANDBOX uses paint code found in vehicle for paint identification.
2. GM-Based colors. No Isuzu Option Code.

N/W Series Towing Procedures

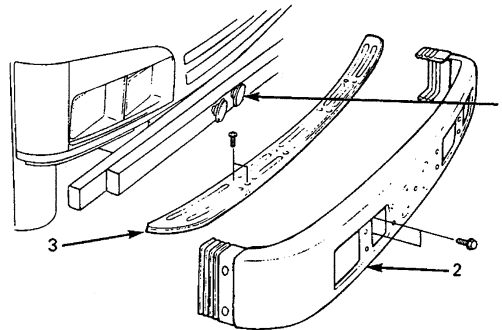
NOTE: When towing, disconnect the propeller shaft at the rear axle to ensure the automatic transmission is not damaged.

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 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 towing chains do not contact the horns or the bumper.



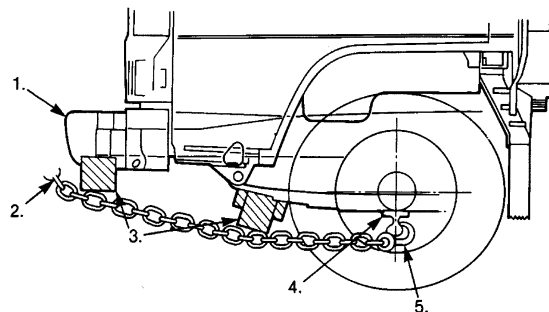
1. Horns
2. Bumper (removed for towing)
3. Filler

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.



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.

Mechanical & Cab Specifications

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.

REAR END TOWING

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.

FRR/WT TOWING PROCEDURE

Your vehicle should be towed by an authorized dealership or professional towing service to prevent damage. Proper equipment must be used and state (Provincial in Canada) and local laws, which apply to vehicles in tow, must be followed. Vehicles should not be towed 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.

FRONT END TOWING (FRONT WHEELS OFF THE GROUND)

BEFORE TOWING

Block the rear wheels of the disabled vehicle.

Release the parking brake as described under "Air Operated Parking Brake" in this section.

Drain rear axle oil and 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, remove the covers from the hub openings and install the axle shafts. Apply the parking brake before disconnecting from the towing vehicle. Check and fill rear axle with oil if required.

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 will not have power assist. If air pressure is exhausted, the vehicle will not have brakes. There must be a tow bar installed between the towing and the disabled vehicle.

BEFORE TOWING

Block the wheels of the disabled vehicle.

Disconnect the propshaft at the rear axle. Secure the propshaft to the frame or crossmember.

If there is, damage or suspected damage to the rear axle, drain oil and 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 and propeller shafts. Check for proper phasing of universal joints. Apply the parking brake before disconnecting from the towing vehicle. Check and fill rear axle with oil if required.

REAR END TOWING (REAR WHEELS OFF THE GROUND)

BEFORE TOWING

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.

AFTER TOWING

Block the rear wheels and release the steering. Apply the parking brake before disconnecting from the towing vehicle. Check and fill the rear axle with oil as required.

SPECIAL TOWING INSTRUCTIONS

1. Call your local authorized dealership or professional towing service.
2. All state and local laws regarding such items as warning signals, night illumination, speed, etc. must be followed.
3. Safety chains must be used.
4. No vehicle should ever be towed over 55 mph (90 km/h).
5. Loose or protruding parts of damaged vehicles should be secured before moving.
6. A safety chain system completely independent of the primary lifting and towing attachment must be used.
7. 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.
8. No towing operation, which for any reason jeopardizes the safety of the wrecker operator or any bystanders or other motorists, should be attempted.

FSR, FTR & FVR SERIES TOWING PROCEDURE

CAUTION
<ul style="list-style-type: none">• Never let passengers ride in a vehicle that is being towed.• Never tow faster than safe or posted speeds.• Never tow with damaged parts not fully secured.• Never get under your vehicle after it has been lifted.• Always use separate safety chains on each side when towing a vehicle.

Try to have a GM/Isuzu dealer or a professional towing service tow your vehicle. They can provide the right equipment and knowledge to tow it without damage.

Before you do anything, turn on the hazard warning flashers (if they have not been damaged).

When you call, tell the towing service:

- That your vehicle has rear-wheel drive.
- The make, model and year of your vehicle.
- Whether you can still move the shift lever.
- An estimation of the total weight plus cargo so that the towing company can use the proper equipment.
- If there was an accident, what was damaged.

When the towing service arrives, let the tow operator know that the owner's manual contains detailed towing instructions. The operator may want to see them.

Mechanical & Cab Specifications

Towing Your Vehicle From the Front (Front Wheels Off the Ground)

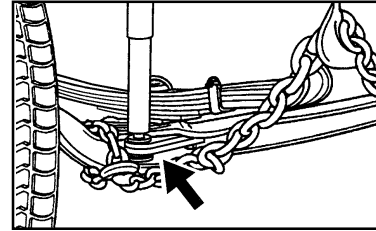
BEFORE TOWING

Block the rear- wheels of the disabled vehicle. On vehicles with air brakes, release the emergency brake system by compressing brake chamber springs as outlined in this section. (Note: This is to prevent the possibility of the emergency brake being applied during towing.)

On vehicles with hydraulic brakes, release the parking brake fully by moving the lever handle to the fully released position.

Towing the Vehicle with the Front Bumper Removed

1. Remove the front bumper.
2. Connect and lock the lift chains to the front axle, outside of the spring anchor plates as shown.
3. Connect lift chains to the tow bar and raise the tow bar until lift chain slack has been taken up.
4. Raise the vehicle to the required height.



Rear Axle

Disconnect the propshaft at the rear axle. Secure the propshaft to the frame or crossmember.

After Towing

Block the rear wheels and install axle and propeller shafts.

Check for proper phasing of universal joints. Apply the emergency brake system before disconnecting from the towing vehicle. Check and fill the rear axle with oil as required.

Towing Your Vehicle From the Front (All Wheels On the Ground)

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

Before Towing

Block the wheels of the disabled vehicle. On vehicles with air brakes, release the emergency brake system by compressing brake chamber springs as outlined in this section. (Note: This is to prevent the possibility of the emergency brake being applied during towing.)

On vehicles with hydraulic brakes, release the parking brake fully by moving the lever handle to the fully released position.

If there is, damage or suspected damage to the axle(s), remove the axle shafts. Cover the hub openings to prevent the loss of lubricant or entry of dirt or foreign objects.

After Towing

Block the rear wheels and install axle and propshafts. Check for proper phasing of universal joints. Apply the parking brake system before disconnecting from the towing vehicle. Check and fill rear axle with oil as required.

Towing Your Vehicle From the Rear (Rear Wheels Off the Ground)

CAUTION

- Never let passengers ride in a vehicle that is being towed.
- Never tow faster than safe or posted speeds.
- Never tow with damaged parts not fully secured.
- Never get under your vehicle after it has been lifted.
- Always use separate safety chains on each side when towing a vehicle.

Before Towing

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 Certification/Tire label.

After Towing

Block the rear wheels and release the steering wheel. Apply the parking brake system before disconnecting from the towing vehicle. Check and fill the rear axle with oil as required.

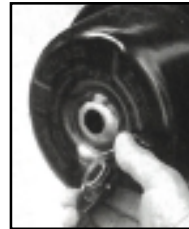
Releasing Air-Operated Parking Brakes

If your vehicle has air brakes, you could have a special towing problem. If your vehicle has to be towed because you had a complete loss of air pressure from both systems, the parking brakes may have applied. The tow operator can release the brakes manually by using the following steps. Then your vehicle can be with all wheels or just the rear wheels on the ground.

1. Block the wheels of the vehicle.
2. Remove the release stud and nut from the side pocket of the brake chamber. Some chambers have studs that are visible at all times.



3. Remove the rubber cap from the rear of the chamber.
4. Put the release stud, nut and flat washer into the chamber.
5. Turn the stud clockwise one quarter of a turn.



6. Using a 3/4" wrench, turn the stud nut clockwise several turns to release the brakes. Follow the same procedure to release the other brake.



7. At the repair facility, apply air pressure of at least 70 psi (480 kPa) to the brake chambers, either from an external air supply or the vehicle's air system.
8. Turn the stud nut counterclockwise several turns. Remove the stud from the chamber.
9. Put the stud into the side pocket of the chamber, and replace the rubber cap.

Weight Distribution Concepts

Weight Restrictions & Specifications

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 the 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

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 GAWR's allow the second stage manufacturer some flexibility in the design of the weight distribution of the attached unit.

Weighing the Vehicle

Front and rear GAWR's 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

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 king pin 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.
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 up hill.
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 wheel bases, 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 king pins and bushings, wheel bearings and steering gear. Excessive front axle loads also over stress the front axle, springs, tires and wheels. All of these contribute directly to higher maintenance costs and hard steering, both of which are undesirable.

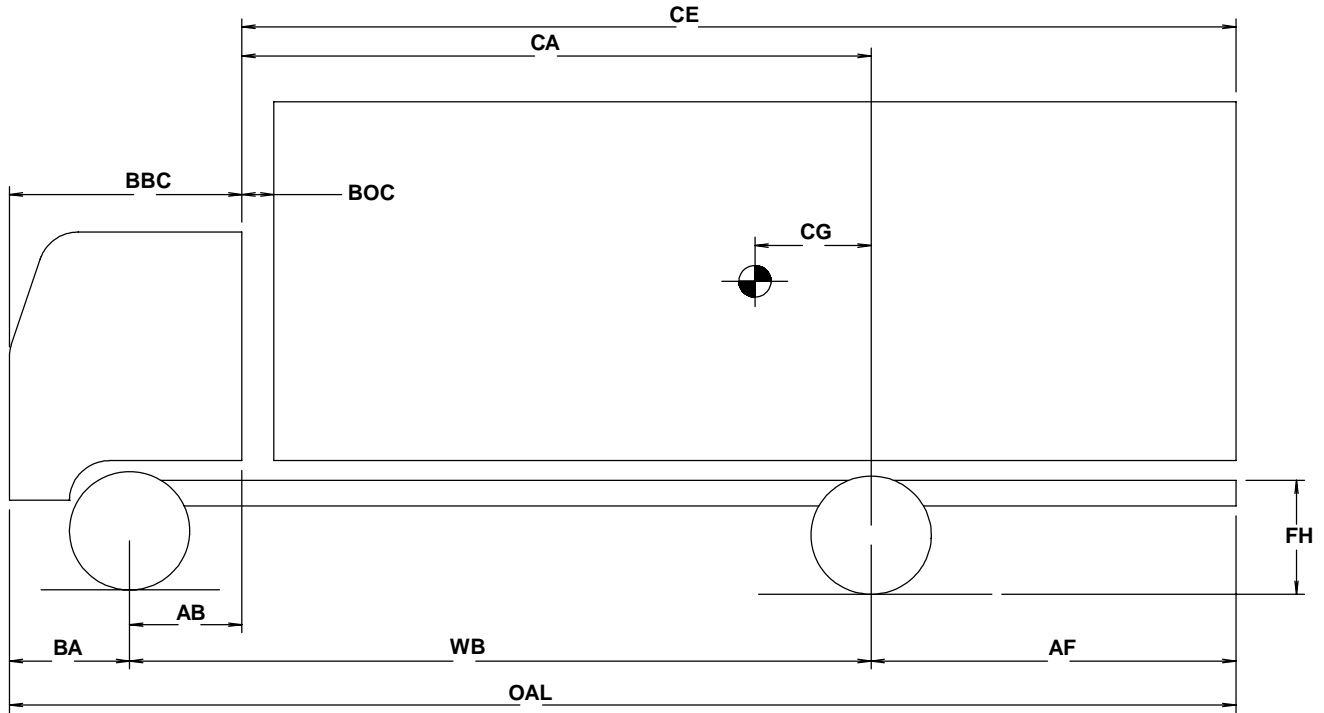
Weight Restrictions & Specifications

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

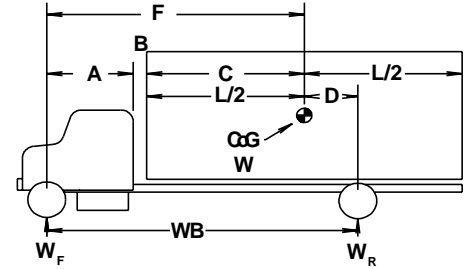
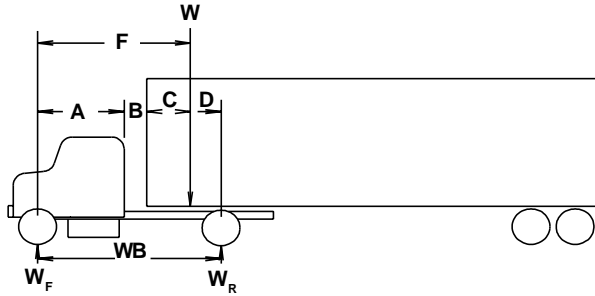
WB - Wheelbase

OAL - Overall length

AF - Axle to end of frame

FH - Frame height

WEIGHT DISTRIBUTION 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

Basic Formulas:

- (a) $W \times D = W_f \times WB$
- (b) $W \times F = W_r \times WB$
- (c) $WB = (A + B + C + D) = (F + D)$
- (d) $W = W_f \times W_r$

or

1. $W_f = \frac{W \times D}{WB}$
2. $D = \frac{W_f \times WB}{W}$
3. $WB = \frac{W \times D}{W_f}$
4. $W = \frac{W_f \times WB}{D}$
5. $W_r = \frac{W \times F}{WB}$
6. $F = \frac{W_r \times WB}{W}$
7. $WB = \frac{W \times F}{W_r}$
8. $W = \frac{W_r \times WB}{F}$

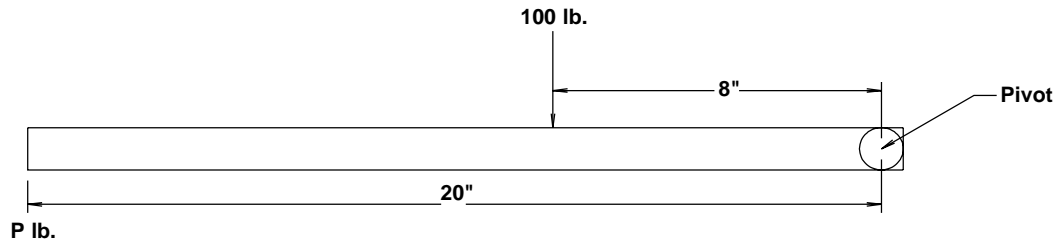
Weight Restrictions & Specifications

WEIGHT DISTRIBUTION FORMULAS IN WORDS

To find:

1. Weight transferred to front axle =
$$\frac{(\text{Total weight}) \times (\text{Distance C.G. is ahead of the rear axle})}{(\text{Wheelbase})}$$
2. Distance C.G. must be placed ahead of rear axle =
$$\frac{(\text{Weight transferred to the front axle}) \times (\text{Wheelbase})}{(\text{Total weight})}$$
3. Wheelbase =
$$\frac{(\text{Total weight}) \times (\text{Distance C.G. is ahead of the rear axle})}{(\text{Weight to be transferred to the front axle})}$$
4. Total Weight =
$$\frac{(\text{Weight to be transferred to the front axle}) \times (\text{Wheelbase})}{(\text{Distance C.G. is ahead of the rear axle})}$$
5. Weight transferred to the rear axle =
$$\frac{(\text{Total weight}) \times (\text{Distance C.G. is behind the front axle})}{(\text{Wheelbase})}$$
6. Distance C.G. must be placed behind the front axle =
$$\frac{(\text{Weight transferred to the rear axle}) \times (\text{Wheelbase})}{(\text{Total weight})}$$
7. Wheelbase =
$$\frac{(\text{Total weight}) \times (\text{Distance C.G. is behind the front axle})}{(\text{Weight to be transferred to the rear axle})}$$
8. Total weight =
$$\frac{(\text{Weight to be transferred to the rear axle}) \times (\text{Wheelbase})}{(\text{Distance C.G. is behind the front axle})}$$
9. Remember - Total weight must always equal weight transferred to the rear axle plus the weight transferred to the front axle.

Weight Restrictions & Specifications



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

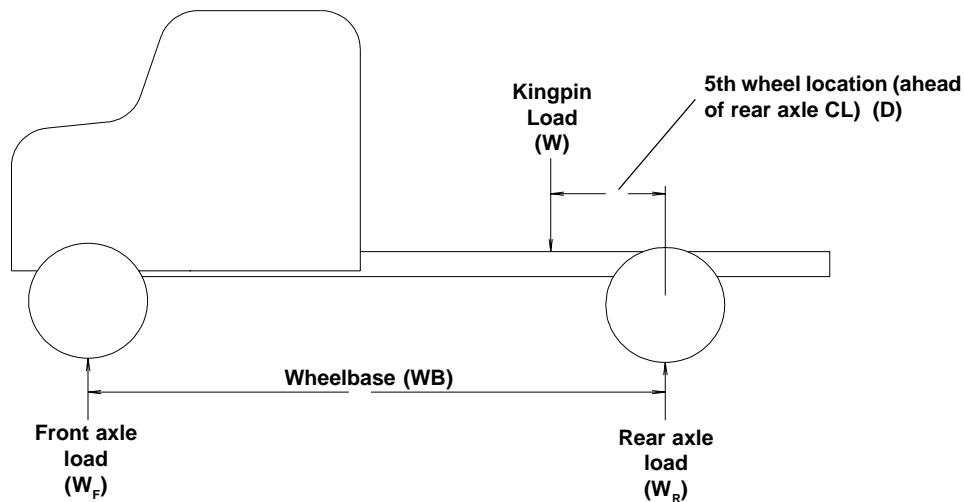
i.e.
 $100 \text{ lb} \times 8 \text{ in} = "P" \times 20 \text{ in}$
 or

$$"P" = \frac{100 \text{ lb} \times 8 \text{ in}}{20 \text{ in}}$$

Therefore:

$$"P" = 40 \text{ lb}$$

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.



Front Axle Load:

$$= \frac{\text{Kingpin Load} \times \text{5th Wheel Location}}{\text{Wheelbase}}$$

$$\text{Rear Axle Load} = 20,000 - 2,000 = 18,000 \text{ lb}$$

Rear Axle Load:

$$= \text{Kingpin Load} - \text{Front Axle Load}$$

Therefore:

$$\text{Total Front Axle Weight} = 2,000 + 9,000 \text{ lb}$$

$$\text{Total Rear Axle Weight} = 4,400 + 18,000 \text{ lb} = 22,400 \text{ lb}$$

Example: (4) A tractor has a wheelbase of 150 inches. If the kingpin load is 20,000 lb 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 lb on the front axle and 4,400 lb on the rear axle.

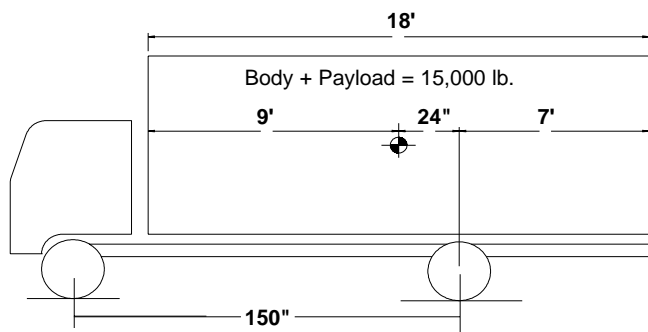
$$\begin{aligned} \text{Front Axle} &= \text{Load} \\ \frac{20,000 \times 15}{150} &= 2,000 \text{ lb} \\ \text{WB} & \end{aligned}$$

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 center line, we must determine the position of the center of gravity of the payload and body weight in relation to the rear axle center line.

Weight Restrictions & Specifications

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:

$$\text{Front Axle Load} = \frac{(\text{Body Weight} + \text{Payload}) \times \text{C of G location}}{\text{Wheelbase}}$$

$$\text{Rear Axle Load} = (\text{Body Weight} + \text{Payload}) - \text{Front Axle Load}$$

$$\text{Therefore, Front Axle Load} = \frac{15,000 \times 24}{150} = 2400 \text{ lb}$$

$$\text{Rear Axle Load} = 15,000 - 2,400 = 12,600 \text{ lb}$$

If the truck tare weight without the body is 5,000 lb on the front axle and 2,400 lb on the rear axle, then

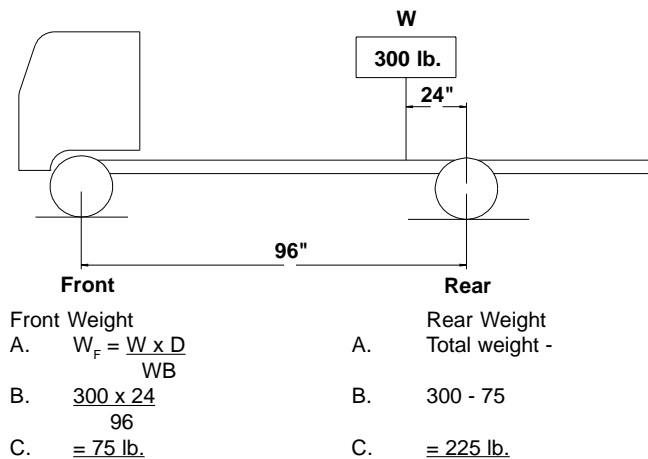
$$\text{Total Front Axle Weight} = 5,000 + 2,400 = 7,400 \text{ lb}$$

$$\text{and Total Rear Axle Weight} = 2,400 + 12,600 = 15,000 \text{ lb}$$

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.

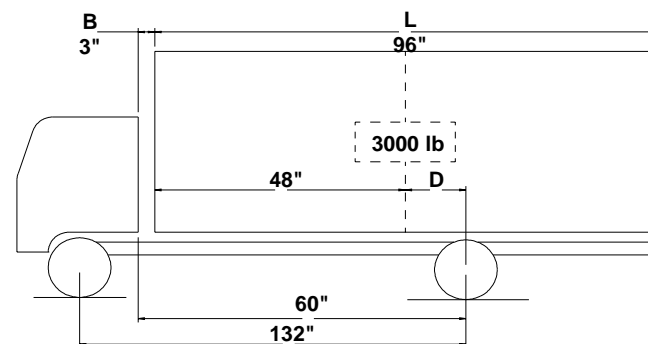
In the case of a tractor/trailer or a tractor with a set of doubles or triple trailers, each unit is handled as a separated unit and then combined to determine the total.

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



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.

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

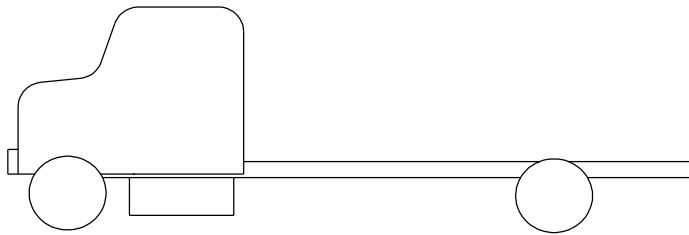


$$D = 60 - 3 - 48 = 9 \text{ inches}$$

$$W_f = 205$$

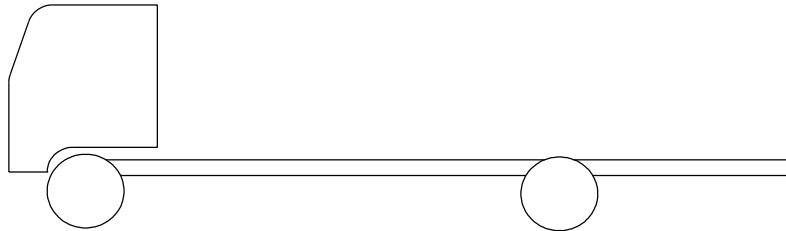
$$W_r = 2,795$$

RECOMMENDED WEIGHT DISTRIBUTION % OF GROSS VEHICLE WEIGHT BY AXLE



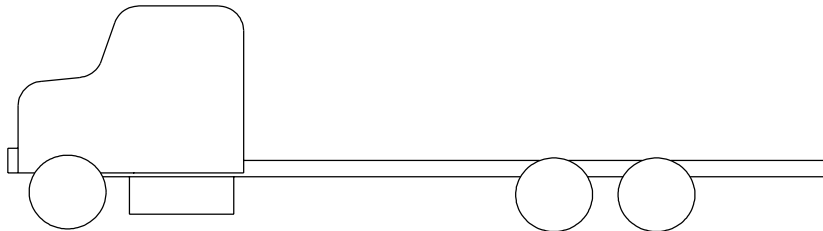
CONVENTIONAL (2 Axle)

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



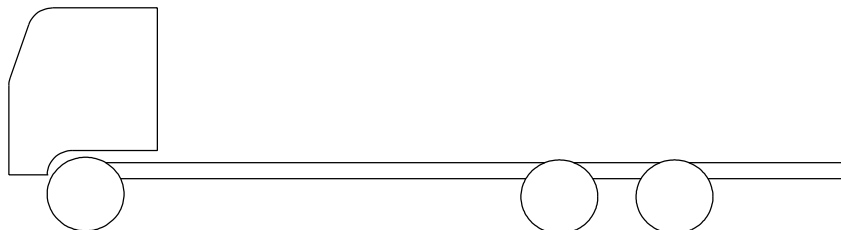
COE (2 Axle)

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



CONVENTIONAL (3 Axle)

Front Axle	Desired	Rear Axle
20%	80%	
18-25%	75-82%	

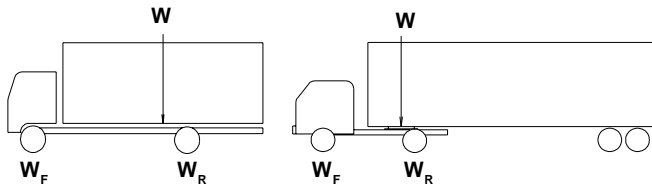


COE (3 Axle)

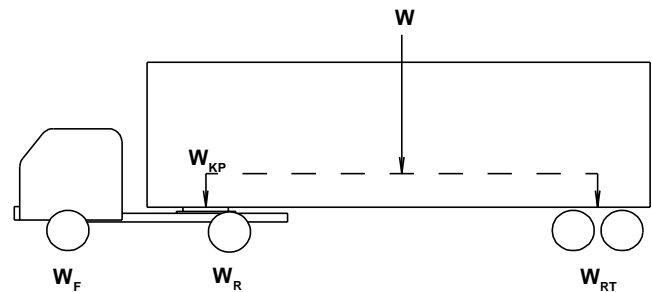
Front Axle	Desired	Rear Axle
25%	75%	
20-30%	70-80%	

Weight Restrictions & Specifications

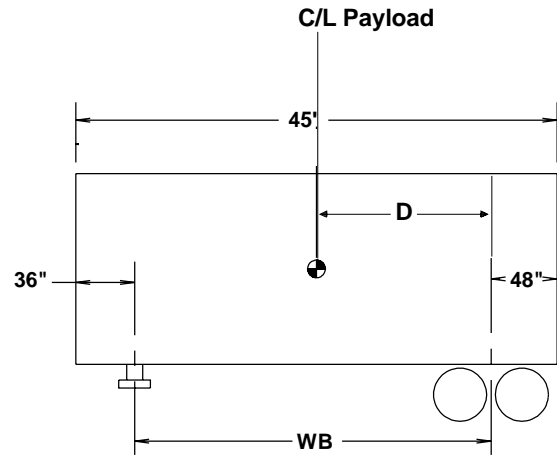
Calculating tractor/trailer weight distribution can be thought of in the same terms as calculating full trucks.



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.

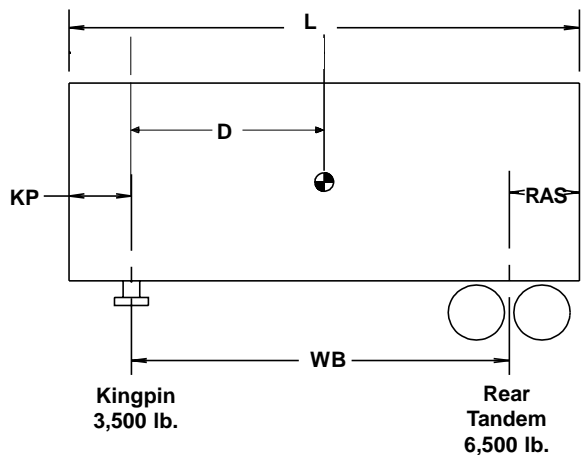


In the following example, a 50,000 pound payload at water level loading. Calculate the payload (PL) weight transfer to kingpin and the rear axle.



NOTE: Apply the same principles used with truck chassis

TRAILER WEIGHT



A. Payload at Kingpin

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

Calculate the "D" dimension

$$OAL/2 - AF = D$$

$$45 \text{ feet}/2 - 48 \text{ inches} = 222 \text{ inches}$$

$$PL_{kp} = \frac{50,000 \text{ lb} \times 222 \text{ in}}{456 \text{ in}} = 24,342 \text{ lb}$$

$$PL_{kp} = \underline{24,342 \text{ lb}}$$

B. Payload at Rear Tandem

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

$$PL_{rt} = 50,000 \text{ lb} - 24,342 \text{ lb} = 25,658 \text{ lb}$$

$$PL_{rt} = \underline{25,658 \text{ lb}}$$

Fill in:

L = 40 feet

RAS = 48 inches

KP = 36 inches

WB = ? 396

D = ? 204

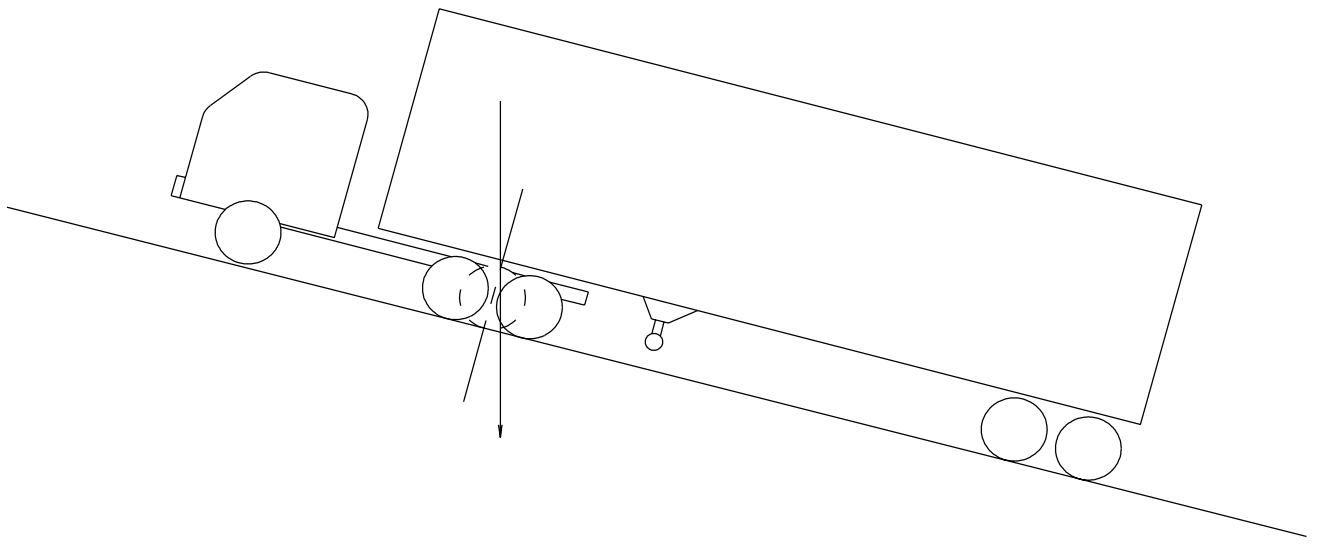
Once the weight on the kingpin is determined, it can then be treated on the tractor the same as a weight on a straight truck.

Due to the variations in hauling and wheelbase requirements from one truck application to another, there is no one specific 5th wheel setting that will apply in all cases.

A “rule of thumb” which has proven satisfactory in many cases sets the 5th wheel one inch ahead of the rear axle for each 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 5th 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.

A tractor on a hill with the 5th 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.



Weight Restrictions & Specifications

PERFORMANCE CALCULATIONS

The following calculations have been included to help the users of this book determine the performance characteristics required by their 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.

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

Definitions in formulas:

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

Example:

NPR 12,000 GVWR automatic transmission.

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

$$\text{MPH @ Governed Speed} = \frac{(60) \times (3000)}{(674) \times (.703 \times 5.375)}$$

MPH @ Governed Speed = 70 MPH

2. Grade Horsepower Formula

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

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

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

Example:

NPR 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 following formula (3) for calculation)

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

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.

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

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

Example:

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

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

$$\text{FA} = 73.47 \text{ FT}^2$$

$$\text{Cd} = 0.70$$

$$\text{Speed} = 55 \text{ MPH}$$

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

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

Weight Restrictions & Specifications

4. Engine Horsepower Formula

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

$$\text{Horsepower} = \frac{\text{Torque X RPM}}{5252}$$

Definitions in formula:

Torque	=	Twisting output of engine given in lb-ft
RPM	=	Revolutions per minute of engine
5252	=	Constant

Example:

NPR 12,000 GVWR automatic transmission.

Torque	=	347 lb-ft
RPM	=	2000

$$132 \text{ HP} = \frac{(347) \times (2000)}{5252}$$

5. Gradeability Formula

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

$$\text{Percent Grade} = \frac{1200 \times (T) \times (E) \times (C) \times (R)}{\text{GVWR} \times r} - \text{RR}$$

Definitions in formula:

1200	=	Constant
T	=	Maximum Torque of Engine
E	=	Engine Efficiency (0.9)
C	=	Driveline Efficiency (0.9)
R	=	Transmission Ratio X Axle Ratio
RR	=	Rolling Resistance (see chart on following page)
GVWR	=	Gross Vehicle Weight Rating
r	=	Loaded radius of tire.

Example:

NPR 12,000 GVWR automatic transmission on concrete highway.

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

$$\text{Percent Grade} = \frac{1200 \times (347) \times (0.9) \times (0.9) \times (.703) \times (5.375)}{12,000 \times 14.1} - 1.0$$

$$\text{Percent Grade} = 6.53 - 1$$

$$\text{Gradeability} = 5.53\%$$

ROAD ROLLING RESISTANCE:			
Road Rolling Resistance - Expressed in Percent Grade.			
Road Surface			
Concrete, excellent	1.0	Cobbles, ordinary	5.5
Concrete, good	1.5	Cobbles, poor	8.5
Concrete, poor	2.0	Snow, 2 inch	2.5
Asphalt, good	1.25	Snow, 4 inch	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.

$$\text{Startability} = \frac{(1200) \times (\text{CET}) \times (\text{E}) \times (\text{C}) \times (\text{R})}{(\text{GVWR} \times r)} - 10\%$$

Definitions in formula:

1200	=	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

Example:

NPR 12,000 GVWR manual transmission.

CET	=	260 lb-ft
R	=	6.02 X 4.10
GVWR	=	12,000 lb
r	=	14.1 in

$$\text{Startability} = \frac{(1200) \times (260) \times (0.9) \times (0.9) \times (6.02 \times 4.10)}{(12,000 \times 14.1)} - 10\%$$

$$\text{Startability} = 26.86\%$$

Weight Restrictions & Specifications

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.

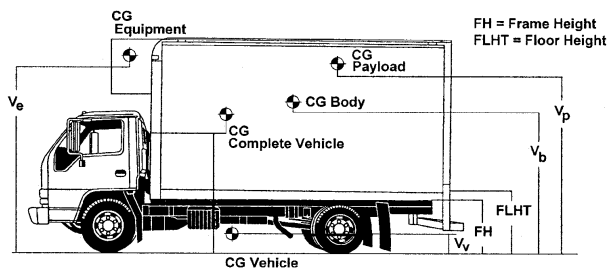
$$7.1 \quad W_v \times (V_v) = M_v$$

$$7.2 \quad W_b \times (V_b) = M_b$$

$$7.3 \quad W_p \times (V_p) = M_p$$

$$7.4 \quad W_e \times (V_e) = M_e$$

$$7.5 \quad VC_g = \frac{(M_v + M_b + M_p + M_e)}{(W_v + W_b + W_p + W_e)}$$



Definitions in formula:

VC _g	=	The total average vertical center of gravity of the completed vehicle (vehicle, body, payload and equipment)
W _v	=	Weight of Vehicle
W _b	=	Weight of Body
W _p	=	Weight of Payload
W _e	=	Weight of Equipment
V _v	=	Distance from ground to center of gravity of the vehicle
V _b	=	Distance from ground to center of gravity of the body
V _p	=	Distance from ground to center of gravity of the payload
V _e	=	Distance from ground to center of gravity of the equipment
M _v	=	Moment of vehicle
M _b	=	Moment of Body
M _p	=	Moment of payload
M _e	=	Moment of equipment

Example:

NPR 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.

W _v	=	5291 lbs	(from vehicle specifications)
W _b	=	2100 lbs	(from body manufacturer)
W _p	=	4609 lbs	(GVWR - (W _v + W _b + W _e))
V _v	=	24.9 in	(from Body Builder 's Guide, NPR section, page 6)
V _b	=	80 in	(from body manufacturer)
V _p	=	62 in	(1/2 of payload height + frame height + height from frame to flooring)
M _v	=	5291 X 24.9 = 131,746 lb-in	(from 7.1)
M _b	=	2100 X 80 = 168,000 lb-in	(from 7.2)
M _p	=	4609 X 62 = 285,758 lb-in	(from 7.3)
W _e , V _e , M _e	=	None in this example	

$$VC_g = \frac{(131,746 + 168,000 + 285,758)}{(5291 + 2100 + 4609)}$$

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

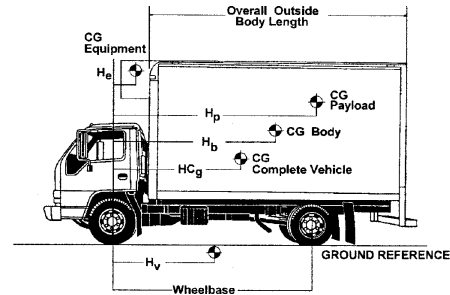
48.8 < 54.0 inches (54 inches is maximum allowable VC_g per mfg. specifications - from Body Builder's Guide, NPR section, page 6)

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

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, snow plow, etc.) is installed on either extremes along the completed vehicle's overall length.

$$\begin{aligned}
 8.1 \quad & W_v \times (H_v) = M_v \\
 8.2 \quad & W_b \times (H_b) = M_b \\
 8.3 \quad & W_p \times (H_p) = M_p \\
 8.4 \quad & W_e \times (H_e) = M_e \\
 8.5 \quad & HC_g = \frac{(M_v + M_b + M_p + M_e)}{(W_v + W_b + W_p + W_e)}
 \end{aligned}$$



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

Example:

NPR 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	=	5291 lbs	<i>(from vehicle specifications)</i>
Wb	=	2100 lbs	<i>(from body manufacturer)</i>
Wp	=	3609 lbs	<i>(GVWR - (Wv + Wb + We))</i>
We	=	1000 lbs	<i>(from equipment manufacturer)</i>
Hv	=	42.4 in	<i>(from Body Builder 's Guide, NPR section, page 6)</i>
Hb	=	107.5 in	<i>(from body manufacturer)</i>
Hp*	=	107.5 in	<i>(1/2 of payload length + distance from front axle to front of body)</i>
He	=	17.5 in	<i>(from equipment manufacturer)</i>
Mv	=	5291 X 42.4 = 224,338 lb-in	<i>(from 8.1)</i>
Mb	=	2100 X 107.5 = 225,750 lb-in	<i>(from 8.2)</i>
Mp	=	3609 X 107.5 = 387,967 lb-in	<i>(from 8.3)</i>
Me	=	1000 X 17.5 = 17,500 lb-in	<i>(from 8.4)</i>

$$HC_g = \frac{(224,338 + 225,750 + 387,967 + 17,500)}{(5291 + 2100 + 3609 + 1000)}$$

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

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

Since the 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 Restrictions & Specifications

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 with 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 lb.

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 lb 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 lb.

Single Axle Weight:

The total weight at the ground by all wheels of an axle whose centers may be included between parallel transverse planes forty 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 lb.

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 forty inches but not more than ninety-six 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 lb.

CONSECUTIVE AXLE WEIGHT:

The Federal law states that any two consecutive or more 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 lb 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" 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 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.

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			
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
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 lb. Maximum load on any single axle, 20,000 lb. Weights over 80,000 lb are in excess of the Federal GVW on the National Highway Network.

Commodity & Material Weights

APPROXIMATE WEIGHTS OF COMMODITIES AND MATERIALS

Product	Size Container	Lb. Per Cu. Ft.	No. of Lb.	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	4450	cu. yard
Apples,	Fresh		48	bushel
	Western, box	11.5"x12"x20"	50	box
	New England, box	11.25"x14.5"x17.5"	56	box
	Standard barrel	17" hd., 28.5" stave	160	barrel
	Dried	bushel	24	bushel
Apricots,	Fresh	bushel	48	bushel
	Western, box	5.5"x12"x20"	23	box
Artichokes,	Box	10"x11.5"x22"	44	box
Asbestos		153	4130	cu. yard
Asparagus,	Crate			
	Loose	11.5" high x 9.57" top	38	crate
	Bunches	11" bottom x 19.38" long	31	crate
Avacados,	Box	5.75"x11.25"x17.5"	16	box
Bananas,	Single stem		45-65	bunch
Barley		bushel	48	bushel
Barytes,	Mineral	280	7560	cu. yard
Basalt,	Rock	185	5000	cu. yard
Beans, dry	Lima	bushel	56	bushel
	White	bushel	60	bushel
	Castor	bushel	46	bushel
Fresh	Lima	bushel	39	bushel
	String	bushel	36	bushel
		hamper, 5 peck	45	hamper
Beef,	Slack barrel	21"x30" stave (200 lb. net)	254	barrel
Beer,	Wood barrel	0.5 barrel (16 gal.)	205	barrel
	Wood barrel	0.25 barrel (8 gal.)	105	barrel
	Steel barrel	0.5 barrel (16 gal.)	190	barrel
	Steel barrel	0.25 barrel (8 gal.)	95	barrel
	Dutchman	0.13 barrel (4 gal.)	51	barrel
Case carton-24, 12 oz.	Regular bottles	17.25"x11.5"x9.88"	45	case
	Steinie bottles	18.38"x12.13"x7.38"	40	case
	Tin cans	16.13"x11"x5.13"	28	case
Wooden case-24, 12 oz.	Regular bottles	21"x13.5"x10"	35	case
	Steinie bottles	22"x13.75"x7.5"	46	case
Beets		bushel	50-60	bushel
	Small crate	9.75"x13.75"x24"	50	crate
	Western crate	14"x19"x24.5"	95	crate

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

Weight Restrictions & Specifications

APPROXIMATE WEIGHTS OF COMMODITIES AND MATERIALS

Product	Size Container	Lb. Per Cu. Ft.	No. of Lb.	Per	
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	3240	cu. yard	
Bone	.....	115	3110	cu. yard	
Borax	.....	110	2970	cu. yard	
Bran	..... bushel	--	20	bushel	
Brick-	Soft	2.25" x 4" 8.25"	--	4320	M
	Common	2.25" x 4" x 8.25"	--	5400	M
	Hard	2.25" x 4.25" x 8.5"	--	6480	M
	Pressed	2.38" x 4" x 8.38"	--	7500	M
	Paving	2.25" x 4" 8.5"	--	6750	M
	Paving block	3.5" x 4" x 8.5"	--	8750	M
	Fire	2.5" x 4.5" x 9"	--	7000	M
Broccoli-	Bushel crate	12.75" x 12.75" x 17"	--	30	bushel
Brussel 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
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"x11.75"x23.5"	--	58	crate
	Standard	12.75"x12.75"x23.5"	--	68	crate
	Jumbo	13.75"x13.75"x23.5"	--	78	crate
	Pony flat	4.75"x12.75"x23.5"	--	26	crate
	Standard flat	5.25"x14.25"x23.5"	--	28	crate
	Jumbo flat	5.75"x15.25"x23.5"	--	32	crate
Honeydew (Casaba)	6.38"x15.13"x23.5"	--	35	crate	
Carbolic acid	.....	60	8.0	gallon	
Carrots,	Topped	bushel	--	55	bushel
	With tops	bushel	--	40	bushel
	Crate	11.75"x14.13"x24"	--	60	crate
Castor oil	.....	61	8.1	gallon	
Cauliflower	..... bushel	--	30	bushel	
	Crate	9.38"x19"x24"	--	50	crate
Cedar*	.....	30	2500	M. Bd. ft.	

APPROXIMATE WEIGHTS OF COMMODITIES AND MATERIALS

Product	Size Container	Lb. Per Cu. Ft.	No. of Lb.	Per	
Celery	Standard crate	11.63"x22"x22.63"	--	70	crate
	Half crate	10.75"x13"x20.38	--	35	crate
	Northern crate	16.5"x21.25"x22"	--	85	crate
Cement	Block	8"x8"x16"	--	42	each
	Block	8"x12"x16"	--	58	each
	Portland	sack	--	94	sack
	Portland	barrel (4 sacks per barrel)	--	376	barrel
Chalk			137	3700	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,	Un-stemmed	bushel	--	56	bushel
	Stemmed	bushel	--	64	bushel
	Lug box	5.63"x11.88"x19.75"	--	17	box
Chestnut (lumber)			37	3080	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"x35"x13"	--	18	crate
Cinder blocks,	8"x8"x16"		--	35	each
	8"x12"x16"		--	45	each
Cinders			50	1350	cu. yard
Clay,	Dry lumps		85	2300	cu. yard
	Wet lumps		110	2970	cu. yard
	Wet packed		135	3650	cu. yard
	Fire		125	3375	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"x12.88"x24"	--	60	crate
Corn meal		bushel	--	44	bushel
Corn oil			58	7.8	gallon
Corn syrup			86	11.5	gal.
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	gal.
Cottonwood (lumber)*			37	3080	M. Bd. ft.
Cow,	Live-feeder (avg.)	per head	--	600	head
	Butcher (avg.)	per head	--	800	head
	Butcher steer (avg.)	per head	--	1100	head

Weight Restrictions & Specifications

APPROXIMATE WEIGHTS OF COMMODITIES AND MATERIALS

Product	Size Container	Lb. Per Cu. Ft.	No. of Lb.	Per
Cranberries-	0.25 barrel box 9.5" x 11" x 14"	--	28	box
	0.25 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	2050	cu. yard
	Packed	95	2565	cu. yard
	Wet	125	3375	cu. yard
Eggplant,	Hamper bushel	--	40	bushel
	Crate 14" x 11.75" x 24"	--	54	crate
Eggs,	30 doz. crate 12" x 12" x 26"	--	55	crate
Elm,	Soft*	38	3170	M. Bd. ft.
	Rock*	45	3750	M. Bd. ft.
Fertilizer, Fir,Douglas	Commercial burlap bag	--	100-200	bag
	..... 32	2670	M. Bd. ft.	
Fish, fresh-	Eastern	25	2080	M. Bd. ft.
	Barrel 19" head, 29" stave	--	300	barrel
Flour,	0.5 barrel 18.5" head, 23.5" stave	--	160	1/2 barrel
	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	1915	cu. yard
Garbage,	Dry, paper wrapped	15-30	405-810	cu. yard
	Wet	50	1240	cu. yard
Gasoline	.....	45	6.0	gallon
Glass,	Common window	--	162	cu. foot
	Plate or crown	--	161	cu. foot
	0.25" plate	--	3.3	sq. foot
Glue	.....	80	2160	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" 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	2565	cu. yard
	Wet	125	3375	cu. yard
Greens	..... bushel	--	25	bushel
Groceries,	Misc. asst'd	30	810	cu. yard
Hay,	Bale 26" x 30" 46"	--	210	bale
	Bale 17" x 22" x 43"	--	115	bale
	Bale 14" x 16" 43"	--	85	bale

APPROXIMATE WEIGHTS OF COMMODITIES AND MATERIALS

Product	Size Container	Lb. Per Cu. Ft.	No. of Lb.	Per
Hog,	Live (average) per head	--	225-250	head
Honey	.....	90	12.0	gallon
Horse,	Live (average) per head	--	1200-1500	head
Horseradish roots	..... bushel	--	35	bushel
Ice	.....	57	1540	cu. yard
Ice (mfg.),	Block 11" x 22" x 32"	--	250	block
	Block 14" x 14" x 40"	--	255	block
	Block 11" x 22" x 56"	--	440	block
Ice Cream,	2.5 gal. can,			
	Full 9" dia. x 11"	--	18	can
	Empty	--	6	can
	5 gal. can,			
	Full 9" dia. x 21"	--	35	can
	Empty	--	11	can
Kale	..... bushel	--	25	bushel
Kerosene	.....	50	6.6	gallon
Lamb,	Live (avg.) per head	--	75-85	head
Lard,	Barrel 18" head, 30" stave	--	425	barrel
Lath-standard length 29 in. Packed in bundles of 50.	..... Avg. bundle-diameter 9 inches	--	25	bundle
Leather,	Dry	55	1485	cu. yard
	Wet	65	1755	cu. yard
Lemons,	Western box 10" x 13" x 25"	--	80	box
	Southern box 12.75" x 12.75" x 27"	--	90	box
Lentils	..... bushel	--	60	bushel
Lettuce,	Hamper	--	25	bushel
	Hamper 1.5 bushel	--	38	hamper
	Basket..... 8.5" x 11.75" x 21.38"	--	17	basket
	Crate 18.75" x 17.5" x 24.5"	--	75	crate
	1/2 crate 9.5" x 13.5" x 24.5"	--	40	1/2 crate
Lime,	Hydrated	--	30	bushel
	Barrel (small) 16.5" head, 27.5" stave	62	210	barrel
	Barrel (large)	62	320	barrel
Limes,	Western box 10" x 13" x 25"	--	80	box
	Southern box 12.75" x 12.75" x 27"	--	90	box
Linseed oil	.....	59	7.9	gallon
Lubricating oil	.....	52	7.0	gallon
Malt,	Barley	--	28	bushel
	Rye	--	32	bushel
	Brewer's grain	--	40	bushel
Maple syrup	..... gallon	82	11	gallon
Maple,	Hard (lumber)*	44	3670	M. Bd. ft.
	Soft*	34	2830	M. Bd. ft.
Meal-corn	..... bushel	--	44	bushel
Milk,	Bulk	64	8.6	gallon
	5 gallon can 10.25" dia. x 19"	--	62	can
	10 gallon can 13" dia. x 23"	--	115	can
	Crate-20.5 pt. bottles 8.5" x 12.75" x 16.75"	--	33	crate
	20 pt. bottles 8.5" x 12.75" x 16.75"	--	54	crate

Weight Restrictions & Specifications

APPROXIMATE WEIGHTS OF COMMODITIES AND MATERIALS

Product	Size Container	Lb. Per Cu. Ft.	No. of Lb.	Per
Millet	bushel	--	50	bushel
Molasses		90	12	gallon
	Barrel	--	675	barrel
Mortar, Lime	20.25" head, 34" stave	110	2970	cu. yard
Mud, Flowing		106	2860	cu. yard
	Packed	125	3375	cu. yard
Muriatic acid, 40%		40	10	gallon
Naptha, Petroleum		42	5.6	gallon
Nitric acid, 91%		94	12.5	gallon
Oak-red, Black*		42	3500	M. Bd. ft.
	White*	48	4080	M. Bd. ft.
Oats	bushel	--	32	bushel
Okra, Hamper	1/2 bushel	--	18	hamper
	Hamper	--	34	bushel
Oleomargarine (mfg.-tub)	21" head, 34" stave	--	70	tub
	Cases	--	15-65	case
Olive oil		58	7.7	gallon
Onions dry, Basket	bushel	--	55	bushel
	Bag	--	50	bag
	Crate	--	58	crate
	Green (with tops)	--	32	bushel
Oranges, Western box	11.5" x 11.5" x 24"	--	80	box
	Southern box	--	90	box
	Bushel box	--	65	box
Oysters (shucked or meats)				
	Crate-with 5.1 gal. cans (11.5 lb. per gal.)	--	67	crate
	With shells (bags)	--	75	bushel
Paint, Lead and oil		127	17	gallon
Paper, Average solid		58	1565	cu. yard
	Newspaper rolls	--	500	roll
		--	1000	roll
		--	1300	roll
Paraffin		56	1510	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	--	50	crate
	Western box	--	22	box
Peanuts, Unshelled	bushel	--	22	bushel
	Bag	--	100	bag
Peanut oil		57	7.6	gallon
Pears, Basket	bushel	--	50	bushel
	Western box	--	51	box

APPROXIMATE WEIGHTS OF COMMODITIES AND MATERIALS

Product	Size Container	Lb. Per Cu. Ft.	No. of Lb.	Per
Peas,	Dry	bushel	--	60 bushel
	Fresh hamper	bushel	--	35 hamper
	Hamper	40 qts.	--	45 hamper
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	5400 cu. yard
Pine,	Long leaf* .....	.....	44	3670 M. Bd. ft.
	North Carolina* .....	.....	36	3000 M. Bd. ft.
	Oregon* .....	.....	32	2670 M. Bd. ft.
	Red* .....	.....	30	2500 M. Bd. ft.
	White* .....	.....	26	2170 M. Bd. ft.
	Yellow-long leaf* .....	.....	44	3670 M. Bd. ft.
Pineapples,	Short leaf* .....	.....	38	3170 M. Bd. ft.
	Crate	11" x 12.5" x 36"	--	85 crate
Pitch	.....	.....	70	1900 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	2250 M. Bd. ft.
Porcelain	.....	.....	150	4050 cu. yard
Pork (dressed),	Barrel (200 lb. 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
Radishes,	Basket	bushel	--	34 bushel
	Crate	9.75" x 13.75" x 24"	--	40 crate
Redwood*	.....	.....	30	2500 M. Bd. ft.
Resin	.....	.....	68	1835 cu. yard
Rhubarb (pie plant)	.....	bushel	--	50 bushel
	Box	5.25" x 11.5" x 22"	--	24 box
Rice,	Unhulled	bushel	--	43 bushel
Rock,	Crushed (avg.) .....	.....	100	2700 cu. yard
Romaine,	Crate	13.88" x 18.88" x 24.5"	--	64 crate
	Crate	12.25" x 13" x 15.25"	--	27 crate
Rubber goods	.....	.....	94	2540 cu. yard
Rutabagas	.....	bushel	--	56 bushel

Weight Restrictions & Specifications

APPROXIMATE WEIGHTS OF COMMODITIES AND MATERIALS

Product	Size Container	Lb. Per Cu. Ft.	No. of Lb.	Per	
Rye	bushel	--	56	bushel	
Salt-rock,	Solid	136	3670	cu. yard	
	Coarse	45	1215	cu. yard	
	Fine	50	1350	cu. yard	
	Barrel (avg.)	--	280	barrel	
Sand- Fine,	Dry	110	2970	cu. yard	
	Wet	125	3375	cu. yard	
Coarse,	Dry	95	2565	cu. yard	
	Wet	120	3240	cu. yard	
Mixed		115	3100	cu. yard	
Sandstone,	Solid	147	3970	cu. yard	
	Crushed	86	2325	cu. yard	
Shale,	Solid	172	4645	cu. yard	
	Crushed	92	2485	cu. yard	
Sheep,	Live (avg.)	--	125-150	head	
Shingles-packed in bundles of 200-250. Size of bundle					
	(avg.) 24" x 20" x 10"	--	50	bundle	
Snow,	Moist-packed	50	1350	cu. yard	
Soft drinks,	Half depth bottle box 24-6 to 8 oz. bottles				
		12.25" x 18.75" x 8.5"	--	39	box
	Full depth bottle box 12-24 to 32 oz. bottles				
		13.38" x 18.5" x 12.25"	--	60	box
Sorghum syrup		86	11.5	gallon	
Soybeans	bushel	--	60	bushel	
Soybean oil		58	7.7	gallon	
Spinach,	Hamper	bushel	--	20	bushel
	Basket	bushel	--	27	basket
Spruce*		28	2330	M. Bd. ft.	
Squash	bushel	--	46	bushel	
Starch		96	2590	cu. yard	
Stone,	Crushed (avg.)	100	2700	cu. yard	
	Rip-rap	65	1755	cu. yard	
Straw,	Bale	17" x 22" x 42"	--	110	bale
	Bale	26" x 30" x 46"	--	180	bale
Street sweepings		32	865	cu. yard	
Sugar		100	2700	cu. yard	
Sugar,	Bag (100 lb. net)	--	101	bag	
	Barrel (22 lb. empty)	19.13" head, 30" stave	--	345	barrel
	Case	24 - 5-lb. cartons	--	135	case
	Case	60 - 2-lb. cartons	--	135	case
Sugar cane syrup		85	11.3	gallon	
Sulphur		125	3375	cu. yard	
Sulfuric acid, 87%		112	15	gallon	
Sweet corn,	Basket	bushel	--	45	bushel
	Crate	13" x 13" x 24"	--	60	crate
Sycamore*		37	3080	M. Bd. ft.	

*Kiln dried lumber averages 10% to 15% lighter and green lumber 40% to 50% heavier than air dried. All weights in table.

APPROXIMATE WEIGHTS OF COMMODITIES AND MATERIALS

Product	Size Container	Lb. Per Cu. Ft.	No. of Lb.	Per
Tallow	.....	60	1620	cu. yard
Tanks,				
Acetylene	102 cu. ft.	empty ..	70	tank
		filled ..	75	tank
	310 cu. ft.	empty ..	200	tank
		filled ..	220	tank
Oxygen	150 cu. ft.	empty ..	80	tank
		filled ..	92	tank
	300 cu. ft.	empty ..	133	tank
		filled ..	153	tank
Tar	.....	65	1755	cu. yard
Tile,	Solid	115	3100	cu. yard
	Partition (construction)	40	1080	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	2215	cu. yard

NPR NPR HD/W3500 W4500 Gas

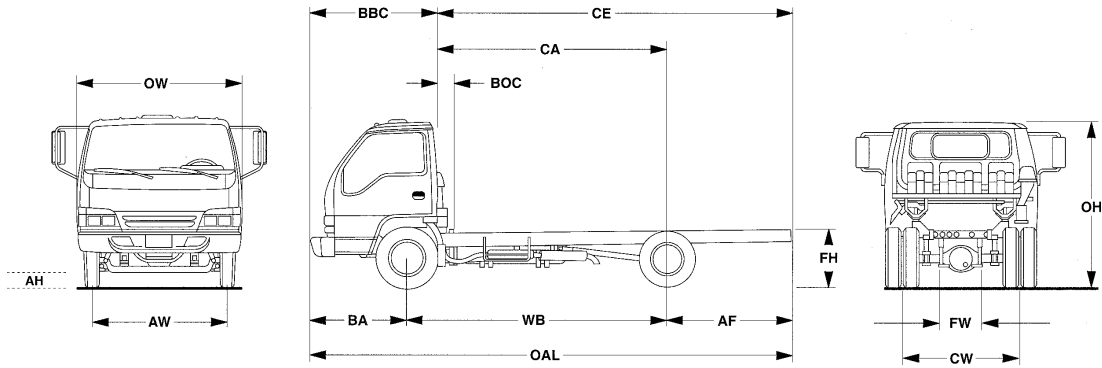
MODEL	NPR GAS/W3500 GAS
GVWR	12,000 lb
WB	109 in, 132.5 in, 150 in, 176 in.
ENGINE	GMPT 8-cylinder, V Block 4-cycle, OHV, water cooled, Sequential Port Fuel Injection
Model/Displacement	GMPT-V8/350 CID (5.7 liters)
HP (Gross)	250 HP @ 4200 rpm
Torque (Gross)	330 lb-ft torque @ 2800 rpm
Equipment	Sequential Port Fuel Injection (SFI), mass air flow meter, powertrain control module (VCM), onboard diagnostics, oxygen sensors, catalytic convertor, map sensor, with external oil cooler.
TRANSMISSION	4L80-E Hydra-Matic 4-speed automatic with lock-up converter and overdrive.
STEERING	Integral power steering 20.9:1 ratio. Tilt and telescoping steering column.
FRONT AXLE	Reverse Elliot "I" -beam rated at 6,830 lb.
Suspension	Semi-elliptical steel alloy leaf springs with stabilizer bar and shock absorbers.
GAWR	4,700 lb
REAR AXLE	Full floating single speed with hypoid gearing rated at 11,020 lb.
Suspension	Semi-elliptical steel alloy leaf springs and shock absorbers.
GAWR	7,950 lb
WHEELS	16 x 6. 6 hole disc wheels, painted white.
TIRES	215/85R-16E (10 pr) tubeless steel belted radials, all season tread 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 6-way joint on the front brake lines. Disc front and self-adjust outboard mounted drum rear. The parking brake is a mechanical, cable actuated, internal expanding drum type, transmission mounted. Anti-lock brake system.
FUEL TANK	30 gal. rectangular steel fuel tank. Mounted between the frame rails with electric type fuel pump (mounted in tank). Through the rail fuel fill.
FRAME	Ladder type channel section straight frame rail 33.5 inches wide through the total length of the frame. Yield strength 44,000 psi, section modulus 7.20 in ³ ., RBM 316,800.
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, Delco maintenance free battery (located under cab), 600 CCA, 80 Amp alternator with integral regulator.
OPTIONS	Air conditioning; AM/FM cassette stereo radio; spare wheel; 6" stainless steel mirrors. Power windows and Door Locks.
	NOTE: These selected specifications are subject to change without notice.

NPR NPR HD/W3500 W4500 Gas

MODEL	NPR HD GAS/W4500 GAS
GVWR	14,050 lb
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-V8/350 CID (5.7 liters)
HP (Gross)	250 HP @ 4200 rpm
Torque (Gross)	330 lb-ft torque @ 2800 rpm
Equipment	Sequential Port Fuel Injection (SFI), mass air flow meter, powertrain control module (VCM), onboard diagnostics, oxygen sensors, catalytic convertor, map sensor, with external oil cooler.
TRANSMISSION	4L80-E Hydra-Matic 4-speed automatic with lock-up converter and overdrive.
STEERING	Integral power steering 20.9:1 ratio. Tilt and telescoping steering column.
FRONT AXLE	Reverse Elliot "I" -beam rated at 6,830 lb.
Suspension	Semi-elliptical steel alloy leaf springs with stabilizer bar and shock absorbers.
GAWR	5,360 lb
REAR AXLE	Full floating single speed with hypoid gearing rated at 11,020 lb.
Suspension	Semi-elliptical steel alloy leaf springs and shock absorbers.
GAWR	9,880 lb
WHEELS	19.5 x 6.0 6 hole disc wheels, painted white.
TIRES	225/70R-19.5F (12 ply) tubeless steel belted radials, premium highway tread 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 6-way joint on the front brake lines. Disc front and self-adjust outboard mounted drum rear. The parking brake is a mechanical, cable actuated, internal expanding drum type, transmission mounted. Anti-lock brake system.
FUEL TANK	30 gal. rectangular steel fuel tank. Mounted between the frame rails with electric type fuel pump (mounted in tank). Through the rail fuel fill.
FRAME	Ladder type channel section straight frame rail 33.5 inches wide through the total length of the frame. Yield strength 44,000 psi, section modulus 7.20 in ³ ., RBM 316,800.
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, Delco maintenance free battery (located under cab), 600 CCA, 80 Amp alternator with integral regulator.
OPTIONS	Air conditioning; AM/FM cassette stereo radio; spare wheel; 6" stainless steel mirrors. Power windows and Door Locks.

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

VEHICLE WEIGHTS, DIMENSIONS AND RATINGS



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: 14,050 GVW

Code	Inches	Code	Inches
AH	8.6	BW	84.0
AW	65.6	CW	65.0
BA	47.4	FW	33.5
BBC	68.0	OH	88.1
BOC	9.25	OW	78.5
		FH	32.8

Dimension Constants: 12,000 GVW

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

14,050 lb GVWR with 4L80-E Hydra-Matic Transmission Model California/Federal

Chassis Cab and Maximum Payload Weights

Model	WB	Unit	Front	Rear	Total	Payload
CE1	109.0 in	lb	3,230	1,874	5,104	8,946
CE2	132.5 in	lb	3,274	1,896	5,170	8,880
CE3	150.0 in	lb	3,296	1,918	5,214	8,836
CE4	176.0 in	lb	3,340	1,940	5,280	8,770

12,000 lb GVWR with 4L80-E Hydra-Matic Transmission

Model Federal

Chassis Cab and Maximum Payload Weights

Model	WB	Unit	Front	Rear	Total	Payload
BB1	109.0 in	lb	3,160	1,799	4,959	7,041
BB2	132.5 in	lb	3,204	1,821	5,025	6,975
BB3	150.0 in	lb	3,226	1,843	5,069	6,931
BB4	176.0 in	lb	3,270	1,865	5,135	6,865

Vehicle Weight Limits:

GVWR		
Designed maximum	12,000 lb	14,050 lb
GAWR, Front	4,700 lb	5,360 lb
GAWR, Rear	7,950 lb	9,880 lb

12,000 lb GVWR with 4L80-E Hydra-Matic Transmission

Model California

Chassis Cab and Maximum Payload Weights

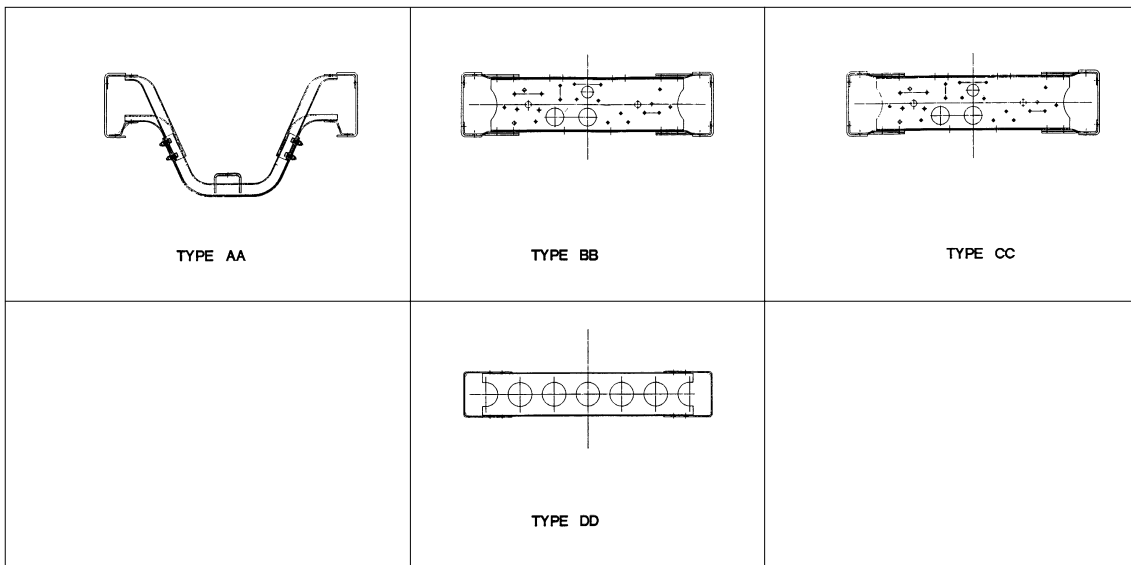
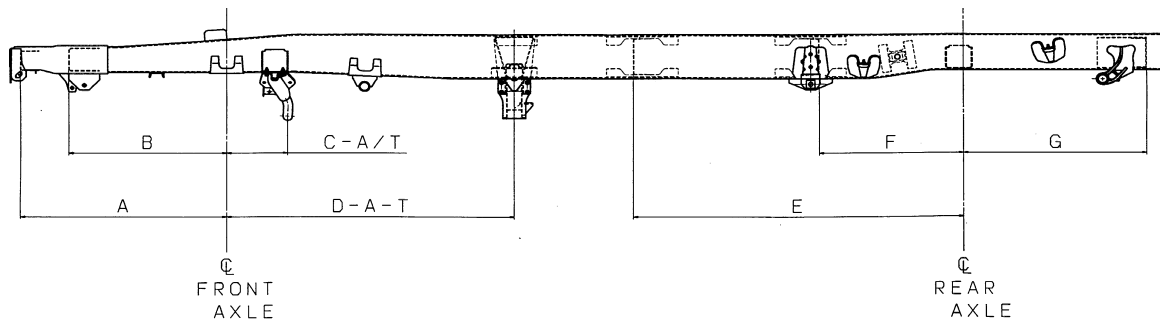
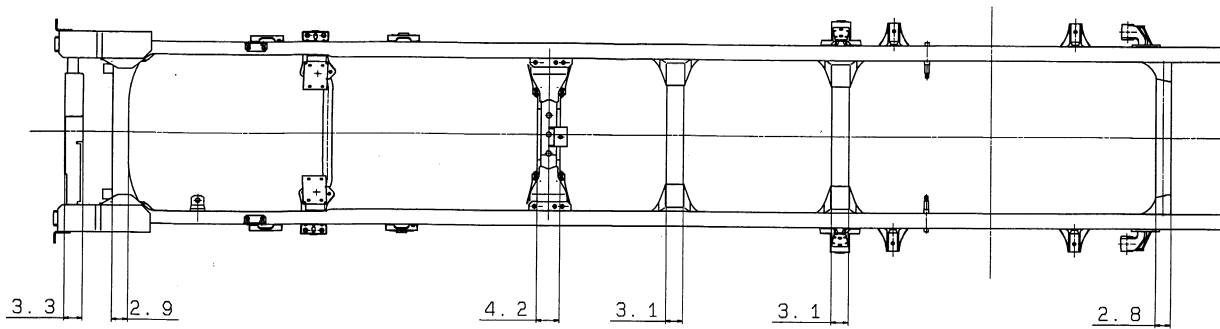
Model	WB	Unit	Front	Rear	Total	Payload
AB1	109.0 in	lb	3,160	1,799	4,959	7,041
AB2	132.5 in	lb	3,204	1,821	5,025	6,975
AB3	150.0 in	lb	3,226	1,843	5,069	6,931
AB4	176.0 in	lb	3,270	1,865	5,135	6,865

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.

