


# Body Builder Book

February 2015 Edition

PBB-43100

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# PREFACE

## FOREWORD

The CT-471 – Body Builder Books are a set of publications of which this Body Builder is a part. The complete set contains information related to the features and specifications for each truck in the International® product line.

### Disclaimer

The Body Builder Books provide product information to assist those who wish to modify these products for individual applications. Navistar, Inc. does not recommend or approve any firm or party nor make any judgements on the quality of the work performed by a particular firm or party. Individuals who use the services of a Body Builder must satisfy themselves as to the quality of the work.

The party installing a body, a fifth wheel, any other equipment, or making any modifications to complete the vehicle for delivery and make it road-ready is responsible to see that the completed vehicle complies with all applicable certification procedures and safety standards, as may be set forth in federal, state, and local statues, rules and regulations.Specifications, descriptions and illustrative material in this literature are as accurate as known at time of publication but are subject to change without notice. Navistar, Inc. cannot accept responsibility for typographical errors which may have occurred. Illustrations are not always to scale and may include optional equipment and accessories but may not include all standard equipment.

Any changes to the fuel delivery and return system may negatively affect the performance of the engine. Should changes be made the installer should verify that those changes still meet the requirements of the engine for proper system performance. Navistar, Inc. cannot accept responsibility for engine performance issues, error messages, or any other issues caused by changes to the fuel delivery and return system. Please contact Navistar, Inc. for information on the engine requirements for the fuel delivery and return system if needed.

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## PUBLICATION ORDERING INFORMATION

You can easily order the CT-471 set or any of its components by accessing the Marketing Resource Center and clicking the “Order Brochures” link, using your regular User ID and password.

Revisions to the following product publications are available automatically by subscribing to the Product Information Revision Service. Also, additional copies of product publications can be ordered individually on a one-time basis. When ordering, include the publication number, description and quantity required.

**Body Builder Books** – Complete Set ..... **CT-471**

**UC Commercial Bus:** Cutaway Bus Chassis Body Builder Book ..... **PBB-39100**

**DuraStar® Series:** Medium Conventional Body Builder Book ..... **PBB-43100**

**TerraStar® Series:** Medium Conventional Body Builder Book ..... **PBB-44100**

**PayStar® Series:** Premium On/Off Highway Conventional Body Builder Book ..... **PBB-45100**

**HX® Series:** Premium On/Off Highway Conventional Body Builder Book ..... **PBB-47100**

**WorkStar® Series:** Medium & Heavy Conventional Body Builder Book ..... **PBB-50100**

**Diamond Logic® Control Systems** ..... **PBB-71000**

# GOVERNMENT REQUIREMENTS

## *YOUR OBLIGATIONS UNDER THE LAW*

The important information in this section will acquaint you with U.S. and Canadian safety and emission standards that apply to Navistar, Inc. (Navistar) vehicles sold in the two countries, of those laws that established these standards, and the identity of the parties responsible for certification of compliance for both **COMPLETE VEHICLES** and **INCOMPLETE VEHICLES**. To the best of Navistar's knowledge, it is correct as of the date of this printing. Navistar, however cannot accept responsibility for its completeness and currency. User must ascertain this on their own. This section is written specifically for trucks with a Gross Vehicle Weight Rating (GVWR) greater than 10,000 lbs. (4,536 kg).

The National Traffic and Motor Vehicle Safety Act of 1966, in the U.S., gave rise to the Federal Motor Vehicle Safety Standards (FMVSS). In addition, The Environmental Protection Agency (EPA), through the Environmental Policy Act of 1969, set forth environmental protection standards.

In Canada, the Motor Vehicle Safety Act of 1970 established the Canadian Motor Vehicle Safety Standards (CMVSS) Act and Environment Canada establishes environmental protection standards.

These standards place the responsibility for compliance of a **COMPLETE VEHICLE** on the vehicle and engine manufacturers. Any vehicle purchased from Navistar, as a **COMPLETE VEHICLE,** as defined by section 568.3 of Title 49 of the Code of Federal Regulations (CFR) is certified by Navistar to comply with all applicable safety standards provided modifications or additions to the vehicle do not result in non-compliance with applicable U.S. and Canadian standards to which Navistar has certified compliance. The Engine Manufacturer is responsible to certify the engine to the U.S. EPA and Environment Canada's standards.

It is the responsibility of every International dealer to assure that the service work or modifications that can affect compliance, performed on a new vehicle prior to delivery to the customer, meets the requirements specified by all mandated standards. It is the responsibility of the Final-Stage Manufacturer who typically installs a body, a fifth wheel, or any other equipment, or makes any modifications to an **INCOMPLETE VEHICLE** supplied by Navistar, to certify compliance with the applicable standards for the vehicle when completed. Further, it is the responsibility of the Final-Stage Manufacturer to determine, and fully comply with, any additional requirements of the several States and Provinces. In addition, the Final-Stage Manufacturer must certify compliance with any other standards set forth in U.S. and Canadian regulations, statutes and ordinances.

## *PENALTIES FOR VIOLATIONS*

Violation of the provisions contained within the U.S. Federal Motor Vehicle Safety Standards is subject to fines of up to $5,000 per vehicle or up to a maximum of $15,000,000. The following violations are subject to these penalties:

1. Any manufacturer who knowingly or unknowingly produces for sale a motor vehicle subject to the law, but which does not meet all the applicable provisions of the law.

2. Any party who sells or offers for sale a motor vehicle built after the effective date of a standard, which in the knowledge of the selling party does not comply with the standard.
3. Any party (manufacturer, dealer, body builder or other) who completes a vehicle for sale in compliance with the law but fails to certify the completed vehicle in the prescribed manner.
4. Any party who knowingly certifies a vehicle as complying, which does not in fact meet the requirements of the law.

Situations where the government was intentionally misled in regards to safety related defects are criminal violations and are punishable by a maximum of 15 years in prison.

The U.S. Department of Transportation has declared its intent to institute procedures periodically to inspect vehicles subject to the law, and to implement enforcement procedures that will permit detection of violations.

The requirements of the law are stringent and the penalties for violation are severe. It is therefore mandatory that all personnel involved in any of the following aspects of motor vehicles become familiar with the provisions of the law as they relate to their responsibilities.

- Installation of equipment sub-assemblies and/or bodies (Intermediate and Final Stage Manufacturer)
- Sales
- Preparation for delivery
- Modification or conversion (Alterer)
- Maintenance and repair

Violation of the Canada Motor Vehicle Safety Standards law carries similar penalties.

NOTE: The Canadian, Mexican, and U.S. vehicle standards, which regulate the manufacture of vehicles for sale in their respective countries, may at any time exceed all or a portion of the mandated requirements of one or both of the other two countries. This situation exists due to established standards or regulatory revisions in one country, which have not yet been incorporated by the other(s).

Each of these countries require that any vehicle crossing its border(s) in commerce must comply with all applicable standards of their country and comply with the standards that were in effect as of the date of manufacture of that vehicle.

## *Federal Motor Vehicle Standards (FMVSS) and Canadian Motor Vehicle Safety Standards (CMVSS)*

The following standards of Title 49 of the CFR apply to Trucks having a GVWR greater than 10,000 pounds (4,536 kg.). Presently, all International® trucks fall in this classification.

For any vehicle manufactured by and purchased from Navistar and defined by section 567.3 of Title 49 of the CFR as an Incomplete Vehicle, consult the Incomplete Vehicle Document (IVD) provided with each Incomplete Vehicle to determine those particular safety standards with which the vehicle complies. Any standards, with which Navistar cannot certify compliance because of the level of completion of that vehicle, become the responsibility of the Intermediate Manufacturer or Final-Stage Manufacture or both.

**Table 1.1**

| **SAFETY STANDARD IDENTIFICATION**<br>(Applicable to all completed vehicles greater than 10,000 LBS.) | |
|---|---|
| FMVSS 101, CMVSS 101 | Controls, Telltales, and Indicators |
| FMVSS 102, CMVSS 102 | Transmission Shift Position Sequence, Starter Interlock and Transmission Braking Effect |
| FMVSS 103, CMVSS 103 | Windshield Defrosting and Defogging Systems |
| FMVSS 104, CMVSS 104 | Windshield Wiping and Washing Systems |
| FMVSS 105, CMVSS 105 | Hydraulic and Electric Brake Systems |
| FMVSS 106, CMVSS 106 | Brake Hoses |
| FMVSS 108, CMVSS 108 | Lamps, Reflective Devices and Associated Equipment |
| FMVSS 111, CMVSS 111 | Rearview Mirrors |
| FMVSS 113, CMVSS 113 | Hood Latch System |
| U.S. 49 CFR part 565, CMVSS 115 | Vehicle Identification Number Requirements |
| FMVSS 116, CMVSS 116 | Motor Vehicle Brake Fluids |
| FMVSS 119, CMVSS 119 | New Pneumatic Tires for Vehicles other than passenger cars |
| FMVSS 120, CMVSS 120 | Tire selection and Rims for vehicles with a GVWR of more than 4,536 Kilograms (10,000 pounds) |
| FMVSS 121, CMVSS 121 | Air Brake Systems |
| FMVSS 124, CMVSS 124 | Acceleration Control Systems |
| FMVSS 125 | Warning Devices |

* N/A – Not Applicable

**SAFETY STANDARD IDENTIFICATION**

(Applicable to all completed vehicles greater than 10,000 LBS.)

| | |
|---|---|
| FMVSS 205, CMVSS 205 | Glazing Materials |
| FMVSS 206, CMVSS 206 | Door Locks and Door Retention Components |
| FMVSS 207, CMVSS 207 | Seating Systems |
| FMVSS 208, CMVSS 208 | Occupant Crash Protection |
| FMVSS 209, CMVSS 209 | Seat Belt Assemblies |
| FMVSS 210, CMVSS 210 | Seat Belt Assembly Anchorages |
| FMVSS 213, CMVSS 213 | Child Restraint Systems |
| FMVSS 302, CMVSS 302 | Flammability of Interior Materials |
| FMVSS 403 | Platform Lift Systems for Motor Vehicles |
| FMVSS 404 | Platform Lift Installations in Motor Vehicles |
| CMVSS 301.1 | LPG Fuel System Integrity |
| CMVSS 301.2 | CNG Fuel System Integrity |
| FMVSS 304 | CNG Fuel Container |
| CMVSS 1106 | Noise Emissions |

* N/A – Not Applicable

Lighting Devices and Reflectors Required by FMVSS 108 and CMVSS 108

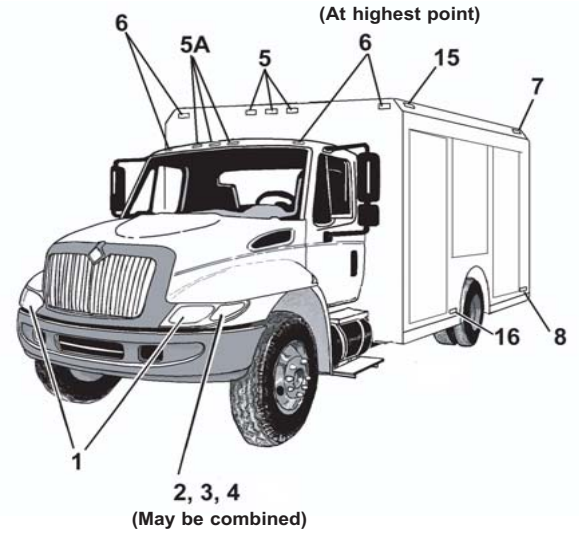
**Table 1.2**

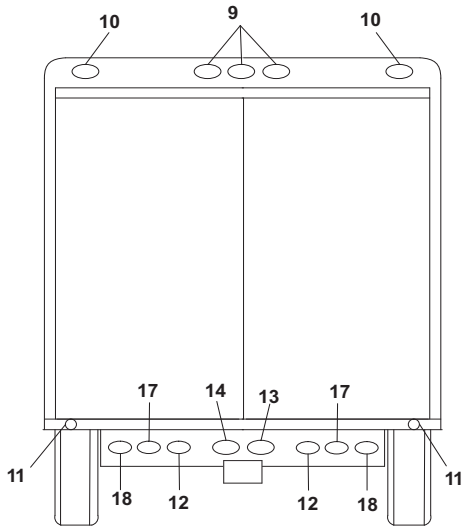
**Required Vehicle Lighting Equipment for Trucks with an Overall Width of 80 Inches or More**

| REQUIRED LIGHTING EQUIPMENT | QTY | COLOR | LOCATION | POSITION | HEIGHT ABOVE ROAD SURFACE (In inches measured from the center of the lamp on vehicle at curb height.) |
|---|---|---|---|---|---|
| Headlamps (Lower Beam) | 2 minimum | White | Forward road illumination | On the front, symmetrical, as far apart as practicable (if 4 lamp system, outboard or above upper beams) | Not less than 22 or more than 54. |
| Headlamps (Upper Beam) | 2 minimum | White | Forward road illumination | On the front, symmetrical (if 4 lamp system, inboard or below lower beams) | Not less than 22 or more than 54. |
| Daytime Running Lamps - Attention: for Canada required, for US optional | 2 minimum | White or Yellow | Indicate in-use vehicle | Front, symmetrical, as far apart as practicable | 380 (15) minimum. Maximum depends on tyupe of DRL. |
| Turn signal (Front) | 2 | Amber | At or near front | One on each side of the vertical centerline at the same height and as far apart as practicable. | Not less than 15 or more than 83. |
| Identification Lamp (Front) | 3 | Amber | Front | As close as practicable to the vertical centerline of the vehicle or the vertical centerline of the cab where different from the centerline of the vehicle. | All three on same level as close as practicable to the top of the vehicle with lamp centers spaced not less than 6 inches or more than 12 inches apart. |
| Tail Lamp | 2 | Red | Rear | One lamp each side of the vertical centerline at the same height and as far apart as practicable. | Both on the same level between 15 and 72. |
| Stop Lamp | 2 | Red | Rear | One lamp each side of the vertical centerline at the same height and as far apart as practicable. | Both on the same level between 15 and 72. |
| Front Clearance Lamps | 2 | Amber | One on each side of front | One on each side of the vertical centerline to indicate width. | Both on the same level as high as practicable. |
| Rear Clearance Lamps | 2 | Red | One on each side of rear | One on each side of the vertical centerline to indicate overall width. | Both on the same level as high as practicable. |
| Side Marker Lamp, Intermediate | 2 | Amber | One on each side | At or near midpoint between front and rear side marker lamps, if vehicle over 30' in length. | Not less than 15. |

| REQUIRED LIGHTING EQUIPMENT | QTY | COLOR | LOCATION | POSITION | HEIGHT ABOVE ROAD SURFACE (In inches measured from the center of the lamp on vehicle at curb height.) |
|---|---|---|---|---|---|
| Reflex Reflector Intermediate (Side) | 2 | Amber | One on each side | At or near midpoint between front and rear side reflectors if over 30' in length. | Between 15 and 60. |
| Reflex Reflector (Rear) | 2 | Red | Rear | One on each side of vertical centerline, as far apart as practicable. | Both on the same level, between 15 and 60. |
| Reflex Reflector (Rear Side) | 2 | Red | One on each side (rear) | As far to the rear as practicable. | Between 15 and 60. |
| Reflex Reflector (Front Side) | 2 | Amber | One on each side (front) | As far to the front as practicable. | Between 15 and 60. |
| License Plate Lamp Rear | 1 | White | At rear license plate | To illuminate the license plate from the top or sides. | No requirements. |
| Side Marker Lamp (Front) | 2 | Amber | One on each side | As far to the front as practicable. | Not less than 15. |
| Side Marker Lamp (Rear) | 2 | Red | One on each side | As far to the rear as practicable. | Not less than 15. |
| Turn Signal (Rear) | 2 | Amber or Red | Rear | One lamp on each side of the vertical centerline as far apart as practicable. | Both on the same level, between 15 and 83. |
| Identification Lamp (Rear) | 3 | Red | Rear | One as close as practicable to vertical centerline. One on each side. | All three on the same level as close as practicable to the top of the vehicles with lamp centers spaced not less than 6" or more than 12" apart. |
| Vehicular Hazard Warning Flashing Lamps | 2 | Amber | Front | One lamp on each side of vertical centerline as far apart as practicable. | Both on the same level, between 15 and 83. |
| | 2 | Amber or Red | Rear | | |
| Backup Lamp | 1 | White | Rear | Rear | No requirement. |
| Rear Upper Body Marking (Tractor) | exactly 2 pairs of 300mm long strips | White | Rear | Rear upper corners of cab, facing rearward | As high as practicable excluding fairings |
| Rear Marking (Tractor) | Exactly 2 sections, minimum 600mm each | Red/ White | Rear | Rear, facing rearward, on fenders, on mud flap brackets, or within 300mm below the top of mud flaps | As horizontal as practicable and not higher than 1,525 mm from the ground |

(Figures 1.1, 1.2 and 1.3 for Illustration Purposes Only)




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## LEGEND

1. Headlamps (2) – White (4 optional)
2. Side marker lamps. Front (2) – Amber
3. Side reflectors. Front (2) – Amber
4. Turn signal lamps. Front (2) – Amber

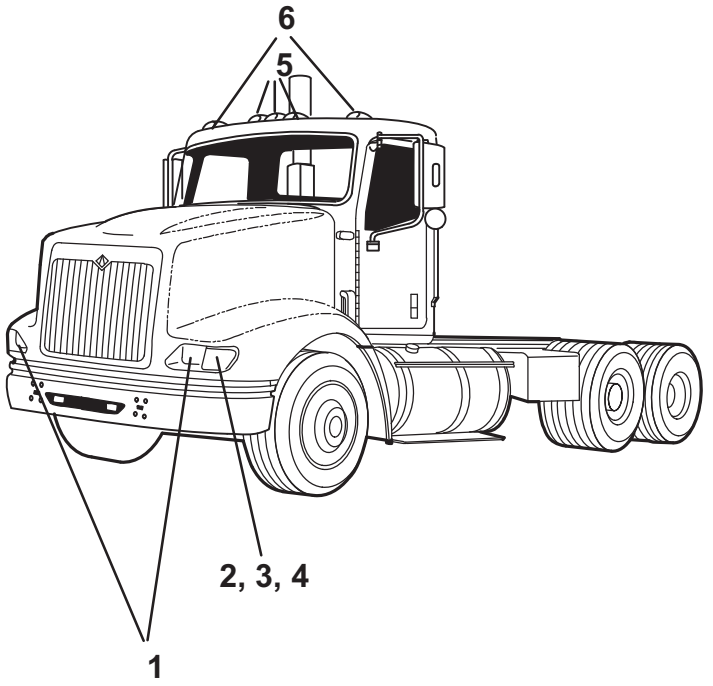
4a. Turn signal lamps. Front (2) – Amber (Optional location)

5. Identification lamps. Front (3) – Amber

5a. Identification lamps. Front (3) – Amber (Optional location)

6. Clearance lamps. Front (2) – Amber
7. Side marker lamps. Rear (2) – Red
8. Side reflectors. Rear (2) – Red
9. Identification lamps. Rear (3) – Red
10. Clearance lamps. Rear (2) – Red
11. Reflectors Rear (2) – Red
12. Stop lamps. Rear (2) – Red
13. License plate lamp. Rear (1) – White
14. Backup lamp. Rear (1) – White (location optional provided optional requirements are met)
15. Side marker lamps. Intermediate (2) – Amber (if vehicle is 30' or more overall length)
16. Side reflectors. Intermediate (2) – Amber (if vehicle is 30' or more overall length)
17. Turn signal lamps. Rear (2) – Amber or Red
18. Tail lamps. Rear (2) – Red

(Figures 1.1, 1.2 and 1.3 for Illustration Purposes Only)




**LEGEND**

1. Headlamps (2) - White (4 optional)
2. iSide marker lamps. Front (2) - Amber
3. Side reflectors. Front (2) - Amber
4. Turn signal lamps. Front (2) - Amber
5. Identification lamps. Front (3) - Amber
6. Clearance lamps. Front (2) - Amber

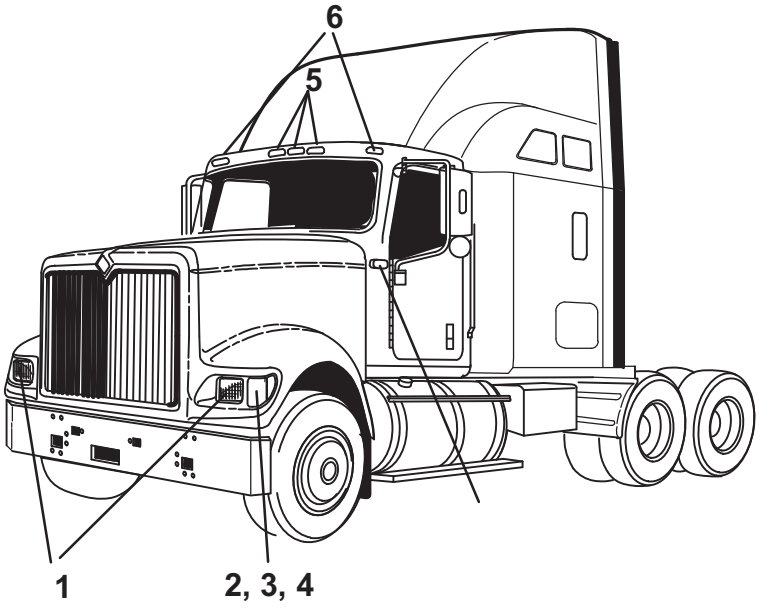
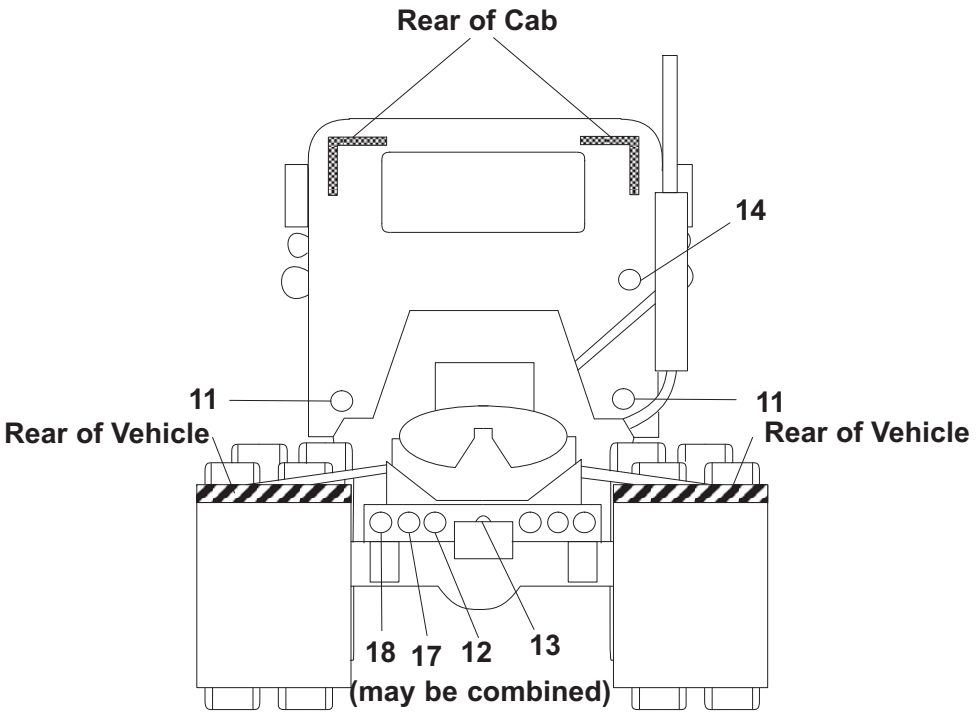



**Figure 1.2**

(Figures 1.1, 1.2 and 1.3 for Illustration Purposes Only)




**LEGEND**

11. Reflectors. Rear (2) – Red
12. Stop lamps. Rear (2) – Red
13. License plate lamp. Rear (1) – White
14. Backup lamp. Rear (1) – White (location optional provided optional requirements are met)
17. Turn signal lamps. Rear (2) – Amber or Red
18. Tail lamps. Rear (2) – Red

**Figure 1.3**

## ADDITIONAL REQUIREMENTS: EPA

***EPA Part 205 Subpart B, CMVSS 1106 – Noise Emission For Medium And Heavy Trucks***

**INCOMPLETE VEHICLES *identified as a* CHASSIS CAB *by Navistar, and all* COMPLETE VEHICLES *will comply with the requirements specified by EPA PART 205 SUBPART B and CMVSS 1106 provided that no changes are made to the noise generating and/or suppression equipment installed by Navistar.***

***EPA Part 86, CMVSS 1100 – Emission Control***

Engines provided with International vehicles will comply with all applicable exhaust emission standards. Modifications to the vehicle and/or engine, which will cause noncompliance, are prohibited by the regulations. For further information see the vehicle operator's manual and the engine manual.

***EPA Part 86, CFR 1037 – Vehicle Emission Controls***

Vehicles manufactured by Navistar have been built to comply with all applicable vehicle emissions standards. Modifications to the vehicle which will cause noncompliance are prohibited by regulations. Refer to the Vehicle Emissions Control Information label on the vehicle for a list of Emissions reduction components. For further information, please review the vehicle operator's manual.

## REPLACEMENT OR SERVICE PARTS

The Motor Vehicle Safety Standards primarily specify the requirements and/or performance standards that a Complete Vehicle must comply with. However, certain specific components of the vehicle, when sold by a dealer or distributor as replacement or service parts, are required to comply with the requirements and/or performance standards specified by the standards. Certification of compliance must also be provided for these components and those items that are subject to these procedures are as follows:

- Windshield and window glass – FMVSS/CMVSS 205
- Seat belts – FMVSS/CMVSS 209
- Hydraulic brake hose – FMVSS/CMVSS 106
- Hydraulic brake fluids – FMVSS/CMVSS 116
- Lamps and reflective devices – FMVSS/CMVSS 108
- Warning devices – FMVSS 125 (Reflective Triangle)
- Tires and Wheels – FMVSS/CMVSS 119/120
- Platform Lift System – FMVSS 403

The standards require that all of the above items manufactured for sale, whether for use in the manufacture of a vehicle or for sale as parts, must comply with applicable provisions of the safety standards. Such items when sold by dealers or distributors must be labeled to certify compliance. Such labeling may be placed on the part itself or on the container in which the part is shipped.

The items listed above that are manufactured by or for Navistar, Inc. as service parts will comply with all applicable standards as required.

## *CERTIFICATION OF INCOMPLETE VEHICLES MANUFACTURED BY NAVISTAR, INC.*

In accordance with the laws of the United States and Canada all vehicles manufactured for sale and sold for use in these countries must comply with the applicable federal safety standards and certification of compliance must be provided with the vehicle.

Section 567.3 of Title 49 of the CFR defines an **INCOMPLETE VEHICLE** as an assemblage consisting, at a minimum, of chassis (including the frame) structure, power train, steering system, suspension system, and braking system, in the state that those systems are to be part of the completed vehicle, but requires further manufacturing operations, to become a completed vehicle. For an **INCOMPLETE VEHICLE** manufactured by Navistar to be classified as a **COMPLETE VEHICLE**, subsequent manufactures must mount a body or other load carrying equipment on the chassis prior to delivery to the end user so that it can perform its intended function.

## Incomplete Vehicle Manufacturer

### *DEFINITION*

Section 567.3 of Title 49 of the CFR defines an Incomplete Vehicle Manufacturer as a person who manufactures an incomplete vehicle by assembling components none of which, taken separately, constitute an incomplete vehicle.

#### *Compliance Responsibility*

As manufactured by Navistar, an Incomplete Vehicle is built with all appropriate safety items that comply with the applicable regulatory requirements to the extent that the vehicle's state of completion will permit. To obtain a Complete Vehicle status under section 567.3 of Title 49 of the CFR, an Intermediate or Final-Stage Manufacturer must mount a body or other similar load carrying equipment on the chassis prior to delivery to the end user.

Navistar identifies an **INCOMPLETE VEHICLE** with one of the following designations depending on the vehicle's state of completion:

- Chassis Cab
- Flat Back Cowl (FBC) Chassis Bus or School Bus
- Partial Cab Bus or School Bus
- Partial Cab Truck
- Stripped Chassis

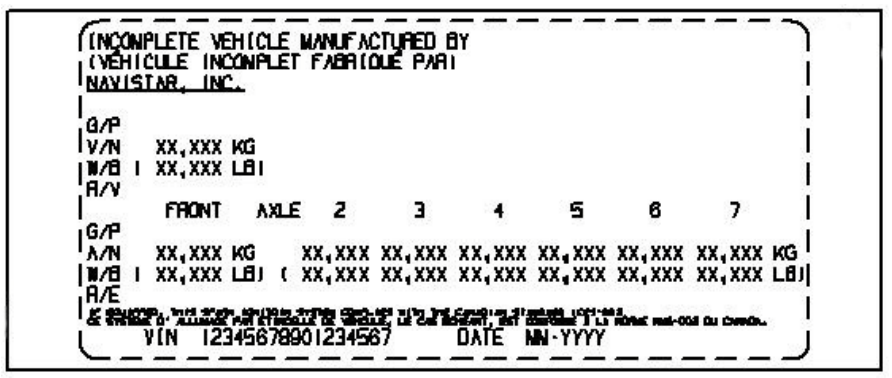
In accordance with section 568.4 of Title 49 of the CFR, Navistar furnishes an **INCOMPLETE VEHICLE** Document (IVD) with each **INCOMPLETE VEHICLE**. This document provides the following information:

- Name and mailing address of the **INCOMPLETE VEHICLE** manufacturer
- Date of manufacture
- Vehicle Identification Number

- GAWR (Gross Axle Weight Rating) for each axle of the intended **COMPLETE VEHICLE**
- GVWR (Gross Vehicle Weight Rating) of the intended **COMPLETE VEHICLE**
- Vehicle Type into which the **INCOMPLETE VEHICLE** may appropriately be manufactured
- Suitable tire and rim choice with inflation pressure
- List of all Federal U.S. or Canadian safety standards applicable to the type of vehicle.
  (Those standards to which the vehicle complies as produced by Navistar, Inc. will be identified.)

For all Incomplete Vehicles except those without a cab, the IVD is placed in the left hand door dispatch compartment. For Incomplete Vehicles without a cab, the IVD is placed in a clear plastic envelope and strap locked to the radiator stay rod.

In accordance with section 567.5 of Title 49 of the CFR, Navistar will also affix an Incomplete Vehicle Information Label to the hinge pillar, door latch post, or door edge that meets the door latch post, next to the driver's seating position (Figure 1.5).




Manufactured in the U.S. or Mexico

**Figure 1.5 Incomplete Vehicle Information Label**

### *CANADA*

All International Incomplete Vehicles manufactured and sold in Canada will also have a Canada National Safety Mark and National Emissions Mark affixed to the vehicle (Figure 1.6).




0_0010

**Figure 1.6 Canada National Safety Mark and National Emissions Mark Label**

## Intermediate Manufacturer

### *DEFINITION*

Section 567.3 of Title 49 of the CFR defines an INTERMEDIATE MANUFACTURER as a person, other than the Incomplete Vehicle Manufacturer or Final Stage Manufacturer, who performs manufacturing operations on a vehicle manufactured in two or more stages.

### *COMPLIANCE RESPONSIBILITY*

In accordance with section 568.4 of Title 49 of the CFR, Navistar furnishes an Incomplete Vehicle Document (IVD) with each incomplete vehicle. Navistar will also affix an information label to the hinge pillar, door latch post, or door edge that meets the door latch post, next to the drivers seating position as specified in part 567.5 of Title 49 of the CFR.

In accordance with section 568.5 of Title 49 of the CFR each intermediate manufacturer is required to provide an addendum to the IVD for any modification made by them to the incomplete vehicle that affects the validity of the compliance statements that appear in the IVD. The addendum must provide the name and mailing address of the intermediate manufacturer and specify the changes that must be made to the IVD to reflect the modifications that they made to the vehicle.

## Final Stage Manufacturer

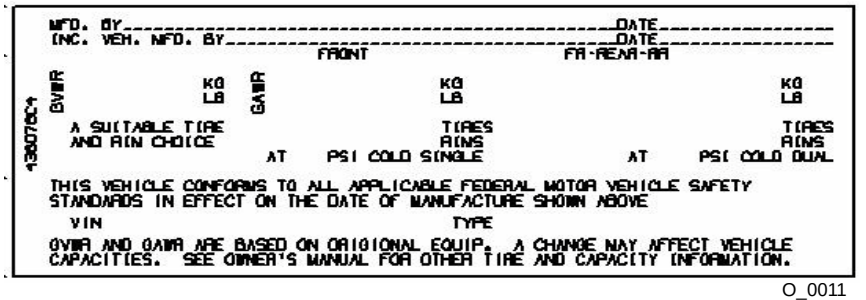
### *DEFINITION*

As defined by section 567.3 of Title 49 of the CFR, a FINAL – STAGE MANUFACTURER is a person who performs such manufacturing operations on an incomplete vehicle that it becomes a complete vehicle.

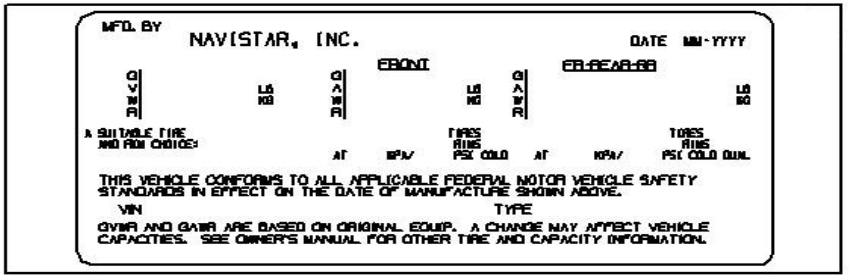
### *COMPLIANCE RESPONSIBILITY*

Section 568.6 of Title 49 of the CFR requires that the final – stage manufacturer shall complete the vehicle in such manner that it meets all applicable safety standards in effect on the date of manufacture of the incomplete vehicle, the date of final completion, or a date between these dates. It should be noted that a vehicle intended for use as a tractor, is not considered a complete vehicle until the fifth wheel has been installed. When completed, the tractor must comply with all applicable Federal Motor Vehicle Safety Standards. Section 567.5 of Title 49 of the CFR stipulates that the Final Stage Manufacturer is responsible for installing an appropriate certification label that must be securely and permanently affixed to the completed vehicle.