FRAME & CROSSMEMBER SPECIFICATIONS

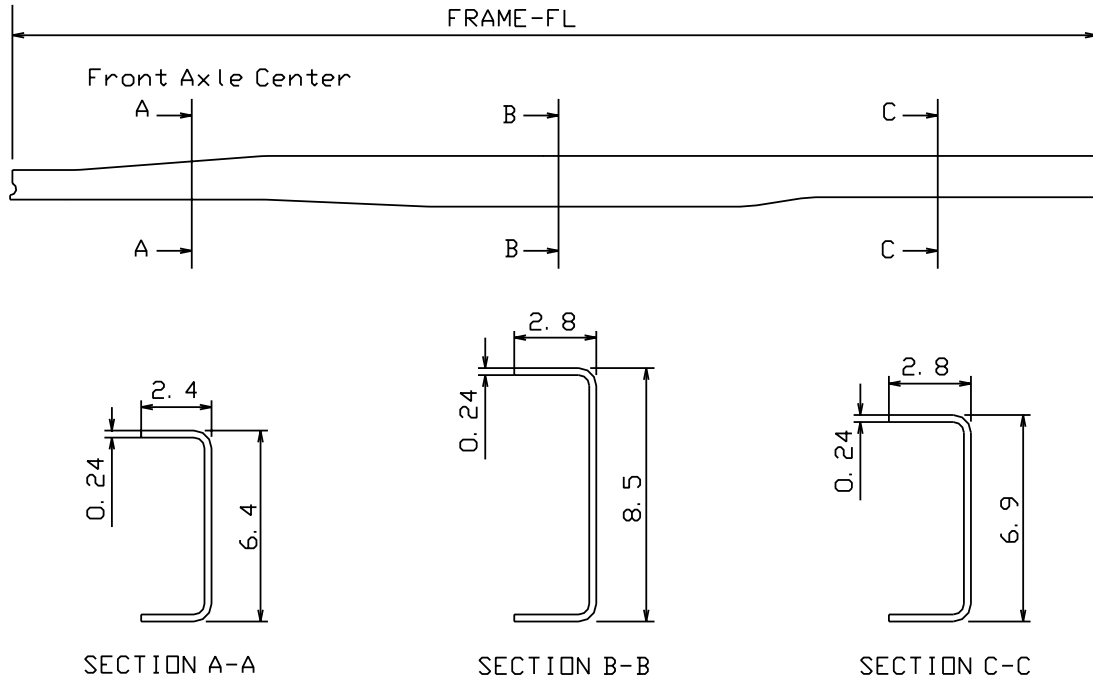


Unit: Inch

Wheel Base	Frame Thick	CROSS MEMBER TYPE/LOCATION						
		A	B	C-A/T	D-A/T	E	F	G
109	0.24	37.0	28.3	11.1	AA 52.0	--	CC 26.0	DD 33.0
132.5	0.24	37.0	28.3	11.1	AA 52.0	BB 59.4	CC 26.0	DD 33.0
150.0	0.24	37.0	28.3	11.1	AA 52.0	BB 59.4	CC 26.0	DD 33.0
176.0	0.24	37.0	28.3	11.1	AA 52.0	BB 59.4	CC 26.0	DD 33.0

A/T= Automatic Transmission

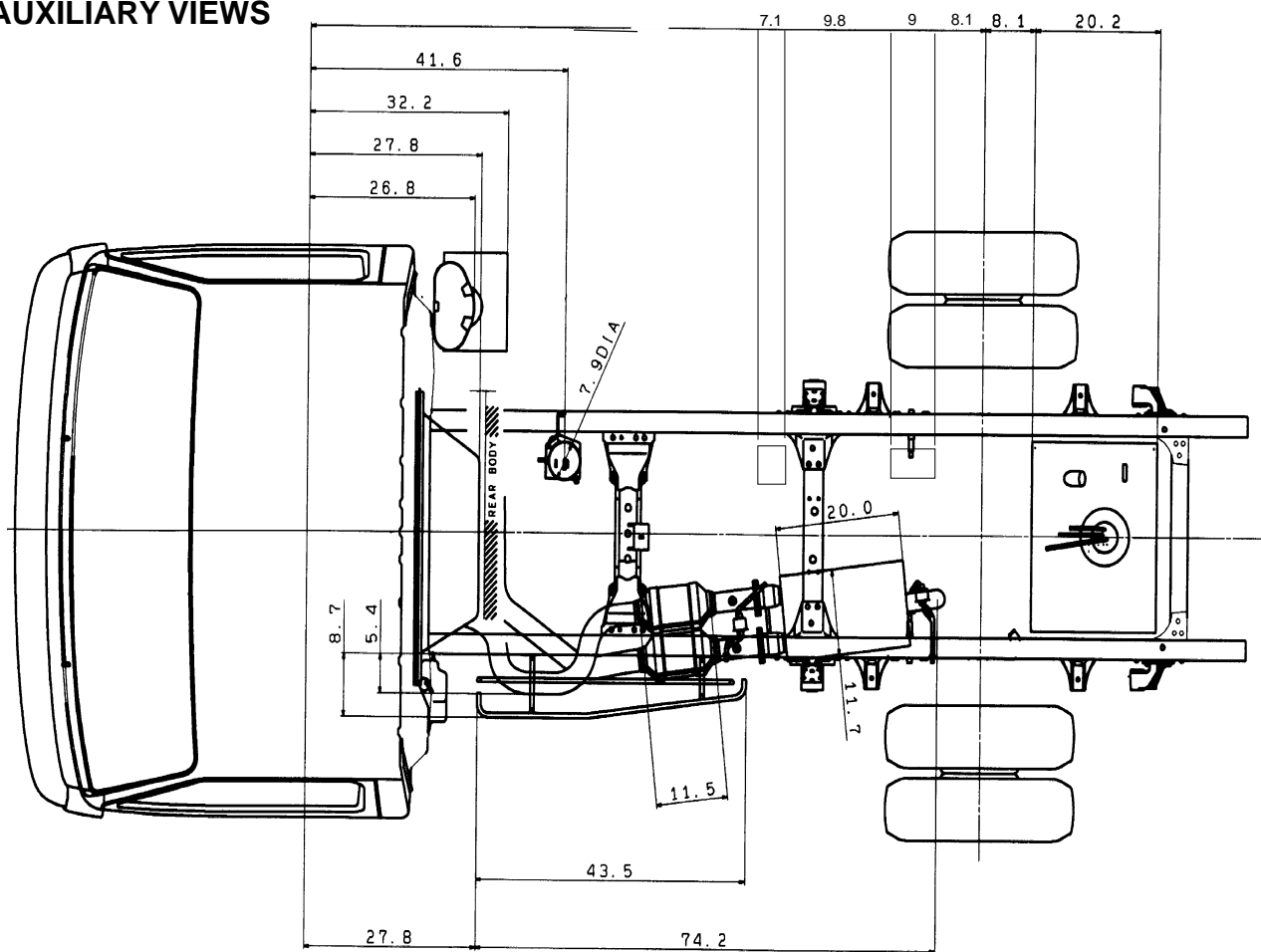
FRAME CHART



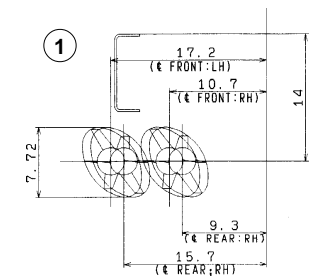
Unit: Inch

WB	FRAME FL	FRAME THICKNESS
109	186.0	0.24
132.5	209.6	0.24
150.0	227.4	0.24
176.0	253.4	0.24

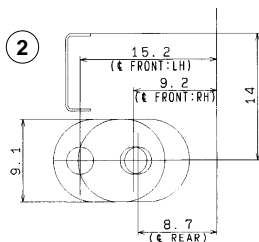
AUXILIARY VIEWS



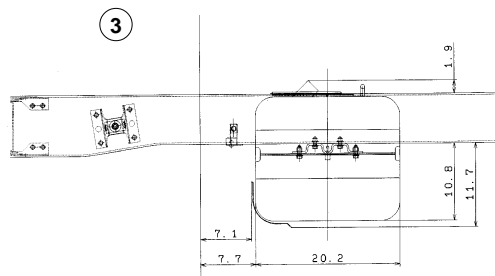
UNIT: INCH



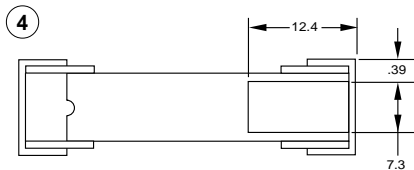
**Rear View
Catalytic Converters**



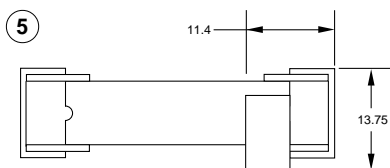
**Rear View
Muffler**



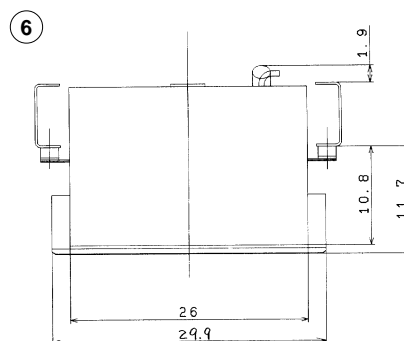
**Side View
In Frame Tank**



**Rear View
ABS Controller**



**Rear View
Emission Canister**



**Rear View
In Frame Tank**

BODY BUILDER WEIGHT INFORMATION CHART

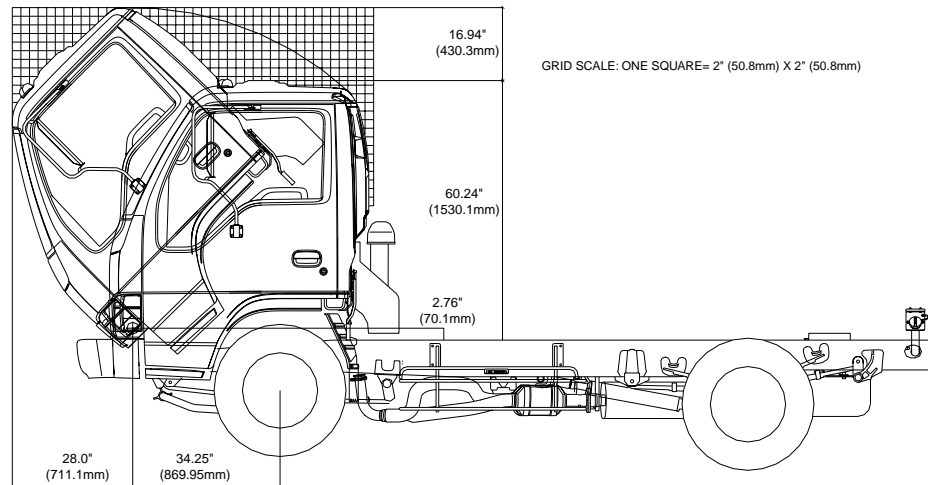
NPR/NPR HD Series

Unit: lb

GVWR	Axle	Wheel Base				Unsprung Weight
		109 in	132.5 in	150 in	176 in	
		A/T	A/T	A/T	A/T	
12,000 ↓	Front	3153	3197	3219	3263	573
	Rear	1742	1764	1786	1808	871
	Total	4895	4961	5005	5071	1444
14,050 ↓	Front	3230	3274	3296	3340	705
	Rear	1874	1896	1918	1940	1134
	Total	5104	5170	5214	5280	1839

A/T = Automatic Transmission

CAB TILT



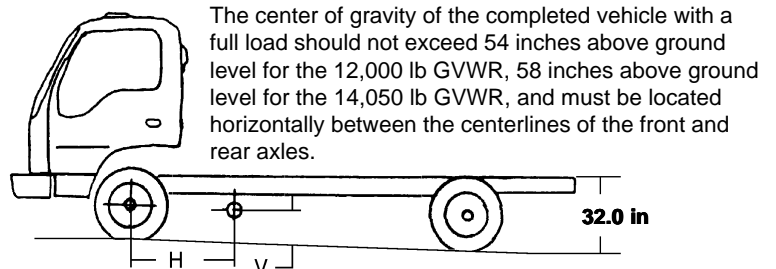
CENTER OF GRAVITY

The center of gravity of the chassis-cab.

Unit: Inch

GVWR	WB	V	H A/T
12,000 ↓	109	21.7	38.8
	132.5	20.1	47.1
	150	19.7	53.5
	176	18.1	62.8
14,050 ↓	109	21.7	40.0
	132.5	20.0	48.6
	150	19.7	55.2
	176	18.1	64.7

A/T = Automatic Transmission

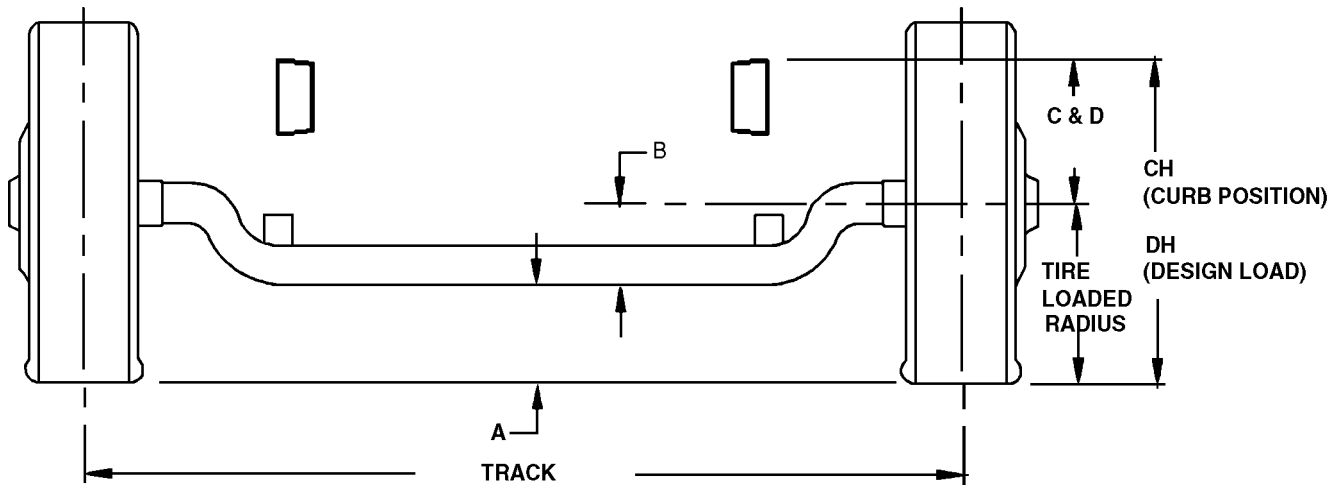


The center of gravity of the completed vehicle with a full load should not exceed 54 inches above ground level for the 12,000 lb GVWR, 58 inches above ground level for the 14,050 lb GVWR, and must be located horizontally between the centerlines of the front and rear axles.

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

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

FRONT AXLE CHART



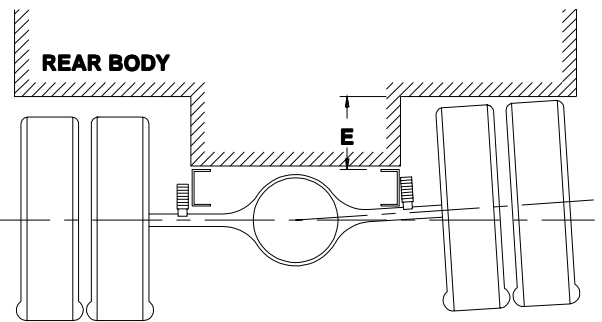
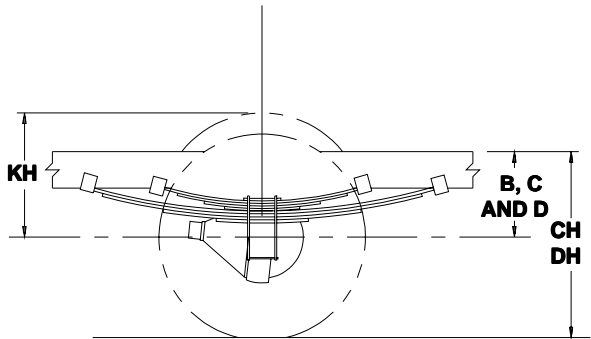
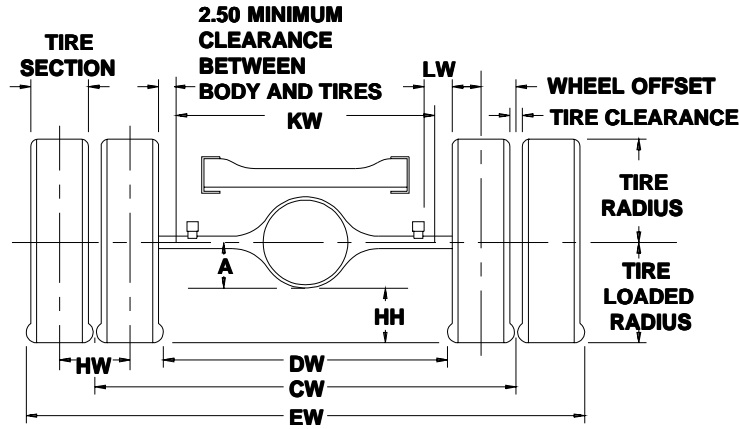
FORMULAS FOR CALCULATING HEIGHT DIMENSIONS

- 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

Unit: Inch

TIRE	GVWR	GAWR	A	B	C	D	CH	DH	TRACK	Tire Radius	
										Unload	Load
215/85R 16-E	11,050 lb	4,700 lb	7.7	6.4	13.0	12.5	27.3	26.6	65.6	15.2	14.1
225/70R 19.5	14,050 lb	5,360 lb	8.4	7.0	13.6	13.1	29	28.1	65.6	15.4	15

REAR AXLE CHART



DEFINITIONS

- A CENTER LINE OF AXLE TO BOTTOM OF AXLE BOWL.
- B CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT METAL TO METAL POSITION.
- C CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT CURB POSITION.
- D CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT DESIGN LOAD.
- E REAR TIRE CLEARANCE:
MINIMUM CLEARANCE REQUIRED FOR TIRES AND CHAIN MEASURED FROM THE TOP OF THE FRAME AT THE VERTICAL CENTER LINE OF THE REAR AXLE, WHEN REAR WHEELS ON ONE SIDE RIDE OVER A HIGH SPOT.
- CH REAR FRAME HEIGHT:
VERTICAL DISTANCE BETWEEN THE NORMAL TOP OF FRAME RAIL AND THE GROUND-LINE THROUGH THE CENTER LINE OF THE REAR AXLE AT CURB POSITION.
- DH REAR FRAME HEIGHT:
VERTICAL DISTANCE BETWEEN THE NORMAL TOP OF FRAME RAIL AND THE GROUND-LINE THROUGH THE CENTER LINE OF THE REAR AXLE AT DESIGN LOAD.
- DW MINIMUM DISTANCE BETWEEN THE INNER SURFACES OF THE REAR TIRES.
- EW MAXIMUM REAR WIDTH:
OVERALL WIDTH OF THE VEHICLE MEASURED AT THE OUTER MOST SURFACE OF THE REAR TIRES.
- HH REAR TIRE CLEARANCE:
MINIMUM CLEARANCE BETWEEN THE REAR AXLE AND THE GROND-LINE.
- HW DUAL TIRE SPACING:
DISTANCE BETWEEN THE CENTER LINES OF THE TIRES IN A SET OF DUAL TIRES.

- KH TIRE BOUNCE CLEARANCE:
MINIMUM DISTANCE REQUIRED FOR TIRE BOUNCE AS MEASURED FROM THE CENTER LINE OF THE REAR AXLE AND THE TOP OF THE REAR TIRE WHEN ONE WHEEL RIDES OVER A HIGH SPOT.
- CW TRACK DUAL REAR WHEEL VEHICLES:
DISTANCE BETWEEN THE CENTER LINES 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
- CH = TIRE LOADED RADIUS + C
- DH = TIRE LOADED RADIUS + D
- DW = TRACK + 2 TIRE SECTIONS - TIRE CLRARANCE
- EW = TRACK + 2 TIRE SECTIONS + TIRE CLEARANCE
- HH = TIRE LOADED RADIUS - A
- JH = KH - B
- KH = TIRE RADIUS + 3.00 INCHES
- KW = DW - 5.00 INCHES
- LW = 1.00 INCH MINIMUM CLEARANCE BETWEEN TIRES AND SPRINGS

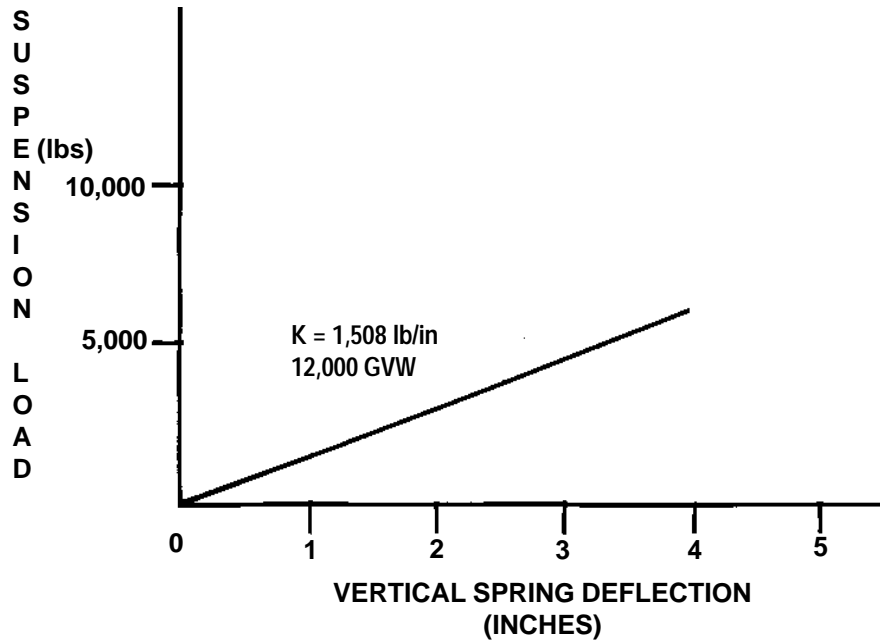
NOTE: TRACK AND OVERALL WIDTH MAY VARY WITH OPTIONAL EQUIPMENT.

Tire	GAWR	Track CW	A	B	C	D	E
215/85R16-E	7950/8760	65.0	6.5	10.6	14.9	13.3	7.8
225/70R 19.5	9880	65	11.6	10.6	14.9	13.0	8.4

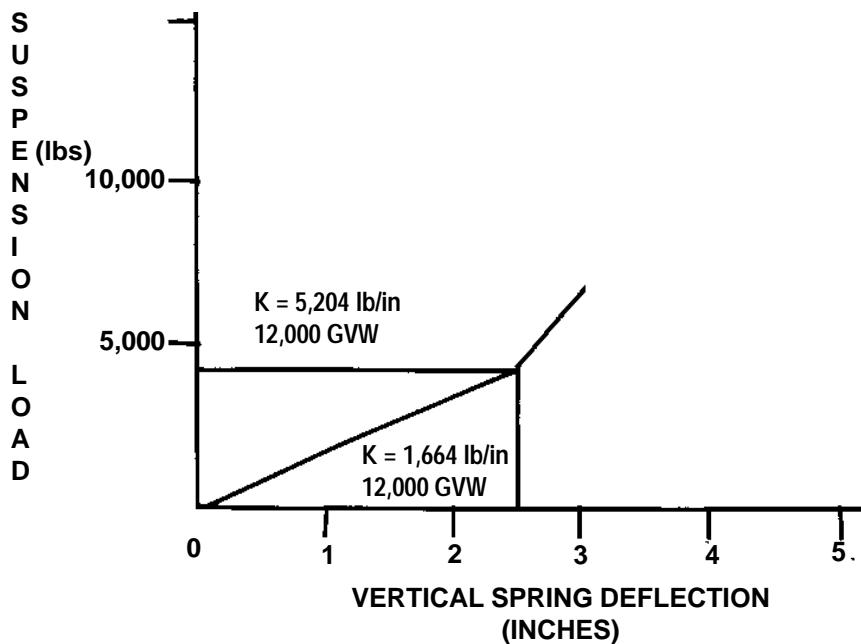
Unit: Inch

SUSPENSION DEFLECTION CHARTS FOR NPR GAS

FRONT LEAF SPRING LOAD VS. DEFLECTION (PER AXLE)

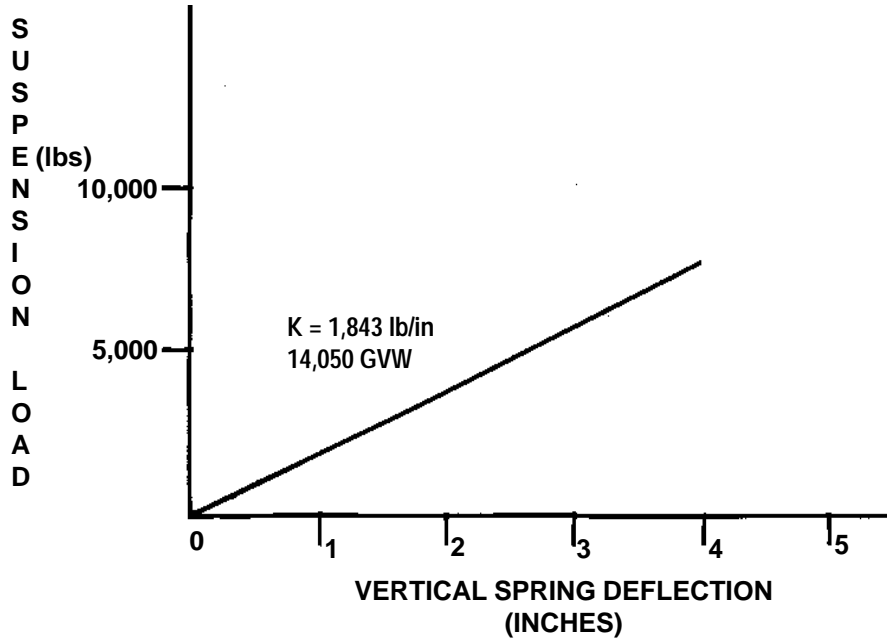


REAR LEAF SPRING LOAD VS. DEFLECTION (PER AXLE)

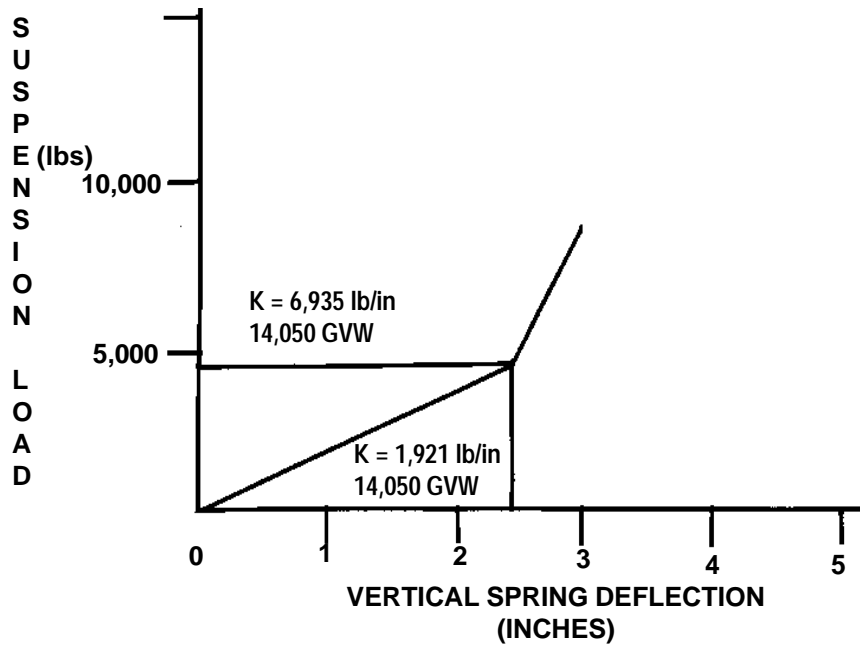


SUSPENSION DEFLECTION CHARTS FOR NPR HD GAS

**FRONT LEAF SPRING LOAD VS. DEFLECTION
(PER AXLE)**



**REAR LEAF SPRING LOAD VS. DEFLECTION
(PER AXLE)**



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	2430	70	2210	70	4860	8840	12,000
225/70R 19.5	3315	85	3115	85	6630	12460	14,050

Unit: Inch

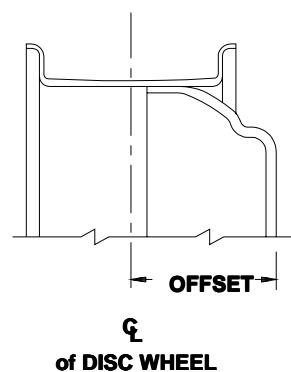
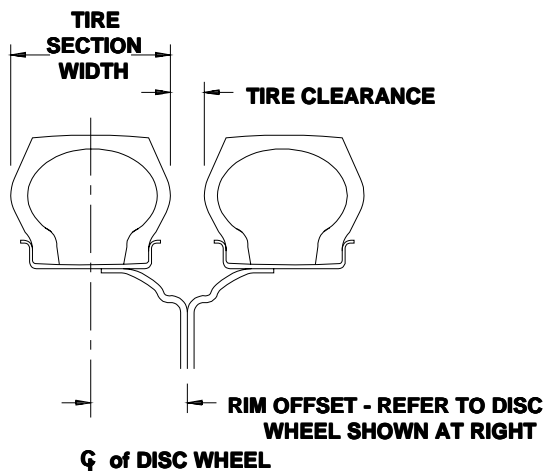
TIRE SIZE	GVWR (lb)	TIRE RADIUS				TIRE SECTION WIDTH	TIRE CLEARANCE	DESIGN RIM WIDTH
		LOADED		UNLOADED				
		FRONT	REAR	FRONT	REAR			
215/85R 16-E	12,000	14.05	14.05	15.21	15.21	8.54	1.46	6.0
225/70R 19.5	14,050	15.00	15.20	15.40	15.80	8.8	1.2	6.0

DISC WHEEL

Unit: Inch

WHEEL SIZE	BOLT HOLES	BOLT CIRCLE DIA	FT/RR NUT SIZE*	REAR STUD SIZE*	NUT/STUD TORQUE SPECS	INNER CIRCLE	OUTSIDE OFFSET	DISC THK	RIM TYPE	MATERIAL MFG.
16x6.00K	6JIS	8.75	1.6142 (41mm) BUD HEX	0.8268 (21mm) SQUARE	289 ft-lb (392 N-M)	6.46	5.0	0.35	5° DC	Steel TOPY
19.5x6.00	6JIS	8.75	1.6142 (41mm) BUD HEX	0.8268 (21mm) SQUARE	325 ft-lb (440 N-M)	6.46	5.0	0.39	5° DC	Steel TOPY

+ O.D. Wrench Sizes



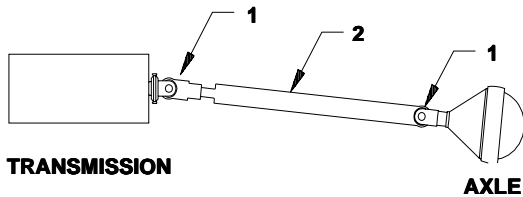
PROPELLER SHAFT

WB	PLANE VIEW	SIDE VIEW
109 in		
132.5 in		
150 in		
176 in		

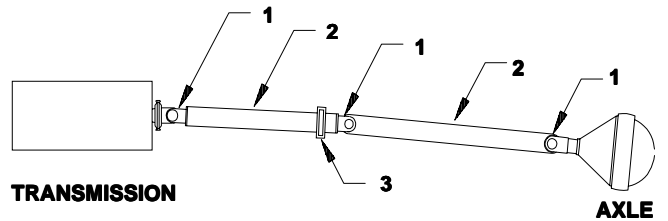
TYPICAL INSTALLATIONS SHOWING YOKES "IN PHASE". "IN PHASE" MEANS THAT THE YOKES AT EITHER END OF A GIVEN PROPELLER SHAFT ASSEMBLY ARE IN THE SAME PLANE.

NPR EFI

(109 in WB)



(132.5 in, 150 in and 176 in WB)



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

WHEEL BASE	PLANE VIEW		SIDE VIEW	
	A A/T	B A/T	C A/T	D A/T
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°

A/T = Automatic Transmission

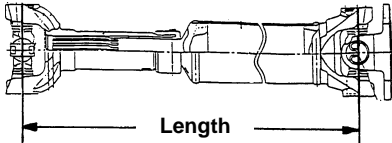
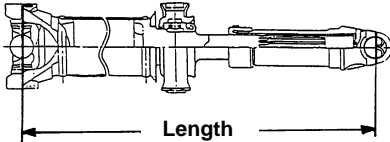
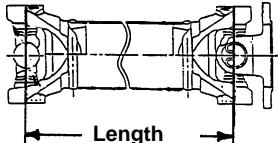
NOTE: ALL DRIVELINE ANGLES ARE AT UNLOADED CONDITION (AT CURB POSITION WITH TYPICAL CARGO BODY).

PROPELLER SHAFT (CONTINUED)

UNIT: INCH

WB	109	132.5	150	176
No. of Shafts	1	2	2	2
Trans. Type	A/T	A/T	A/T	A/T
Shaft #1 O.D.	3.0			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

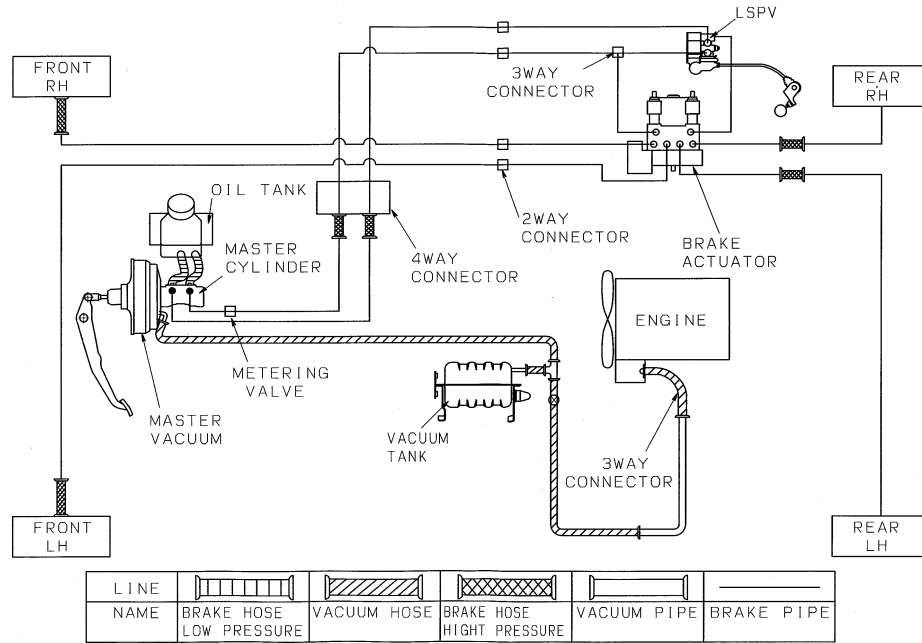
Figure 1.2 NPR/W-SERIES GAS Propshaft Dimensions

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

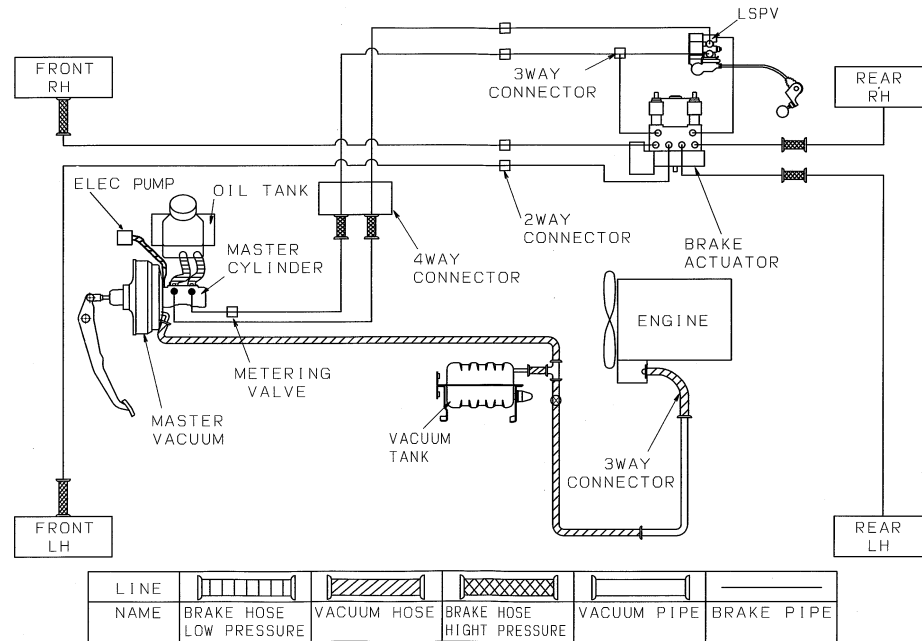
BRAKE SYSTEM DIAGRAM

Vacuum Over Hydraulic

PLEASE REFER TO INTRODUCTION SECTION OF BOOK FOR ANTI-LOCK SYSTEM CAUTIONS AND WHEEL BASE MODIFICATION REQUIREMENTS



NPR/W3500 GAS 12,000 GVW



NPR HD/W4500 GAS 14,500 GVW

THROUGH THE RAIL FUEL FILL

Installation instructions:

Disconnect battery.

Loosen hose from the tie downs.

Remove shipping plate from chassis.

Extend hose out from the driver side of the rail to body rail.

The filler neck must be mounted to allow the fill plate bracket to be parallel to the frame horizontal (see figure 1).

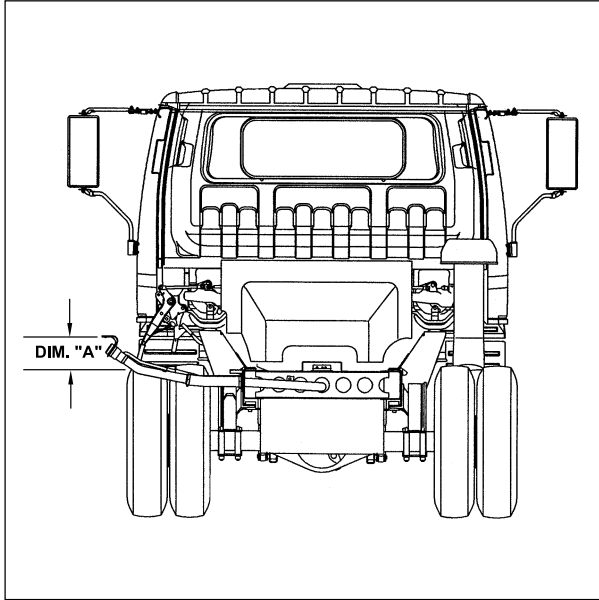
Filler hose is set for 96 inches outside width body.

Filler neck (Dimension A) must be between 6.85 inches and 8.5 inches above frame.

Secure the filler plate to the bottom of the body and check for leaks.

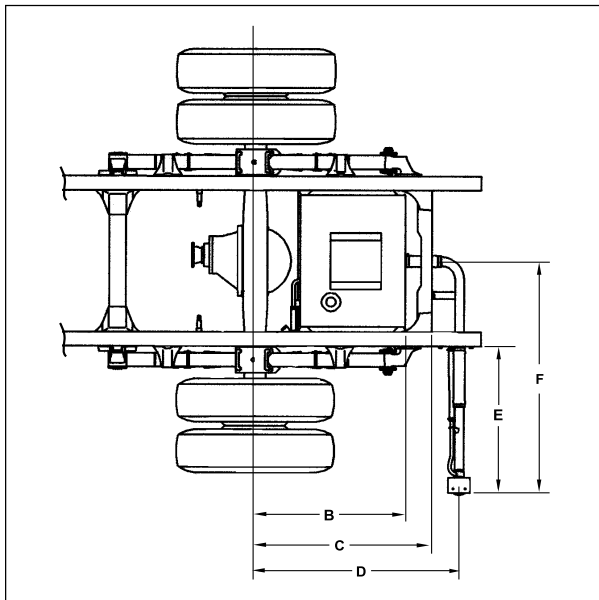
Ensure that fill hose does not sag, creating an area where the fuel could pool in the fill hose.

Reconnect battery.



Rear View Fuel Fill

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



Top View Fuel Fill

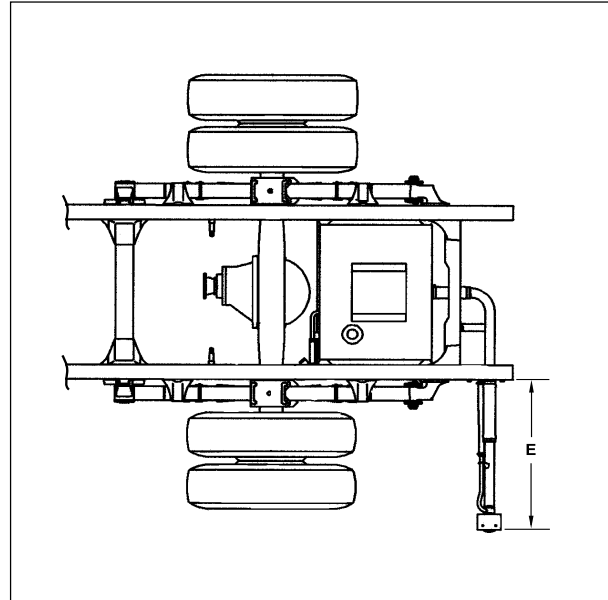
Dimensions:

- B = 28.85 inches (733mm)
- C = 34.00 inches (863mm)
- D = 39.29 inches (998mm)
- E = 46.61 inches (1184mm)
- F = 96.00 inches (2438mm)

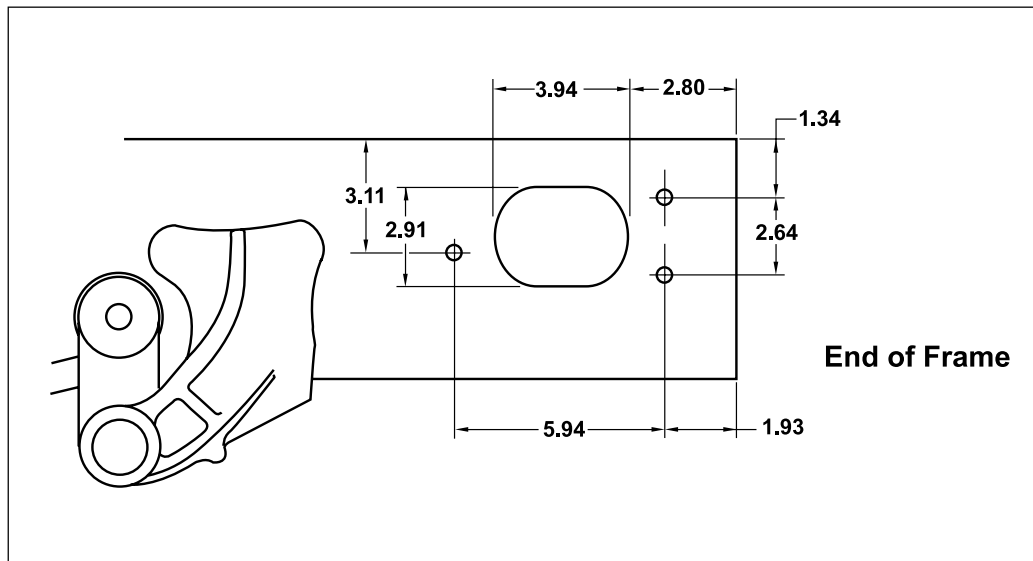
Top View

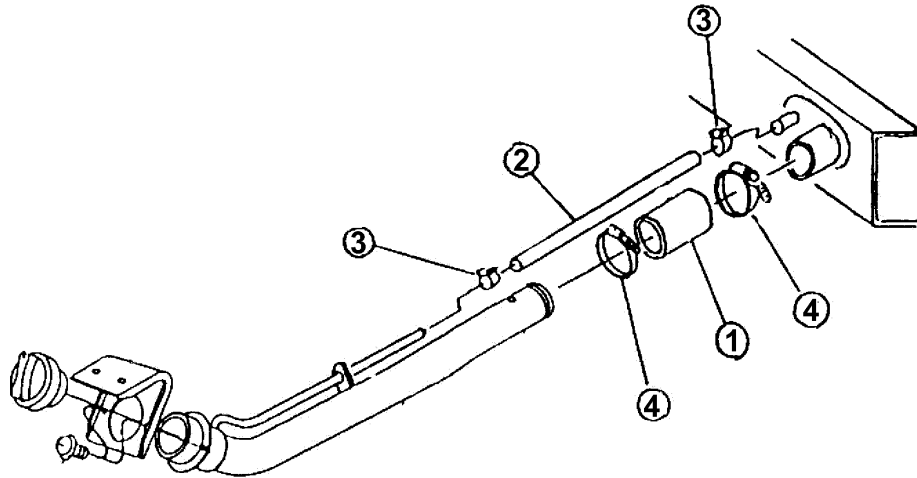
Body Width Adjustment:

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



Through the Rail
Fuel Fill
Frame Hole



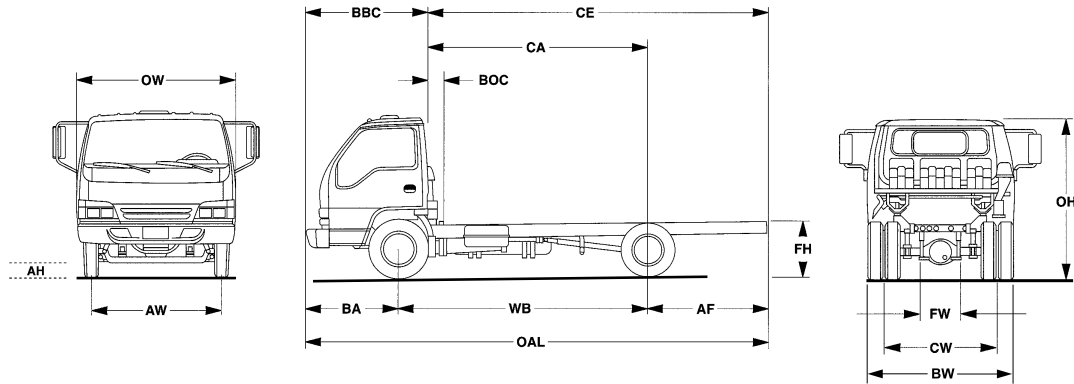


No.	Description	Part Number	Part Number	Qty.
	FEDERAL PARTS	ISUZU	GM	
1	HOSE, FUEL FILLER	897213-6540	897213-6540	1
2	HOSE , BREATHER	897214-2710	897214-2710	1
3	CLIP, RUBBER HOSE	897177-5810	897177-5810	2
4	CLIP, FILLER HOSE	802465-8140	802465-8140	2
	CALIFORNIA PARTS			
1	HOSE, FUEL FILLER	897213-6540	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 NPR HD/W3500 W4500 Diesel

MODEL	NPR Diesel/W3500	NPR HD Diesel/W4500
GVWR	12,000 lb	14,500 lb
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	4HE1-TC/290 CID (4.75 liters)	
HP (Gross)	142 HP/2800 RPM (Manual Transmission)	175 HP/2700 RPM (Automatic Transmission)
Torque (Gross)	275 lb ft torque/1300 RPM	347 lb ft torque/2000 RPM
Equipment	Dry element air cleaner with vertical intake; 2 rows 506 in ² radiator; 6 blade 18.7 in diameter fan with viscous drive. Cold weather starting device and an oil cooler.	
CLUTCH	Single, dry plate, 11.8 in dia, actuated by self adjusting hydraulic master/slave cylinder.	
* TRANSMISSION	MXA5C 5-speed manual, all forward gears synchronized. Fifth gear is direct. 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 20.9:1 ratio. Tilt and telescoping steering column.	
FRONT AXLE	Reverse Elliot "I" -Beam rated at 6,830 lb.	
Suspension	Semi-elliptical steel alloy leaf springs with stabilizer bar and shock absorbers.	
GAWR	4,700 lb	5,360 lb
REAR AXLE	Full floating single speed with hypoid gearing rated at 11,020 lb.	
Suspension	Semi-elliptical steel alloy leaf springs and shock absorbers.	
GAWR	7,950 lb	9,880 lb
WHEELS	16x6.0 6 hole disc wheels, painted white.	
TIRES	215/85R-16E (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-adjust 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. Anti-lock brake system.	
FUEL TANK	30 gal. rectangular steel fuel tank mounted in frame rail behind rear axle. Fuel water seperator mounted on rail.	
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.	
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 cassette stereo radio; PTO; engine block heater; engine oil pan heater; Fuel Tank mounted on right hand rail (33 gal); spare wheel; 6" stainless steel convex mirrors. Power windows and door locks.	
NOTE:	These selected specifications are subject to change without notice. *All Transmissions have a PTO gear in all wheelbases.	

VEHICLE WEIGHTS, DIMENSIONS AND RATINGS



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

In-Frame Tank

12,000 lb GVWR Manual Transmission Model

Chassis Curb and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NA1	109.0 in	lb	3472	1885	5357	6643
NA2	132.5 in	lb	3516	1907	5423	6577
NA3	150.0 in	lb	3560	1929	5489	6511
NA4	176.0 in	lb	3605	1951	5556	6444

In-Frame Tank

14,500 lb GVWR Manual Transmission Model

Chassis Curb and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NE1	109.0 in	lb	3483	1885	5368	9132
NE2	132.5 in	lb	3527	1907	5434	9066
NE3	150.0 in	lb	3571	1929	5500	9000
NE4	176.0 in	lb	3616	1951	5567	8933

In-Frame Tank

12,000 lb GVWR Automatic Transmission Model

Chassis Curb and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NB1	109.0 in	lb	3538	1929	5467	6533
NB2	132.5 in	lb	3582	1951	5533	6467
NB3	150.0 in	lb	3627	1973	5600	6400
NB4	176.0 in	lb	3671	1995	5666	6334

In-Frame Tank

14,500 lb GVWR Automatic Transmission Model

Chassis Curb and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NF1	109.0 in	lb	3549	1929	5478	9022
NF2	132.5 in	lb	3593	1951	5544	8956
NF3	150.0 in	lb	3638	1973	5611	8889
NF4	176.0 in	lb	3682	1995	5677	8823

Side Mounted Tank

12,000 lb GVWR Manual Transmission Model

Chassis Curb and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NA1	109.0 in	lb	3660	1620	5280	6720
NA2	132.5 in	lb	3704	1642	5346	6654
NA3	150.0 in	lb	3748	1664	5412	6588
NA4	176.0 in	lb	3792	1687	5479	6521

Side Mounted Tank

14,500 lb GVWR Manual Transmission Model

Chassis Curb and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NE1	109.0 in	lb	3671	1620	5291	9209
NE2	132.5 in	lb	3715	1642	5357	9143
NE3	150.0 in	lb	3759	1664	5423	9077
NE4	176.0 in	lb	3803	1687	5490	9010

Side Mounted Tank

12,000 lb GVWR Automatic Transmission Model

Chassis Curb and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NB1	109.0 in	lb	3726	1664	5390	6610
NB2	132.5 in	lb	3770	1687	5457	6543
NB3	150.0 in	lb	3814	1709	5523	6477
NB4	176.0 in	lb	3858	1731	5589	6411

Side Mounted Tank

14,500 lb GVWR Automatic Transmission Model

Chassis Curb and Maximum Payload Weights						
Model	WB	Unit	Front	Rear	Total	Payload
NF1	109.0 in	lb	3737	1664	5401	9099
NF2	132.5 in	lb	3781	1687	5468	9032
NF3	150.0 in	lb	3825	1709	5534	8966
NF4	176.0 in	lb	3869	1731	5600	8900

Vehicle Weight Limits:

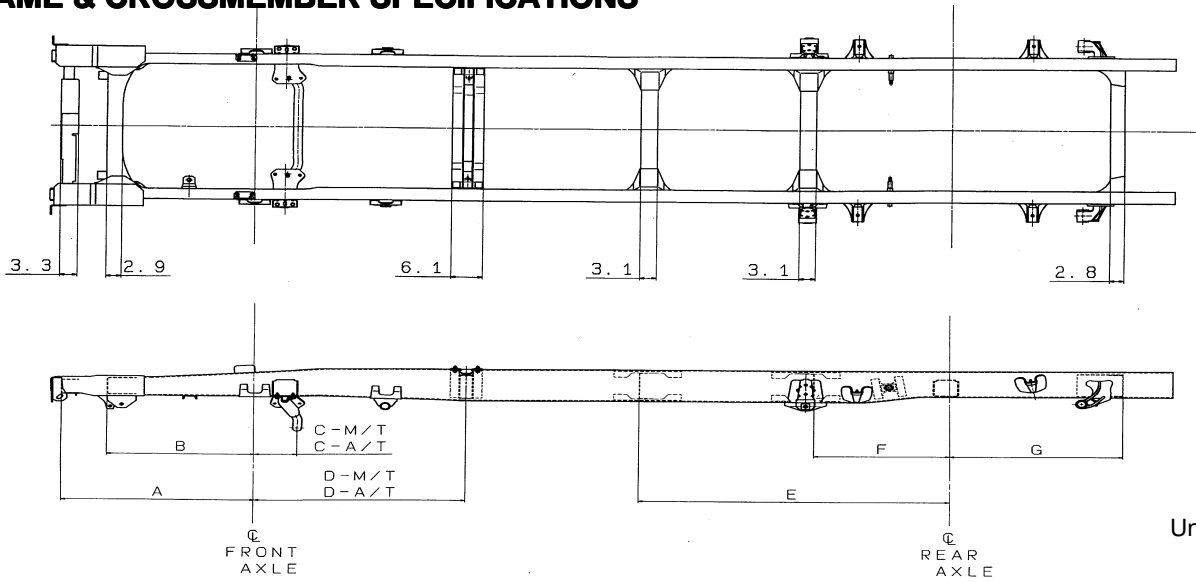
GVWR		
Designed maximum	12,000 lb	14,500 lb
GAWR, Front	4,700 lb	5,360 lb
GAWR, Rear	7,950 lb	9,880 lb

Technical Notes:

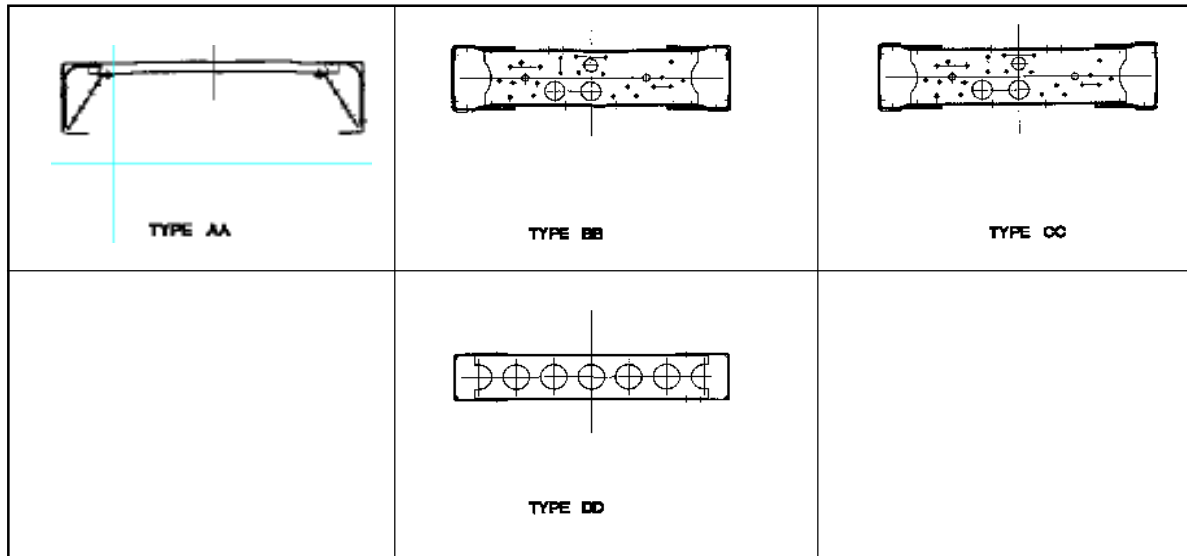
Chassis Curb Weight reflects standard equipment and fuel, but no driver or payload.

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

FRAME & CROSSMEMBER SPECIFICATIONS



Unit: Inch

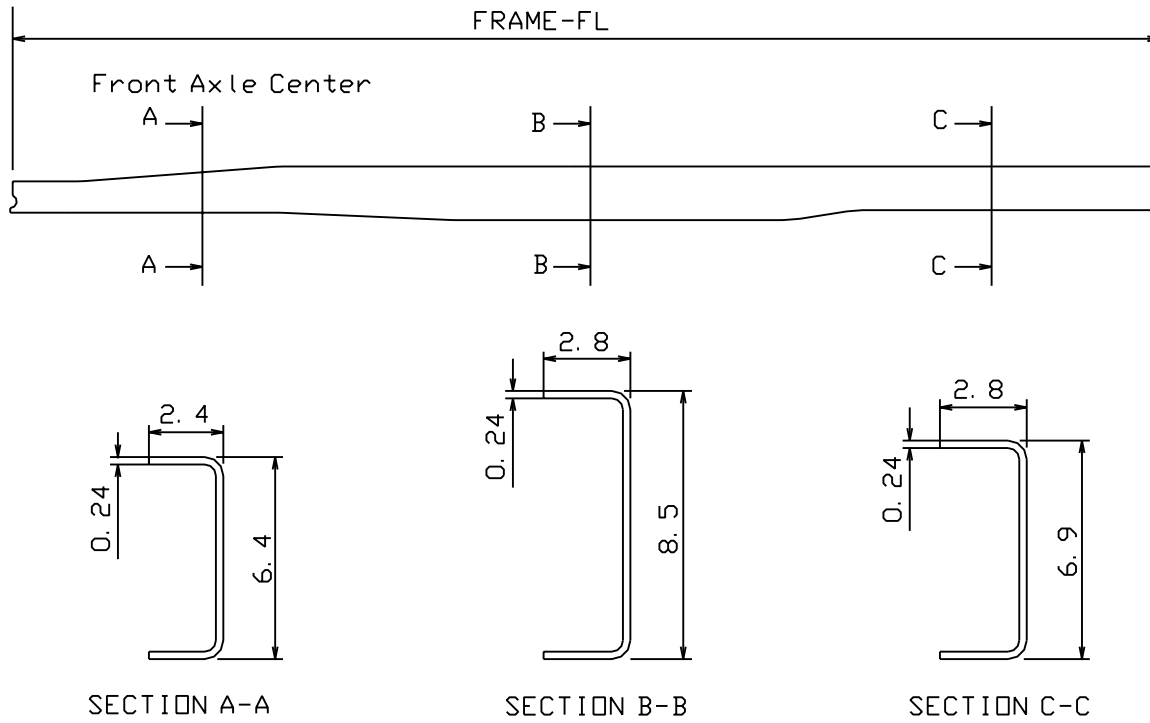


Unit: Inch

Wheel Base	Frame Thick	CROSS MEMBER TYPE/LOCATION								
		A	B	C-M/T	C-A/T	D-M/T	D-A/T	E	F	G
109	0.24	37.0	28.3	8.4	8.4	AA 40.5	AA 44.7	--	CC 26.0	DD 33.0
132.5	0.24	37.0	28.3	8.4	8.4	AA 40.5	AA 44.7	BB 59.4	CC 26.0	DD 33.0
150.0	0.24	37.0	28.3	8.4	8.4	AA 40.5	AA 44.7	BB 59.4	CC 26.0	DD 33.0
176.0	.024	37.0	28.3	8.4	8.4	AA 40.5	AA 44.7	BB 59.4	CC 26.0	DD 33.0

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

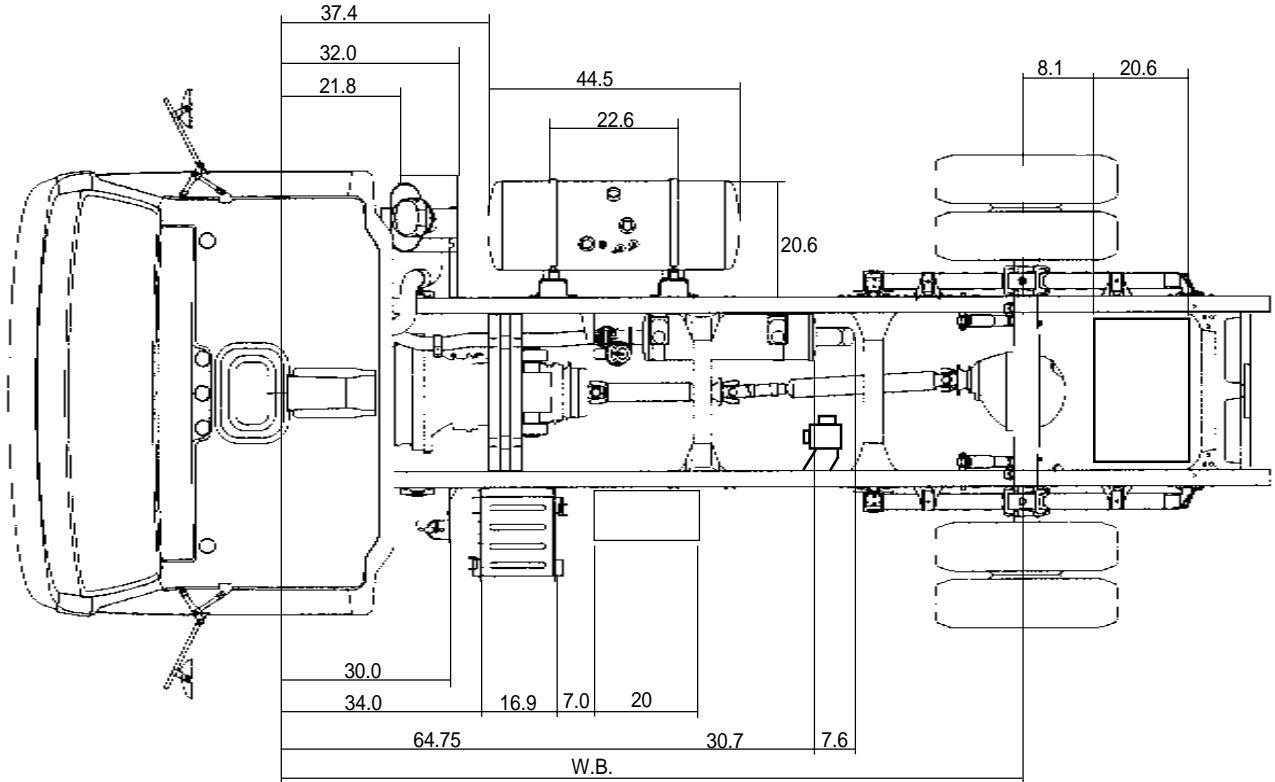
FRAME CHART



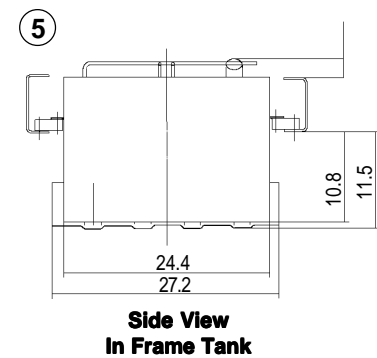
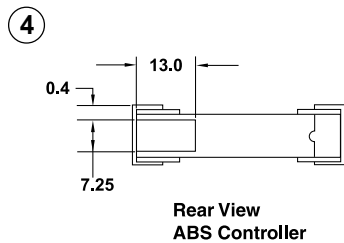
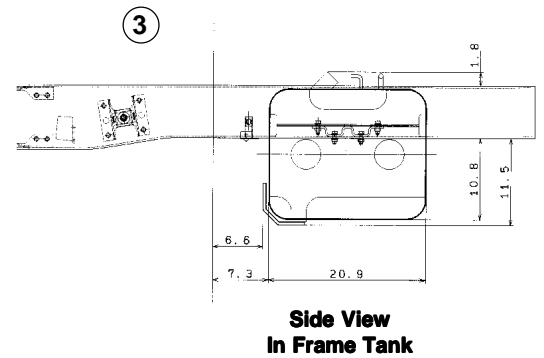
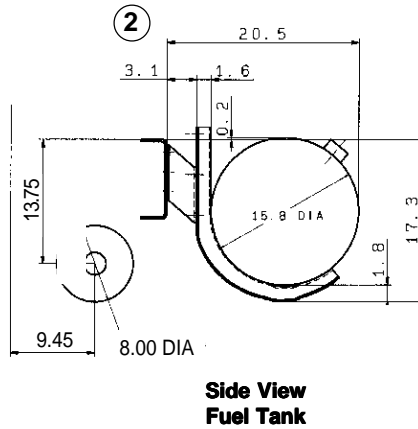
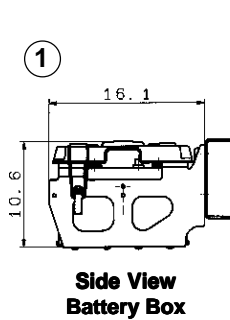
Unit: Inch

WB	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

AUXILIARY VIEWS



Unit: Inch



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.

BODY BUILDER WEIGHT INFORMATION CHART

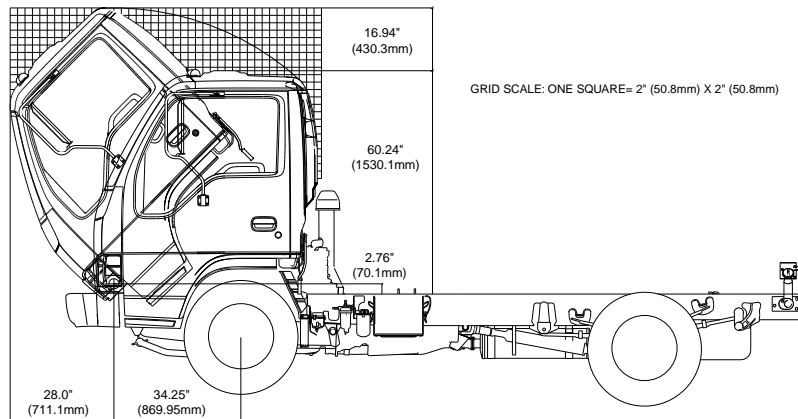
NPR Series

Unit: lb

GVWR	Axle	Wheel Base								Unsprung Weight
		109 in		132.5 in		150 in		176 in		
		M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T	
12,000 ↓	Front	3472	3538	3516	3582	3560	3627	3605	3671	573
	Rear	1885	1929	1907	1951	1929	1973	1951	1995	871
	Total	5357	5467	5423	5533	5489	5600	5556	5666	1444
14,500 ↓	Front	3483	3549	3527	3593	3571	3638	3616	3682	573
	Rear	1885	1929	1907	1951	1929	1973	1951	1995	904
	Total	5368	5478	5434	5544	5500	5611	5567	5677	1477

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

CAB TILT



Unit: Inch

CENTER OF GRAVITY

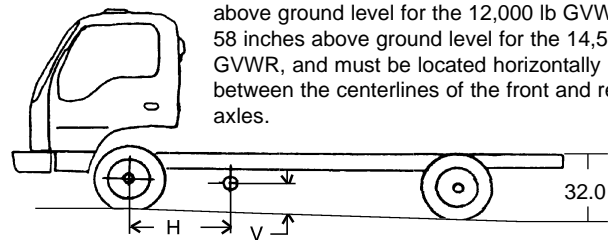
The center of gravity of the chassis-cab.

Unit: Inch

GVWR	WB	V	H	
			M/T	A/T
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

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

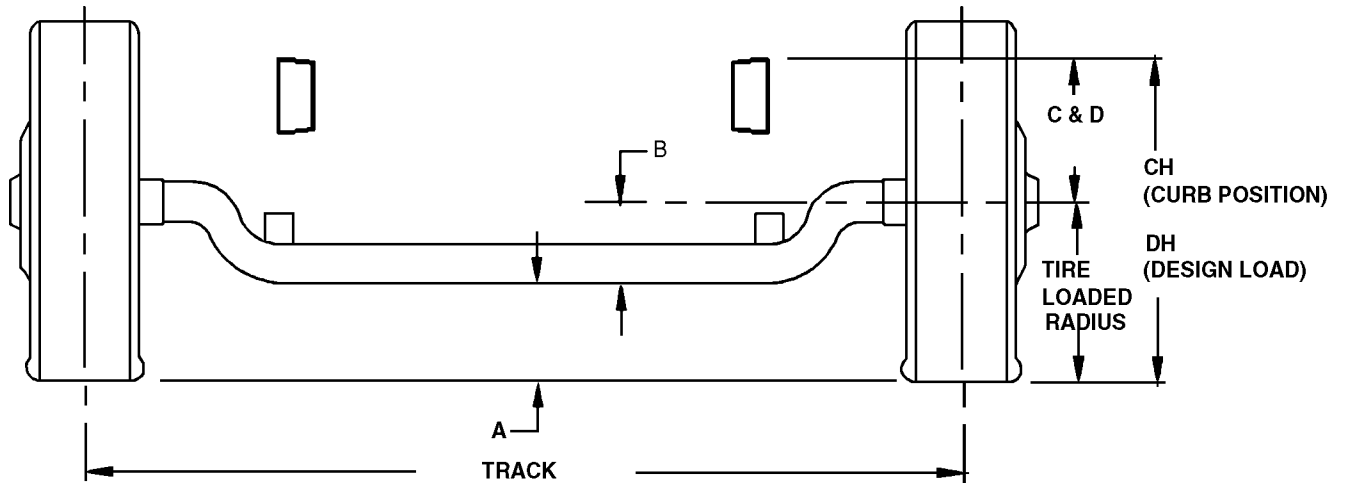
The center of gravity of the completed vehicle with a full load should not exceed 54 inches above ground level for the 12,000 lb GVWR, 58 inches above ground level for the 14,500 GVWR, and must be located horizontally between the centerlines of the front and rear axles.



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

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 GMCT Application Engineering. In the West Coast call 1-562-229-5314 and in the East Coast call 1-404-257-3013.

FRONT AXLE CHART



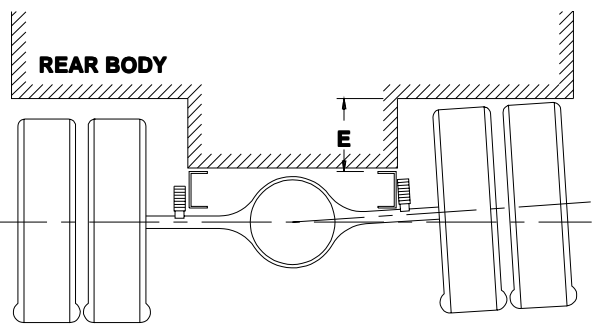
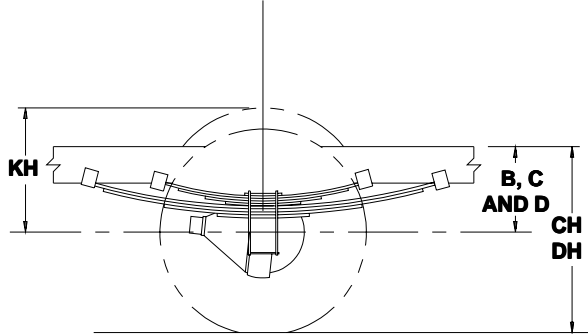
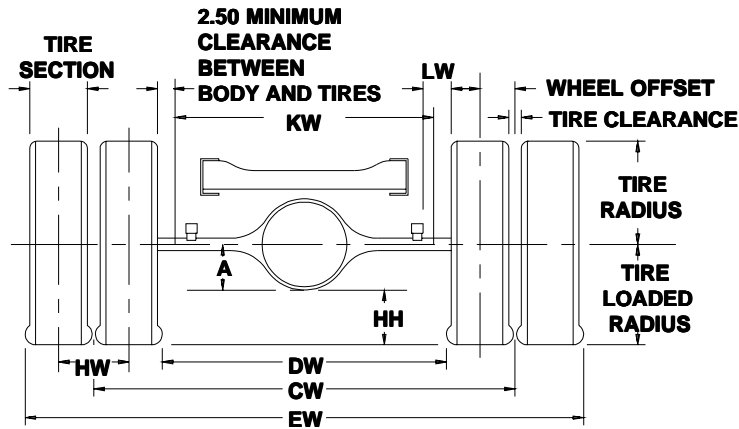
FORMULAS FOR CALCULATING HEIGHT DIMENSIONS

- 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

Unit: Inch

TIRE	GVWR	GAWR	A	B	C	D	CH	DH	TRACK	Tire Radius	
										Unload	Load
215/85R 16-E	12,000 lb	4,700 lb	7.7	6.4	13.0	12.5	27.3	26.6	65.6	14.3	14.1
	14,500 lb	5,360 lb	7.7	6.4	13.0	12.5	27.3	26.6	65.6	14.3	14.1

REAR AXLE CHART



DEFINITIONS

- A CENTER LINE OF AXLE TO BOTTOM OF AXLE BOWL.
- B CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT METAL TO METAL POSITION.
- C CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT CURB POSITION.
- D CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT DESIGN LOAD.
- E REAR TIRE CLEARANCE: MINIMUM CLEARANCE REQUIRED FOR TIRES AND CHAIN MEASURED FROM THE TOP OF THE FRAME AT THE VERTICAL CENTER LINE OF THE REAR AXLE, WHEN REAR WHEELS ON ONE SIDE RIDE OVER A HIGH SPOT.
- CH REAR FRAME HEIGHT: VERTICAL DISTANCE BETWEEN THE NORMAL TOP OF FRAME RAIL AND THE GROUND-LINE THROUGH THE CENTER LINE OF THE REAR AXLE AT CURB POSITION.
- DH REAR FRAME HEIGHT: VERTICAL DISTANCE BETWEEN THE NORMAL TOP OF FRAME RAIL AND THE GROUND-LINE THROUGH THE CENTER LINE OF THE REAR AXLE AT DESIGN LOAD.
- DW MINIMUM DISTANCE BETWEEN THE INNER SURFACES OF THE REAR TIRES.
- EW MAXIMUM REAR WIDTH: OVERALL WIDTH OF THE VEHICLE MEASURED AT THE OUTER MOST SURFACE OF THE REAR TIRES.
- HH REAR TIRE CLEARANCE: MINIMUM CLEARANCE BETWEEN THE REAR AXLE AND THE GROND-LINE.

- HW DUAL TIRE SPACING: DISTANCE BETWEEN THE CENTER LINES OF THE MINIMUM DISTANCE REQUIRED FOR TIRE BOUNCE AS MEASURED FROM THE CENTER LINE OF THE REAR AXLE AND THE TOP OF THE REAR TIRE WHEN ONE WHEEL RIDES OVER A HIGH SPOT.
- CW TRACK DUAL REAR WHEEL VEHICLES: DISTANCE BETWEEN THE CENTER LINES 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
- CH = TIRE LOADED RADIUS + C
- DH = TIRE LOADED RADIUS + D
- DW = TRACK + 2 TIRE SECTIONS - TIRE CLARANCE
- EW = TRACK + 2 TIRE SECTIONS + TIRE CLEARANCE
- HH = TIRE LOADED RADIUS - A
- JH = KH - B
- KH = TIRE RADIUS + 3.00 INCHES
- KW = DW - 5.00 INCHES
- LW = 1.00 INCH MINIMUM CLEARANCE BETWEEN TIRES AND SPRINGS

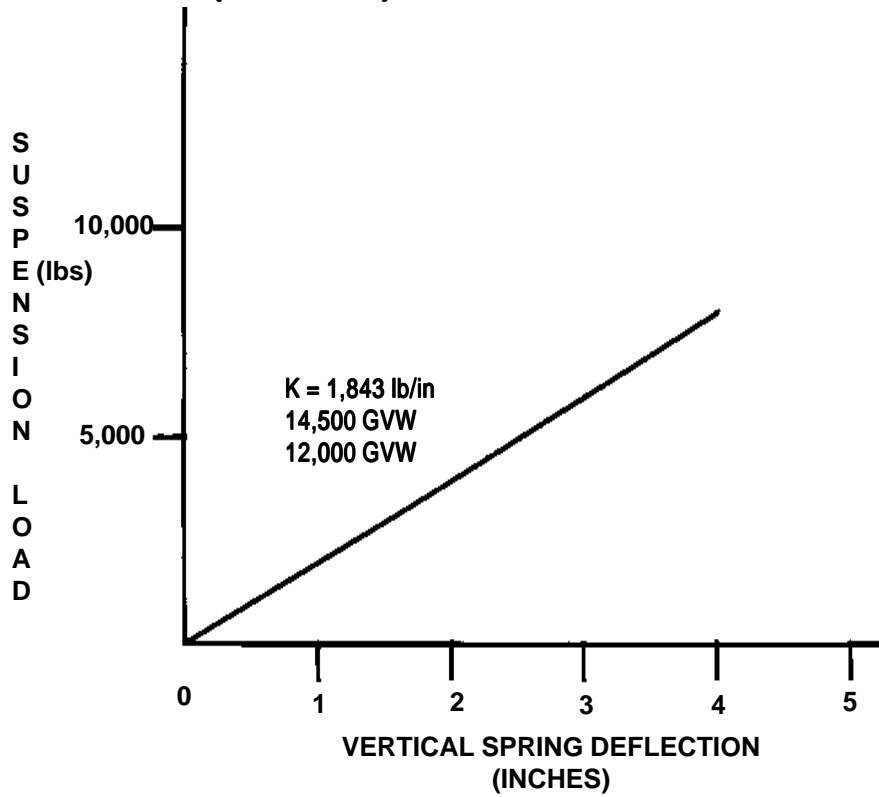
NOTE: TRACK AND OVERALL WIDTH MAY VARY WITH OPTIONAL EQUIPMENT.

Unit: Inch

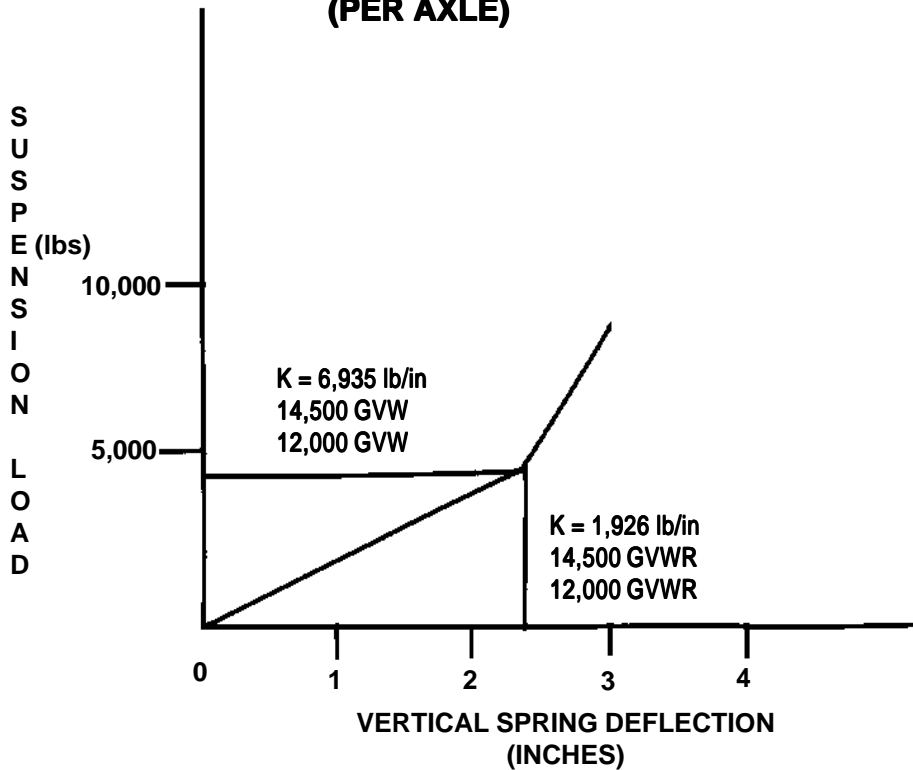
Tire	GAWR	Track CW	A	B	C	D	E
215/85R16-E	7950/9880 lb	65.0	10.6	10.6	14.9	13.3	7.8

SUSPENSION DEFLECTION CHARTS

**FRONT LEAF SPRING LOAD VS. DEFLECTION
(PER AXLE)**



**REAR LEAF SPRING LOAD VS. DEFLECTION
(PER AXLE)**



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	2430	70	2210	70	4860	8840	12,000
215/85R 16-E	2680	80	2470	80	5360	9880	14,500

Unit: Inch

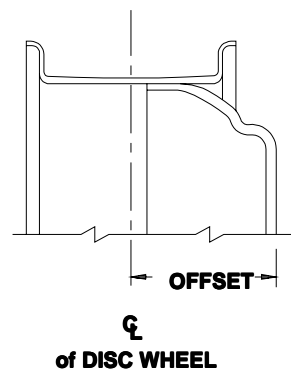
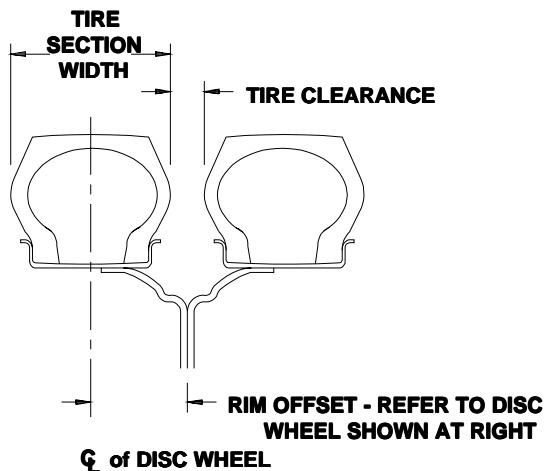
TIRE SIZE	GVWR (lb)	TIRE RADIUS				TIRE SECTION WIDTH	TIRE CLEARANCE	DESIGN RIM WIDTH
		LOADED		UNLOADED				
		FRONT	REAR	FRONT	REAR			
215/85R 16-E	12,000	14.1	14.1	14.3	14.7	8.2	1.8	6.0
215/85R 16-E	14,500	14.1	14.1	14.3	14.7	8.2	1.8	6.0

DISC WHEEL

Unit: Inch

WHEEL SIZE	BOLT HOLES	BOLT CIRCLE DIA	FT/RR NUT SIZE*	REAR STUD SIZE*	NUT/STUD TORQUE SPECS.	INNER CIRCLE	OUTSIDE OFFSET	DISC THK	RIM TYPE	MATERIAL MFG.
16x6.00K	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	0.35	5° DC	Steel TOPY

*O.D. Wrench Sizes

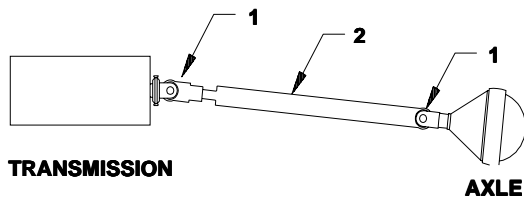


PROPELLER SHAFT

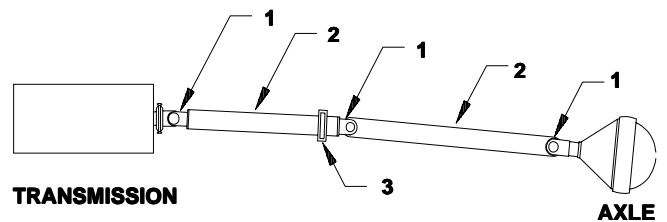
WB	PLANE VIEW	SIDE VIEW
109 in		
132.5 in		
150 in		
176 in		

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.

(109 in WB)



(132.5 in, 150 and 176 in WB)



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

WHEEL BASE	PLANE VIEW				SIDE VIEW			
	A M/T	A A/T	B M/T	B A/T	C M/T	C A/T	D M/T	D A/T
109 in	--	--	2.0°	2.3°	--	--	8.3°	--
132.5 in	0°	0°	2.4°	2.4°	4.4°	5°	6.2°	6.1°
150 in	0°	0°	2.4°	2.4°	2.5°	2.6°	6.4°	6.4°
176 in	0°	0°	1.7°	1.7°	2.8°	2.8°	4.5°	4.5°

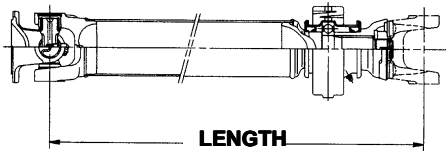
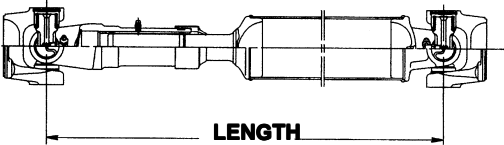
M/T = Manual Transmission
A/T = Automatic Transmission

NOTE: ALL DRIVELINE ANGLES ARE AT UNLOADED CONDITION (CURB POSITION WITH TYPICAL CARGO BODY).

PROPELLER SHAFT (CONTINUED)

WB	109		132.5		150		176	
No. of Shafts	1		2		2		2	
Trans. Type	5M/T	4A/T	5M/T	4A/T	5M/T	4A/T	5M/T	4A/T
Shaft #1 O.D.	3.25							
Thickness	0.091							
Length	44.5	39.1	29.7	24.3	47.4	41.9	59.1	53.7
Type	B	B	A	A	A	A	A	A
Shaft #2 O.D.	3.25							
Thickness	0.091							
Length	N/A	N/A	38.3	38.3	38.3	38.3	52.6	52.6
Type	N/A	N/A	B	B	B	B	B	B

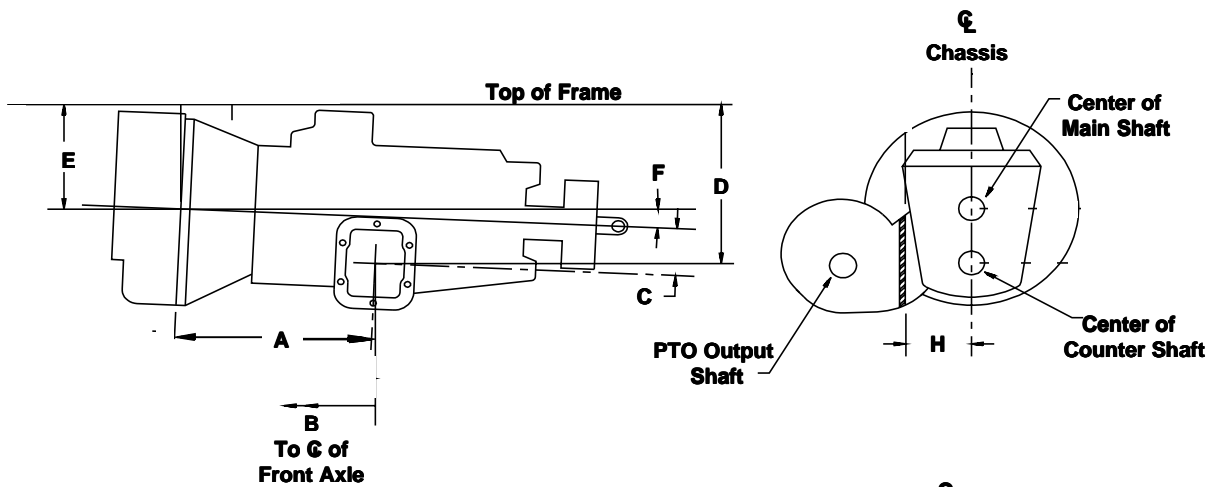
UNIT: INCH

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

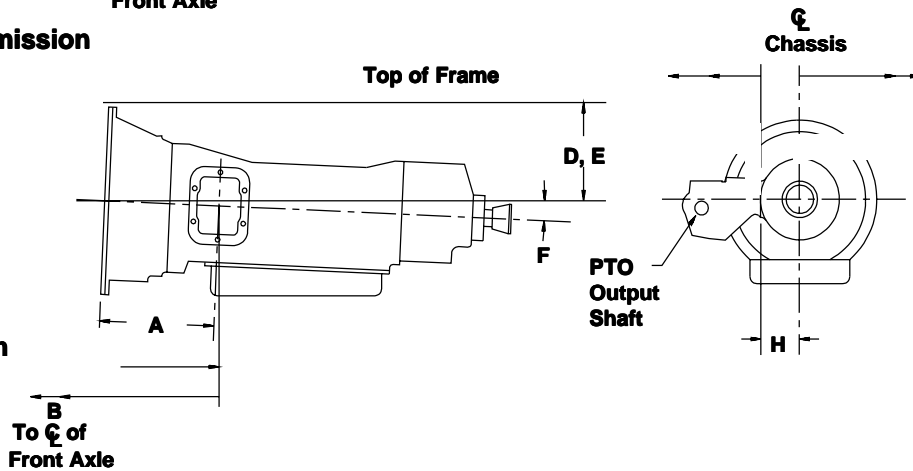
M/T = Manual Transmission
A/T = Automatic Transmission

PTO LOCATION, DRIVE GEAR AND OPENING INFORMATION

Manual Transmission



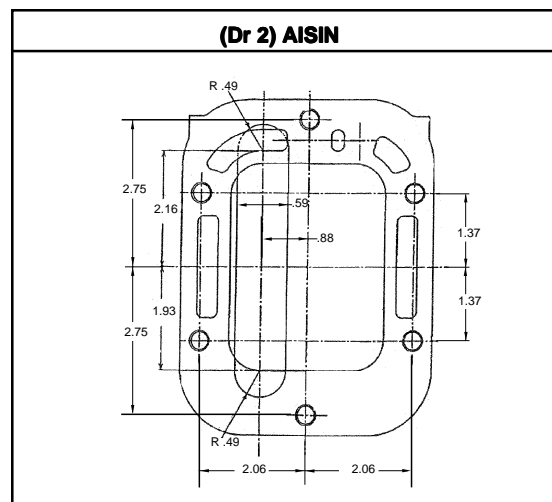
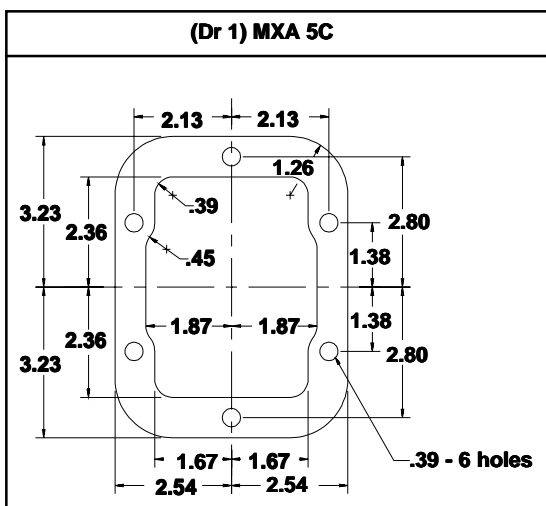
Automatic Transmission



Opening Diagram

Unit: Inch

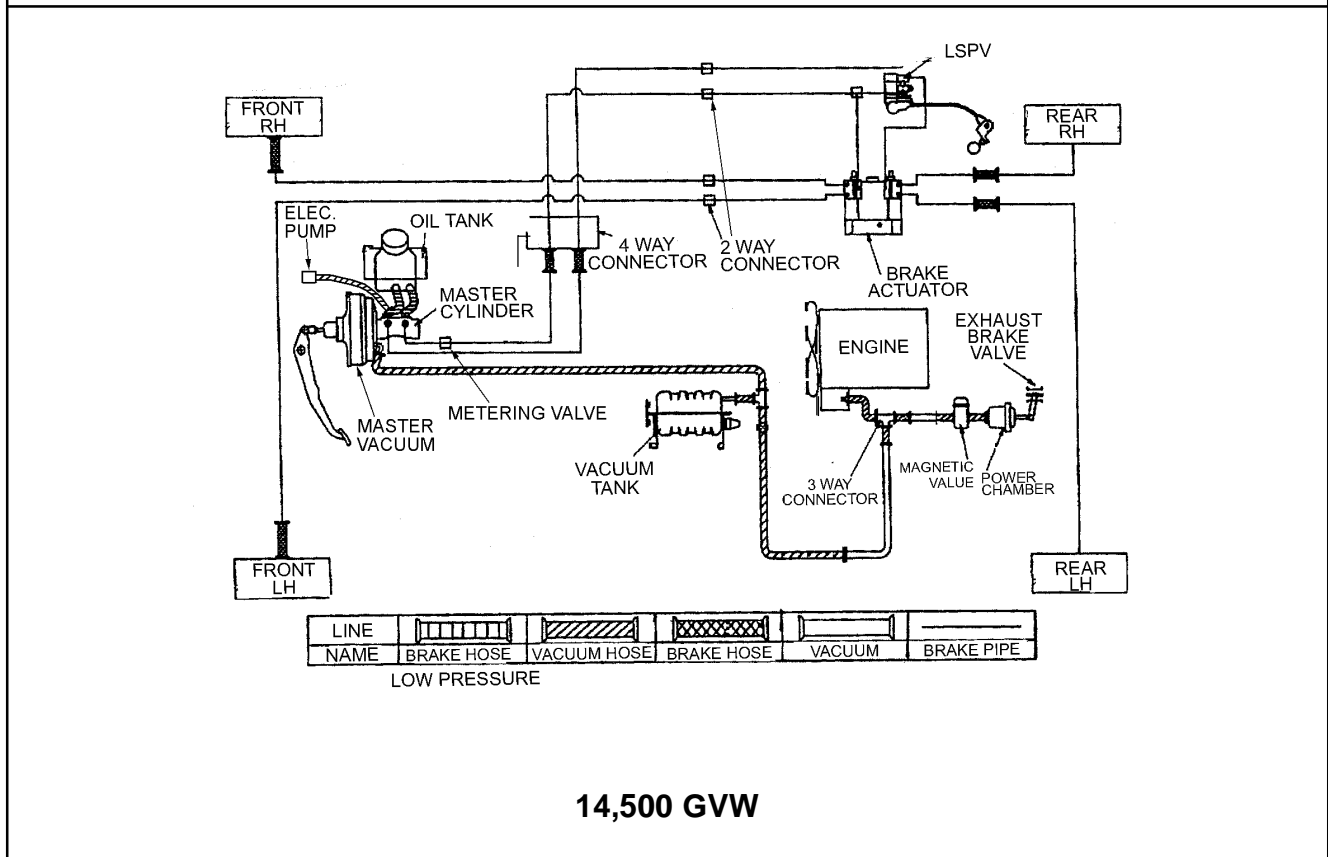
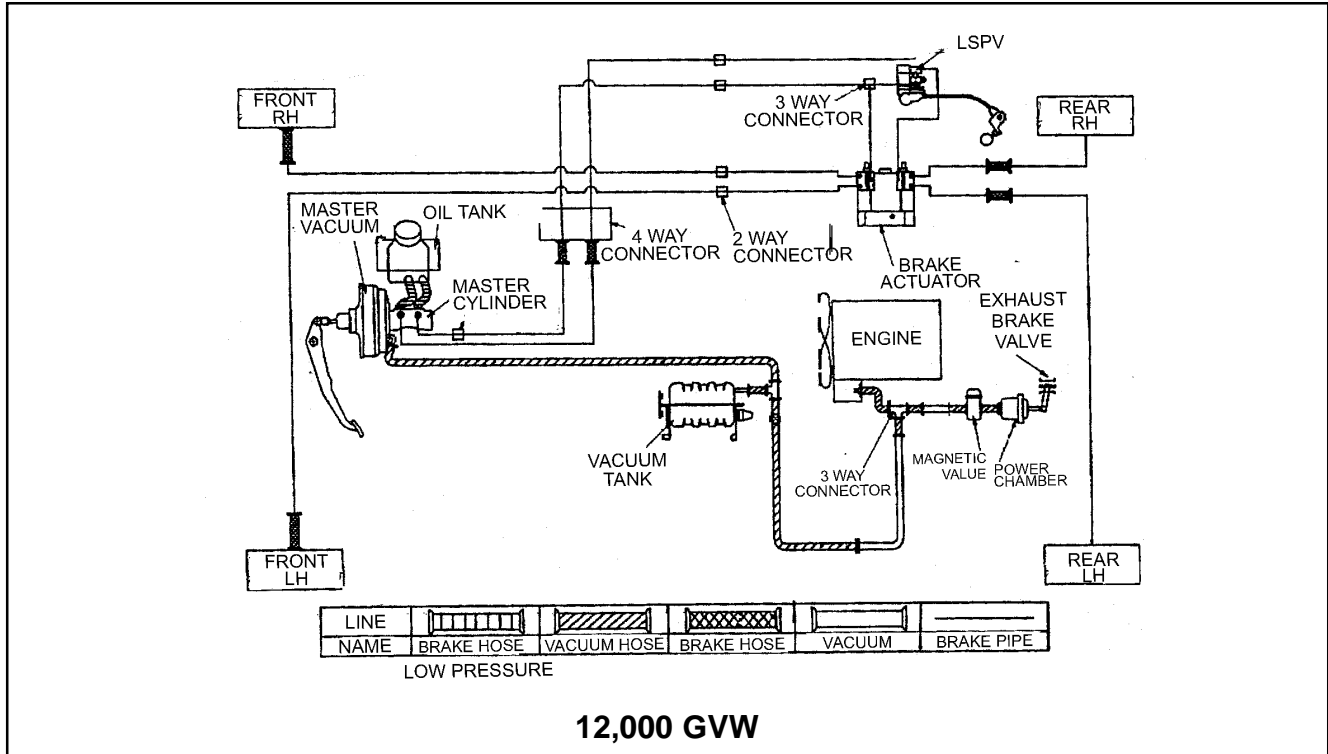
Transmission	Opening Location	Bolt Pattern	A	B	C	D	E	F	H	PTO Drive Gear Location	Ratio of PTO Drv Gear Spd to Eng Spd	Number of Teeth	Pitch	Helix Angle	Maximum Output Torque
MXA 5C	Left	(Dr 1)	13.2	39	3.4	11.2	7.1	2.5°	4.1	2nd Gear Trans Countershaft	25/49=.51	20	3.175	15°	145 lb-ft @ 1000 RPM
Aisin 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 lb-ft @ 1000 RPM



BRAKE SYSTEM DIAGRAM

Vacuum Over Hydraulic

PLEASE REFER TO INTRODUCTION SECTION OF BOOK FOR ANTI-LOCK SYSTEM CAUTIONS AND WHEEL BASE MODIFICATION REQUIREMENTS



IN FRAME DIESEL FUEL FILL

Installation instructions:

Disconnect battery.

Loosen hose from the tie downs. Remove caps from plate on rail.

Install hoses on to the plate.

Extend hose out from the driver side of the rail to body rail.

The filler neck must be mounted to allow the fill plate bracket to be parallel to the frame horizontal (see Figure 4).

Cover with protector wrap and secure with tie wraps.

Filler hose is set for 96 inches outside width body.

Filler neck (dimension A) must be between 6.85 inches and 8.5 inches above frame.

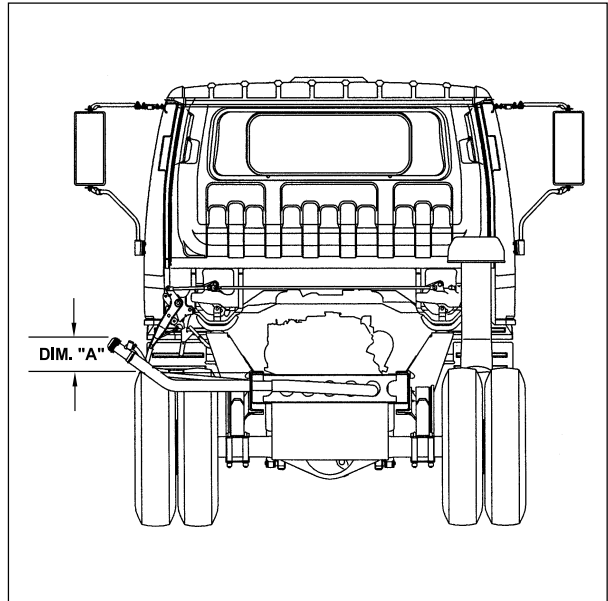
Secure the filler plate to the bottom of the body and check for leaks.

Ensure that fill hose does not sag, creating an area where the fuel could pool in the fill hose.

Reconnect battery.

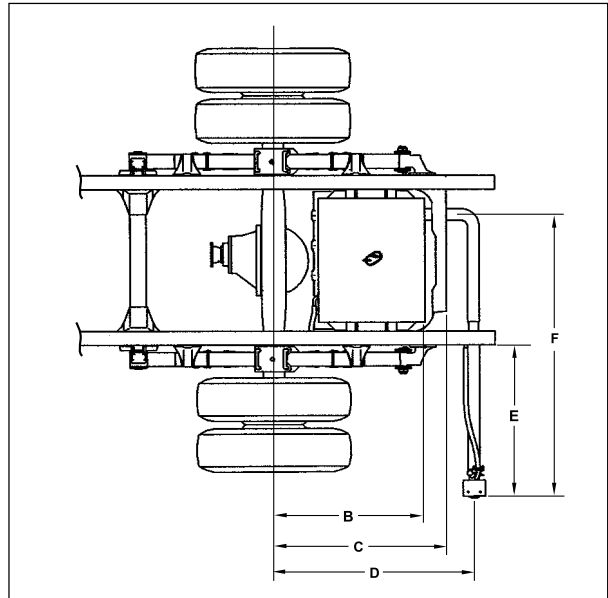
Rear View Fuel Fill

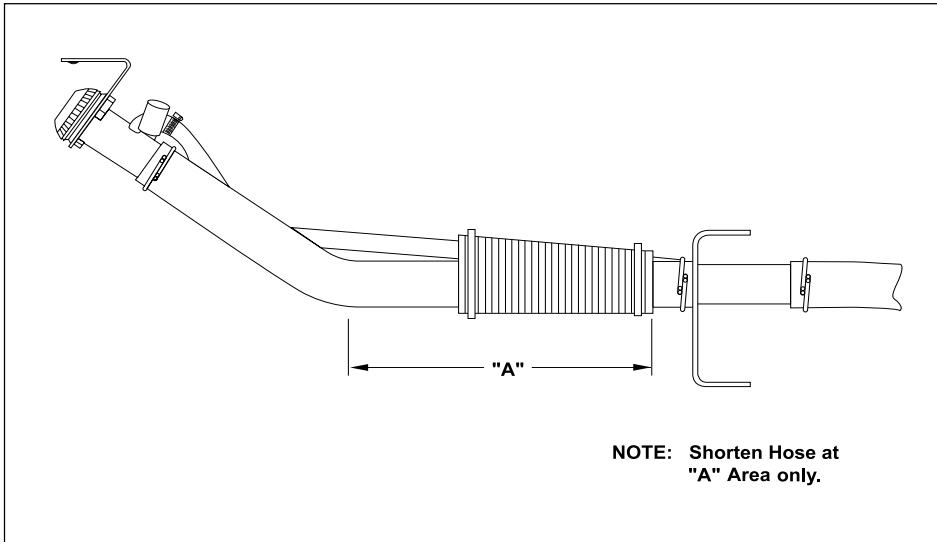
Dimension A = 6.85 - 8.50 (174-216mm)



Top View Fuel Fill

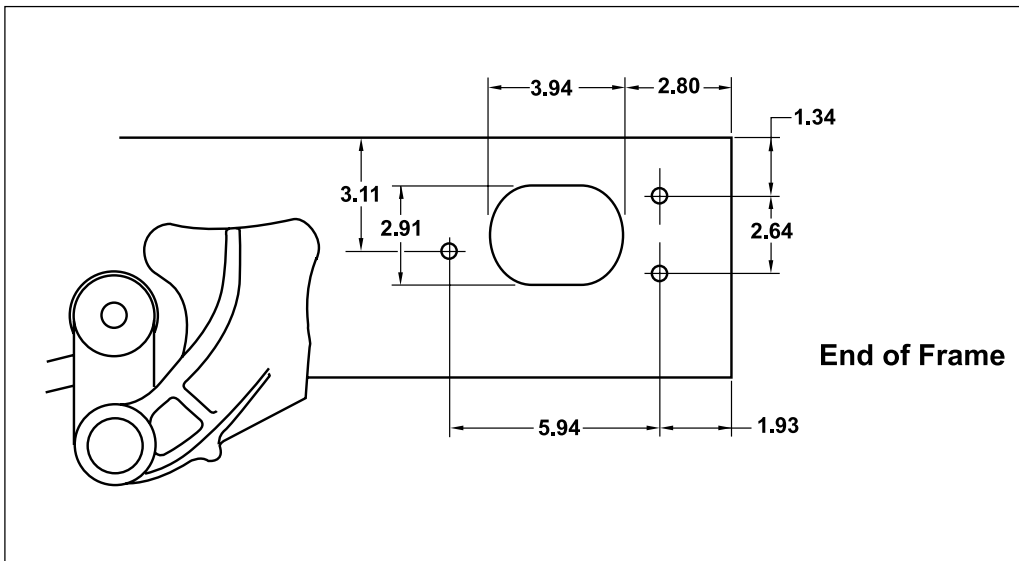
Dimensions:
B = 29.75 in (756mm)
C = 34.00 in (863mm)
D = 39.29 in (998mm)
E = 30.86 in (784mm)
F = 56.6 in (1438mm)





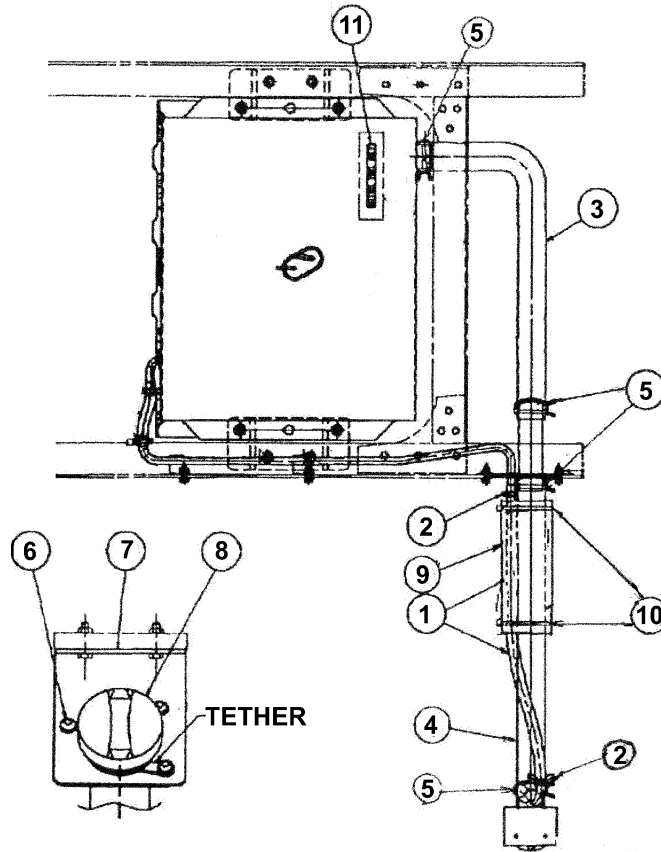
Hose Modification for Various Width Bodies

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



Through the Rail
Fuel Fill
Frame Hole

FUEL FILL



No.	Description	Isuzu P/N	GM P/N	Qty.
1	BREATHER HOSE	897206-0420	-	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	-	3
7	BRACKET, FILLER NECK	897116-621Y	97116621	1
8	CAP, FILLER	897118-7020	-	1
9	PROTECTOR	897114-0630	97114063	1
10	CLIP	109707-1070	94062296	2
11	CAUTION PLATE	894414-3530	94414353	1

NQR/W5500 Diesel

MODEL	NQR/W5500
GVWR	17,950 lb
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	4HE1-TC/290 CID (4.75 liters)
HP (Gross)	175 HP/2700 RPM
Torque (Gross)	347 lb ft torque/2000 RPM
Equipment	Dry element air cleaner with vertical intake; 2 rows 506 in ² radiator; 6 blade 18.7 in diameter fan with viscous drive. Cold weather starting device and an oil cooler.
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 20.9:1 ratio. Tilt and telescoping steering column.
FRONT AXLE	Reverse Elliot "I" -Beam rated at 6,830 lb.
Suspension	Semi-elliptical steel alloy leaf springs with stabilizer bar and shock absorbers.
GAWR	6,830 lb
REAR AXLE	Full floating single speed with hypoid gearing rated at 14,550 lb.
Suspension	Semi-elliptical steel alloy leaf springs and shock absorbers.
GAWR	12,980 lb
WHEELS	19.5x6.0 6 hole disc wheels, painted white.
TIRES	225/70R-19.5F(12 pr) tubeless steel belted radials, highway 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-adjust 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. Antilock brake system.
FUEL TANK	30-gal. rectangular steel fuel tank mounted in frame rail behind rear axle. Fuel water separator mounted on rail.
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.
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 cassette stereo radio; PTO; engine block heater; engine oil pan heater; heated fuel/water separator; spare wheel; 6" stainless steel convex mirrors. Auxillary transmission oil cooler, mandatory for 20,950 GCWR. Power Windows and door Locks. 33-gal. fuel tank mounted on right hand rail, in place of 30-gal. in frame tank.
NOTE:	These selected specifications are subject to change without notice.

VEHICLE WEIGHTS, DIMENSIONS AND RATINGS

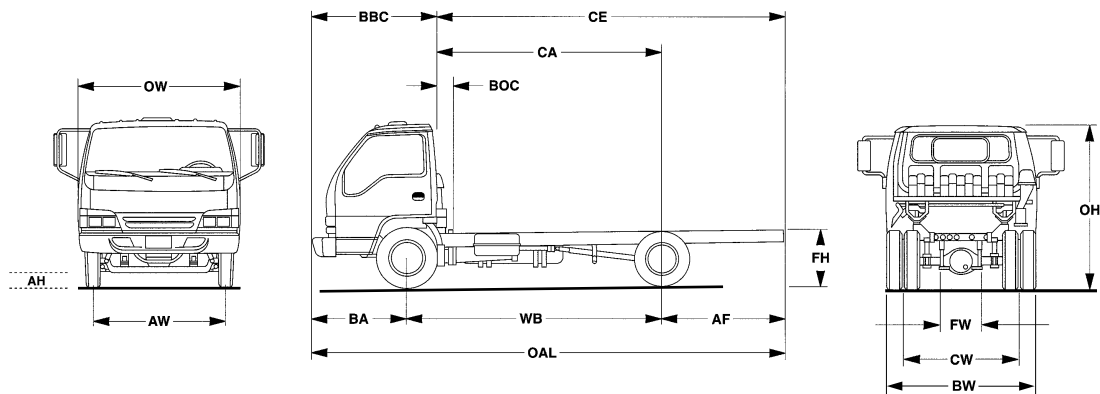


Figure 2.1 NQR/W Series Diesel Cab Chassis Dimensions

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
AH	8.6	BW	83.3
AW	65.6	CW	65.0
BA	47.4	FW	33.5
BBC	68.0	OH	88.1
BOC	9.25	OW	78.5
		FH	32.8

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	3704	2304	6008	11942
NQ2	132.5 in	lb	3748	2326	6074	11876
NQ3	150.0 in	lb	3781	2359	6140	11810
NQ4	176.0 in	lb	3825	2381	6206	11744

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	3737	2326	6063	11887
NR2	132.5 in	lb	3781	2348	6129	11821
NR3	150.0 in	lb	3825	2370	6195	11755
NR4	176.0 in	lb	3869	2392	6261	11689

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	3891	2039	5930	12020
NQ2	132.5 in	lb	3935	2061	5996	11954
NQ3	150.0 in	lb	3968	2094	6062	11888
NQ4	176.0 in	lb	4012	2116	6128	11822

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	3924	2061	5985	11965
NR2	132.5 in	lb	3968	2083	6051	11899
NR3	150.0 in	lb	4012	2105	6117	11833
NR4	176.0 in	lb	4056	2127	6183	11767

Vehicle Weight Limits:

GVWR

Designed maximum 17,950 lb

GAWR, Front 6,830 lb

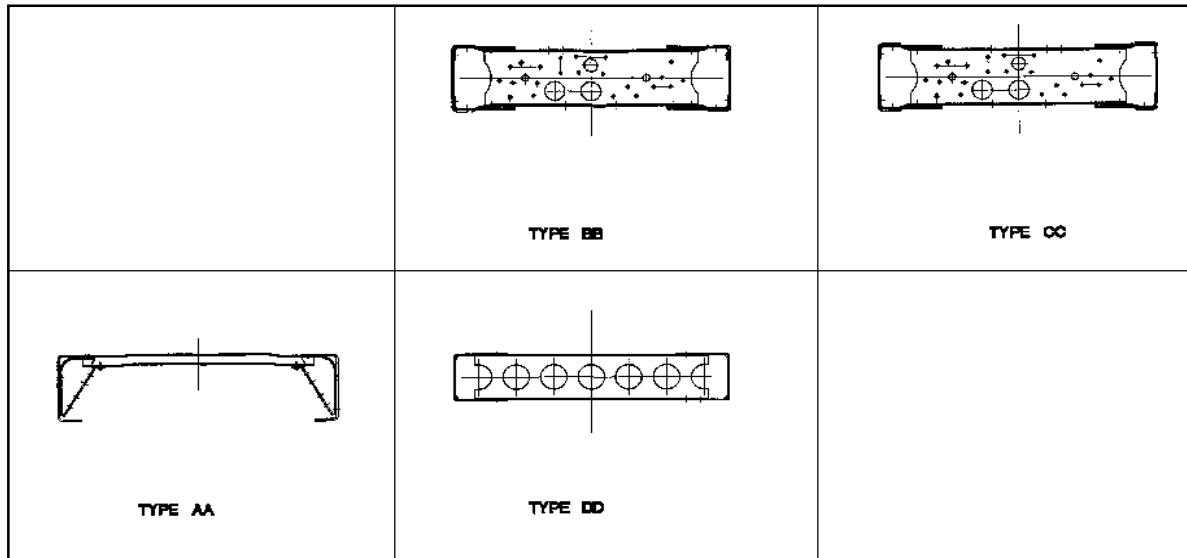
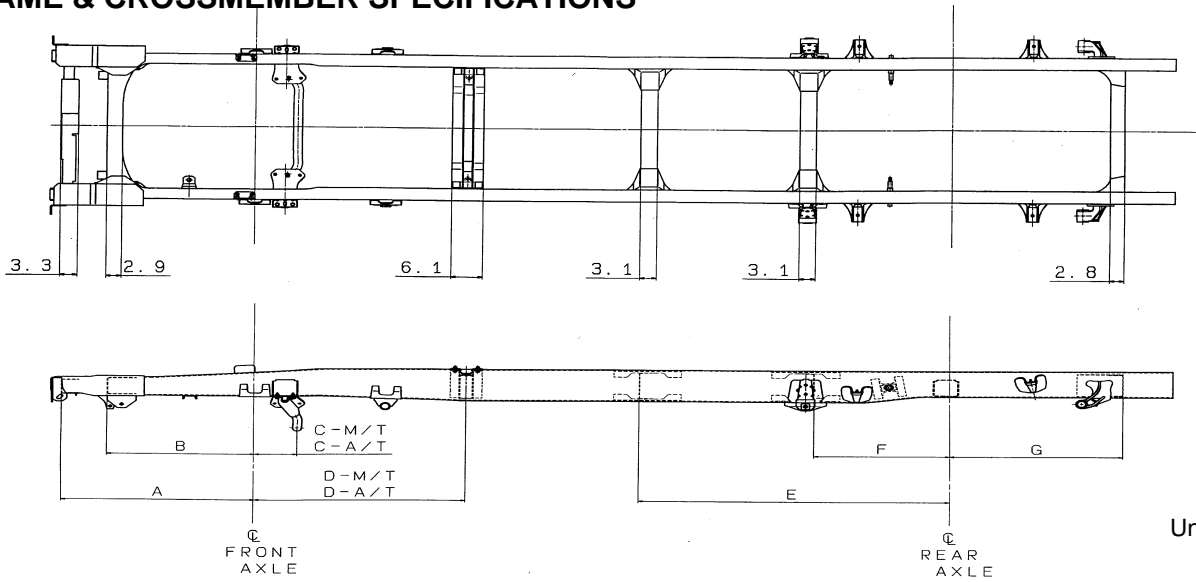
GAWR, Rear 12,980 lb

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.

FRAME & CROSSMEMBER SPECIFICATIONS

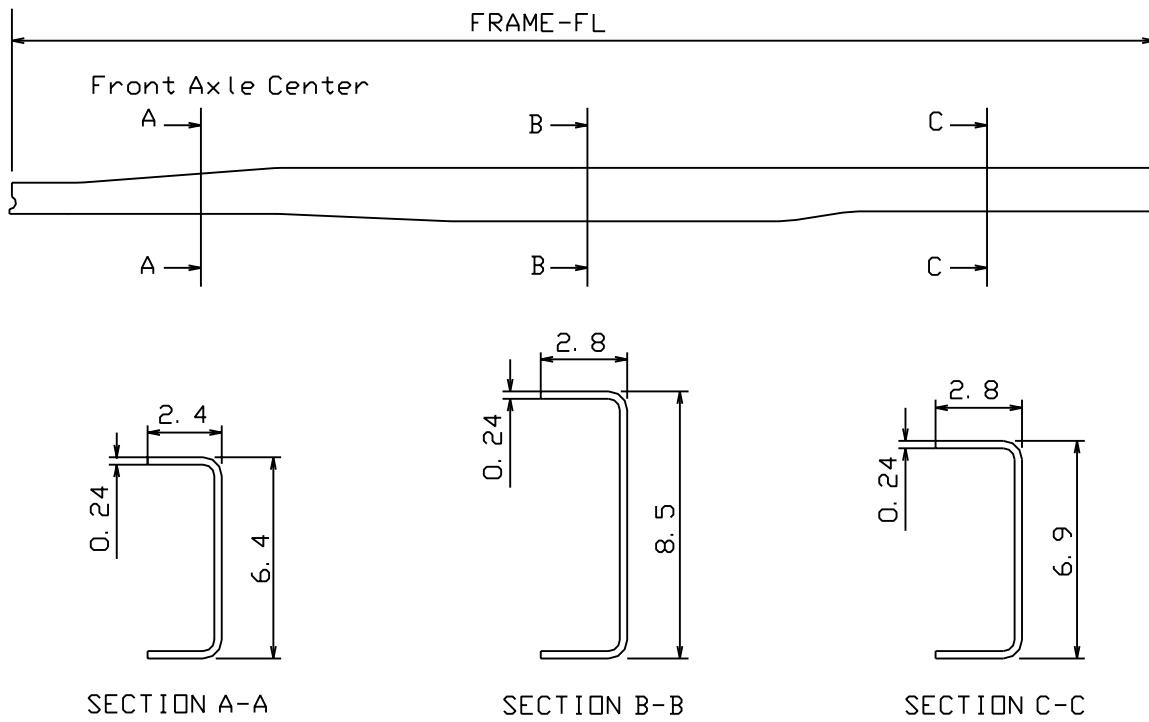


Unit: Inch

Wheel Base	Frame Thick	CROSS MEMBER TYPE/LOCATION								
		A	B	C-M/T	C-A/T	D-M/T	D-A/T	E	F	G
109	0.24	37.0	28.3	8.4	8.4	AA 40.5	AA 44.7	--	CC 26.0	DD 33.0
132.5	0.24	37.0	28.3	8.4	8.4	AA 40.5	AA 44.7	BB 59.4	CC 26.0	DD 33.0
150.0	0.24	37.0	28.3	8.4	8.4	AA 40.5	AA 44.7	BB 59.4	CC 26.0	DD 33.0
176.0	.024	37.0	28.3	8.4	8.4	AA 40.5	AA 44.7	BB 59.4	CC 26.0	DD 33.0

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

FRAME CHART



Unit: Inch

WB	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

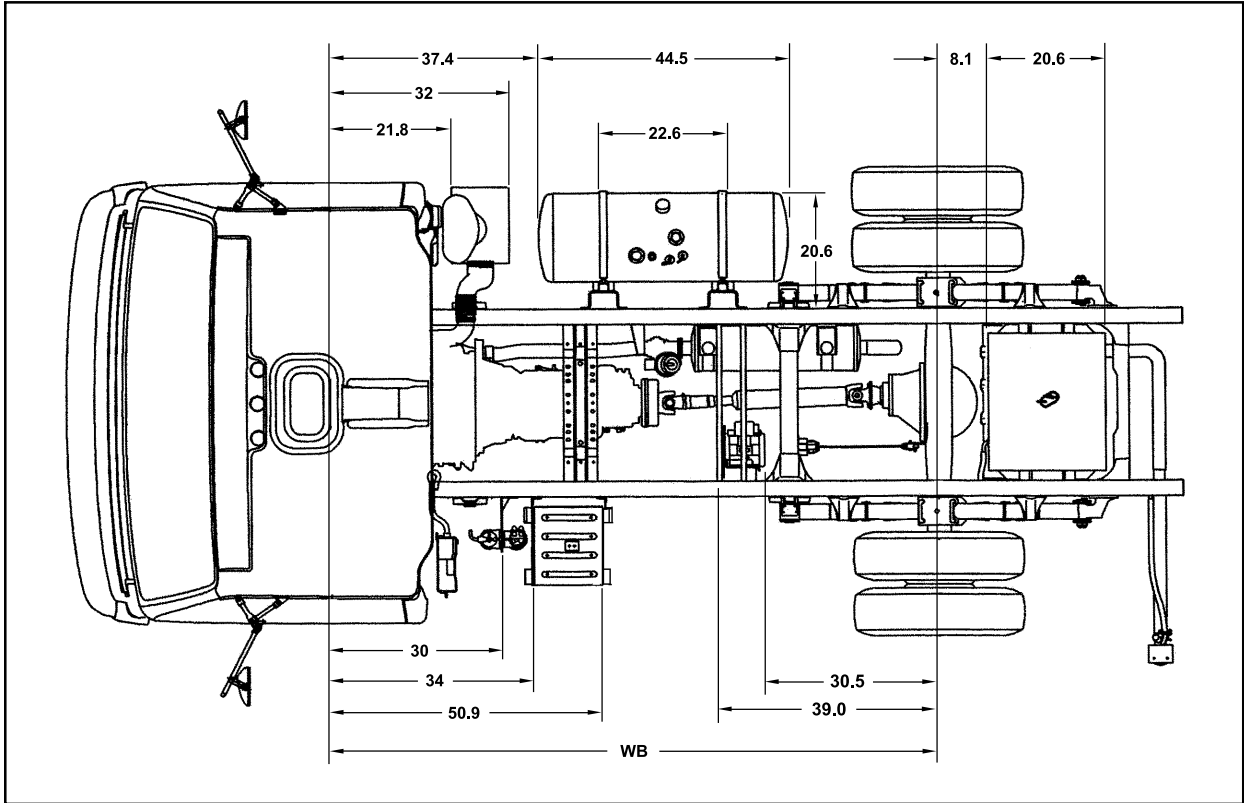


Figure 9

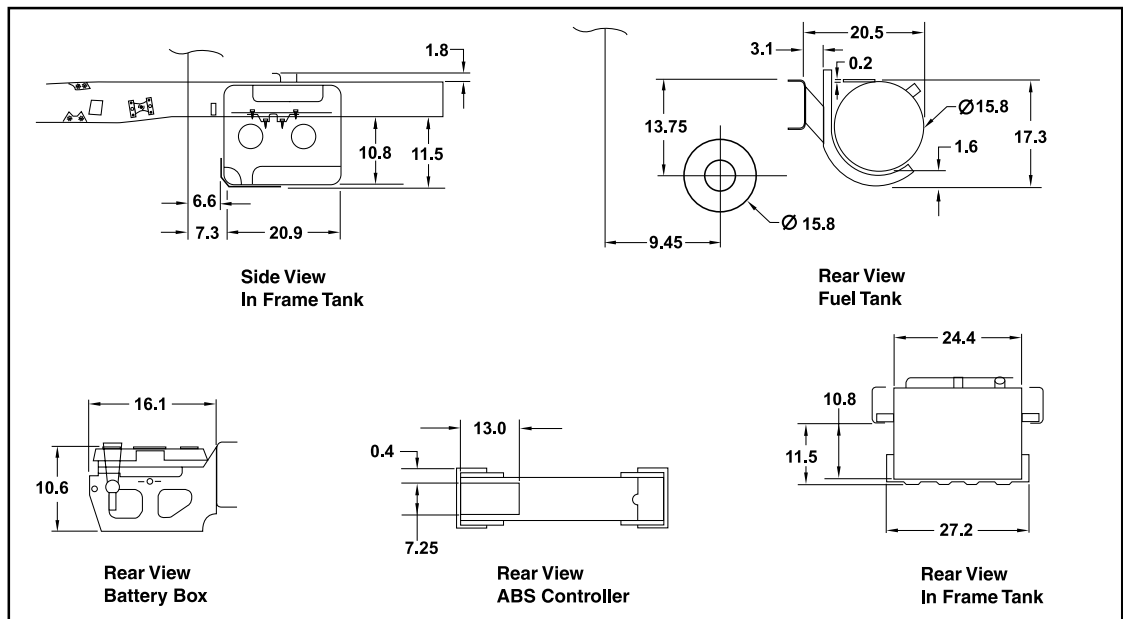


Figure 10

NOTES:

Frame mounted fuel tank available on 109", 132.5", 150" and 176", WB as an option.

Allow 3" additional for battery box opening clearance.

BODY BUILDER WEIGHT INFORMATION CHART

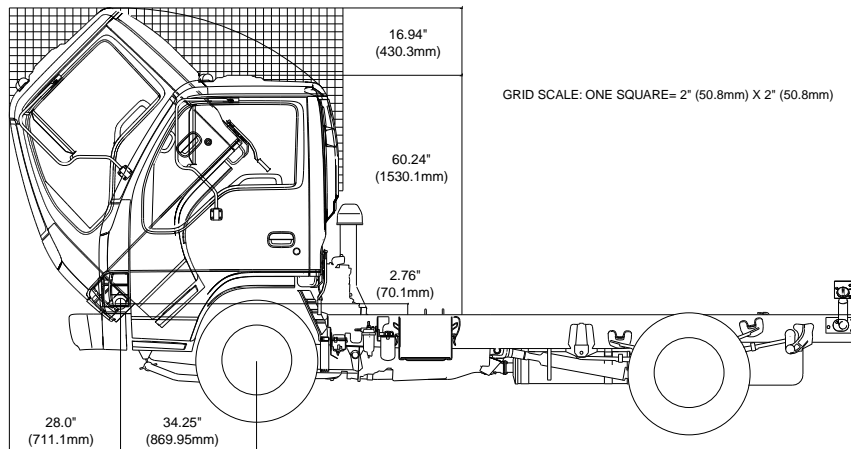
NPR Series

Unit: lb

GVWR	Axle	Wheel Base								Unsprung Weight
		109 in		132.5 in		150 in		176 in		
		M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T	
17,950 ↓	Front	3704	3737	3748	3781	3781	3825	3825	3869	573
	Rear	2304	2326	2326	2348	2359	2370	2381	2392	871
	Total	6008	6063	6074	6129	6140	6195	6206	6261	1444

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

CAB TILT



Unit: Inch

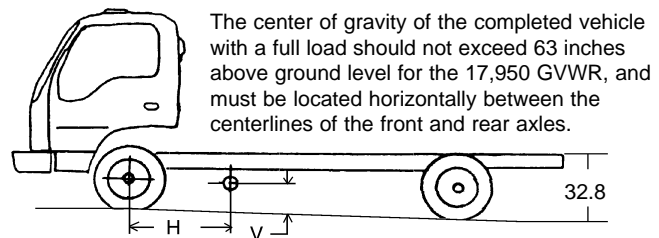
CENTER OF GRAVITY

The center of gravity of the chassis-cab.

Unit: Inch

GVWR	WB	V	H	
			M/T	A/T
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

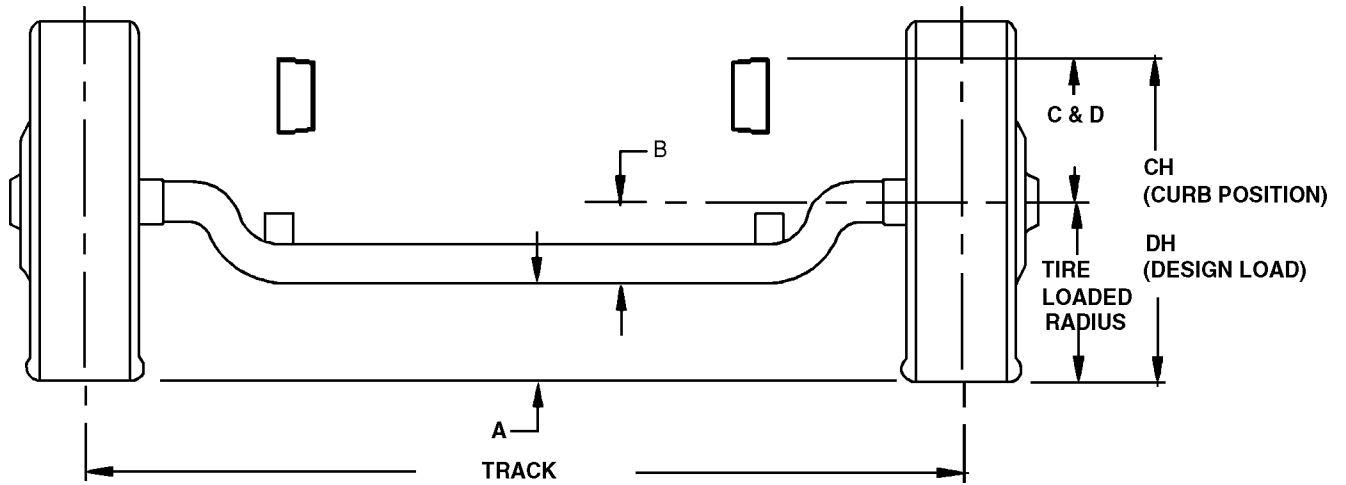
M/T = Manual Transmission
A/T = Automatic Transmission



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

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

FRONT AXLE CHART



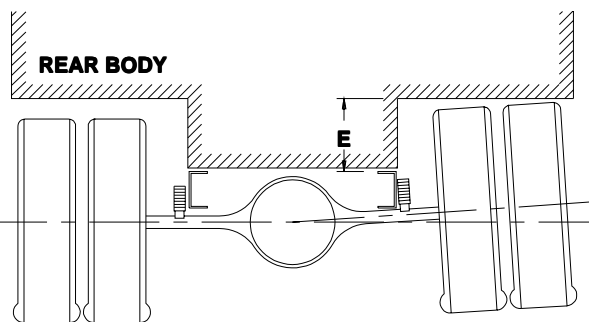
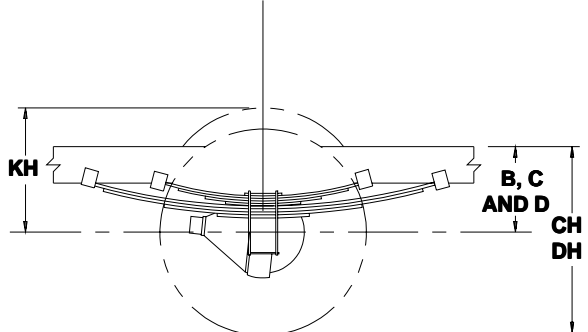
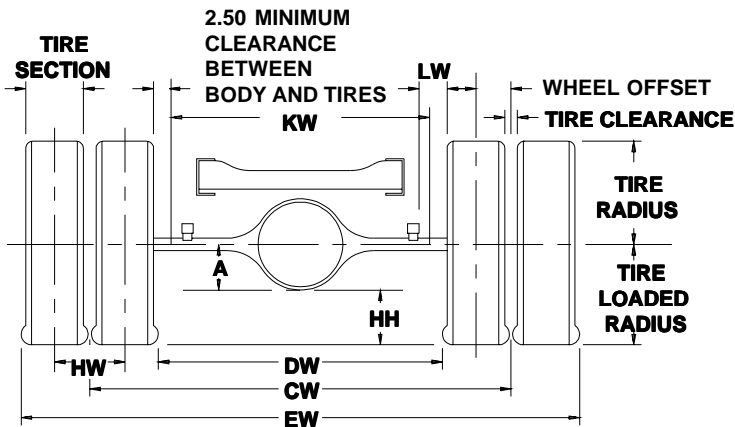
FORMULAS FOR CALCULATING HEIGHT DIMENSIONS

- 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

Unit: Inch

TIRE	GVWR	GAWR	A	B	C	D	CH	DH	TRACK	Tire Radius	
										Unload	Load
225/70R 19.5	17,950 lb	6,830 lb	8.4	7.0	13.6	13.1	29	28.1	66.1	15.4	15.0

REAR AXLE CHART



DEFINITIONS

- A CENTER LINE OF AXLE TO BOTTOM OF AXLE BOWL.
- B CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT METAL TO METAL POSITION.
- C CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT CURB POSITION.
- D CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT DESIGN LOAD.
- E REAR TIRE CLEARANCE: MINIMUM CLEARANCE REQUIRED FOR TIRES AND CHAIN MEASURED FROM THE TOP OF THE FRAME AT THE VERTICAL CENTER LINE OF THE REAR AXLE, WHEN REAR WHEELS ON ONE SIDE RIDE OVER A HIGH SPOT.
- CH REAR FRAME HEIGHT: VERTICAL DISTANCE BETWEEN THE NORMAL TOP OF FRAME RAIL AND THE GROUND-LINE THROUGH THE CENTER LINE OF THE REAR AXLE AT CURB POSITION.
- DH REAR FRAME HEIGHT: VERTICAL DISTANCE BETWEEN THE NORMAL TOP OF FRAME RAIL AND THE GROUND-LINE THROUGH THE CENTER LINE OF THE REAR AXLE AT DESIGN LOAD.
- DW MINIMUM DISTANCE BETWEEN THE INNER SURFACES OF THE REAR TIRES.
- EW MAXIMUM REAR WIDTH: OVERALL WIDTH OF THE VEHICLE MEASURED AT THE OUTER MOST SURFACE OF THE REAR TIRES.
- HH REAR TIRE CLEARANCE: MINIMUM CLEARANCE BETWEEN THE REAR AXLE AND THE GROND-LINE.

- HW DUAL TIRE SPACING: DISTANCE BETWEEN THE CENTER LINES OF THE MINIMUM DISTANCE REQUIRED FOR TIRE BOUNCE AS MEASURED FROM THE CENTER LINE OF THE REAR AXLE AND THE TOP OF THE REAR TIRE WHEN ONE WHEEL RIDES OVER A HIGH SPOT.
- CW TRACK DUAL REAR WHEEL VEHICLES: DISTANCE BETWEEN THE CENTER LINES 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
- CH = TIRE LOADED RADIUS + C
- DH = TIRE LOADED RADIUS + D
- DW = TRACK + 2 TIRE SECTIONS - TIRE CLARANCE
- EW = TRACK + 2 TIRE SECTIONS + TIRE CLEARANCE
- HH = TIRE LOADED RADIUS - A
- JH = KH - B
- KH = TIRE RADIUS + 3.00 INCHES
- KW = DW - 5.00 INCHES
- LW = 1.00 INCH MINIMUM CLEARANCE BETWEEN TIRES AND SPRINGS

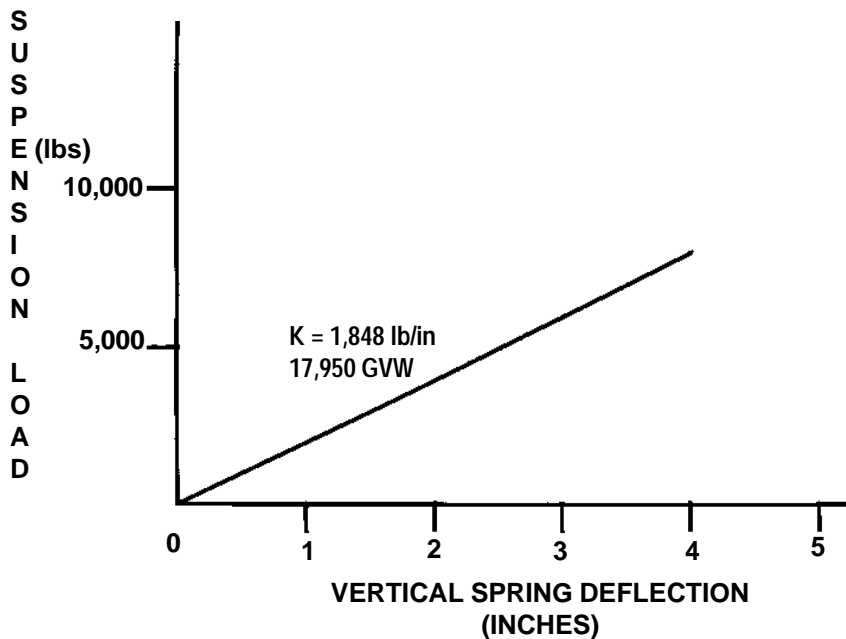
NOTE: TRACK AND OVERALL WIDTH MAY VARY WITH OPTIONAL EQUIPMENT.

Unit: Inch

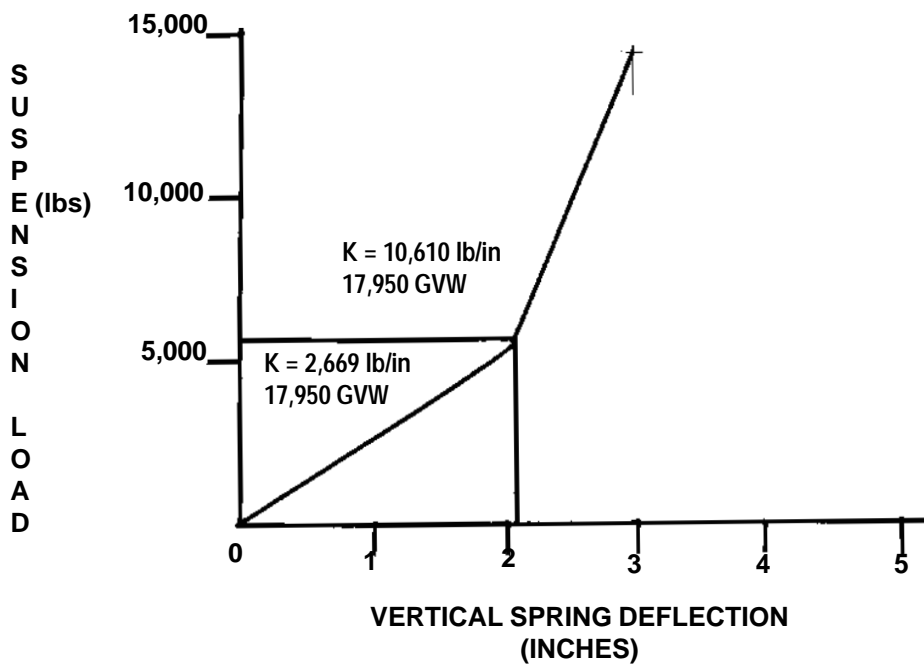
Tire	GAWR	Track CW	A	B	C	D	E
225/70R19.5	12980 lb	65.0	11.6	10.6	14.9	13.0	8.4

SUSPENSION DEFLECTION CHARTS

FRONT LEAF SPRING LOAD VS. DEFLECTION
(PER AXLE)



REAR LEAF SPRING LOAD VS. DEFLECTION
(PER AXLE)



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	3450	90	3245	90	6900	12980	17,950

Unit: Inch

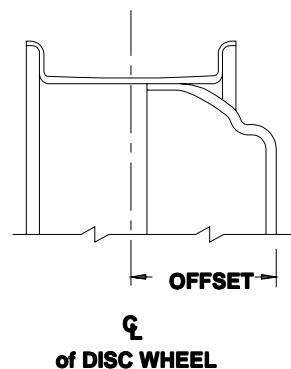
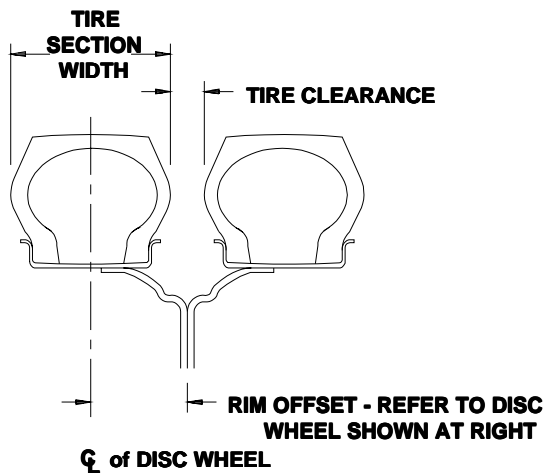
TIRE SIZE	GVWR (lb)	TIRE RADIUS				TIRE SECTION WIDTH	TIRE CLEARANCE	DESIGN RIM WIDTH
		LOADED		UNLOADED				
		FRONT	REAR	FRONT	REAR			
225/70R 19.5F	17,950	15.0	15.2	15.4	15.8	8.8	1.2	6.0

DISC WHEEL

Unit: Inch

WHEEL SIZE	BOLT HOLES	BOLT CIRCLE DIA	FT/RR NUT SIZE*	REAR STUD SIZE*	NUT/STUD TORQUE SPECS.	INNER CIRCLE	OUTSIDE OFFSET	DISC THK	RIM TYPE	MATERIAL MFG.
19.5x6.00K	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	0.39	15° DC	Steel TOPY

*O.D. Wrench Sizes

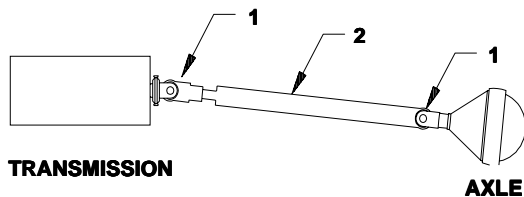


PROPELLER SHAFT

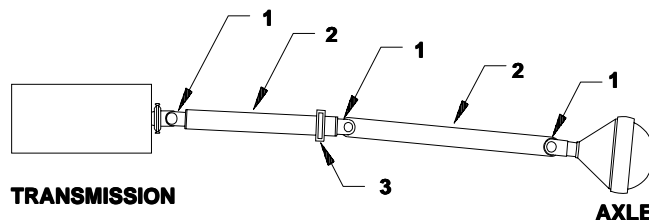
WB	PLANE VIEW	SIDE VIEW
109 in		
132.5 in		
150 in		
176 in		

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.

(109 in WB)



(132.5 in, 150 and 176 in WB)



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

WHEEL BASE	PLANE VIEW				SIDE VIEW			
	A M/T	A A/T	B M/T	B A/T	C M/T	C A/T	D M/T	D A/T
109 in	--	--	3.1°	3.1°	--	--	10.3°	9.4°
132.5 in	0°	0°	3.1°	3.1°	4.9°	5.0°	7.8°	7.3°
150 in	0°	0°	3.1°	3.1°	2.5°	2.6°	8.2°	7.7°
176 in	0°	0°	2.3°	2.3°	2.8°	2.8°	4.8°	4.8°

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

NOTE: ALL DRIVELINE ANGLES ARE AT UNLOADED CONDITION (CURB POSITION WITH TYPICAL CARGO BODY).

PROPELLER SHAFT (CONTINUED)

WB	109		132.5		150		176	
No. of Shafts	1		2		2		2	
Trans. Type	6M/T	4A/T	6M/T	4A/T	6M/T	4A/T	6M/T	4A/T
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	38.3	38.6	18.4	24.3	36.1	41.9	47.9	53.7
Type	D	C	B	A	B	A	B	A
Shaft #2 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	N/A	N/A	37.8	38.3	37.8	38.3	51.9	52.6
Type	N/A	N/A	D	C	D	C	D	C

UNIT: INCH

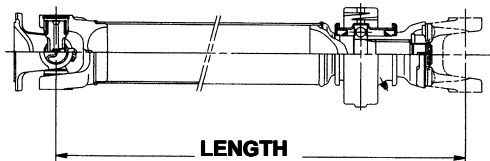
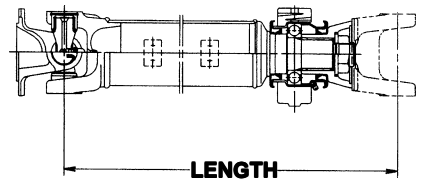
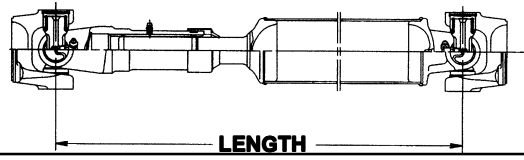
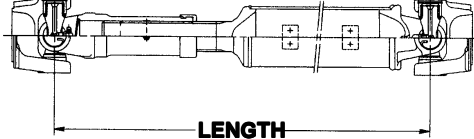
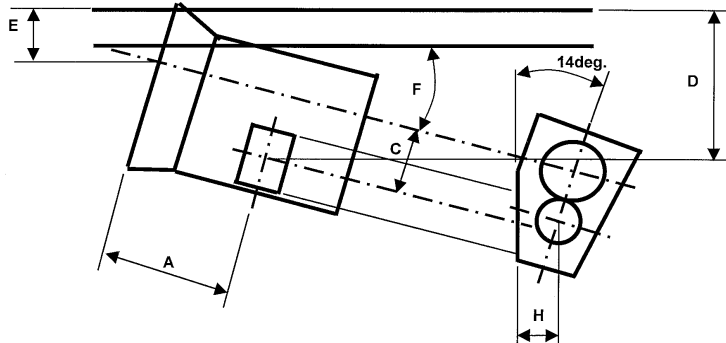
Type	Description	Model	Illustration
Type A	1 st shaft in 2 piece driveline.	P20	
Type B		P30	
Type C	1 st shaft in 1 piece driveline. 2 nd shaft in 2 piece driveline.	P20	
Type D		P30	

Figure 2.5 NQR/W Series Diesel Propeller Shaft

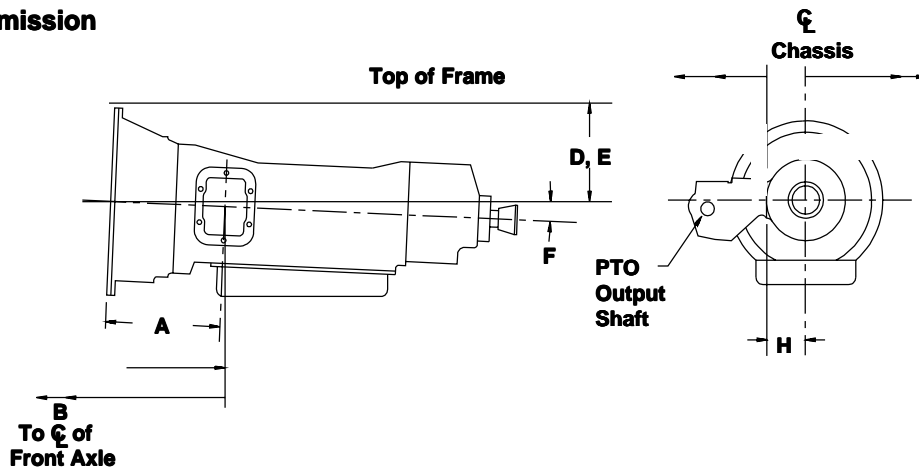
M/T = Manual Transmission
A/T = Automatic Transmission

PTO LOCATION, DRIVE GEAR AND OPENING INFORMATION

Manual Transmission



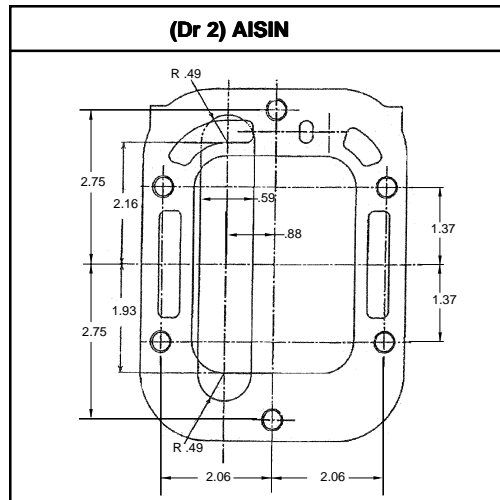
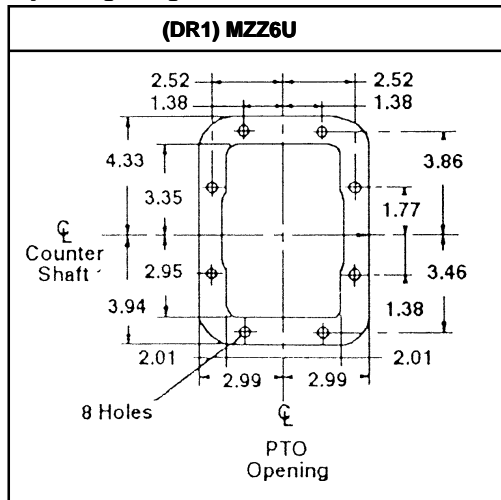
Automatic Transmission



Opening Transmission	Bolt Location	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	Maximum Output Torque
MZZ 6U	Left	(Dr 1)	11.6	37.57	4.6	12.8	7.7	2.5°	3.7 w/ 14° angle	4th Gear Trans Countershaft	25/46=0.543	37	3 Degrees	25° RH	180 lb-ft Torque@ 1000 RPM
Aisin ¹	Left	(Dr 2)	12.6	38.59		8	7.5	2.5°	4.48	PTO Gear	11 with turbine	58	N/A	0°	134 lb-ft Torque@ 1000 RPM

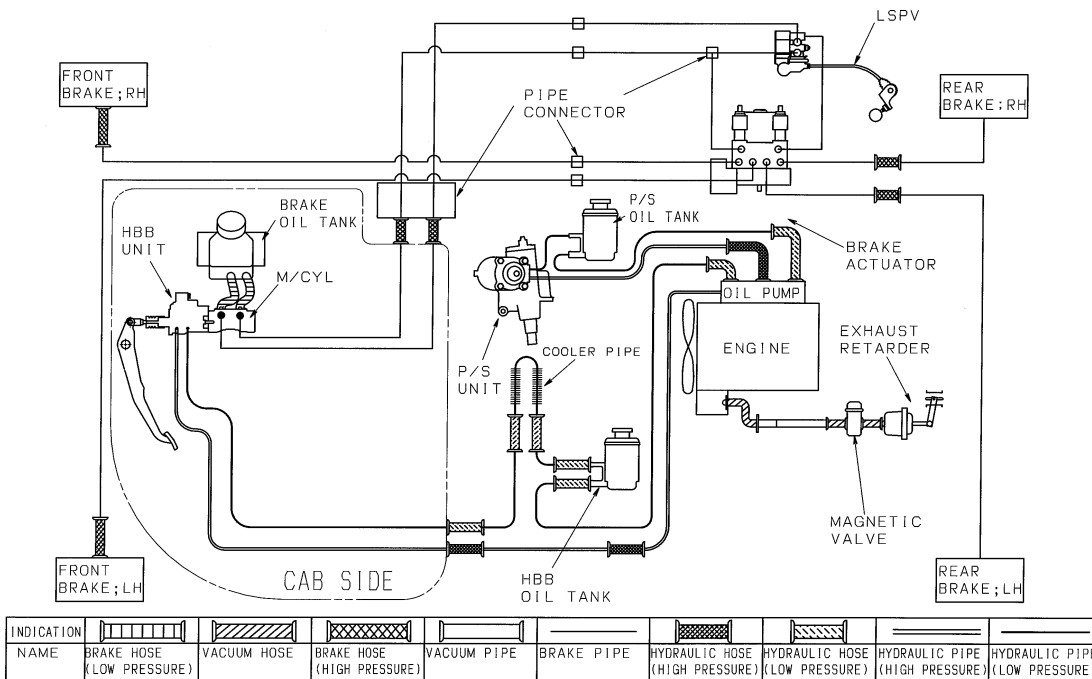
Unit: Inch

Opening Diagram



Brake System Diagram Hydraulic Brake Booster

PLEASE REFER TO INTRODUCTION SECTION OF BOOK FOR ANTI-LOCK SYSTEM CAUTIONS AND WHEEL BASE MODIFICATION REQUIREMENTS



DIESEL FUEL FILL

Installation instructions:

Disconnect battery.