For those situations when an entity other than a Navistar facility certifies a completed vehicle, that entity becomes the Final – Stage Manufacturer and has the option to create its own label or purchase a label from International service parts. Labels purchased from service parts do not have the name of the Final - Stage Manufacturer and information about the vehicle. This information has been left blank. Final – Stage Manufacturers that utilize the appropriate label and protective cover (435654C2) and provide the required information comply with the requirements specified by part 567 of Title 49 of the CFR. The label (Figure1.7) is referred to as a “Final Stage Manufacturer Certification Label” and is identified with Navistar part number 3591119C3 for a vehicle sold in the U.S. or 3591120C3 for a vehicle sold in Canada.




3591110C3 – U.S.




3591120C3 – Canada

**Figure 1.7 Final Stage Manufacturer Certification**

## *CANADA*

Certified Final – Stage Manufacturers of Canadian vehicles may be required to affix the Canada National Safety Mark and National Emissions Mark with their identification number installed on it next to the final certification label shown above. Such authorization and identification number must be obtained from the Minister of Transport at Transport Canada. (Figure 1.6 – “Canada National Safety Mark and National Emissions Mark.)

## ALTERATIONS TO COMPLETED VEHICLES

## *DEFINITION*

Section 567.3 of Title 49 of the CFR defines an Altered Vehicle as a completed vehicle previously certified in accordance with section 567.4 or 567.5 that has been altered other than by the addition, substitution, or removal of readily attachable components or by minor finishing operations, before the first purchase of the vehicle other than for resale, in such a manner as may affect the conformity of the vehicle with one or more FMVSS or the validity of the vehicle's stated weight ratings or vehicle type classification.

## *COMPLIANCE RESPONSIBILITY*

In accordance with section 567.7 of Title 49 of the CFR, if a person alters a certified vehicle before the first purchase of the vehicle other than for resale**,** the responsibility for compliance of the modified vehicle rests with the Alterer. The vehicle manufacturer's Certification Label and any Information Labels shall remain affixed to the vehicle and the alterer shall affix an additional certification label that will supplement the certification label originally furnished with the vehicle by Navistar or the Final – Stage Manufacturer. This certification label must state the following:

> "This vehicle was altered by (name of Alterer) in (month and year in which alterations were completed) and as altered it conforms to all applicable Federal Motor Vehicle Safety Bumper and Theft Prevention Standards affected by the alteration and in effect on the date of (no earlier than the date of manufacture of the certified vehicle as specified on the certification label and no later than the date alterations were completed)."

This label (Figure 1.8) is available from International service parts under Part No. 449893C5 for U.S. Certified Vehicles and Part No.1676840C3 for Canada Certified Vehicles. Protective cover 435654C2 should be installed over this label.

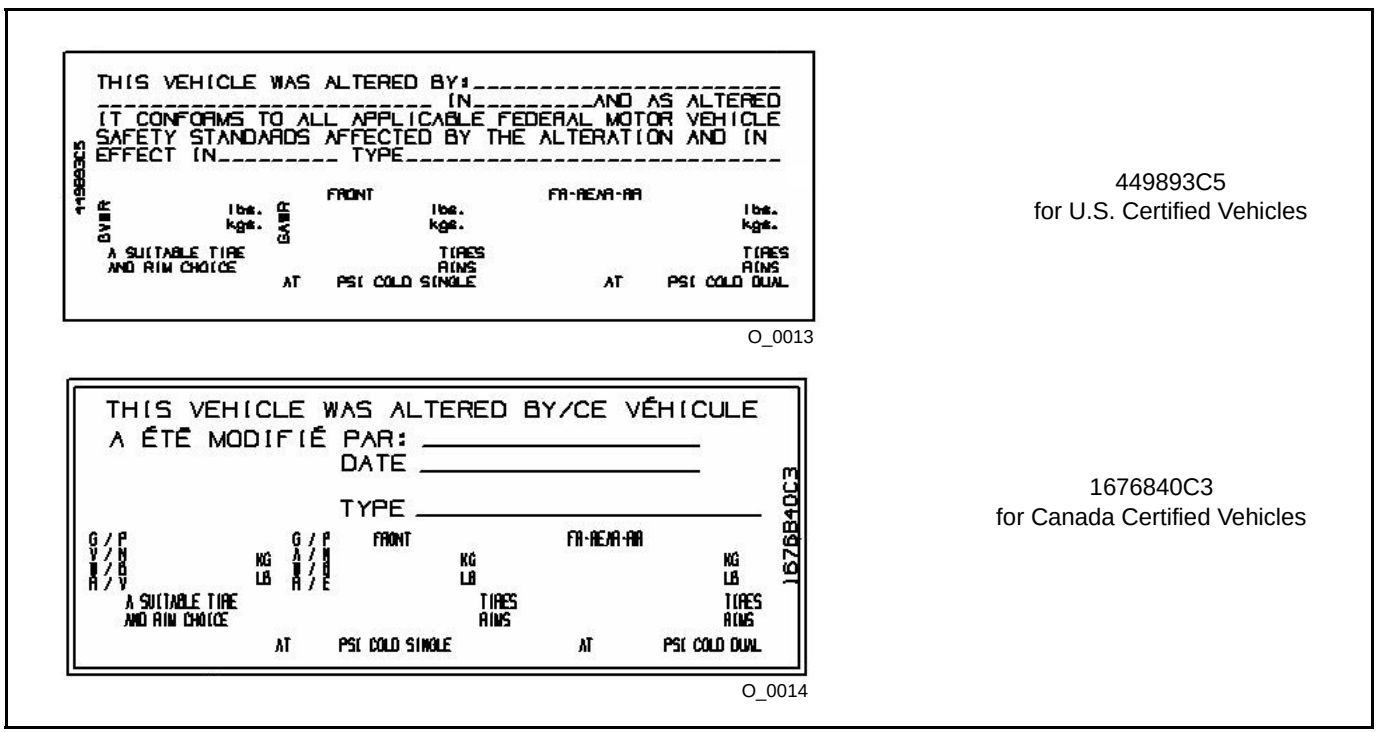
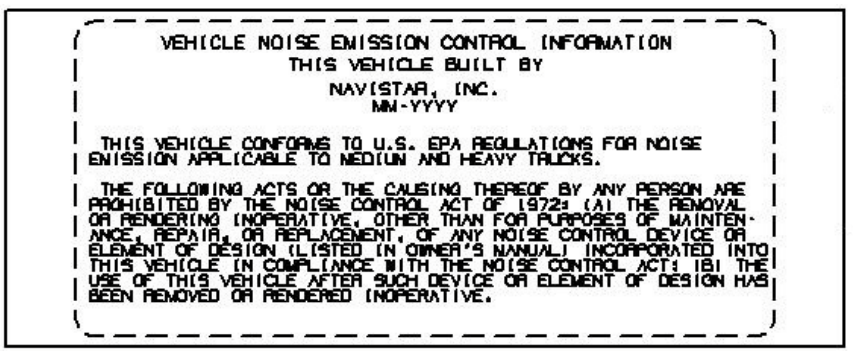



**Figure 1.8 Vehicle Alterer Certification Label**

Alterers of Canadian certified vehicles must apply the Canada National Safety Mark and National Emissions Mark, with their identification number, adjacent to the Vehicle Alterer Certification label. Such authorization and identification number must be obtained from the Minister of Transport at Transport Canada. (Figure 1.6 – Canada National Safety Mark and National Emissions Mark.)

### *EXTERIOR NOISE CERTIFICATION LABEL*

Incomplete vehicles identified as chassis cabs by Navistar have the vehicle exterior noise label (Figure 1.9) permanently attached in a readily visible position in the operators compartment. For incomplete vehicles other than a chassis cab, the final stage manufacturer must assume responsibility and comply with EPA PART 205 SUBPART B, CMVSS 1106 – NOISE EMISSION FOR MEDIUM AND HEAVY TRUCKS.




For Vehicles Built in the U.S.

**Figure 1.9 Vehicle Exterior Noise Label**

## ADDITIONAL CERTIFICATION LABEL INFORMATION AND INSTRUCTIONS

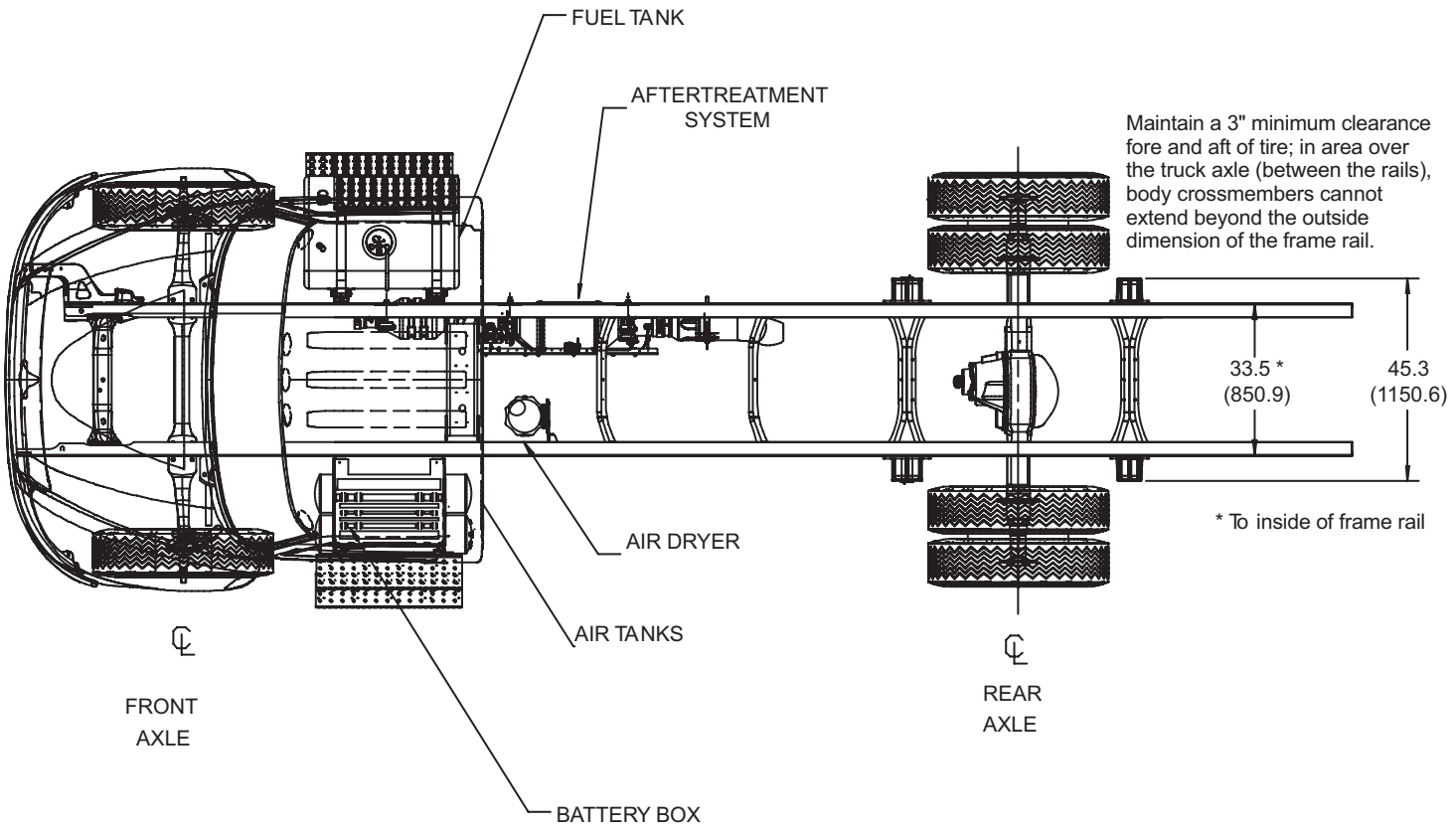
1. All labels must be fully filled out.
2. All labels must be affixed to the vehicle in accordance with Sections 567 of Title 49 of the CFR or Canadian Motor Vehicle Safety Regulations, Sections 6 and 7.
3. No label shall be installed over another label.
4. It is unlawful to affix an incorrect certification label to a vehicle.

# CHASSIS DIAGRAMS (EGR)

## 4300 4X2 MODELS

### *Chassis Diagram*

#### ***Plan View – Standard Cab***



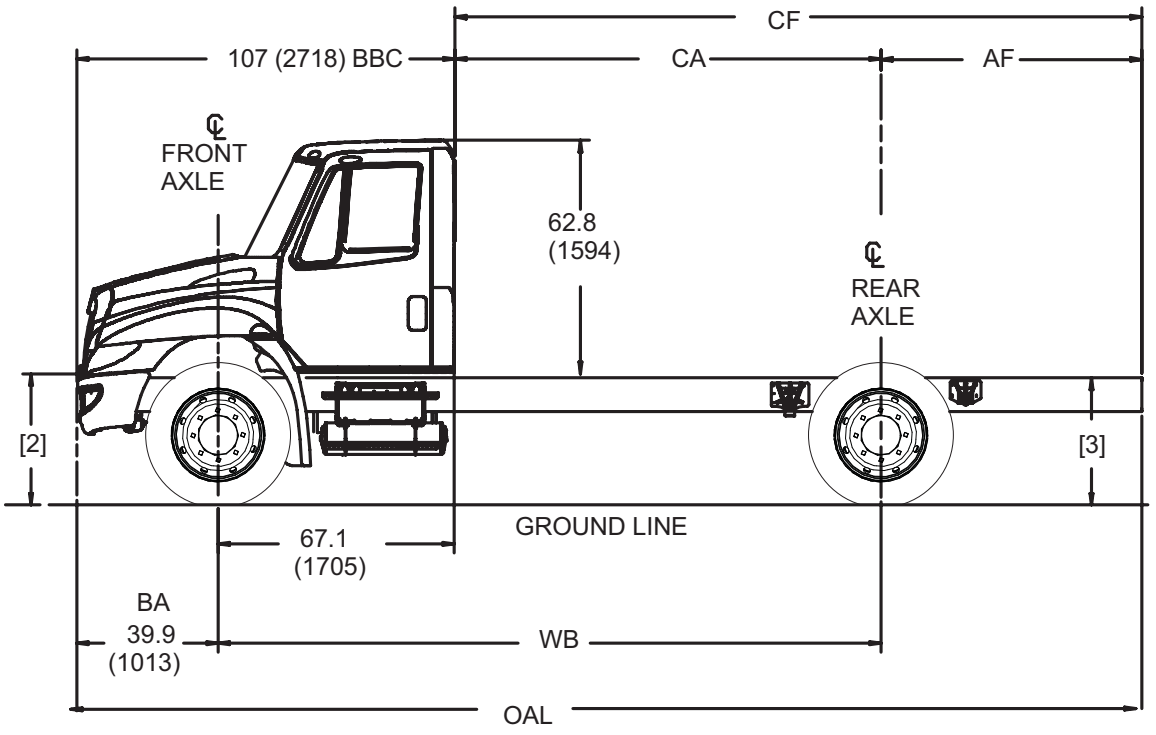

4000_plan_4x2_standard

NOTE: This drawing *should not* be used to determine crossmember locations – this information can be found later in this book.

4300 4X2 MODELS

## *Chassis Diagram*

### ***Side View – Standard Cab***




4000_side_4x2_standard

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded - 33.69”, loaded - 31.73”

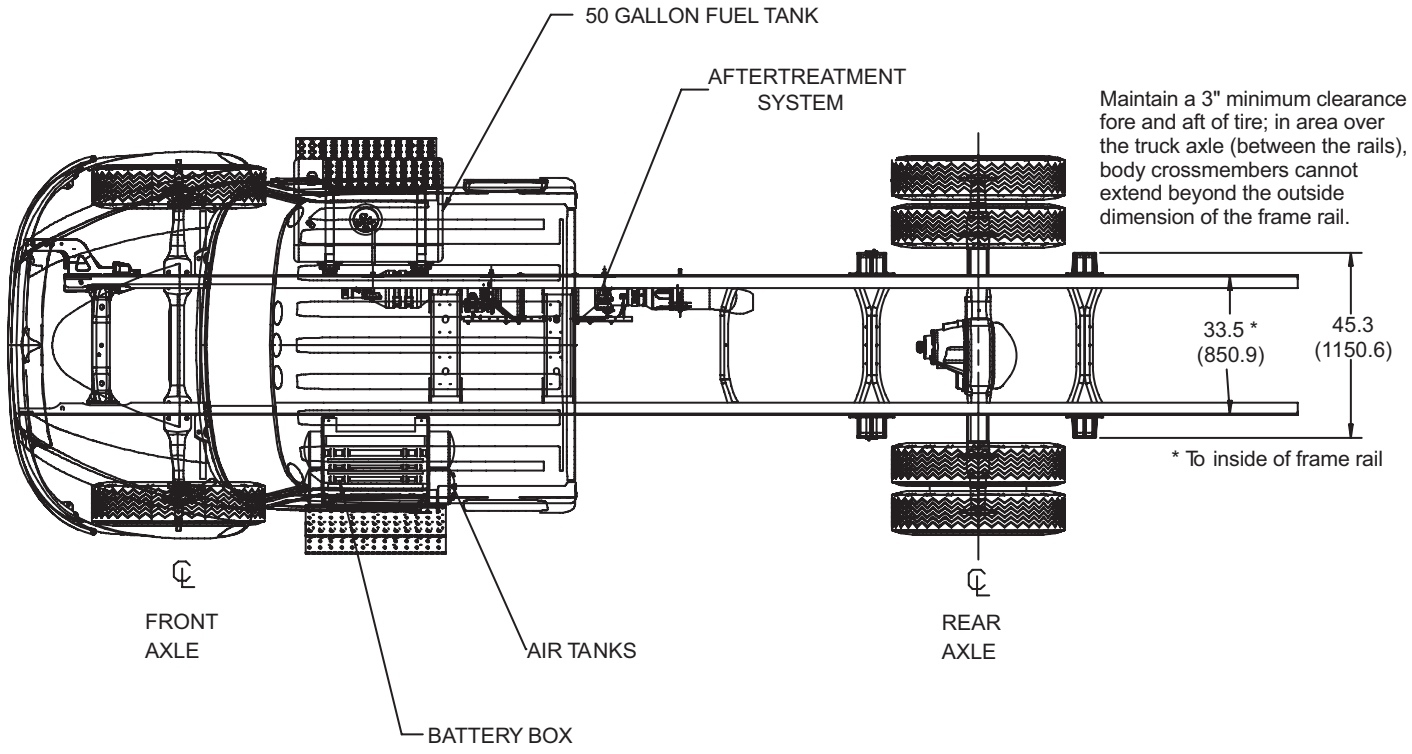
[3] Frame Height at centerline of rear axle: unloaded - 35.56”, loaded - 32.02”

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

4300 4X2 MODELS

## *Chassis Diagram*

### ***Plan View – Extended Cab***



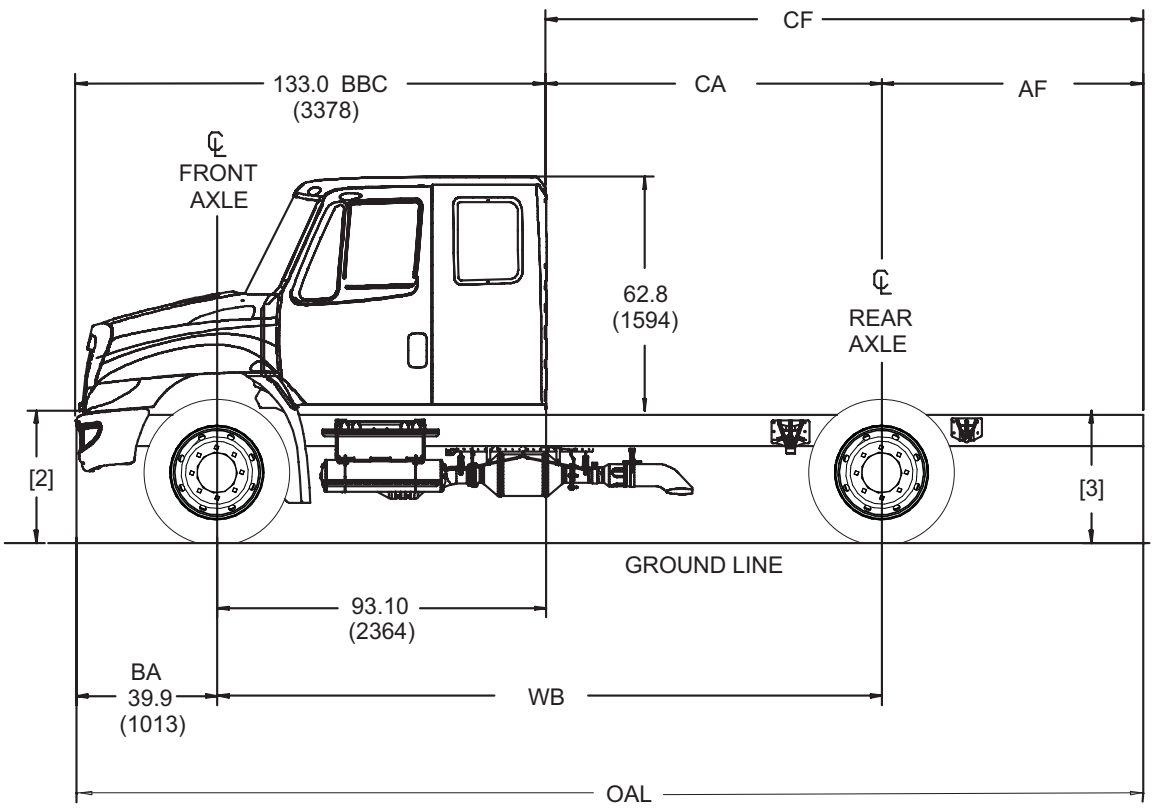

4000_plan_4x2_extended

NOTE: This drawing *should not* be used to determine crossmember locations – this information can be found later in this book.

4300 4X2 MODELS

## *Chassis Diagram*

### ***Side View – Extended Cab***




4000_side_4x2_extended

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded – 33.69", loaded – 31.73"

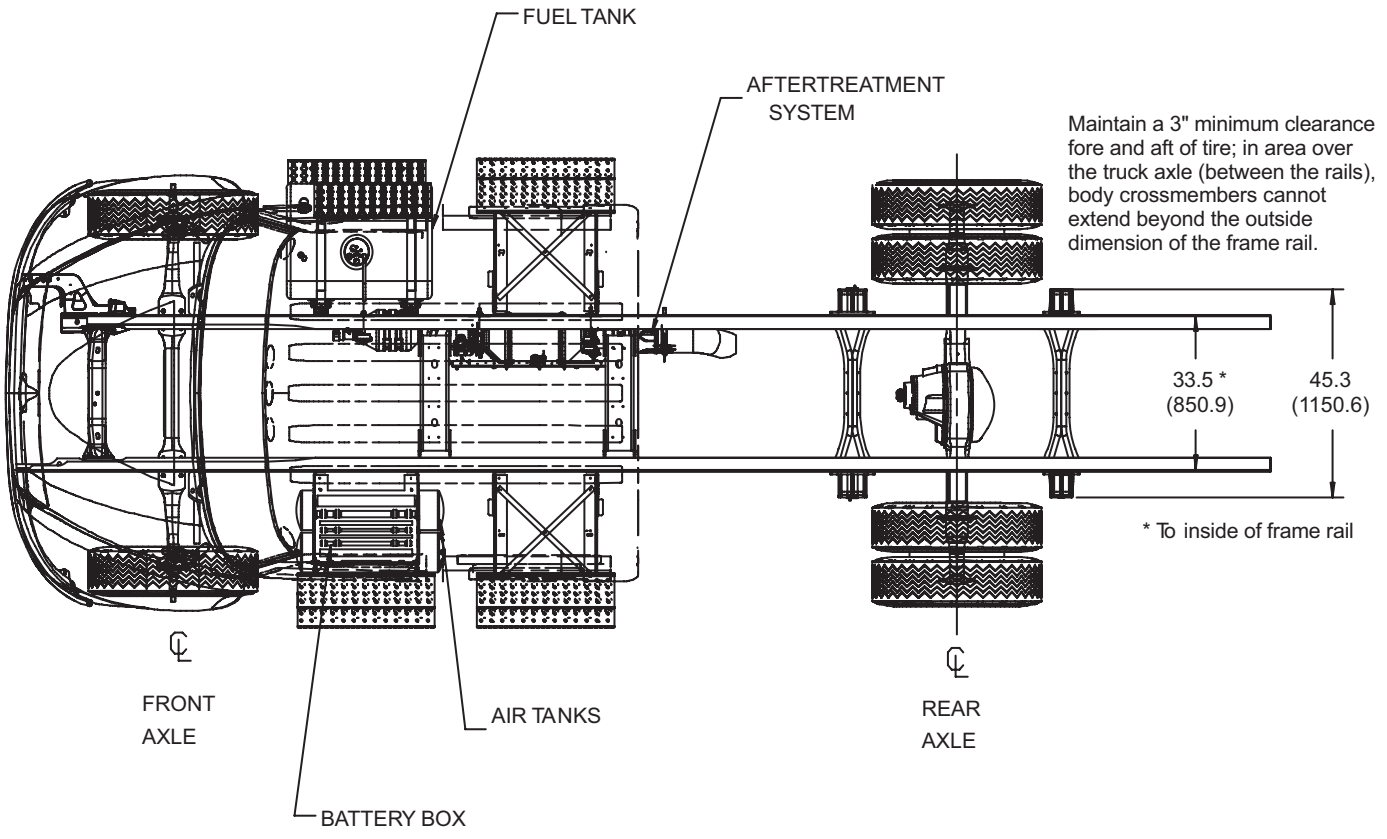
[3] Frame Height at centerline of rear axle: unloaded – 35.56", loaded – 32.02"

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

4300 4X2 MODELS

## *Chassis Diagram*

### ***Plan View – Crew Cab***



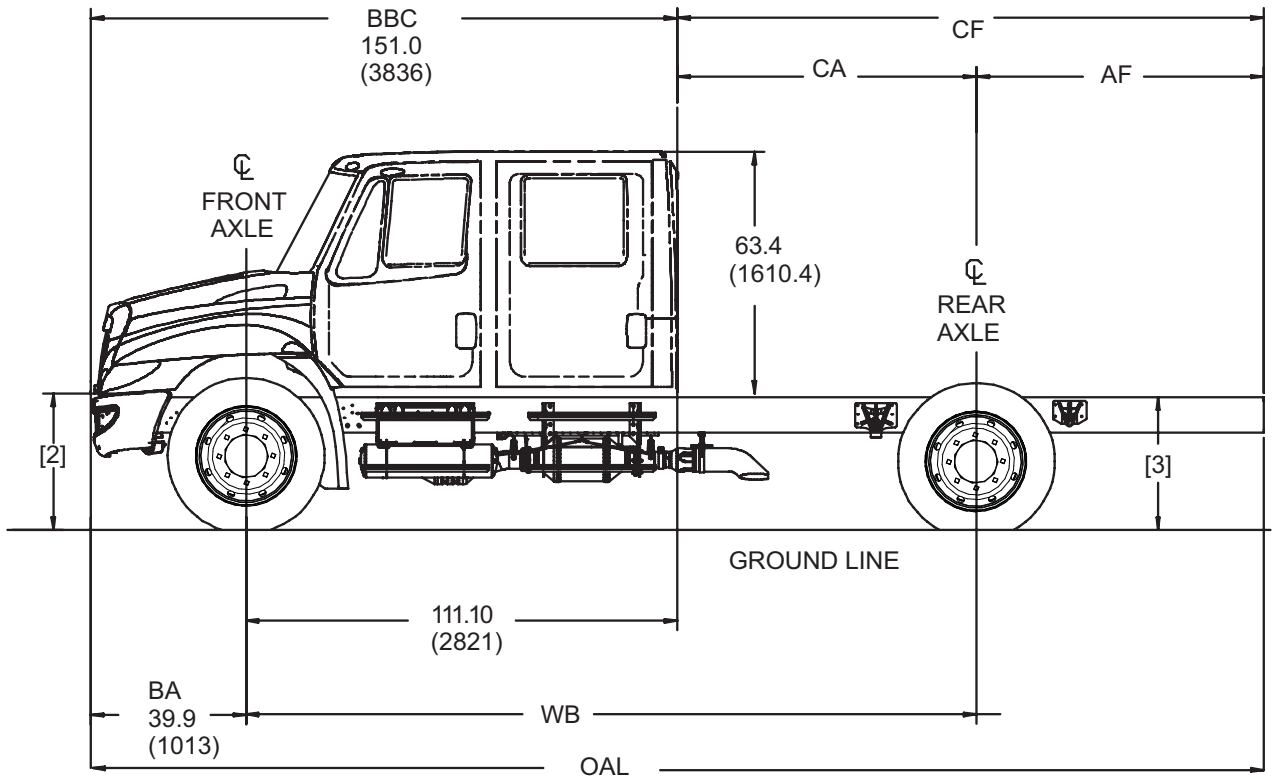

4000_plan_4x2_crew

This drawing *should not* be used to determine crossmember locations – this information can be found later in this book.

4300 4X2 MODELS

## *Chassis Diagram*

### ***Side View – Crew Cab***




4000_side_4x2_crew

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

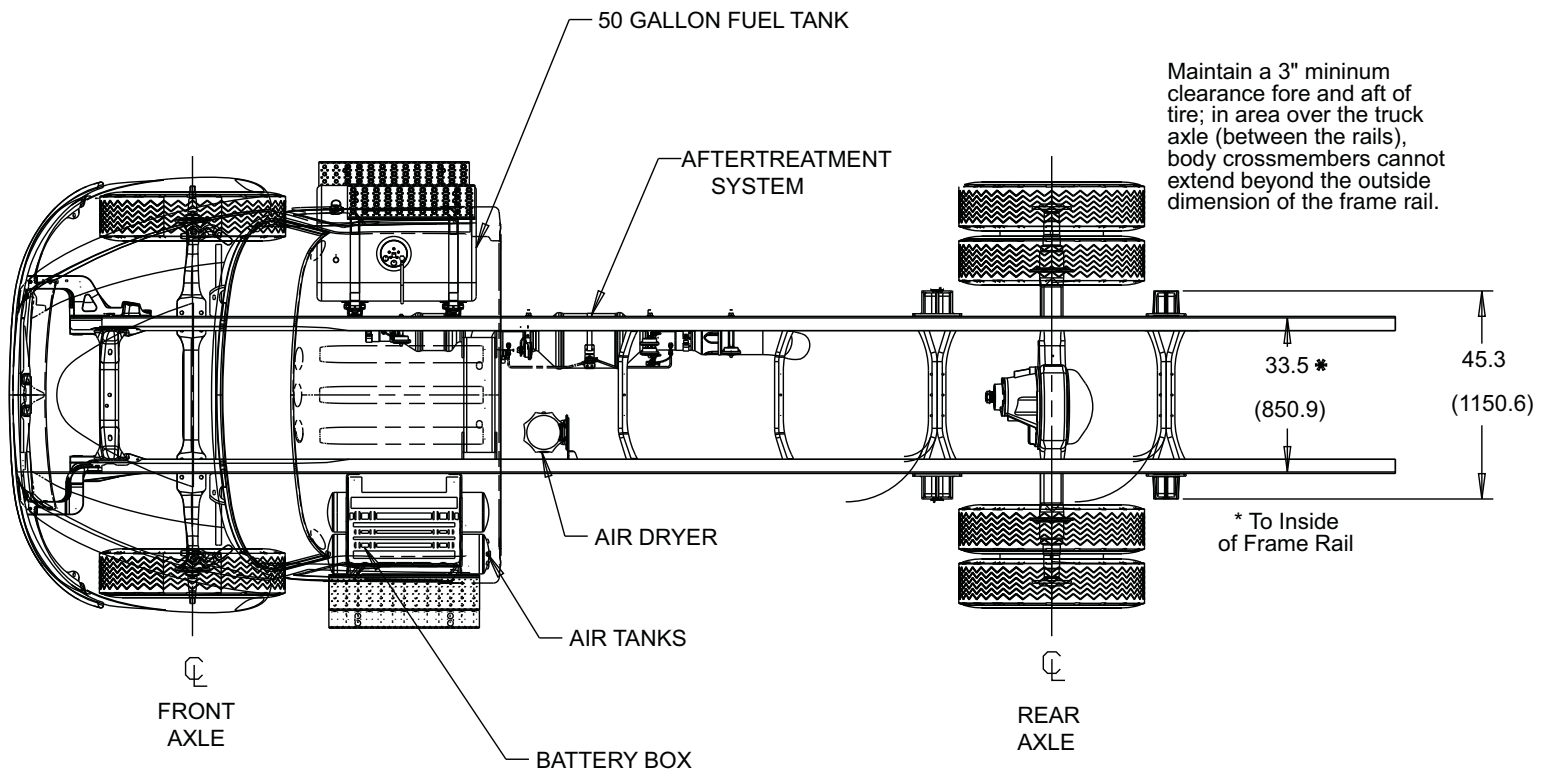
[2] Frame Height at centerline of front axle: unloaded – 33.69", loaded – 31.73"

[3] Frame Height at centerline of rear axle: unloaded – 35.56", loaded – 32.02"

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

## *Chassis Diagram*

### ***Plan View – Standard Cab***



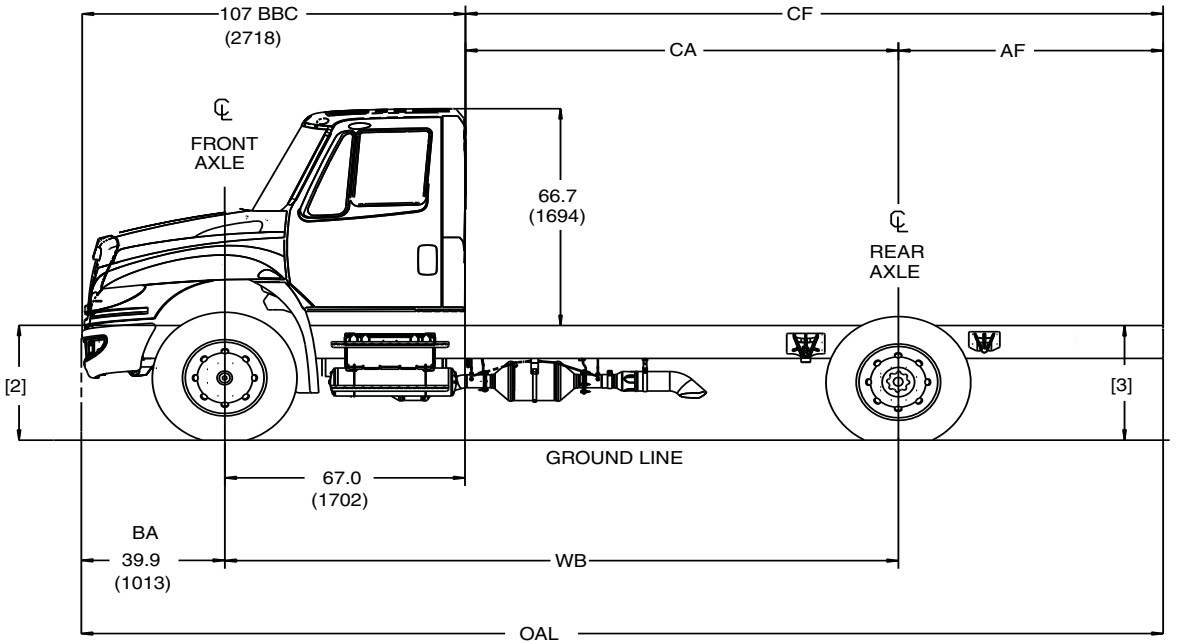

4400_plan_4x2_standard_dual_mega.