Loosen hose from the tie downs. Remove caps from plate on rail.

Install hoses on to the plate.

Extend hose out from the driver side of the rail to body rail.

The filler neck must be mounted to allow the fill plate bracket to be parallel to the frame horizontal (see Figure 4).

Cover with protector wrap and secure with tie wraps.

Filler hose is set for 96 inches outside width body.

Filler neck (dimension A) must be between 6.85 inches and 8.5 inches above frame.

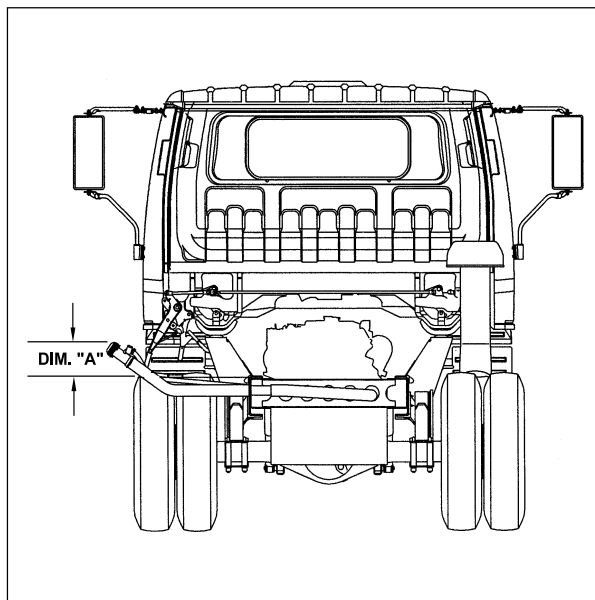
Secure the filler plate to the bottom of the body and check for leaks.

Ensure that fill hose does not sag, creating an area where the fuel could pool in the fill hose.

Reconnect battery.

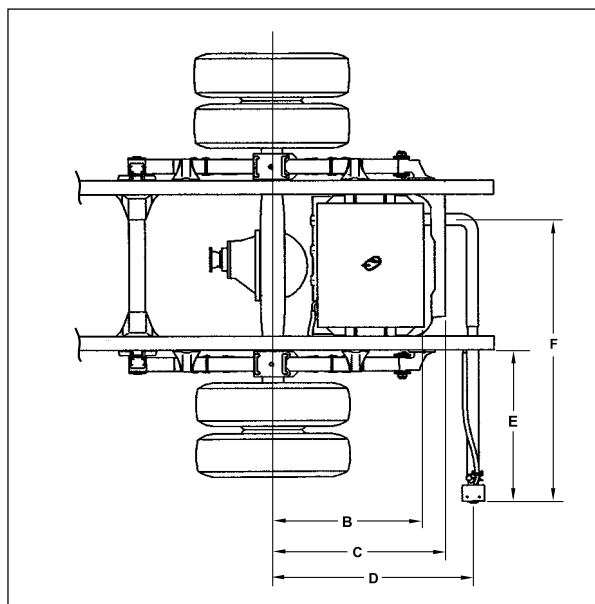
Rear View Fuel Fill

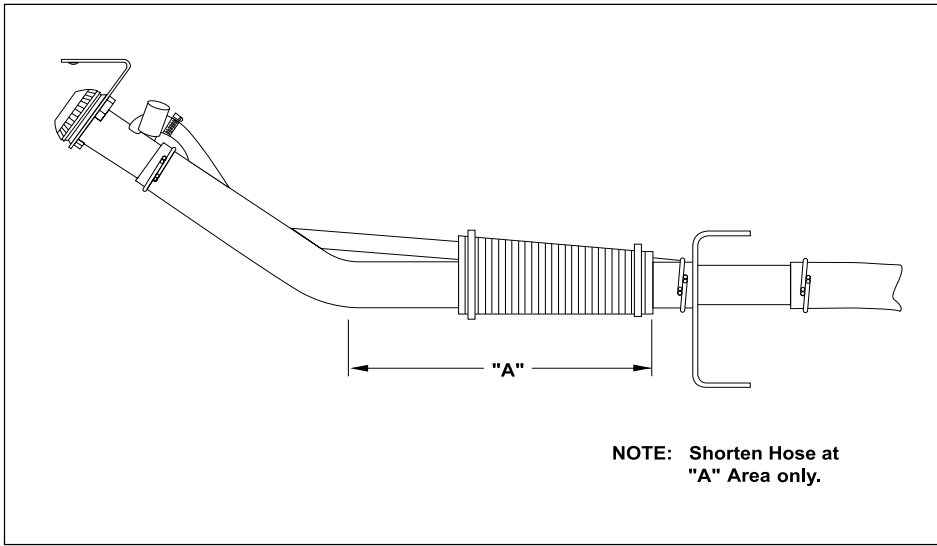
Dimension A = 6.85 - 8.50 (174-216mm)



Top View Fuel Fill

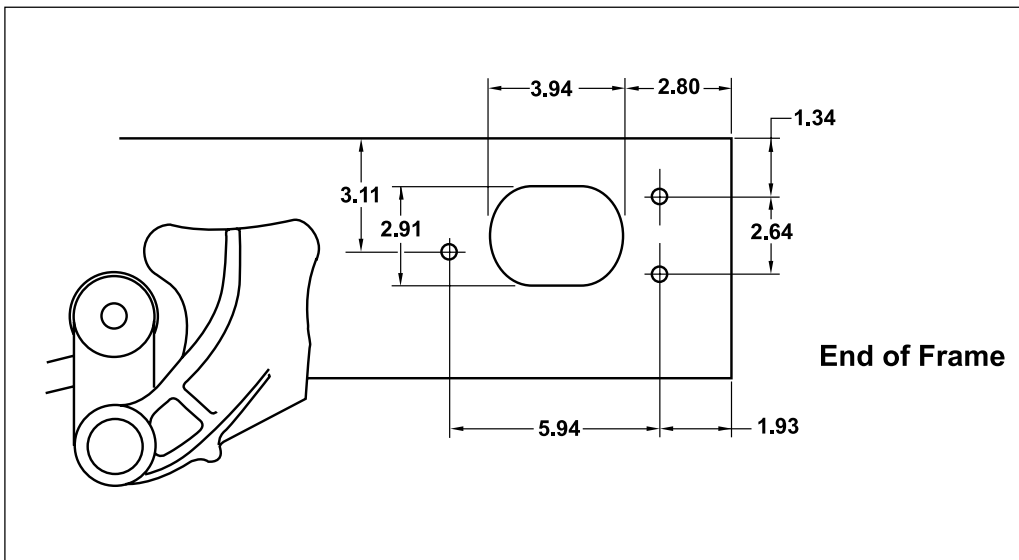
Dimensions:
B = 29.75 in (756mm)
C = 34.00 in (863mm)
D = 39.29 in (998mm)
E = 30.86 in (784mm)
F = 56.6 in (1438mm)





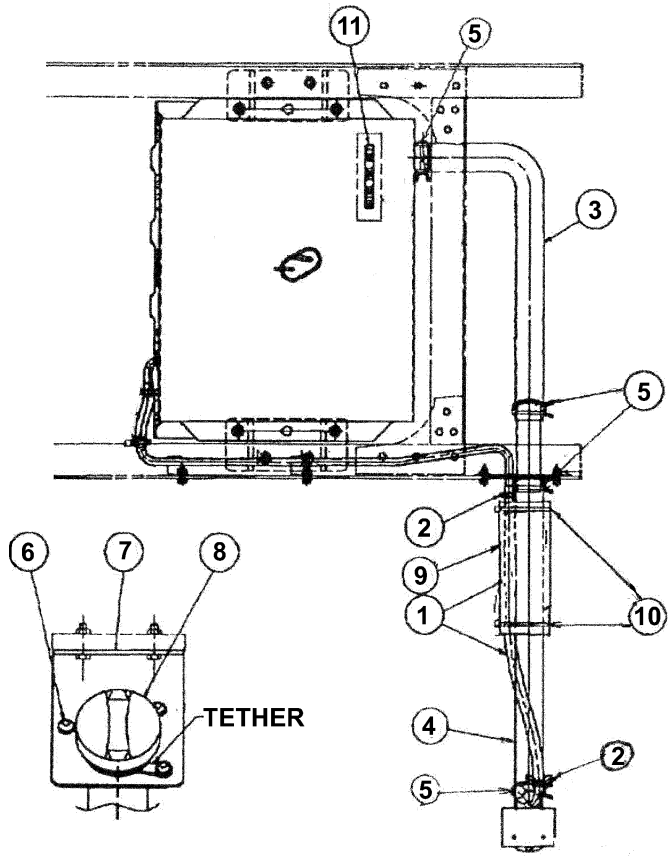
Hose Modification for Various Width Bodies

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



Through the Rail
Fuel Fill
Frame Hole

NQR DIESEL
Fuel Fill Parts List



No.	Description	Isuzu P/N	GM P/N	Qty.
1	BREATHER HOSE	897206-0420	-	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	-	3
7	BRACKET, FILLER NECK	897116-621Y	97116621	1
8	CAP, FILLER	897118-7020	-	1
9	PROTECTOR	897114-0630	97114063	1
10	CLIP	109707-1070	94062296	2
11	CAUTION PLATE	894414-3530	94414353	1

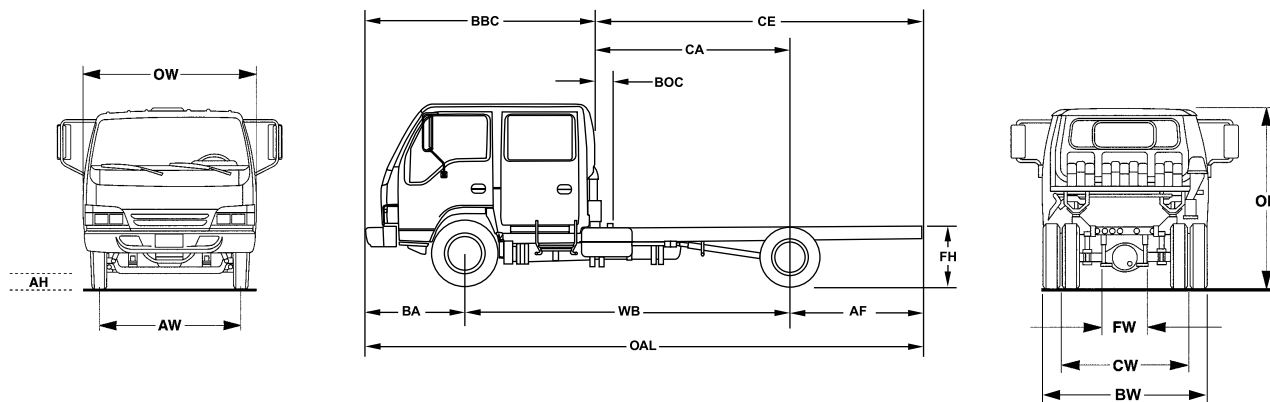
NPR HD NQR/W4500 W5500 Crew Cab Diesel

MODEL	NPR HD Diesel/W4500 Crew Cab
GVWR	14,500 lb
WB	150 in, 176 in
ENGINE	Isuzu 4-cylinder, in-line 4-cycle, turbocharged, intercooled, direct injection diesel.
Model/Displacement	4HE1-TC/290 CID (4.75 liters)
HP (Gross)	175 HP/2700 RPM
Torque (Gross)	347 lb ft torque/2000 RPM
Equipment	Dry element air cleaner with vertical intake; 2 rows 506 in ² radiator; 6 blade 18.7 in diameter fan with viscous drive. Cold weather starting device and an oil cooler. Engine warning alarm for high water temperature, low water level and low oil pressure.
* 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 20.9:1 ratio. Tilt and telescoping steering column.
FRONT AXLE	Reverse Elliot "I" -Beam rated at 6,830 lb.
Suspension	Semi-elliptical steel alloy leaf springs with stabilizer bar and shock absorbers.
GAWR	5,360 lb
REAR AXLE	Full floating single speed with hypoid gearing rated at 11,020 lb.
Suspension	Semi-elliptical steel alloy leaf springs and shock absorbers.
GAWR	9,880 lb
WHEELS	16x6.0 6 hole disc wheels, painted white.
TIRES	215/85R-16E (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-adjust 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 anti-lock brake system.
FUEL TANK	30 gal. rectangular steel fuel tank mounted in frame rail behind rear axle. Fuel water seperator mounted on rail.
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.
CAB EQUIPMENT	All steel 7 passenger low cab forward, BBC 108.6 in. 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 cassette 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 gal. fuel tank mounted on right hand rail, spare wheel. Engine shutdown and alarm for high water temperature, low water level and low oil pressure. Rear cab heater, cruise control and engine hour meter
NOTE:	These selected specifications are subject to change without notice. *All Transmissions have a PTO gear in all wheelbases.

NPR HD NQR/W4500 W5500 Crew Cab Diesel

MODEL	NQR Diesel/W5500 Crew Cab
GVWR	17,950 lb
WB	150 in, 176 in
ENGINE	Isuzu 4-cylinder, in-line 4-cycle, turbocharged, intercooled, direct injection diesel.
Model/Displacement	4HE1-TC/290 CID (4.75 liters)
HP (Gross)	175 HP/2700 RPM
Torque (Gross)	347 lb ft torque/2000 RPM
Equipment	Dry element air cleaner with vertical intake; 2 rows 506 in ² radiator; 6 blade 18.7 in diameter fan with viscous drive. Cold weather starting device and an oil cooler. Engine warning alarm for high water temperature, low water level and low oil pressure.
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 20.9:1 ratio. Tilt and telescoping steering column.
FRONT AXLE	Reverse Elliot "I" -Beam rated at 6,830 lb.
Suspension	Semi-elliptical steel alloy leaf springs with stabilizer bar and shock absorbers.
GAWR	6,830 lb
REAR AXLE	Full floating single speed with hypoid gearing rated at 14,550 lb.
Suspension	Semi-elliptical steel alloy leaf springs and shock absorbers.
GAWR	12,980 lb
WHEELS	19.5x6.0 6 hole disc wheels, painted white.
TIRES	225/70R-19-5F-(12 pr) tubeless steel belted radials, all season front and rear.
BRAKES	Dual circuit power assisted hydraulic service brakes with load sensing proportioning valve in rear brake circuit. Disc front and self-adjust 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 anti-lock brake system.
FUEL TANK	30 gal. rectangular steel fuel tank mounted in frame rail behind rear axle. Fuel water seperator mounted on rail.
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 lb / ft /in
CAB EQUIPMENT	All steel 7 passenger low cab forward, BBC 108.6 in. 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 cassette 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 gal. fuel tank mounted on right hand rail, spare wheel. Engine shutdown and alarm for high water temperature, low water level and low oil pressure. Rear cab heater, cruise control and engine hour meter.
NOTE:	These selected specifications are subject to change without notice.

VEHICLE WEIGHTS, DIMENSIONS AND RATINGS



NPR-HD/ W4500 Variable Chassis Dimensions:

Unit	WB	CA	CE	OAL	AF
Inch	150	88.9	132.0	240.5	43.1
Inch	176	114.9	158.0	266.5	43.1

NQR/W5500 Variable Chassis Dimensions:

Unit	WB	CA*	CE*	OAL	AF0
Inch	150	88.9	132.0	240.5	43.1
Inch	176	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
AH	7.9	BW	83.3
AW	65.6	CW	65.0
BA	47.4	FW	33.5
BBC	108.6	OH	87.4
BOC	4.2	OW	78.5
		FH	32.0

NQR/W5500 Dimension Constants:

Code	Inches	Code	Inches
AH	8.6	BW	83.3
AW	65.6	CW	65.0
BA	47.4	FW	33.5
BBC	108.6	OH	88.1
BOC	4.2	OW	78.5
		FH	32.8

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 in	lb	3,979	2,161	6,140	8,360
NG4	176 in	lb	4,056	2,149	6,205	8,295

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 in	lb	4,167	2,557	6,724	11,226
NS4	176 in	lb	4,244	2,546	6,790	11,160

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 in	lb	4,167	1,896	6,063	8,437
NG4	176 in	lb	4,244	1,885	6,129	8,371

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 in	lb	4,354	2,293	6,647	11,303
NS4	176 in	lb	4,431	2,282	6,713	11,237

VEHICLE WEIGHT LIMITS:

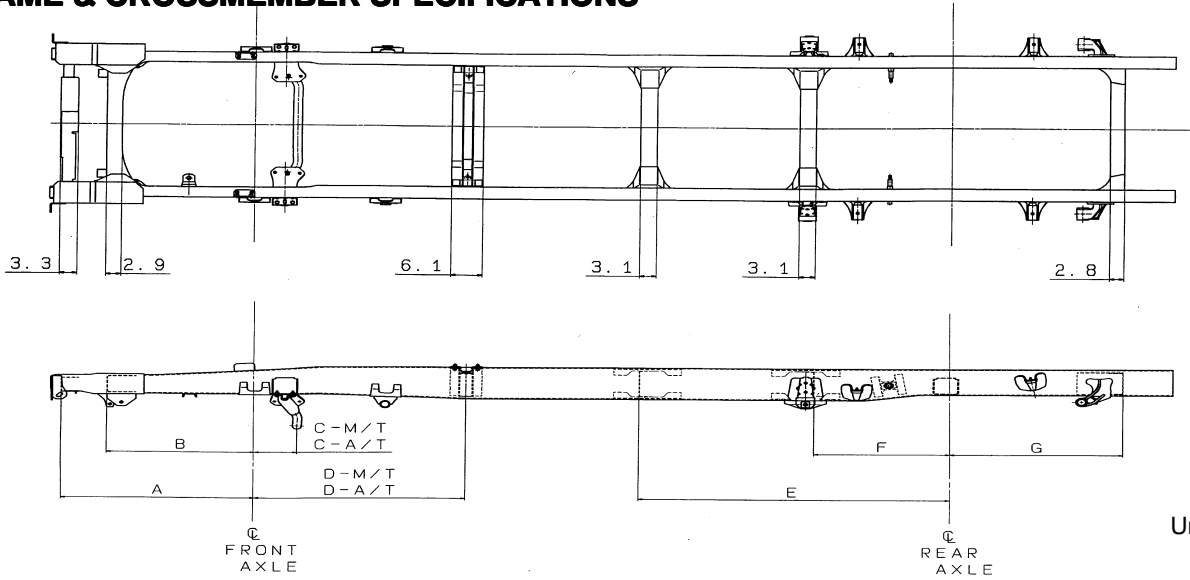
	NPR HD/W4500	NQR/W5500
GVWR		
Designed maximum	14,500 lb	17,950 lb
GAWR, Front	5,360 lb	6,830 lb
GAWR, Rear	9,880 lb	12,980 lb

Technical Notes:

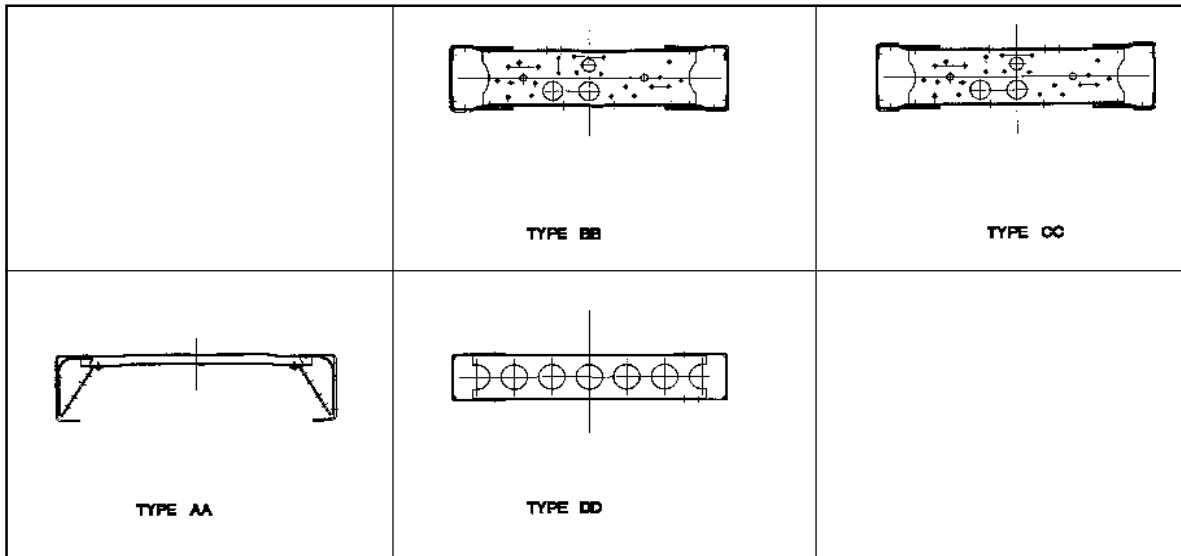
Chassis curb weight includes standard equipment and fuel. Does not include driver, passenger, payload, body or special equipment.

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.

FRAME & CROSSMEMBER SPECIFICATIONS



Unit: Inch

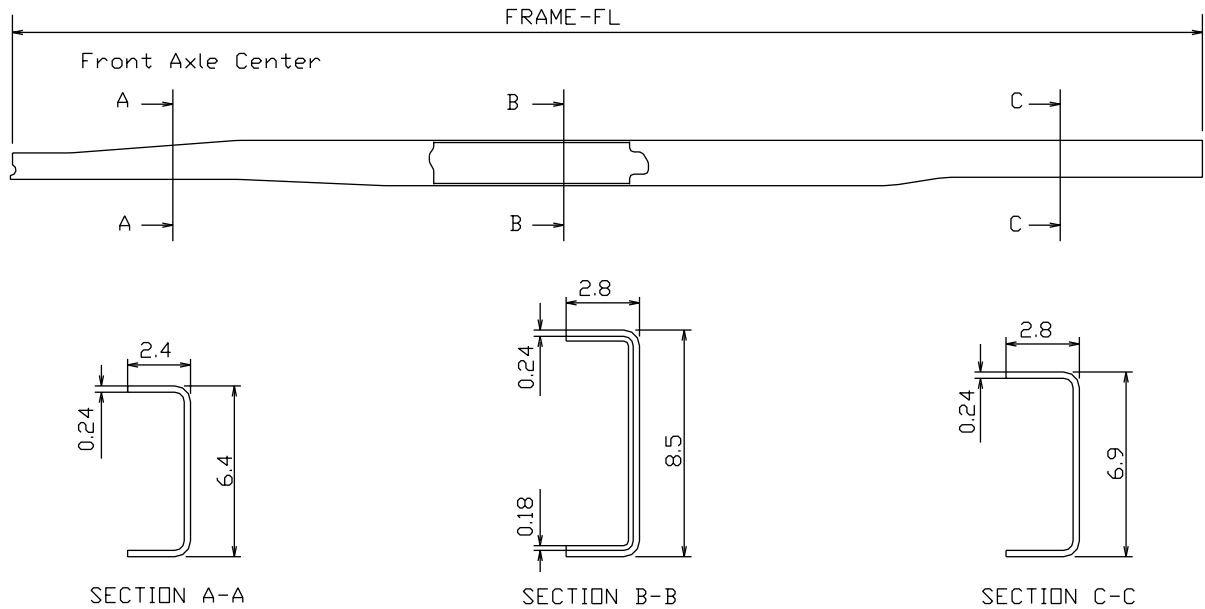


Unit: Inch

Wheel Base	Frame Thick	CROSS MEMBER TYPE/LOCATION								
		A	B	C-M/T	C-A/T	D-M/T	D-A/T	E	F	G
150.0	0.24	37.0 +0.18	28.3	8.1	8.1	AA 40.5	AA 44.7	BB 59.4	CC 26.0	DD 33.0
176.0	.024	37.0 +0.18	28.3	8.1	8.1	40.5	44.7	59.4	26.0	33.0

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

FRAME CHART



Unit: Inch

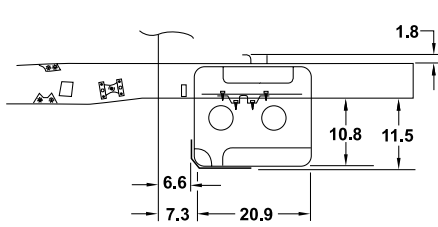
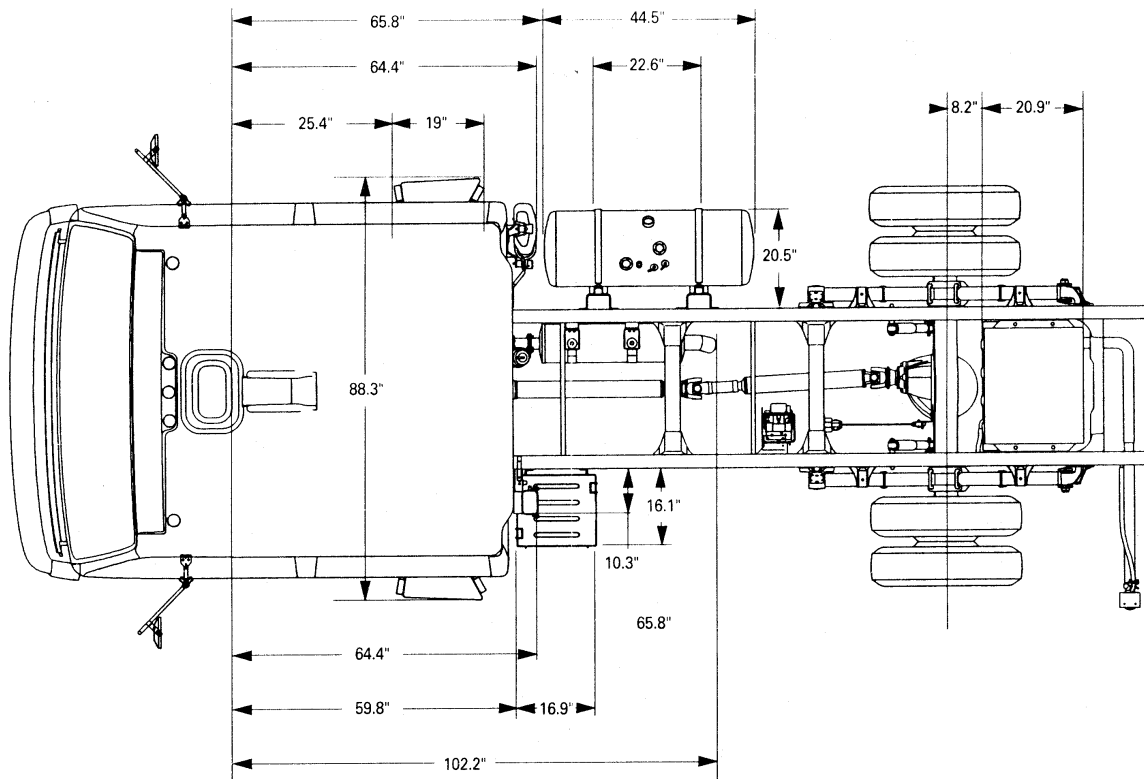
WB	FRAME FL	FRAME THICKNESS
150.0	227.4	0.24+0.18
176.0	253.4	0.24+0.18

NOTE:

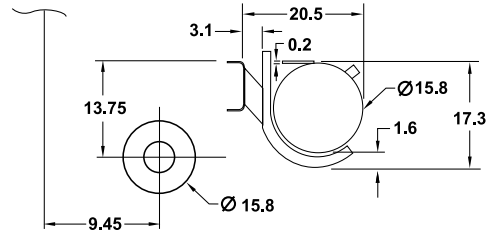
On this model chassis, GMICT will require that the body installed on the chassis have an understructure manufactured with any of the following structural steel "C" channels.

- 4 inch X 1^{5/8} inch, 7.25 lb/ft.
- 5 inch X 1^{3/4} inch, 6,7 or 9.0 lb/ft.
- 6 inch X 2 inch, 8.2, 10.5 or 13 lb/ft.

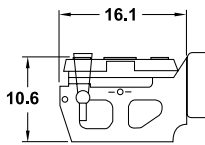
AUXILIARY VIEWS



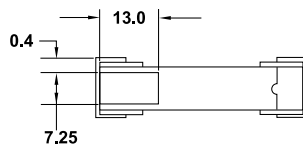
**Side View
In Frame Tank**



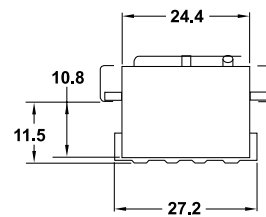
**Rear View
Fuel Tank**



**Rear View
Battery Box**



**Rear View
ABS Controller**



**Rear View
In Frame Tank**

BODY BUILDER WEIGHT INFORMATION CHART

NPR Series/W4500

GVWR	Axle	Wheel Base		
		150 in	176 in	Unsprung Weight
		A/T	A/T	
14,500 ↓	Front	3979	4056	573
	Rear	2161	2149	904
	Total	6140	6205	1,477

A/T = Automatic Transmission

Unit: lb

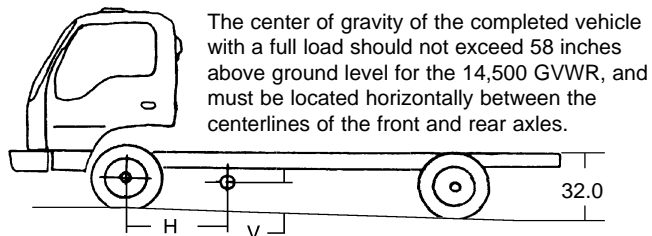
CENTER OF GRAVITY

The center of gravity of the chassis-cab.

GVWR	WB	V	H
			A/T
14,500	150	21.4	52.8
	176	20.0	60.9

Unit: Inch

A/T = Automatic Transmission



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

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

BODY BUILDER WEIGHT INFORMATION CHART

NQR Series/W5500

GVWR	Axle	Wheel Base		
		150 in	176 in	Unsprung Weight
		A/T	A/T	
17,950 ↓	Front	4167	4244	705
	Rear	2557	2546	1,366
	Total	6724	6790	2,071

A/T = Automatic Transmission

Unit: lb

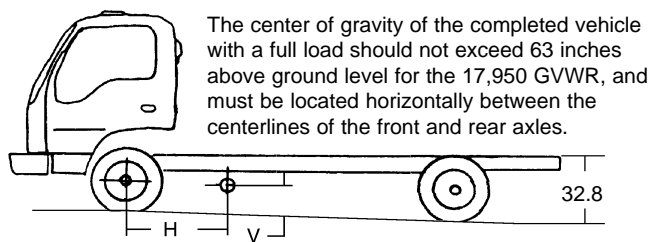
CENTER OF GRAVITY

The center of gravity of the chassis-cab.

GVWR	WB	V	H
			A/T
17,950	150	21.3	57.0
	176	19.9	66.0

Unit: Inch

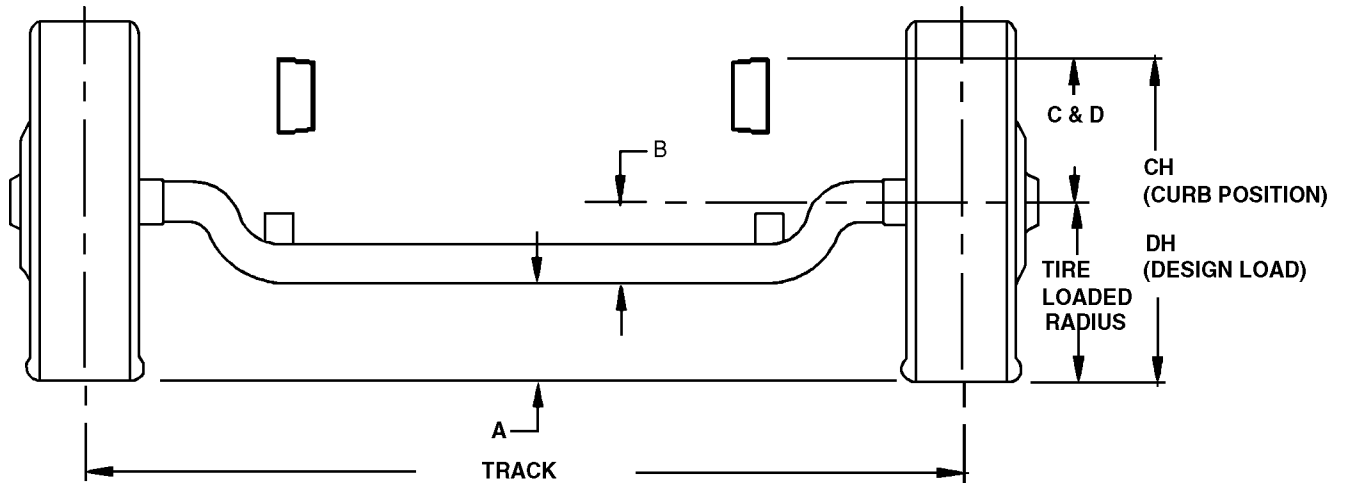
A/T = Automatic Transmission



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

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

FRONT AXLE CHART NPR-HD/W4500



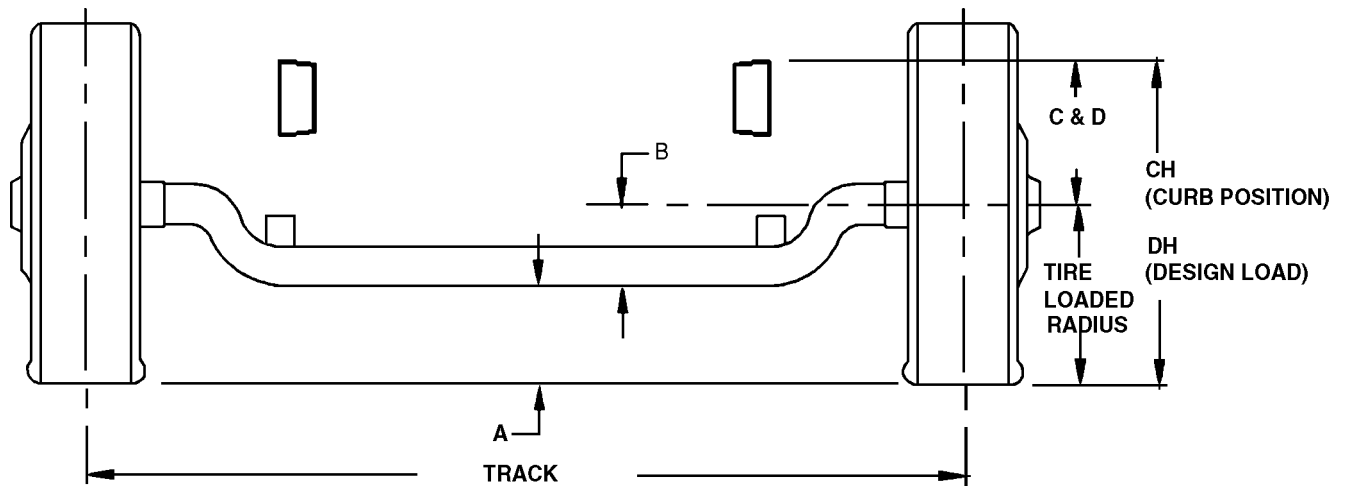
FORMULAS FOR CALCULATING HEIGHT DIMENSIONS

- 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

Unit: Inch

TIRE	GVWR	GAWR	A	B	C	D	CH	DH	TRACK	Tire Radius	
										Unload	Load
215/85R 16-E	14,500 lb	5,360 lb	7.7	6.4	13.0	12.5	27.3	26.6	65.6	14.3	14.1

FRONT AXLE CHART NQR/W55000



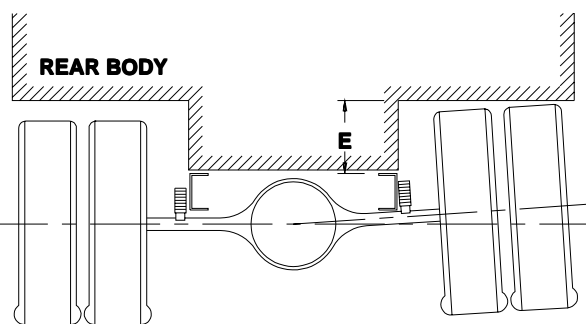
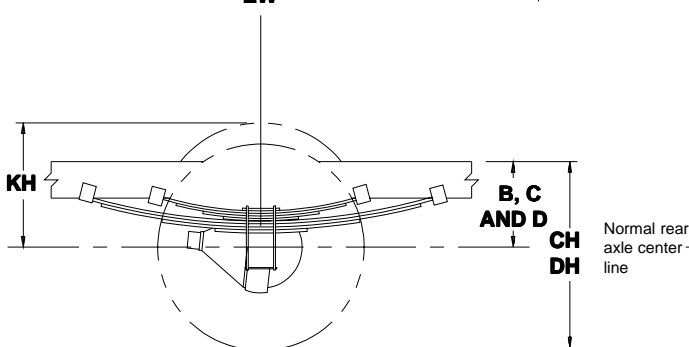
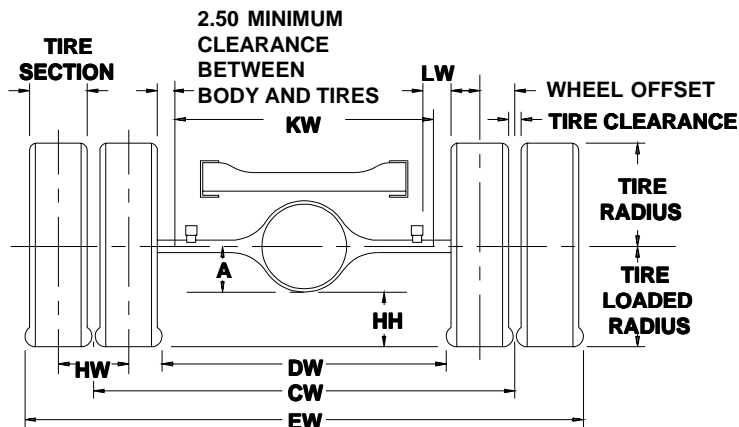
FORMULAS FOR CALCULATING HEIGHT DIMENSIONS

- 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

Unit: Inch

TIRE	GVWR	GAWR	A	B	C	D	CH	DH	TRACK	Tire Radius	
										Unload	Load
225/70R 19.5	17,950 lb	6,830 lb	8.4	7.0	13.6	13.1	29	28.1	66.1	15.4	15.0

REAR AXLE CHART NPR HD/W4500



DEFINITIONS

- A CENTER LINE OF AXLE TO BOTTOM OF AXLE BOWL.
- B CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT METAL TO METAL POSITION.
- C CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT CURB POSITION.
- D CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT DESIGN LOAD.
- E REAR TIRE CLEARANCE: MINIMUM CLEARANCE REQUIRED FOR TIRES AND CHAIN MEASURED FROM THE TOP OF THE FRAME AT THE VERTICAL CENTER LINE OF THE REAR AXLE, WHEN REAR WHEELS ON ONE SIDE RIDE OVER A HIGH SPOT.
- CH REAR FRAME HEIGHT: VERTICAL DISTANCE BETWEEN THE NORMAL TOP OF FRAME RAIL AND THE GROUND-LINE THROUGH THE CENTER LINE OF THE REAR AXLE AT CURB POSITION.
- DH REAR FRAME HEIGHT: VERTICAL DISTANCE BETWEEN THE NORMAL TOP OF FRAME RAIL AND THE GROUND-LINE THROUGH THE CENTER LINE OF THE REAR AXLE AT DESIGN LOAD.
- DW MINIMUM DISTANCE BETWEEN THE INNER SURFACES OF THE REAR TIRES.
- EW MAXIMUM REAR WIDTH: OVERALL WIDTH OF THE VEHICLE MEASURED AT THE OUTER MOST SURFACE OF THE REAR TIRES.
- HH REAR TIRE CLEARANCE: MINIMUM CLEARANCE BETWEEN THE REAR AXLE AND THE GROND-LINE.
- HW DUAL TIRE SPACING: DISTANCE BETWEEN THE CENTER LINES OF THE

- MINIMUM DISTANCE REQUIRED FOR TIRE BOUNCE AS MEASURED FROM THE CENTER LINE OF THE REAR AXLE AND THE TOP OF THE REAR TIRE WHEN ONE WHEEL RIDES OVER A HIGH SPOT.
- CW TRACK DUAL REAR WHEEL VEHICLES: DISTANCE BETWEEN THE CENTER LINES 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

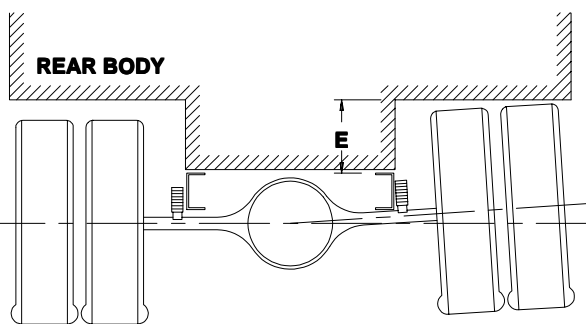
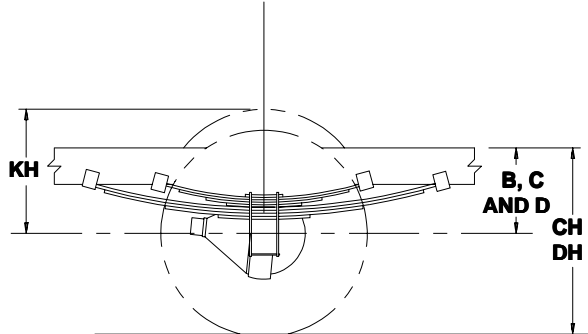
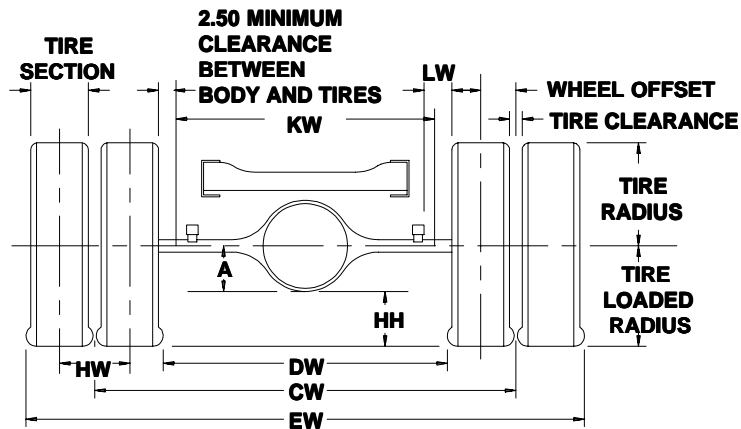
- CW = TRACK
- CH = TIRE LOADED RADIUS + C
- DH = TIRE LOADED RADIUS + D
- DW = TRACK + 2 TIRE SECTIONS - TIRE CLRARANCE
- EW = TRACK + 2 TIRE SECTIONS + TIRE CLEARANCE
- HH = TIRE LOADED RADIUS - A
- JH = KH - B
- KH = TIRE RADIUS + 3.00 INCHES
- KW = DW - 5.00 INCHES
- LW = 1.00 INCH MINIMUM CLEARANCE BETWEEN TIRES AND SPRINGS

NOTE: TRACK AND OVERALL WIDTH MAY VARY WITH OPTIONAL EQUIPMENT.

Unit: Inch

Tire	GAWR	Track CW	A	B	C	D	E
215/85R16-E	9880 lb	65.0	10.6	10.6	14.9	13.3	7.8

REAR AXLE CHART NQR/W5500



When all of rear wheels ride over a high spot.

When rear wheels on one side ride over a high spot.

DEFINITIONS

- A CENTER LINE OF AXLE TO BOTTOM OF AXLE BOWL.
- B CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT METAL TO METAL POSITION.
- C CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT CURB POSITION.
- D CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT DESIGN LOAD.
- E REAR TIRE CLEARANCE: MINIMUM CLEARANCE REQUIRED FOR TIRES AND CHAIN MEASURED FROM THE TOP OF THE FRAME AT THE VERTICAL CENTER LINE OF THE REAR AXLE, WHEN REAR WHEELS ON ONE SIDE RIDE OVER A HIGH SPOT.
- CH REAR FRAME HEIGHT: VERTICAL DISTANCE BETWEEN THE NORMAL TOP OF FRAME RAIL AND THE GROUND-LINE THROUGH THE CENTER LINE OF THE REAR AXLE AT CURB POSITION.
- DH REAR FRAME HEIGHT: VERTICAL DISTANCE BETWEEN THE NORMAL TOP OF FRAME RAIL AND THE GROUND-LINE THROUGH THE CENTER LINE OF THE REAR AXLE AT DESIGN LOAD.
- DW MINIMUM DISTANCE BETWEEN THE INNER SURFACES OF THE REAR TIRES.
- EW MAXIMUM REAR WIDTH: OVERALL WIDTH OF THE VEHICLE MEASURED AT THE OUTER MOST SURFACE OF THE REAR TIRES.
- HH REAR TIRE CLEARANCE: MINIMUM CLEARANCE BETWEEN THE REAR AXLE AND THE GROND-LINE.
- HW DUAL TIRE SPACING: DISTANCE BETWEEN THE CENTER LINES OF THE

MINIMUM DISTANCE REQUIRED FOR TIRE BOUNCE AS MEASURED FROM THE CENTER LINE OF THE REAR AXLE AND THE TOP OF THE REAR TIRE WHEN ONE WHEEL RIDES OVER A HIGH SPOT.

CW TRACK DUAL REAR WHEEL VEHICLES: DISTANCE BETWEEN THE CENTER LINES 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
- CH = TIRE LOADED RADIUS + C
- DH = TIRE LOADED RADIUS + D
- DW = TRACK + 2 TIRE SECTIONS - TIRE CLRRANCE
- EW = TRACK + 2 TIRE SECTIONS + TIRE CLEARANCE
- HH = TIRE LOADED RADIUS - A
- JH = KH - B
- KH = TIRE RADIUS + 3.00 INCHES
- KW = DW - 5.00 INCHES
- LW = 1.00 INCH MINIMUM CLEARANCE BETWEEN TIRES AND SPRINGS

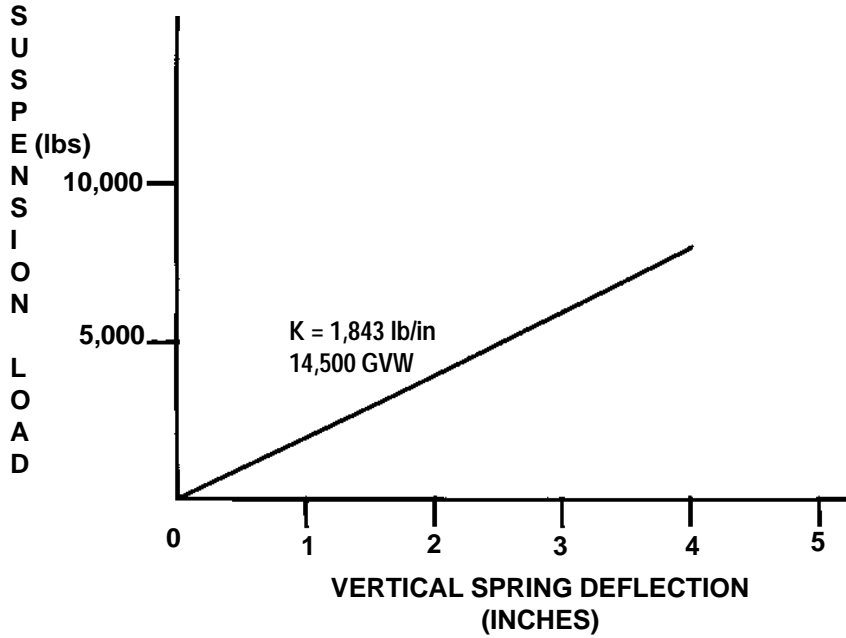
NOTE: TRACK AND OVERALL WIDTH MAY VARY WITH OPTIONAL EQUIPMENT.

Unit: Inch

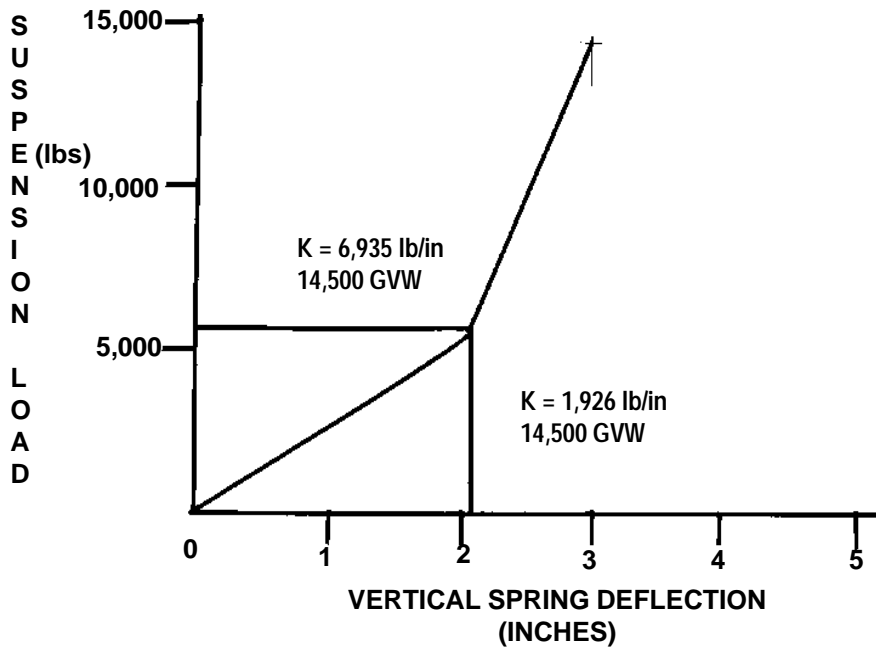
Tire	GAWR	Track CW	A	B	C	D	E
225/70R19.5	12980 lb	65.0	11.6	10.6	14.9	13.0	8.4

SUSPENSION DEFLECTION CHARTS NPR HD/W4500

FRONT LEAF SPRING LOAD VS. DEFLECTION
(PER AXLE)

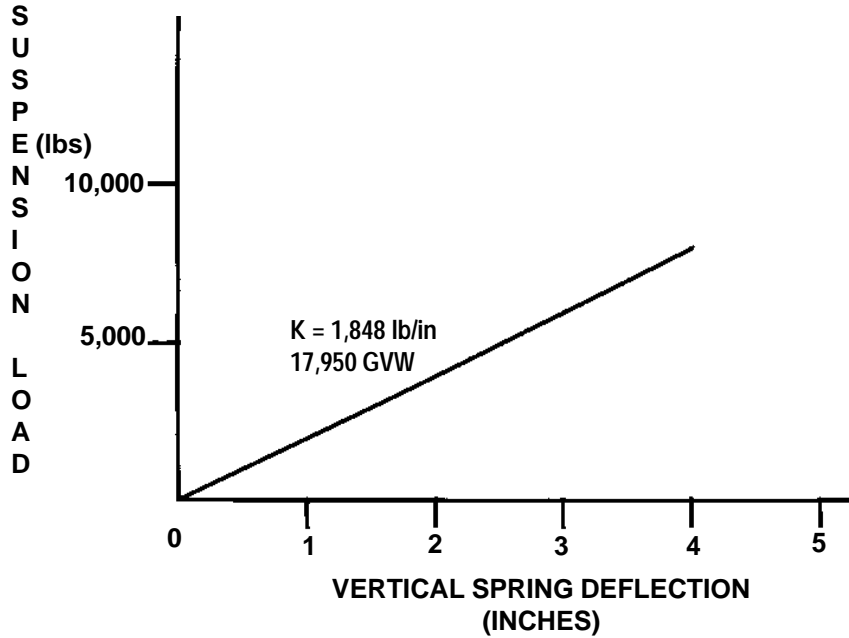


REAR LEAF SPRING LOAD VS. DEFLECTION
(PER AXLE)

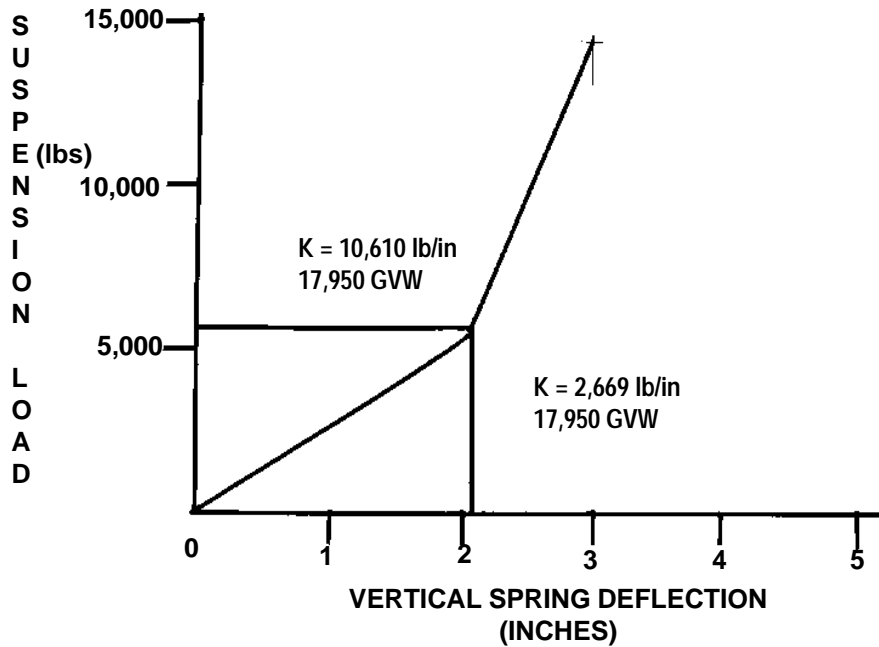


SUSPENSION DEFLECTION CHARTS NQR/W5500

FRONT LEAF SPRING LOAD VS. DEFLECTION (PER AXLE)



REAR LEAF SPRING LOAD VS. DEFLECTION (PER AXLE)



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 16-E	2680	80	2470	80	5360	9880	14,500

Unit: Inch

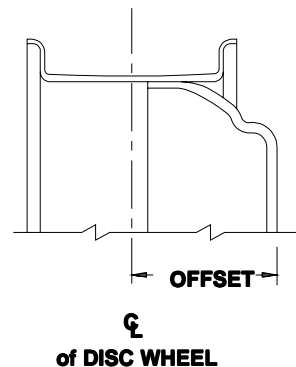
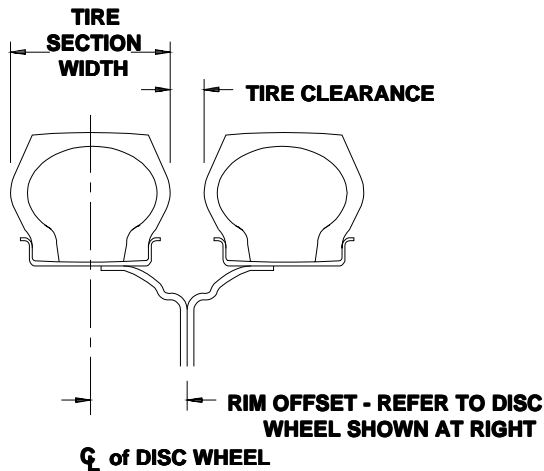
TIRE SIZE	GVWR (lb)	TIRE RADIUS				TIRE SECTION WIDTH	TIRE CLEARANCE	DESIGN RIM WIDTH
		LOADED		UNLOADED				
		FRONT	REAR	FRONT	REAR			
215/85R 16-E	14,500	14.1	14.1	14.3	14.7	8.2	18	6.0

DISC WHEEL

Unit: Inch

WHEEL SIZE	BOLT HOLES	BOLT CIRCLE DIA	FT/RR NUT SIZE*	REAR STUD SIZE*	NUT/STUD TORQUE SPECS.	INNER CIRCLE	OUTSIDE OFFSET	DISC THK	RIM TYPE	MATERIAL MFG.
16.6x6.00K	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	15° DC	Steel TOPY

*O.D. Wrench Sizes



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	3450	90	3245	90	6900	12980	17,950

Unit: Inch

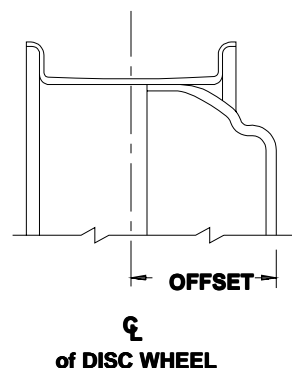
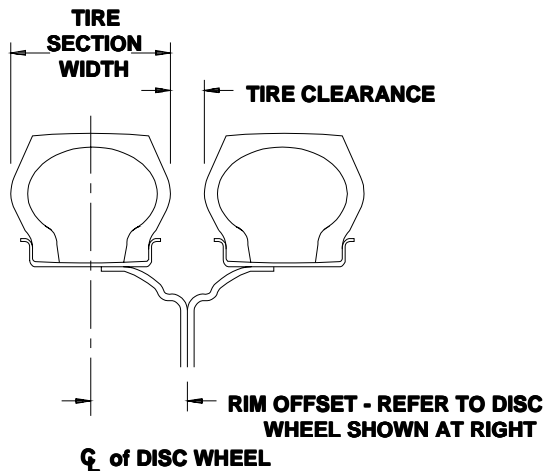
TIRE SIZE	GVWR (lb)	TIRE RADIUS				TIRE SECTION WIDTH	TIRE CLEAR-ANCE	DESIGN RIM WIDTH
		LOADED		UNLOADED				
		FRONT	REAR	FRONT	REAR			
225/70R 19.5F	17,950	15.0	15.2	15.4	15.8	8.8	1.2	6.0

DISC WHEEL

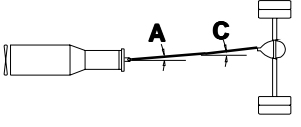
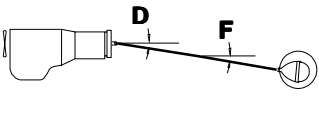
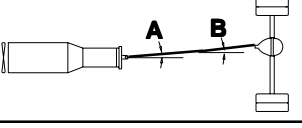
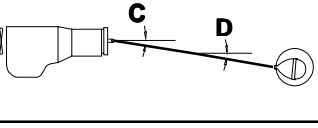
Unit: Inch

WHEEL SIZE	BOLT HOLES	BOLT CIRCLE DIA	FT/RR NUT SIZE*	REAR STUD SIZE*	NUT/STUD TORQUE SPECS.	INNER CIRCLE	OUTSIDE OFFSET	DISC THK	RIM TYPE	MATERIAL MFG.
19.5x6.00K	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	0.39	15° DC	Steel TOPY

*O.D. Wrench Sizes

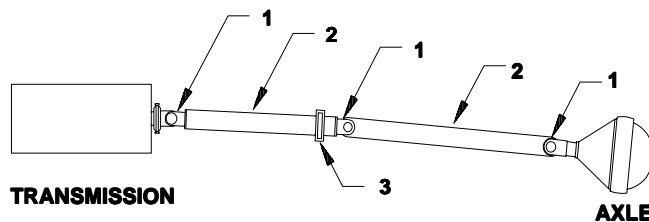


PROPELLER SHAFT NPR HD/W4500

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)



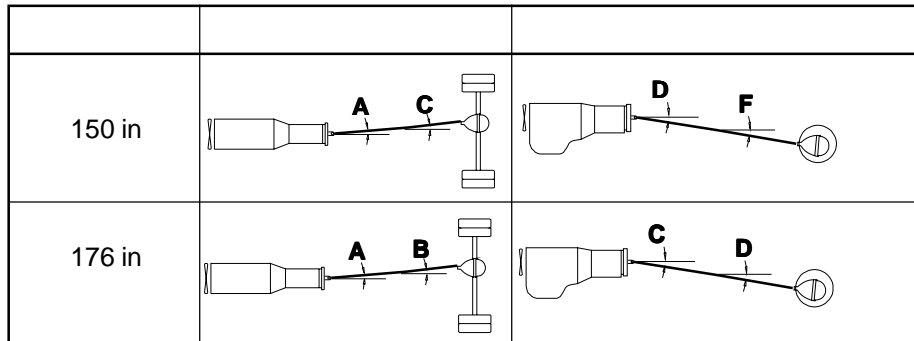
- 1. UNIVERSAL JOINT
- 2. PROPELLER SHAFT
- 3. CENTER CARRIER BEARING

WHEEL BASE	PLANE VIEW		SIDE VIEW	
	A A/T	B A/T	C A/T	D A/T
150 in	0°	2.4°	2.6°	6.4°
176 in	0°	1.7°	2.8°	4.5°

A/T = Automatic Transmission

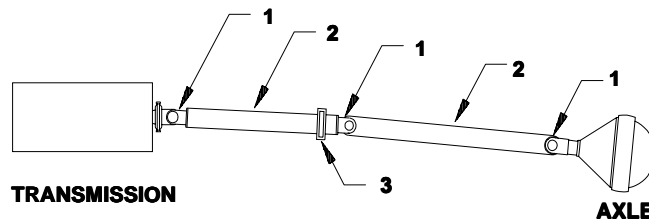
NOTE: ALL DRIVELINE ANGLES ARE AT UNLOADED CONDITION (CURB POSITION WITH TYPICAL CARGO BODY).

PROPELLER SHAFT NQR/W5500



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

WHEEL BASE	PLANE VIEW		SIDE VIEW	
	A A/T	B A/T	C A/T	D A/T
150 in	0°	3.1°	2.6°	7.7°
176 in	0°	2.3°	2.8°	4.8°

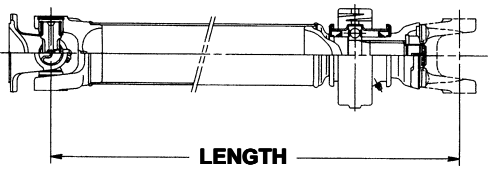
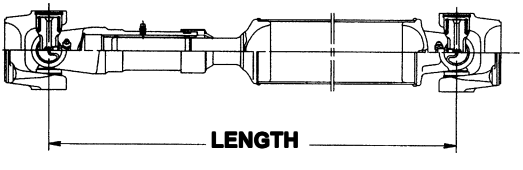
A/T = Automatic Transmission

NOTE: ALL DRIVELINE ANGLES ARE AT UNLOADED CONDITION (CURB POSITION WITH TYPICAL CARGO BODY).

PROPELLER SHAFT (CONTINUED) NPR-HD/W4500/NQR/W5500

WB	150	176
No. of Shafts	1	2
Trans. Type	6M/T	4A/T
Shaft #1 O.D.	3.25	3.25
Thickness	0.091	0.091
Length	41.9	53.7
Type	A	A
Shaft #2 O.D.	3.25	3.25
Thickness	0.091	0.091
Length	38.3	52.6
Type	C	C

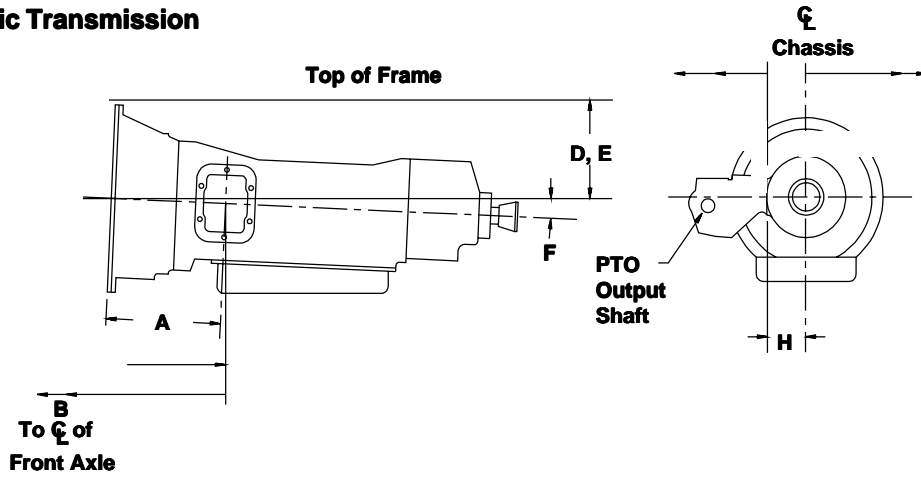
UNIT: INCH

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

A/T = Automatic Transmission

PTO LOCATION, DRIVE GEAR AND OPENING INFORMATION

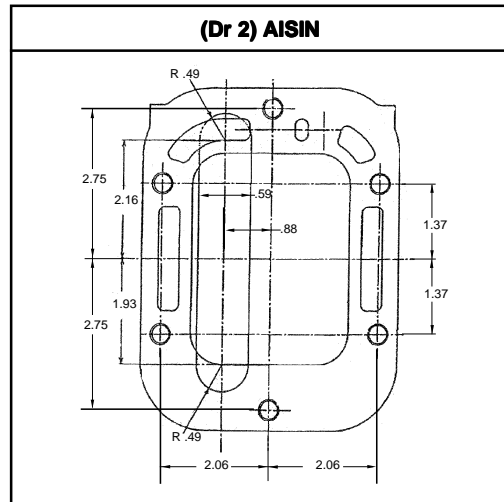
Automatic Transmission



Transmission	Opening Location	Bolt Pattern	A	B	C	D	E	F	H	PTO Drive Gear Location	Ratio of PTO Drv Gear Spd to Eng Spd	Number of Teeth	Pitch	Helix Angle	Maximum Output Torque
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 lb-ft @ 1000 RPM

Unit: Inch

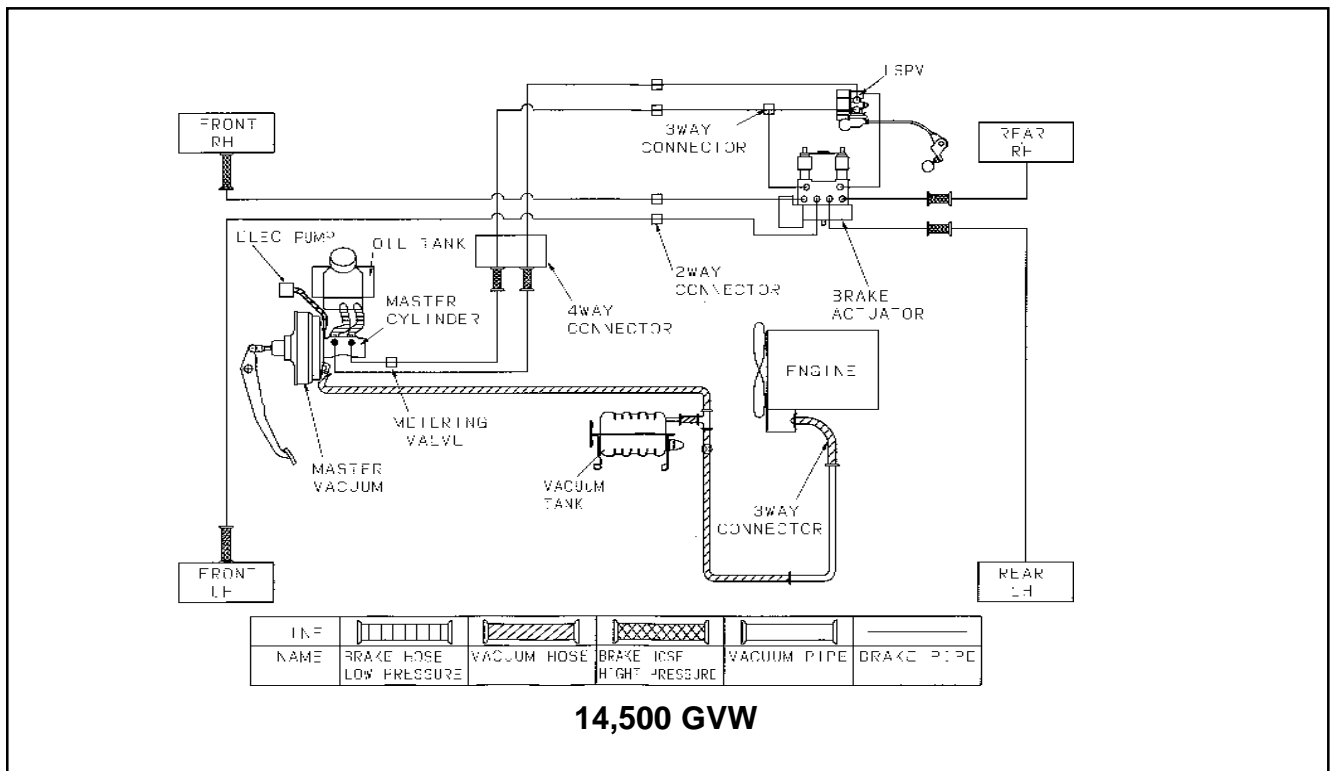
Opening Diagram



BRAKE SYSTEM DIAGRAM

Vacuum Over Hydraulic

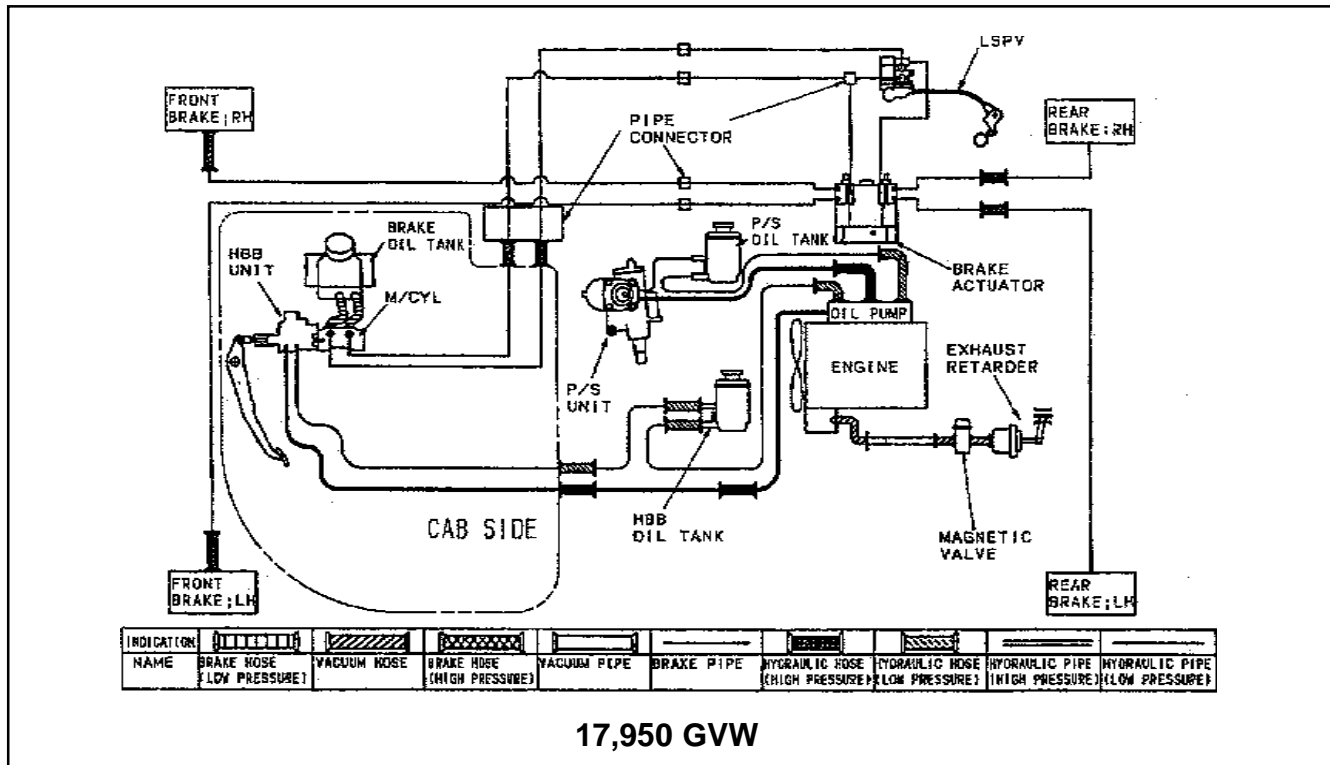
PLEASE REFER TO INTRODUCTION SECTION OF BOOK FOR ANTI-LOCK SYSTEM CAUTIONS AND WHEEL BASE MODIFICATION REQUIREMENTS



BRAKE SYSTEM DIAGRAM

Hydraulic Brake Booster

PLEASE REFER TO INTRODUCTION SECTION OF BOOK FOR ANTI-LOCK SYSTEM CAUTIONS AND WHEEL BASE MODIFICATION REQUIREMENTS



DIESEL FUEL FILL

Installation instructions:

Disconnect battery.

Loosen hose from the tie downs. Remove caps from plate on rail.

Install hoses on to the plate.

Extend hose out from the driver side of the rail to body rail.

The filler neck must be mounted to allow the fill plate bracket to be parallel to the frame horizontal (see Figure 4).

Cover with protector wrap and secure with tie wraps.

Filler hose is set for 96 inches outside width body.

Filler neck (dimension A) must be between 6.85 inches and 8.5 inches above frame.

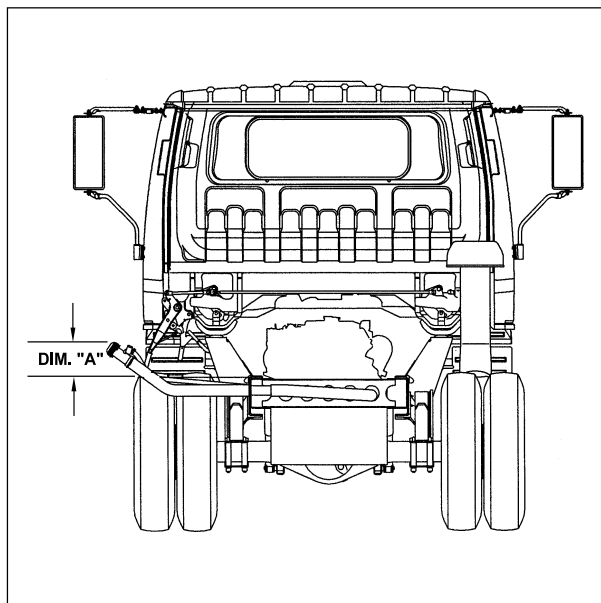
Secure the filler plate to the bottom of the body and check for leaks.

Ensure that fill hose does not sag, creating an area where the fuel could pool in the fill hose.

Reconnect battery.

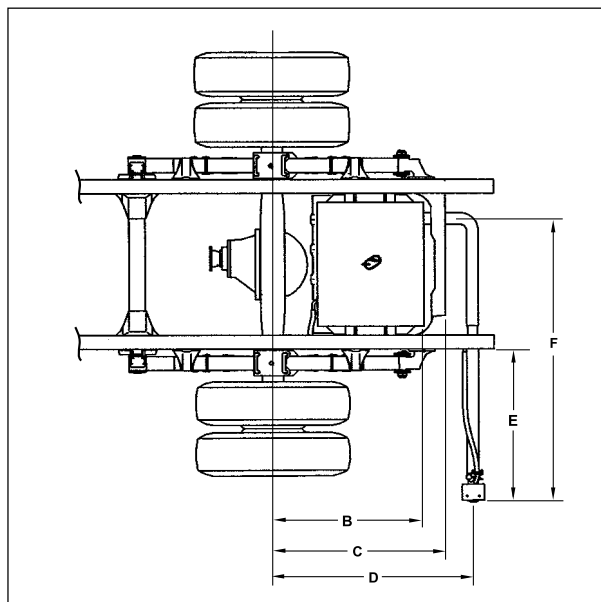
Rear View Fuel Fill

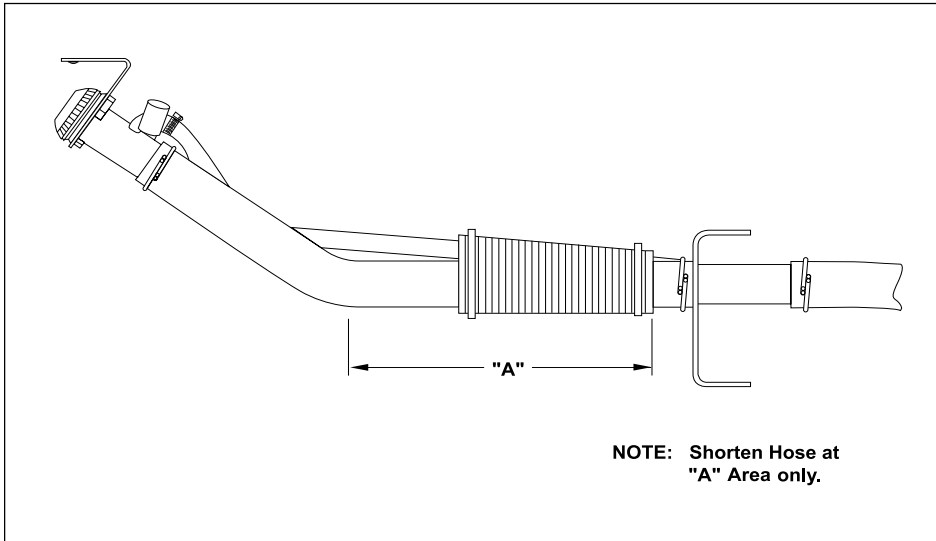
Dimension A = 6.85 - 8.50 (174-216mm)



Top View Fuel Fill

Dimensions:
B = 29.75 in (756mm)
C = 34.00 in (863mm)
D = 39.29 in (998mm)
E = 30.86 in (784mm)
F = 56.6 in (1438mm)

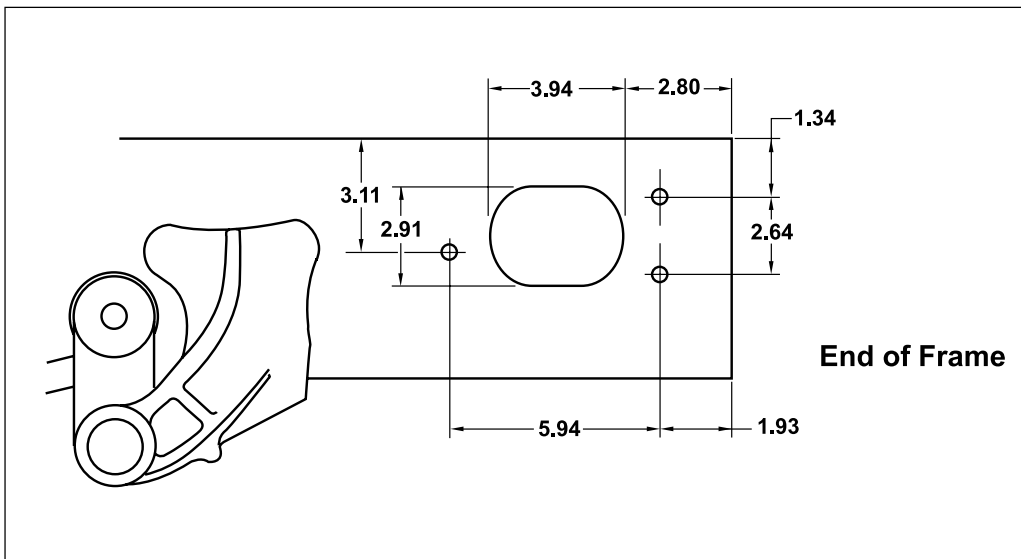




Hose Modification for Various Width Bodies

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

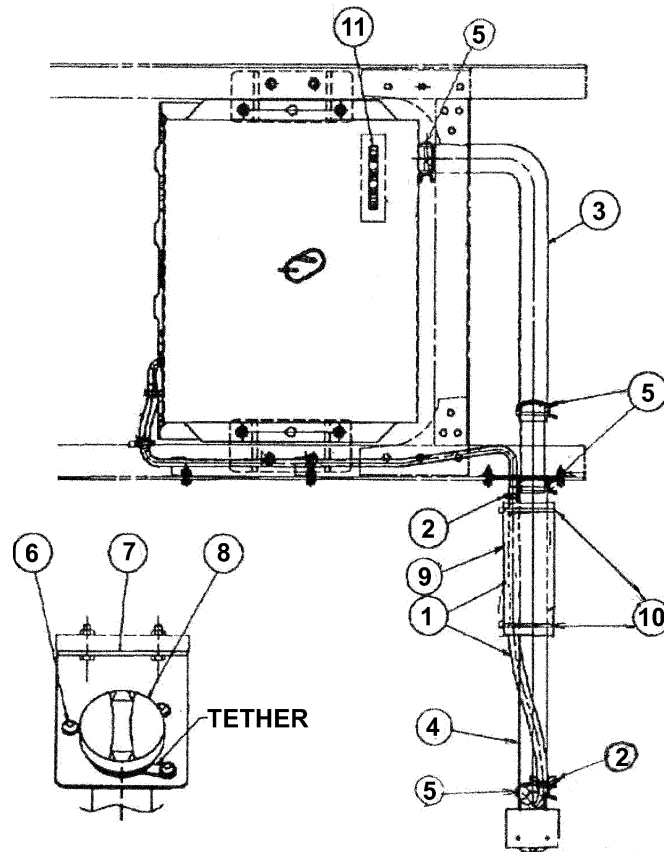
NOTE: Shorten Hose at "A" Area only.



Through the Rail
Fuel Fill
Frame Hole

End of Frame

Fuel Fill Parts List

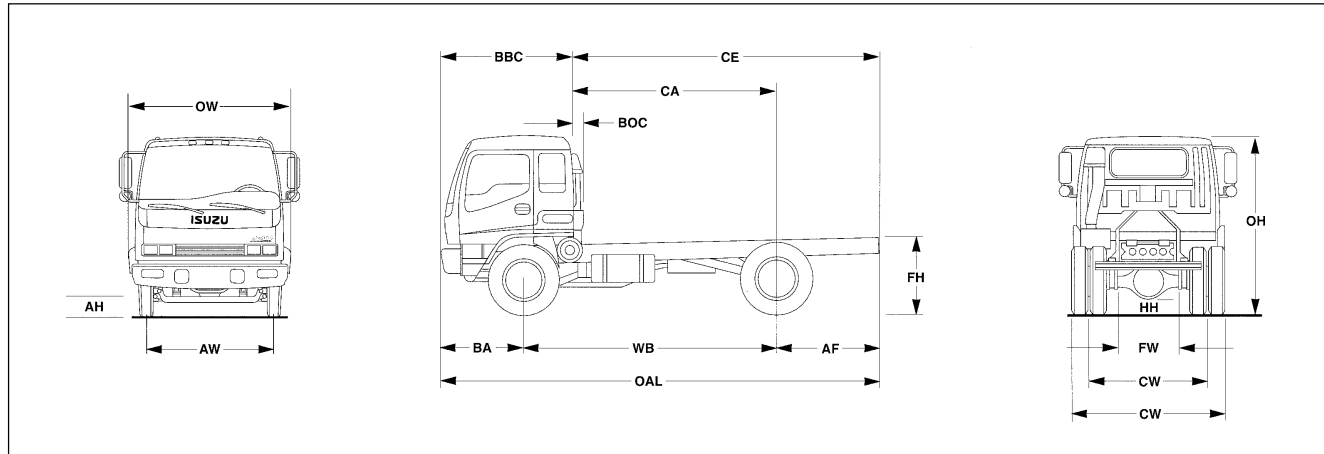


No.	Description	Isuzu P/N	GM P/N	Qty.
1	BREATHER HOSE	897206-0420	-	1
2	CLIP RUBBER HOSE	894242-0340	94242034	2
3	HOSE, FUEL FILLER	897187-8750	97187875	1
4	HOSE FUEL FILLER	897253-1400	97253140	1
5	CLIP, FILLER HOSE	894435-8760	97724373	4
6	SCREW, FILLER HOSE	894384-6460	-	3
7	BRACKET, FILLER NECK	897116-621Y	97116621	1
8	CAP, FILLER	897118-7020	-	1
9	PROTECTOR	897114-0630	97114063	1
10	CLIP	109707-1070	94062296	2
11	CAUTION PLATE	894414-3530	94414353	1

MODEL	FRR/WT5500	
GVWR/GCWR	18,000/30,000 lb (26,000 lb with automatic)	
	19,500/30,000 lb (26,000 lbs with automatic).	
WB	148 in, 167 in, 179 in, 191 in, 218 in	
ENGINE	Isuzu 6-cyl., in-line 4-cycle, OHC, turbocharged, intercooled, direct injection diesel.	
Model/Displacement	6HK1-TC/475 CID (7.8L)	
HP (Gross)	200 HP @ 2,400 rpm	
Torque (Gross)	441 lb-ft torque @ 1,500 rpm	
Equipment	Dry element air cleaner with vertical inlet. Spin-on paper element type fuel and oil filters. Cold weather starting device. Fuel water separator, common rail type electronic fuel injection system and an oil cooler.	
CLUTCH	Single dry disc, hydraulic actuation, 14 in diameter, cerametallic Spicer.	
* TRANSMISSION	MLD 6Q Manual 6-Speed synchronized second through sixth, sixth gear is overdrive.	
Optional Trans.	Allison 1000 Series , 5 Speed overdrive, Automatic Transmission with lockup torque converter	
STEERING	Integral power steering with variable ratio (18.8-16.1:1).	
FRONT AXLE	Reverse Elliot "I"-beam rated at 8,800 lb.	
Suspension	Semi-elliptical alloy steel leaf springs with stabilizer bar and shock absorbers.	
GAWR	6,800 lb	7,060 lb
REAR AXLE	Full floating single speed with hypoid gearing rated at 14,330 lb.	
Ratio MT/AT	4.11:1/4.33:1	
Suspension	Semi-elliptical alloy steel leaf springs.	
GAWR	13,000 lb	13,680 lb
WHEELS	19.5 x 6.00 on 6-hole disc wheels, painted white.	
TIRES	225/70R19.5F low profile tubeless radial.	
FUEL TANK	42 gal rectangular steel, mounted on LH frame rail, fuel/water separator frame mounted. Fuel filter.	
BRAKES	Anti-Lock Brake system with dual circuit air over hydraulic self adjusting service brakes. Mechanical cable actuated internal expanding drum parking brake, transmission mounted. An exhaust brake is also standard.	
FRAME	Ladder type channel section 33 in width at load platform area, section modulus of 7.63 in ³ and RBM 412,200 lb-ft/in per rail.	
CAB	All steel, low cab forward, BBC 78.7 in, 45° mechanical tilt with torsion assist.	
Equipment	Dual exterior rear view mirrors, electrically operated wipers and window washer. Steering column tilts and telescopes. Includes 2-3 point seat belts and retractors, and a 2 point seat belt. Right hand power window.	
ELECTRICAL	12 Volt, dual Delco maintenance free batteries, 750 CCA each. 110 Amp alternator with integral regulator. Right hand power window.	
OPTIONS	2nd fuel tank on 167", 179", 191" and 218" WB, transmission mounted PTO, Air Conditioning, block heater, oil pan heater, AM/FM Cassette Stereo Radio, rear traction tread tires, spare wheel, spare tire carrier, spare tire	
NOTE:	These selected specifications are subject to change without notice. *All Transmissions have a PTO gear in all wheelbases.	

FRR/WT5500

VEHICLE WEIGHTS, DIMENSIONS AND RATINGS



VEHICLE WEIGHTS, DIMENSIONS AND RATINGS • Variable Chassis Dimensions:

Unit	WB*	CA*	CE*	OAL	AF
Inch	148	117.7	180.6	259.3	62.9
Inch	167	136.2	206.5	285.2	70.3
Inch	179	148.0	226.2	304.9	78.1
Inch	191	159.8	243.9	322.6	84.1
Inch	218	187.4	283.3	362.0	95.9

*Effective CA & CE are 7.5 inch less for MT.

*Effective CA & CE are 10.0 inch less for AT.

Dimensions Constants

Code	Inches
AH	8.2
HH	6.7
AW	70.5
BA	47.8
BBC	78.7
BOC	7.5 MT/10.0 AT
BW	85.3
CW	65.4
FW	33.0
OH	103.5/105.5
OW	86.3
FH	35.3
FH 191 and 218 WB	37.3

Chassis Curb & Maximum Payload Weights 19,500 GVW

With 6-Speed Manual Transmission

Model	WB*	Unit	Front	Rear	Total	Payload
SA1	148 in	lb	5027	2448	7475	12025
SA2	167 in	lb	5116	2414	7530	11970
SA3	179 in	lb	5182	2403	7585	11915
SA4	191 in	lb	5171	2503	7674	11826
SA5	218 in	lb	5270	2547	7817	11683

18,000 GVW

With 6-Speed Manual Transmission

Model	WB*	Unit	Front	Rear	Total	Payload
SE1	148 in	lb	5027	2448	7475	10525
SE2	167 in	lb	5116	2414	7530	10470
SE3	179 in	lb	5182	2403	7585	10415
SE4	191 in	lb	5171	2503	7674	10326
SE5	218 in	lb	5270	2547	7817	10183

Chassis Curb & Maximum Payload Weights

19,500 GVW

With Automatic Transmission

Model	WB*	Unit	Front	Rear	Total	Payload
SB1	148 in	lb	5045	2426	7471	12029
SB2	167 in	lb	5134	2392	7526	11974
SB3	179 in	lb	5189	2381	7570	11930
SB4	191 in	lb	5178	2481	7659	11841
SB5	218 in	lb	5277	2525	7802	11698

18,000 GVW

With Automatic Transmission

Model	WB*	Unit	Front	Rear	Total	Payload
SF1	148 in	lb	5045	2426	7471	10529
SF2	167 in	lb	5134	2392	7526	10474
SF3	179 in	lb	5189	2381	7570	10430
SF4	191 in	lb	5178	2481	7659	10341
SF5	218 in	lb	5277	2525	7802	10198

Truck Weight Limits: Unit

GVWR Designed Max.	lb	18,000	19,500
GAWR Front	lb	6,800	7,060
GAWR Rear	lb	13,000	13,680

Technical Notes:

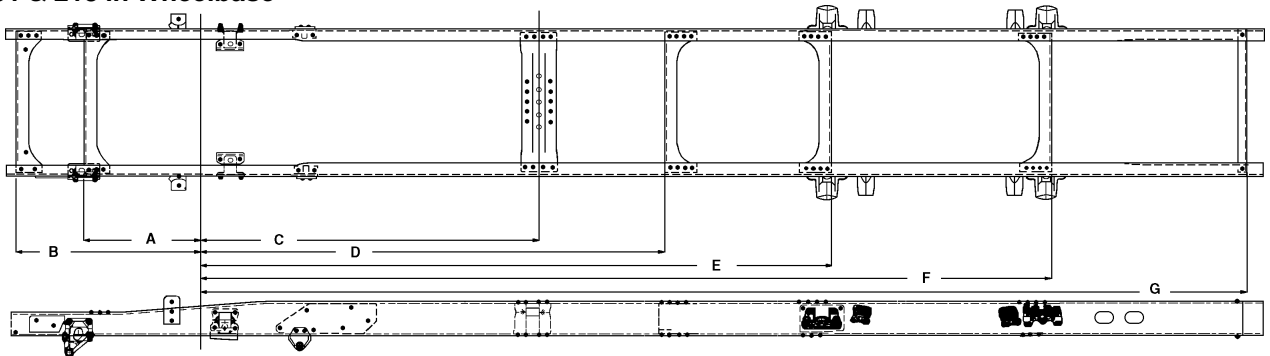
Chassis Curb Weight reflects standard environment and fuel but no driver or load.

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

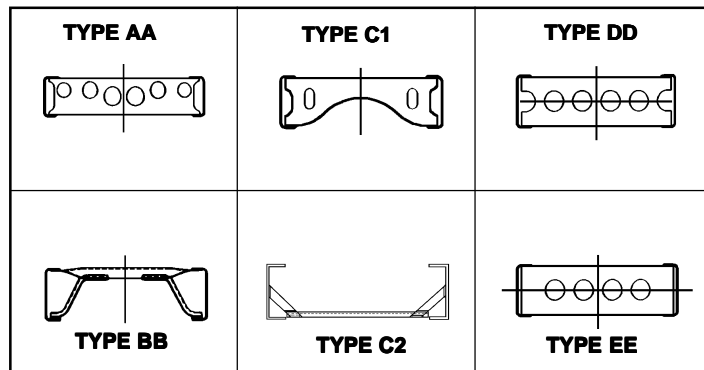
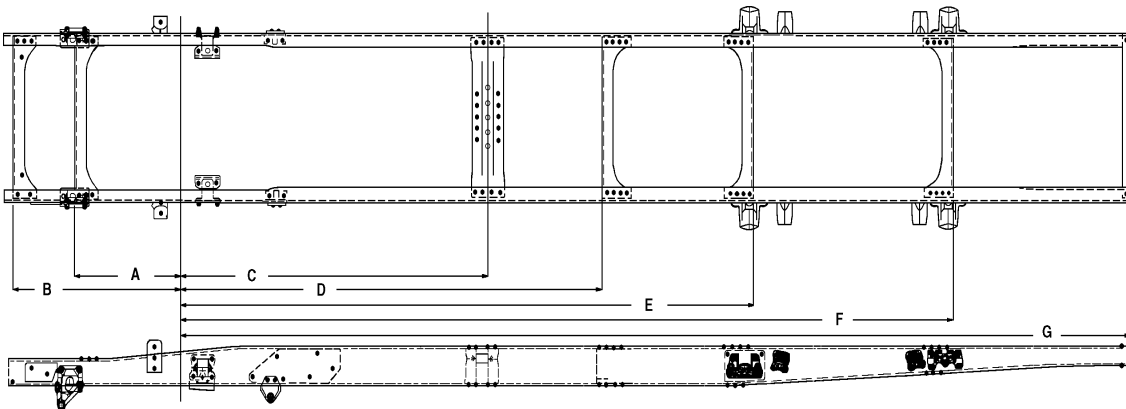
*Frame is tapered at the rear of the 148", 167" and 179" WB, but straight on the 191" and 218" WB.

FRAME & CROSSMEMBER SPECIFICATIONS

191 & 218 in Wheelbase



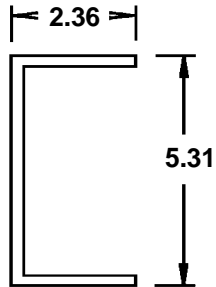
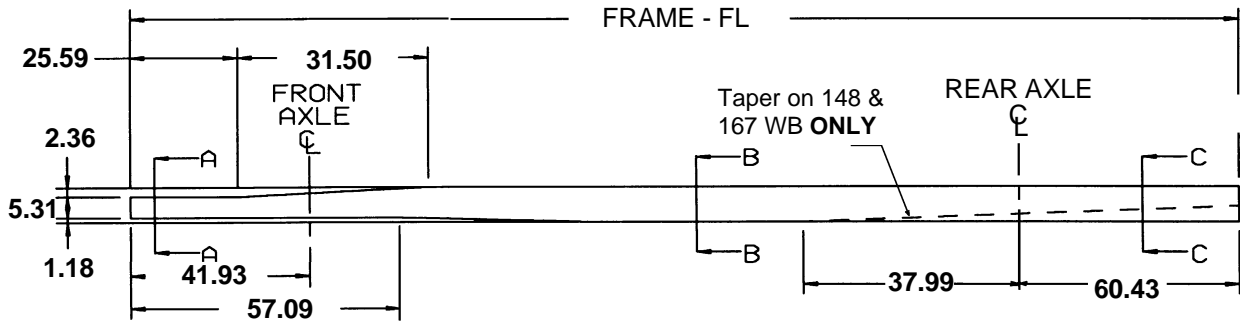
148, 167 & 179 in Wheelbase



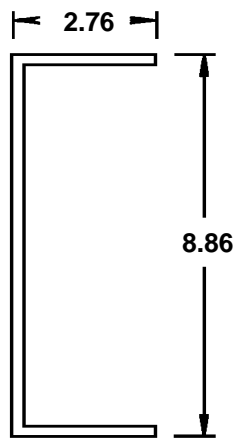
Unit: Inch

Wheel Base	Frame FL	Frame Thick	CROSS MEMBER TYPE/LOCATION							
			A	B	C	D	D	E	F	G
148	253.9	0.24	AA 24.3	AA 39.6	BB 77.9	-	C2 96.1	DD 125.4	DD 175.0	EE 212.0
167	279.5	0.24	AA 24.3	AA 39.6	BB 77.9	-	C1 106.3	DD 143.9	DD 193.5	EE 237.6
179	299.2	0.24	AA 24.3	AA 39.6	BB 77.9	-	C3 106.3	DD 155.7	DD 205.3	EE 257.3
191	316.9	0.24	AA 24.3	AA 39.6	BB 77.9	-	C1 117.7	DD 167.5	DD 217.1	EE 267.1
218	356.3	0.24	AA 24.3	AA 39.6	BB 77.9	C2 106.28	C1 145.27	DD 195.0	DD 244.6	EE 314.3

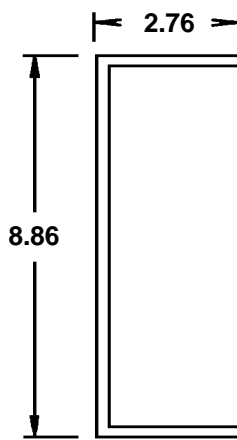
FRAME CHART



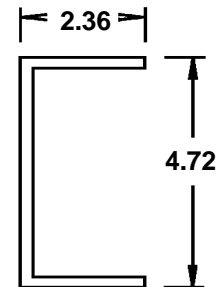
SECTION A-A



SECTION B - B



SECTION C - C
179 191, 218in WB

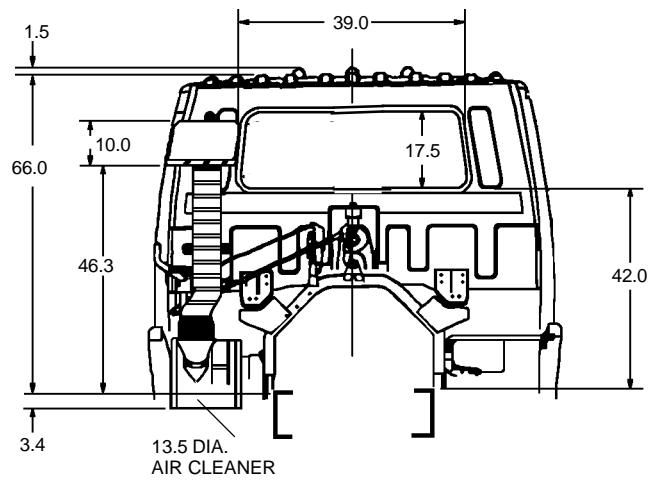
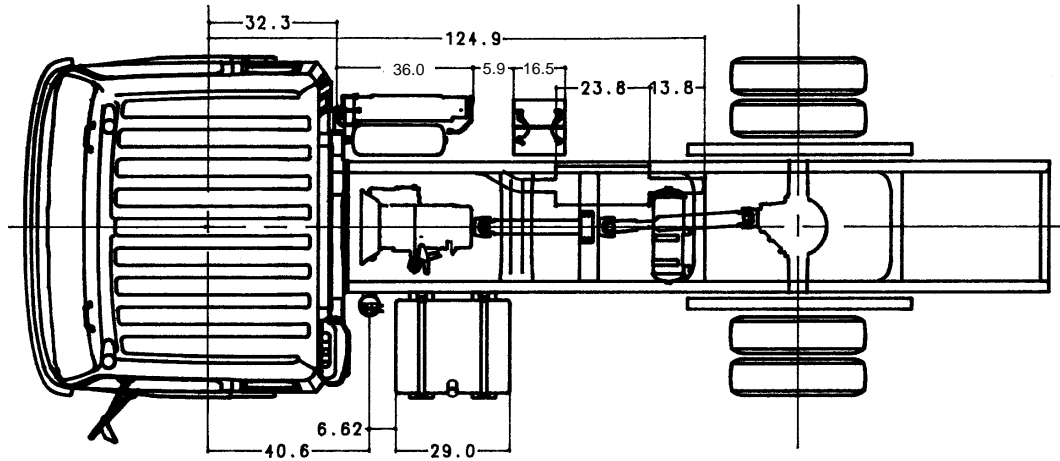


SECTION C-C
148 & 167 in WB
at end of frame

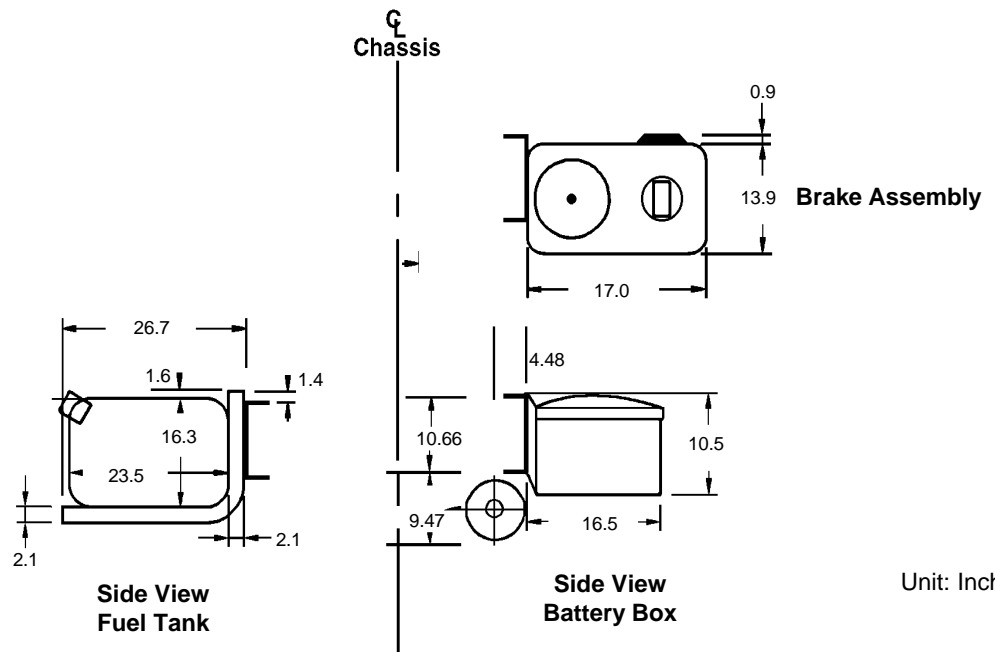
Unit: Inch

WB	FRAME FL	CA	CE	FRAME THICKNESS
148	253.9	117.7	180.6	0.24
167	279.5	132.2	206.5	0.24
191	299.2	148	226.2	0.24
179	316.9	159.8	243.9	0.24
218	356.3	187.4	283.3	0.24

AUXILIARY VIEWS



Cab Mount Member, Air Intake & Rear Window



Unit: Inch

BODY BUILDER WEIGHT INFORMATION CHART

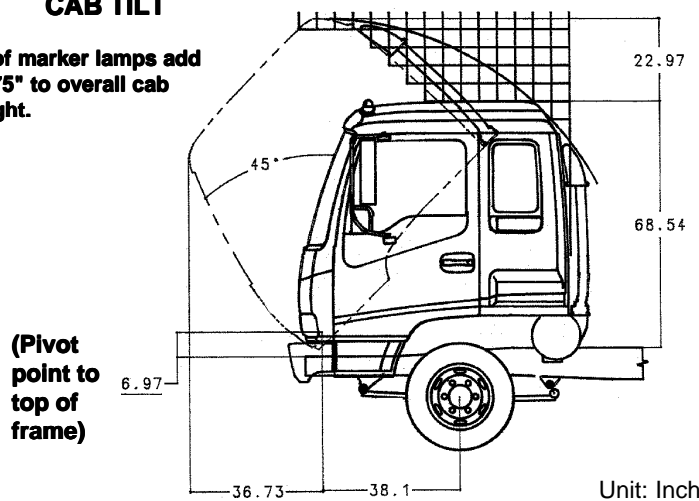
FRR Series

GVWR	Axle	148		167		179		191		218		Unsprung Weight
		MT	AT	MT	AT	MT	AT	MT	AT	MT	AT	
19500	Frnt.	5027	4994	5116	5083	5182	5138	5171	5127	5270	5226	770
19500	Rear	2448	2426	2414	2392	2403	2381	2503	2481	2547	2525	1335
19500	Total	7475	7420	7530	7475	7585	7519	7674	7608	7817	7751	2105

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

CAB TILT

NOTE: Roof marker lamps add 1.575" to overall cab height.



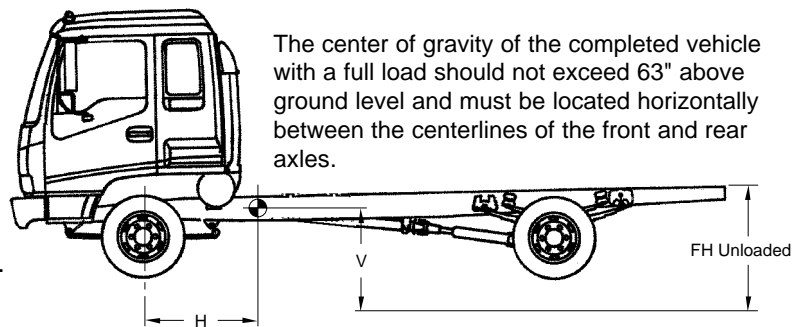
GRID SCALE:
One square is 5 in. x 5 in.

(Pivot point to top of frame)

Unit: Inch

CENTER OF GRAVITY

The center of gravity of the chassis-cab.



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

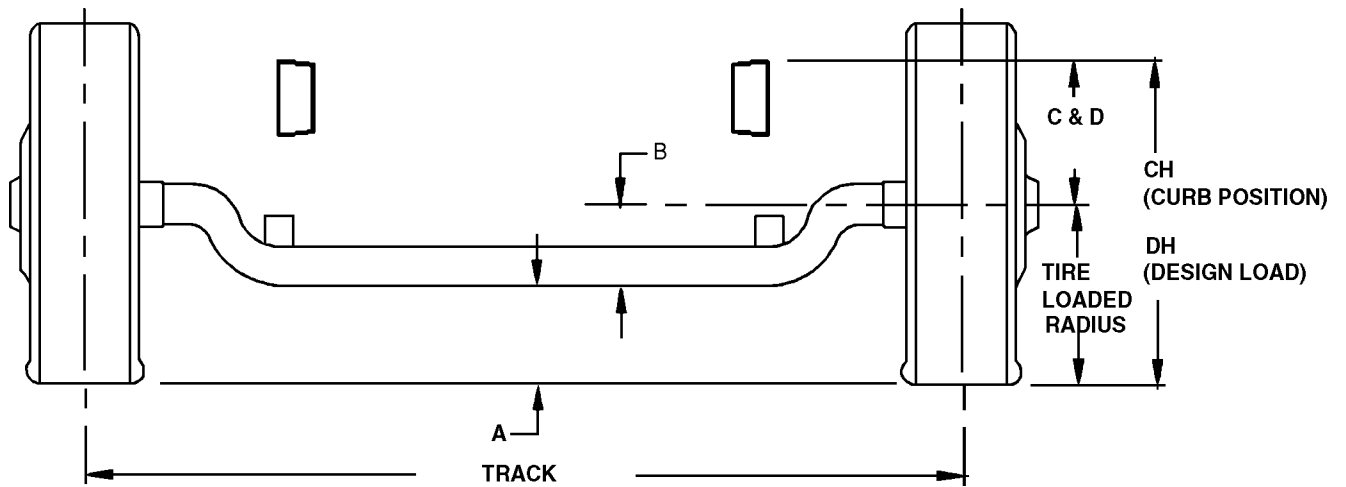
Unit: Inch

GVWR	WB	V	M/T	A/T
19,500	148	27.5	48.7	48.6
	167	27.5	53.7	53.6
	179	27.5	56.8	56.7
	191	28.3	62.3	62.3
	218	28.3	71.2	71.2

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

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

FRONT AXLE CHART



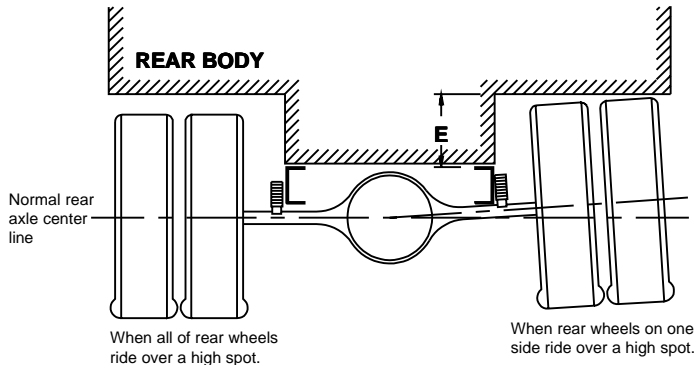
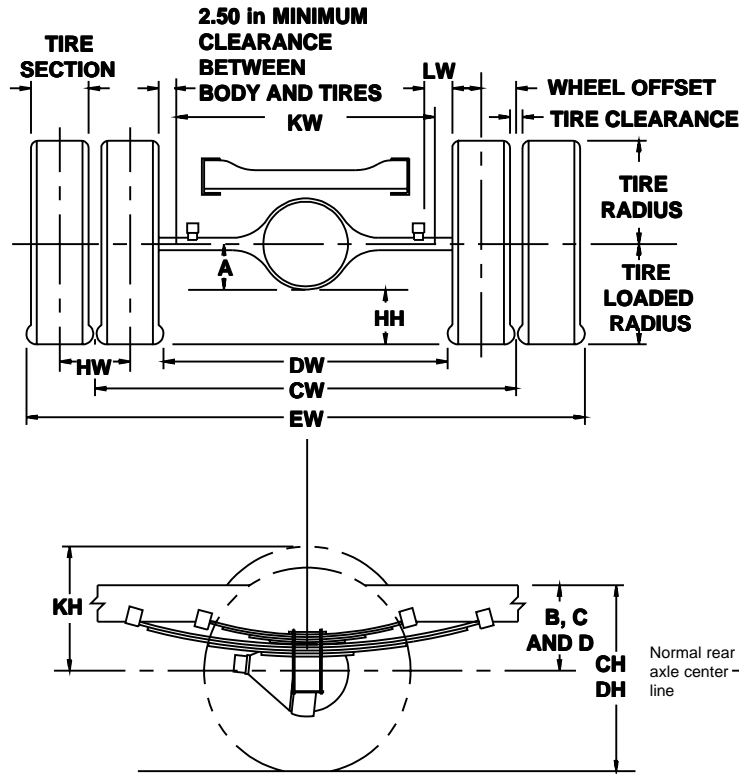
FORMULAS FOR CALCULATING HEIGHT DIMENSIONS

- 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

Unit: Inch

TIRE	GVWR	AXLE CAPACITY	SUSP. CAPACITY	A	B	C	D	CH	DH	TRACK	Tire Radius	
											Unload	Load
225/70R19.5	19,500 lb	8,800 lb	7,060 lb	8.2	6.9	12.3	11.39	27.52	26.41	70.5	15.4	15.0

REAR AXLE CHART



DEFINITIONS

- A CENTER LINE OF AXLE TO BOTTOM OF AXLE BOWL.
- B CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT METAL POSITION.
- C CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT CURB POSITION.
- D CENTER LINE OF AXLE TO TOP OF FRAME RAIL AT DESIGN LOAD.
- E REAR TIRE CLEARANCE:
MINIMUM CLEARANCE REQUIRED FOR TIRES AND CHAIN MEASURED FROM THE TOP OF THE FRAME AT THE VERTICAL CENTER LINE OF THE REAR AXLE, WHEN REAR WHEELS ON ONE SIDE RIDE OVER A HIGH SPOT.
- CH REAR FRAME HEIGHT:
VERTICAL DISTANCE BETWEEN THE NORMAL TOP OF FRAME RAIL AND THE GROUND-LINE THROUGH THE CENTER LINE OF THE REAR AXLE AT CURB POSITION.
- DH REAR FRAME HEIGHT:
VERTICAL DISTANCE BETWEEN THE NORMAL TOP OF FRAME RAIL AND THE GROUND-LINE THROUGH THE CENTER LINE OF THE REAR AXLE AT DESIGN LOAD.
- DW MINIMUM DISTANCE BETWEEN THE INNER SURFACES OF THE REAR TIRES.
- EW OVERALL REAR WIDTH:
OVERALL WIDTH OF THE VEHICLE MEASURED AT THE OUTER MOST SURFACE OF THE REAR TIRES.
- HH REAR TIRE CLEARANCE:
MINIMUM CLEARANCE BETWEEN THE REAR AXLE AND THE GROUND-LINE.
- HW DUAL TIRE SPACING:
DISTANCE BETWEEN THE CENTER LINES OF THE TIRES IN A SET OF DUAL TIRES.
- KH TIRE BOUNCE CLEARANCE:
MINIMUM DISTANCE REQUIRED FOR TIRE BOUNCE AS MEASURED FROM THE CENTER LINE OF THE REAR AXLE AND THE TOP OF THE REAR TIRE WHEN ONE WHEEL RIDES OVER A HIGH SPOT.

- CW TRACK DUAL REAR WHEEL VEHICLES:
DISTANCE BETWEEN THE CENTER LINES 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
- CH = TIRE LOADED RADIUS + C
- DH = TIRE LOADED RADIUS + D
- DW = TRACK + 2 TIRE SECTIONS - TIRE CLEARANCE
- EW = TRACK + 2 TIRE SECTIONS + TIRE CLEARANCE
- HH = TIRE LOADED RADIUS - A
- JH = KH - B
- KH = TIRE RADIUS + 3.00 INCHES
- KW = DW - 5.00 INCHES
- LW = 1.00 INCH MINIMUM CLEARANCE BETWEEN TIRES AND SPRINGS

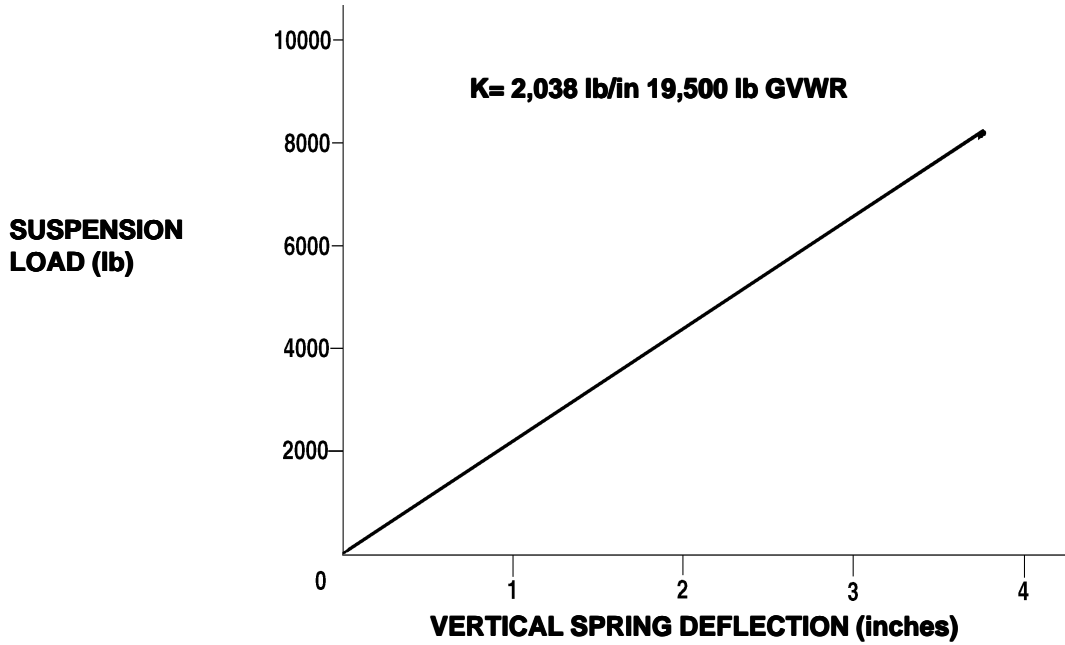
NOTE: TRACK AND OVERALL WIDTH MAY VARY WITH OPTIONAL EQUIPMENT.

Unit: Inch

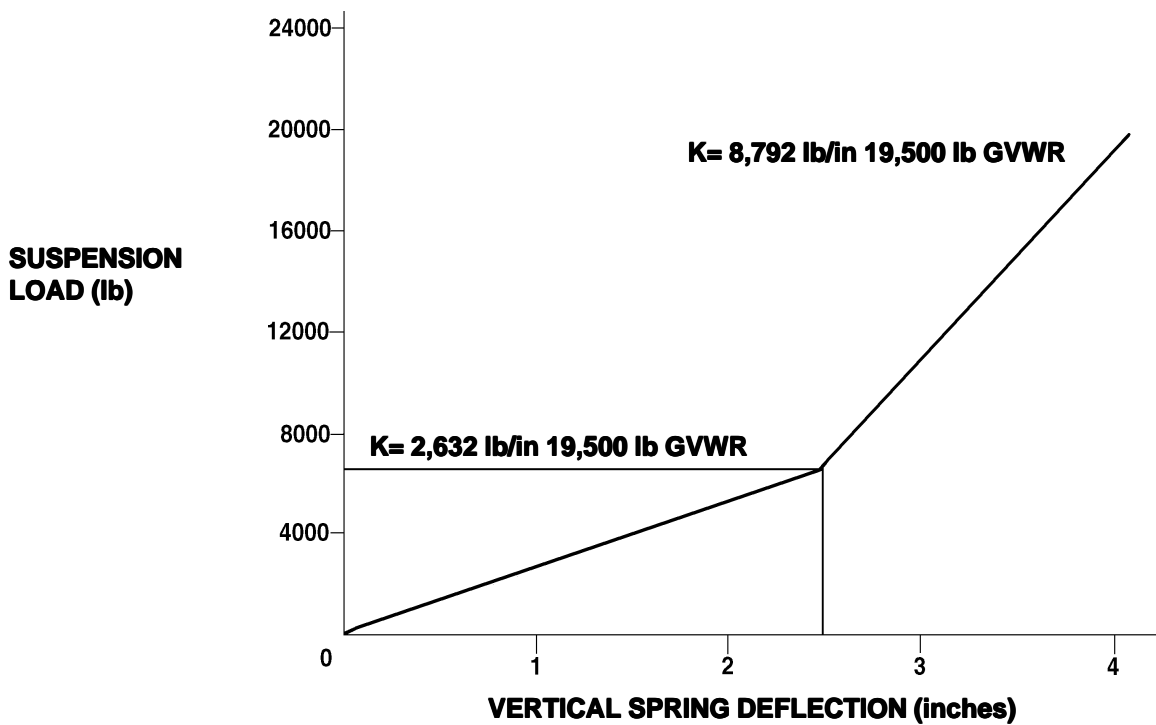
Tire	GVWR	Axle Capacity	Suspension Capacity	A	B	C	D	E	Track CW
225/70R19.5 (12 pr)	19,500 lb	14,330 lb	13,680 lb	8.1	11.2	17.4	15.1	9.8	65.3

SUSPENSION DEFLECTION CHARTS

**FRONT LEAF SPRING LOAD VS. DEFLECTION
(PER AXLE)**



**REAR LEAF SPRING LOAD VS. DEFLECTION
(PER AXLE)**



TIRE AND DISC WHEEL CHART

TIRE

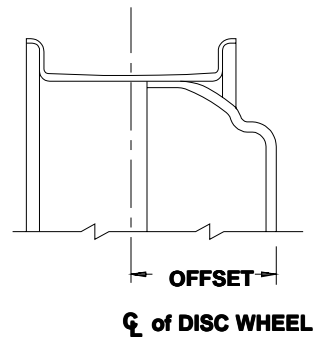
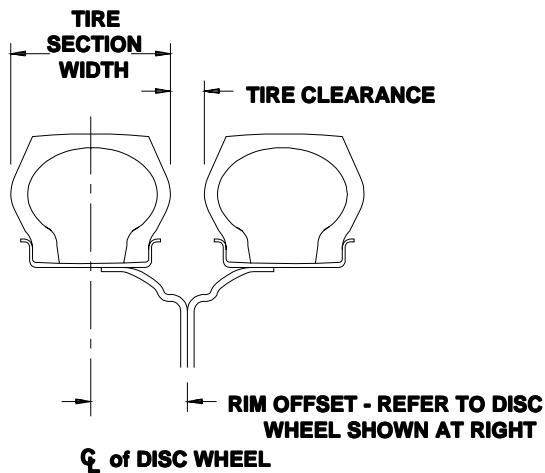
	RADIAL				MAXIMUM TIRE LOAD LIMITS		GVWR
	SINGLE		DUAL		FRONT	REAR	
TIRE SIZE	(lb)	(psi)	(lb)	(psi)	2 SINGLE	4 DUAL	(lb)
225/70R19.5F (12 pr)	13,640	95	3,420	95	7,280	13,680	19,500

TIRE SIZE	GVWR (lb)	TIRE RADIUS		TIRE SECTION WIDTH	TIRE CLEAR-RANCE	DESIGN RIM WIDTH
		LOADED	UNLOADED			
225/70R19.5F	19,500	15.0 in	15.4 in	8.8 in	1.20 in	6.0 in

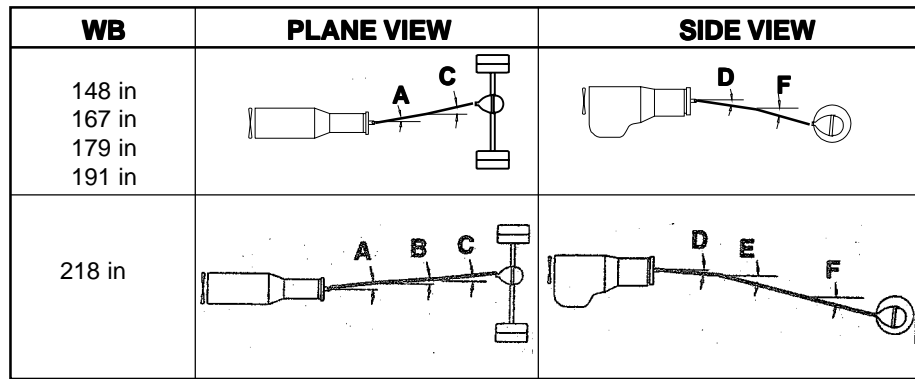
DISC WHEEL

WHEEL SIZE	BOLT HOLES	BOLT CIRCLE DIA	FT/RR NUT SIZE*	REAR STUD SIZE*	NUT/STUD TORQUE SPECS.	INNER CIRCLE	OUTSIDE OFFSET	DISC THK	RIM TYPE	MATERIAL MFG.
19.5x6.00	6 JIS	8.75 in	1.6142 in (41 mm) BUD HEX	0.8268 in (21 mm) SQUARE	400 ft-lb (550 N-M)	6.46 in	5.3 in	0.35 in	15° DC	STEEL TOPY

*O.D. Wrench Sizes

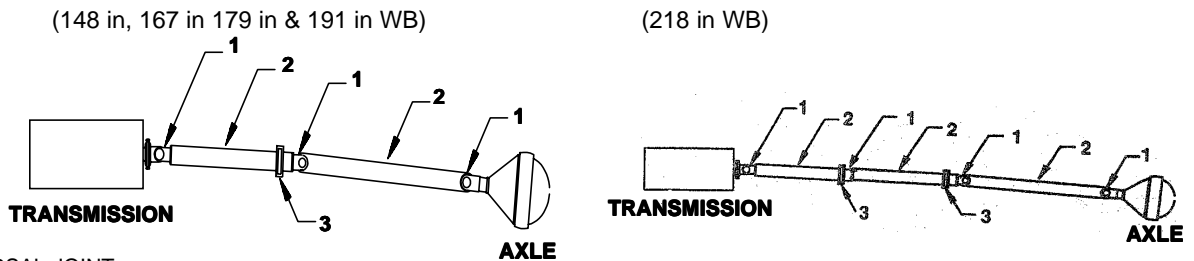


PROPELLER SHAFT



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.

FRR



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

	PLAN VIEW							
	A		B		C			
	M/T	A/T	M/T	A/T	UNLOADED		LOADED	
WHEELBASE	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T
148 in	0.0°	4.4°			4.8°	9.6°	9.6°	4.9°
167 in	0.0°	3.8°			3.5°	6.6°	6.6°	3.2°
179 in	0.0°	3.8°			2.6°	5.0°	5.0°	2.4°
191 in	0.0°	4.6°			2.6°	4.8°	4.8°	2.2°
218 in	0.0°	3.7°	0.0°	4.2°	2.6°	3.2°	3.2°	0.7°

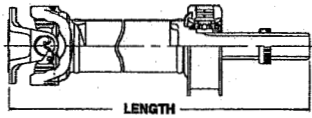
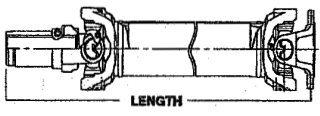
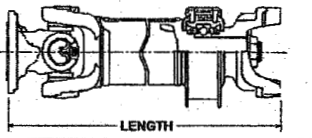
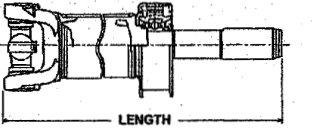
	SIDE VIEW							
	D		E		F			
	M/T	A/T	M/T	A/T	UNLOADED		LOADED	
WHEELBASE	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T
148 in	1.7°	1.9°			7.1°	7.1°	2.4°	2.4°
167 in	1.2°	1.3°			4.2°	4.1°	0.7°	0.7°
179 in	1.2°	1.3°			2.5°	2.5°	-0.1°	-0.1°
191 in	2.0°	2.1°			2.2°	2.3°	-0.2°	-0.3°
218 in	1.2°	1.2°	1.6°	1.7°	0.7°	0.7°	-1.8°	-1.8°

Engine install at 2.5° degree angle from horizontal frame.
 Side view angles are measured from 2.5° degree angle.
 Positive angles are in addition to 2.5° angle.
 Negative angles are in subtraction from 2.5° angle.

NOTE: Loaded at Design Load
 Unloaded at Curb Position (With typical cargo body)

PROPELLER SHAFT (CONTINUED)

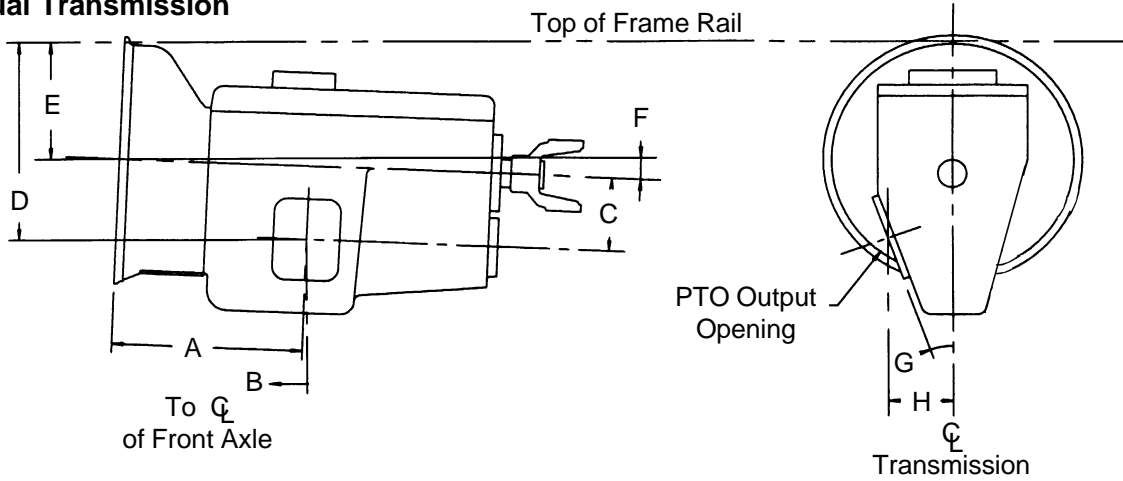
WB	148		167		179		191		218	
No. of Shafts	2		2		2		2		3	
Trans. Type	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T
Shaft #1 O.D.	4.0									
Thickness	0.134									
Length	37.89	35.80	46.16	44.07	46.16	44.07	57.57	55.49	42.37	40.28
Type	A	A	A	A	A	A	A	A	C	C
Shaft #2 O.D.	4.0									
Thickness	0.134									
Length	38.20	38.20	48.44	48.44	60.05	60.05	60.65	60.65	42.89	42.89
Type	B	B	B	B	B	B	B	B	D	D
Shaft #3 O.D.	4.0									
Thickness	0.134									
Length									60.65	60.65
Type									B	B

Type	Description	Illustration
Type A	1 st shaft in 2 piece driveline. 6-speed manual and automatic.	
Type B	2 nd shaft in 2 piece driveline. 3 rd shaft in 3 piece driveline. 6-speed manual and automatic.	
Type C	1 st shaft in 3 piece driveline. 6-speed manual and automatic.	
Type D	2 nd shaft in 3 piece driveline. 6-speed manual and automatic.	

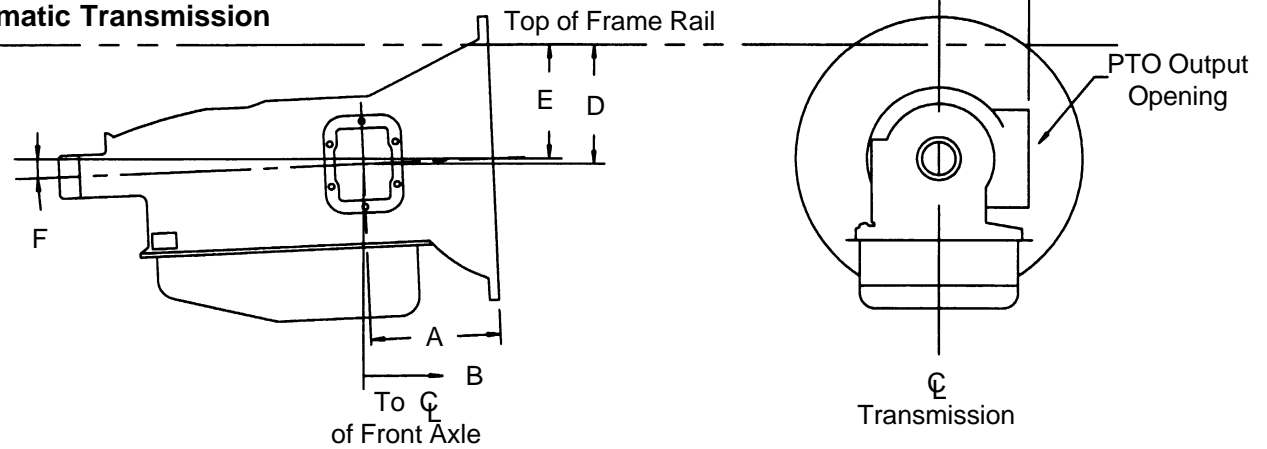
**M/T = Manual Transmission
A/T = Automatic Transmission**

PTO LOCATION, DRIVE GEAR AND OPENING INFORMATION

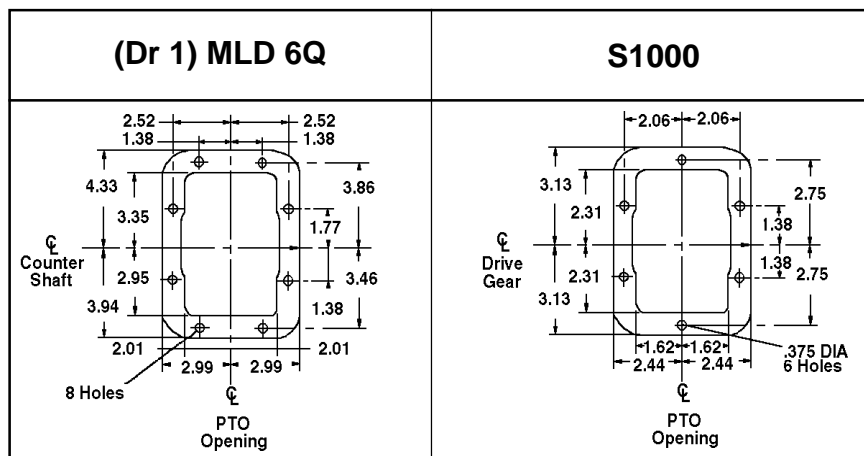
Manual Transmission



Automatic Transmission



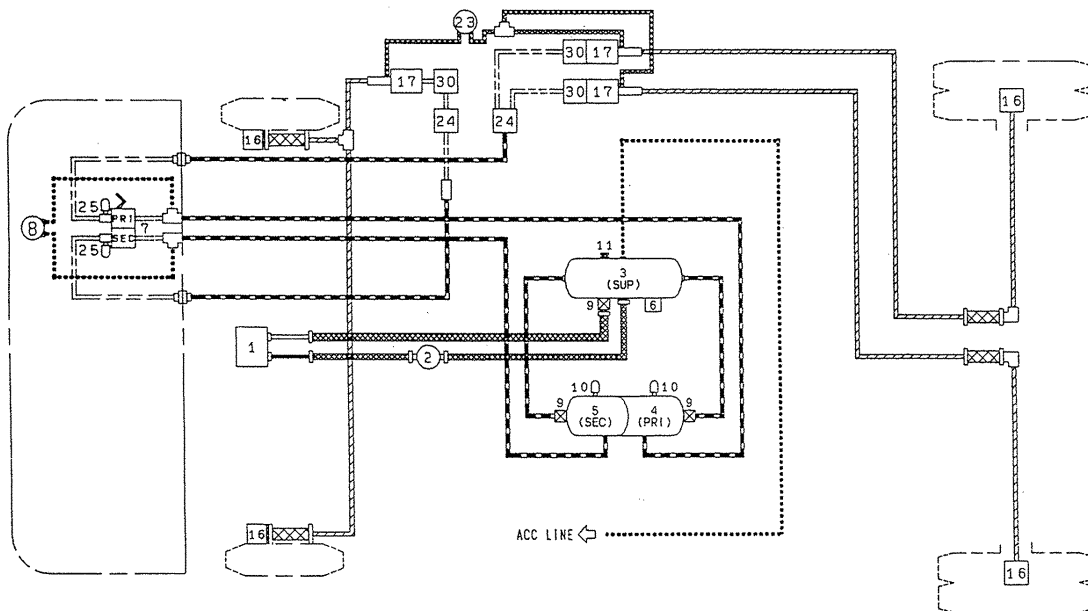
Transmission	Opening Location	Bolt Pattern	A	B	C	D	E	F	G	H	PTO Drive Gear Location	Ratio of PTO Drv Gear Spd to Eng Spd	No. of Teeth	Pitch	Helix Angle	Maximum Output Torque
MLD6Q	Left	(Dr 1)	11.3	43.2	5.1	12.9	7.3	2.5°	0°	5.6	4th Gear Trans. Countershaft	25/42-0.595	36	6.6299	24°RH	180 lb-ft @ 1500 RPM
S1000	Right	SAE-6	11.94	43.7	0	7.8	7.3	2.5°	0°	5.67	Converter Driven PTO Gear	1:1 with turbine	64	6.865	0°	250 lb-ft @ 1500 RPM



BRAKE SYSTEM DIAGRAM

Air Over Hydraulic

PLEASE REFER TO INTRODUCTION SECTION OF BOOK FOR ANTI-LOCK
SYSTEM CAUTIONS AND WHEEL BASE MODIFICATION REQUIREMENTS



- ☒ FLEX HOSE
- AIR PIPE (Ø6.35)
- AIR PIPE (Ø8)
- === AIR PIPE (Ø10)
- === AIR PIPE (Ø12)
- === AIR PIPE (Ø15)
- NYLON TUBE (12X1.5)
- NYLON TUBE (8X1.0)
- RUBBER HOSE
- OIL PIPE (Ø6.35)

Allision Transmission Rating Guide

	Input Torque		Input Power		Turbine	GVW kg (lbs)	GCW kg (lbs)	N/V Ratio ³ rpm/kMph (rpm/mph)	Vocations
	Gross ¹ N•m (lb-ft)	Net N•m (lb-ft)	Gross ^{1,2} kW (hp)	Net kW (hp)	Torque N•m (lb-ft)				
General	740 (545)	705 (520)	280 (375)	254 (340)	1152 (850)	9000 (19,850)	11,800 (26,000)	24-38 (38-62)	One-Way Rental, School Bus, General Purpose
Severe Duty	740 (545)	705 (520)	280 (375)	254 (340)	1152 (850)	7500 (16,540)	n/a —	24-38 (38-62)	Refuse Vehicles (On-Highway Only)
Specialty	740 (545)	705 (520)	280 (375)	254 (340)	1152 (850)	9980 (22,000)	11,800 (26,000)	24-38 (38-62)	Motorhome
Transit Bus	576 (425)	542 (400)	149 (200)	134 (180)	1017 (750)	7500 (16,540)	n/a —	24-38 (38-62)	Transit Bus
Transit Bus w/ SEM ⁴	630 (465)	603 (445)	149 (200)	134 (180)	1017 (750)	7500 (16,540)	n/a —	24-38 (38-62)	Transit Bus

1. Gross Power and Torque ratings are included for reference only.
 2. Gross Power rating as defined by SAE J1995.
 3. Ratio of transmission output rpm to vehicle ground speed. N/V is only used to limit park pawl applications.
 4. SEM = Engine controls with Shift Energy Management

Note: Consult Allison for transmission applications and approvals not listed above.

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CONDENSED BASE MODEL SPECIFICATIONS

MODEL /DESCRIPTION	FSR 10	FSR 11	FSR 50	FSR 51
GVW	23100	23100	23100	23100
FRONT GAWR	8100	8100	8100	8100
REAR GAWR	15000	15000	15000	15000
ENGINE	6HK1-TC	6HK1-TC	6HK1-TC	6HK1-TC
HORSEPOWER	200 HP	200 HP	200 HP	200 HP
TRANSMISSION	MLD6Q	AT545	MLD6Q	AT545
FRONT AXLE CAP	8100	8100	8100	8100
FRONT SUSPENSION CAP	8100	8100	8100	8100
REAR AXLE CAP	15000	15000	15000	15000
REAR SUSPENSION CAP	15000	15000	15000	15000
REAR AXLE RATIO	5.29	3.7	5.57	4.11
TIRES	245/75R22.5	245/75R22.5	10R22.5F	10R22.5F
BRAKES	HYD	HYD	HYD	HYD
FRAME MAT	50000 PSI	50000 PSI	80000 PSI	80000 PSI
FUEL CAPACITY	50	50	100	100
ALTERNATOR	110 AMP	110 AMP	110 AMP	110 AMP

MODEL /DESCRIPTION	FTR 10	FTR 11	FTR12	FTR13	FTR 50	FTR 51	FTR 20	FTR 21	FTR 22	FTR 23
GVW	25950	25950	25950	25950	25950	25950	30000	30000	30000	30000
FRONT GAWR	9350	9350	9350	9350	11000	11000	11000	11000	11000	11000
REAR GAWR	17640	17640	17640	17640	17850	17850	19000	19000	19000	19000
ENGINE	6HK1-TC	6HK1-TC	6HK1-TC	6HK1-TC	6HK1-TC	6HK1-TC	6HK1-TC	6HK1-TC	6HK1-TC	6HK1-TC
HORSEPOWER	200 HP	200 HP	200 HP	200 HP	200 HP	200 HP	200 HP	200 HP	200 HP	200 HP
TRANSMISSION	MLD6Q	AT545	MLD6Q	AT545	MLD6Q	AT545	MLD6Q	AT545	MLD6Q	AT542
FRONT AXLE CAP	11000	11000	11000	11000	11000	11000	11000	11000	11000	11000
FRONT SUSPENSION CAP	12000	12000	12000	12000	12000	12000	12000	12000	12000	12000
REAR AXLE CAP	17850	17850	17850	17850	17850	17850	19000	19000	19000	19000
REAR SUSPENSION CAP	19000	19000	19000	19000	19000	19000	19000	19000	19000	19000
REAR AXLE RATIO	5.29	3.9	5.29	3.9	5.57	4.11	5.57	4.11	5.57	4.11
TIRES	245/75R22.5	245/75R22.5	245/75R22.5	245/75R22.5	11R22.5G	11R22.5G	11R22.5G	11R22.5G	11R22.5G	11R22.5G
BRAKES	HYD	HYD	AIR	AIR	HYD	HYD	HYD	HYD	AIR	AIR
FRAME MAT	80000PSI	80000PSI	80000PSI	80000PSI	80000PSI	80000PSI	80000 PSI	80000 PSI	80000 PSI	80000 PSI
FUEL CAPACITY	50	50	50	50	100	100	50	50	50	50
ALTERNATOR	110 AMP	110 AMP	110 AMP	110 AMP	110 AMP	110 AMP	110 AMP	110 AMP	110 AMP	110 AMP

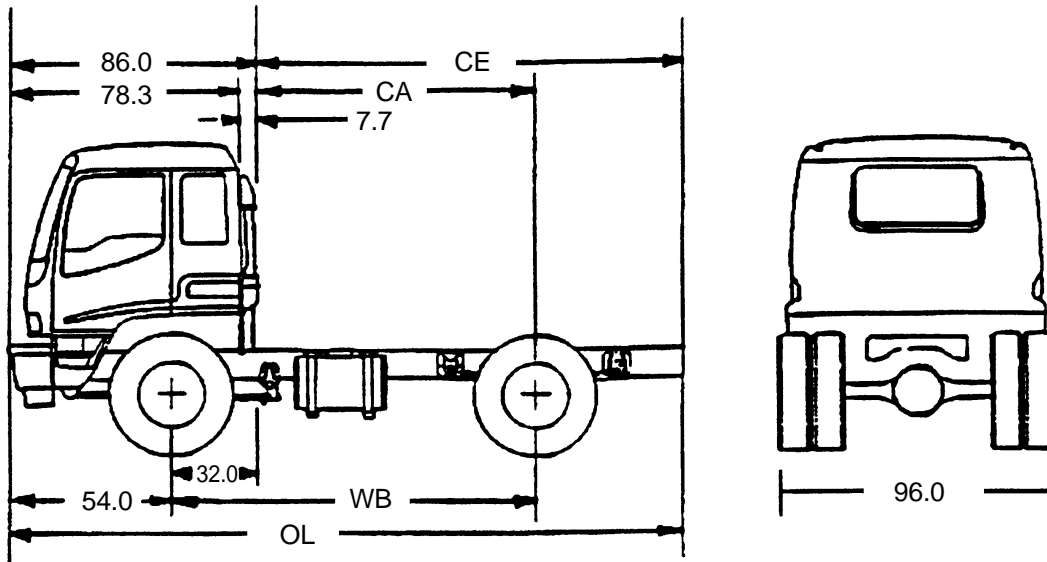
MODEL /DESCRIPTION	FVR 10	FVR 50
GVW	33000	33000
FRONT GAWR	11000	11000
REAR GAWR	22000	22000
ENGINE	6HK1-TC	6HK1-TC
HORSEPOWER	230 HP	230 HP
TRANSMISSION	MLD6Q	MLD6Q
FRONT AXLE CAP	11000	11000
FRONT SUSPENSION CAP	12000	12000
REAR AXLE CAP	22000	22000
REAR SUSPENSION CAP	23500	23500
REAR AXLE RATIO	5.57	5.57
TIRES	11R22.5G	11R22.5G
BRAKES	AIR	AIR
FRAME MAT	80000 PSI	80000 PSI
FUEL CAPACITY	50	100
ALTERNATOR	110 AMP	110 AMP

BASE MODEL WEIGHTS AND FRAME HEIGHTS					
MODEL	FRONT AXLE WEIGHT LB.	REAR AXLE WEIGHT LB.	TOTAL CHASSIS WEIGHT LB.	FRAME HEIGHT UNLOADED IN.	FRAME HEIGHT LOADED IN.
FSR 10	6032	2343	8375	37.38	34.09
FSR 11	6018	2307	8325	37.38	34.09
FSR 50	6441	2959	9400	38.98	35.69
FSR 51	6427	2923	9350	38.98	35.69
FTR 10	6242	2589	8831	37.71	34.70
FTR 11	6228	2553	8781	37.71	34.70
FTR12	6128	2679	8807	37.71	34.70
FTR 13	6116	2646	8762	37.71	34.70
FTR 20	6313	2727	9040	39.91	36.73
FTR 21	6299	2691	8990	39.91	36.73
FTR 22	6199	2874	9073	39.91	36.73
FTR 23	6187	2874	9061	39.91	36.73
FTR 50	6672	3248	9920	39.91	36.90
FTR 51	6658	3212	9870	39.91	36.90
FVR 10	6199	2832	9031	41.00	37.63
FVR 50	6684	3503	10187	41.00	37.63

BASE MODEL WEIGHTS INCLUDE 15 GALLONS OF FUEL.