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

## 4400 4X2 MODELS

### *Chassis Diagram*

#### ***Side View – Standard Cab***




4400_side_4x2_standard_dual_mega

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded - 33.69”, loaded - 31.73”

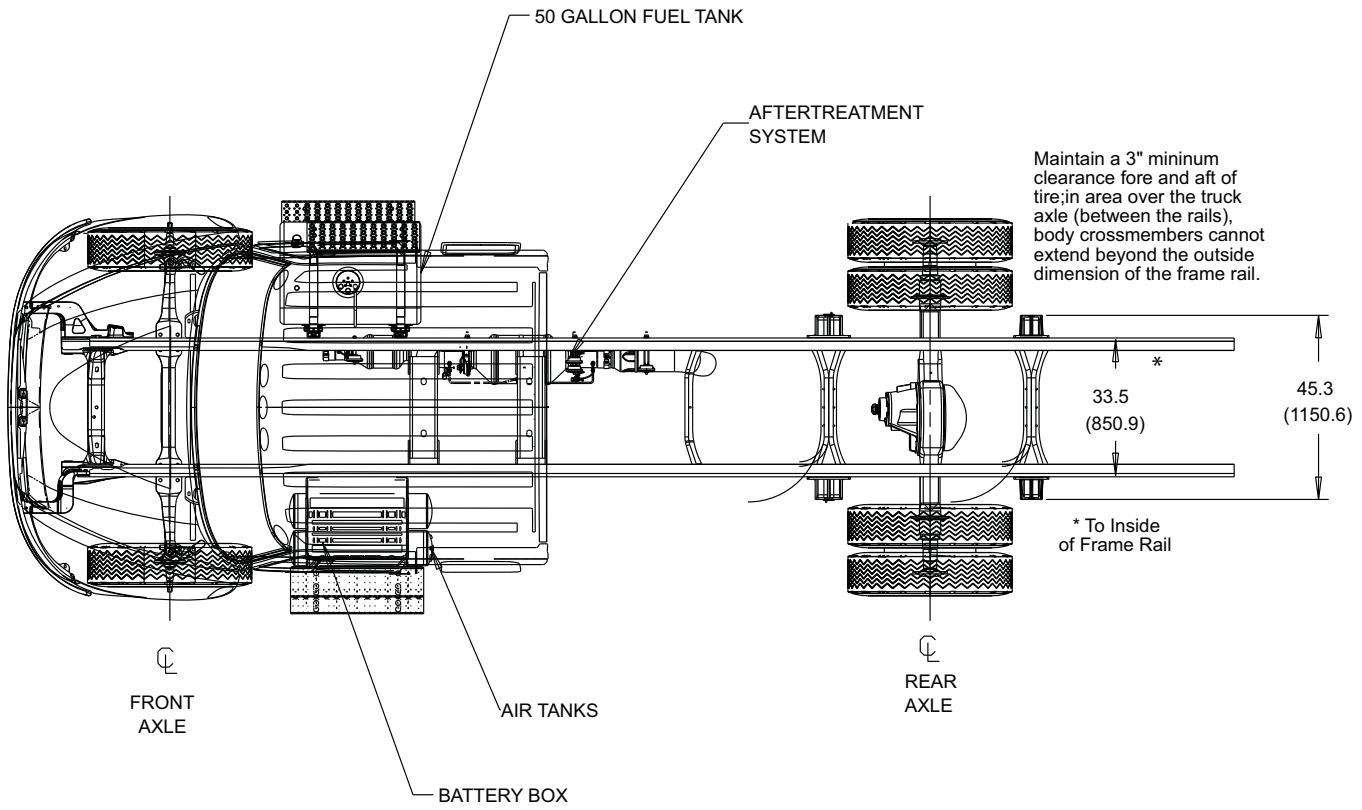
[3] Frame Height at centerline of rear axle: unloaded - 37.00”, loaded - 33.26”

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

4400 4X2 MODELS

## *Chassis Diagram*

### ***Plan View – Extended Cab***



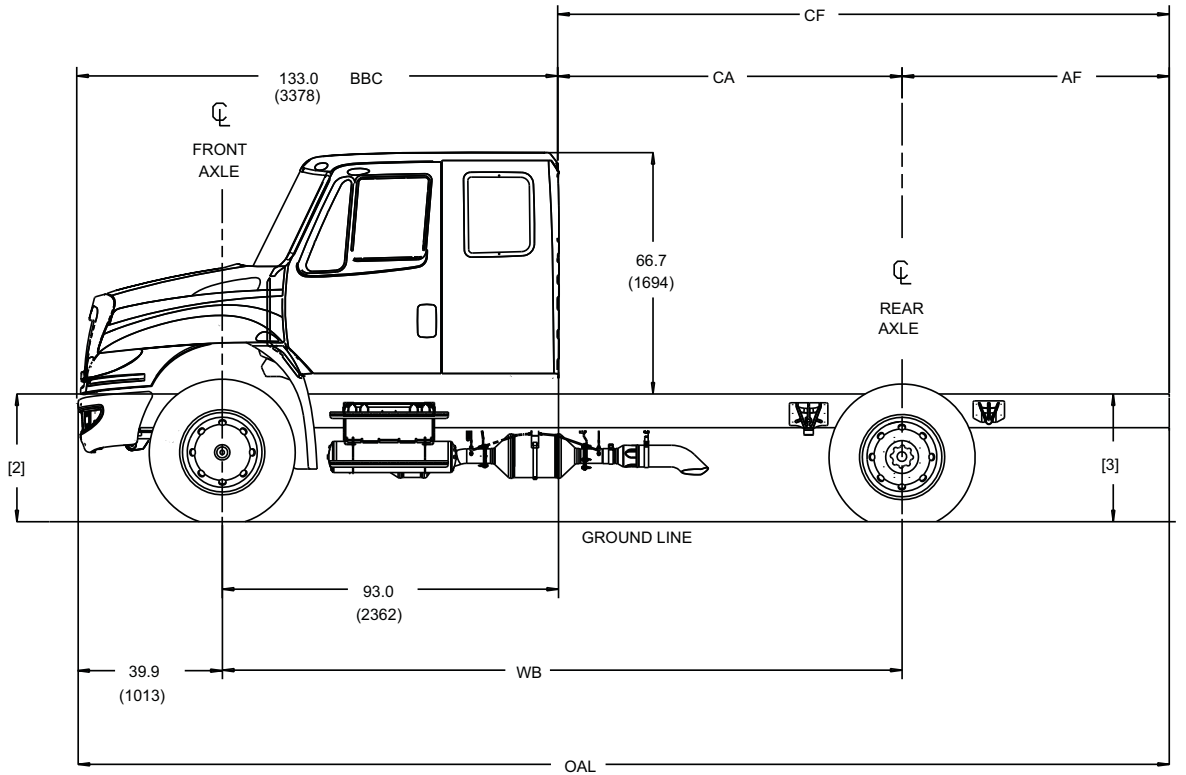

4400_plan_4x2_extended_dual_mega

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

## 4400 4X2 MODELS

### *Chassis Diagram*

#### ***Side View – Extended Cab***




4400_side_4x2_extended_dual_mega

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded – 33.69", loaded – 31.73"

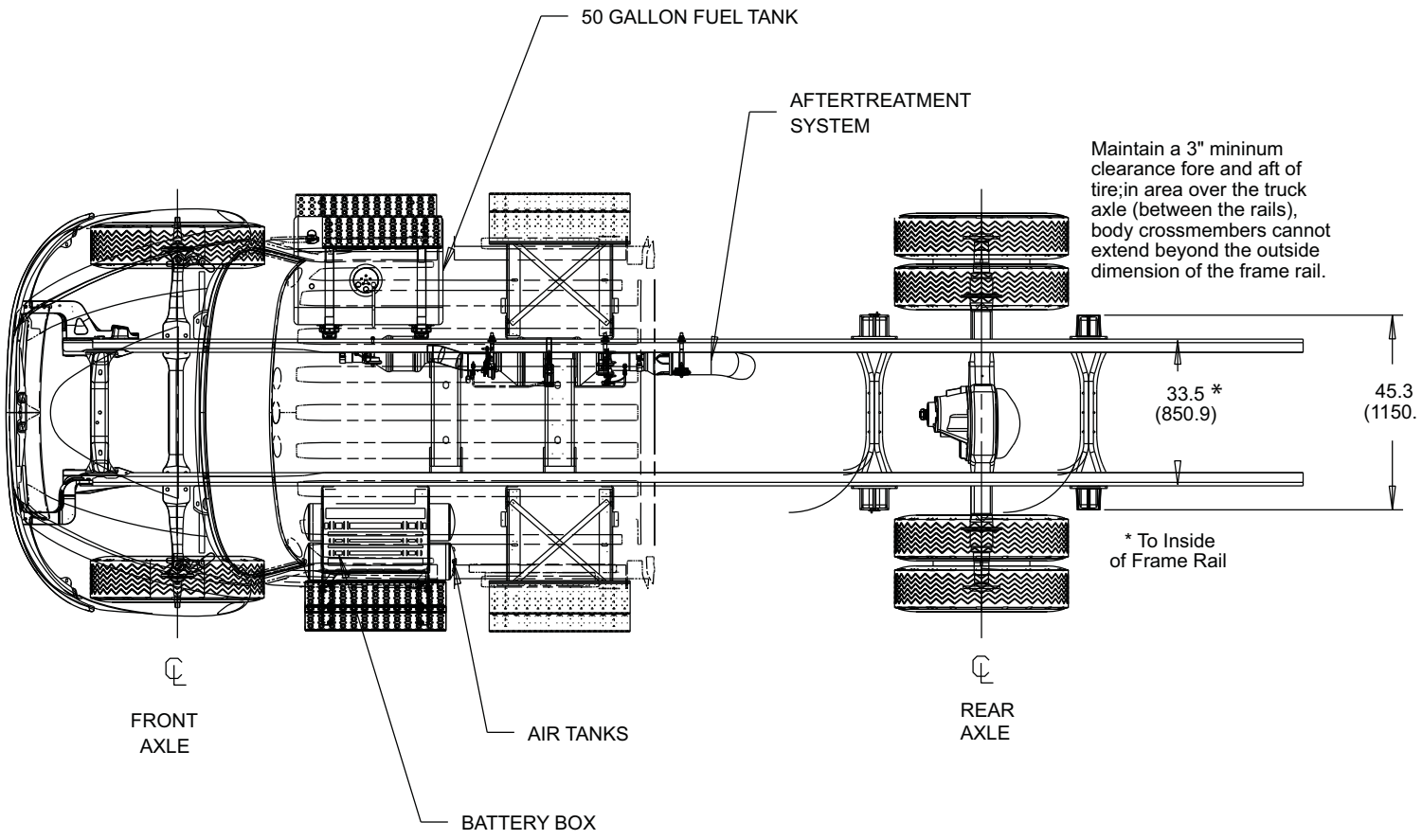
[3] Frame Height at centerline of rear axle: unloaded – 37.00", loaded – 33.26"

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

4400 4X2 MODELS

## *Chassis Diagram*

### ***Plan View – Crew Cab***



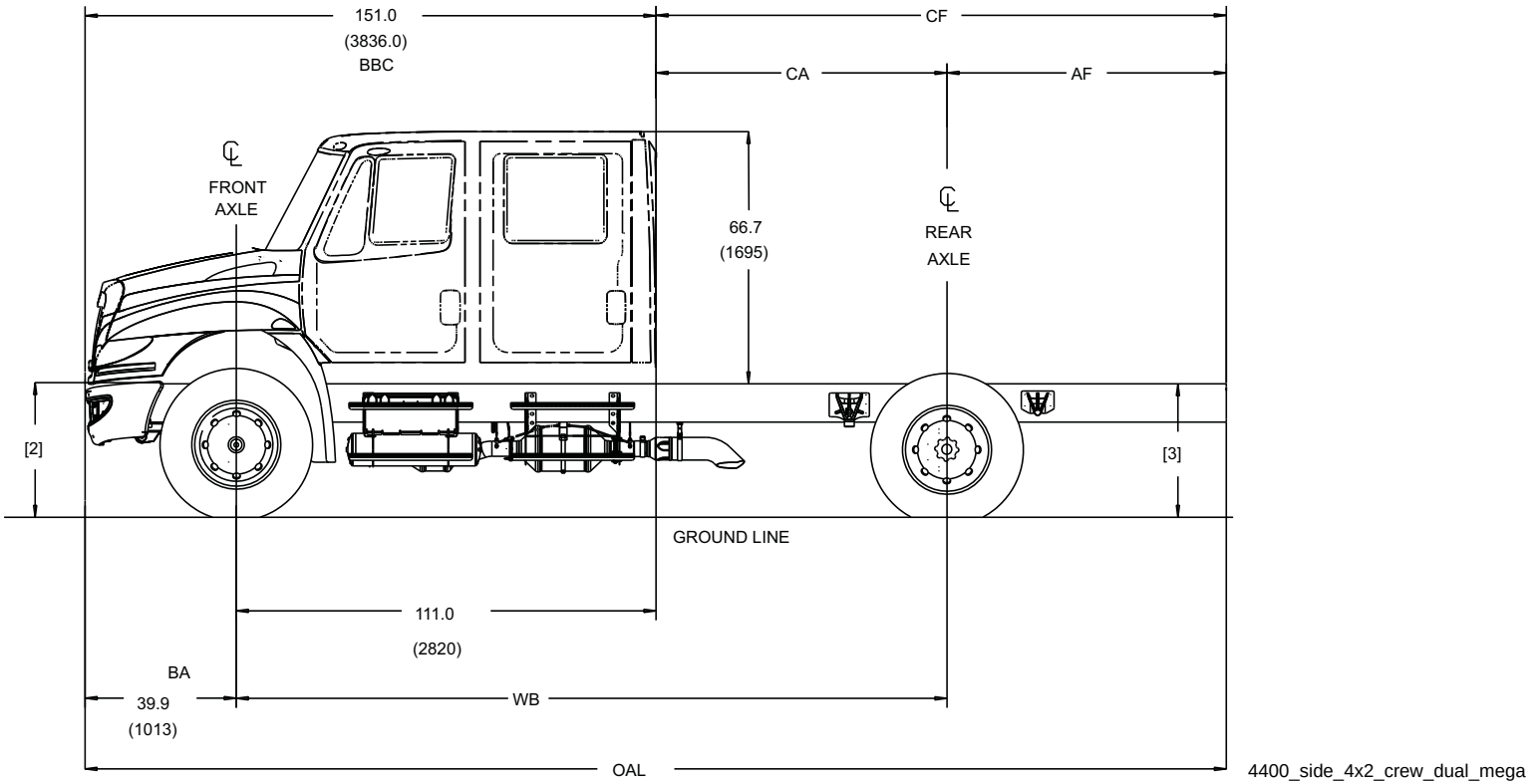

4400_plan_4x2_crew_dual_mega

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

## 4400 4X2 MODELS

### *Chassis Diagram*

#### ***Side View – Crew Cab***




**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

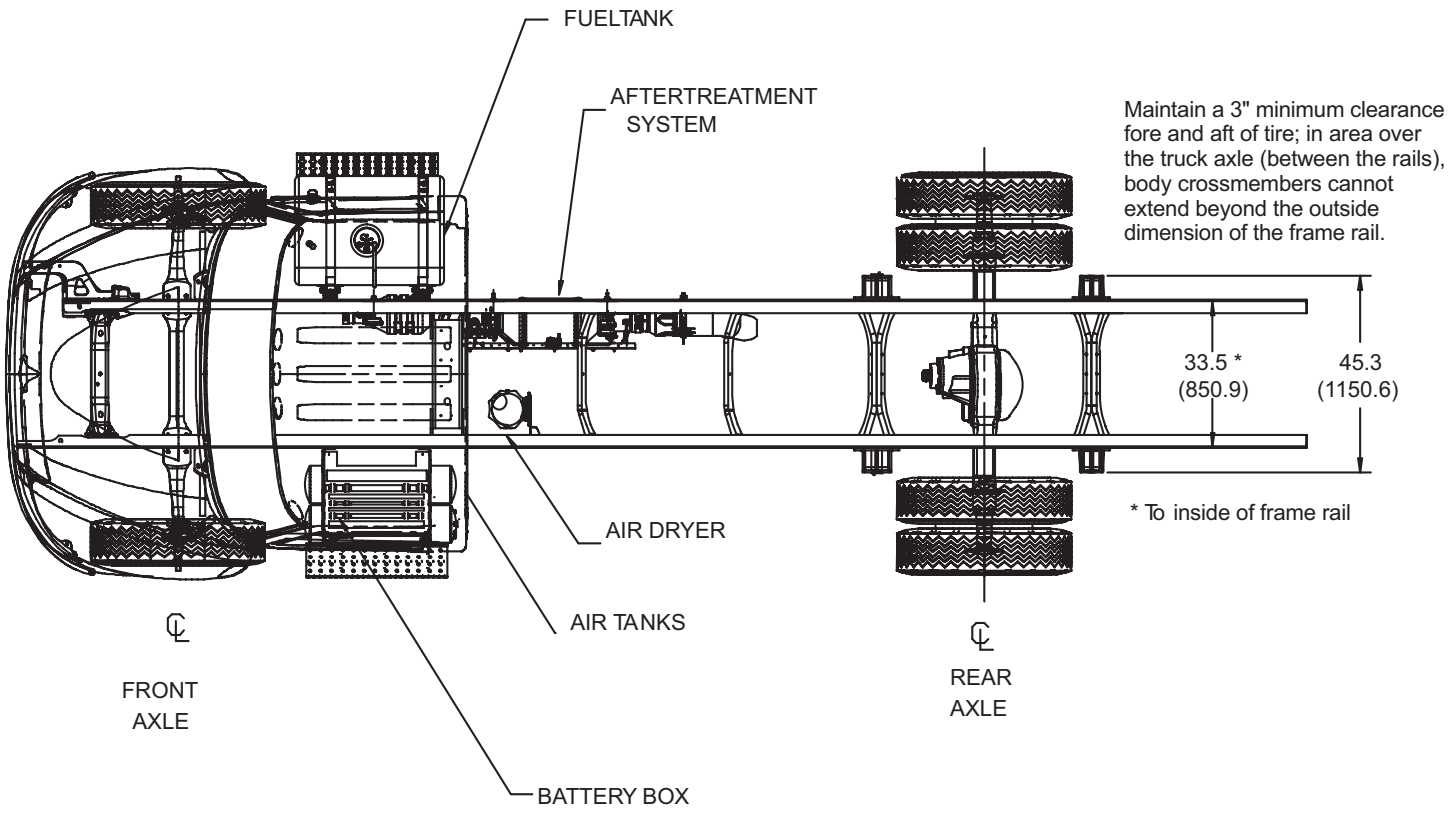
[2] Frame Height at centerline of front axle: unloaded – 33.69", loaded – 31.73"

[3] Frame Height at centerline of rear axle: unloaded – 37.00", loaded – 33.26"

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

## *Chassis Diagram*

### ***Plan View – Standard Cab***



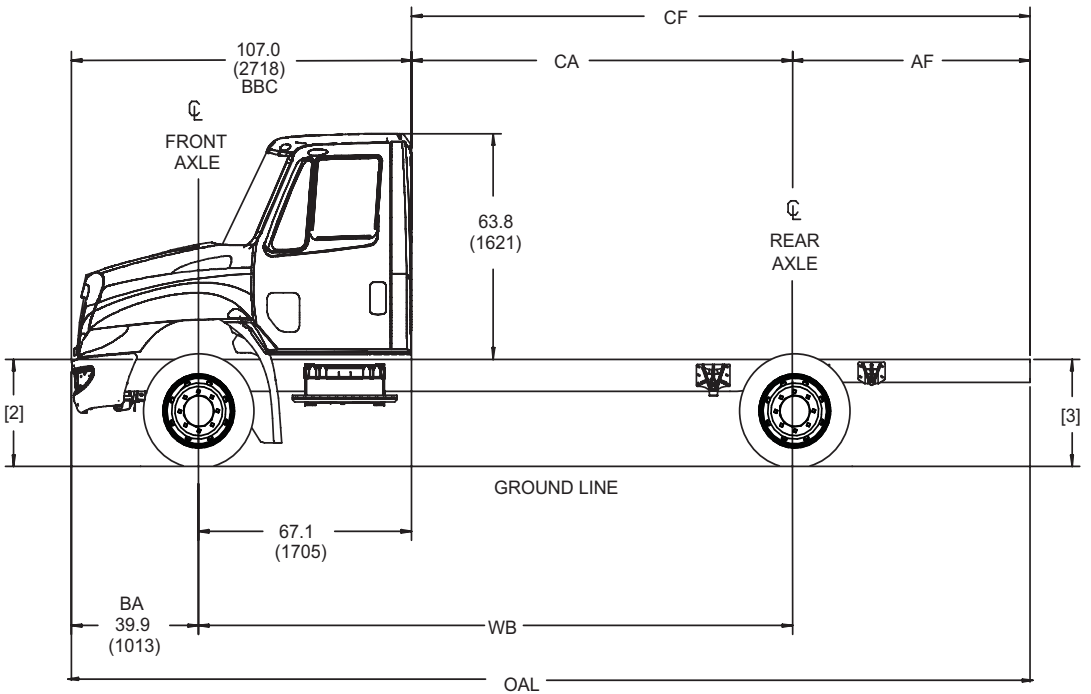

4000_plan_4x2LP_standard

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

## 4300 LP 4X2 MODELS

### *Chassis Diagram*

#### ***Side View – Standard Cab***




4000_side_4x2LP_standard

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle with STD tires: unloaded - 30.87”, loaded - 29.03”

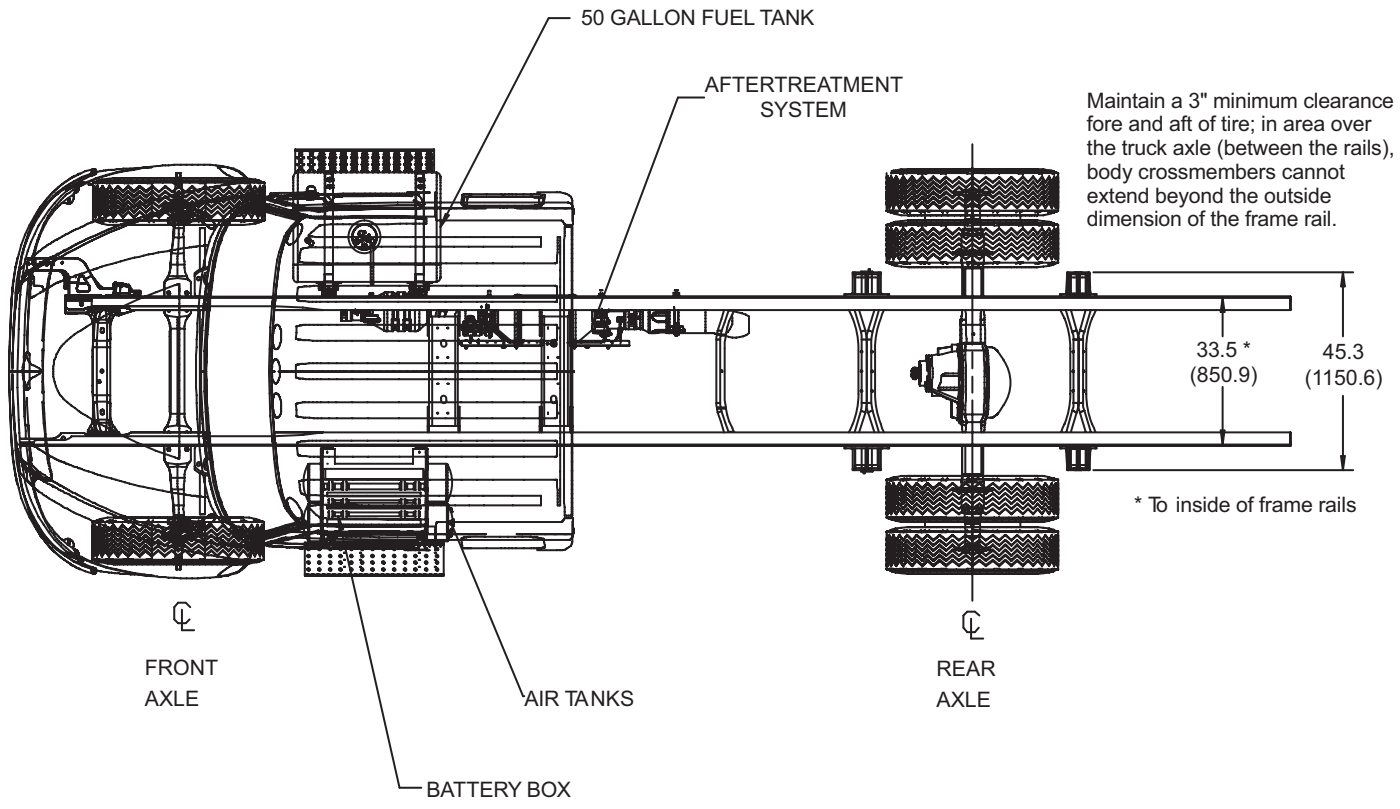
[3] Frame Height at centerline of rear axle with STD suspension and tires: unloaded - 32.98”, loaded - 29.54”.
4300M7 LP:Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded - 30.76”, loaded - 29.64”. Subtract 4.6” with air bags dumped.
4300 LP:Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded – 29.93", loaded – 29.93". Subtract 4.6" with air bags dumped.

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

4300 LP 4X2 MODELS

## *Chassis Diagram*

### ***Plan View – Extended Cab***



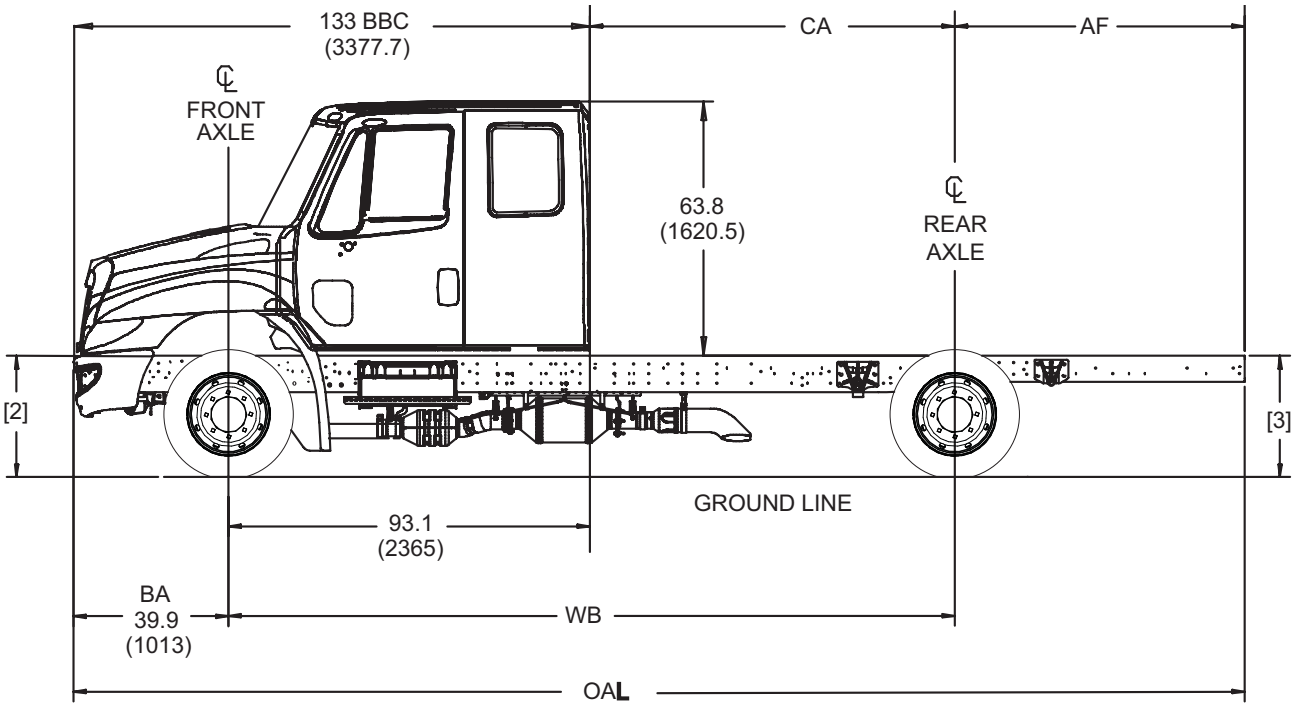

4000_plan_4x2LP_extended

NOTE: This drawing *should not* be used to determine crossmember locations – this information can be found later in this book.

4300 LP 4X2 MODELS

## *Chassis Diagram*

### ***Side View – Extended Cab***




4000_side_4x2LP_extended

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle with STD tires: unloaded - 30.87”, loaded - 29.03”

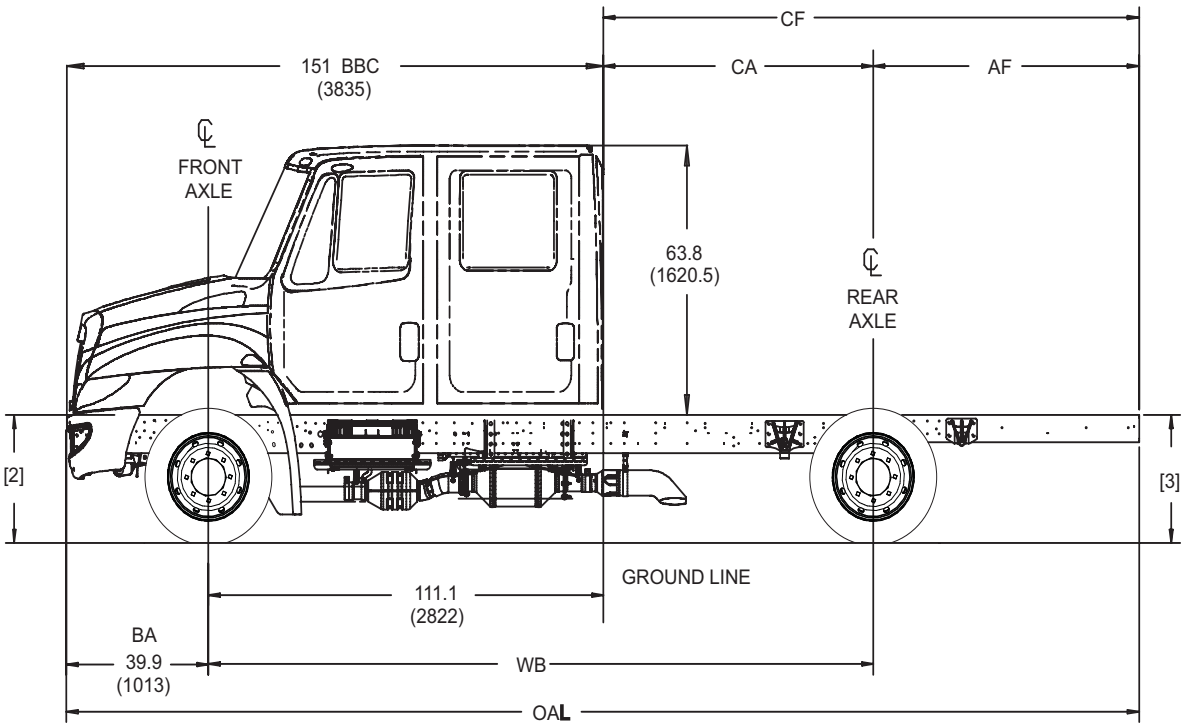
[3] Frame Height at centerline of rear axle with STD suspension and tires: unloaded - 32.98”, loaded - 29.54”.
4300M7 LP: Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded - 30.76”, loaded - 29.64”. Subtract 4.6” with air bags dumped.
4300 LP: Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded – 29.93", loaded – 29.93". Subtract 4.6" with air bags dumped.