**86" BBC ISUZU FSR, FTR & FVR
BODY - PAYLOAD WEIGHT DISTRIBUTION**

Dimensions shown are nominal and with standard equipment.



BODY-PAYLOAD WEIGHT DISTRIBUTION
(% Front/Rear)**

DIMENSIONS - INBODY LENGTHS - FT.

WB	CA*	CE	OL	12	14	16	18	20	22	24	26	28	30	32
140"/FQT	108	159.6	245.6	24/76	15/85									
158"/EG5	126	195.2	281.2		25/75	17/83	9/91							
170"/EH8	138	207.2	293.2		30/70	23/77	16/84	9/91						
188"/EK8	156	249.3	335.2			30/70	24/76	18/82	11/89					
200"/EM2	168	261.3	347.2			35/65	29/71	23/77	17/83	11/89				
218"/FPL	186	279.3	365.2					29/71	23/77	18/82	12/88	7/93		
233"/EQ8	201	294.3	380.2						28/72	23/77	18/82	13/87	8/92	
248"/ES5	216	309.3	395.2							28/72	23/77	18/82	13/87	8/92

$$\frac{CA - CB - (1/2 \times \text{Body Length})}{WB} = \text{percent body and payload weight at front axle.}$$

* Dimensions shown are nominal. * Percentages allow for 3" CB (cab/body clearance).

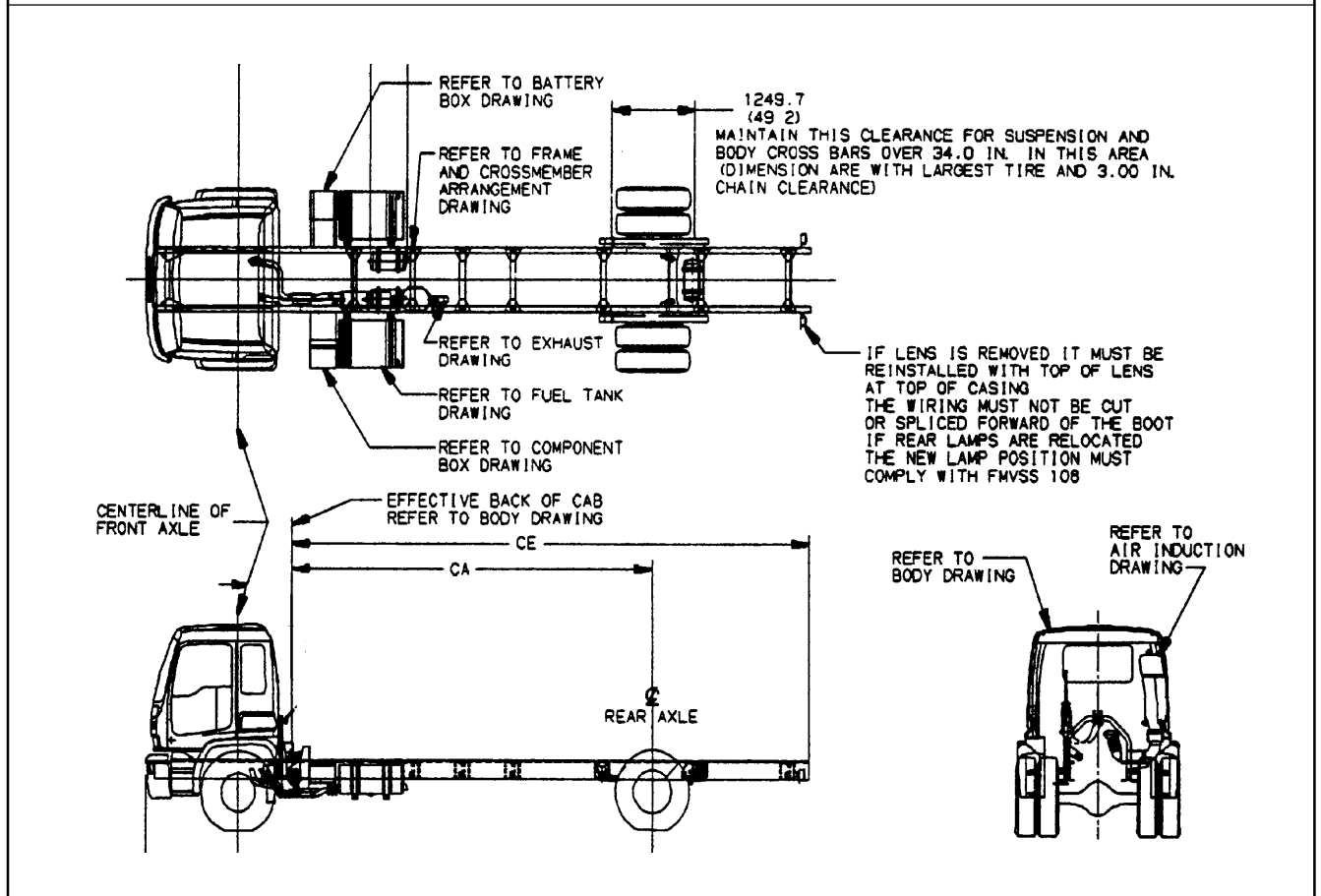
*All Ca. dimensions are measured above frame; Consult Body Builder pages for fuel tank and battery box locations on frame.

Recommended (Wheelbase/Body Length) combinations are shown in bold font.

** Effective length in which front axle load is 6% or less is normally poor distribution.

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 are intended for reference and does not preclude the necessity for an accurate weight distribution calculation.

CHASSIS DEFINITION REFERENCE DRAWING



TOP DIMENSION IS MM (BOTTOM DIMENSION IS INCHES)

	PAGE		PAGE
REFER TO EFFECTIVE BACK OF CAB DRAWING	3	REFER TO FUEL TANK DRAWING	18
REFER TO FRAME AND CROSSMEMBER DRAWING	6	REFER TO EXHAUST DRAWING	19
REFER TO COMPONENT BOX DRAWING	17	REFER TO AIR INDUCTION DRAWING	20
REFER TO BATTERY BOX DRAWING	17	REFER TO CAB DRAWING	21

GCW RATINGS OF MAJOR COMPONENTS

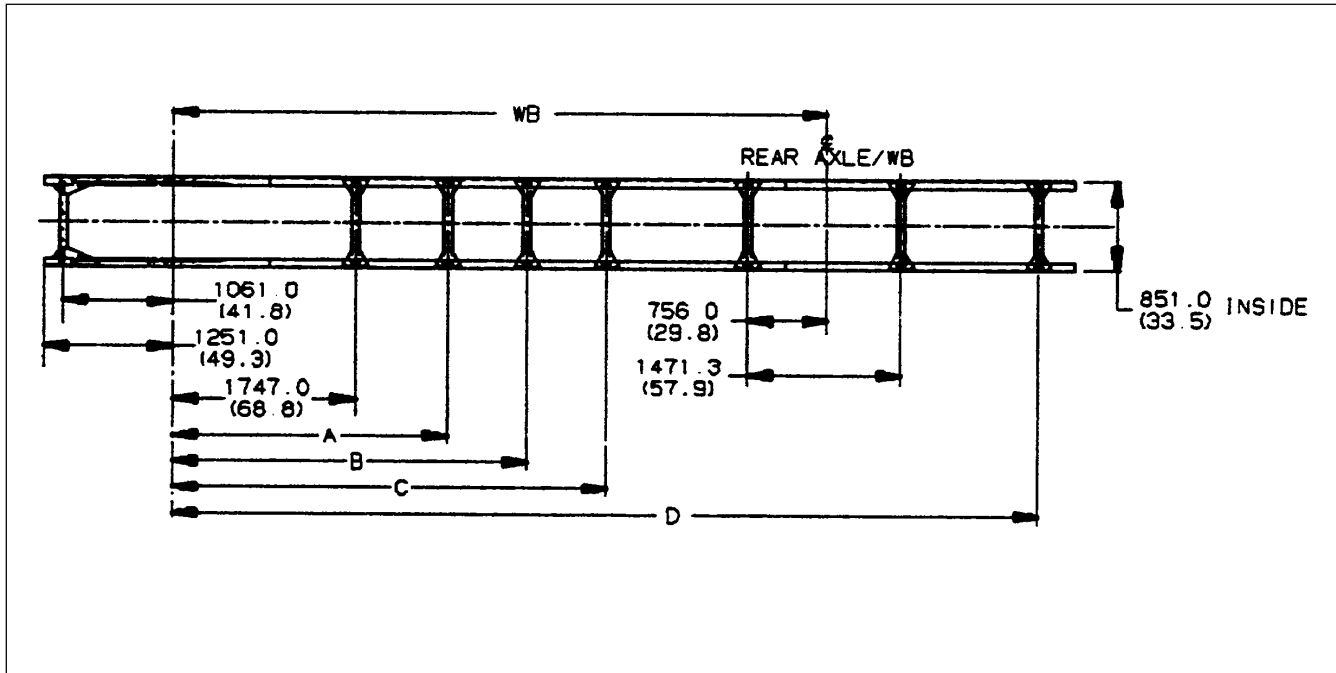
COMPONENTS ENGINE	RPO CODE	MAXIMUM GCW RATING (LB.)
ISUZU 6HK1-TC	LQB LQC	GCW MAY BE LIMITED BY PERFORMANCE RESTRICTIONS BASE ON ENGINE HP, TRANSMISSION, AXLE AND VEHICLE CONFIGURATION.
TRANSMISSION ISUZU MLD6Q ALLISON AT545	M54 MF1	45,000 30,000*
AXLES DANA SPICER 15040S 15,000 LB. CAP. DANA SPICER S150-S15,000 LB.CAP. DANA SPICER 19060S 16,900 LB. CAP. DANA SPICER 19060S 17,850 LB. CAP. DANA SPICER 19060S 19,000 LB. CAP. DANA SPICER 19060T 19,000 LB. CAP. DANA SPICER 21060S 21,000 LB. CAP. DANA SPICER 21060T 21,000 LB. CAP. DANA SPICER 22060S 22,000 LB. CAP. DANA SPICER 22060T 22,000 LB. CAP. DANA SPICER 23080S 23,000 LB. CAP. DANA SPICER 23080T 23,000 LB. CAP. DANA SPICER 23105S 23,000 LB. CAP. HYDRAULIC BRAKE SYSTEM AIR BRAKE SYSTEM	H10 H08 HXC HXB HPK HPM HPP H15 HPG HPH HPQ H20 HNA JE3 JE4	40,000 40,000 60,000 60,000 55,000 55,000 65,000 65,000 65,000 65,000 70,000 70,000 105,000 30,000 45,000

* See Rating Page

AT 545(R) Ratings											
Vocations	Net Input Power		Net Input Torque		Max Turbine Torque		Full Load Gov. Speed Min/Max rpm x 100	Max GVW		Max GVW	
	kW	hp	N m	lb ft	N m	lb ft		kg	lbs	kg	lbs
General	175	235	603	445	1032	761	Note 1	13,608	30,000	13,608	30,000
Motor Home	175	235	603	445	1032	761	Note 1	13,608	30,000	13,608	30,000
School Bus	175	235	603	445	1032	761	Note 1	13,608	30,000	N/A	N/A
Light Vehicle	112	150	420	310	746	550	Note 1	7502	16,540	7502	16,540
Transit Bus, Airport Shuttle	134	180	515	380	881	650	Note 1	12,020	26,500	N/A	N/A
Refuse	175	235	603	445	1032	761	Note 1	10,002	22,050	N/A	N/A
Road Sweeper	175	235	603	445	1032	761	Note 1	14,515	32,000	N/A	N/A
Intercity; Shuttle Bus	175	235	603	445	1032	761	Note 1	13,608	30,000	N/A	N/A
Note 1: AT 500 Series (non retarder) - Diesel: 24/40 Gas: 32/44 AT 500R Series (retarder) - Diesel: 24/36 Gas: 32/36											

**Note: Consult Allison for transmission applications and approvals not listed above.
 Reprint from Allison Transmission Watch # 32 Rev. I March 1999.**

CROSS MEMBER LOCATIONS

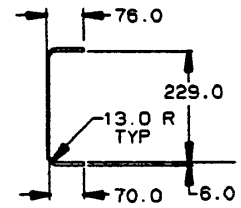
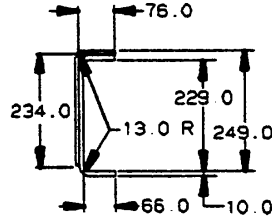
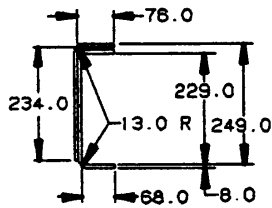
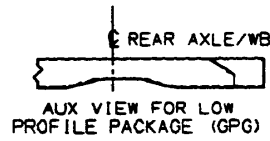
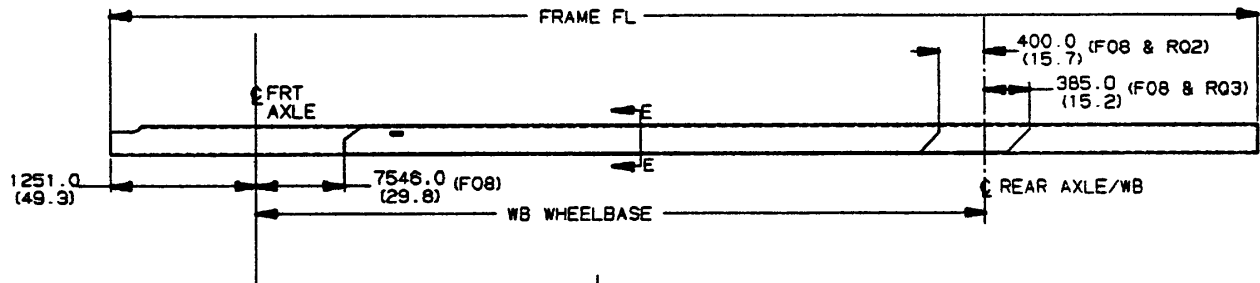


TOP DIMENSION IS MM (BOTTOM DIMENSION IS INCHES)

RPO CODE	WB	A	B	C	D
FQT	140	---	---	---	---
EG5	158	103.8	---	---	213.9
EH8	170	103.8	---	---	225.9
EK8	188	103.8	---	---	267.9
EM2	200	115.8	---	---	279.9
FPL	218	103.8	133.8	---	297.9
EQ8	233	103.8	148.8	---	312.9
ES5	248	103.8	133.8	163.8	327.9

DIMENSIONS ARE IN INCHES.

FRAME REINFORCEMENT LOCATIONS FRAME RAIL DIMENSIONS



TOP DIMENSION IS MM (BOTTOM DIMENSION IS INCHES)

**FULL TRUCK (RQ2) OVERALL
FRAME RAIL LENGTHS**

MODEL	WB CODE	WB (INCHES)	FRAME CODE	FRAME REINF.	FRAME LENGTH
FSR	FQT	140	FD0 FD5 F03	F08	240.9
	EG5	158	FD0 FD5 F03		276.5
	EH8	170	FD0 FD5 F03		288.5
FTR	EK8	188	FD5 F03		330.5
FVR	EM2	200	FD5 F03		342.5
	FPL	218	FD5 F03		360.5
	EQ8	233	FD5 F03		375.5
	ES5	248	FD5 F03		390.5

FD0 = 50000 PSI FRAME

FD5 = 80000 PSI FRAME

F03 = 110000 PSI FRAME HEAT TREATED

FRAME MATERIALS AND PHYSICAL PROPERTIES

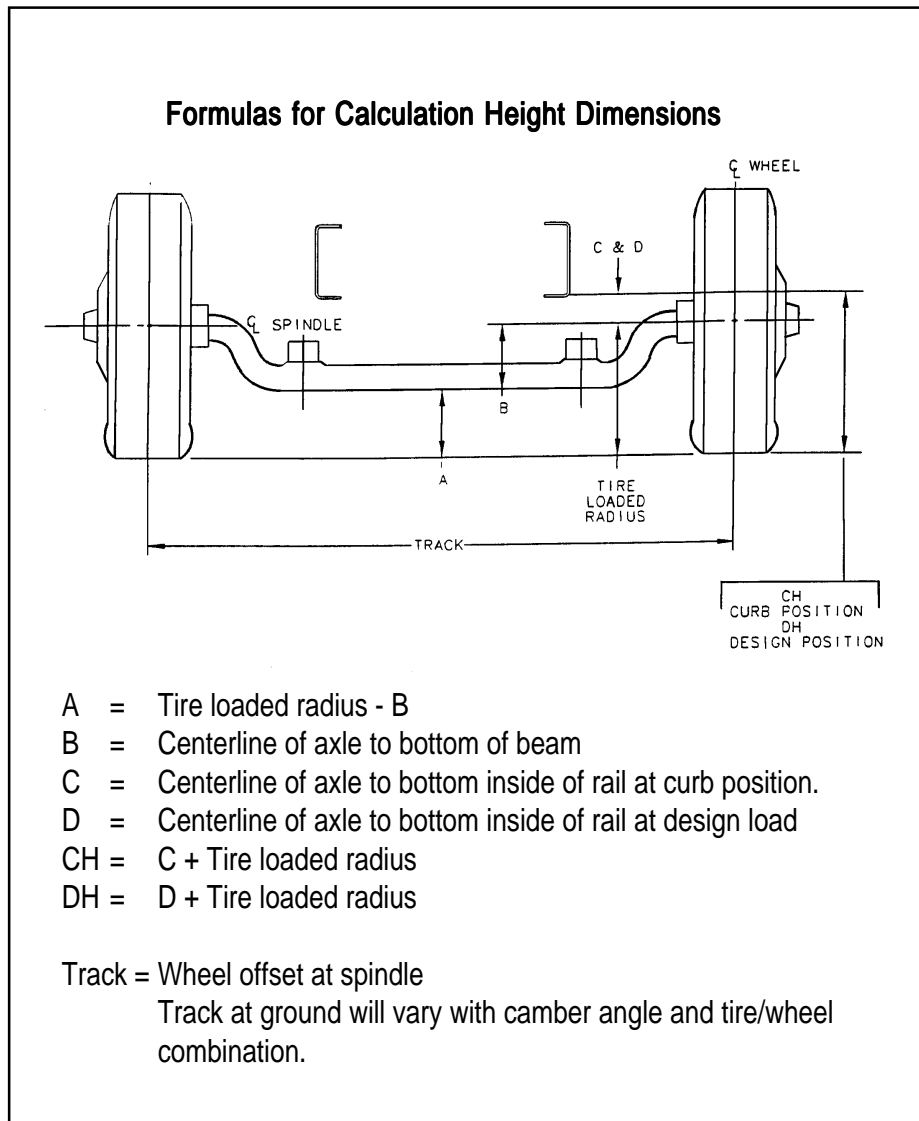
MODEL	DIMENSION	FSR	FTR/FVR	FTR/FVR
FRAME RAIL RPO CODE		FD0	FD5	F03
MATERIAL		STEEL	STEEL	STEEL
TYPE		SAE J1392	SAE J1392	H.T. SAE 1027
GRADE		50	80	-----
YIELD STRENGTH	PSI	50,000	80,000	110,000
WELDABILITY		PERMITTED	PERMITTED	NOT PERMITTED
RBM	IN-LBS	479,000	1,378,300	1,760,000
SECTION MODULUS*	IN ³	9.58	12.53	16.00
OUTSIDE DEPTH	INCH	9.49	9.65	9.80
FLANGE WIDTH	INCH	3.00	3.00	3.00
MATERIAL THICKNESS	INCH	0.24	0.315	0.375
OPTIONAL REINFORCEMENT		N/A	F08	F08
TYPE		-	INVERTED L	INVERTED L
MATERIAL		-	STEEL	STEEL
MATERIAL THICKNESS	INCH	-	0.24	0.24
COMBINED SECTION MODULUS*	IN-LBS	-	20.36	23.56
RATED COMBINED RBM	IN ³	-	2,239,500	2,591,600

*MEASURED BEHIND THE CAB.

FSR, FTR, FVR FRONT AXLE TRACK CHART

WHEEL TYPE	AXLE CAPACITY			FL1 8100 LBS		FL2 11000 LBS		FS7 12000 LBS
	WHEEL			BRAKES		BRAKES		BRAKES
	RPO	SIZE	OFFSET	HYD	FULL AIR	HYD	FULL AIR	FULL AIR
STEEL DISK WHEEL 8 HOLE HUB PILOTED	Q82	19.5X6.75	5.60	81.35	N/A	N/A	N/A	N/A
ALUMINUM DISK WHEEL 8 HOLE HUB PILOTED	RPM	19.5X6.75	6.50	82.33	N/A	N/A	N/A	N/A
STEEL DISK WHEEL 10 HOLE HUB PILOTED	QH3	22.5X7.50	6.44	79.66	79.56	79.86	79.91	79.59
STEEL DISK WHEEL 10 HOLE HUB PILOTED	RPQ	22.5X8.25	6.62	79.43	79.32	79.63	79.68	79.36
ALUMINUM DISK WHEEL 10 HOLE HUB PILOTED	RNH	22.5X8.25	6.59	N/A	N/A	N/A	N/A	N/A

DIMENSIONS ARE IN INCHES



FRONT AXLE DIMENSION CHARTS

THIS CHART IS USED TO FIND FRONT FRAME HEIGHT BY COMBINING THE INFORMATION IN THE CHART WITH THE TIRE INFORMATION FOR THE TIRES USED ON THE CHASSIS AND THE FORMULAS AND ILLUSTRATIONS FOR THE FRONT AXLE FRAME HEIGHT

FD0 = 50,000 PSI STEEL FRAME

FD5 = 80,000 PSI STEEL FRAME

F03 = 110,000 PSI STEEL FRAME

MODEL	FRONT AXLE		SUSPENSION		FRAME	STABILIZER	LOW PRO	DIMENSION								
	RPO	CAPACITY	RPO	CAPACITY	RPO	F59	GPG	B	C	D						
FSR	FL1	8100	F14	8100 TL	FD0	YES	NO	7.32	8.03	6.26						
						NO	NO	7.32	8.07	6.57						
					FD5	YES	YES	7.28	6.89	5.12						
						YES	NO	7.32	8.11	6.34						
						NO	NO	7.32	8.15	6.65						
						NO	NO	7.32	7.83	6.54						
			F15	9000 TL	FD0	YES	NO	7.32	8.07	6.57						
						NO	NO	7.32	7.83	6.54						
					FD5	YES	NO	7.32	8.15	6.65						
						NO	NO	7.32	7.91	6.61						
						NO	NO	7.32	7.64	6.42						
						NO	NO	7.32	7.72	6.50						
FTR 10, 11, 12 & 13	FL2	11000	F15	9000 TL	FD5	YES	NO	8.66	8.94	7.05						
						NO	NO	8.66	8.70	7.09						
					F03	YES	NO	8.66	9.02	7.13						
						NO	NO	8.66	8.78	7.17						
						F26	12000 TL	FD5	YES	NO	8.66	9.29	6.69			
									NO	NO	8.66	9.02	7.13			
			F03	YES	NO			8.66	9.37	6.77						
				NO	NO			8.66	9.09	7.20						
				FTR 10, 11, 12, 13, 20, 21, 22 & 23	FS7			12000	F26	12000 TL	FD5	YES	NO	8.66	9.61	6.69
												NO	NO	8.66	9.41	7.28
			F03			YES	NO		8.66	9.69	6.77					
						NO	NO		8.66	9.49	7.36					
FTR 20, 21, 22 & 23	FS7	12000				FM4	14600 TL		FD5	YES	NO	8.66	9.80	7.68		
										NO	NO	8.66	9.37	7.56		
			F03	YES	NO	8.66	9.88	7.76								
				NO	NO	8.66	9.45	7.64								
				FVR	FL2	11000	F26	12000 TL	FD5	YES	NO	8.66	9.29	6.69		
										NO	NO	8.66	9.02	7.13		
F03	YES	NO	8.66						9.37	6.77						
	NO	NO	8.66						9.09	7.20						
	FS7	12000	F26						12000 TL	FD5	YES	NO	8.66	9.61	6.69	
											NO	NO	8.66	9.41	7.28	
F03			YES		NO	8.66	9.69	6.77								
			NO		NO	8.66	9.80	7.36								
			FM4		14600 TL	FD5	YES	NO	8.66	9.80	7.68					
							NO	NO	8.66	9.37	7.56					
F03	YES	NO				8.66	9.88	7.76								
	NO	NO				8.66	9.45	7.64								

DIMENSIONS IN INCHES

FRONT FRAME HEIGHT UNLOADED = TIRE RADIUS + C DIMENSION + FRAME DIMENSION

FRONT FRAME HEIGHT LOADED = LOADED TIRE RADIUS + D DIMENSION + FRAME DIMENSION

**REAR AXLE TRACK CHART
FSR 10,11**

	AXLE CAPACITY			H08 15000 LBS	H10 15000 LBS	HWY 16900 LBS
WHEEL TYPE	WHEEL			BRAKES		BRAKES
	RPO	SIZE	OFFSET	HYDRAULIC	HYDRAULIC	HYDRAULIC
STEEL DISK WHEEL 8 HOLE HUB PILOTED	Q83	19.5X6.75	5.6	72.30	72.30	71.70
ALUMINUM DISK WHEEL 8 HOLE HUB PILOTED	RPW	19.5X6.75	6.5	72.18	72.18	71.70
STEEL DISK WHEEL 10 HOLE HUB PILOTED	QH4	22.5X7.50	6.44	72.18	72.18	N/A

FTR 10,11, 12 & 13

	AXLE CAPACITY			HZW/HZT 17850 LBS		HPK/HPM 19000 LBS		H11 19000 LBS	
WHEEL TYPE	WHEEL			BRAKES		BRAKES		BRAKES	
	RPO	SIZE	OFFSET	HYD	FULL AIR	HYD	FULL AIR	HYD	FULL AIR
STEEL DISK WHEEL 10 HOLE HUB PILOTED	QH4	22.5X7.50	6.44	71.57	71.81	71.57	71.81	71.57	71.81
STEEL DISK WHEEL 10 HOLE HUB PILOTED	RPR	22.5X8.25	6.62	71.69	71.94	71.69	71.94	71.69	71.94
ALUMINUM DISK WHEEL 10 HOLE HUB PILOTED	RNF	22.5X8.25	6.59	71.57	71.94	71.57	71.94	71.57	71.94

FTR 20, 21, 22 & 23

	AXLE CAPACITY			H11 19000 LBS		HPP/H15 21000 LBS		HPG/HPH 22000 LBS	
WHEEL TYPE	WHEEL			BRAKES		BRAKES		BRAKES	
	RPO	SIZE	OFFSET	HYD	FULL AIR	HYD	FULL AIR	HYD	FULL AIR
STEEL DISK WHEEL 10 HOLE HUB PILOTED	QH4	22.5X7.50	6.44	71.57	71.81	71.46	72.02	N/A	72.02
STEEL DISK WHEEL 10 HOLE HUB PILOTED	RPR	22.5X8.25	6.62	71.69	71.94	71.58	72.14	N/A	72.14
ALUMINUM DISK WHEEL 10 HOLE HUB PILOTED	RNF	22.5X8.25	6.59	71.57	71.94	71.46	72.14	N/A	72.14

FVR 10

	AXLE CAPACITY			HPG/HPH 22000 LBS		HPQ/H20 23000 LBS		HNA 23000 LBS	
WHEEL TYPE	WHEEL			BRAKES		BRAKES		BRAKES	
	RPO	SIZE	OFFSET	HYD	FULL AIR	HYD	FULL AIR	HYD	FULL AIR
STEEL DISK WHEEL 10 HOLE HUB PILOTED	QH4	22.5X7.50	6.44	N/A	72.02	N/A	72.02	N/A	72.02
STEEL DISK WHEEL 10 HOLE HUB PILOTED	RPR	22.5X8.25	6.62	N/A	72.14	N/A	72.14	N/A	72.14
ALUMINUM DISK WHEEL 10 HOLE HUB PILOTED	RNF	22.5X8.25	6.59	N/A	72.14	N/A	72.14	N/A	72.14

DIMENSIONS ARE IN INCHES.

REAR AXLE FORMULAS

Definitions:

- A - Centerline of axle to bottom of axle bowl.
B - Centerline of axle to bottom inside rail at inf. bump.
C - Centerline of axle to bottom inside rail at curb pos.
D - Centerline of axle to bottom inside rail at design load.
- CH - Rear Frame Height
Distance between the bottom inside rail and the ground-line through the vertical centerline of the rear axle at curb position.
- DH - Rear Frame Height
Distance between the bottom inside rail and the ground-line through the vertical centerline of the rear axle at design position.
- HH - Rear Axle Clearance
Minimum clearance between the rear axle and the ground-line.
- JH - Rear Tire Clearance
Minimum clearance required for tires and chains measured from the top of the frame at the vertical centerline of the rear axle.
- KH - Chain Clearance
- LH - Distance from the bottom inside rail to the top of rail.
- CW - Track Dual Wheel Vehicles
Distance between the centerlines of the dual wheels as measured at the ground-line.
- DW - Minimum distance between the inner surfaces of the rear tires.
- EW - Maximum Rear Width
Over-all width of vehicle measured at the outer most surface of the rear tires.
- HW - Dual Tire Spacing
Distance between the centerlines of the tires in a set of dual tires.
- KW - Rear Body Width
Maximum body width between rear tires.

See Tire Chart for values: Tire Selection, Tire Radius, Tire Loaded Radius and Tire Clearance.

Formulas for calculating rear width and height dimensions:

- $CH = \text{Tire loaded radius} + C + LH$
 $DH = \text{Tire loaded radius} + D + LH$
 $HH = \text{Tire loaded radius} - A$
 $JH = KH - B - LH$
 $KH = \text{Tire radius} + 3.00 \text{ inches}$
 $CW = \text{Track}$
 $DW = \text{Track} - 1 \text{ Tire section} - HW$
 $EW = \text{Track} + 1 \text{ Tire section} + HW$
 $KW = DW - 5.00 \text{ inches}$
 $LW = 1.00 \text{ inch minimum clearance between tires and springs}$

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

REAR AXLE DIMENSION CHART

THIS CHART IS USED TO FIND REAR FRAME HEIGHT BY COMBINING THE INFORMATION IN THE CHART WITH THE TIRE INFORMATION FOR THE TIRES USED ON THE CHASSIS AND THE FORMULAS AND ILLUSTRATIONS FOR THE REAR AXLE FRAME HEIGHT.

MODEL	REAR AXLE		SUSPENSION		FRAME	SHOCK ABSORBER	STABILIZER	AUX SPRING	DIMENSION					
	RPO	CAPACITY	RPO	CAPACITY	RPO	RPOG68	RPOGN1	RPOG60	B	C	D			
FSR	H08 H10	15000 LB	GQ0	15000 TL	FD0 FD5	Y OR N	Y	N	4.15	9.91	6.68			
						Y OR N	Y OR N	Y	4.15	9.91	7.00			
			GG0	15000 ML		Y	Y OR N	Y	4.86	10.93	7.79			
						Y	Y OR N	N	4.86	10.93	7.64			
			GG7	16900 TL		Y	Y OR N	Y	N/A	N/A	N/A			
						Y	Y OR N	N	2.46	6.94	5.04			
			GN2	19000 TL		Y	Y OR N	N	4.35	10.51	7.73			
						Y	Y OR N	Y	4.35	10.51	7.89			
			GN0	19000 ML		Y OR N	Y OR N	Y	5.77	11.83	9.28			
						Y OR N	Y OR N	N	5.77	11.84	9.14			
			HWY	16900 LB		GG7	16900 TL	Y	Y OR N	Y	N/A	N/A	N/A	
						Y	Y OR N	N	2.58	7.06	4.94			
						GN2	19000 TL	Y	Y	Y	N	4.47	10.63	7.66
								Y	Y OR N	Y	4.47	10.63	7.89	
					Y OR N	Y OR N	Y	5.10	11.17	8.45				
					Y OR N	Y OR N	N	5.10	11.17	8.29				
FTR	H2T H2W	17850 LB	G40	19000 AIR	FD5 F03	N/A	N/A	N/A	5.30	8.71	8.31			
						Y OR N	Y OR N	N	5.10	11.17	8.16			
						Y OR N	Y OR N	Y	5.10	11.17	8.35			
			GN2	19000 TL		Y	Y	N	4.47	10.63	7.46			
						Y	Y OR N	Y	4.47	10.63	7.74			
			HPK HPM H11	19000 LB		GN0	19000 ML	Y OR N	Y OR N	N	5.10	11.17	7.99	
						Y OR N	Y OR N	Y	5.10	11.17	8.21			
						GN2	19000 ML	Y	Y	N	4.47	10.63	7.23	
								Y	Y OR N	Y	4.44	11.24	7.50	
						G40	19000 AIR	N/A	N/A	N/A	5.30	8.31	8.31	
						GN8	21000 ML	Y OR N	Y OR N	N	5.20	11.35	8.15	
								Y OR N	Y OR N	Y	5.20	11.35	8.35	
						GR9	21000 TL	Y	Y OR N	N	4.69	10.84	7.72	
					Y	Y OR N	Y	4.69	10.84	7.96				
						GP0	23000 TL	Y	Y OR N	N	4.54	10.69	7.96	
								Y	Y OR N	Y	4.54	10.69	7.95	
						GP1	23500 ML	Y OR N	Y OR N	N	6.03	12.26	9.21	
								Y OR N	Y OR N	Y	6.03	12.26	9.35	
			HPP H15	21000 LB		GN8	21000 ML	Y OR N	Y OR N	N	5.23	11.36	7.91	
								Y OR N	Y OR N	Y	5.22	11.35	8.14	
						GR9	21000 TL	Y	Y OR N	N	4.69	10.84	7.44	
								Y	Y OR N	Y	4.69	10.84	7.73	
						GP0	23000 TL	Y	Y	N	4.54	10.69	7.54	
								Y	Y OR N	Y	4.56	10.72	7.76	
					GP1	23500 ML	Y OR N	Y OR N	N	6.03	12.26	9.00		
							Y OR N	Y OR N	Y	6.03	12.26	9.18		
		HPG HPH	22,000		GP0	23000 TL	Y	Y	N	4.54	10.69	7.40		
							Y	Y OR N	Y	4.54	10.69	7.63		
					GP1	23500 ML	Y OR N	Y OR N	N	6.03	12.26	8.89		
							Y OR N	Y OR N	Y	6.03	12.26	9.08		

DIMENSION IN INCHES

REAR FRAME HEIGHT UNLOADED = TIRE RADIUS + C DIMENSION + FRAME DIMENSION

REAR FRAME HEIGHT LOADED = LOADED TIRE RADIUS + D DIMENSION + FRAME DIMENSIONS

REAR AXLE DIMENSION CHART

THIS CHART IS USED TO FIND REAR FRAME HEIGHT BY COMBINING THE INFORMATION IN THE CHART WITH THE TIRE INFORMATION FOR THE TIRES USED ON THE CHASSIS AND THE FORMULAS AND ILLUSTRATIONS FOR THE REAR AXLE FRAME HEIGHT.

MODEL	REAR AXLE		SUSPENSION		FRAME	SHOCK ABSORBER	STABILIZER	AUX SPRING	DIMENSION		
	RPO	CAPACITY	RPO	CAPACITY	RPO	RPO G68	RPO GN1	RPO G60	B	C	D
FVR	HPG HPH	22000 LB	GP0	23000 TL	FD5 F03	Y	Y	N	4.54	10.69	7.40
						Y	Y OR N	Y	4.54	10.69	7.63
			GP1	23500 ML		Y OR N	Y OR N	N	6.03	12.26	8.89
						Y OR N	Y OR N	Y	6.03	12.26	9.08
	HNA HP0 H20	23000 LB	GP0	23000 TL		Y	Y	N	4.74	10.89	7.49
						Y	Y OR N	Y	4.73	10.89	7.73
			GP1	23500 ML		Y OR N	Y OR N	N	6.22	12.45	9.00
						Y OR N	Y OR N	Y	6.03	12.45	9.20

REAR FRAME HEIGHT UNLOADED = TIRE RADIUS + C DIMENSION + FRAME DIMENSION
 REAR FRAME HEIGHT LOADED = LOADED TIRE RADIUS + D DIMENSION + FRAME DIMENSIONS

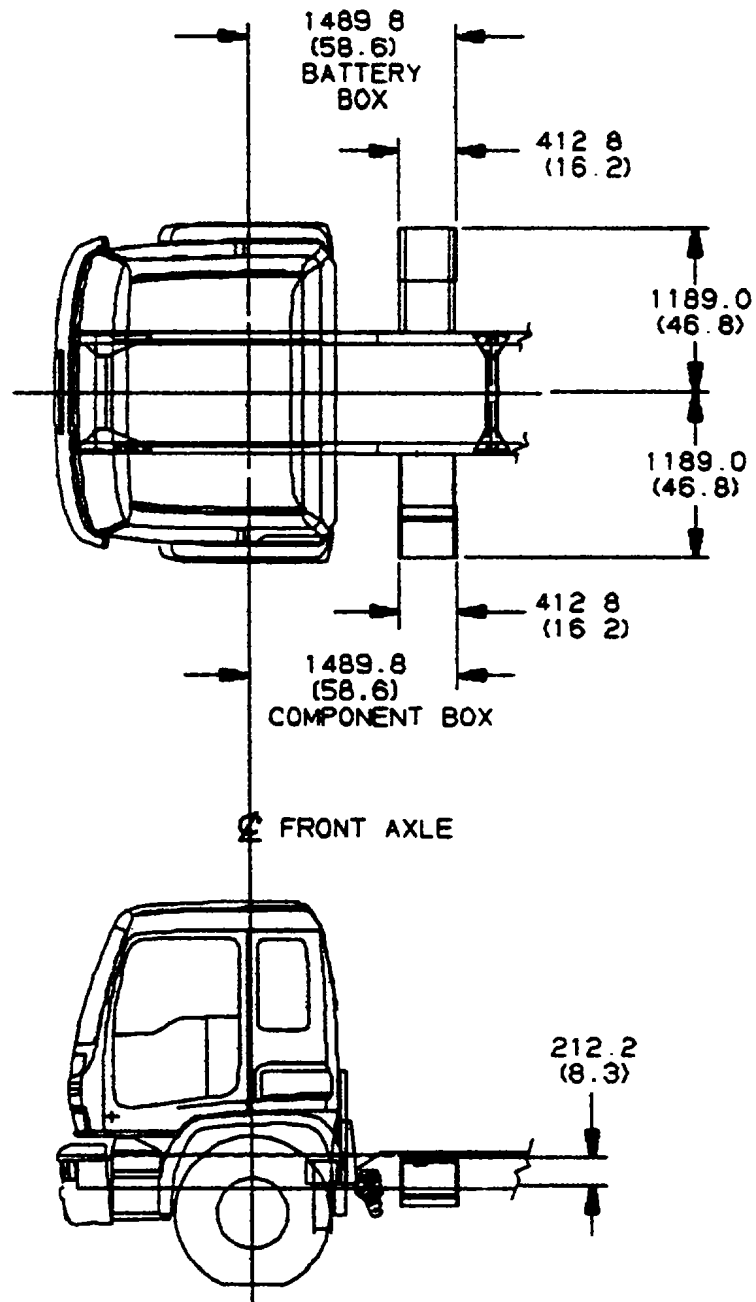
FD0 = 50,000 PSI STEEL FRAME
 FD5 = 80,000 PSI STEEL FRAME
 F03 = 110,000 PSI STEEL FRAME

REAR AXLE "A" DIMENSION CHART

THIS CHART IS USED TO FIND THE "A" DIMENSION
 A = CENTERLINE OF AXLE TO BOTTOM OF AXLE BOWL.

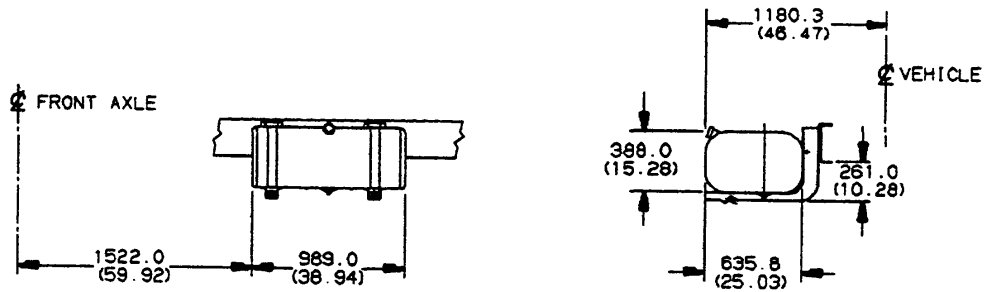
MODEL	REAR AXLE				DIMENSION
	RPO	CAPACITY (LBS)	SPEED	BRAKES	A
FSR FTR FVR	H08	15000	SINGLE	HYD	8.50
	H10	15000	SINGLE	HYD	8.46
	HWY	16900	SINGLE	HYD	8.82
	HZT	17850	TWO	HYD/AIR	9.53
	HZW	17850	SINGLE	HYD/AIR	8.82
	H11	19000	SINGLE	HYD/AIR	8.82
	HPK	19000	SINGLE	HYD/AIR	9.24
	HPM	19000	TWO	HYD/AIR	10.35
	HPP	21000	SINGLE	HYD/AIR	9.24
	H15	21000	TWO	HYD/AIR	10.35
	HPH	22000	TWO	AIR	10.35
	HPG	22000	SINGLE	AIR	9.24
	HPQ	23000	SINGLE	AIR	10.23
	H20	23000	TWO	AIR	10.74
	HNA	23000	SINGLE	AIR	10.99

BATTERY BOX AND COMPONENT BOX DIMENSIONS AND LOCATIONS

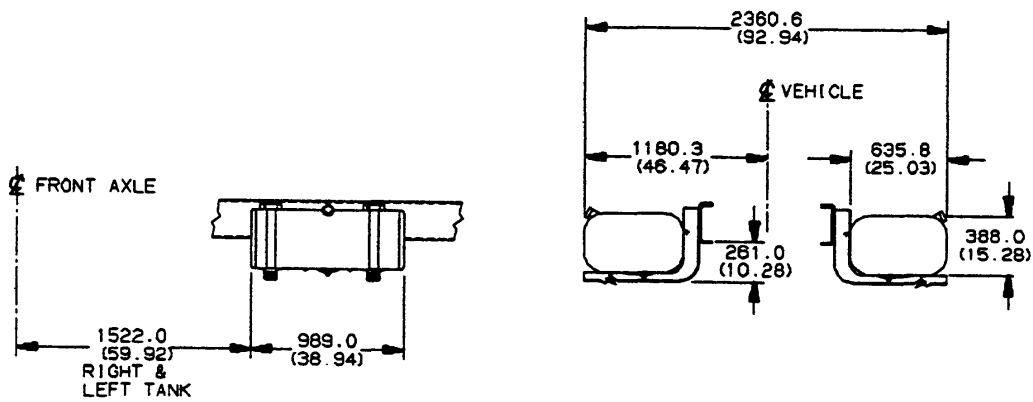


TOP DIMENSION IS MM (BOTTOM DIMENSION IS INCHES)

SINGLE AND DUAL FUEL TANK DIMENSIONS AND LOCATIONS



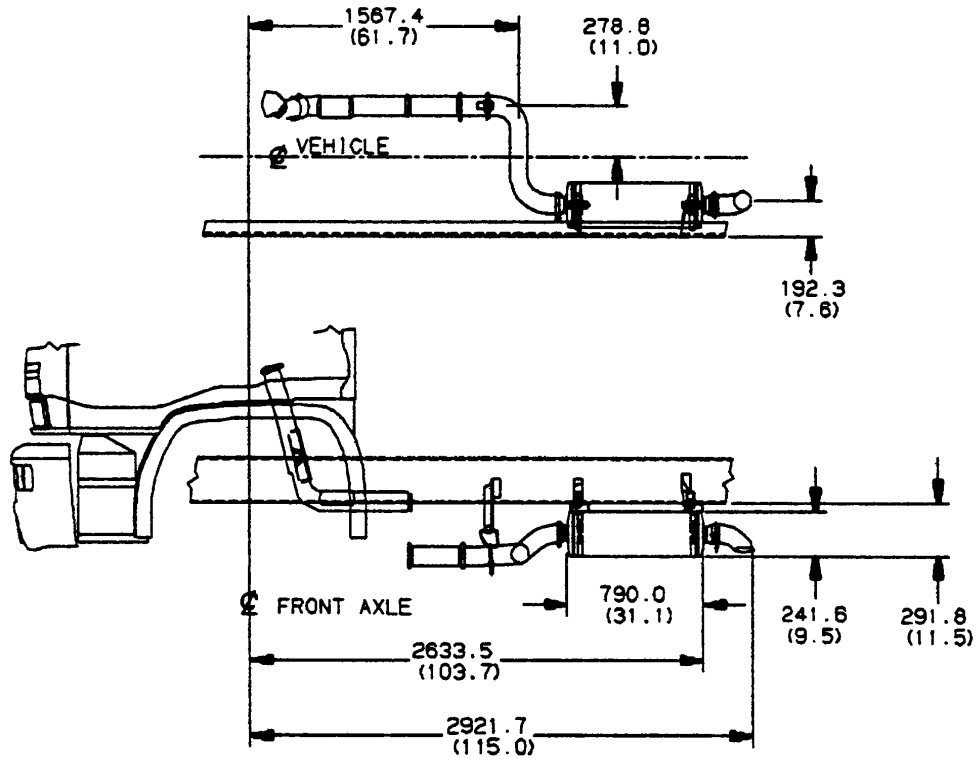
SINGLE L. H. 50 GALLON (NL0)



50 GALLON DUAL TANKS (NL5)

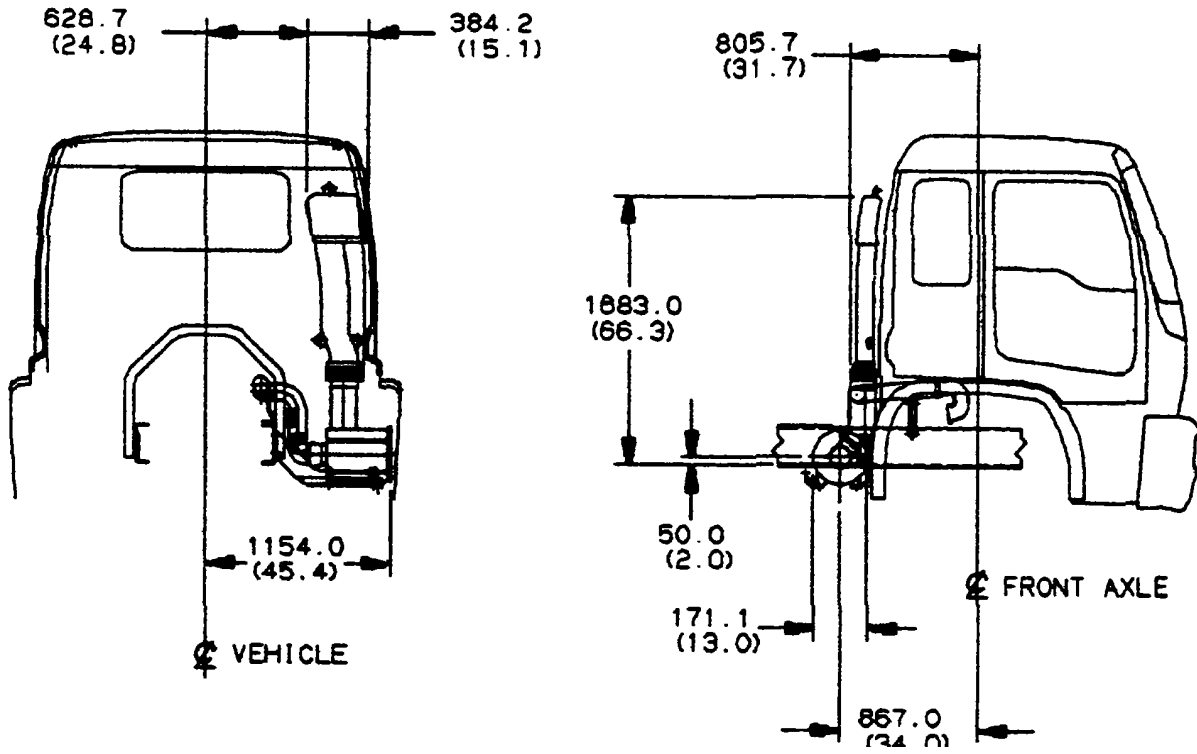
TOP DIMENSION IS MM (BOTTOM DIMENSION IS INCHES)

EXHAUST SYSTEM DIMENSIONS AND LOCATIONS



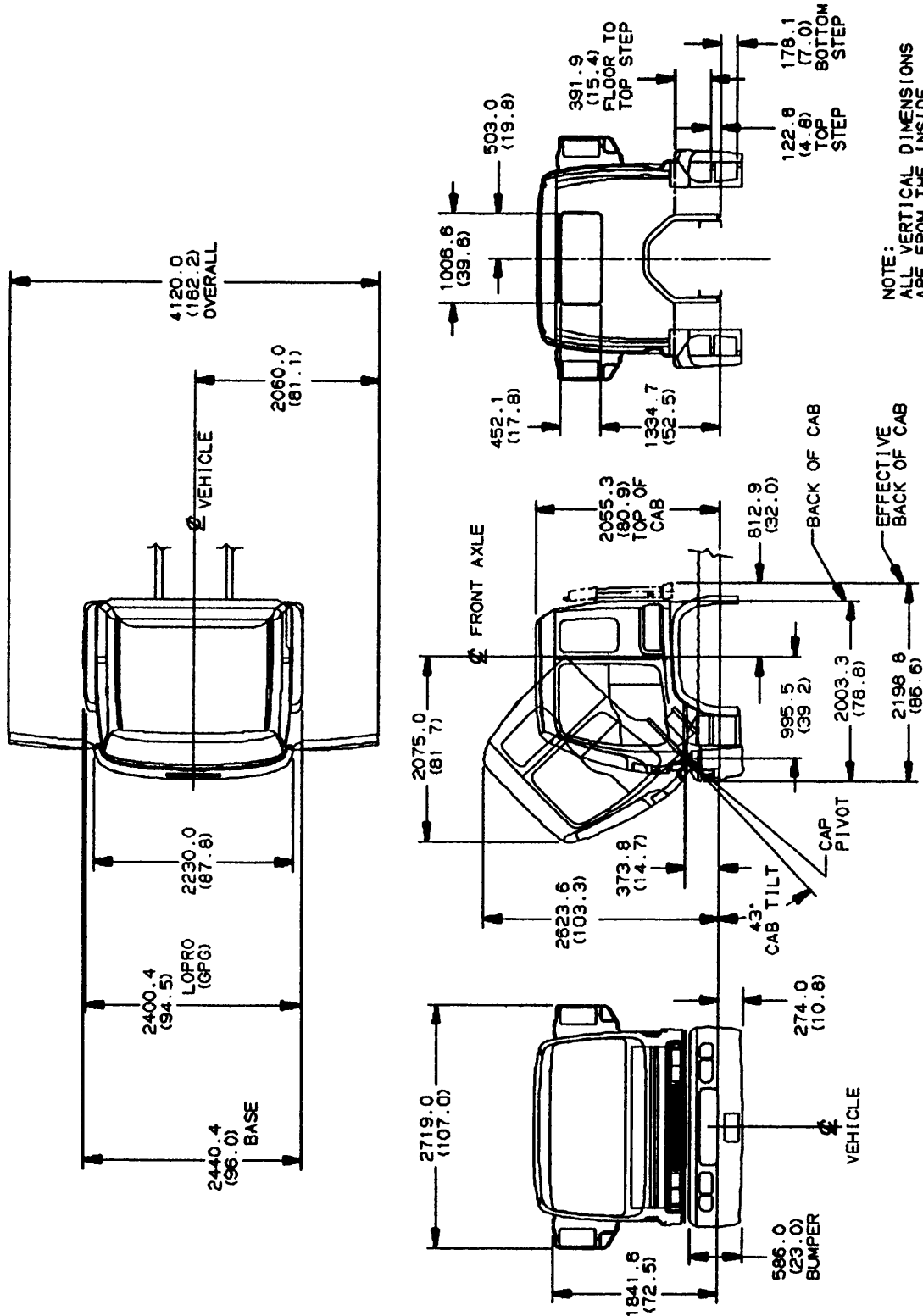
TOP DIMENSION IS MM (BOTTOM DIMENSION IS INCHES)

AIR INTAKE SYSTEM DIMENSIONS



TOP DIMENSION IS MM (BOTTOM DIMENSION IS INCHES)

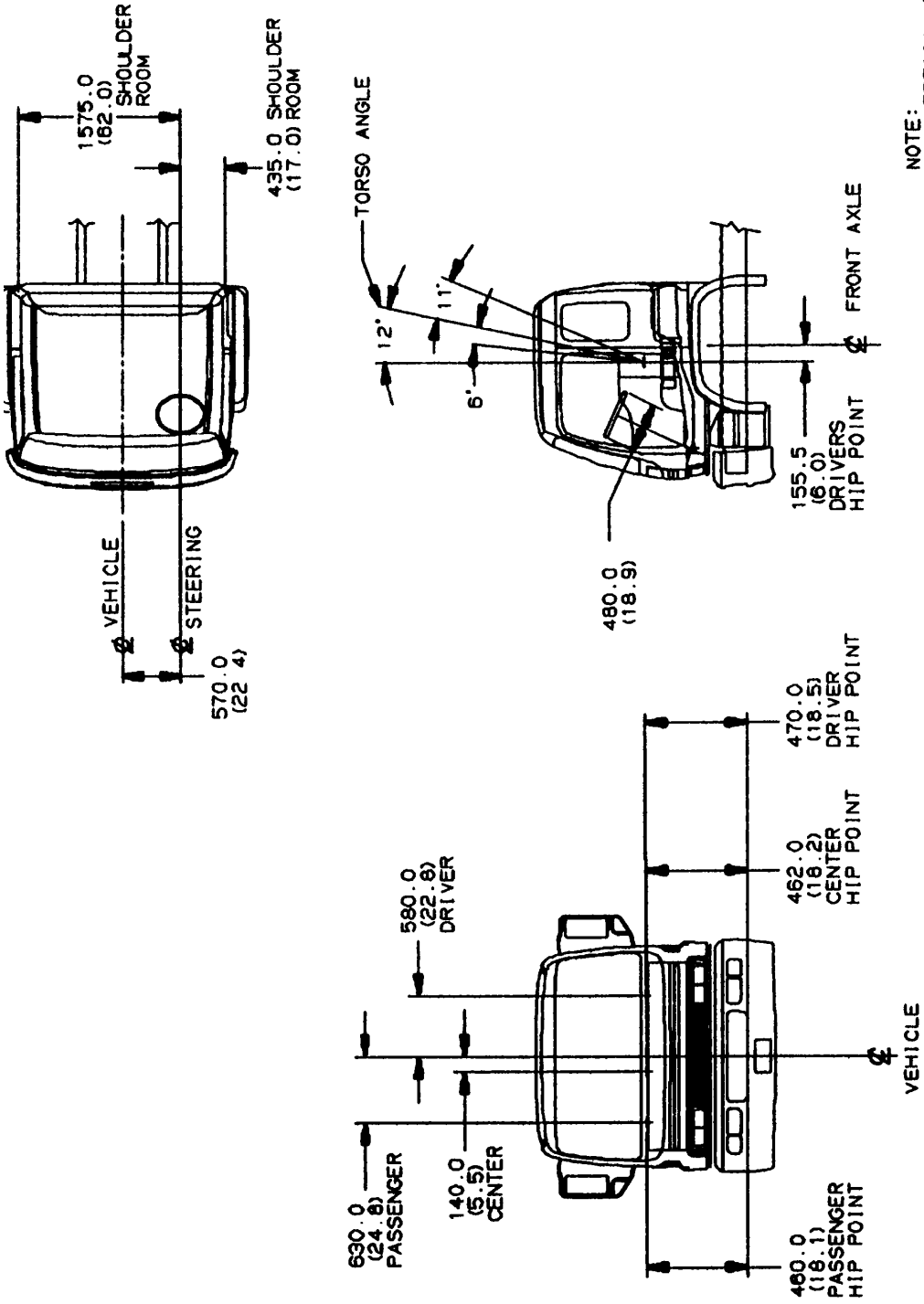
CAB TILT CAB EXTERIOR DIMENSIONS



NOTE:
ALL VERTICAL DIMENSIONS
ARE FROM THE INSIDE
BOTTOM FLANGE OF FRAME

TOP DIMENSION IS MM (BOTTOM DIMENSION IS INCHES)

CAB INTERIOR DIMENSIONS



NOTE: ALL VERTICAL DIMENSIONS ARE FROM THE INSIDE BOTTOM FLANGE OF FRAME

TOP DIMENSION IS MM (BOTTOM DIMENSION IS INCHES)

TIRE BRAND	FSR 10	FSR 11	FTR 10	FTR 11	FTR 12	FTR 13	FTR 20	FTR 21	FTR 22	FTR 23	FVR 10
MICHELIN TIRES FRONT	STD	STD	STD	STD	STD	STD	STD	STD	STD	STD	STD
MICHELIN TIRES REAR	STD	STD	STD	STD	STD	STD	STD	STD	STD	STD	STD
TIRE SIZE											
10R22.5 F (12 PLY)	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	N/A	N/A	N/A	N/A	N/A
11R22.5 G (14 PLY)	N/A	N/A	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL
11R22.5 H (16 PLY)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	AVAIL
225/70R 19.5 F (12 PLY)	AVAIL	AVAIL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
245/70R 19.5 F (12 PLY)	AVAIL	AVAIL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
245/70R 19.5 G (14 PLY)	AVAIL	AVAIL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
235/80R 22.5 G (14 PLY)	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	N/A	N/A	N/A	N/A	N/A
245/75R 22.5 G (14 PLY)	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	N/A	N/A	N/A	N/A	N/A
255/70R 22.5 H (16 PLY)	N/A	N/A	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	N/A
255/80R 22.5 G (14 PLY)	N/A	N/A	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	N/A
265/75R 22.5 G (14 PLY)	N/A	N/A	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	N/A
275/80R 22.5 G (14 PLY)	N/A	N/A	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL	N/A
295/75R 22.5 G (14 PLY)	N/A	N/A	N/A	N/A	N/A	N/A	AVAIL	AVAIL	AVAIL	AVAIL	AVAIL

TIRE AVAILABILITY CHART

MICHELIN TIRE DIMENSION CHART

MICHELIN TIRES R4L/S4L TREAD DESIGN	TREAD CODE	RPO	SIZE	LOAD RANGE	MINIMUM DUAL SPACING	DIMENSIONS				REVS PER MILE	MAX PRESSURE		MAX LOAD PER TIRE	
						NO LOAD		LOADED			SINGLE	DUAL	SINGLE	DUAL
						WIDTH	DIA	WIDTH	SLR					
PXZA	R3C/S3C	XTN/YTN	225/70R19.5	F/12	9.90	8.80	32.30	9.60	14.90	646	85	85	3640	3415
PXZA	R3C/S3C	XTY/YTY	245/70R19.5	G/14	10.90	9.70	33.40	10.60	15.50	624	110	110	4805	4540
PXZA	R3C/S3C	XTB/YTB	255/70R22.5	H/16	11.00	9.70	36.60	10.70	17.00	567	115	115	5510	5070
XAZ-2	R3C/S3C	XWL/YWL	11R22.5	G/14	12.50	11.10	41.30	12.00	19.30	501	100	100	6175	5080
XAZ-2	R3C/S3C	XWM/YWM	11R22.5	H/16	12.50	11.10	41.30	12.00	19.30	501	115	115	6610	5950
XZA-2	R3C/S3C	XSH/YSH	275/80R22.5	G/14	12.30	10.90	40.00	12.00	18.60	518	100	100	6175	5675
PXDU	S3D	YRL	235/80R22.5	G/14	10.40	9.30	37.40	10.20	17.40	554	90	90	4675	4410
PXDU	S3D	YSB	255/80R22.5	G/14	11.30	10.00	38.40	10.90	17.80	540	95	95	5205	4810
XDA2	S3D	YSH	275/80R22.5	G/14	12.30	11.00	40.40	11.90	18.90	516	100	100	6175	5675
XDA2	S3D	YWL	11R22.5	G/14	12.00	10.90	41.70	11.90	19.40	501	100	100	6175	5675
XDA+	S3D	YTB	255/70R22.5	H/16	11.10	9.60	36.90	10.60	17.30	561	115	115	5510	5070
PXZT	S3D	YTN	225/70R19.5	F/12	9.90	8.80	32.50	9.60	15.00	639	85	85	3640	3415
PXZT	S3D	YTY	245/70R19.5	G/14	10.90	9.70	33.60	10.50	15.60	618	110	110	4805	4540
XDY-1	S3T	YWL	11R22.5	G/14	12.80	11.30	42.00	12.50	19.60	493	100	100	6175	5675
XDY-1	S3T	YWM	11R22.5	H/16	12.80	11.30	42.00	12.40	19.60	493	115	115	6610	5950
XDHT	S3H	YWL	11R22.5	G/14	12.60	11.10	41.90	12.00	19.50	500	100	100	6175	5675
PXDHT	S3H	YSH	275/80R22.5	G/14	12.20	10.90	40.70	12.00	18.90	515	100	100	6175	5675
XM+S4	S3J	YWL	11R22.5	G/14	11.10	11.10	41.70	12.10	19.40	499	100	100	6175	5675
XM+S4	S3J	YWM	11R22.5	H/16	12.20	11.20	41.80	12.10	19.40	500	115	115	6610	5950
XM+S4	S3J	YWJ	10R22.5	F/12	10.80	10.80	40.20	10.50	18.60	517	95	95	5150	4240
PXM+S4	S3J	YSH	275/80R22.5	G/14	12.30	11.00	40.40	12.00	18.80	516	100	100	6175	5675
XYZ-1	R3K/S3K	XWL/YWL	11R22.5	G/14	12.80	11.30	41.60	12.50	19.50	497	100	100	6175	5675
XYZ-1	R3K/S3K	XWM/YWM	11R22.5	H/16	12.80	11.30	41.60	12.50	19.50	497	115	115	6610	5950
XZE	R3B/S3B	XWKYWJ	10R22.5	F/12	11.50	10.20	40.10	N/A	18.70	517	95	95	5150	4740
XZE	R3B/S3B	XWL/YWL	11R22.5	G/14	12.40	10.60	41.10	N/A	19.30	501	100	100	6175	5675
XZE	R3B/S3B	XWM/YWM	11R22.5	H/16	12.40	10.60	41.10	N/A	19.30	501	115	115	6610	5950
XZE	R3B/S3B	XTI/YTI	245/70R19.5	F/12	10.90	8.90	33.50	N/A	15.10	619	90	90	4080	3860
XZE	R3B/S3B	XTY/YTY	245/70R19.5	G/14	10.90	8.90	33.50	N/A	15.10	619	110	110	4805	4540
XZE	R3B/S3B	XSH/YSH	275/80R22.5	G/14	12.40	11.10	39.70	N/A	18.40	517	100	100	6175	5675

GOODYEAR R4A/S4A TREADDESIGN	TREAD CODE	RPO	SIZE	LOAD RANGE	MINIMUM DUAL SPACING	DIMENSIONS				REVS PER MILE	MAXPRESSURE		MAX LOAD PER TIRE	
						NO LOAD		LOADED			SINGLE	DUAL	SINGLE	DUAL
						WIDTH	DIA	WIDTH	SLR					
G159	R3C/S3C	XTI/YTI	245/70R19.5	F/12	11.00	9.90	33.00	10.90	15.30	629	95	95	4080	3860
G159	R3C/S3C	XTY/YTY	245/70R19.5	G/14	11.00	9.90	33.00	10.90	15.30	628	110	110	4540	4300
G159	R3C/S3C	XWL/YWL	11R22.5	G/14	12.60	10.90	41.50	12.00	19.40	501	105	95	6040	5300
G159	R3C/S3C	XWM/YWM	11R22.5	H/16	12.60	10.90	41.50	12.00	19.40	501	120	110	6610	5800
G159	R3C/S3C	XTQ/YTQ	245/75R22.5	G/14	11.00	9.50	37.00	10.40	17.20	561	110	100	4675	4300
G159	R3C/S3C	XTU/YTU	265/75R22.5	G/14	11.60	9.90	38.70	10.80	18.00	537	110	100	5205	4805
G159	R3C/S3C	XRN/YRN	295/75R22.5	G/14	12.90	11.20	40.40	12.30	18.70	514	110	100	6175	5675
G159	R3C/S3C	XTB/YTB	255/70R22.5	H/16	11.30	9.80	36.40	10.70	17.00	571	120	115	5510	5070
G159	R3C/S3C	XWJ/YWJ	10R22.5	F/12	11.40	10.10	40.10	11.00	18.80	518	100	100	5150	4875
G124	S3H	YTI	245/70R19.5	F/12	11.00	9.90	33.20	10.90	15.40	622	95	95	4080	3875
G124	S3H	YTY	245/70R19.5	G/14	11.00	9.90	33.20	10.90	15.40	622	110	100	4540	4375
G124	S3H	YTU	265/75R22.5	G/14	11.60	9.90	38.70	11.10	18.20	537	110	100	5205	4805
G124	S3H	YTQ	245/75R22.5	G/14	11.00	9.50	37.30	10.50	17.40	557	110	110	4675	4410
G124	S3H	YWL	11R22.5	G/14	12.60	10.80	41.70	11.90	19.50	498	105	115	6175	5250
G124	S3H	YWM	11R22.5	H/16	12.60	10.80	41.70	11.90	19.50	498	120	110	6610	5800
G124	S3H	YRN	295/75R22.5	G/14	12.90	11.10	40.60	12.30	18.90	512	110	100	6175	5675
G124	S3H	YTB	255/70R22.5	H/16	11.30	9.80	36.80	10.70	17.20	564	115	115	5510	5070
G124	S3H	YWJ	10R22.5	F/12	11.40	10.00	40.40	11.00	19.00	514	100	100	5150	4875
G167	S3D	YWJ	10R22.5	F/12	11.40	9.90	40.70	10.90	19.10	513	100	100	5150	4875
G167	S3D	YWL	11R22.5	G/14	12.60	10.70	42.00	11.80	19.70	497	105	115	6175	5250
G167	S3D	YWM	11R22.5	H/16	12.60	10.70	42.00	11.80	19.70	497	120	110	6610	5800
G167	S3D	YRN	295/75R22.5	G/14	12.90	10.90	40.80	11.90	19.00	512	110	100	6175	5675
G144	S3E	YWL	11R22.5	G/14	12.60	10.80	41.70	11.90	19.50	498	115	105	6175	5250
G144	S3E	YWM	11R22.5	H/16	12.60	10.80	41.70	11.90	19.50	498	120	110	6610	5800
G286	R3F/S3F	XWL/YWL	11R22.5	G/14	12.60	10.80	41.70	11.90	19.50	498	105	115	6040	5250
G186	R3K/S3K	XWJ/YWJ	10R22.5	F/12	11.40	10.00	40.40	11.00	18.90	514	100	100	5150	4875
G186	R3K/S3K	XWL/YWL	11R22.5	G/14	12.60	11.00	41.80	12.10	19.50	497	105	115	6040	5250
G186	R3K/S3K	XWM/YWM	11R22.5	H/16	12.60	11.00	41.80	12.10	19.50	497	120	110	6610	5800
G177	R3L/S3L	XWL/YWL	11R22.5	G/14	12.50	10.90	42.30	12.00	19.70	493	105	115	6040	5250
G177	R3L/S3L	XWM/YWM	11R22.5	H/16	12.50	10.90	42.30	12.00	19.70	493	120	110	6610	5800

GOODYEAR TIRE DIMENSION CHART

GENERAL TIRE DIMENSION CHART

GENERAL TIRES R4H/S4H TREAD DESIGN	TREAD CODE	RPO	SIZE	LOAD RANGE	MINIMUM DUAL SPACING	DIMENSIONS				REVS PER MILE	MAX PRESSURE		MAX LOAD PER TIRE	
						NO LOAD		LOADED			SINGLE	DUAL	SINGLE	DUAL
						WIDTH	DIA	WIDTH	SLR					
AMERI-STEELA	R3B/S3B	XWL/YWL	11R22.5	G/14	12.60	10.80	41.30	12.20	19.20	501	115	105	4970	5250
AMERI-STEELA	R3B/S3B	XWJ/YWJ	10R22.5	F/12	11.40	10.00	40.30	11.30	18.70	514	100	90	5150	4520
AMERI-S380	R3C	XRN	295/75R22.5	G/14	13.20	11.10	40.20	12.00	18.70	515	110	N/A	6175	N/A
AMERI-S380	R3C/S3C	XWL/YWL	11R22.5	G/14	12.60	11.00	41.40	12.00	19.30	500	105	105	6040	4970
AMERI-LUG B	S3D	YWJ	10R22.5	F/12	11.40	10.00	40.30	11.30	18.70	511	95	90	5150	4520
AMERI-MSL RADIAL H	R3K/S3K	XWM/YWM	11R22.5	H/16	12.60	10.70	41.40	12.20	19.30	500	120	110	6610	5800

BRIDGESTONE TIRES R4N/S4N TREAD DESIGN	TREAD CODE	RPO	SIZE	LOAD RANGE	MINIMUM DUAL SPACING	DIMENSIONS				REVS PER MILE	MAX PRESSURE		MAX LOAD PER TIRE	
						NO LOAD		LOADED			SINGLE	DUAL	SINGLE	DUAL
						WIDTH	DIA	WIDTH	SLR					
R294	R3C/S3C	XTB/YTB	255/70R22.5	H/16	11.50	9.90	36.70	10.90	17.40	568	120	115	5510	5070
M711	S3D	YWL	11R22.5	G/14	12.60	10.70	41.90	11.80	19.70	498	105	105	6175	4970
M711	S3D	YRN	295/75R22.5	G/14	13.20	11.10	40.60	12.20	19.10	513	110	100	6175	5675
M716	S3J	YTU	265/75R22.5	G/14	11.60	10.10	38.60	11.10	18.20	541	110	100	5205	4805
M716	S3J	YRN	295/75R22.5	G/14	13.20	11.10	40.40	12.20	19.10	519	110	100	6175	5675
M724	R3M/S3M	XTY/YTY	245/70R19.5	G/14	11.10	9.70	33.50	10.40	15.70	622	110	110	4540	4375
M857	R3K/S3K	XWK/YWK	10R22.5	G/14	11.40	9.80	40.30	10.80	19.00	519	115	105	5680	4970
R250F	R3B/S3B	XRN/YRN	295/75R22.5	G/14	13.20	10.90	40.20	12.00	18.80	519	110	100	6175	5675
R250F	R3B/S3B	XWJ/YWJ	10R22.5	F/12	11.40	9.80	40.00	10.70	18.70	519	100	90	5150	4520
R250F	R3B/S3B	XWL/YWL	11R22.5	G/14	12.60	10.70	41.30	11.80	19.30	502	105	105	6040	4970
R250F	R3B/S3B	XWP/YWP	12R22.5	H/16	13.50	11.60	42.70	12.60	19.80	487	120	110	7200	6610
R250F	R3B/S3B	XTQ/YTQ	245/75R22.5	G/14	11.00	9.70	37.40	10.50	17.60	555	110	100	4675	4300
R250F	R3B/S3B	XTU/YTU	265/75R22.5	G/14	11.60	10.20	38.40	11.10	18.00	541	110	100	5205	4805
R299LP	R3C/S3C	XRN/YRN	295/75R22.5	G/14	13.20	10.90	40.20	12.00	18.80	526	110	100	6175	5675
R299LP	S3C	YRV	285/75R24.5	G/14	12.50	10.60	41.40	11.70	19.40	499	110	100	6175	5675
R293	R3C/S3C	XWL/YWL	11R22.5	G/14	12.60	10.60	41.30	11.70	19.30	519	105	105	6175	5750







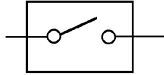

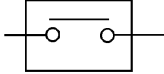
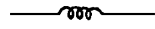
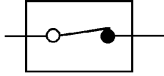
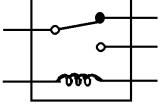

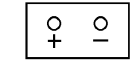
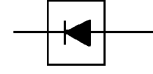

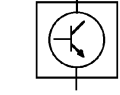
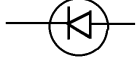

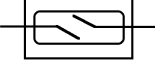
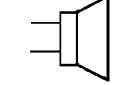
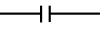
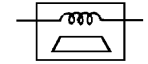
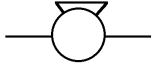
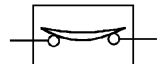
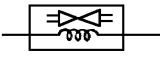
BRIDGESTONE TIRE DIMENSION CHART

STEEL AND ALUMINUM DISC WHEEL SPECIFICATIONS

WHEEL SIZE	RPOPTION		MFG.	OFFSET	DISC THICKNESS	RIM TYPE	BC DIA.	NO. STUDS	RATING LBS @ PSI
	FRONT	REAR							
19.5 X 6.75	Q82	Q83	ACCURIDE	5.60	0.437	DCT	275 MM	8	5000 @ 115
22.5 X 7.50	QH3	QH4	ACCURIDE	6.44	0.375	DCT	285.75 MM	10	6200 @ 120
22.5 X 8.25	RPQ	RPR	ACCURIDE	6.62	0.437	DCT	285.75 MM	10	7300 @ 120
19.5 X 6.75	RPM	RPW	ALCOA	5.55	0.812	DCT	275 MM	8	5500 @ 120
22.5 X 8.25	QM3	QM4	ACCURIDE	6.62	0.437	DCT	285.75 MM	10	7300 @ 120

**NPR/NPR HD
W3500/W4500
Gas Electrical**

NPR/NPR HD/W3500/W4500 Gas Electrical

Symbol	Meaning	Symbol	Meaning
	Fuse		Bulb
	Fusible link		Double filament bulb
	Fusible link wire		Motor
	Switch		Variable resistor rheostat
	Switch		Coil (Inductor), solenoid magnetic valve
	Switch (Normal close type)		Relay
	Contact wiring		
	Battery		
	Diode		Connector
	Electronic parts		Light emitting diode
	Resistor		Reed switch
	Speaker		Condenser
	Buzzer		Horn
	Circuit breaker		Vacuum switching valve

ABBREVIATIONS

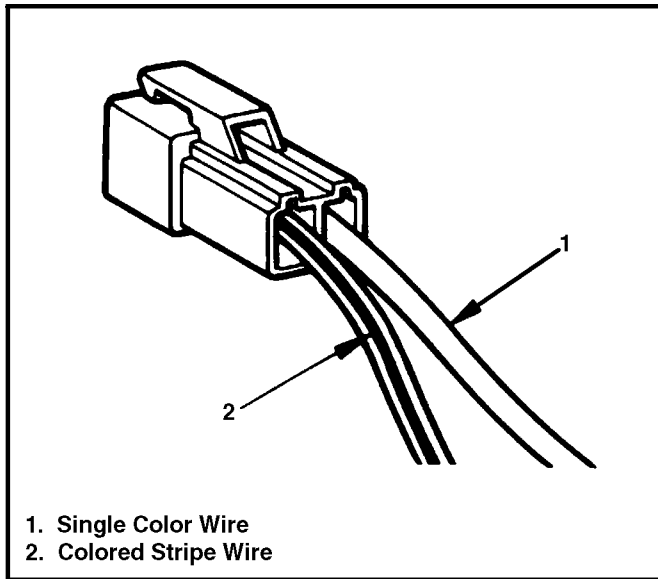
Abbreviation	Meaning of Abbreviation	Abbreviation	Meaning of Abbreviation
A	Ampere (S)	kW	kilowatt
ABS	Anti-lock brake system	LH	Left hand
ASM	Assemblby	LWB	Long wheel base
AC	Alternating current	M/T	Manual transmission
A/C	Air Conditioner	OD	Over drive
ACC	Accessories	OPT	Option
A/T	Automatic transmission	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 wheel base
EFE	Early fuel evaporation	TCM	Transmission control module
4A/T	4-speed automatic transmission	3A/T	3-speed automatic transmission
4X4	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

COLOR CODE FOR WIRING

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
 Red (Stripe color)
 Green (Base color)
 Wire size (0.5 mm²)

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

Figure 18. Wire Color

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, shown below, are specified by AWG (American Wire Gauge) (Nominal size means approximate cross sectional area) (figure 24).

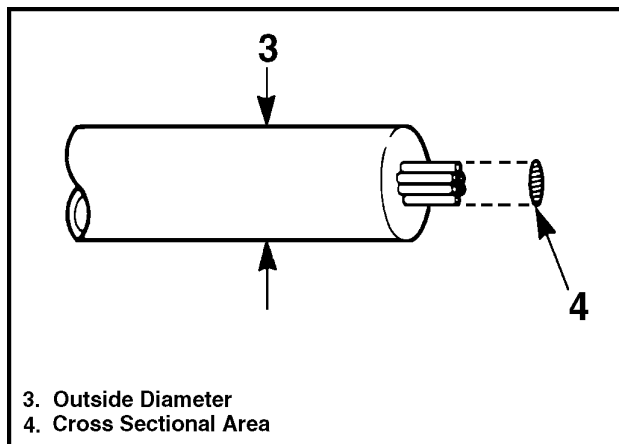
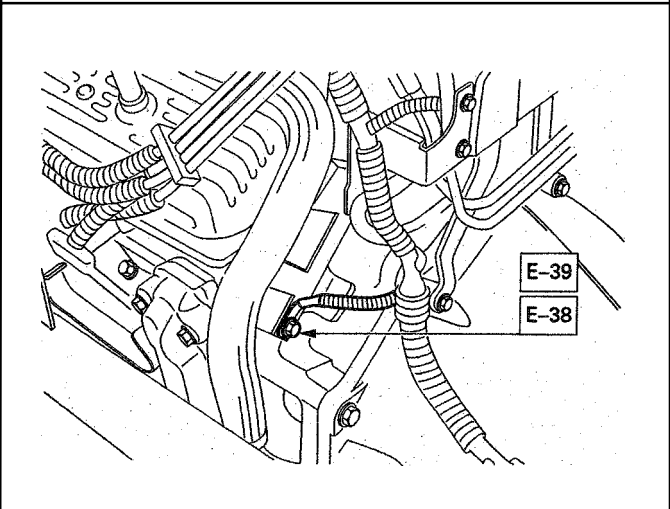
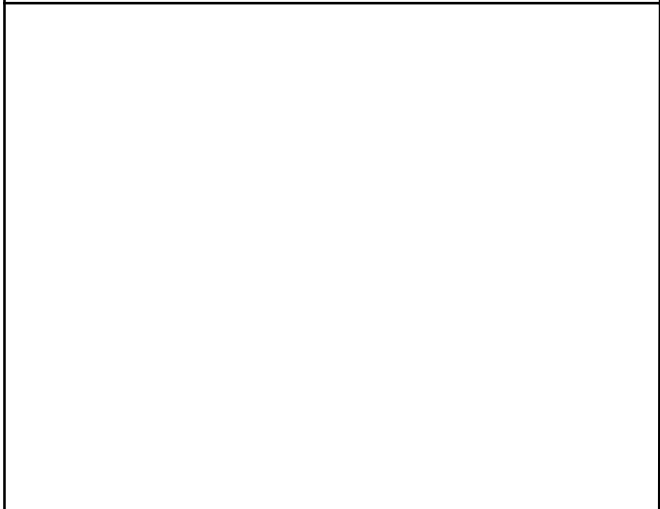
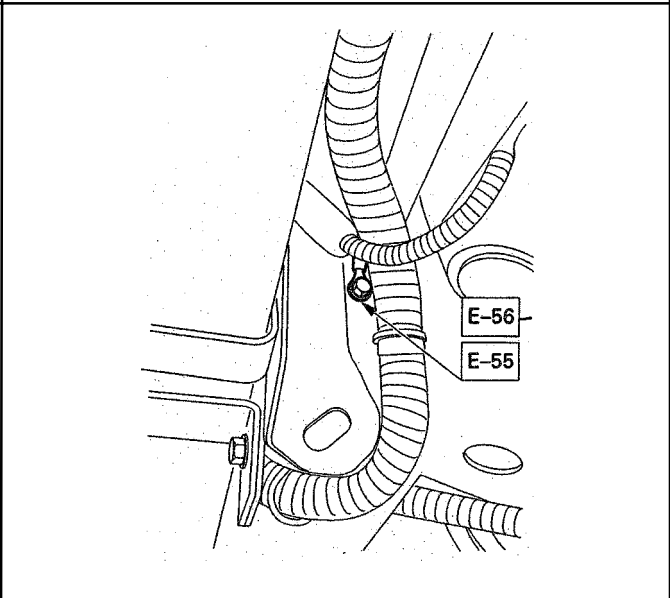
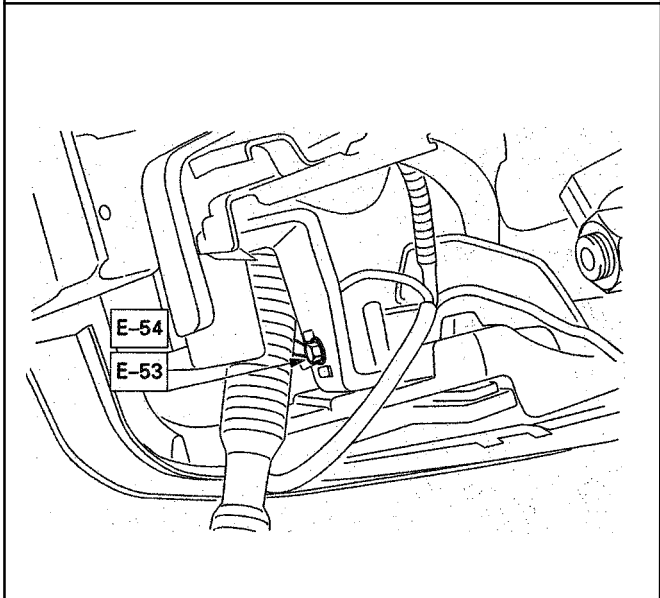
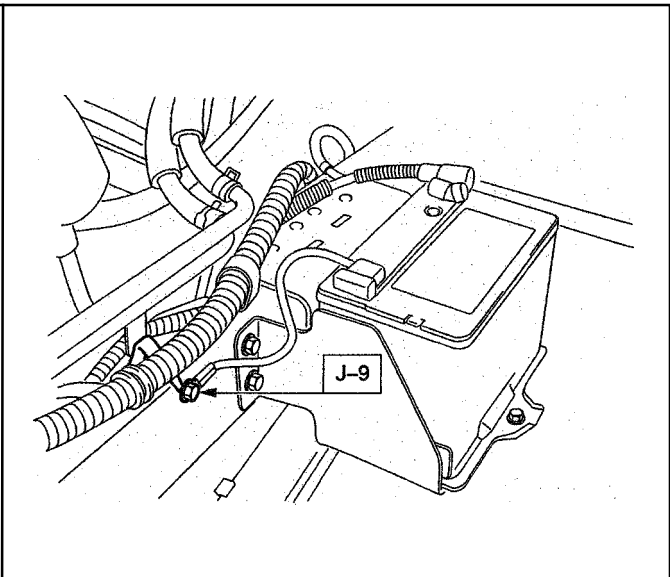
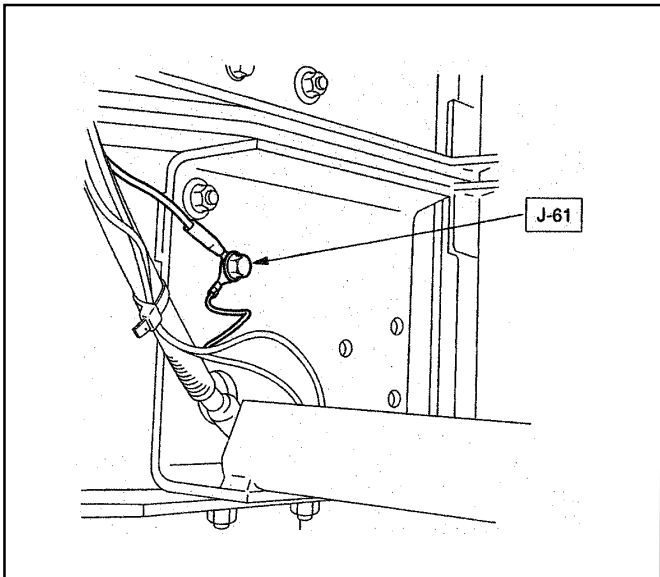


Figure 24. Wire Size

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

GROUNDING POINT LOCATION



REFERENCE TABLE OF GROUNDING POINT

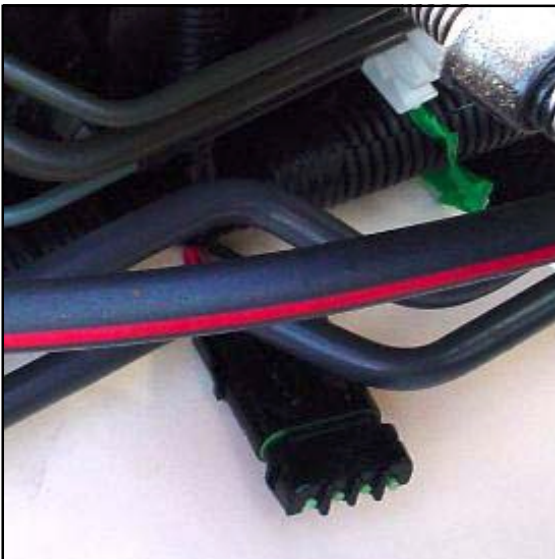
NOTICE: Abnormal phenomena of electrical components are considered resulted from defective grounding. In repair, be sure to inspect grounding points and to tighten all fastening parts surrounding the grounding points.

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, Diagnostic connector
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 light, Tail relay, Cornering light switch, Cornering light, Cornering light relay, Dimmer relay, Wiper motor, Washer motor, Intermittent relay, Heater & A/C relay, Radio & clock, cigar lighter, Fan switch, Blower resistor, A/C Switch, Blower motor, Electronic Thermostat, cab interior switch, Flasher unit, Clearance light, ID light, Illumination, Power source relay, hazard warning switch, turn signal light switch. diagnostic connector, roof marker light, illumination controller
J-9	Frame front harness	Frame-RH (CRT)	Fuel pump relay, ID light relay license plate light, taillight, rear turn signal light, stoplight, backup light inhibitor switch, rear oxygen sensor, (LH, RH)
J-61	Frame rear harness	HORN (LH)	Fuel pump License plate light, taillight, rear turn signal light, stoplight, backup light inhibitor switch
E-38	Engine harness	Engine-LH (RR)	Front O2S (LH, RH) Mass air flow sensor Coil driver, Vehicle control module Purge solenoid vacuum switch
E-39		Engine-LH (RR)	Vehicle control Module

NPR/NPR HD/W3500/W4500 Gas Electrical

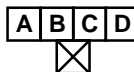
NPR BODY ROOM LIGHT, ID & MARKER LAMP AND (BACK UP LAMP CONNECTOR LOCATION)

NPR BODY CONNECTORS LH FRAME

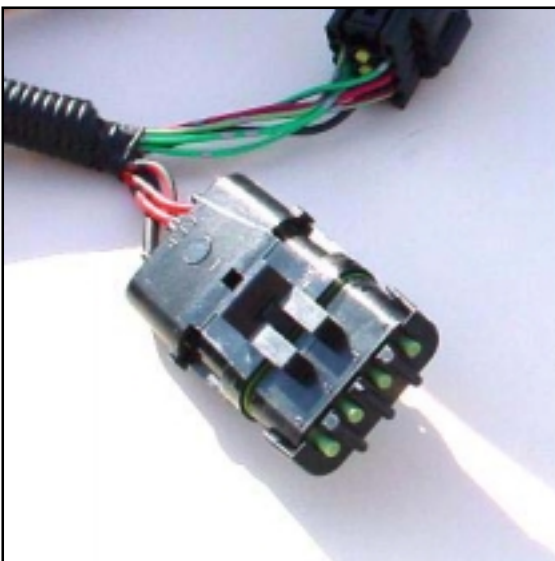


- ◆ PACKARD BODY PLUG
- ◆ 4PIN WEATHER SEAL CONNECTOR WITH MATING PLUG
- ◆ LOCATION:
INSIDE LEFT HAND FRAME RAIL 28 TO 31 INCHES BOC
- ◆ CIRCUITS :

Rear Dome	=	A
Hot Wire	=	B
Marker Lamp	=	C
Ground	=	D

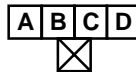


NPR BODY CONNECTORS EOF

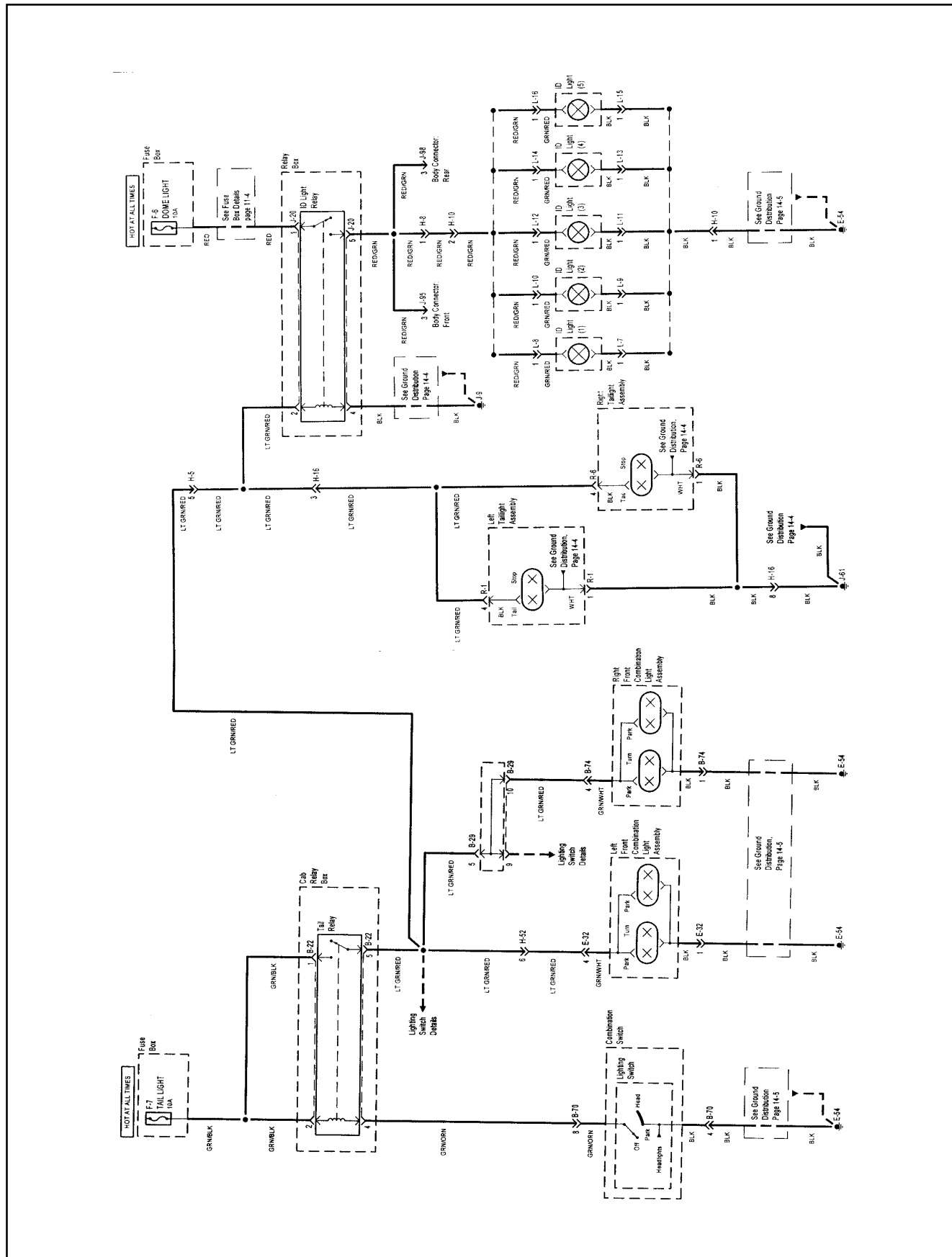


- ◆ PACKARD BODY PLUG
- ◆ 4PIN WEATHER SEAL CONNECTOR WITH MATING PLUG
- ◆ LOCATION:
CENTER OF CROSSMEMBER
- ◆ CIRCUITS :

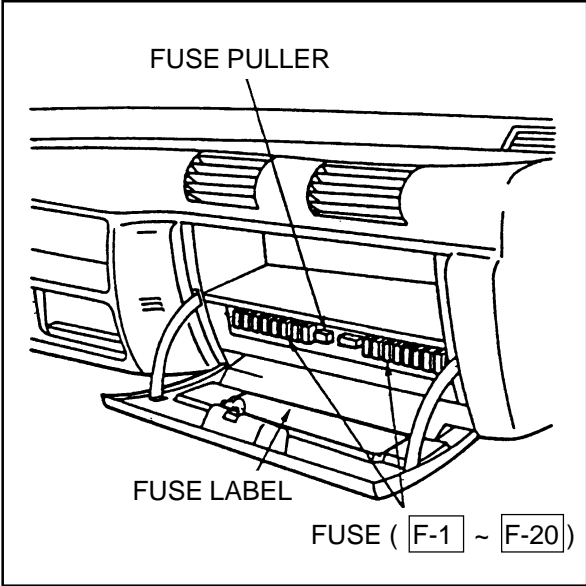
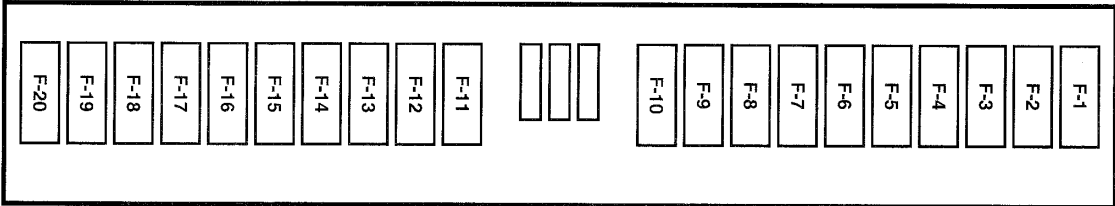
Rear Dome	=	A
Hot Wire	=	B
Marker Lamp	=	C
Ground	=	D



PARK, TAIL, LICENSE & I.D. LIGHTS CIRCUIT DIAGRAM



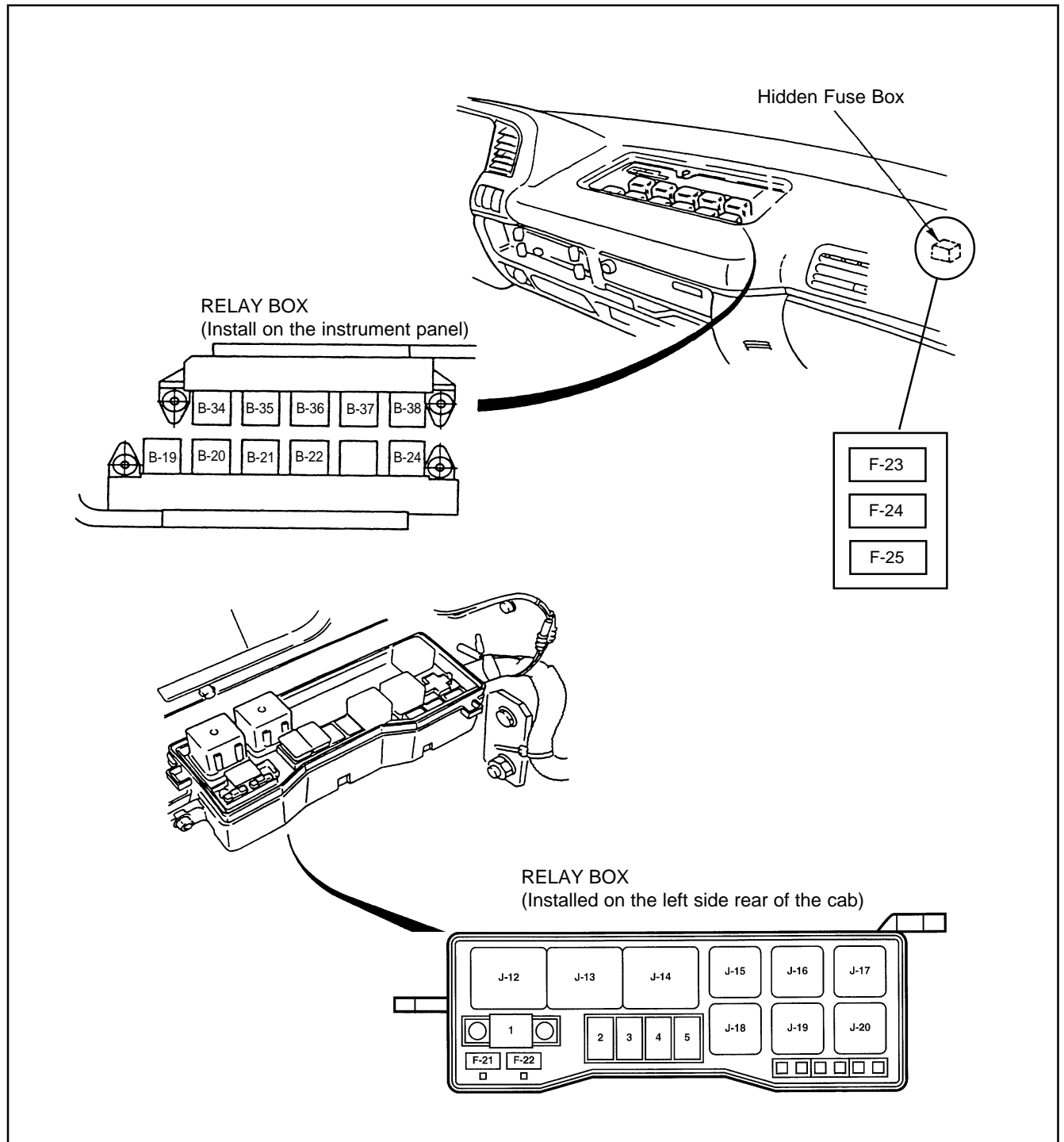
FUSE LOCATION



FUSE BOX

Fuse Number	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)
	VCM (IGN) (Gas)		Engine Controls (Gas)
F-4	D.R.L. (Diesel)	10A	Headlights (Diesel)
	ENGINE (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, Sound System (Gas), Speedometer (Gas)
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 S/LIGHT	10A	Turn Lights
F-14	ECU (IGN) (Diesel)	10A	Engine Controls
	VCM (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)	10A	Engine Controls, Gauges (Gas)
F-18	HAZARD, HORN	20A	Engine Controls, Gauges, Horn, Hazard Lights
F-19	ABS (BAT)	25A	ABS
F-20	STARTER	10A	Starting System

RELAY LOCATION



CAB RELAY

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

Relay Number	Relay
B-19	Charge relay
B-20	Headlight
B-21	Heater & A/C
B-22	Tail
B-23	Buzzer control
B-24	Horn

Relay Number	Relay
B-34	Power source
B-35	Cornering
B-36	Exhaust brake cut (Diesel)
	Vacuum pump (Gas)
B-37	A/C thermo
B-38	Exhaust brake (Diesel)
	Ignition (Gas)

FUSE BOX

Fuse Number	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)

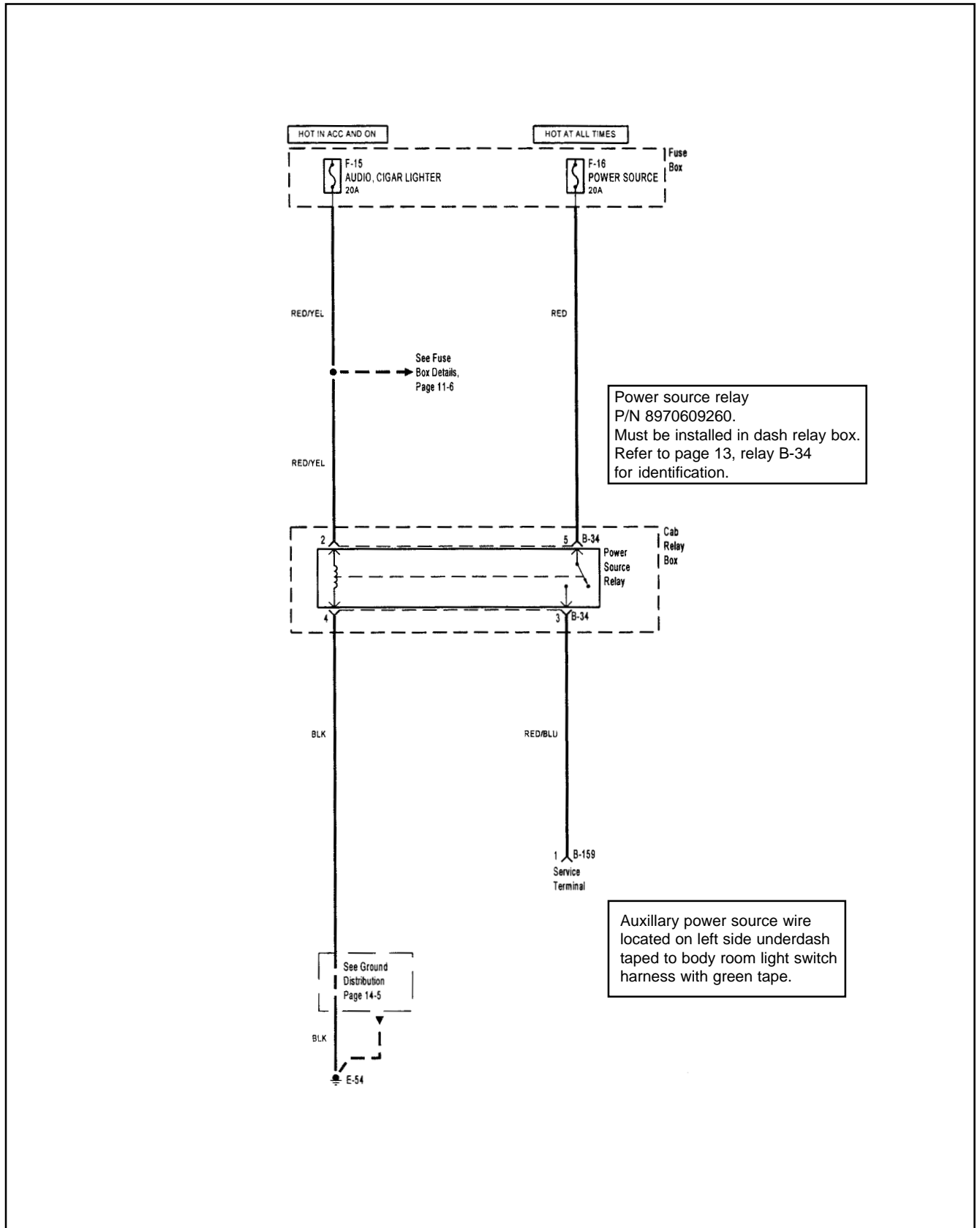
RELAY BOX OUTSIDE CAB

Fuse Number	Fuse Name	Amps	Circuit Protected
1	MAIN	80A	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	—	—	Not used
F-22	CONDENSER FAN (Diesel)	15A	Condenser fan

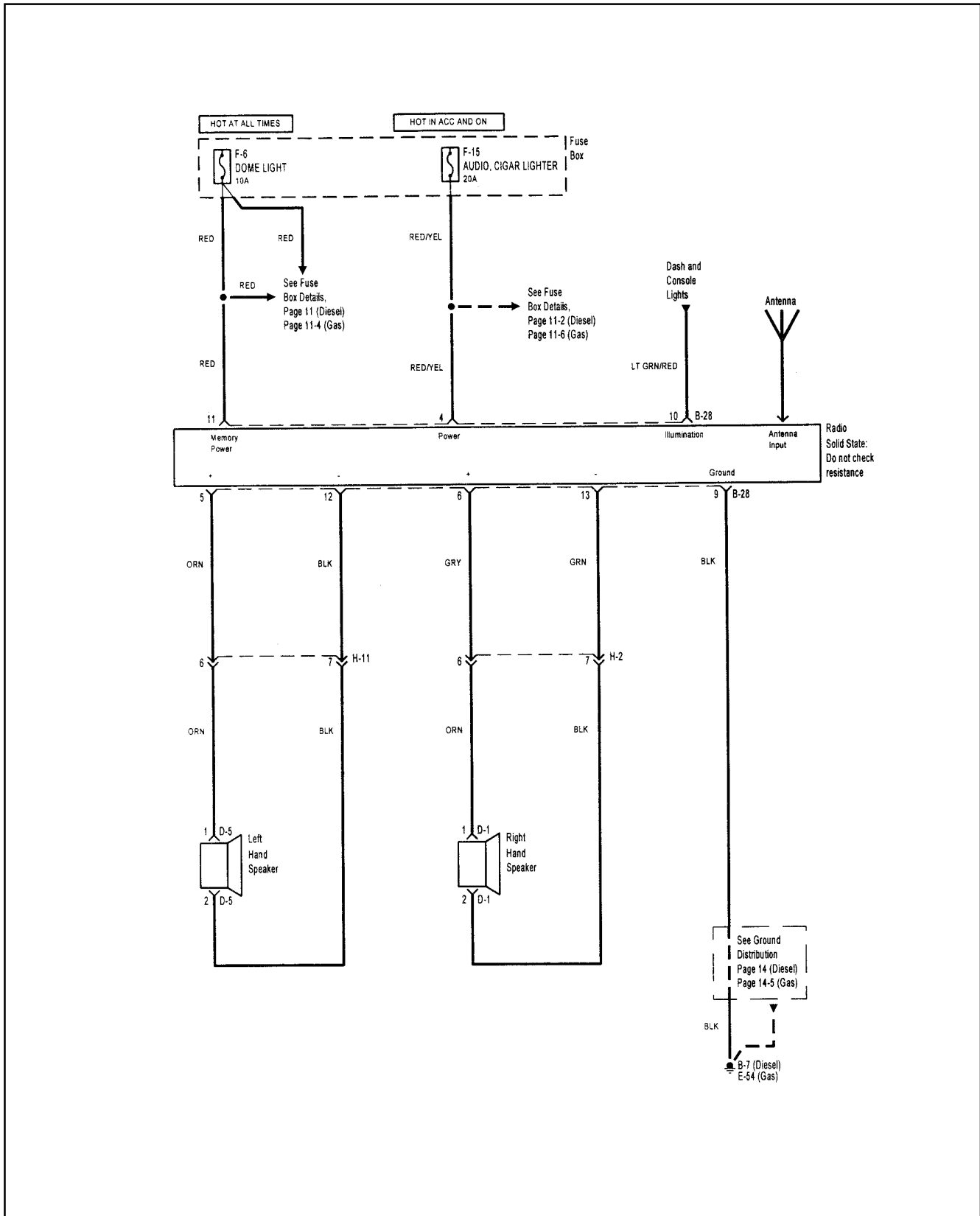
Relay Number	Relay
J-12	Starter
J-13	Glow-1 (Diesel)
J-14	C/Heater (Diesel M/T)
J-15	Warm cut 1 (Diesel)
	A/C enable (Gas)

Relay Number	Relay
J-16	Fuel pump (Gas)
J-17	Condenser (Diesel)
J-18	Exhaust brake control (Diesel)
J-19	Engine warm cut 2 (Diesel A/T)
J-20	I.D. light relay

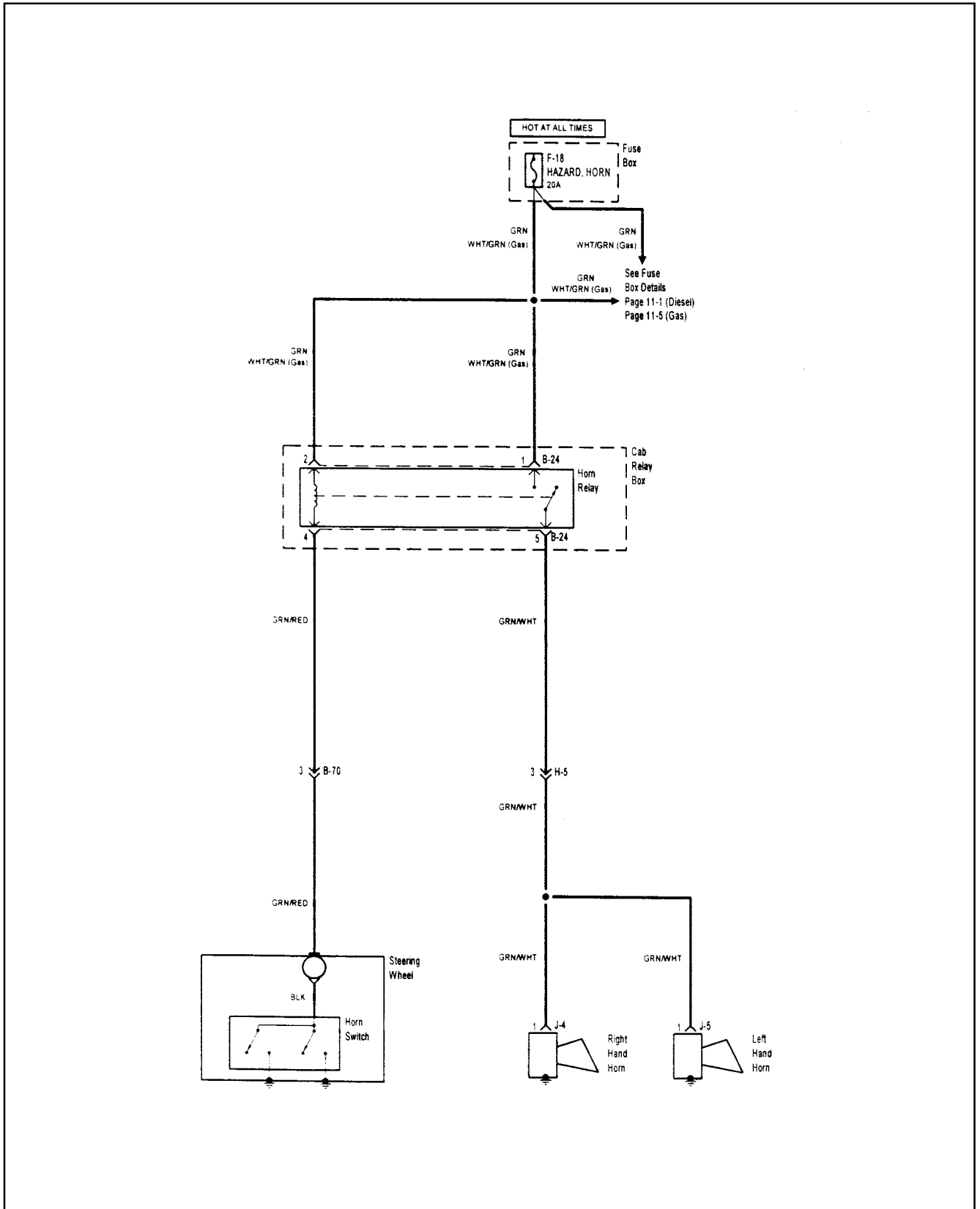
AUXILIARY POWER SOURCE CIRCUIT DIAGRAM



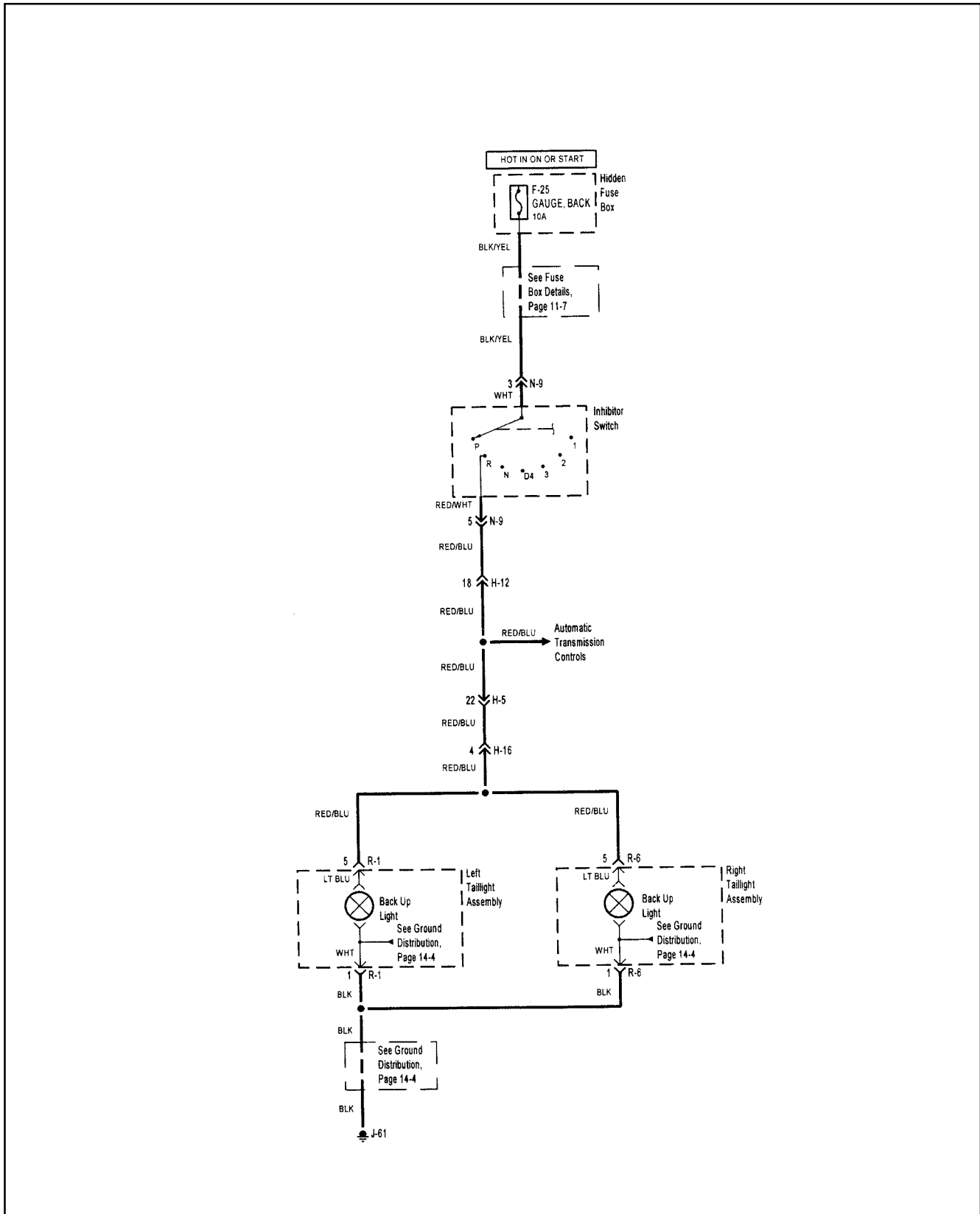
SOUND SYSTEM CIRCUIT DIAGRAM



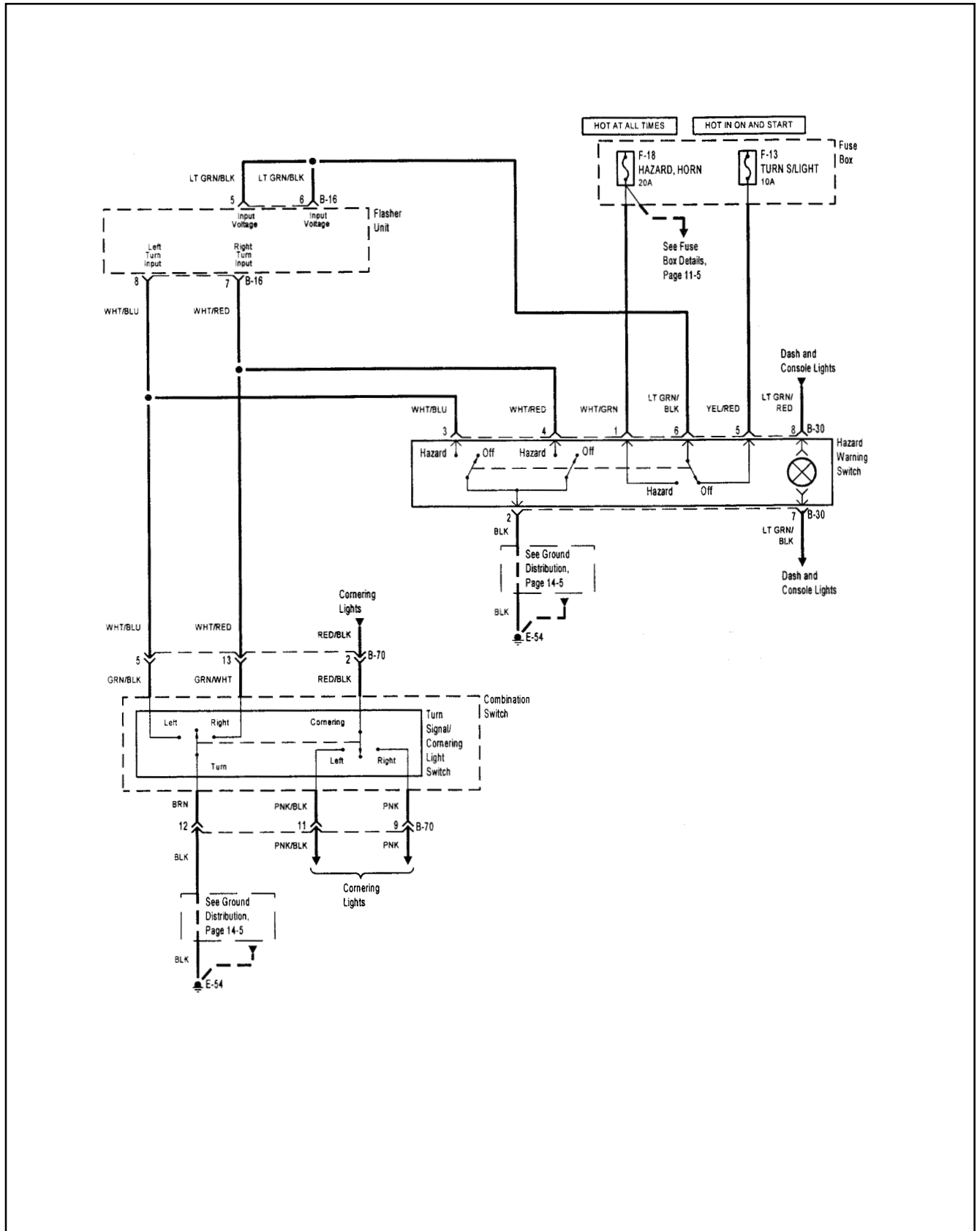
HORN CIRCUIT DIAGRAM



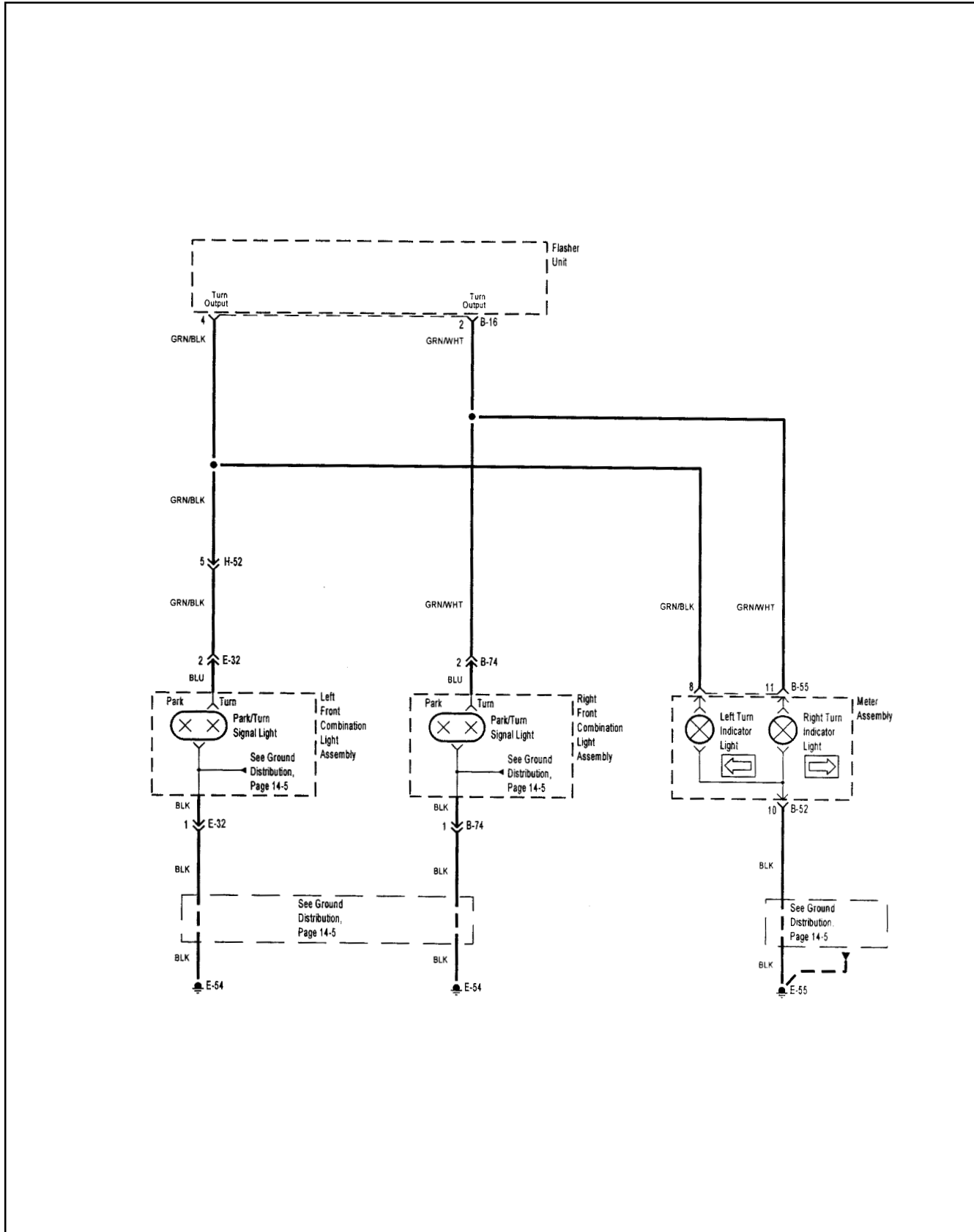
BACK UP LIGHTS CIRCUIT DIAGRAM



TURN & HAZARD LIGHTS CIRCUIT DIAGRAM

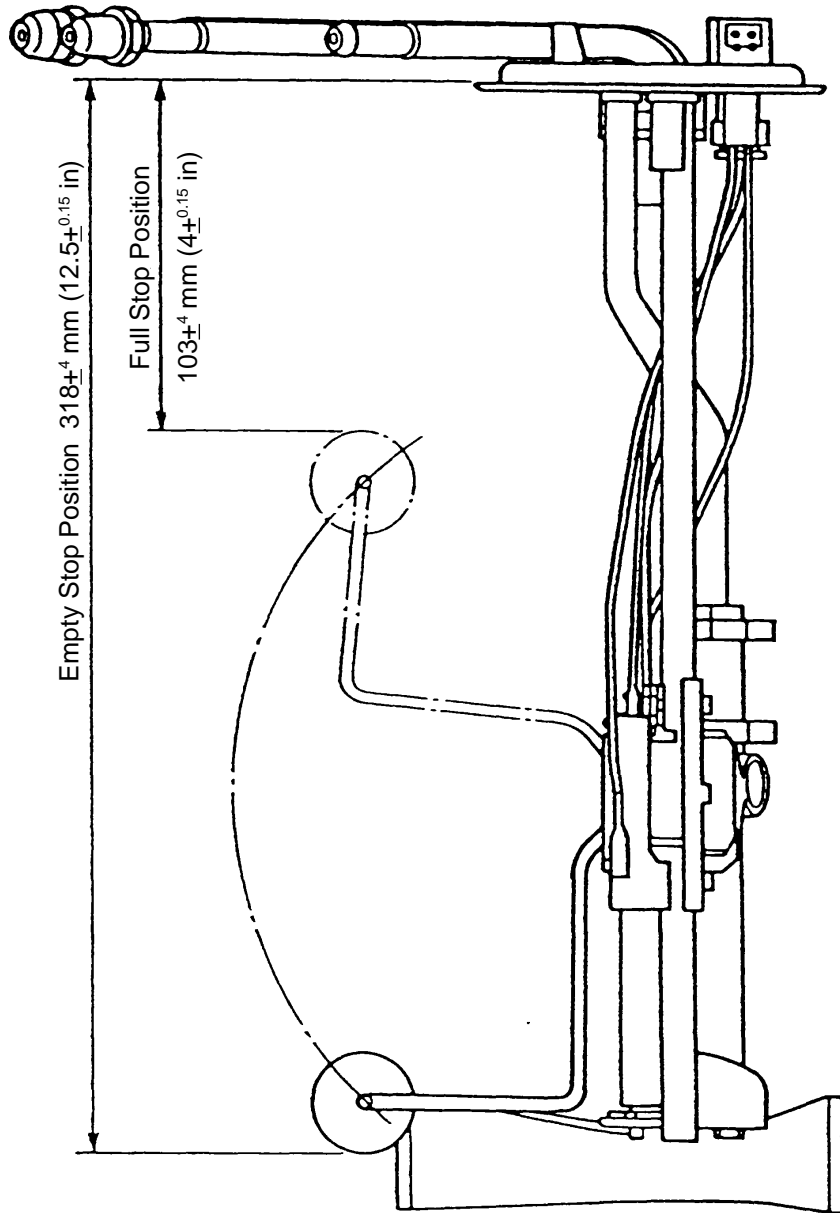


TURN & HAZARD LIGHTS CIRCUIT DIAGRAM









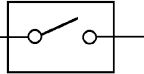

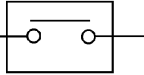
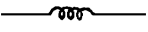
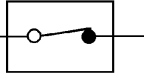
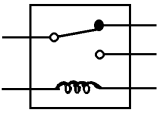

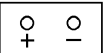
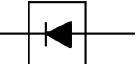


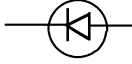

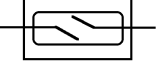

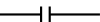
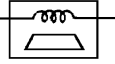

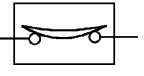

FUEL TANK SENDING UNIT RESISTANCE

Float Position	Standard Resistance (Ω)
Empty stop	110
Full stop	3



**NPR/NPR HD/NQR
W3500/W4500/W5500
Diesel Electrical**

NPR/NPR HD/NQR/W3500/W4500/W5500 Diesel Electrical

Symbol	Meaning	Symbol	Meaning
	Fuse		Bulb
	Fusible link		Double filament bulb
	Fusible link wire		Motor
	Switch		Variable resistor rheostat
	Switch		Coil (Inductor), solenoid magnetic valve
	Switch (Normal close type)		Relay
	Contact wiring		
	Battery		
	Diode		Connector
	Electronic parts		Light emitting diode
	Resistor		Reed switch
	Speaker		Condenser
	Buzzer		Horn
	Circuit breaker		Vacuum switching valve

ABBREVIATIONS

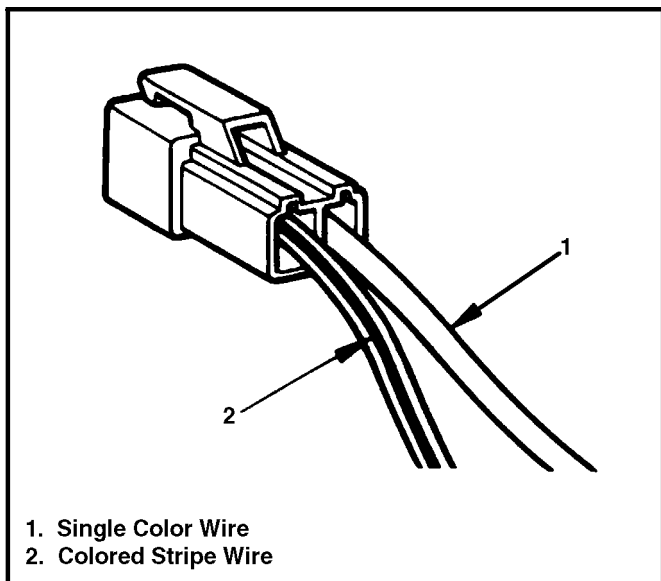
Abbreviation	Meaning of Abbreviation	Abbreviation	Meaning of Abbreviation
A	Ampere (S)	IG	Ignition
ABS	Anti-lock brake system	kW	kilowatt
ASM	Assembly	LH	Left hand
AC	Alternating current	LWB	Long wheel base
A/C	Air Conditioner	M/T	Manual transmission
ACC	Accessories	OD	Over drive
A/T	Automatic transmission	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 wheel base
EFE	Early fuel evaporation	TCM	Transmission control module
4A/T	4-speed automatic transmission	3A/T	3-speed automatic transmission
4X4	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

COLOR CODE FOR WIRING

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
 Red (Stripe color)
 Green (Base color)
 Wire size (0.5 mm²)

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

Figure 18. Wire Color

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,	Other Circuits
R	Lighting Circuit	LG, GR,	
G	Signal Circuits	P, LB, V	

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, shown below, are specified by AWG (American Wire Gauge) (Nominal size means approximate cross sectional area) (figure 24).

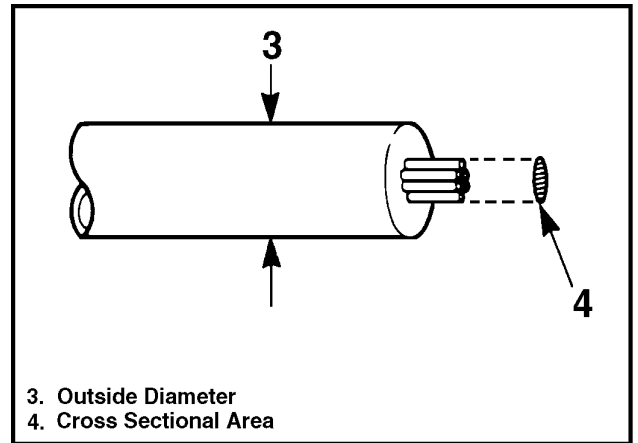
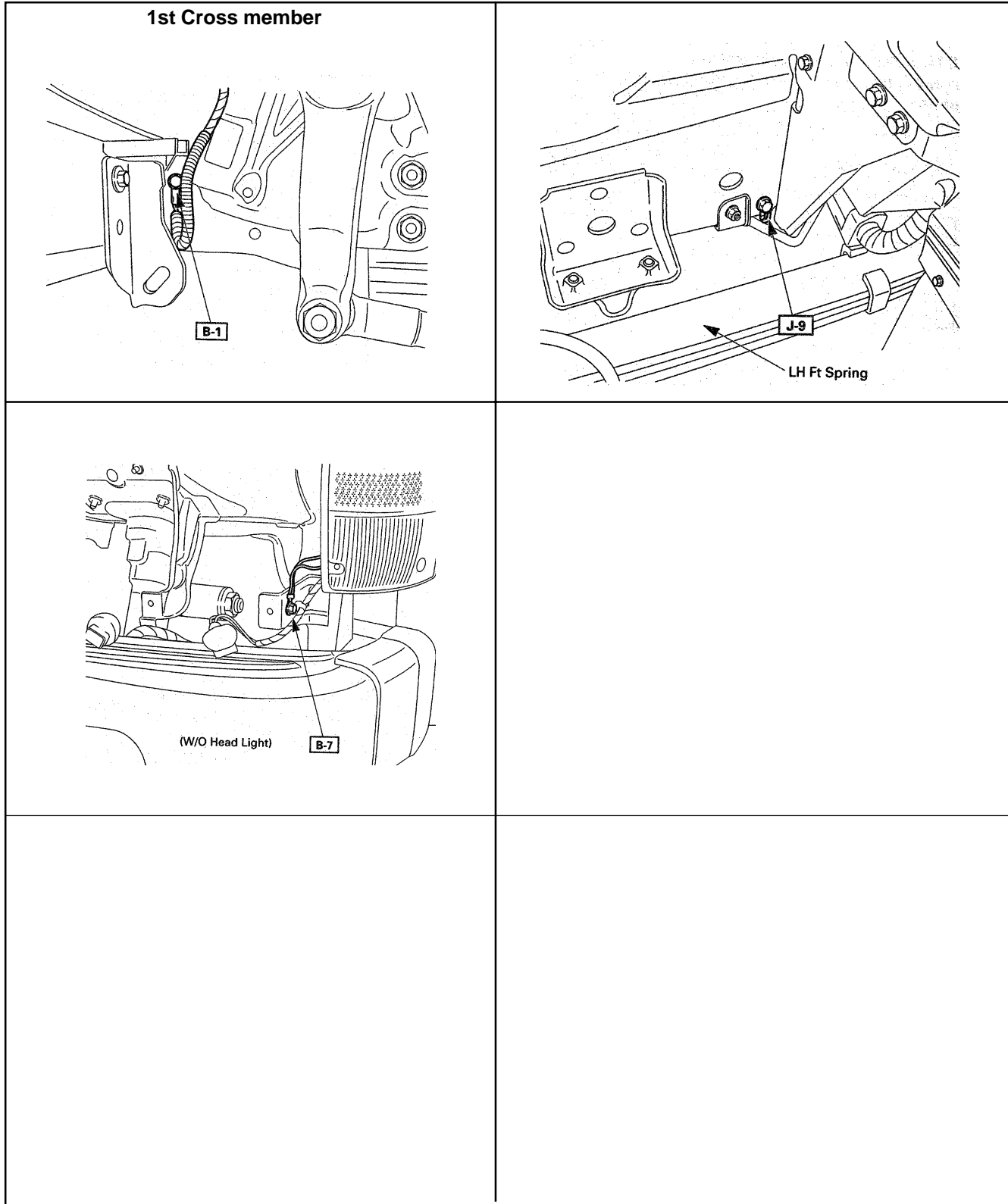


Figure 24. Wire Size

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
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8	7.952	5.5	67	8
15	13.36	7.0	75	6
20	20.61	8.2	97	4

GROUNDING POINT LOCATION



NPR/NPR HD/NQR/W3500/W4500/W5500 Diesel Electrical

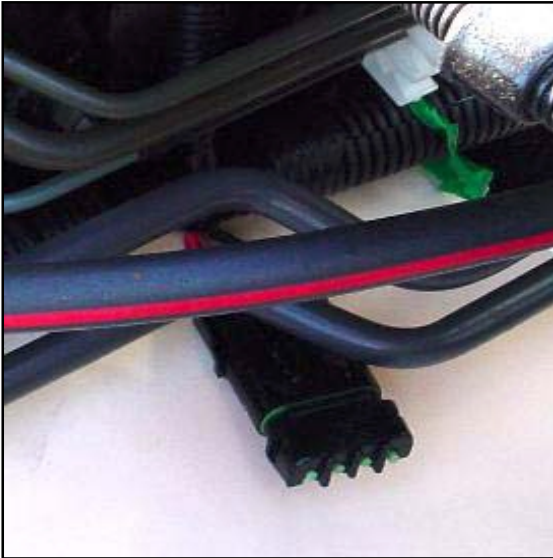
REFERENCE TABLE OF GROUNDING POINT

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, ECM, D.R.L unit, Dome light, Meter, Brake fluid level switch, Tail relay, TCM, Cornering light, Cornering light relay, Wiper motor, Washer motor intermittent relay, Heater & A/C relay, Radio & clock, Cigar lighter, Fan switch, Blower resistor, A/C Switch, Blower motor, Electronic thermostat, Accel switch, Cab interior switch, Flasher unit, Clearance light, ID light, illumination control, Kick down switch, Electronic vacuum pump, Power source relay
J-9	Frame front harness	Frame-LH (CTR)	Fuel tank unit, Starter relay, Neutral switch, Pressure switch, Exhaust brake control relay, Exhaust brake magnetic valve, Accel switch, Clutch switch, Engine stop motor, Inhibitor switch, Engine warming cut relay, ID relay, Condenser fan relay, Condenser fan, License plate light, Taillight, Rear turn signal light, Stoplight, Backup light, Air magnetic valve, VSV 2 EXH (FULL), VSV F1CD Engine warming up switch

NPR NQR BODY ROOM LIGHT, ID & MARKER LAMP AND BACK UP LAMP CONNECTOR LOCATION

**NPR/NQR
BODY CONNECTORS LH FRAME**

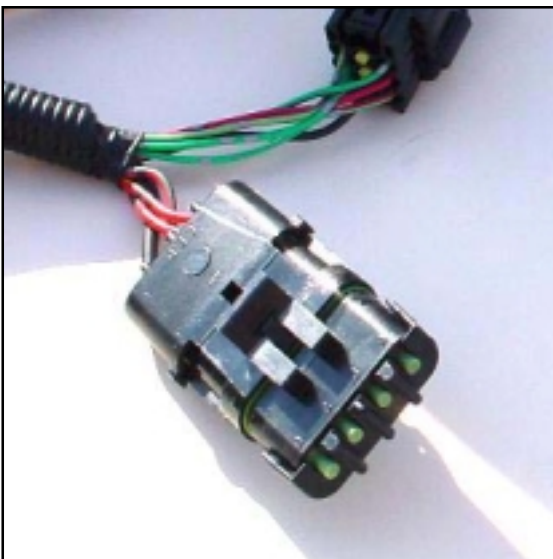


- ◆ PACKARD BODY PLUG
- ◆ 4PIN WEATHER SEAL CONNECTOR WITH MATING PLUG
- ◆ LOCATION:
INSIDE LEFT HAND FRAME RAIL 28 TO 31 INCHES BOC
- ◆ CIRCUITS :

Rear Dome	=	A
Hot Wire	=	B
Marker Lamp	=	C
Ground	=	D



**NPR/NQR
BODY CONNECTORS EOF**

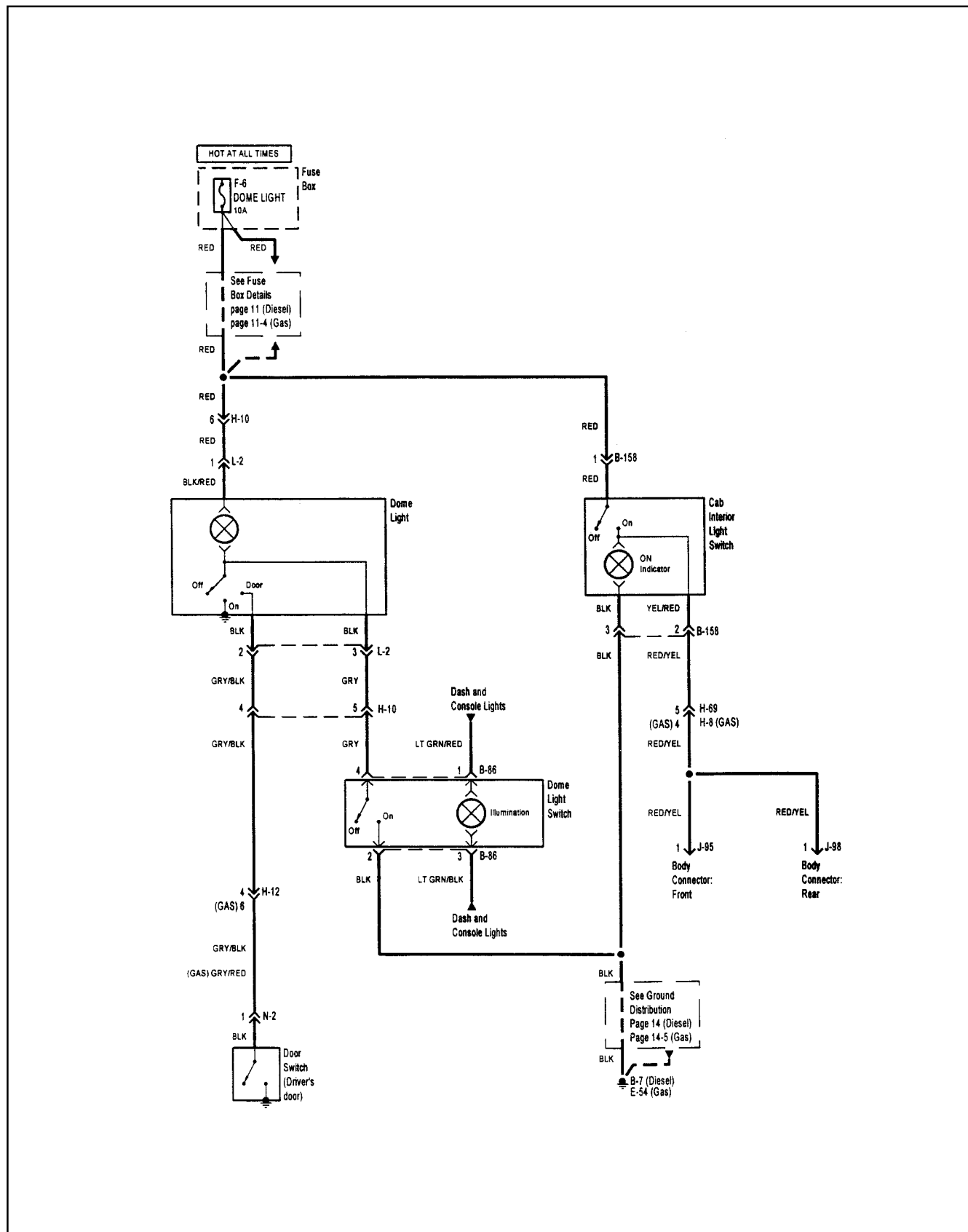


- ◆ PACKARD BODY PLUG
- ◆ 4PIN WEATHER SEAL CONNECTOR WITH MATING PLUG
- ◆ LOCATION:
CENTER OF CROSSMEMBER
- ◆ CIRCUITS :

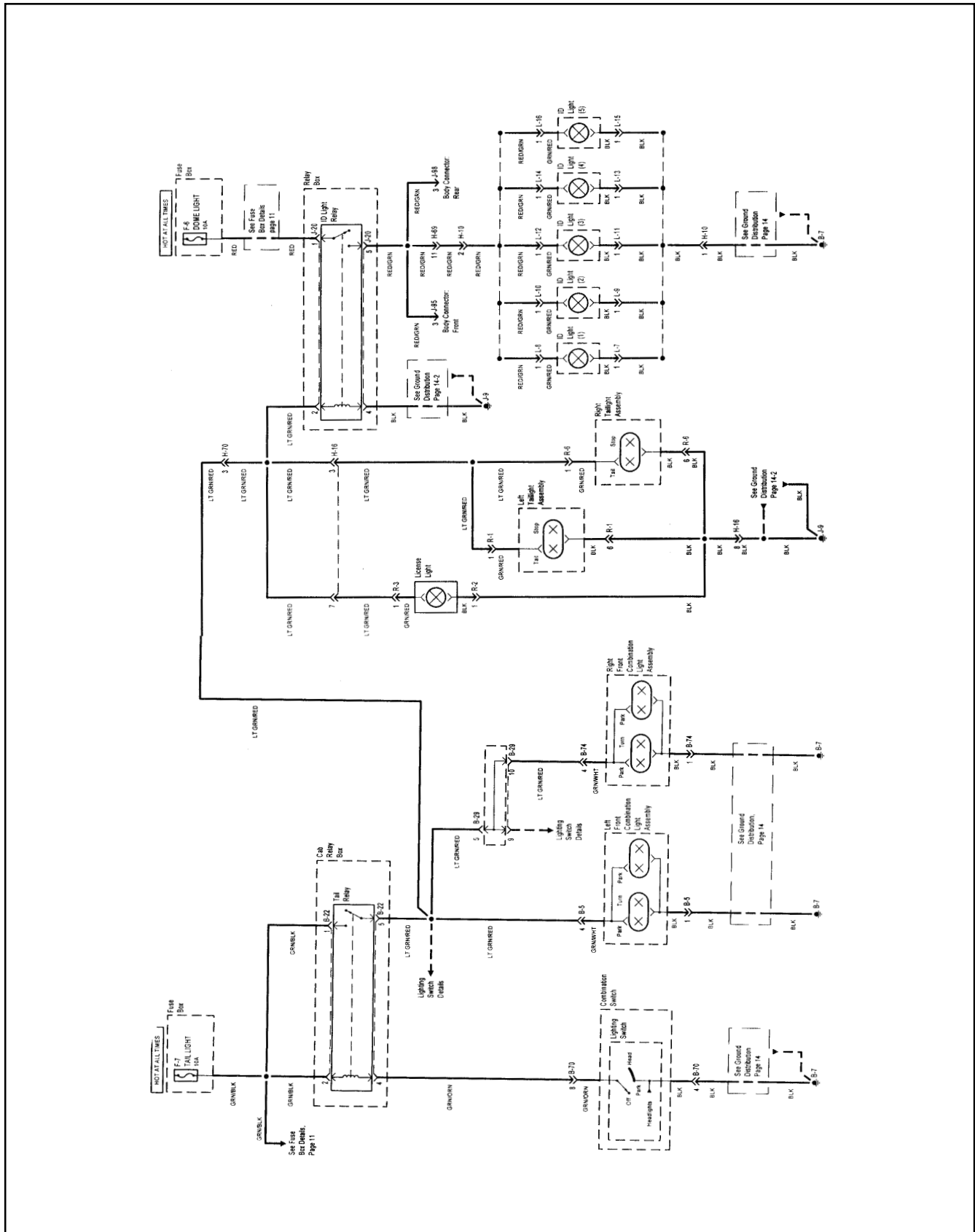
Rear Dome	=	A
Hot Wire	=	B
Marker Lamp	=	C
Ground	=	D