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

4300 LP 4X2 MODELS

## *Chassis Diagram*

### ***Side View – Crew Cab***




4000_side_4x2LP_crew

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle with STD tires: unloaded - 30.87”, loaded - 29.03”

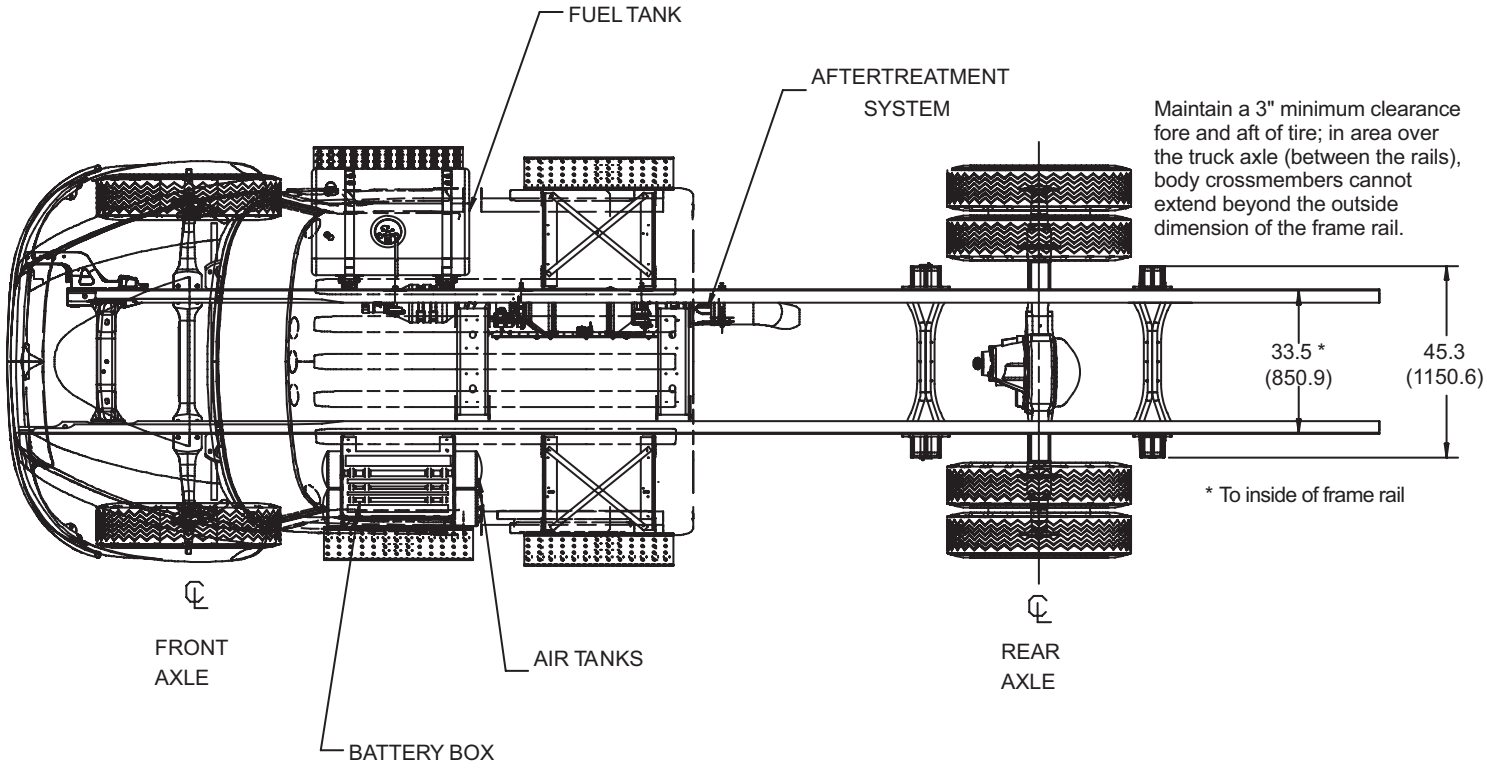
[3] Frame Height at centerline of rear axle with STD suspension and tires: unloaded - 32.98”, loaded - 29.54”.
4300M7 LP: Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded - 30.76”, loaded - 29.64”. Subtract 4.6” with air bags dumped.
4300 LP: Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded – 29.93", loaded – 29.93". Subtract 4.6" with air bags dumped.

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

4300 LP 4X2 MODELS

## *Chassis Diagram*

### ***Plan View – Crew Cab***



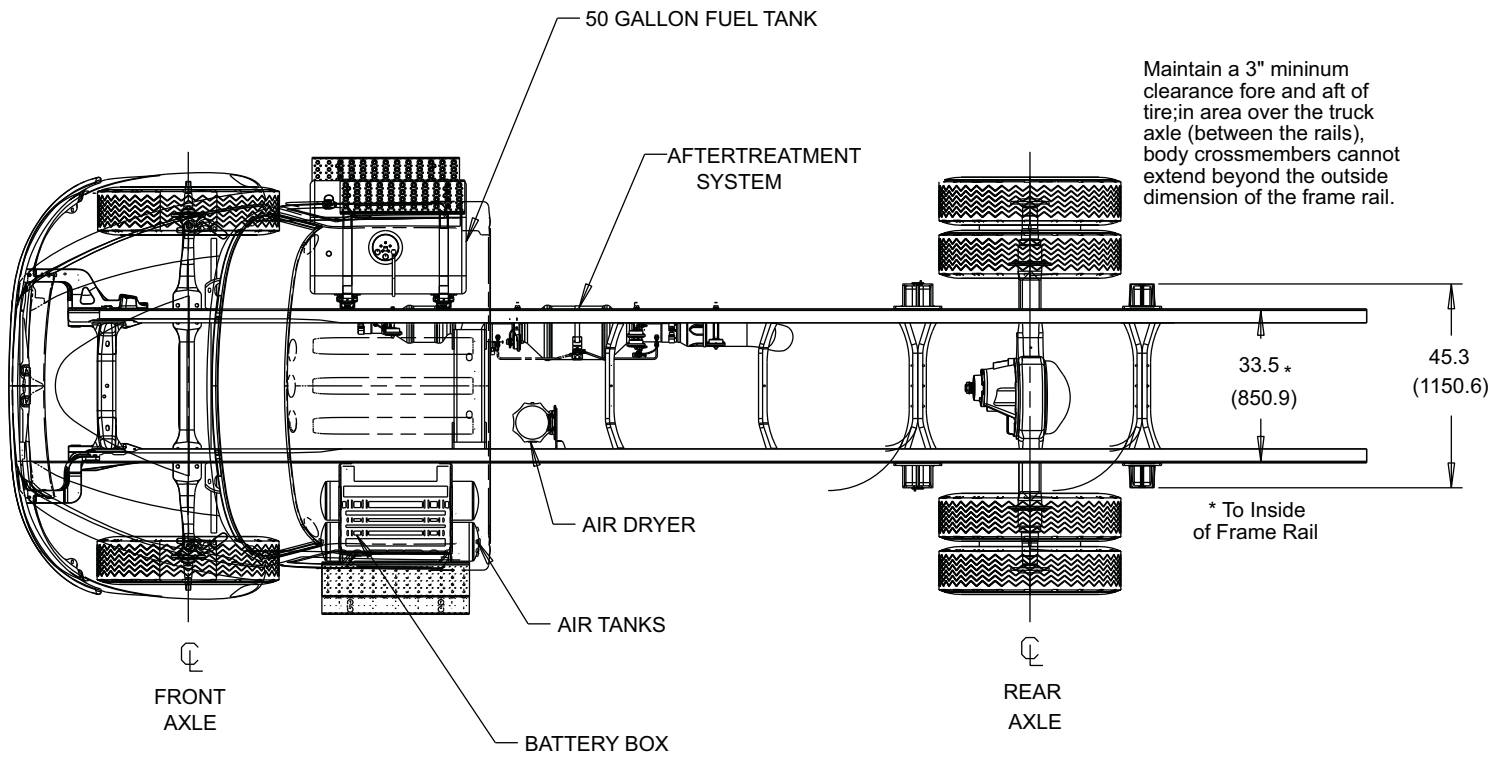

4000_plan_4x2LP_crew

NOTE: This drawing *should not* be used to determine crossmember locations – this information can be found later in this book.

4400 LP 4X2 MODELS

## *Chassis Diagram*

### ***Plan View – Standard Cab***



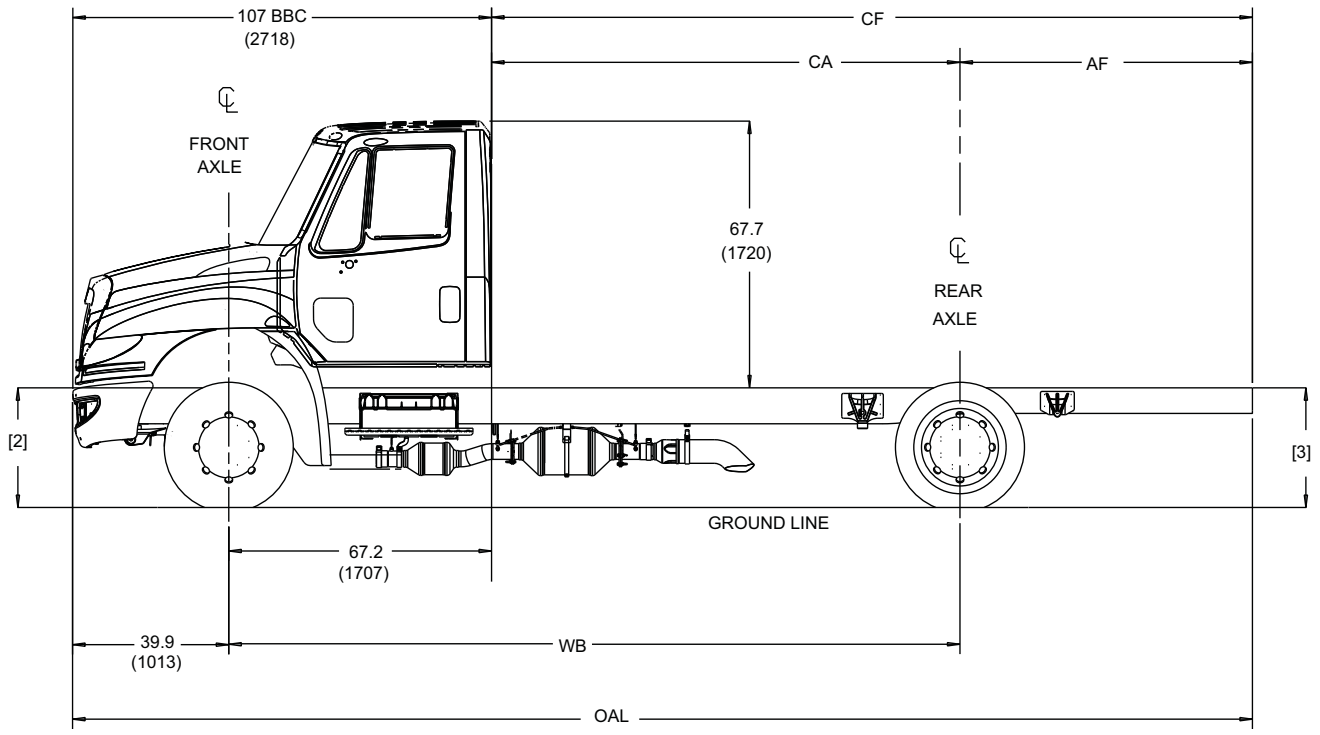

4400_plan_4x2LP_standard_dual_mega

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

# 4400 LP 4X2 MODELS

## *Chassis Diagram*

### ***Side View – Standard Cab***




4400_side_4x2LP_standard_dual_mega

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle with STD tires: unloaded – 30.87", loaded – 29.03"

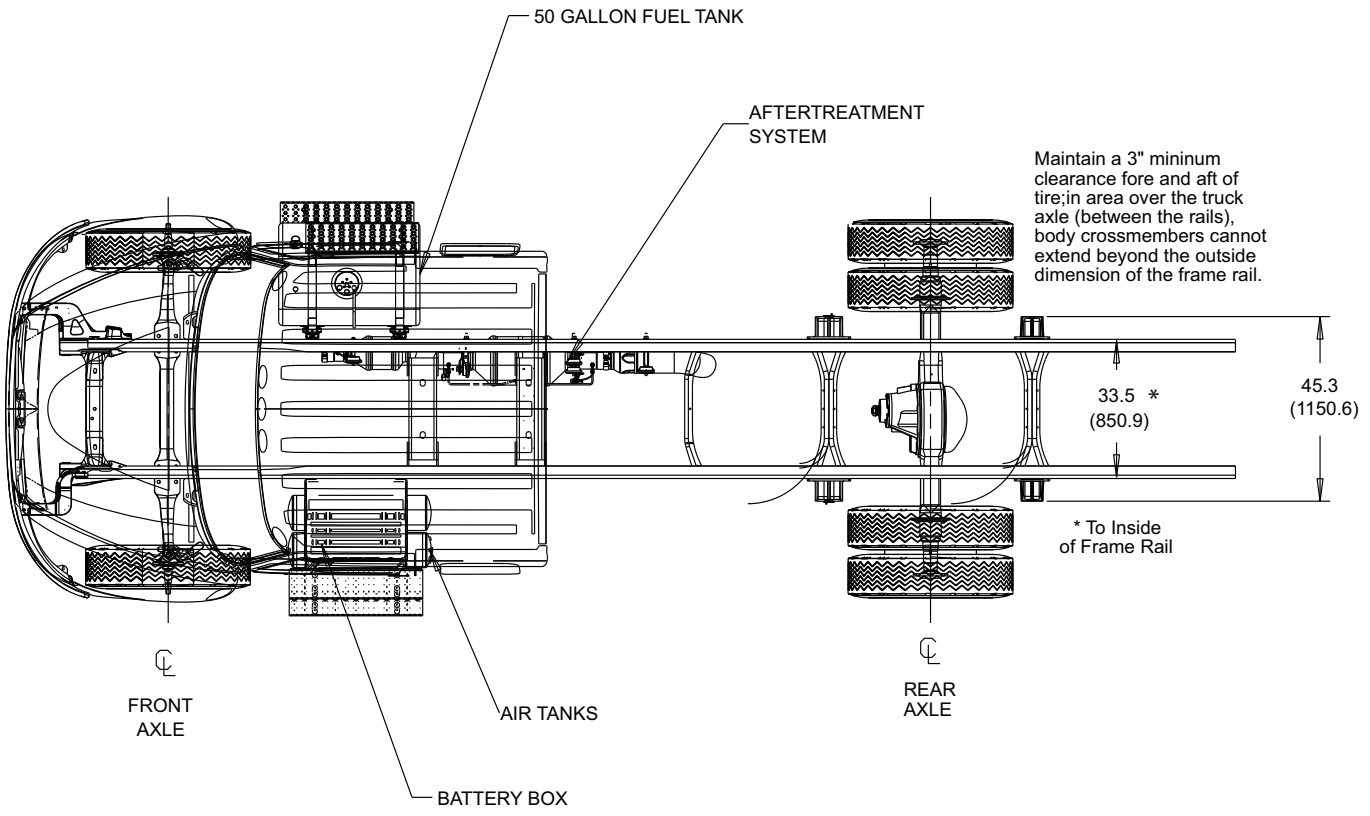
[3] Frame Height at centerline of rear axle with STD suspension and tires: unloaded – 32.98", loaded – 29.54"
Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded – 29.93", loaded – 29.93". Subtract 4.6" with air bags dumped.

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

4400 LP 4X2 MODELS

## *Chassis Diagram*

### ***Plan View – Extended Cab***



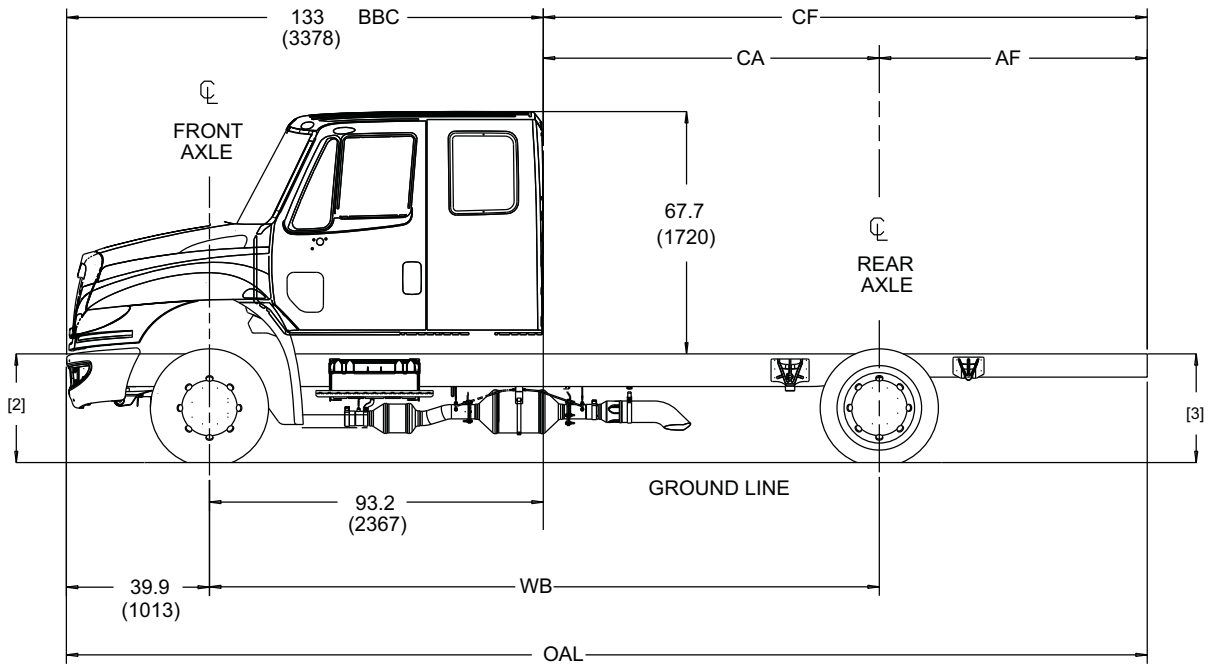

4400_plan_4x2LP_extended_dual_mega

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

4400 LP 4X2 MODELS

## *Chassis Diagram*

### ***Side View – Extended Cab***




4400_side_4x2LP_extended_dual_mega

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle with STD tires: unloaded – 30.87", loaded – 29.03"

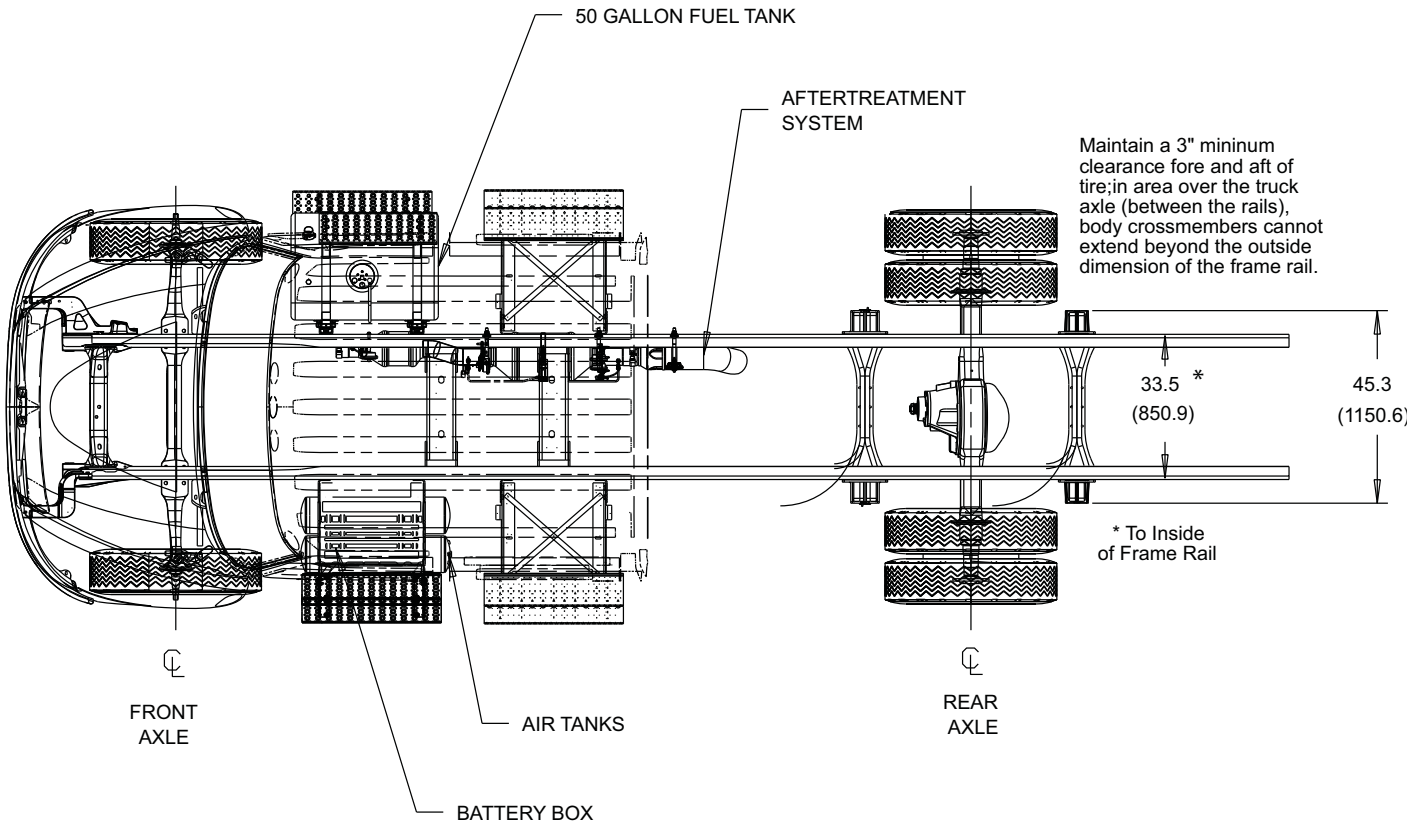
[3] Frame Height at centerline of rear axle with STD suspension and tires: unloaded – 32.98", loaded – 29.54"
Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded – 29.93", loaded – 29.93". Subtract 4.6" with air bags dumped.

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

4400 LP 4X2 MODELS

## *Chassis Diagram*

### ***Plan View – Crew Cab***



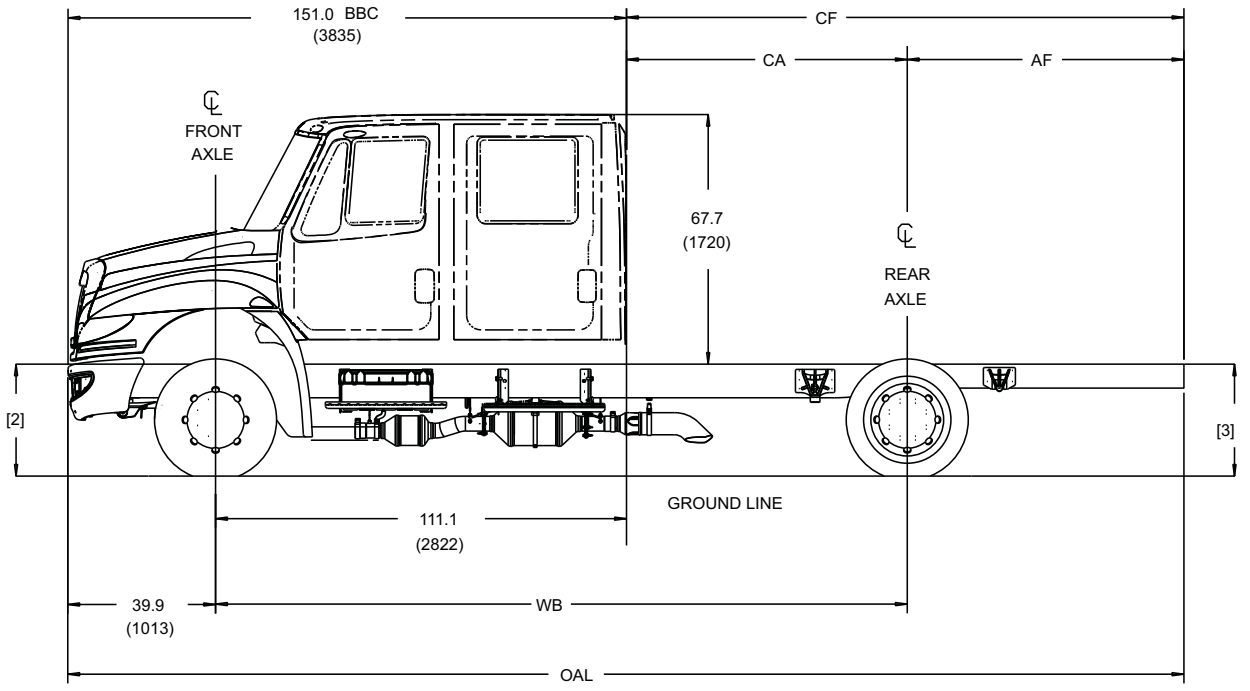

4400_plan_4x2LP_crew_dual_mega

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

# 4400 LP 4X2 MODELS

## *Chassis Diagram*

### ***Side View – Crew Cab***




4400_side_4x2LP_crew_dual_mega

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

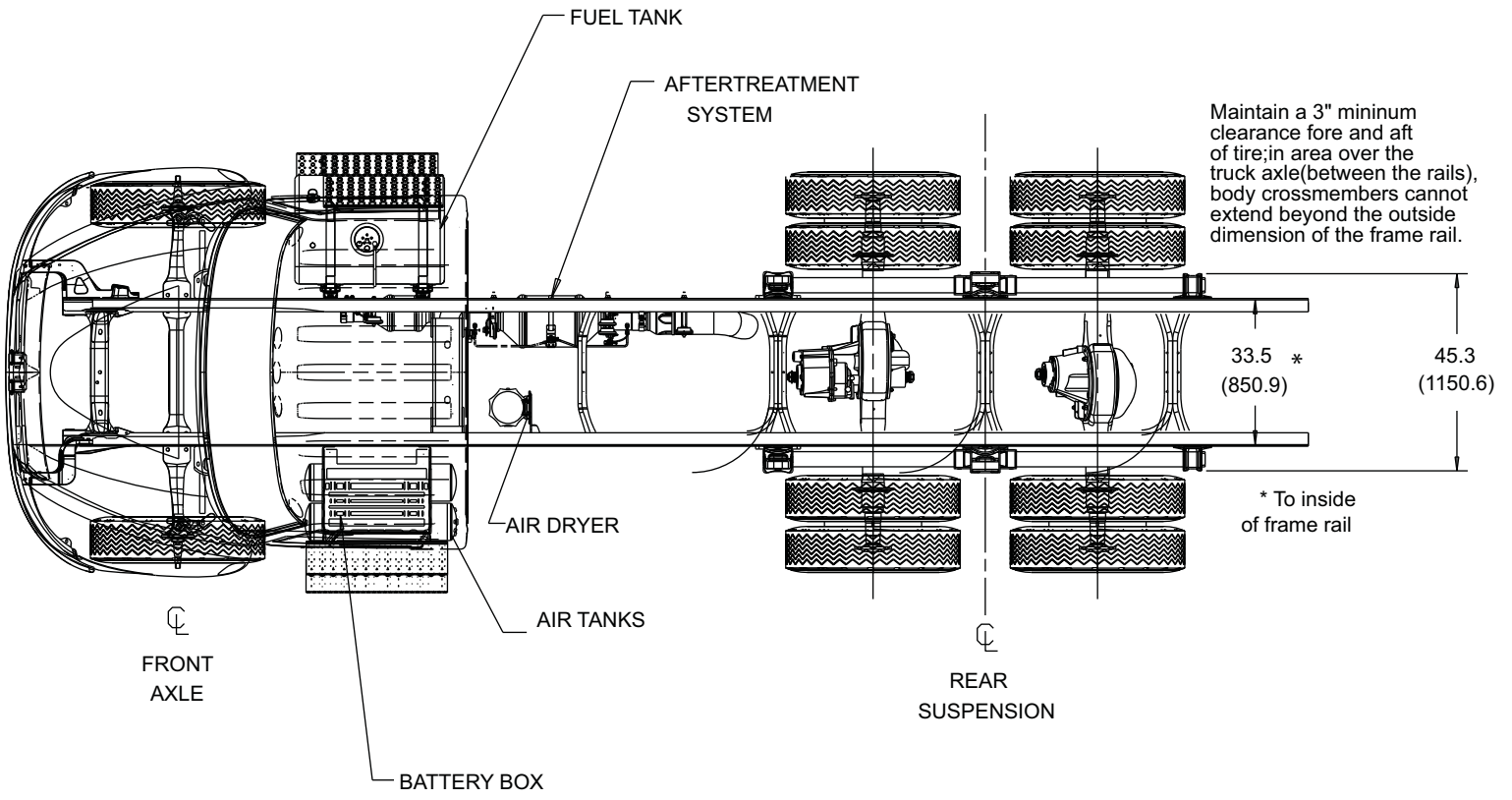
[2] Frame Height at centerline of front axle with STD tires: unloaded – 30.87", loaded – 29.03"

[3] Frame Height at centerline of rear axle with STD suspension and tires: unloaded – 32.98", loaded – 29.54"
Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded – 29.93", loaded – 29.93". Subtract 4.6" with air bags dumped.

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

## *Chassis Diagram*

### ***Plan View – Standard Cab***



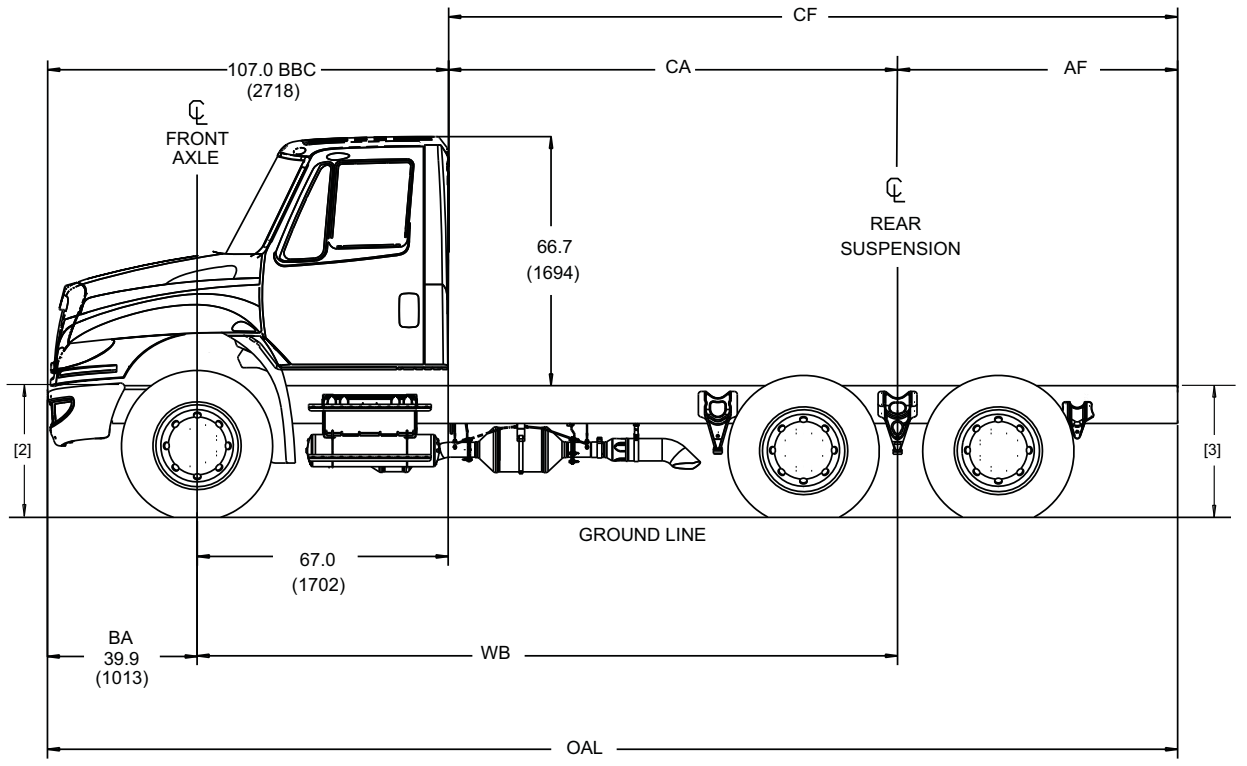

4400_plan_6x4_standard_dual_mega

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

4400 6x4 MODELS

## *Chassis Diagram*

### ***Side View – Standard Cab***




4400_side_6x4_standard_dual_mega

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded – 35.29", loaded – 32.73"

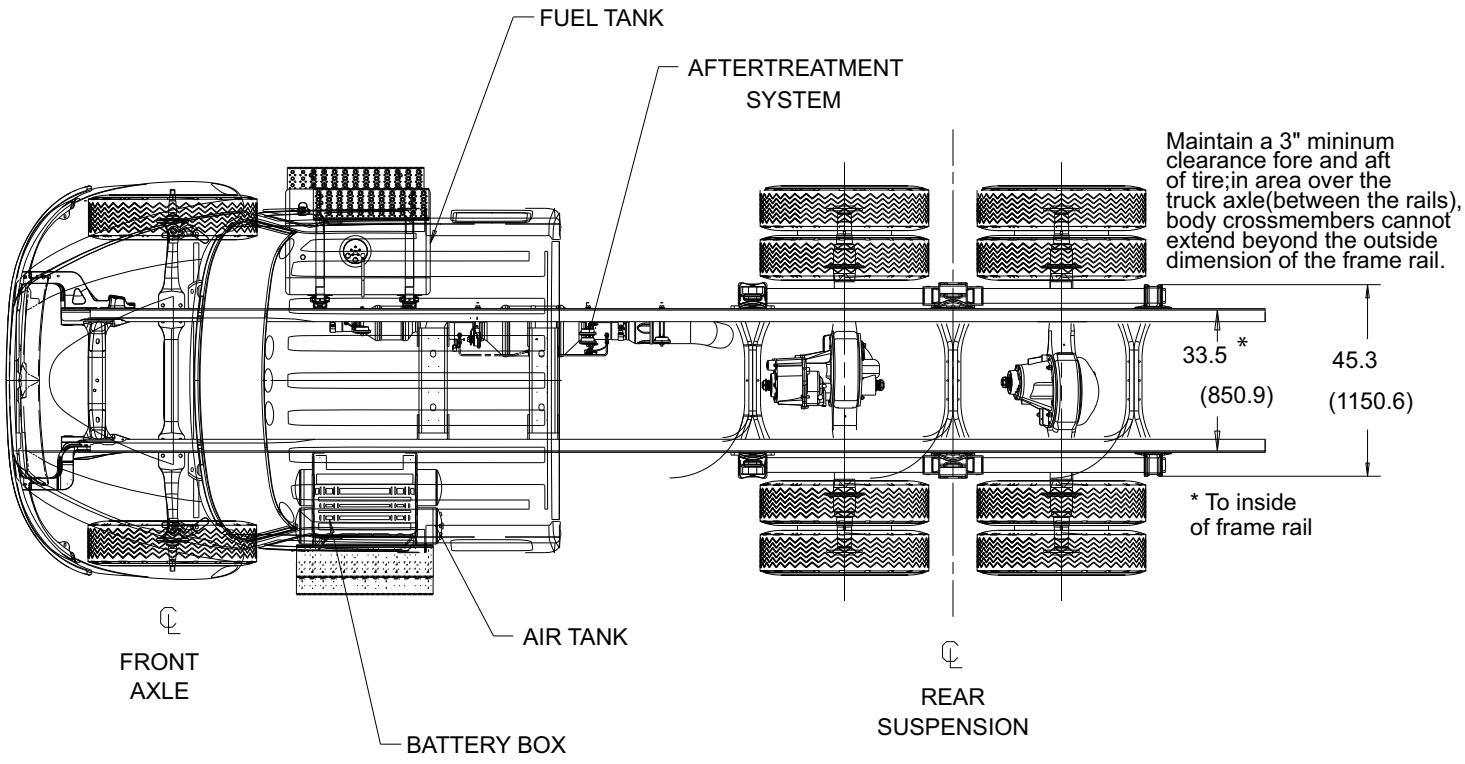
[3] Frame Height at centerline of rear axle: unloaded – 39.87", loaded – 38.29"

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

4400 6x4 MODELS

## *Chassis Diagram*

### ***Plan View – Extended Cab***



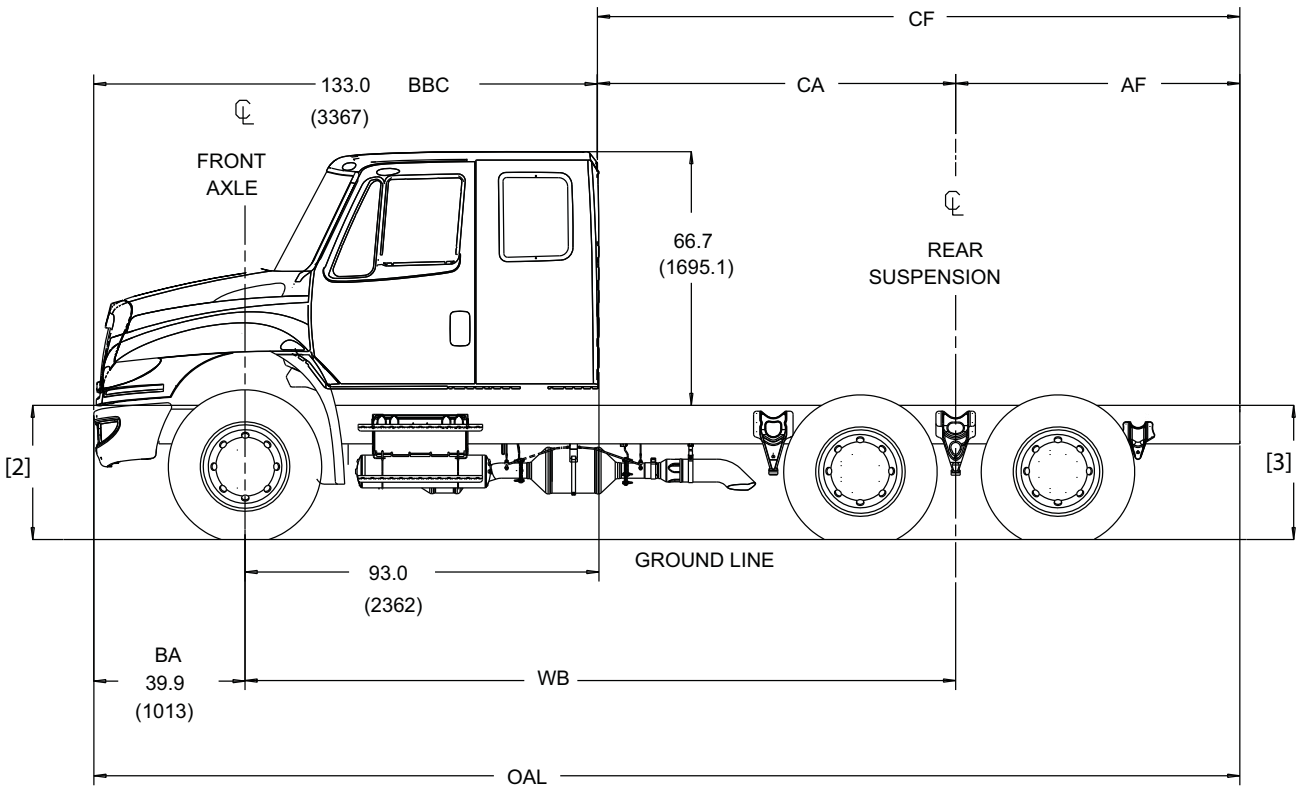

4400_plan_6x4_extended_dual_mega

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

4400 6x4 MODELS

## *Chassis Diagram*

### ***Side View – Extended Cab***




4400_side_6x4_extended_dual_mega

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded – 35.29", loaded – 32.73"

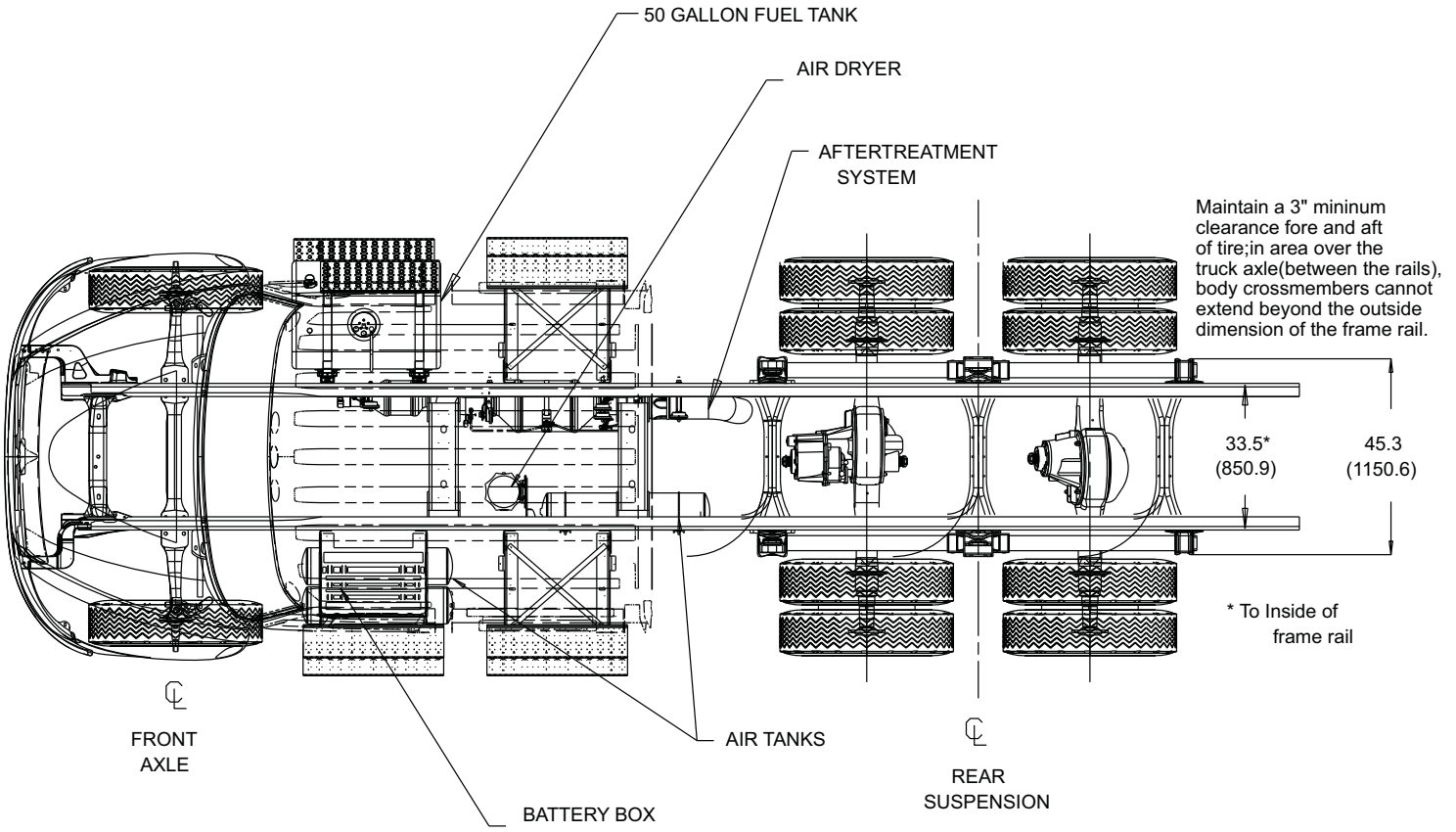
[3] Frame Height at centerline of rear axle: unloaded – 39.87", loaded – 38.29"

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

4400 6x4 MODELS

## *Chassis Diagram*

### ***Plan View – Crew Cab***



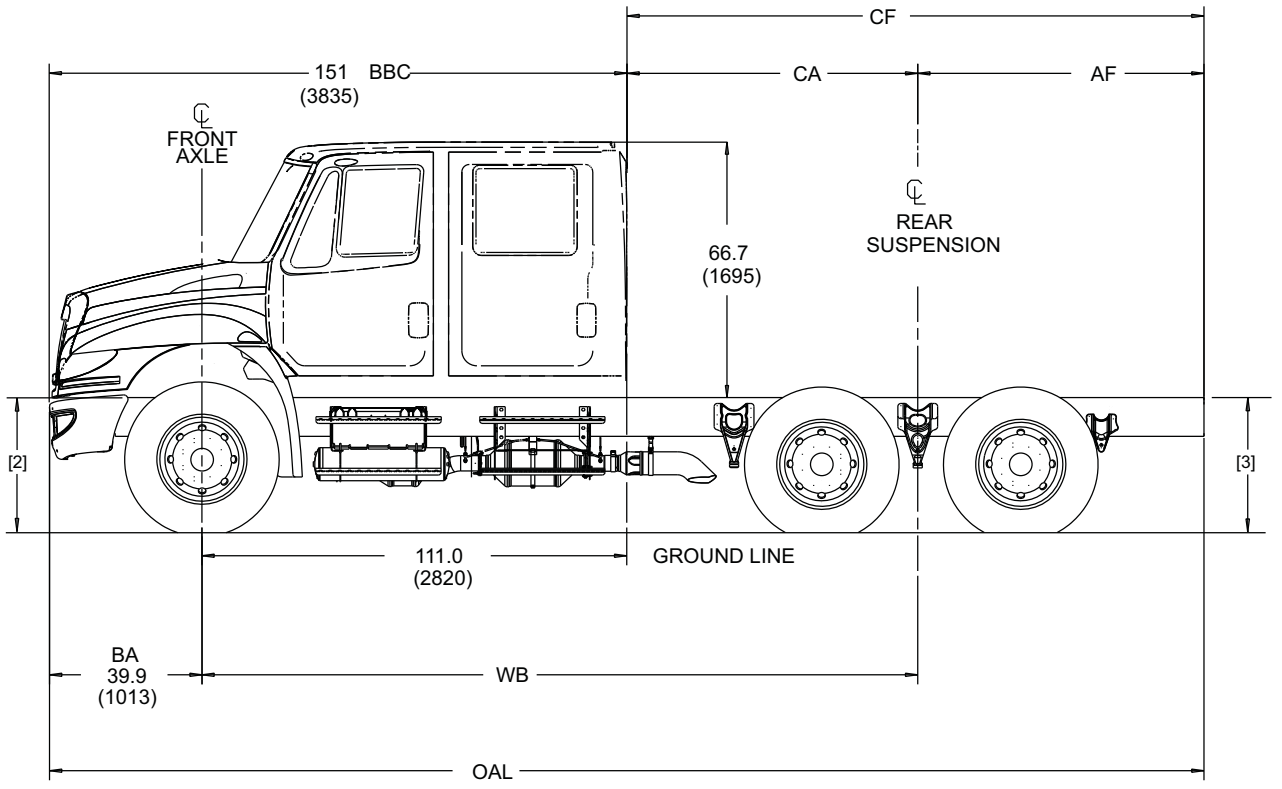

4400_plan_6x4_crew_dual_mega

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

4400 6x4 MODELS

## *Chassis Diagram*

### ***Side View – Crew Cab***




4400_side_6x4_crew_dual_mega

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

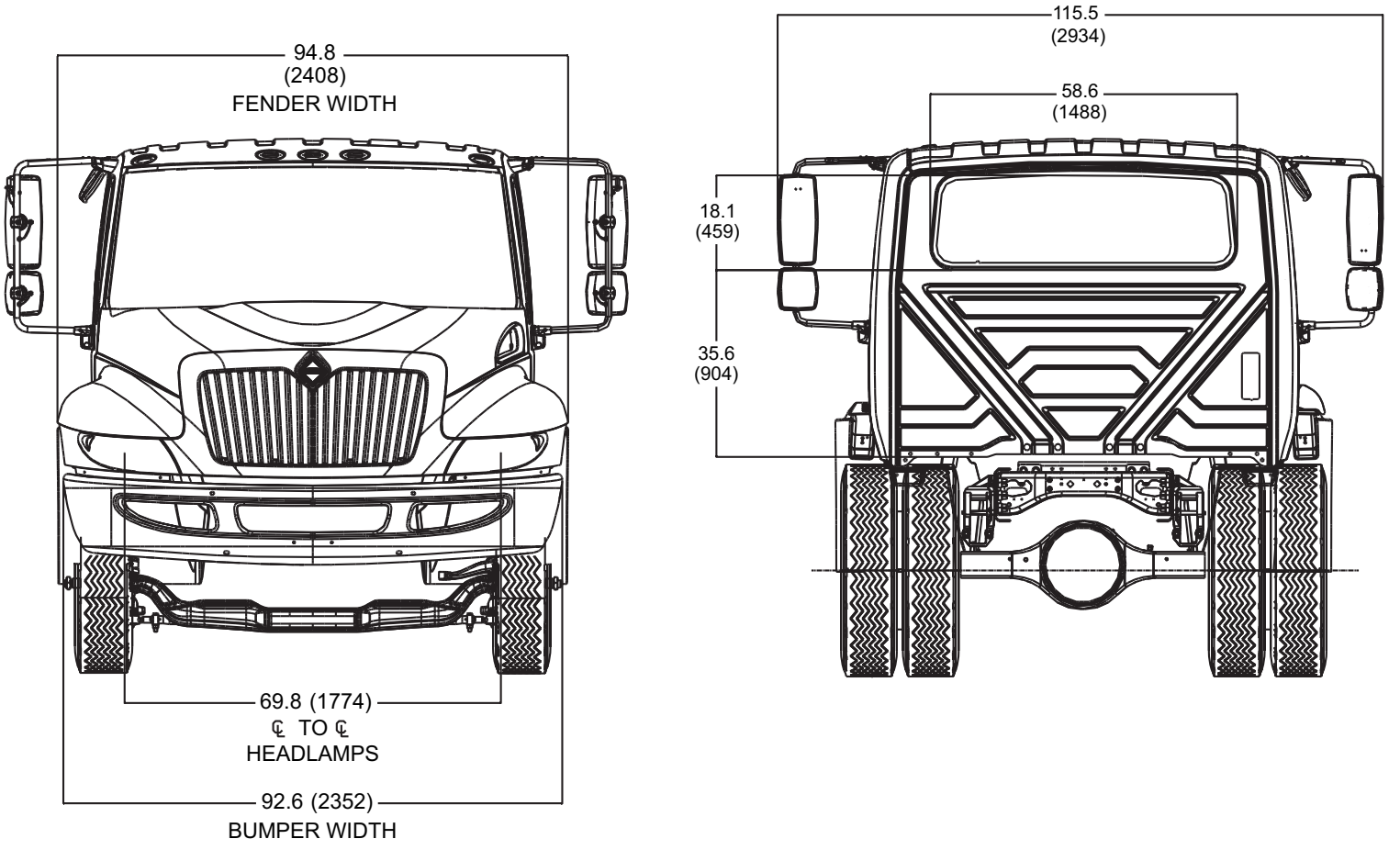
[2] Frame Height at centerline of front axle: unloaded – 35.29", loaded – 32.73"

[3] Frame Height at centerline of rear axle: unloaded – 39.87", loaded – 38.29"

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

## FRONT AND REAR VIEW

### *All Models*




4000_front_rear

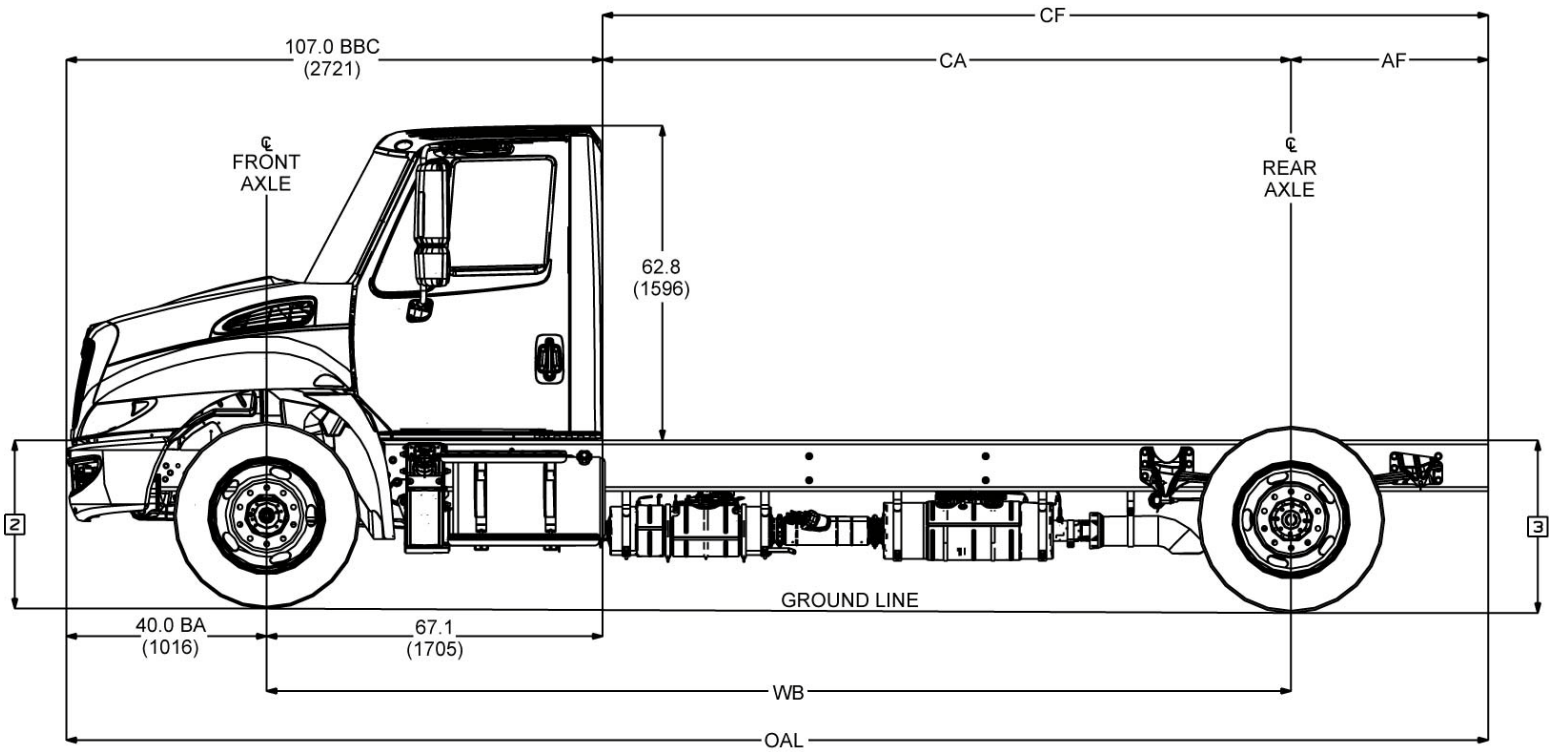
INTERNATIONAL
A NAVISTAR COMPANY

# CHASSIS DIAGRAMS (SCR)

## *4300 4X2 MODELS*

### *Chassis Diagram*

#### ***Side View – Day Cab***




4300_4x2_MA025_isb_day_cab_lsv

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded - 33.69”, loaded - 31.73”

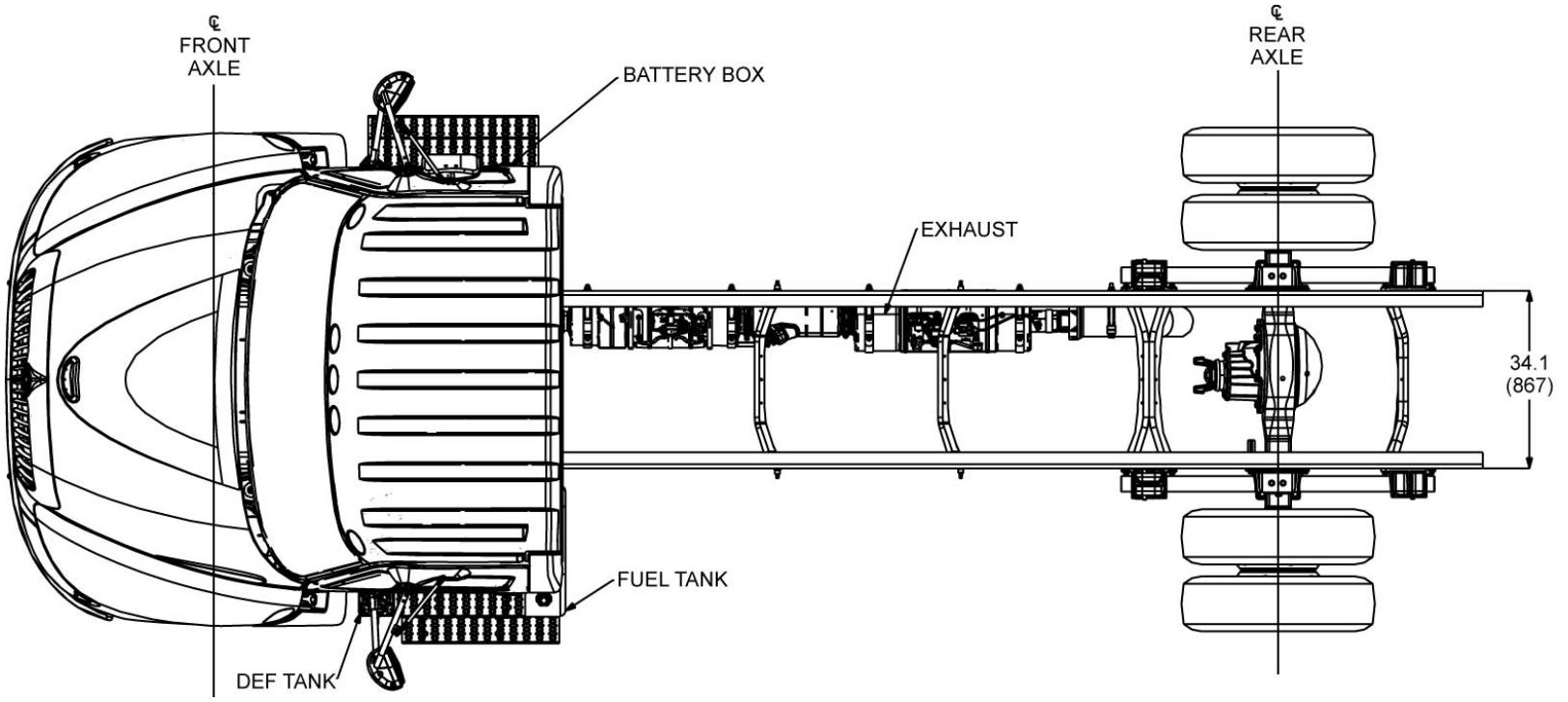
[3] Frame Height at centerline of rear axle: unloaded - 35.56”, loaded - 32.02”

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4300 4X2 MODELS*

## *Chassis Diagram*

### ***Plan View – Day Cab***



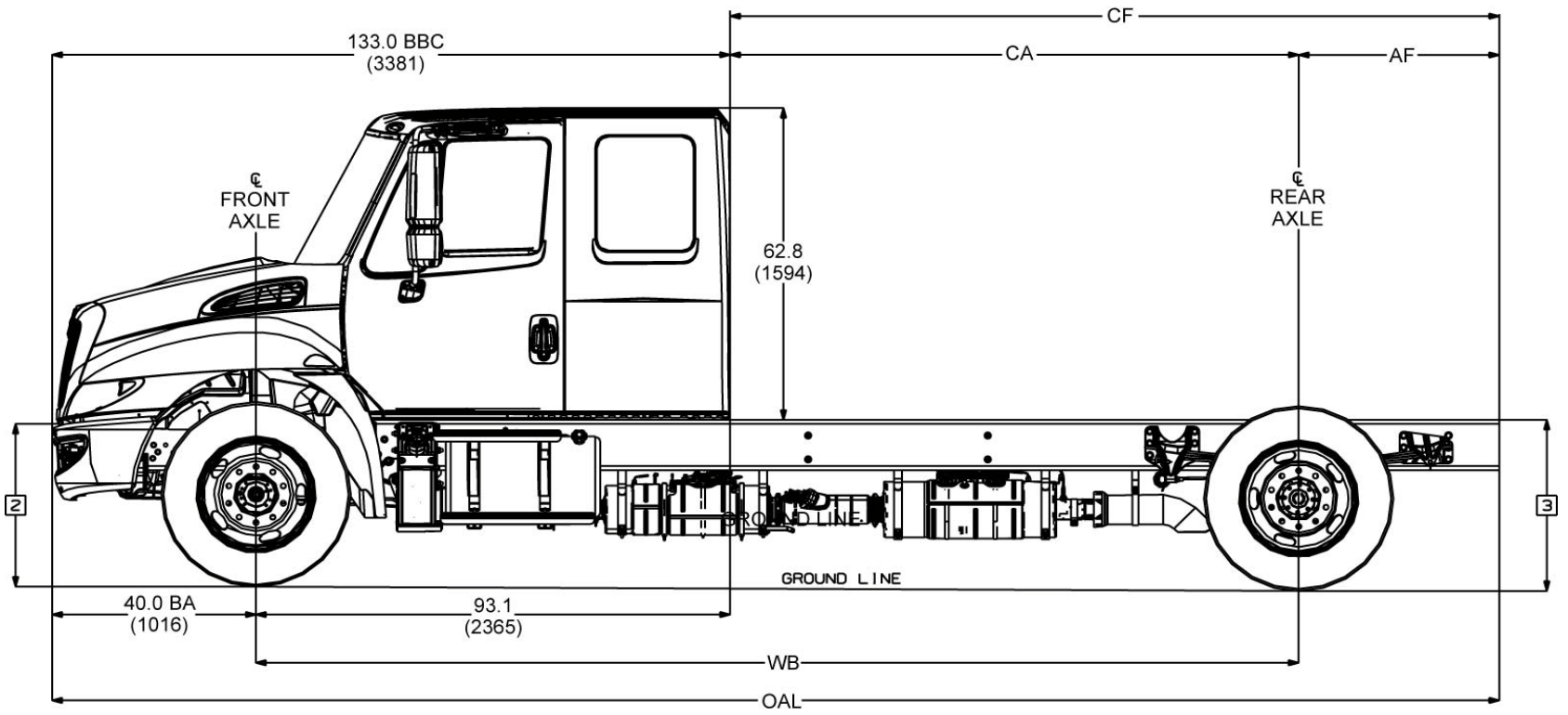

4300_4x2_MA025_isb_day_cab_plan

NOTE: This drawing *should not* be used to determine crossmember locations – this information can be found later in this book.

## 4300 4X2 MODELS

### Chassis Diagram

#### *Side View – Extended Cab*




4300_4x2_MA025_isb_ext_cab_lsv

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded – 33.69", loaded – 31.73"

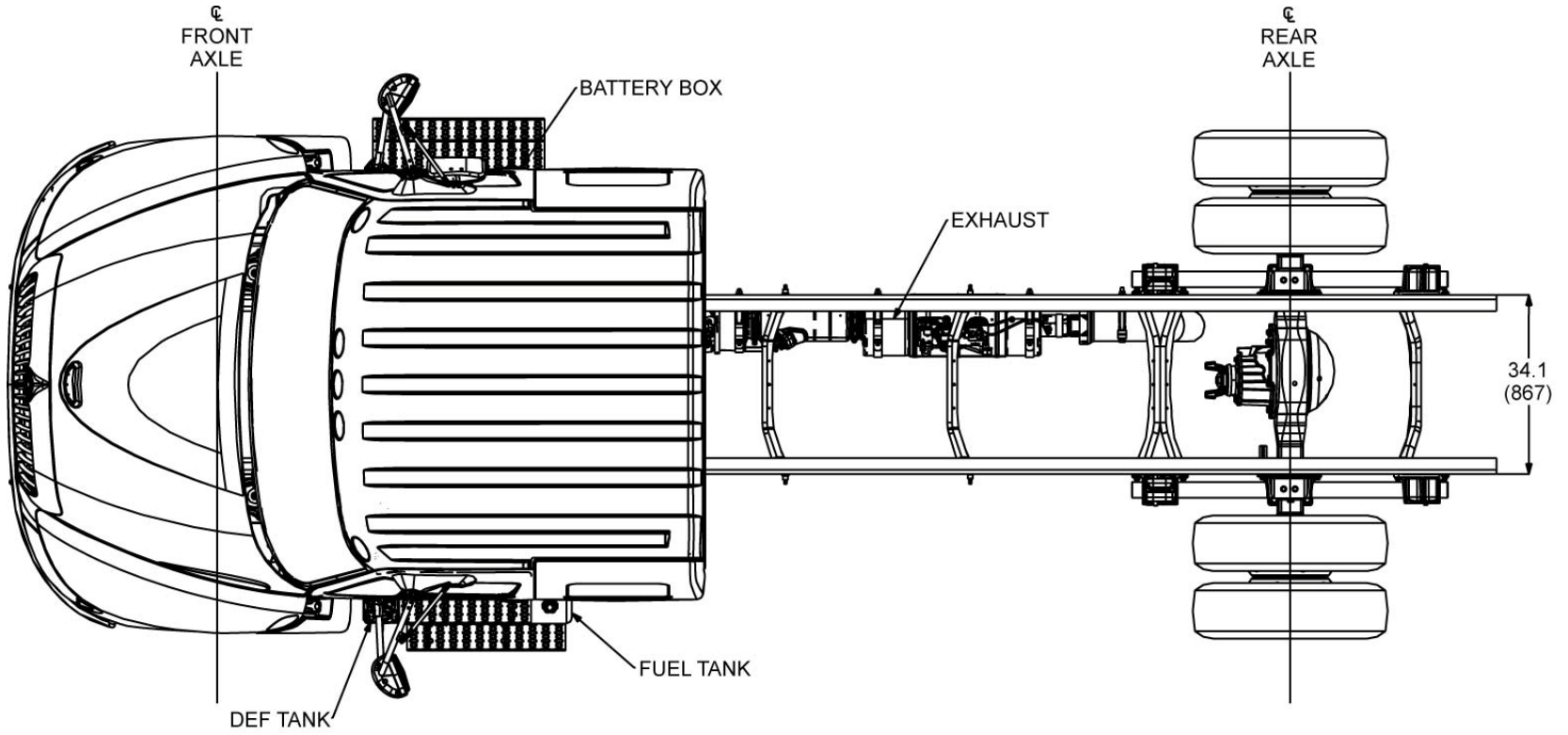
[3] Frame Height at centerline of rear axle: unloaded – 35.56", loaded – 32.02"

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4300 4x2 MODELS*

## *Chassis Diagram*

### ***Plan View – Extended Cab***



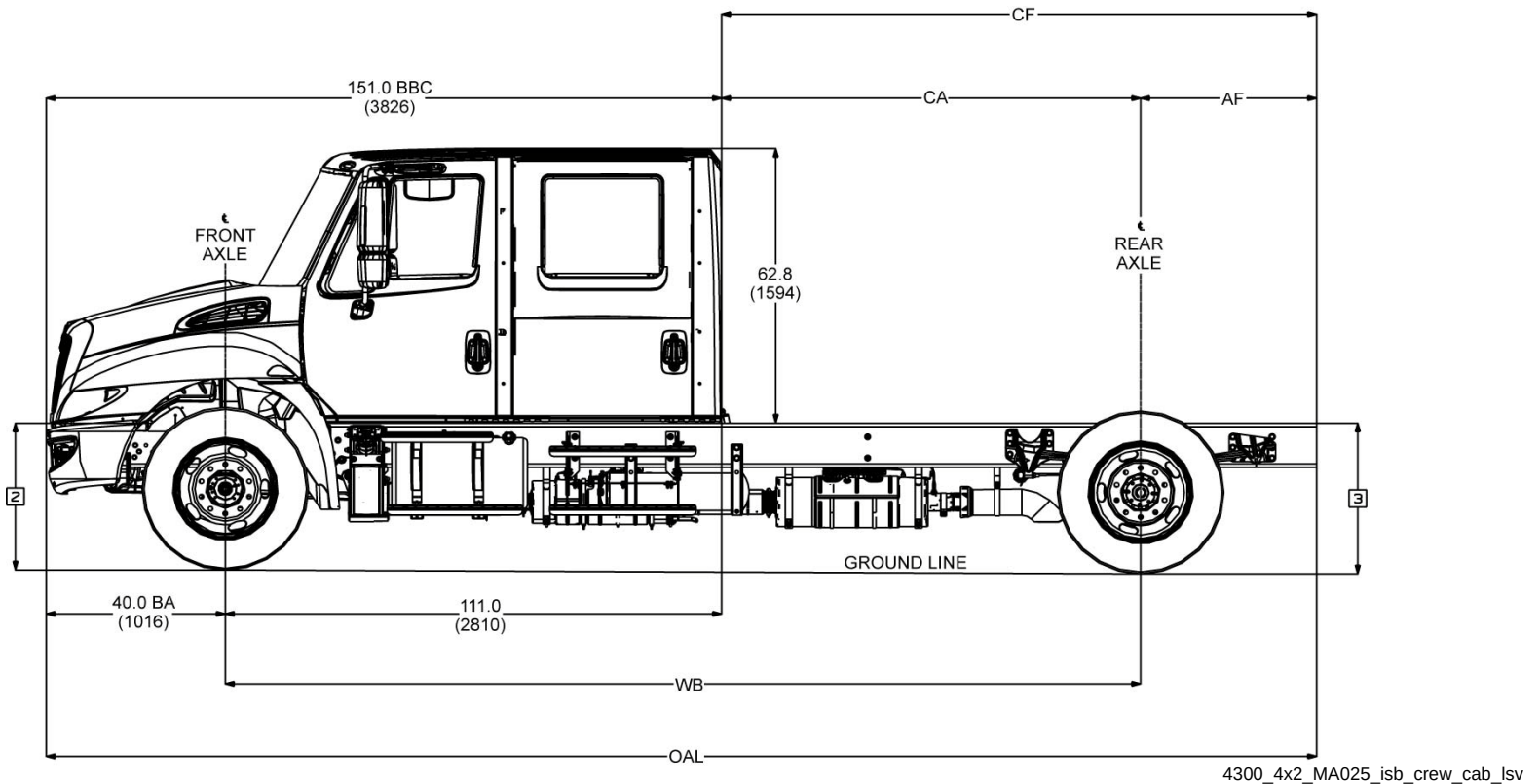

4300_4x2_MA025_isb_ext_cab_plan

NOTE: This drawing *should not* be used to determine crossmember locations – this information can be found later in this book.