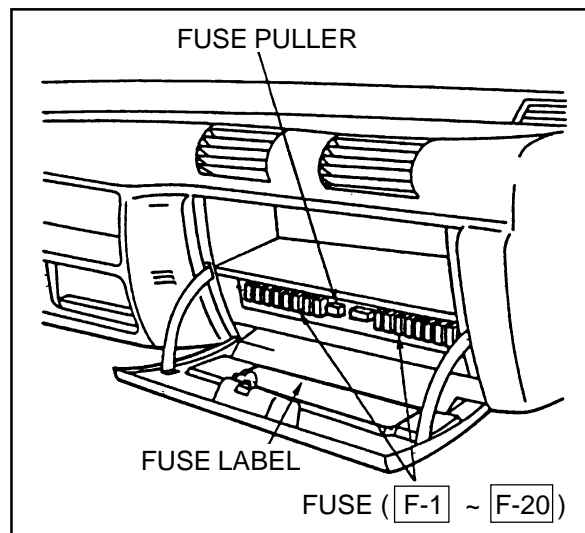
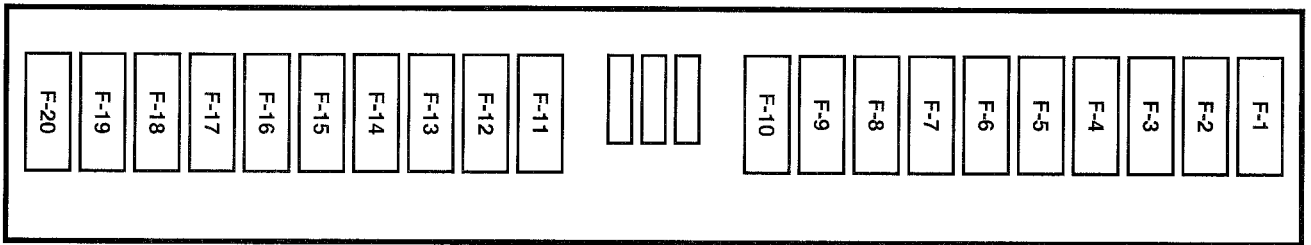
DOME & INTERIOR LIGHTS CIRCUIT DIAGRAM



PARK, TAIL, LICENSE & I.D. LIGHTS CIRCUIT DIAGRAM



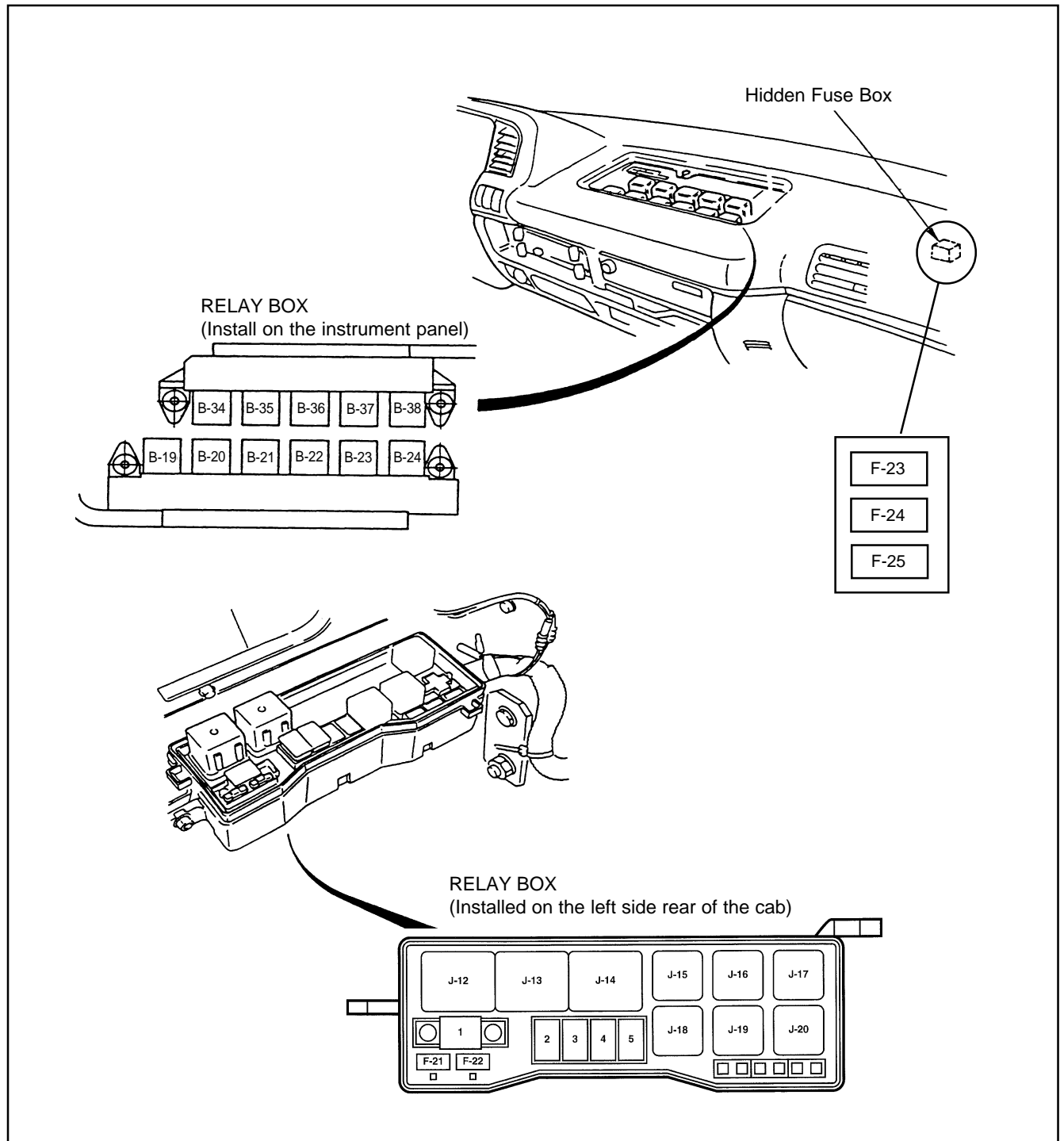
FUSE LOCATION



FUSE BOX

Fuse Number	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)
	VCM (IGN) (Gas)		Engine Controls (Gas)
F-4	D.R.L. (Diesel)	10A	Headlights (Diesel)
	ENGINE (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, Sound System (Gas), Speedometer (Gas)
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 S/LIGHT	10A	Turn Lights
F-14	ECU (IGN) (Diesel)	10A	Engine Controls
	VCM (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)	10A	Engine Controls, Gauges (Gas)
F-18	HAZARD, HORN	20A	Engine Controls, Gauges, Horn, Hazard Lights
F-19	ABS (BAT)	25A	ABS
F-20	STARTER	10A	Starting System

RELAY LOCATION



CAB RELAY

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

Relay Number	Relay
B-19	Charge relay
B-20	Headlight
B-21	Heater & A/C
B-22	Tail
B-23	Buzzer control
B-24	Horn

Relay Number	Relay
B-34	Power source
B-35	Cornering
B-36	Exhaust brake cut (Diesel)
	Vacuum pump (Gas)
B-37	A/C thermo
B-38	Exhaust brake (Diesel)
	Ignition (Gas)

FUSE BOX

Fuse Number	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)

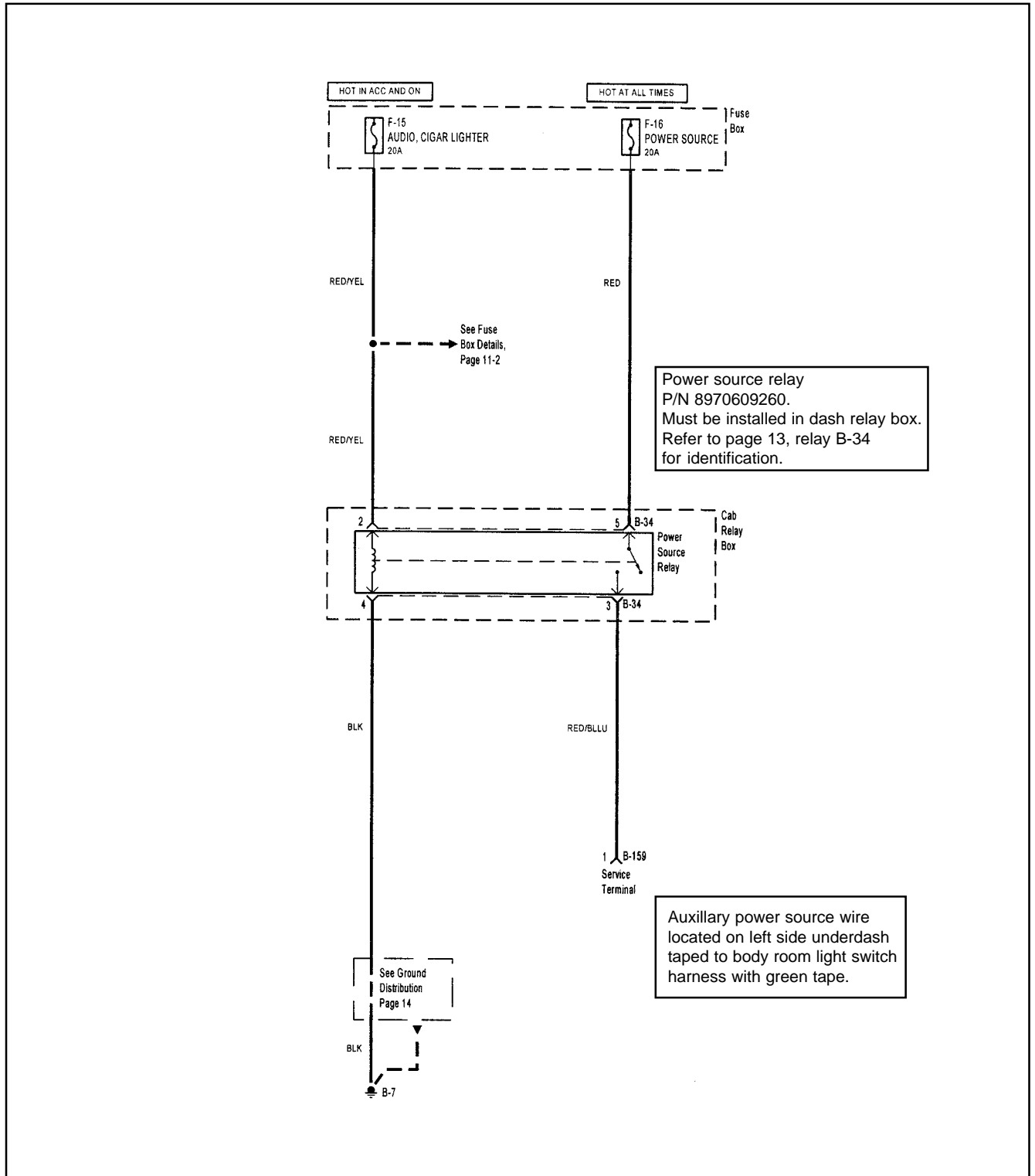
RELAY BOX OUTSIDE CAB

Fuse Number	Fuse Name	Amps	Circuit Protected
1	MAIN	80A	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	—	—	Not used
F-22	CONDENSER FAN (Diesel)	15A	Condenser fan

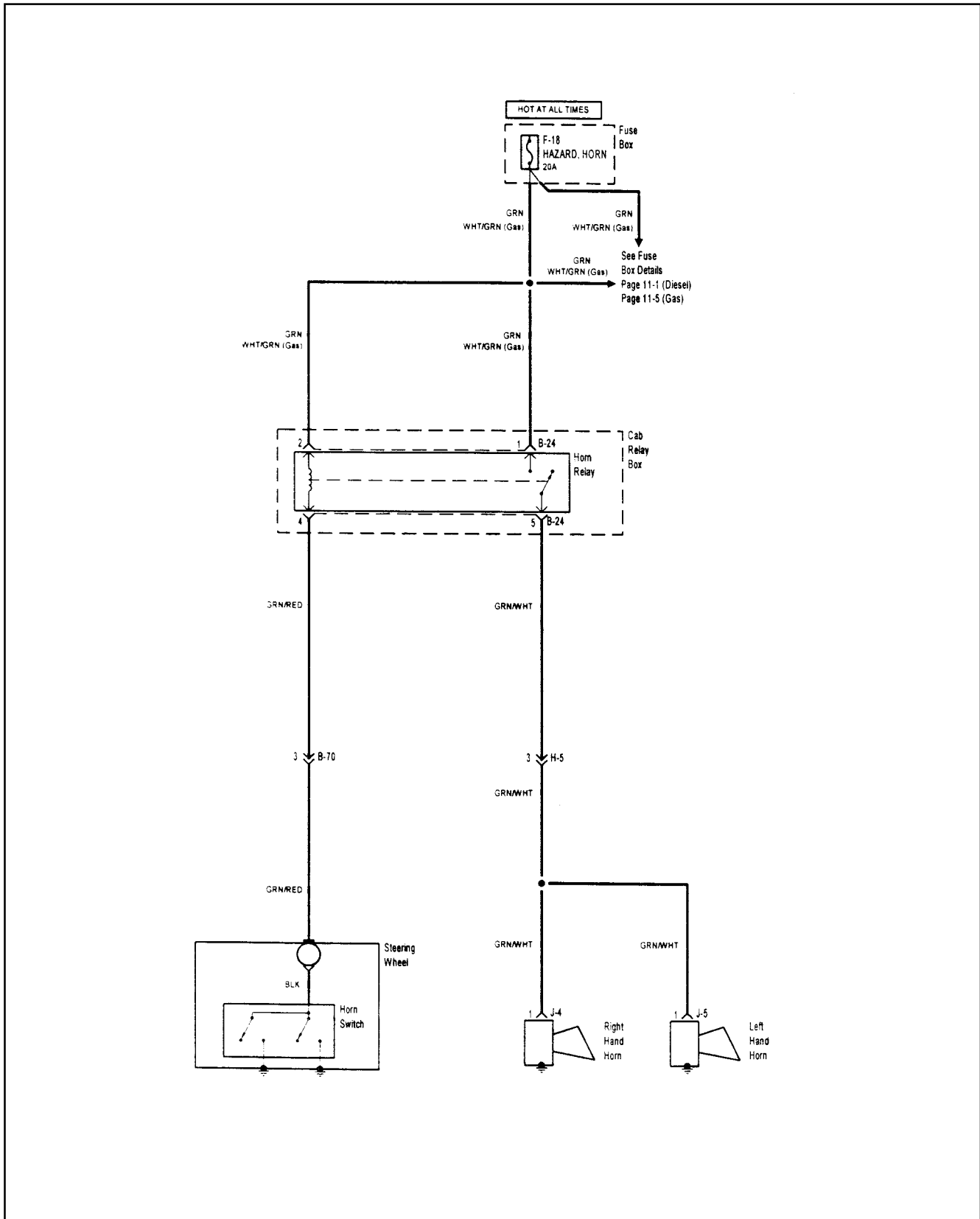
Relay Number	Relay
J-12	Starter
J-13	Glow-1 (Diesel)
J-14	C/Heater (Diesel M/T)
J-15	Warm cut 1 (Diesel)
	A/C enable (Gas)

Relay Number	Relay
J-16	Fuel pump (Gas)
J-17	Condenser (Diesel)
J-18	Exhaust brake control (Diesel)
J-19	Engine warm cut 2 (Diesel A/T)
J-20	I.D. light relay

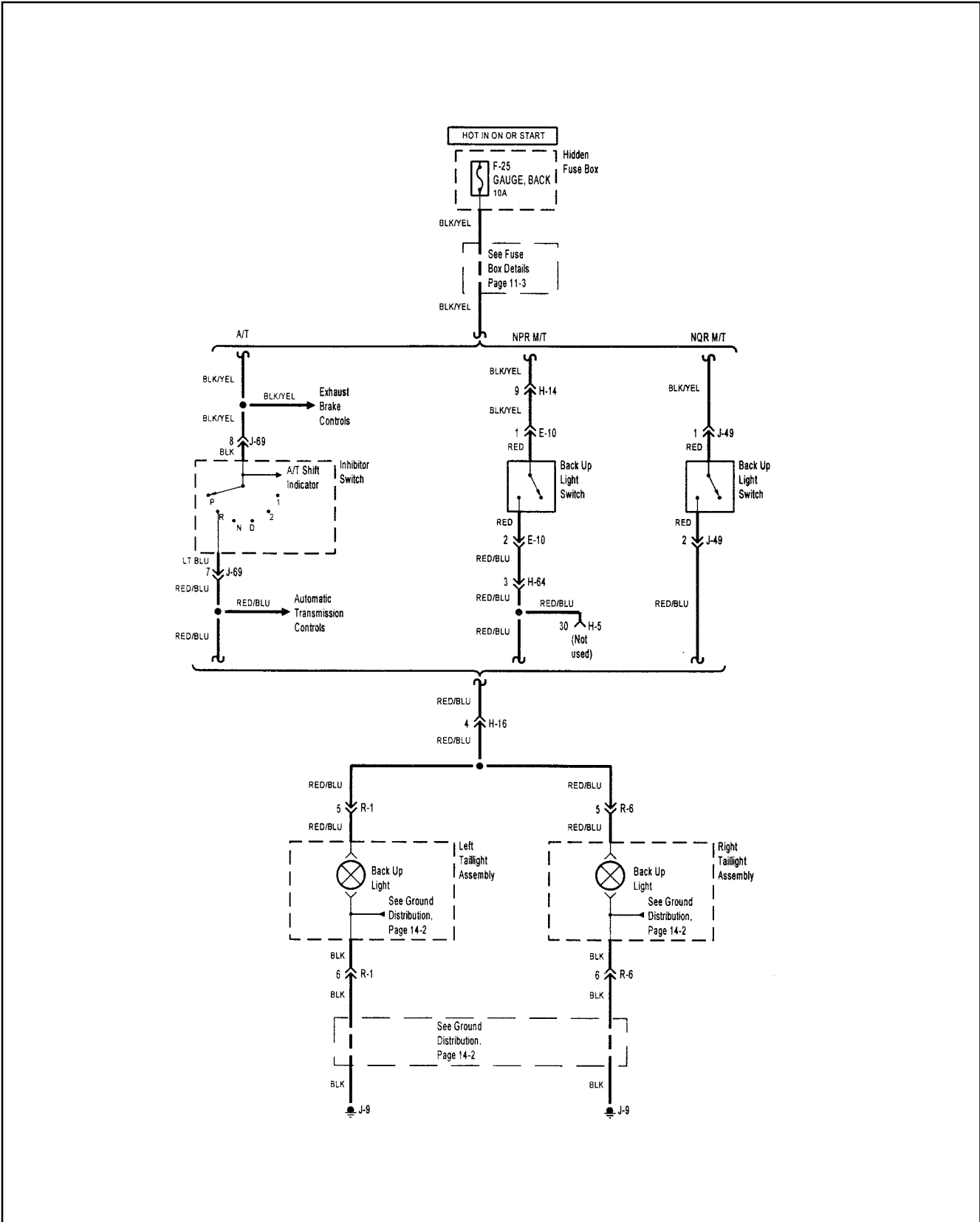
AUXILIARY POWER SOURCE CIRCUIT DIAGRAM



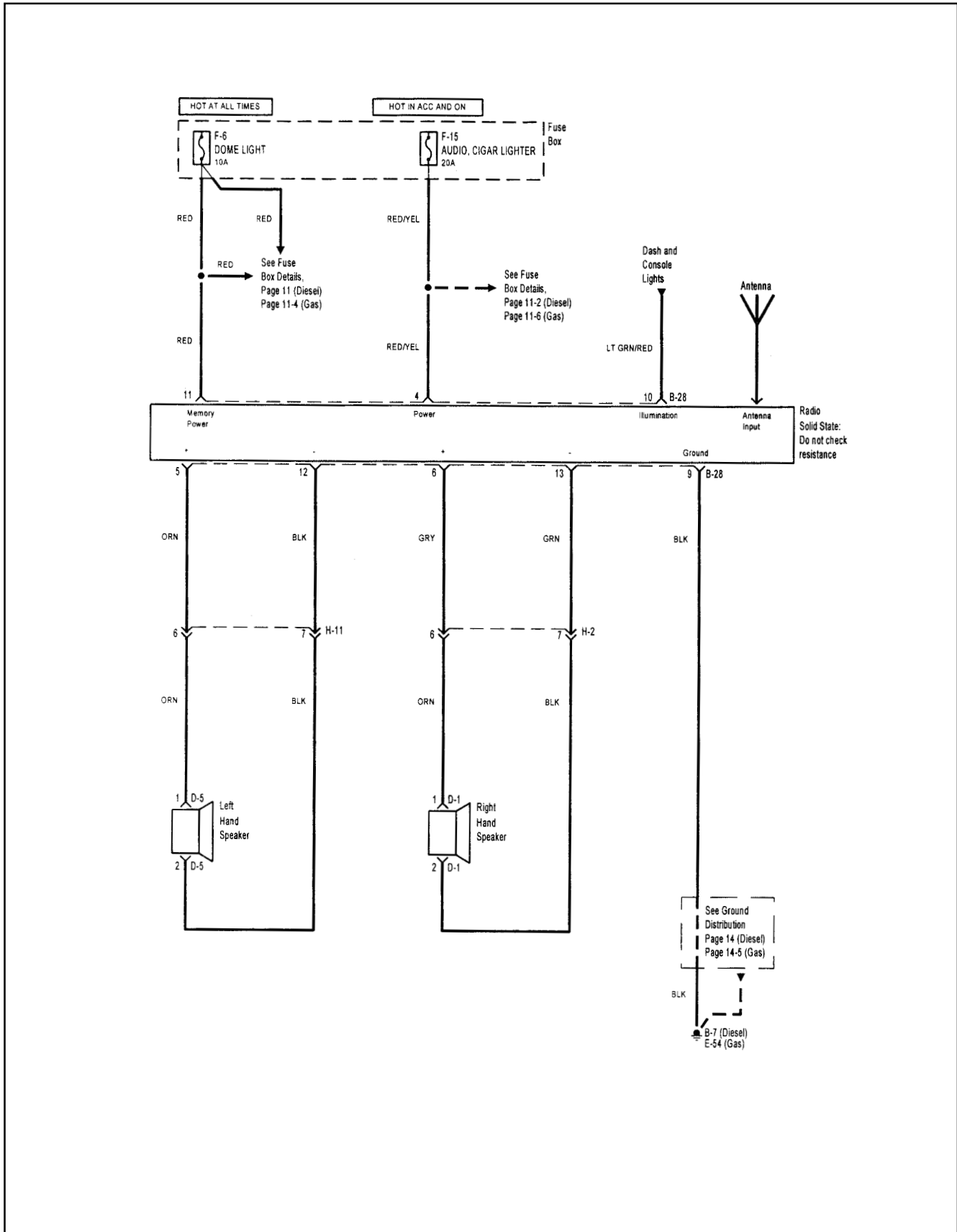
HORNS CIRCUIT DIAGRAM



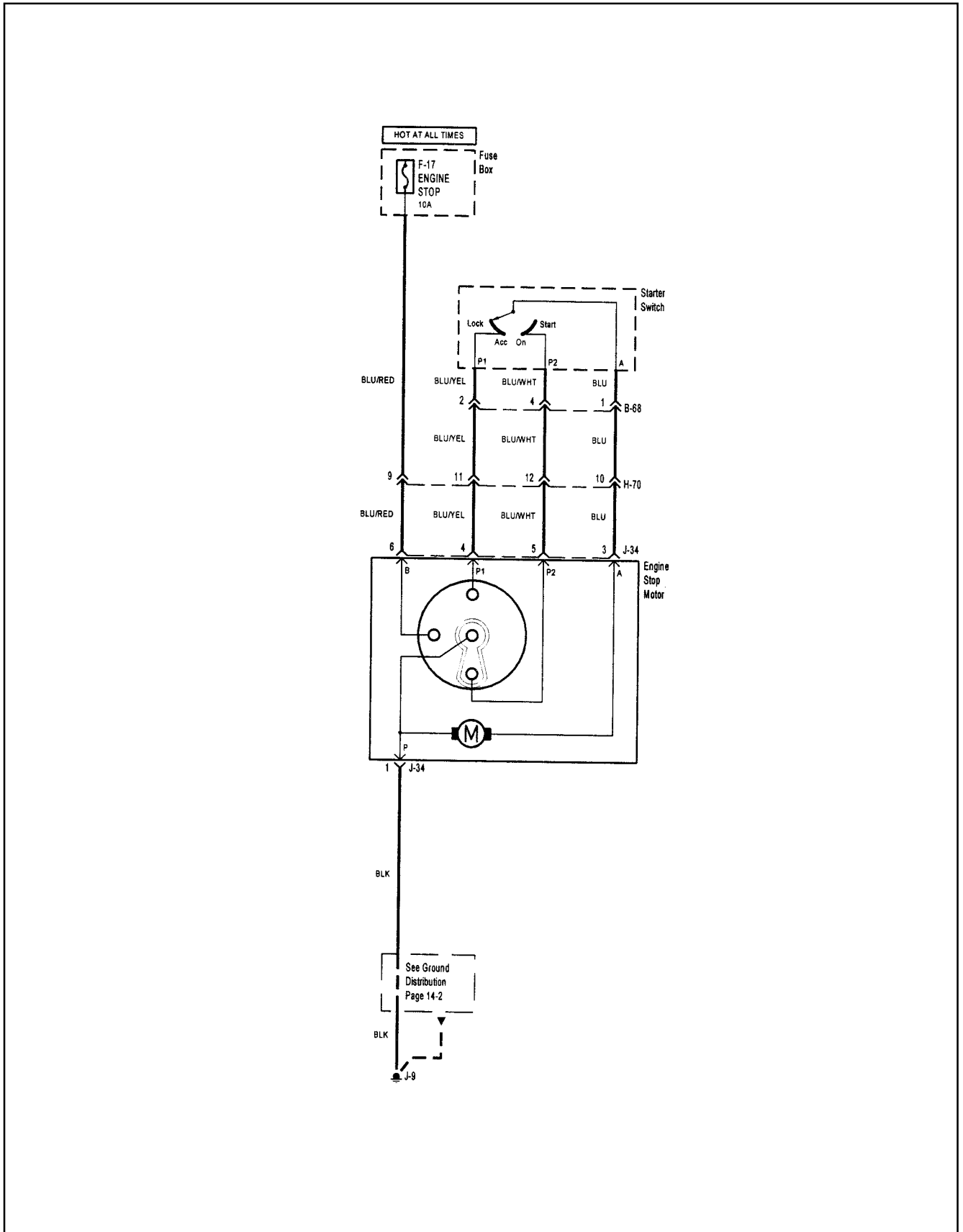
BACK UP LIGHTS CIRCUIT DIAGRAM



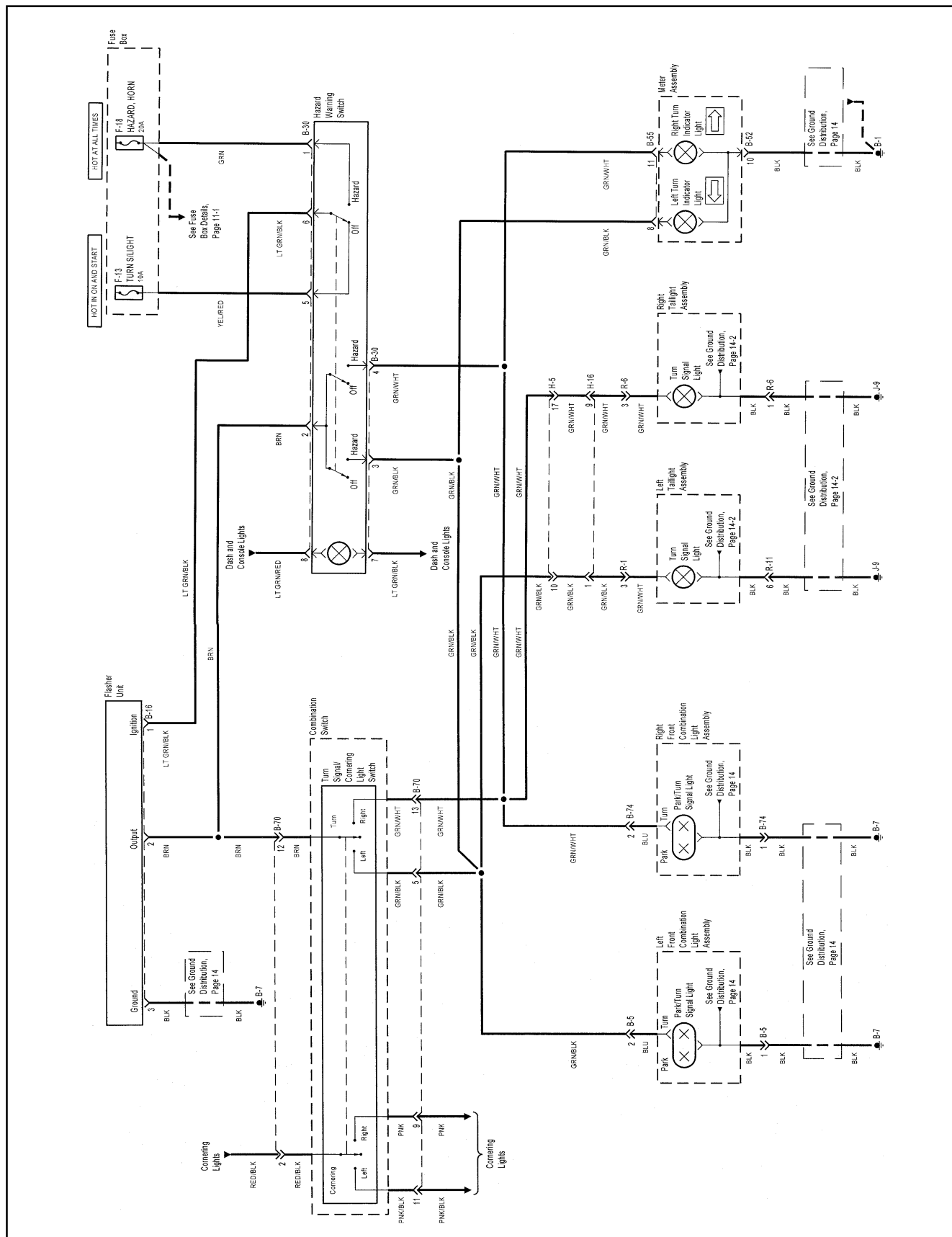
SOUND SYSTEM CIRCUIT DIAGRAM



ENGINE STOP MOTORS CIRCUIT DIAGRAM

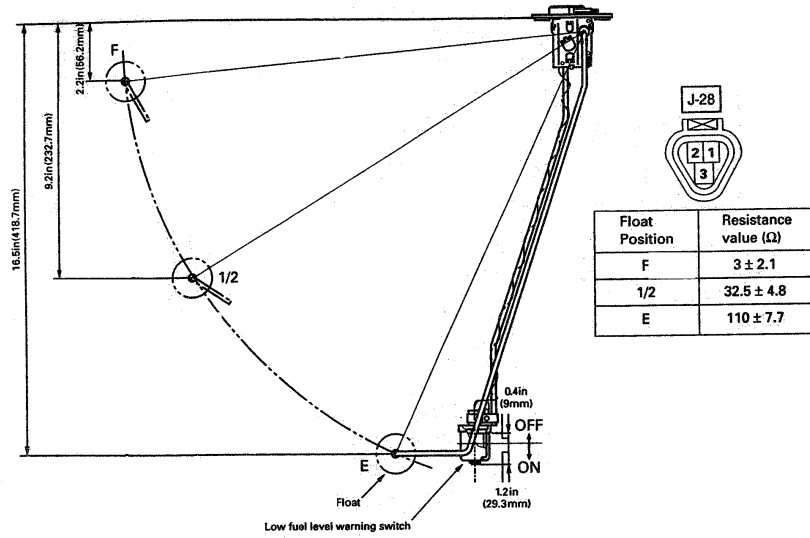


TURN AND HAZARD LIGHTS CIRCUIT DIAGRAM

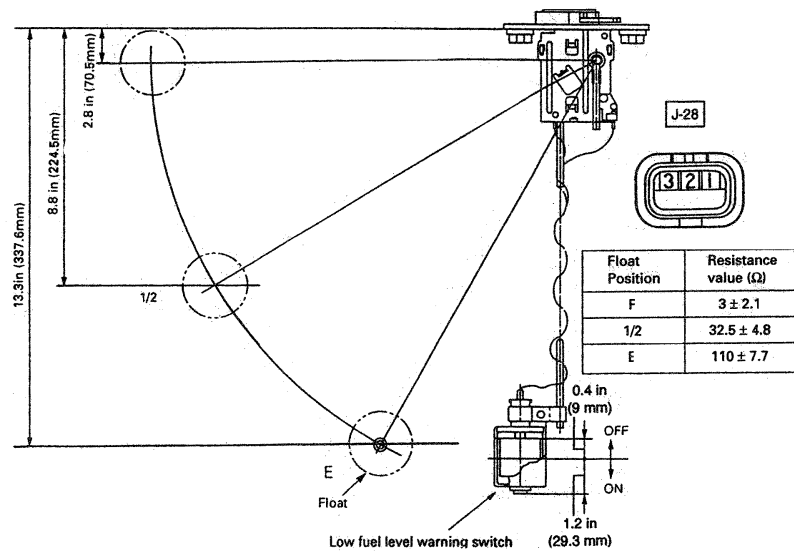


FUEL TANK SENDING UNIT RESISTANCE

IN FRAME TANK

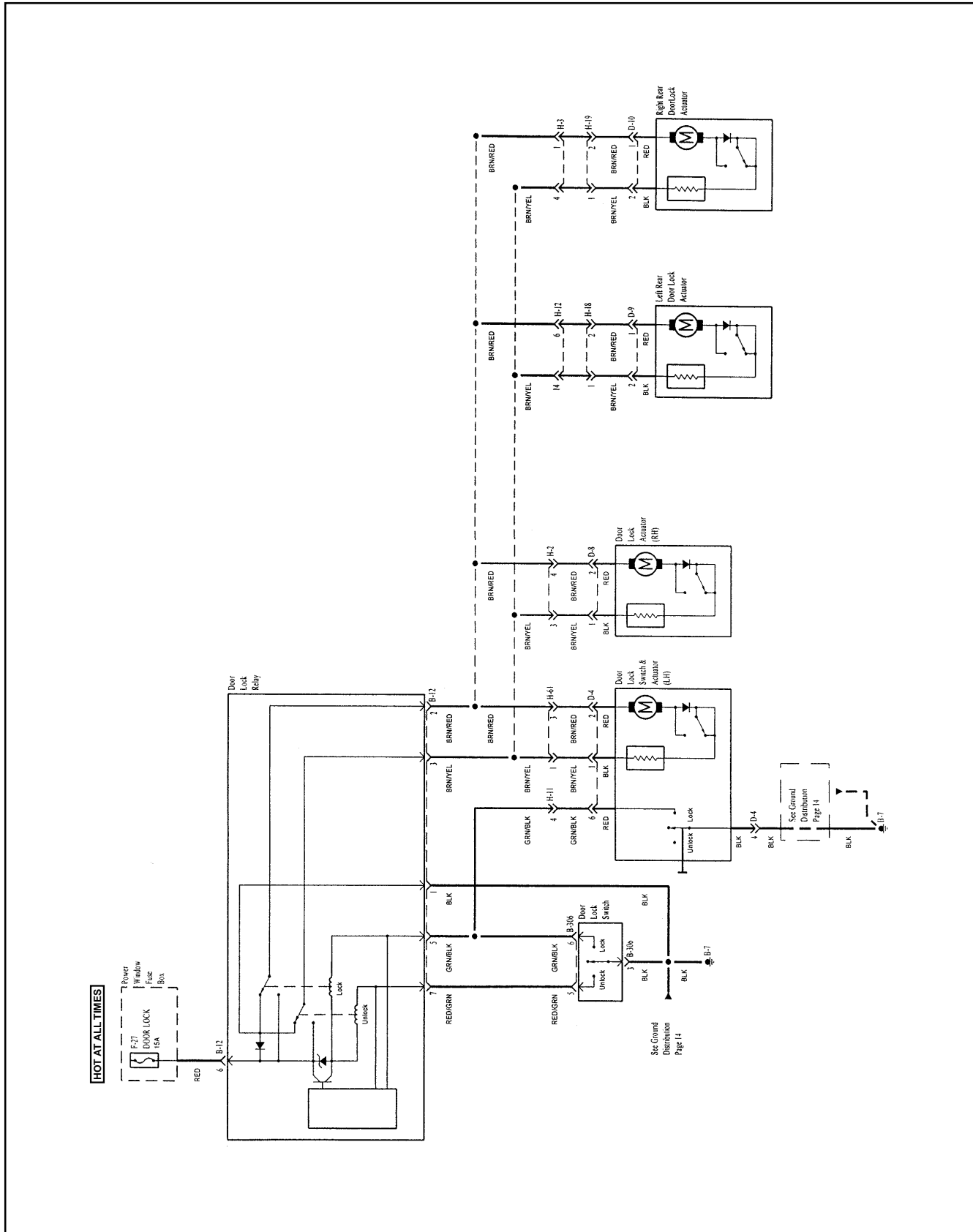


SIDE MOUNTED TANK

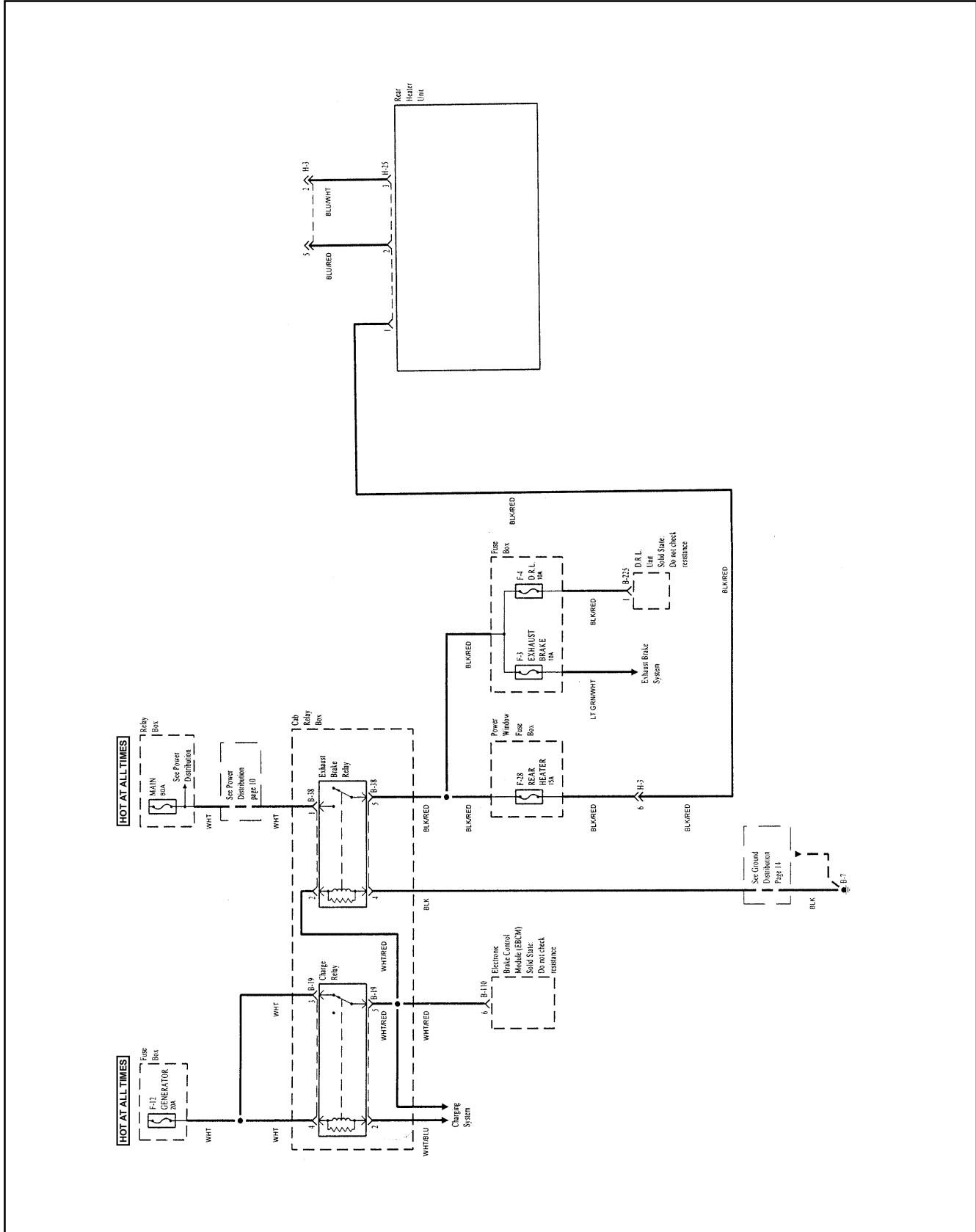


NPR HD/NQR/W4500 Crew Cab Electrical

POWER DOOR LOCKS



REAR HEATER



**NOTE:
FOR FURTHER ELECTRICAL WIRING INFORMATION PLEASE REFER TO
THE NPR/NQR DIESEL ELECTRICAL SECTION.**

FRR, FSR, FTR & FVR ELECTRICAL

NOTE: FSR, FTR, and FVR 2002 Model

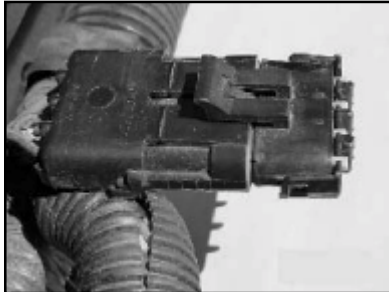
FRR SERIES TAIL LIGHT CONNECTORS



FRR BODY CONNECTOR LOCATION

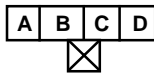
FRR

BODY CONNECTORS LH FRAME



- PACKARD BODY PLUG
- 4PIN WEATHER SEAL CONNECTOR WITH MATING PLUG
- LOCATION: INSIDE LEFT HAND FRAME RAIL 26 TO 28 INCHES BOC
- CIRCUITS

A	REAR DOME	BLUE
B	-	-
C	MARKER LAMP	BROWN
D	GROUND	BLACK/BLUE



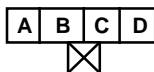
FRR

BODY CONNECTORS LH FRAME



- PACKARD BODY PLUG
- 4PIN WEATHER SEAL CONNECTOR WITH MATING PLUG
- LOCATION: LH SIDE, END OF FRAME
- CIRCUITS

A	REAR DOME	BLUE
B	-	-
C	MARKER LAMP	BROWN
D	GROUND	BLACK/BLUE



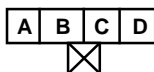
FRR

BACK-UP ALARM WIRING

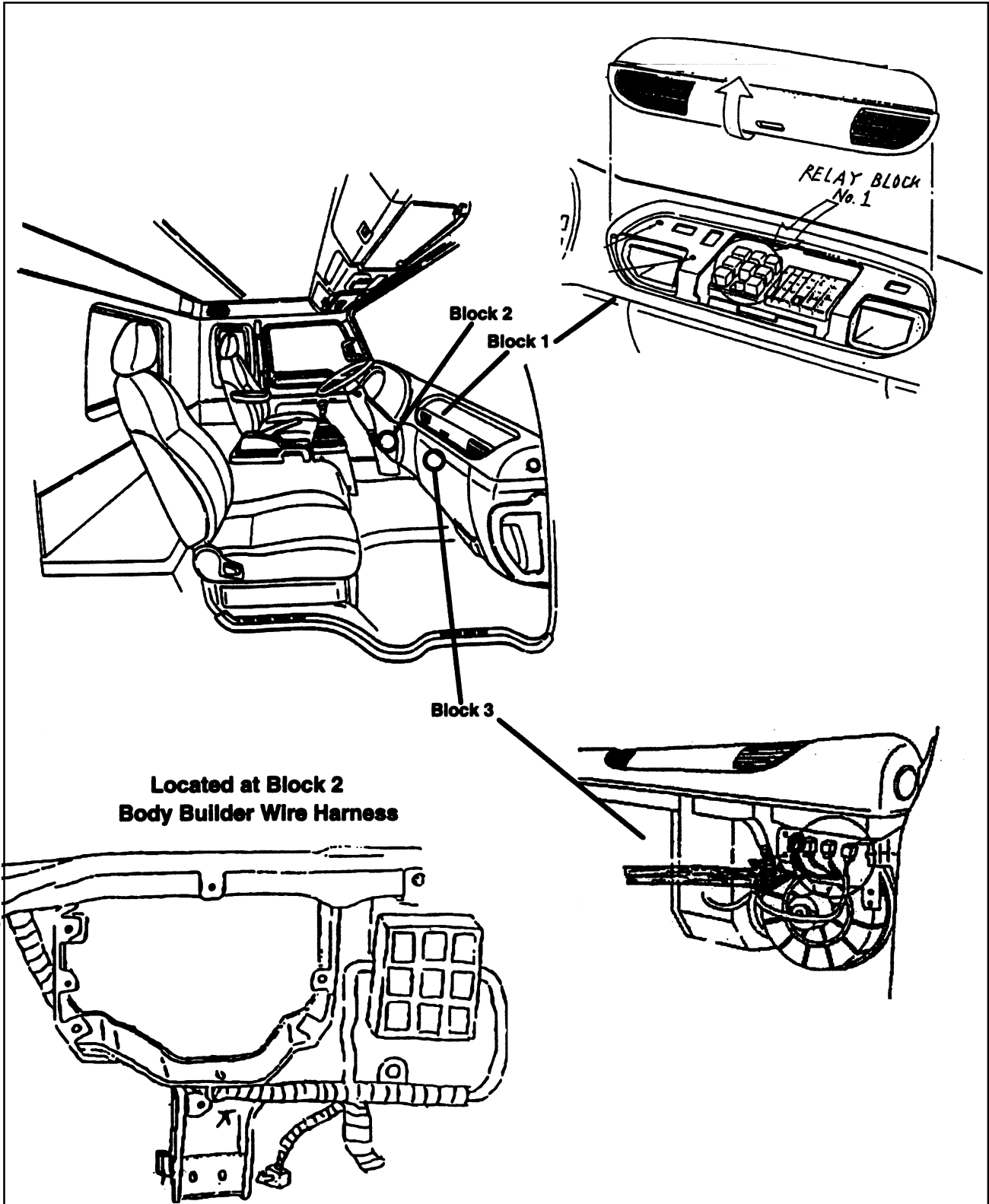


- BULLET TYPE BODY PLUG
- LOCATION: RH SIDE, END OF FRAME
- CIRCUITS

A	REAR DOME	BLUE
B	-	-
C	MARKER LAMP	BROWN
D	GROUND	BLACK/BLUE



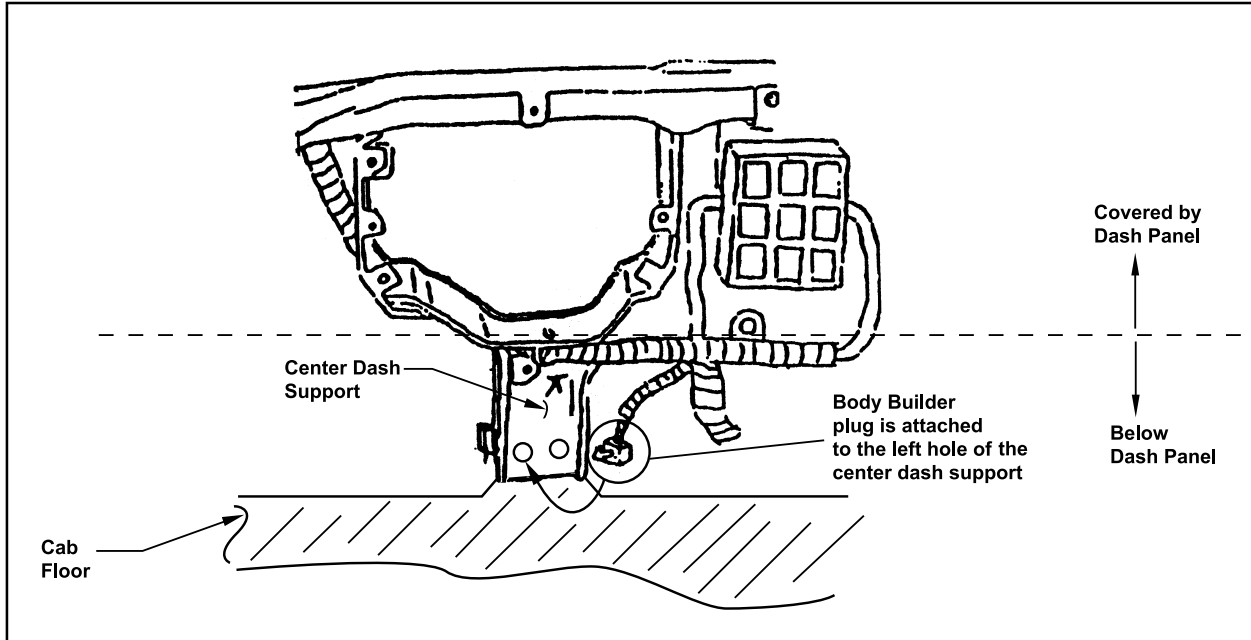
FSR FTR FVR-SERIES RELAY LOCATION



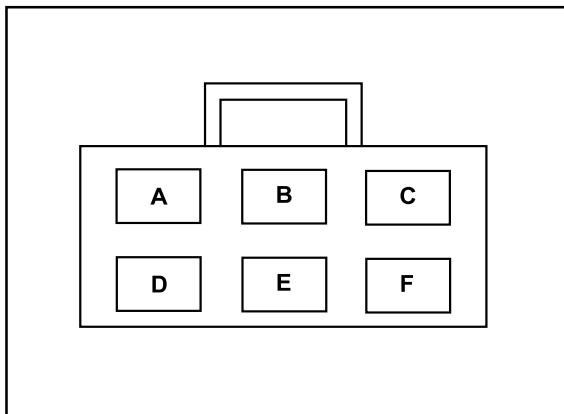
FSR, FTR & FVR Body Builders Connector Cab interior location view & exterior location view



**FSR, FTR and FVR Series
BODY BUILDER CONNECTOR CAB
INTERIOR LOCATION VIEW**



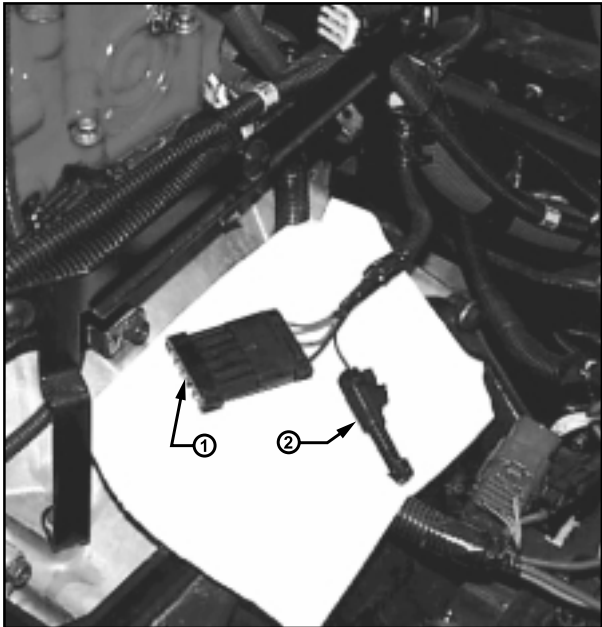
**INTERIOR UP-FITTER
CONNECTOR**



Mating Male Connector Pin
P/N 894452-5650

Connector Part Information		• 6 Way • Female	
PIN	Wire Color	Circuit No.	Function
A	Brown	317	Exterior Lamps
B	Orange	640	Fuse Output-Battery
C	Green	322	Upfitter Connector (Exterior) Pin-C
D	Yellow	318	Fuse Output-Ignition
E	Pink	320	Auxillary Connector (Relay Center 2)
F	Blue	323	Upfitter Connector (Exterior) Pin-E

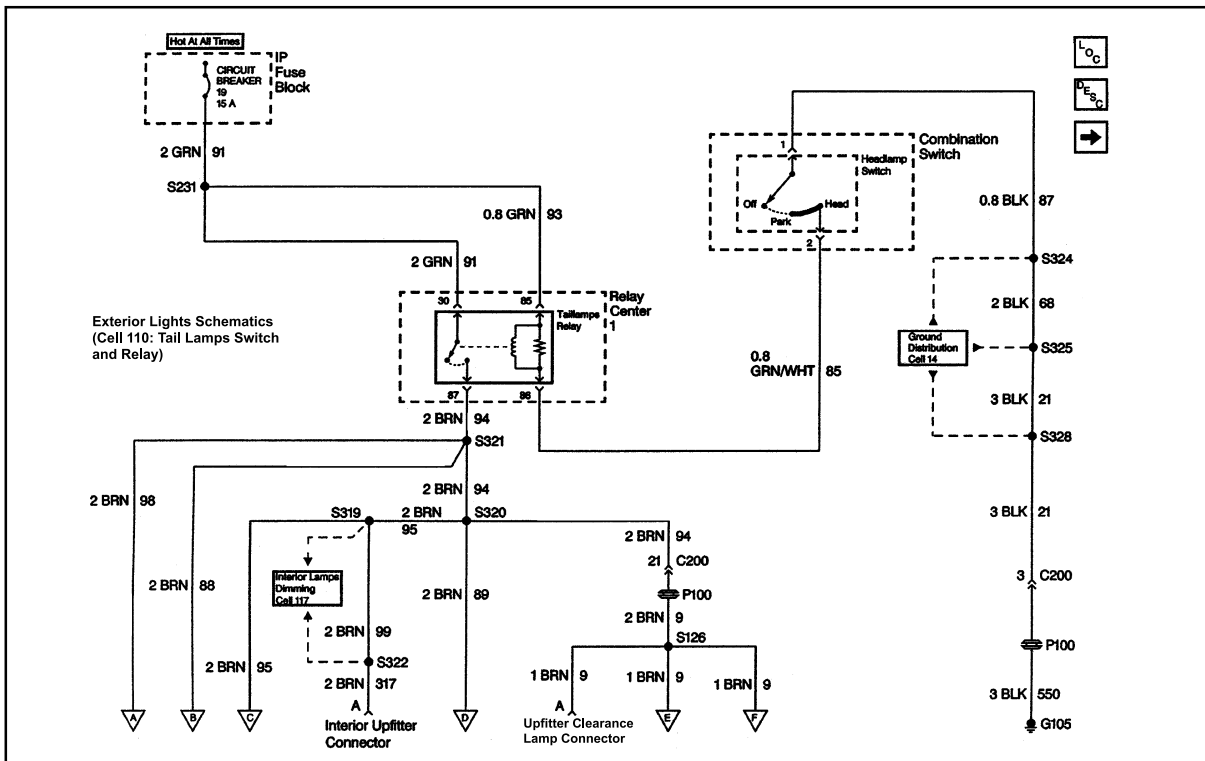
FSR FTR FVR Series



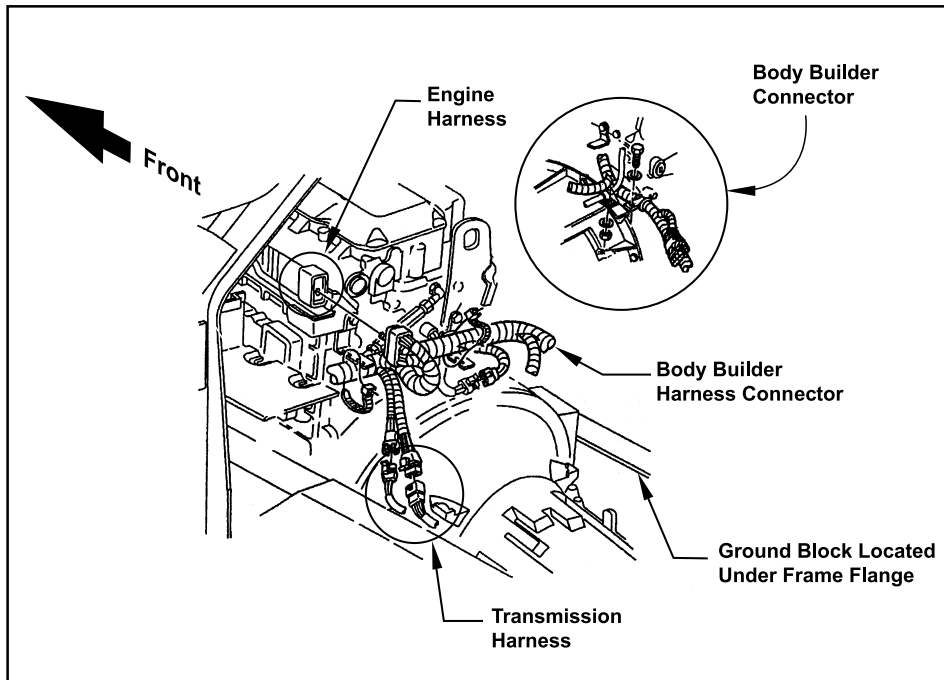
Exterior Connector Location

1. Body Builder Connector
2. Body Clearance Light Connector Exterior

Wiring Diagram for exterior connector for clearance lights (connector #2)

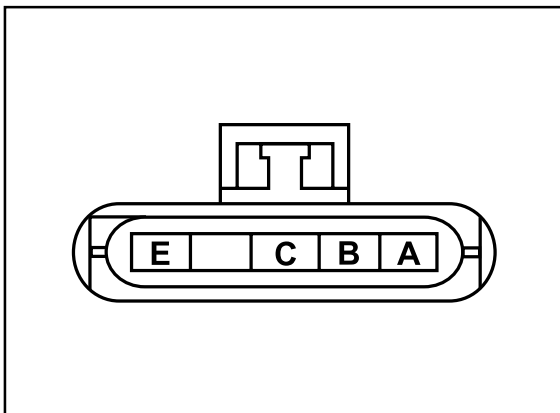


FSR FTR FVR Series



F-Series Body Builder Connector Exterior Location View

Exterior Upfitter Connector



Mating female Connector Pin
P/N 12084872

Connector Part Information		<ul style="list-style-type: none"> • 12065862 • 4-way Metri-Pack 280 Sealed (BLK) 	
PIN	Wire Color	Circuit No.	Function
A	Orange	640	Fuse Output-Battery
B	Pink	339	Fuse Output-Ignition
C	Dark Green	909	Interior Upfitter Connector
D	--	--	Not Used Sealed
E	Dark Blue	910	Interior Upfitter Connector

Body-Chassis Electrical Connectors

The wiring harness were designed for reliability, durability and to simplify installation for body builders and customers. All wires, connectors and components are located for fast easy access. The electrical circuits that may be available for connecting to and their locations are as follows:

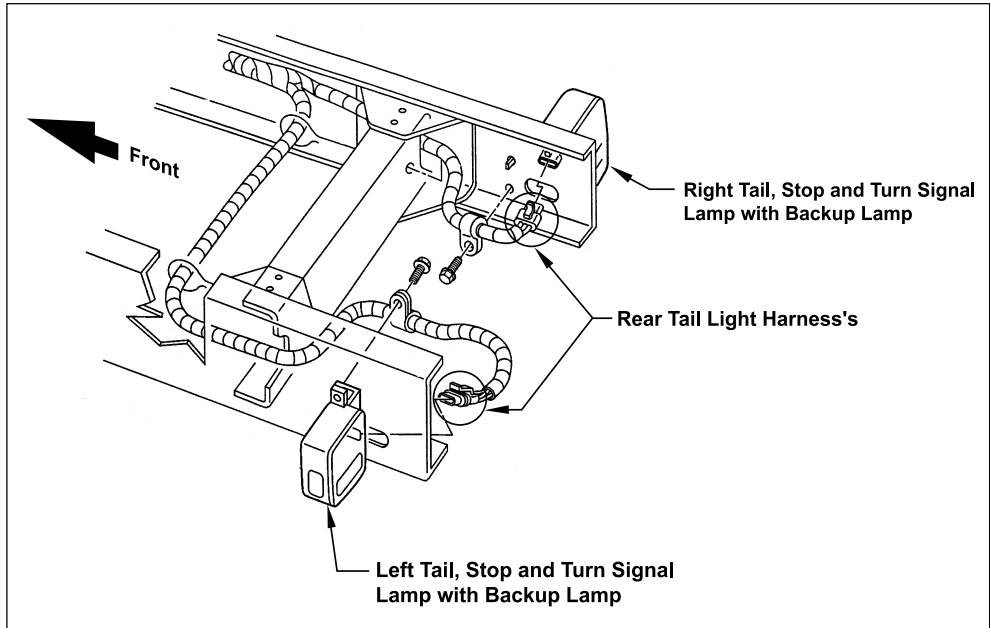
Circuit	Max. Load	Battery Fed	Ignition Switch	Headlamp Switch	Availability F-Series
Dedicated Body Builder Lead	15.0 Amps	x			2-Pickup Loactions, In Cab & Under Cab Behind Engine
Dedicated Body Builder Lead	15.0 Amps		x		
Auxiliary Power	7.0 Amps		x		All Vehicles
Auxiliary Marker Lamp	7.0 Amps			x	
Cigar Lt. & Aux. Pwr. Jacks	15.0 Amps	x			Vehicle w/o a Cigar lighter or Auxiliary Power Jacks
2-Speed Axle	20.0 Amps		x		Vehicle w/o 2-Speed Axle (single axle only)
Air Dryer/ Moisture Ejector	20.0 Amps		x		Vehicle w/o an Air Dryer/Moisture Ejector
Total	54.0 Amps				

In the above circuits, the auxiliary marker lamp circuits are available on all vehicles, the remainder are available depending on the option content of the vehicle. And in some cases, even when an air dryer/moisture ejector has not been installed, this circuit could have been used for factory installed special equipment options. Therefore, it is important to check the option content to each vehicle prior to making the body/equipment wiring harnesses.

FSR, FTR and FVR SERIES TAIL LIGHT CONNECTORS

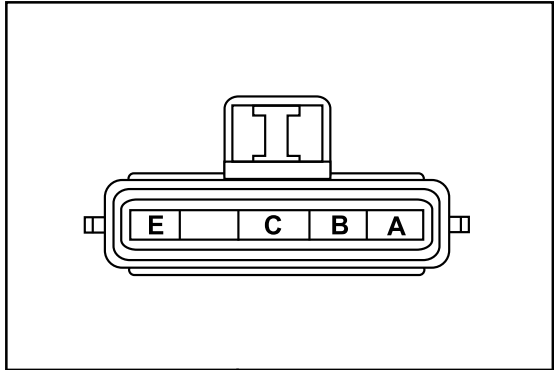


FSR FTR FVR Series Tail Light Connectors



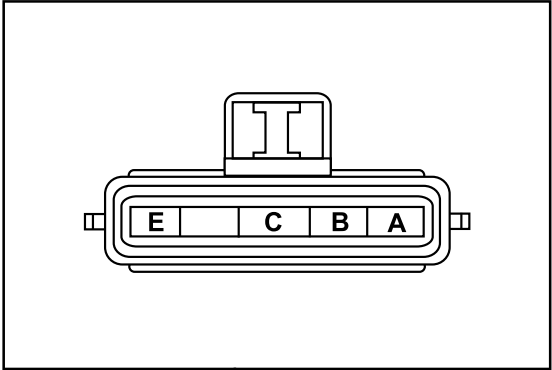
Rear Chassis Harness and Tail Lamps

Tail, Stop and Turn Signal Lamp Left



Connector Part Information		<ul style="list-style-type: none"> • 12065862 • ASM 4F M/P 280 (BLK) 	
PIN	Wire Color	Circuit No.	Function
A	LT Green	24	Back-up Lamp Feed
B	Brown	9	Park Lamp Feed
C	Yellow	19	Stop/Turn Lamp Feed Left Rear
D	--	--	Not Used Sealed
E	Black	150	Ground

Tail, Stop and Turn Signal Lamp Right



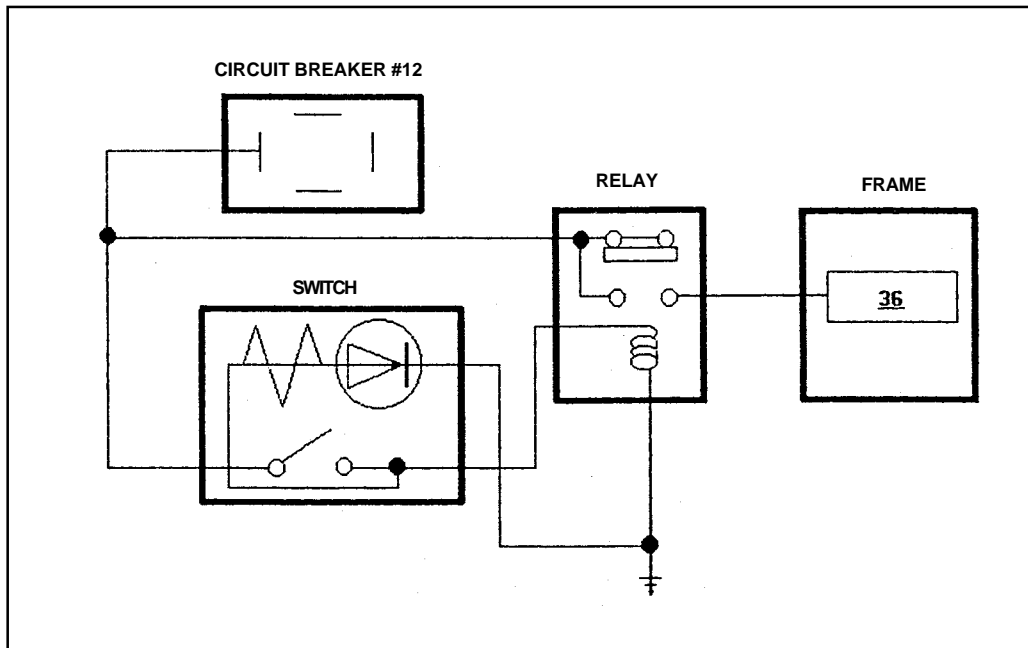
Connector Part Information		<ul style="list-style-type: none"> • 12065862 • ASM 4F M/P 280 (BLK) 	
PIN	Wire Color	Circuit No.	Function
A	LT Green	24	Back-up Lamp Feed
B	Brown	9	Park Lamp Feed
C	DK Green	18	Stop/Turn Lamp Feed Right Rear
D	--	--	Not Used Sealed
E	Black	150	Ground

FSR, FTR and FVR SERIES BODY ROOM LIGHT DIAGRAMS

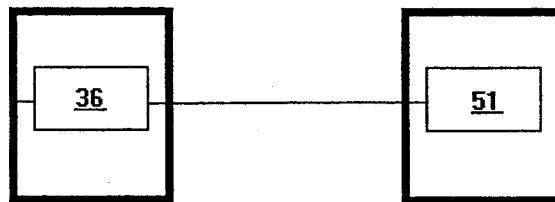


FSR, FTR and FVR chassis are equipped with a body room light switch mounted in the dash. The body room light switch is located on the dash near the side window to the left of the fast idle switch, This switch controls a relay (illustration "B") that will allow current to flow the body room light. The power wire from the relay runs down from the relay to cab frame connector box (illustration "C"). The body room light wiring should be connected to terminal number 36.

Rear Body Light Switch Wiring Diagram

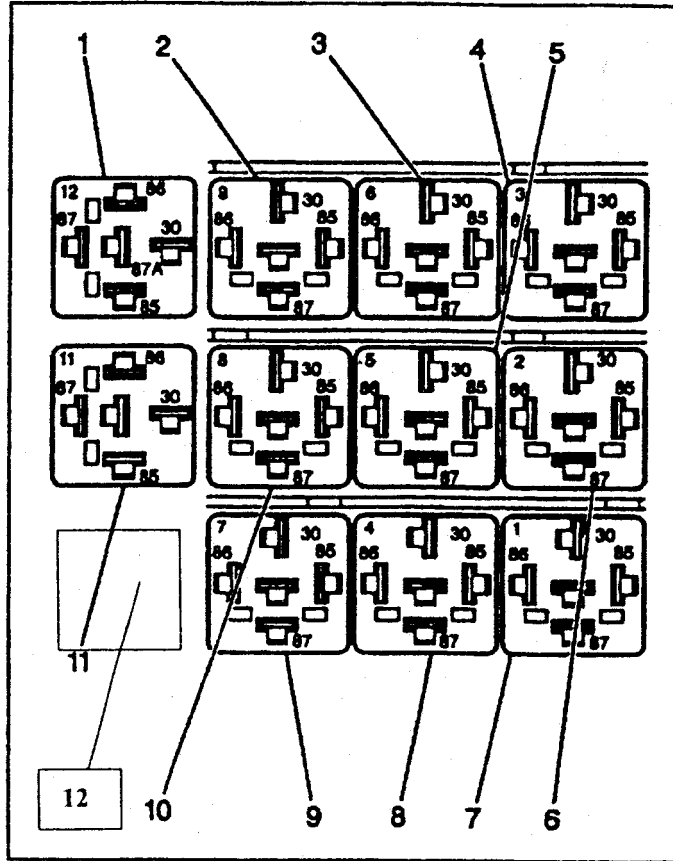


Alternate wiring to send power for Body Room light to back of Cab Body Builder connector.



Attach jumper between the number 36 pin of the 202 connector and the number 51 pin of the 200 connector, this will connect the body room light switch to body builders connector at the rear of the cab position.

Illustration B



Legend

- (1) Engine Stop Relay
- (2) Ignition #3 Relay
- (3) Ignition #2 Relay
- (4) Blower Relay
- (5) Ignition #1 Relay
- (6) Compressor Relay
- (7) Condenser Fan Relay
- (8) Accessory Relay
- (9) Auxiliary Relay
- (10) Horn Relay
- (11) Stoplamp Relay
- (12) Body Room Light Relay

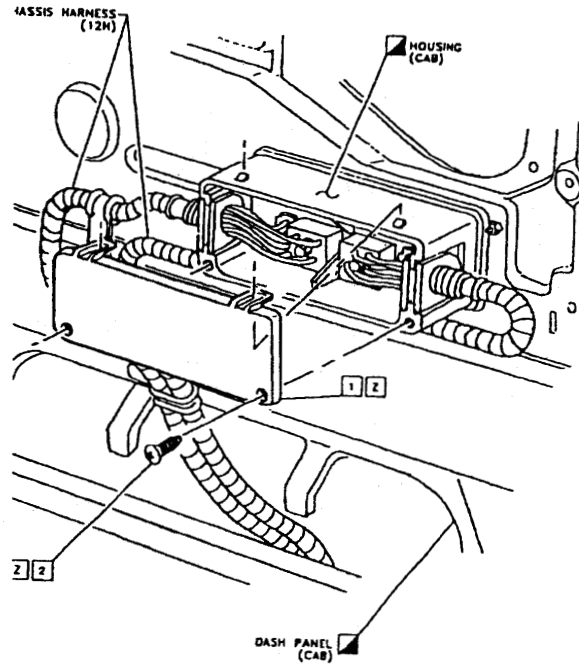
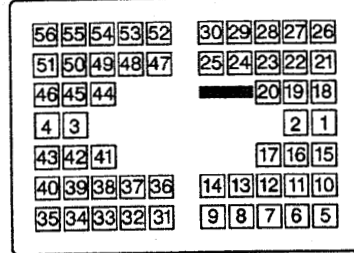
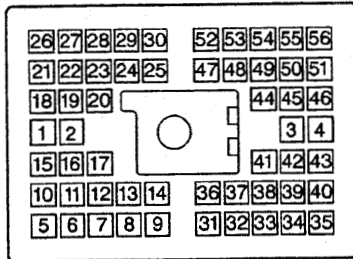
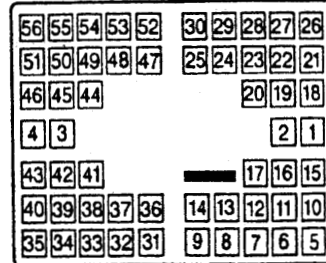
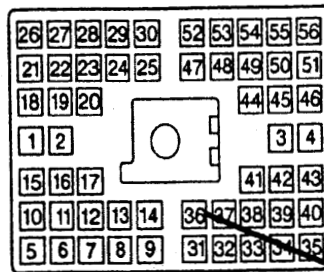


Illustration C

Inline Connector C200



Inline Connector C202



Body room light terminal