# 4300 4X2 MODELS

## Chassis Diagram

### *Side View – Crew Cab*




**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded – 33.69", loaded – 31.73"

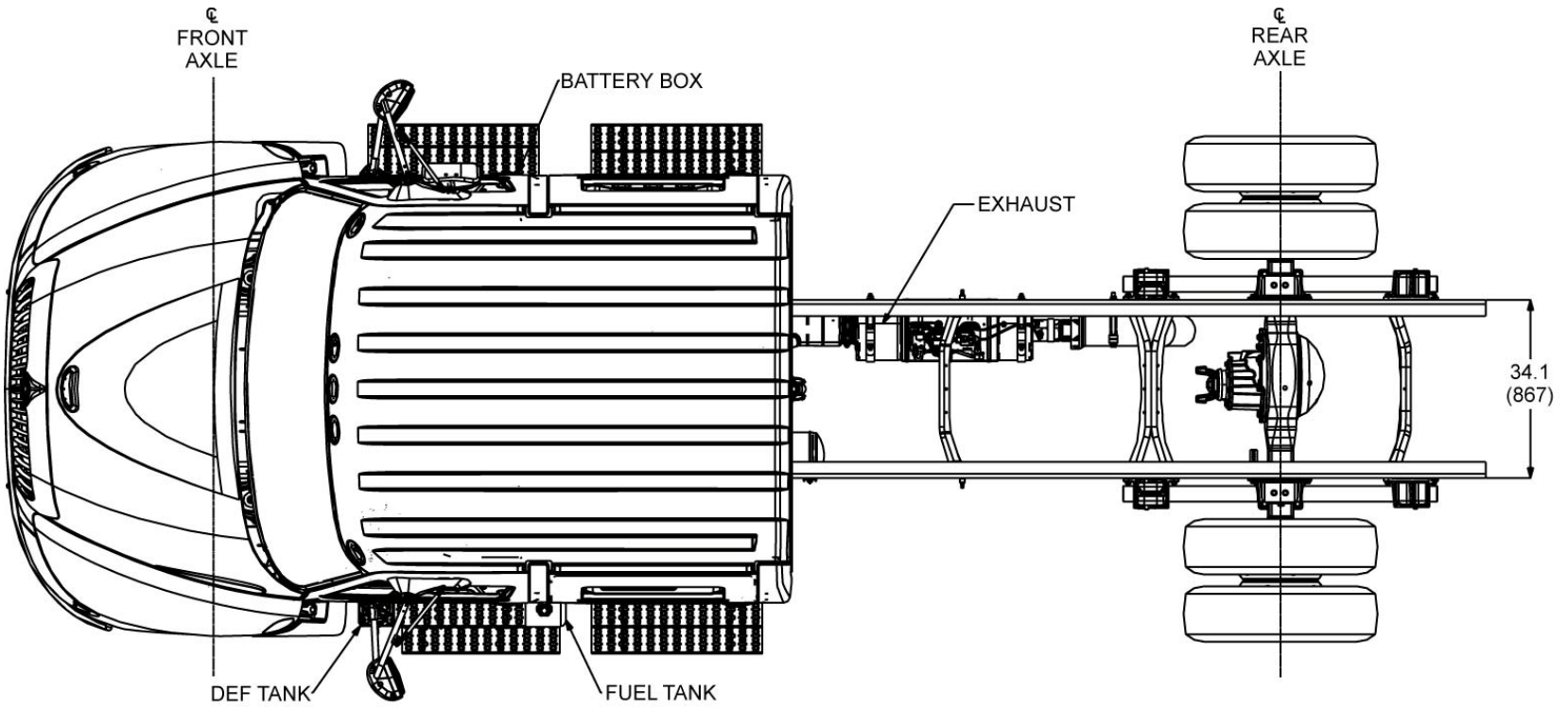
[3] Frame Height at centerline of rear axle: unloaded – 35.56", loaded – 32.02"

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4300 4X2 MODELS*

## *Chassis Diagram*

### ***Plan View – Crew Cab***



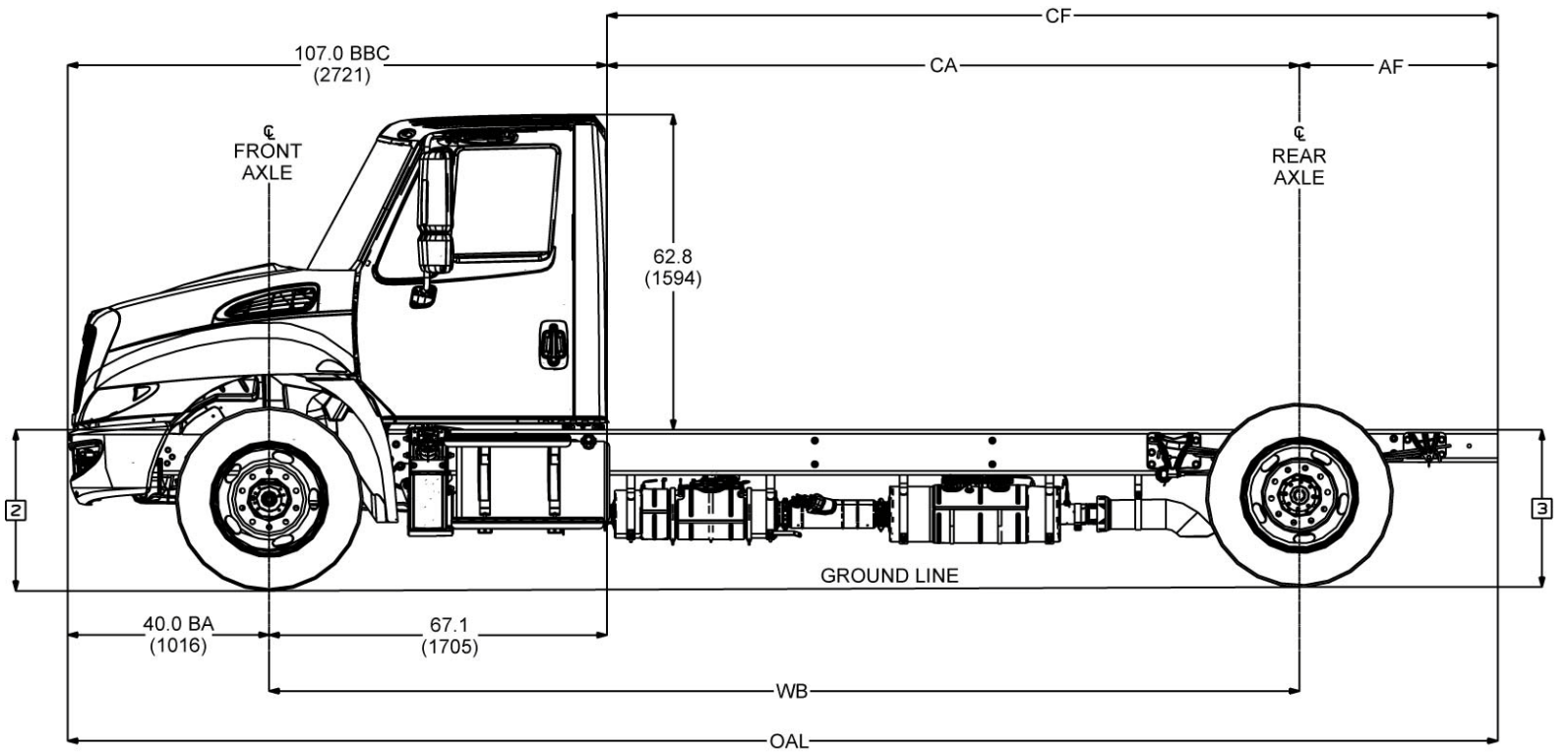

4300_4x2_MA025_isb_crew_cab_plan.

NOTE: This drawing *should not* be used to determine crossmember locations – this information can be found later in this book.

# 4300 LP 4X2 MODELS

## Chassis Diagram

### *Side View – Day Cab*




4300LP_4x2_MH025_isb_day_cab_lsv

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded - 30.87”, loaded - 29.03”

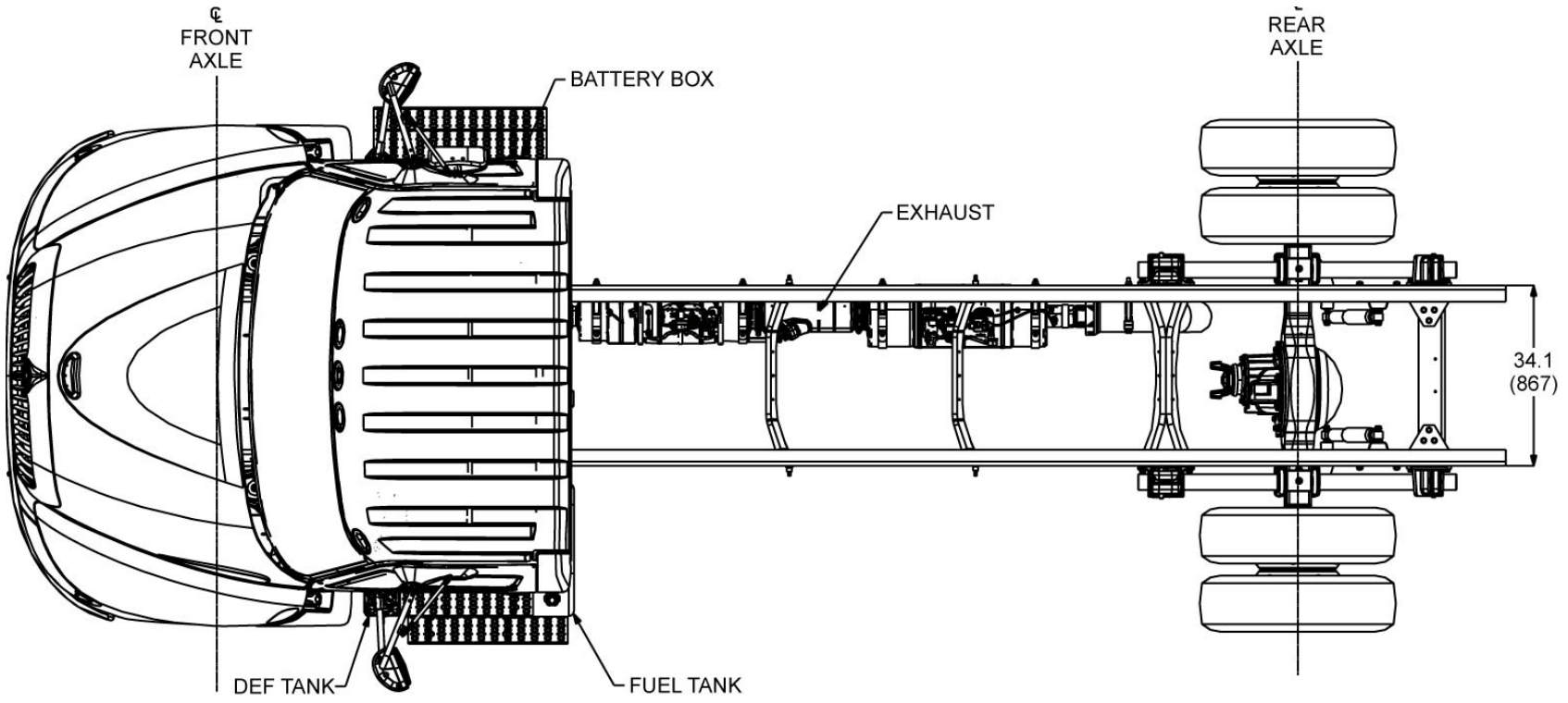
[3] Frame Height at centerline of rear axle: unloaded - 32.98”, loaded - 29.54”. Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded - 30.76”, loaded - 29.64”. Subtract 4.6” with air bags dumped.

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4300 LP 4X2 MODELS*

## *Chassis Diagram*

### ***Plan View – Day Cab***



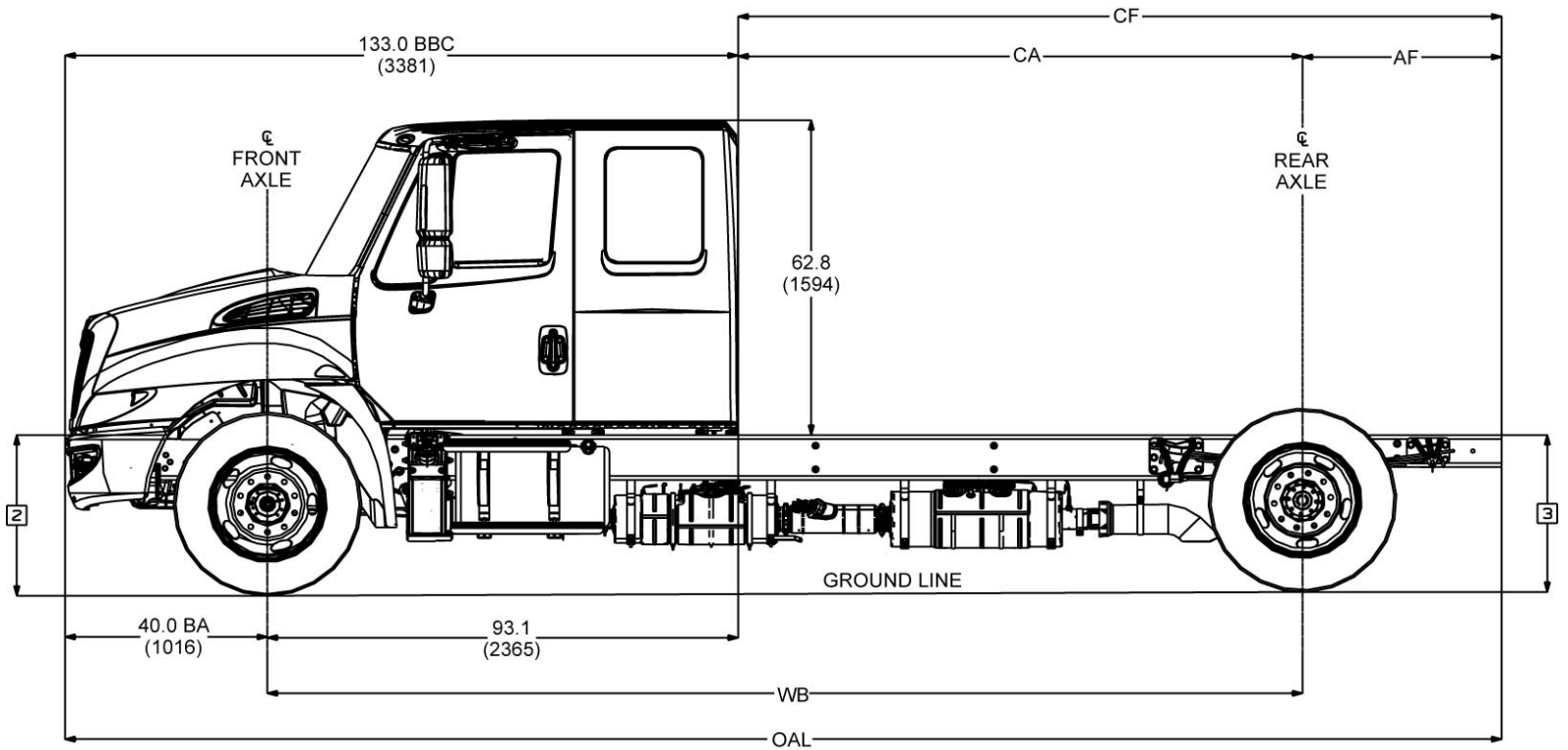

4300_lp_4x2_MH025_isb_day_cab_plan

NOTE: This drawing *should not* be used to determine crossmember locations – this information can be found later in this book.

## *4300 LP 4X2 MODELS*

### *Chassis Diagram*

#### ***Side View – Extended Cab***




4300LP_4x2_MH025_isb_ext_cab_lsv

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded - 30.87", loaded - 29.03"

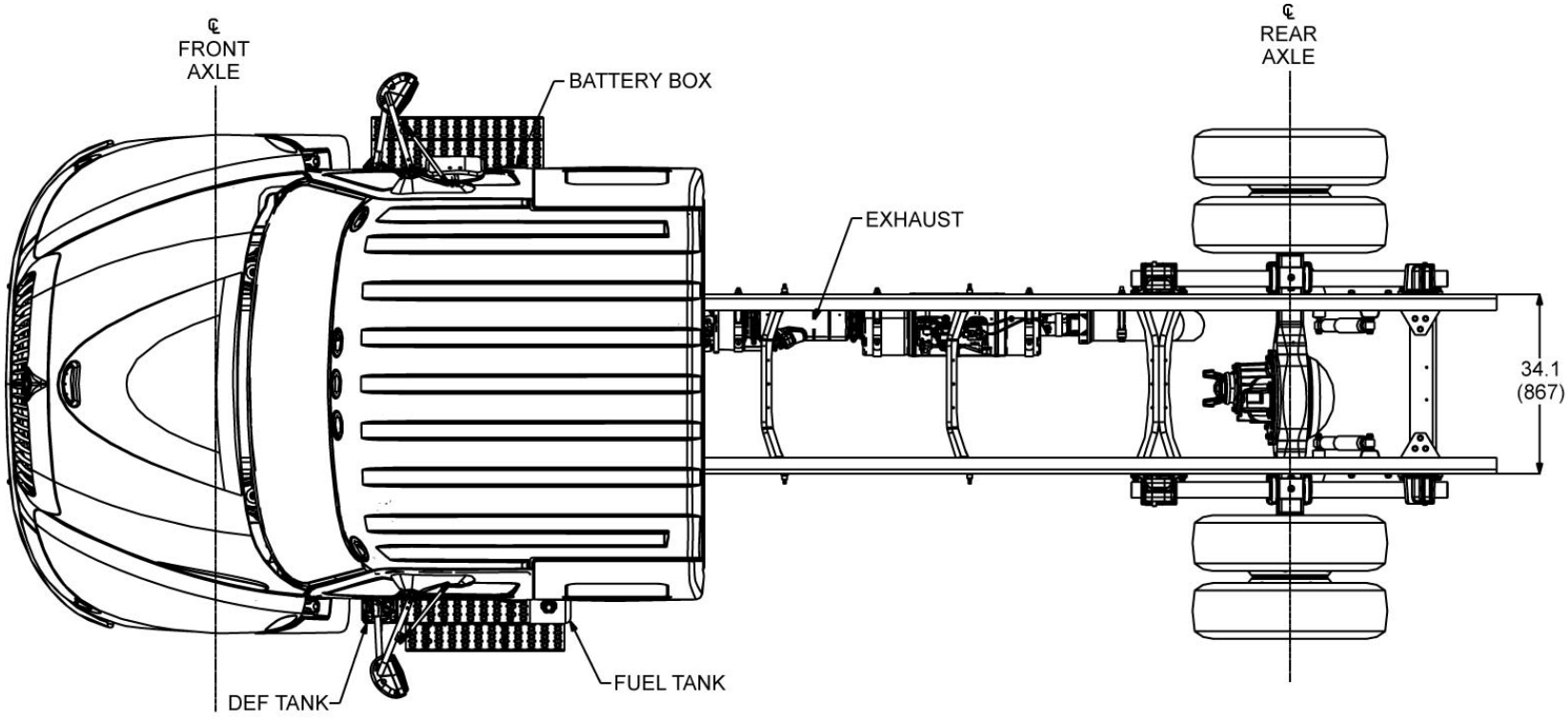
[3] Frame Height at centerline of rear axle: unloaded - 32.98", loaded - 29.54". Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded - 30.76", loaded - 29.64". Subtract 4.6" with air bags dumped.

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4300 LP 4x2 MODELS*

## *Chassis Diagram*

### ***Plan View – Extended Cab***



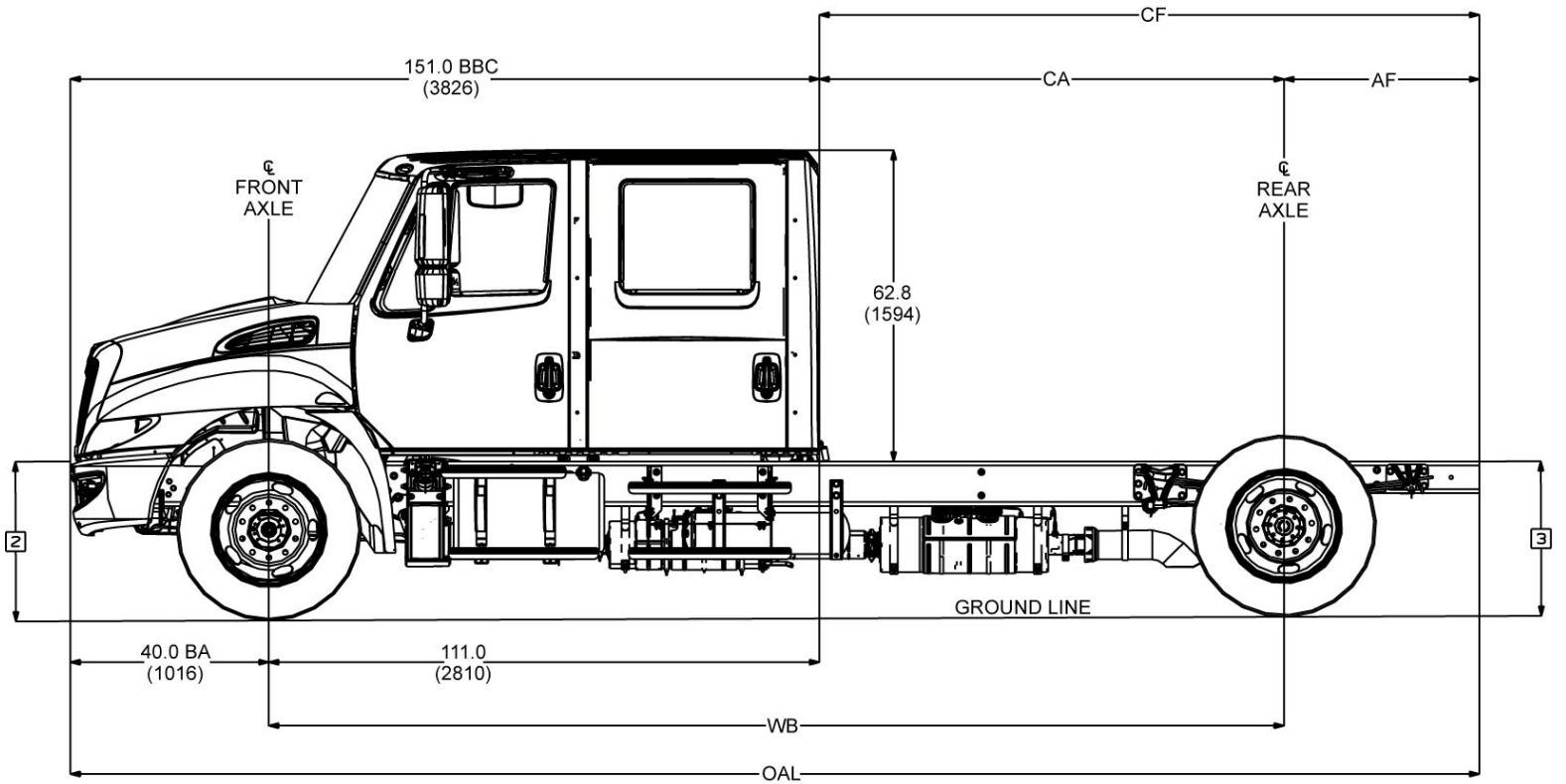

4300_lp_4x2_MH025_isb_ext_cab_plan

NOTE: This drawing *should not* be used to determine crossmember locations – this information can be found later in this book.

## *4300 LP 4X2 MODELS*

### *Chassis Diagram*

#### ***Side View – Crew Cab***




4300LP_4x2_MH025_isb_crew_cab_lsv

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded - 30.87”, loaded - 29.03”

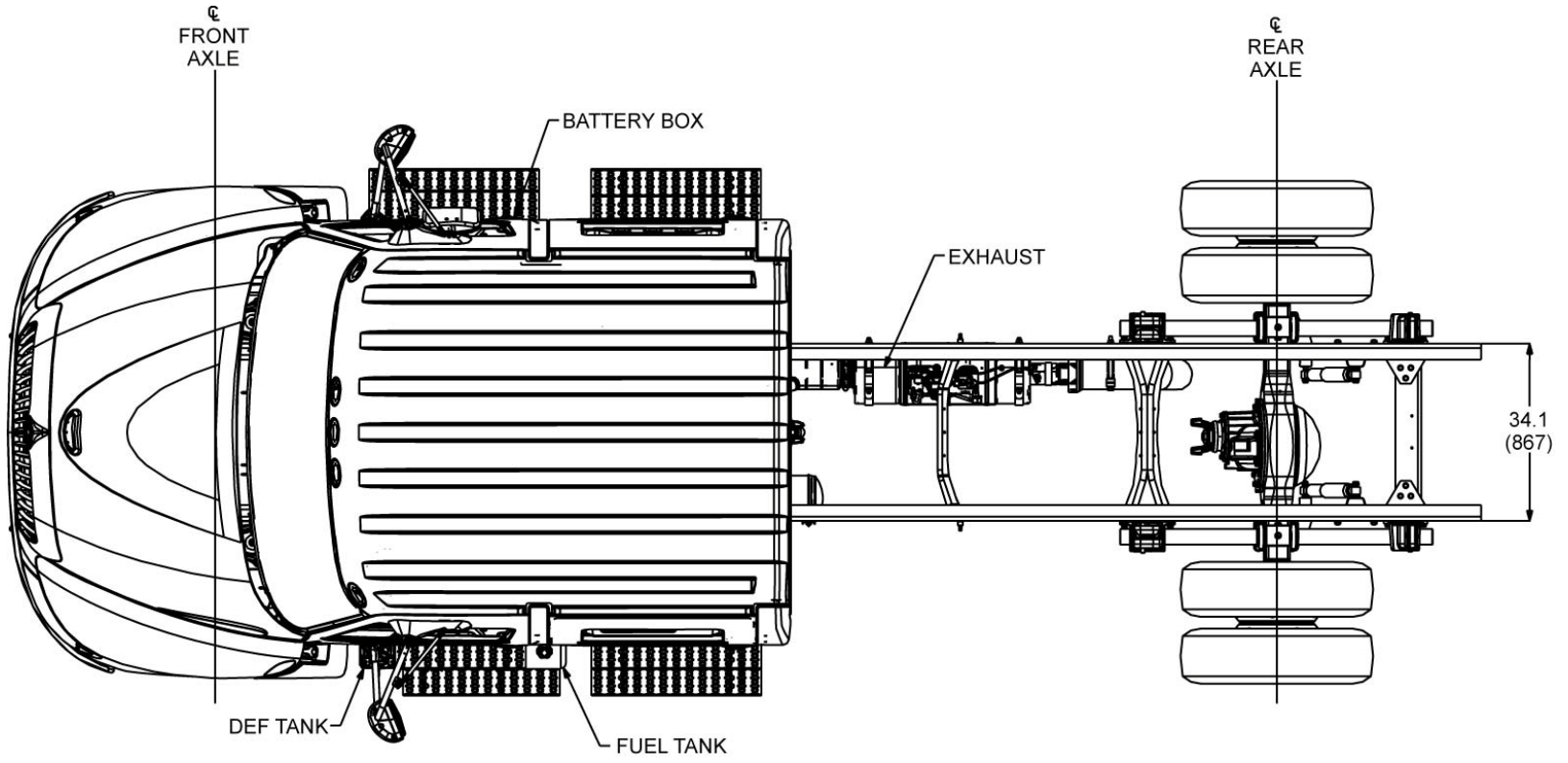
[3] Frame Height at centerline of rear axle: unloaded - 32.98”, loaded - 29.54”. Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded - 30.76”, loaded - 29.64”. Subtract 4.6” with air bags dumped.

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4300 LP 4x2 MODELS*

## *Chassis Diagram*

### ***Plan View – Crew Cab***



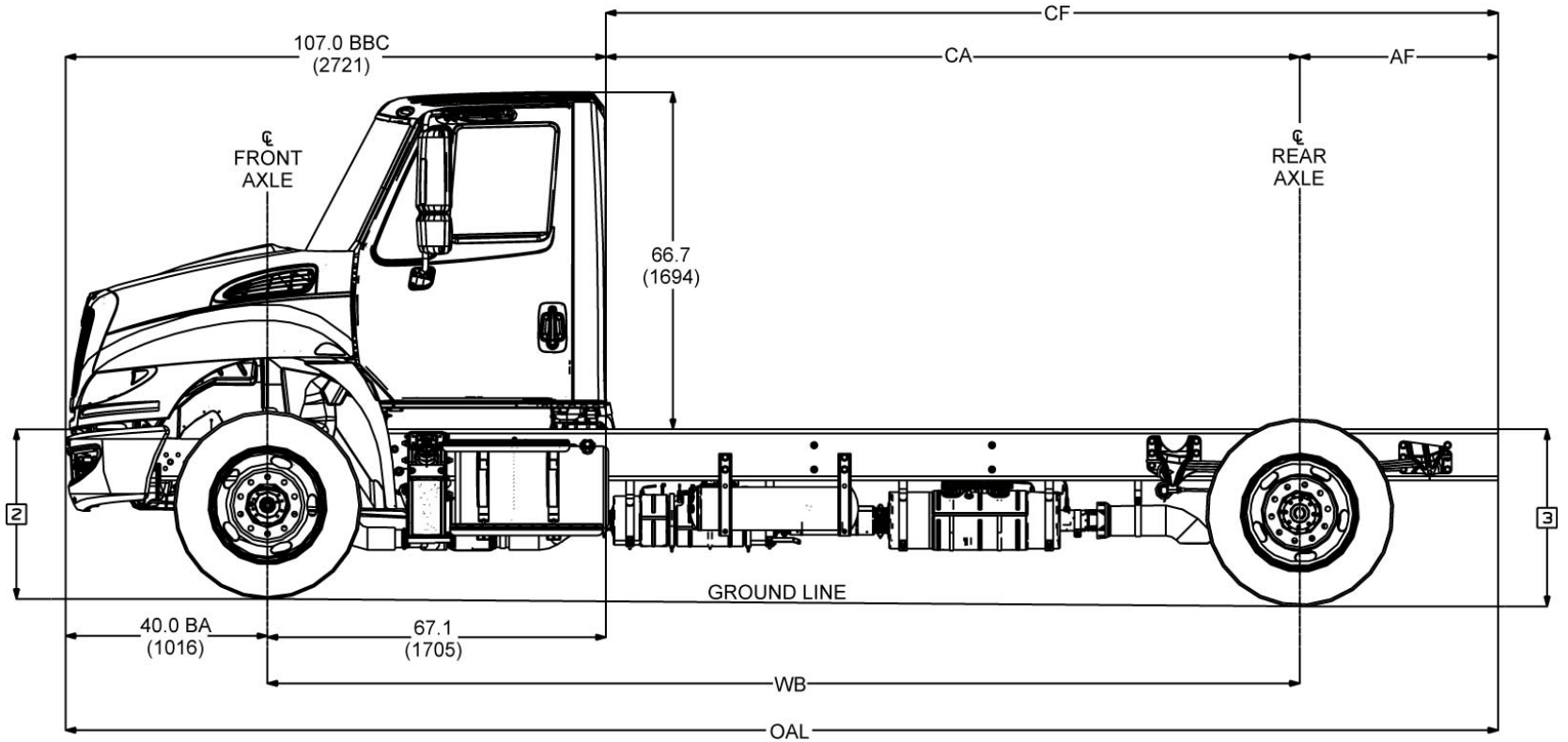

4300_lp_4x2_MH025_isb_crew_cab_plan.

NOTE: This drawing *should not* be used to determine crossmember locations – this information can be found later in this book.

# 4400 4X2 MODELS

## Chassis Diagram

### *Side View – Day Cab*




4400_4x2_MA035_N9_day_cab_lsv

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded - 33.69”, loaded - 31.73”

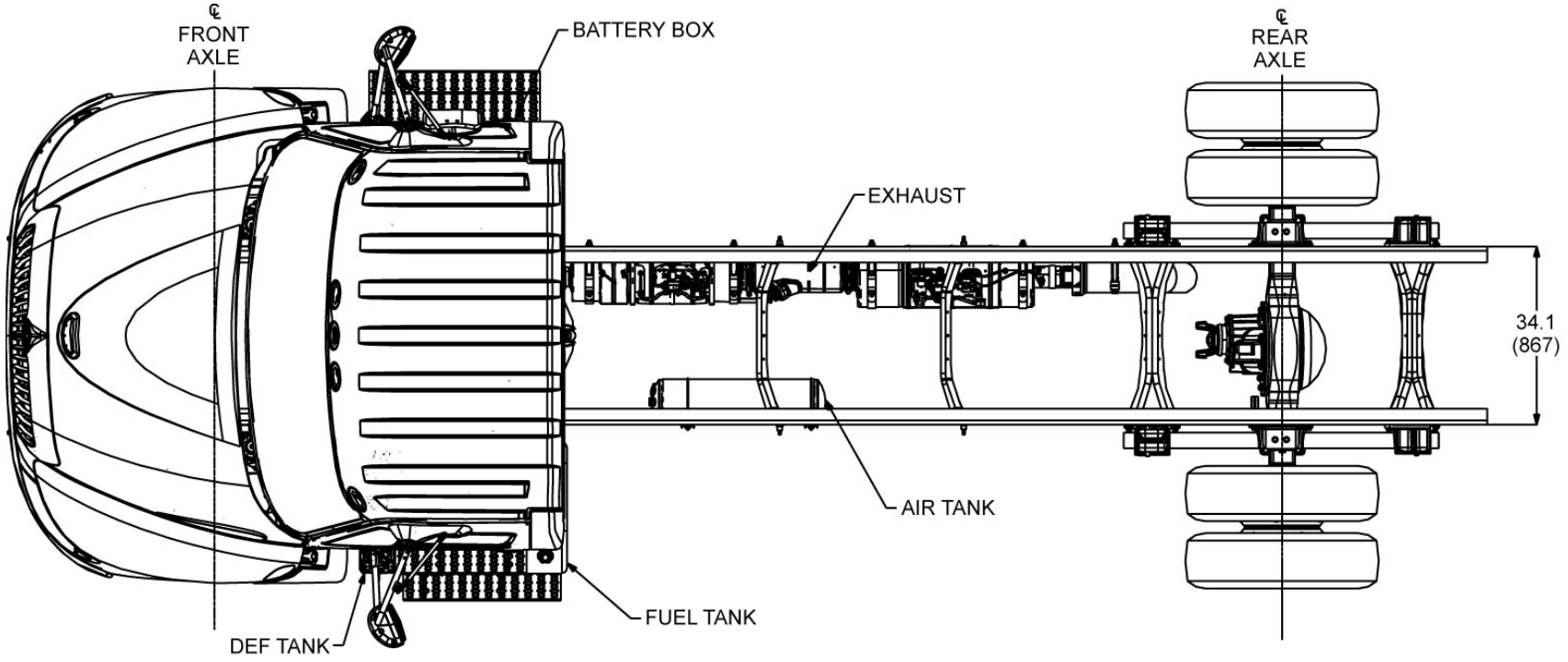
[3] Frame Height at centerline of rear axle: unloaded - 37.00”, loaded - 33.26”

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4400 4X2 MODELS*

## *Chassis Diagram*

### ***Plan View – Day Cab***



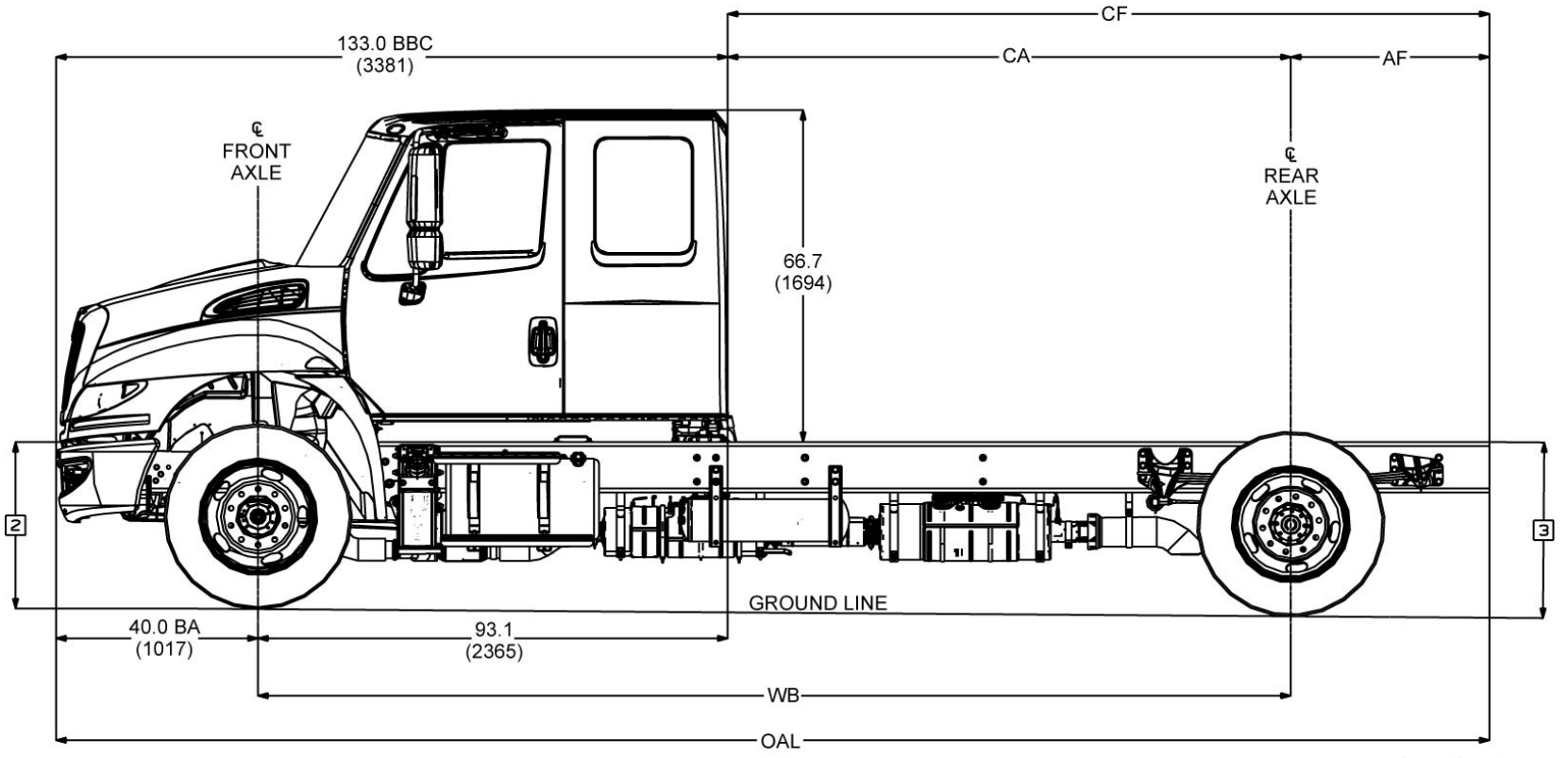

4400_4x2_MA035_N9_day_cab_plan

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

## 4400 4X2 MODELS

### Chassis Diagram

#### *Side View – Extended Cab*




4400_4x2_MA035_N9_ext_cab_lsv

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded – 33.69", loaded – 31.73"

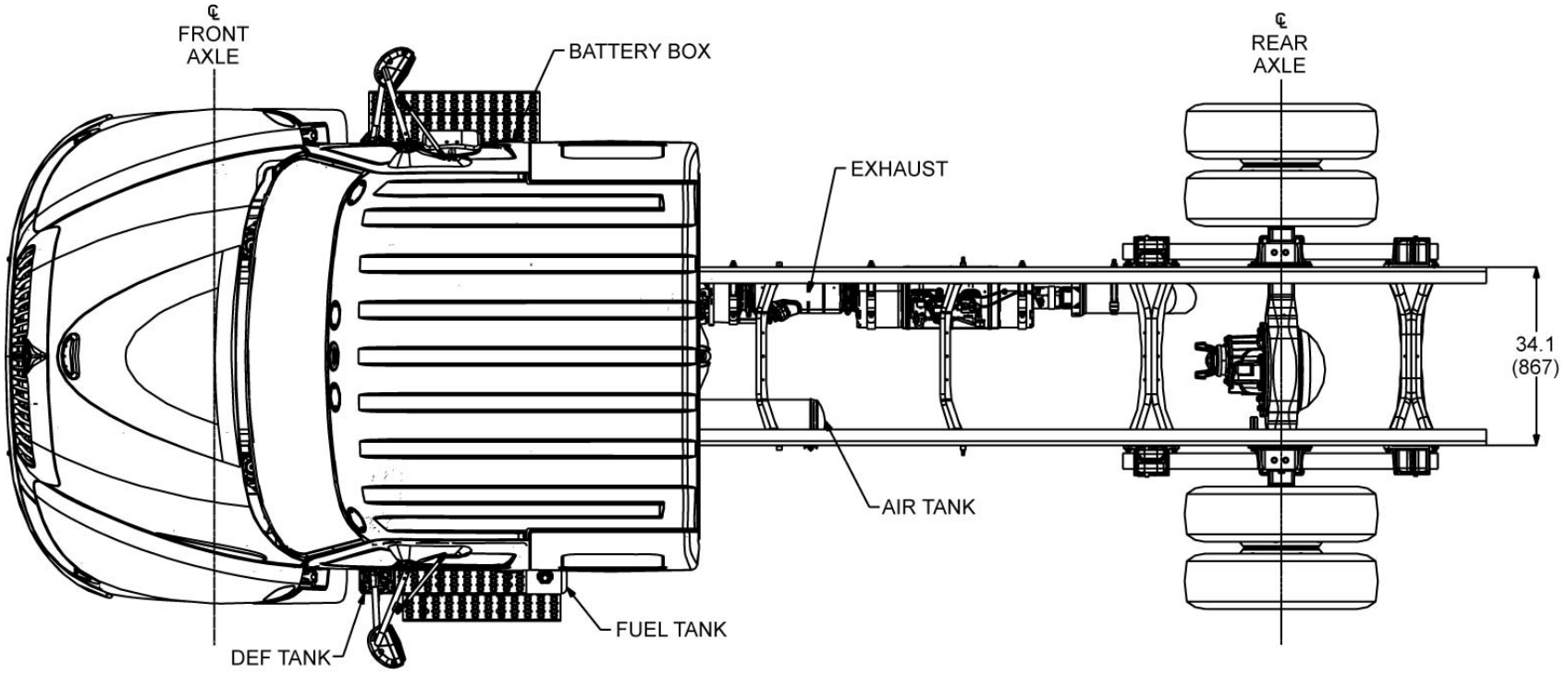
[3] Frame Height at centerline of rear axle: unloaded – 37.00", loaded – 33.26"

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4400 4X2 MODELS*

## *Chassis Diagram*

### ***Plan View – Extended Cab***



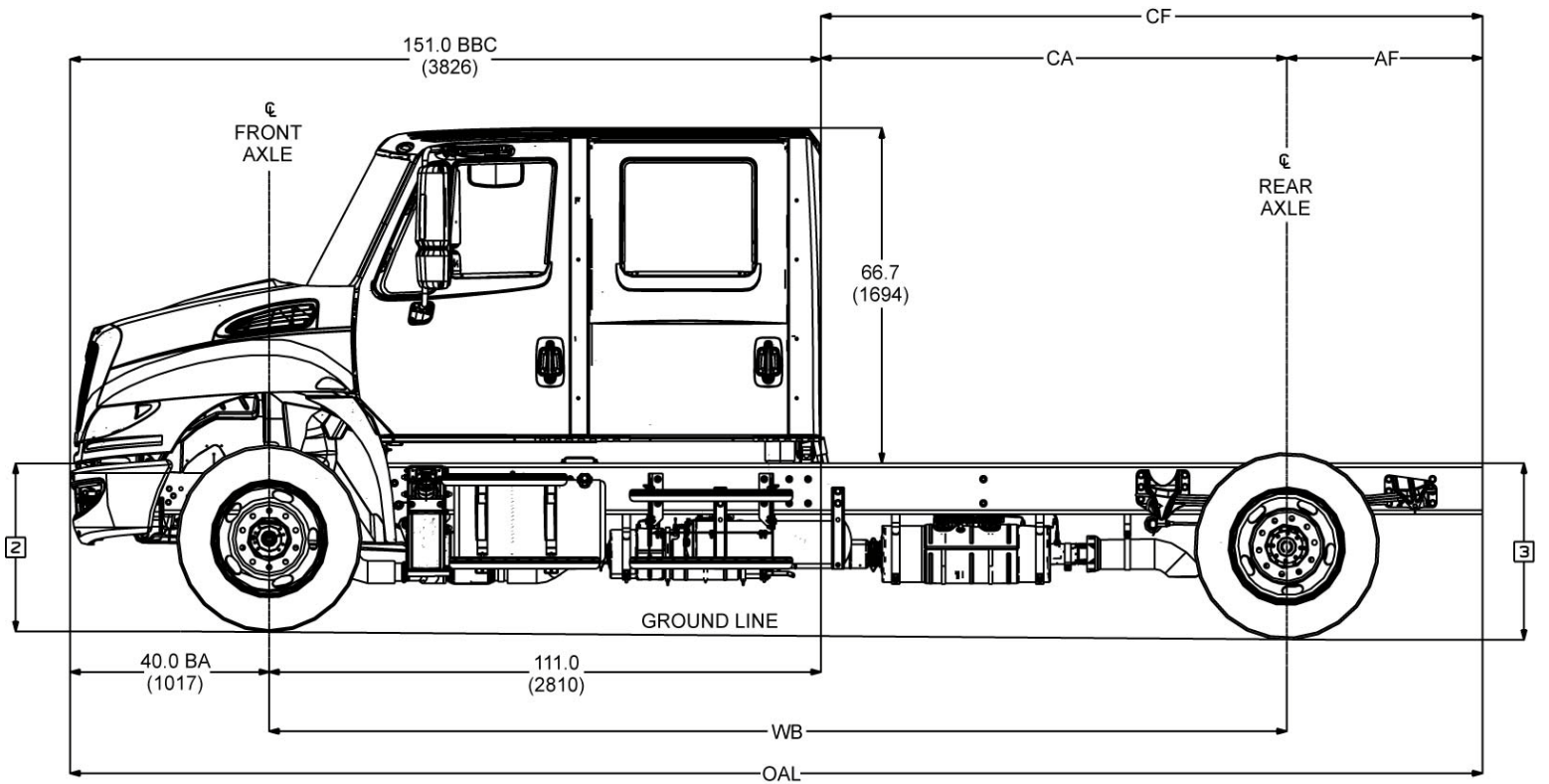

4400_4x2_MA035_N9_ext_cab_plan

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

# 4400 4X2 MODELS

## Chassis Diagram

### *Side View – Crew Cab*




4400_4x2_MA035_N9_crew_cab_lsv

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded – 33.69", loaded – 31.73"

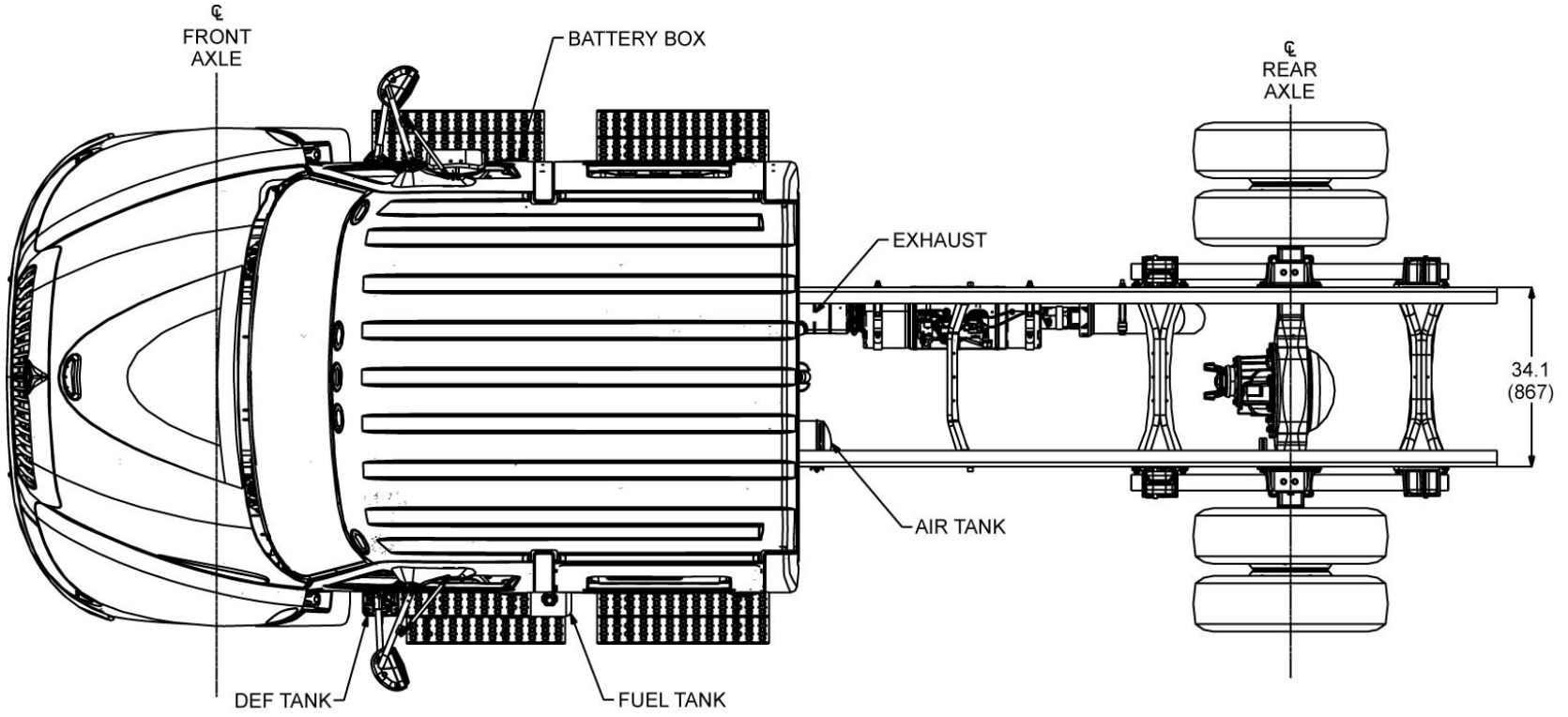
[3] Frame Height at centerline of rear axle: unloaded – 37.00", loaded – 33.26"

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4400 4X2 MODELS*

## *Chassis Diagram*

### ***Plan View – Crew Cab***



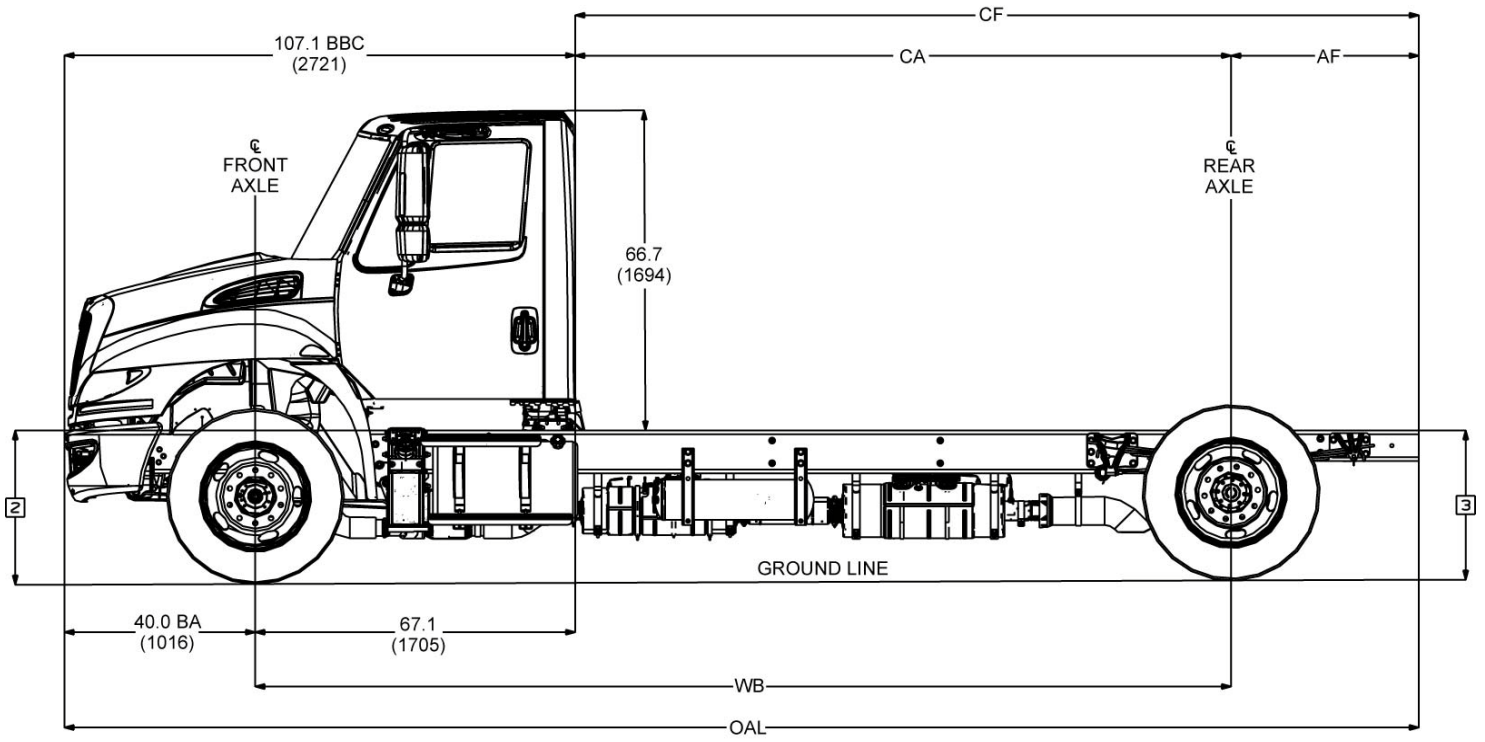

4400_4x2_MA035_N9_crew_cab_plan

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

# *4400 LP 4X2 MODELS*

## *Chassis Diagram*

### ***Side View – Day Cab***




4400LP_4x2_MH035_N9_day_cab_lsv

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle with STD tires: unloaded - 30.87”, loaded - 29.03”

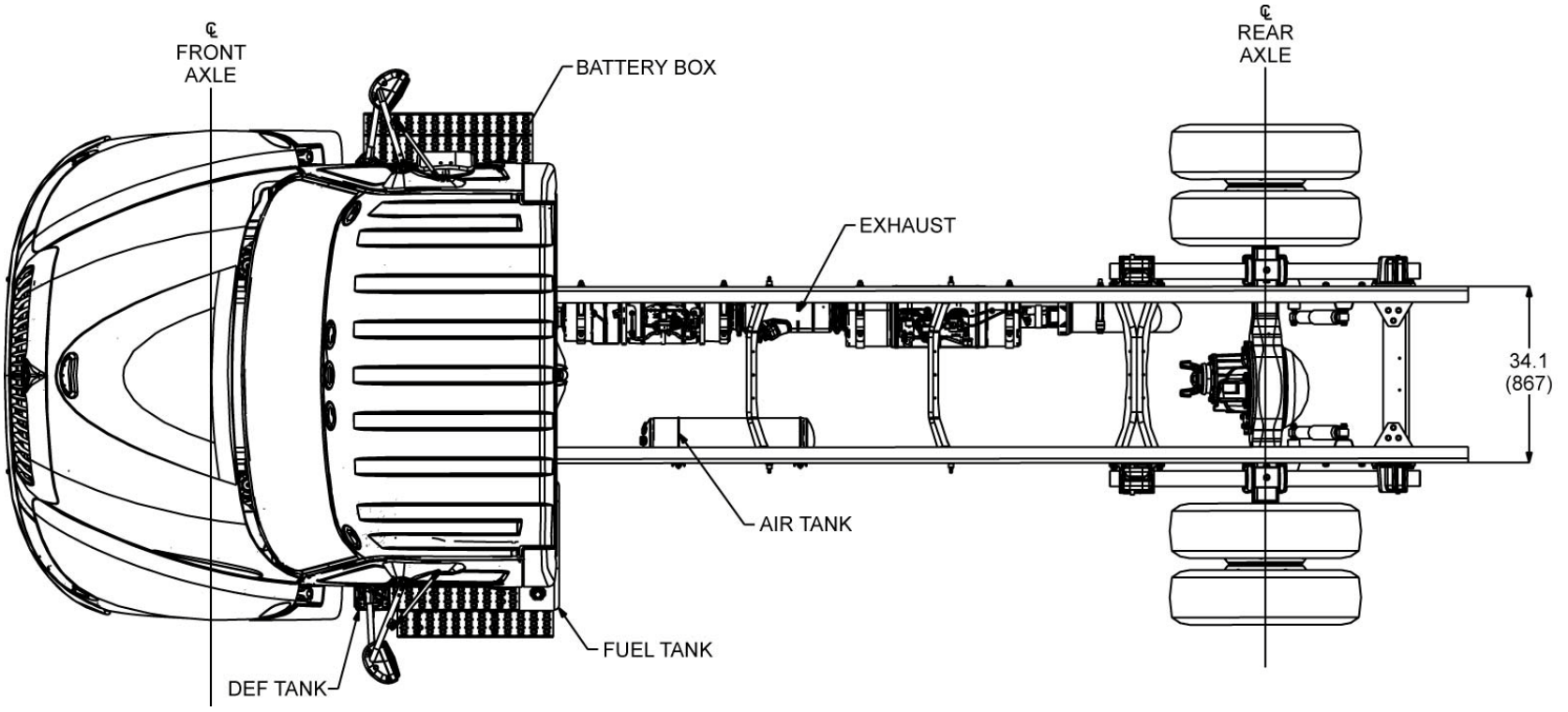
[3] Frame Height at centerline of rear axle with STD suspension and tires: unloaded - 32.98”, loaded - 29.54”.
Frame Height at centerline of rear axle with STD suspension and tires: unloaded - 32.98”, loaded - 29.54”. Subtract 4.6” with air bags dumped.
4300 LP:Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded – 30.76", loaded – 29.64". Subtract 4.6" with air bags dumped.

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4400 LP 4x2 MODELS*

## *Chassis Diagram*

### ***Plan View – Day Cab***



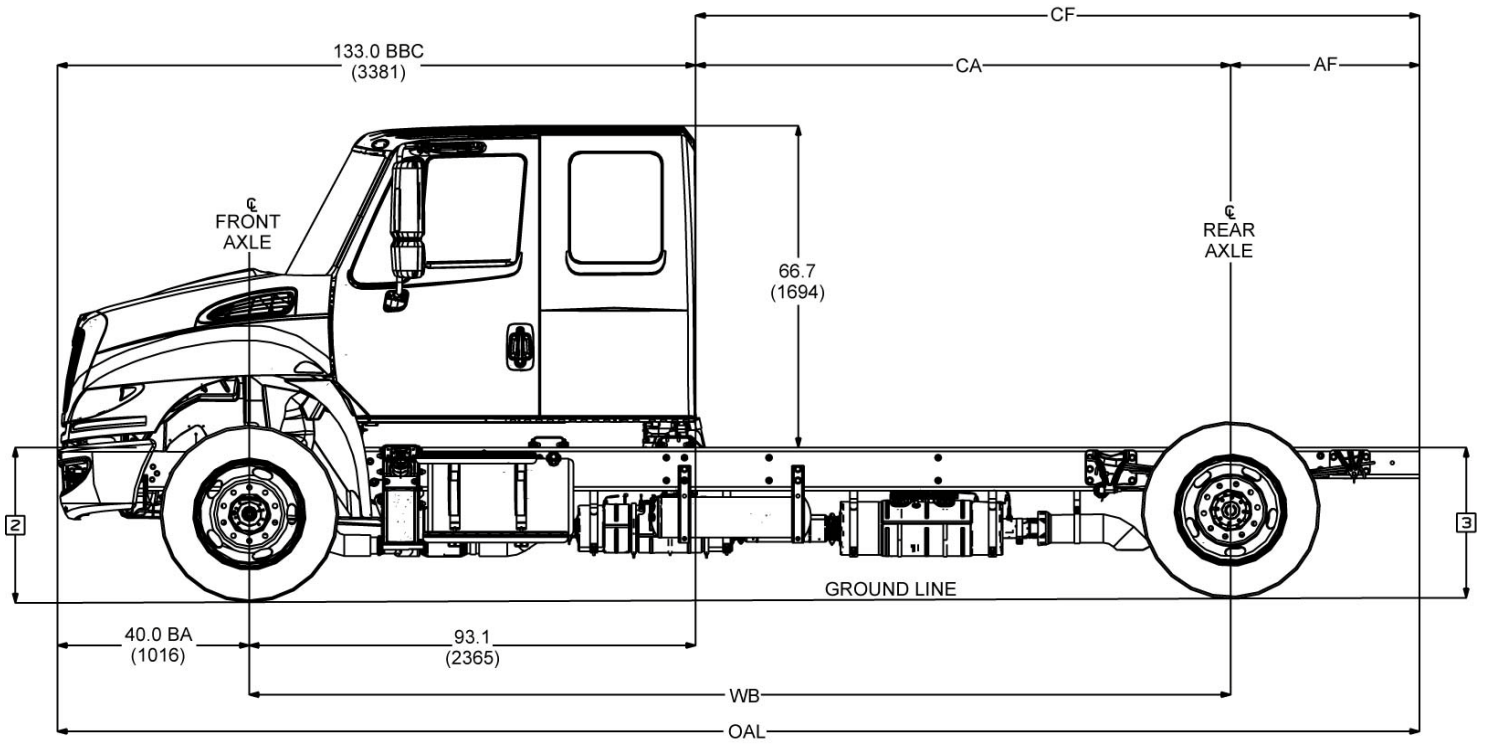

4400_lp_4x2_MH035_N9_day_cab_plan

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

# *4400 LP 4X2 MODELS*

## *Chassis Diagram*

### ***Side View – Extended Cab***




4400LP_4x2_MH035_N9_ext_cab_lsv.

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle with STD tires: unloaded - 30.87", loaded - 29.03"

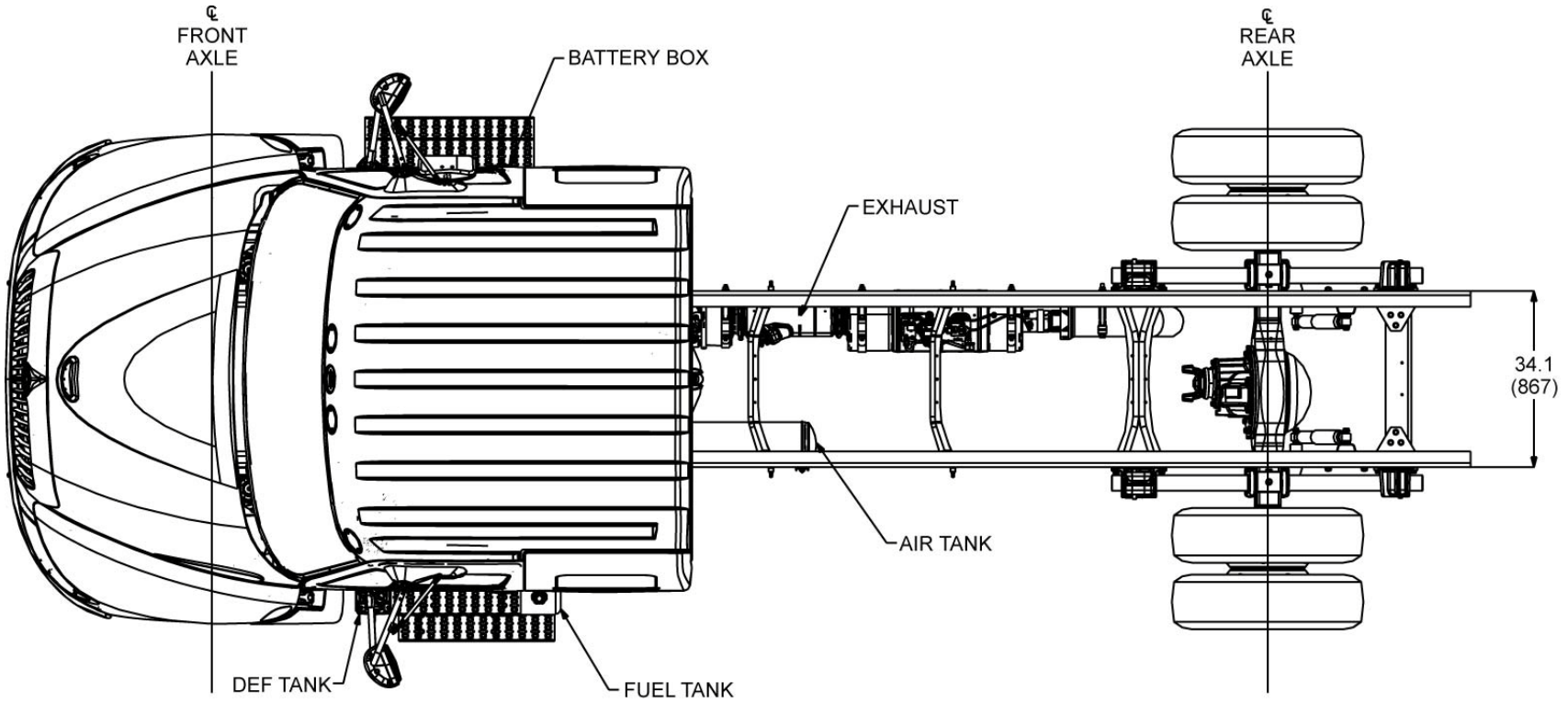
[3] Frame Height at centerline of rear axle with STD suspension and tires: unloaded - 32.98", loaded - 29.54".
Frame Height at centerline of rear axle with STD suspension and tires: unloaded - 32.98", loaded - 29.54". Subtract 4.6" with air bags dumped.
4300 LP:Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded – 30.76", loaded – 29.64". Subtract 4.6" with air bags dumped.

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4400 LP 4x2 MODELS*

## *Chassis Diagram*

### ***Plan View – Extended Cab***



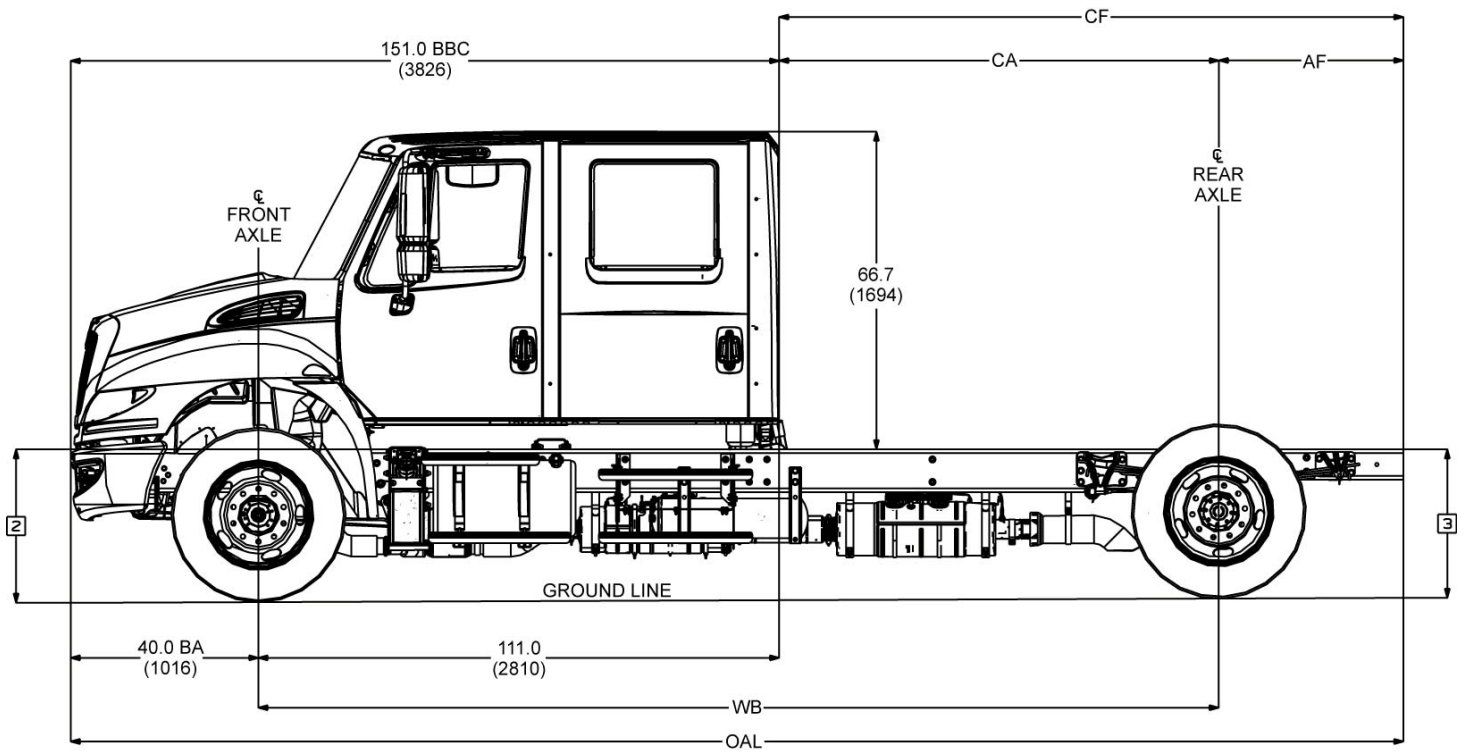

4400_lp_4x2_MH035_N9_ext_cab_plan

NOTE: This drawing *should not* be used to determine crossmember locations – this information can be found later in this book.

# *4400 LP 4X2 MODELS*

## *Chassis Diagram*

### ***Side View – Crew Cab***




4400LP_4x2_MH035_N9_crew_cab_lsv

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle with STD tires: unloaded - 30.87”, loaded - 29.03”

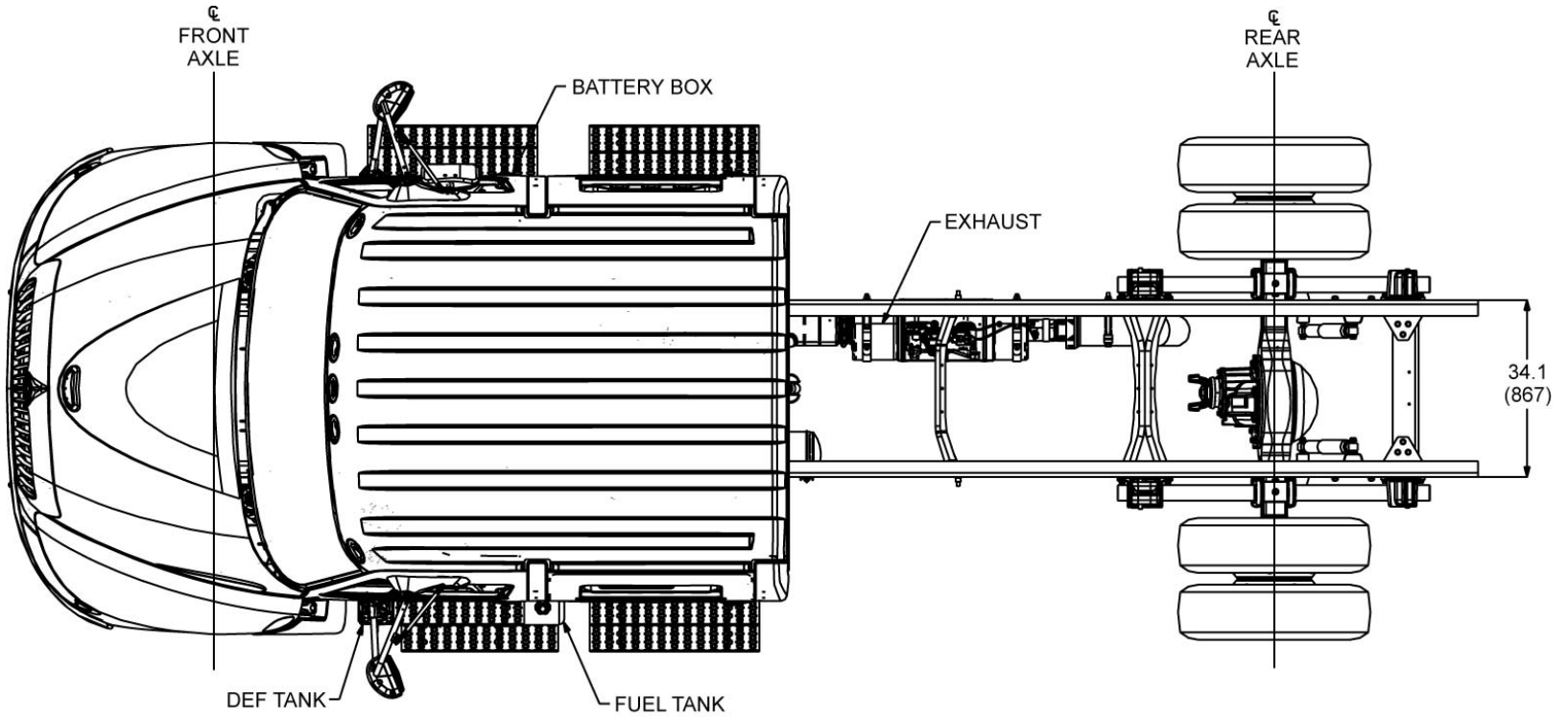
[3] Frame Height at centerline of rear axle with STD suspension and tires: unloaded - 32.98”, loaded - 29.54”.
Frame Height at centerline of rear axle with STD suspension and tires: unloaded - 32.98”, loaded - 29.54”. Subtract 4.6” with air bags dumped.
4300 LP:Frame Height at centerline of rear axle with air suspension (Code 14TBM) with standard tires: unloaded – 30.76", loaded – 29.64". Subtract 4.6" with air bags dumped.

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4400 LP 4x2 MODELS*

## *Chassis Diagram*

### ***Plan View – Crew Cab***



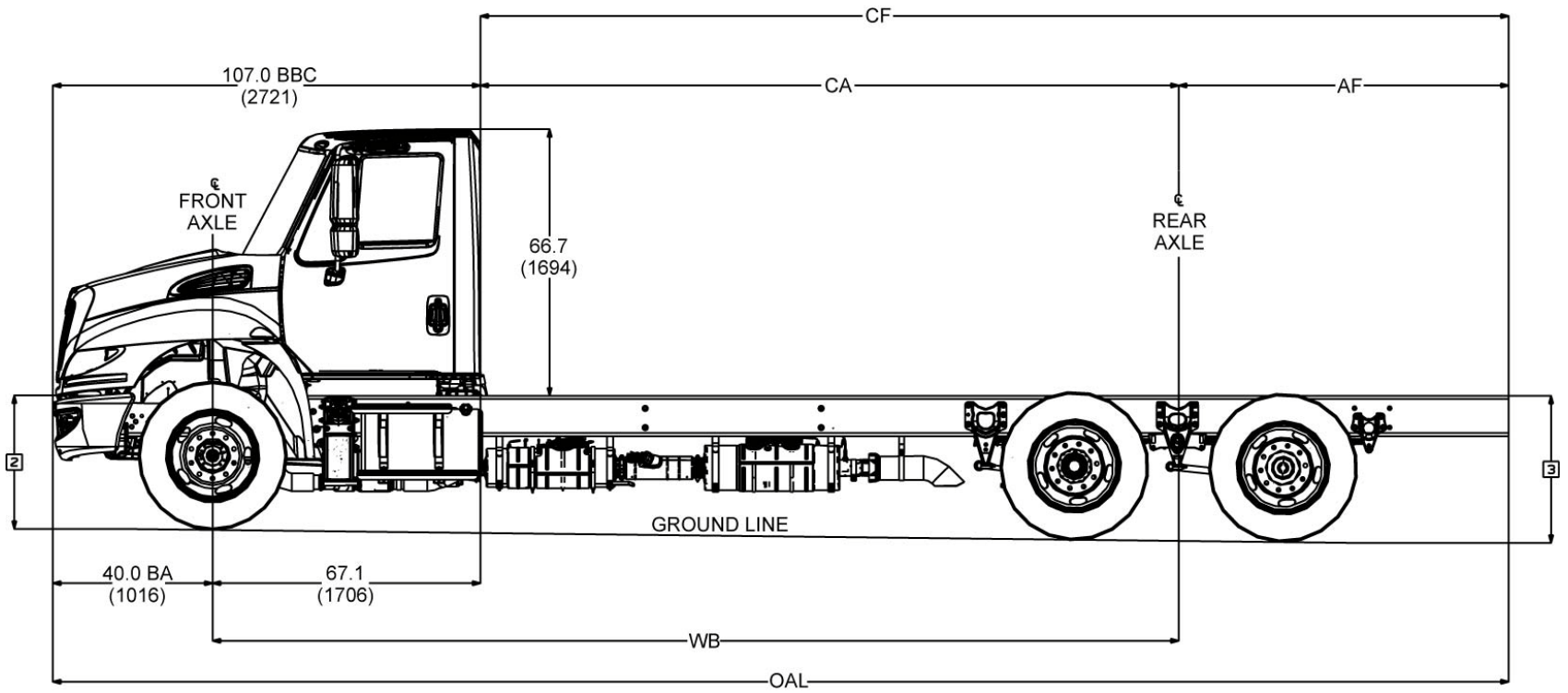

4400_lp_4x2_MH035_N9_crew_cab_plan

NOTE: This drawing *should not* be used to determine crossmember locations – this information can be found later in this book.

## *4400 6x4 MODELS*

### *Chassis Diagram*

#### ***Side View – Day Cab***




4400_6x4_MF035_N9_day_cab_lsv

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded – 35.29", loaded – 32.73"

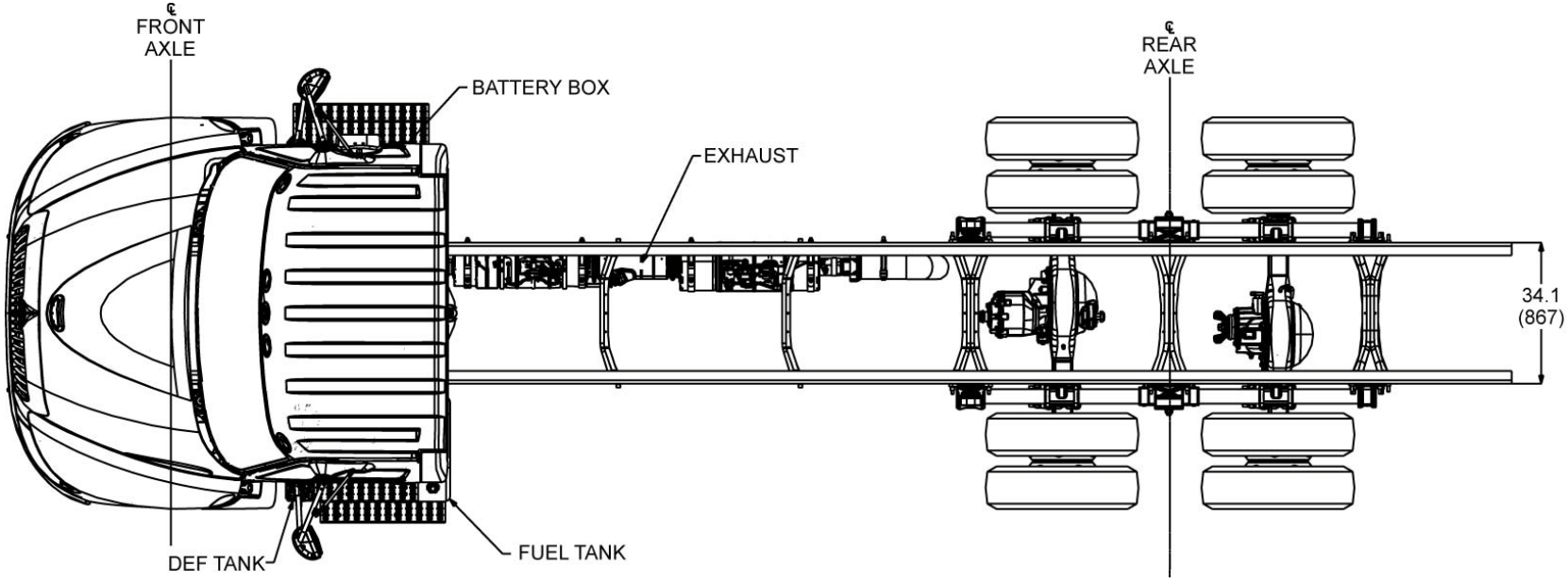
[3] Frame Height at centerline of rear axle: unloaded – 38.59", loaded – 36.19"

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4400 6x4 MODELS*

## *Chassis Diagram*

### ***Plan View – Day Cab***



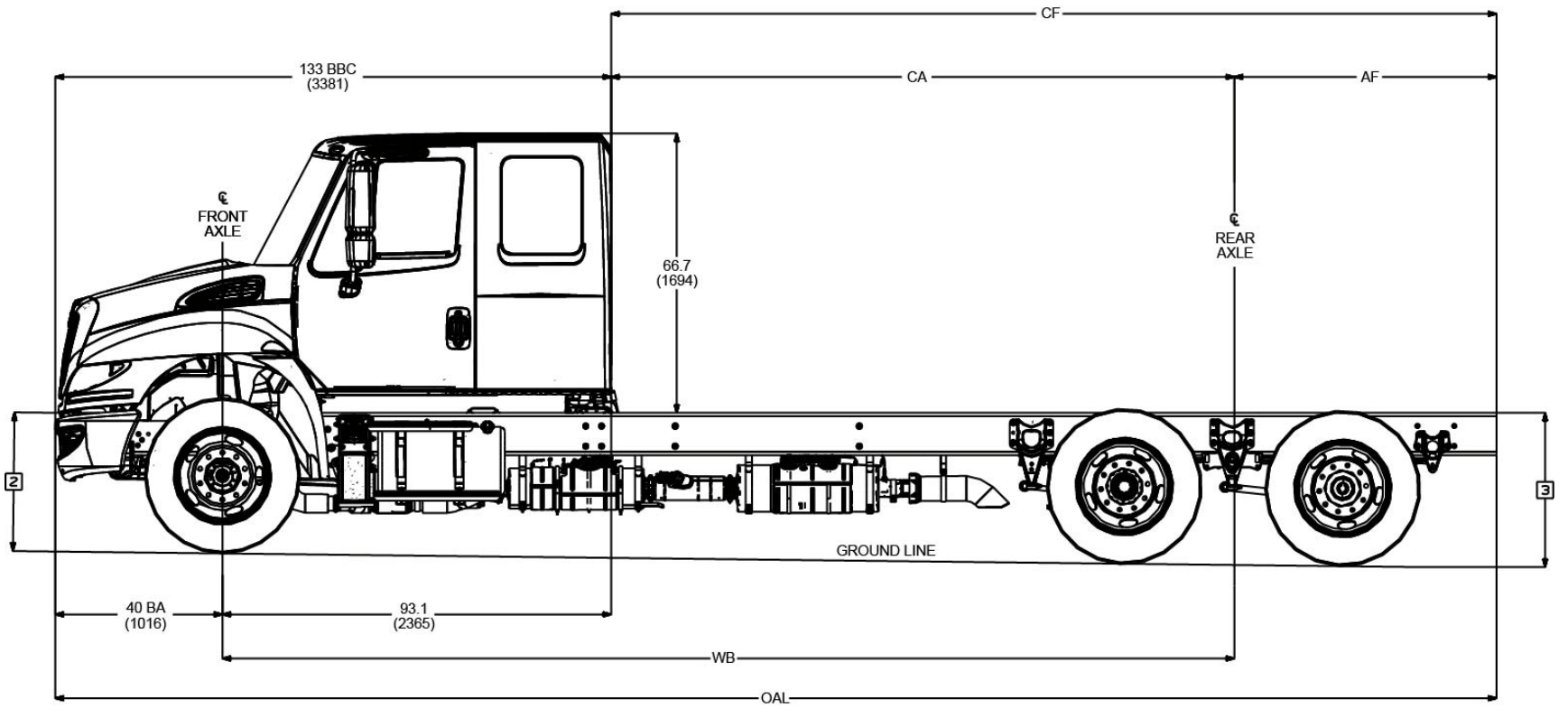

4400_6x4_MF035_N9_day_cab_plan

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

## *4400 6x4 MODELS*

### *Chassis Diagram*

#### ***Side View – Extended Cab***




4400_6x4_MF035_N9_ext_cab_lsv

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded – 35.29", loaded – 32.73"

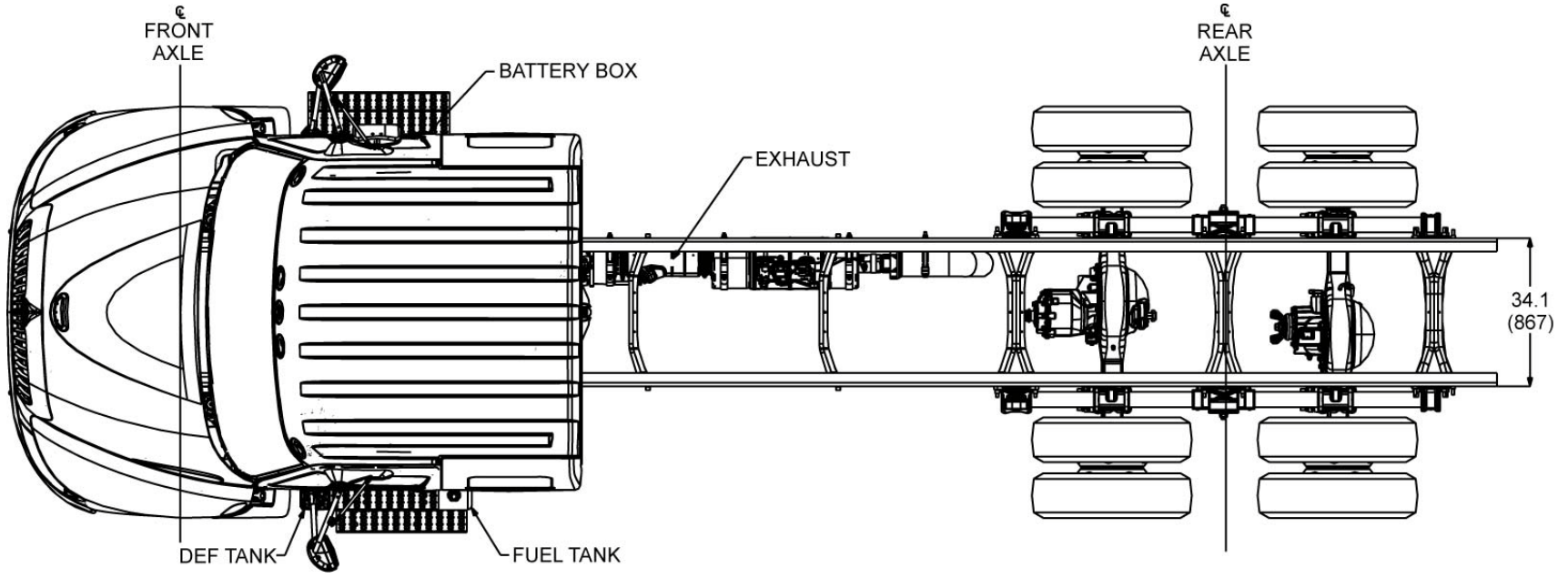
[3] Frame Height at centerline of rear axle: unloaded – 38.59", loaded – 36.19"

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4400 6x4 MODELS*

## *Chassis Diagram*

### ***Plan View – Extended Cab***



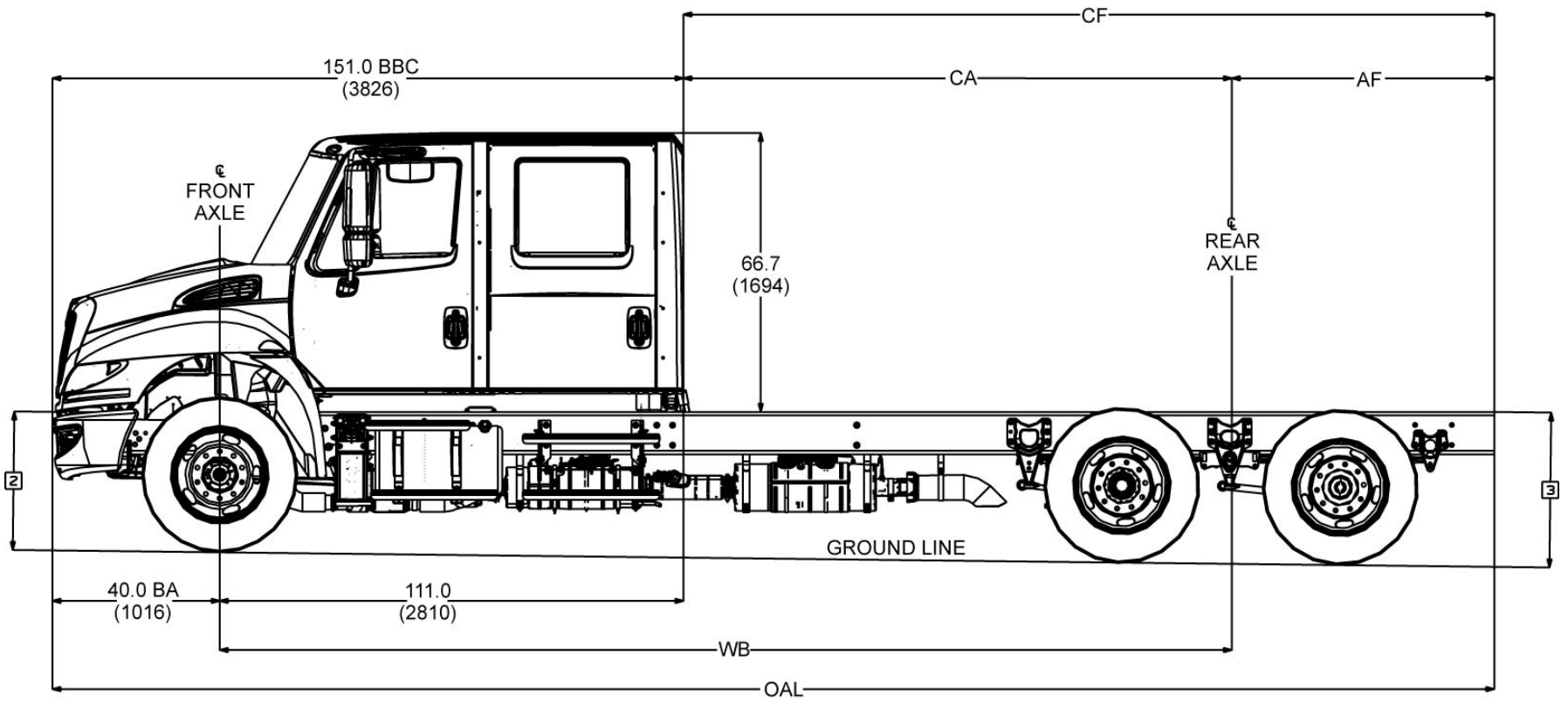

4400_6x4_MF035_N9_ext_cab_plan

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

## *4400 6x4 MODELS*

### *Chassis Diagram*

#### ***Side View – Crew Cab***




4400_6x4_MF035_N9_crew_cab_lsv

**Frame height values represent standard equipment and are intended for reference only. To compute actual frame height, refer to the frame height calculation section beginning on page 56.**

[2] Frame Height at centerline of front axle: unloaded – 35.29", loaded – 32.73"

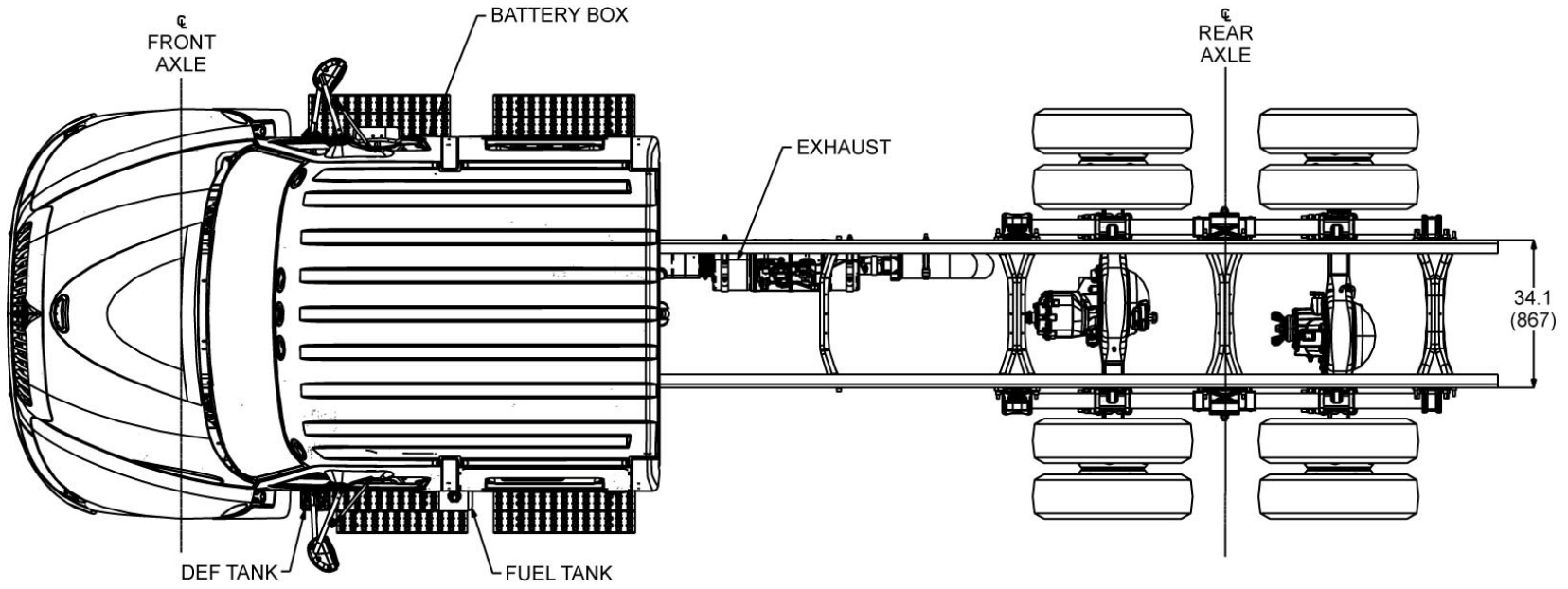
[3] Frame Height at centerline of rear axle: unloaded – 38.59", loaded – 36.19"

NOTE: Due to internal spring friction and manufacturing tolerances, these values may vary up to 0.5 inches. To achieve these nominal values directly after loading or unloading a vehicle, it may be necessary to drive the vehicle for a short period.

# *4400 6x4 MODELS*

## *Chassis Diagram*

### ***Plan View – Crew Cab***

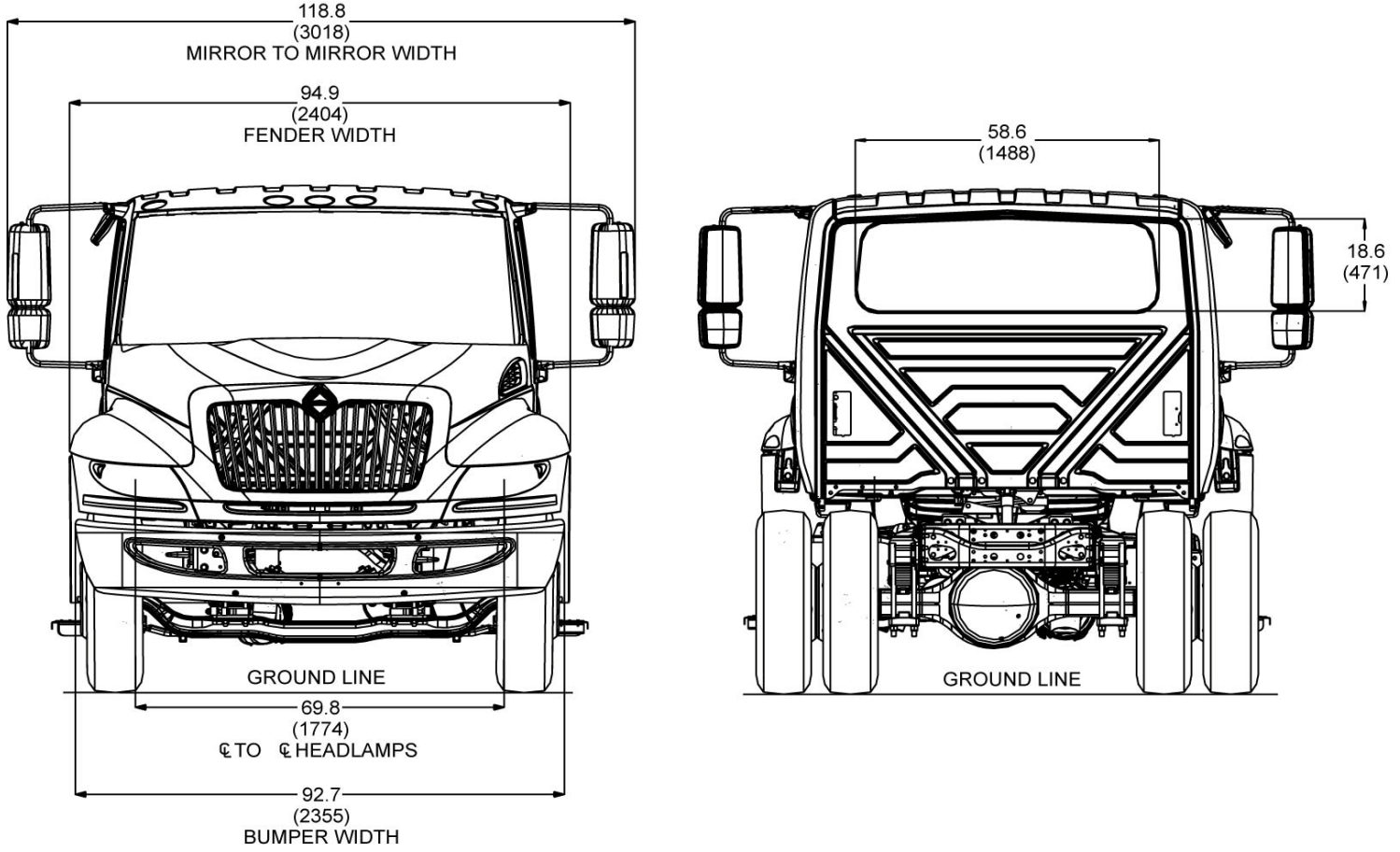



4400_6x4_MF035_N9_crew_cab_plan

NOTE: This drawing ***should not*** be used to determine crossmember locations – this information can be found later in this book.

## *FRONT AND REAR VIEW*

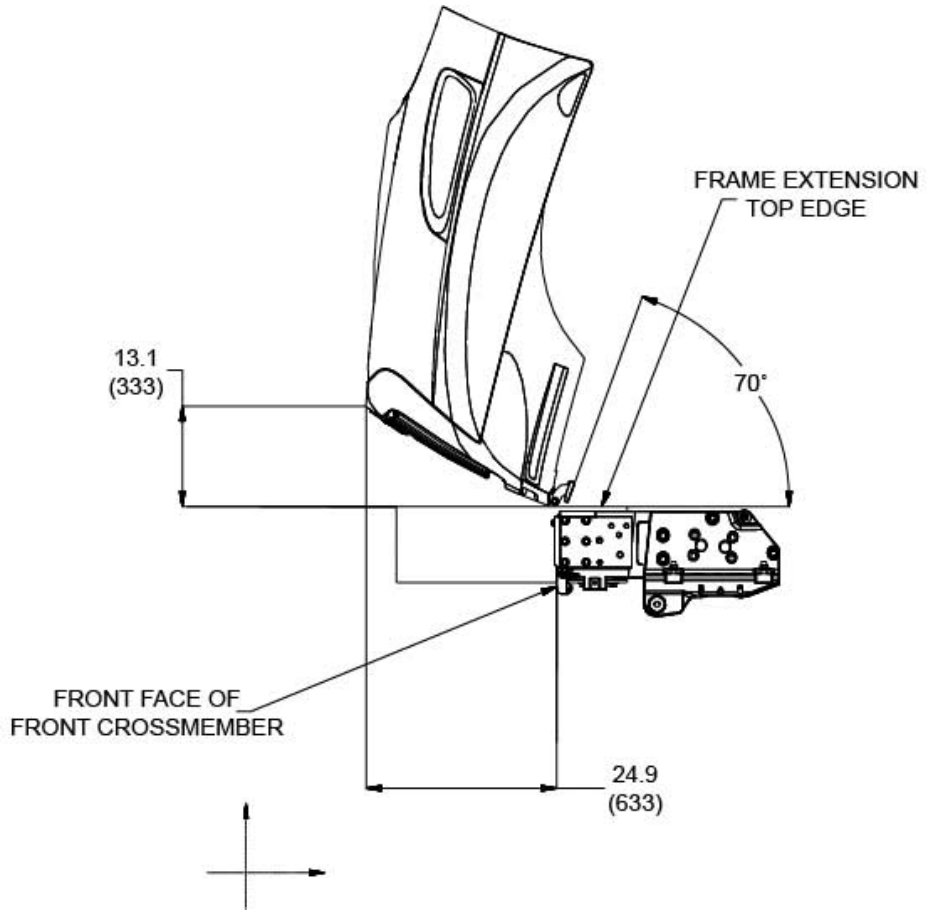
### *All Models*




4300_4400_front_rear

## HOOD TILT

### All Models




durastar_hood_tilt

NOTE: -A fixed grill is not available on models with a Mid-High Cab and Front Frame Extensions configuration.
-A fixed grill is available on models with a Low-Cab configuration.
-The above image details the available space above the rail for component mounting.

# FRAMES

## *General Frame Information*

### *All Models*

#### Introduction

The frame is the structure that carries and supports the rated load under anticipated driving conditions and secures the major components of a vehicle in their relative positions. The frame assembly consists of two sidemembers and depending upon the length of the frame, five or more crossmembers.u01

#### General Frame Recommendations

It is very important that the frame be inspected periodically for cracks, buckling, crossmember loosening or other damage that may cause eventual failure of the frame. Additional inspections should be made whenever the chassis has been overloaded or involved in an accident. An alignment check IS NOT SUFFICIENT since local cracks, crossmember loosening or sidemember buckling will not necessarily cause misalignment.

On reinforced sidemember sections, when cracks exist in either of the sidemember sections, the members must be separated for repair. After separation follow the procedures for non-reinforced sections. The two sidemember sections MUST NOT be welded together. After the weld repairs, the sections should be reinforced with the appropriate section and re-assembled with mounting bolts tightened to SAE Grade 8 torque levels.

#### Drilling or Notching

Sidemembers should not be drilled or notched without approval from Navistar Engineering. Do not exceed the maximum allowable sidemember hole size in the unrestricted zones. For illustrations, see the Frame Drilling Restrictions later in this book.

#### Welding or Flame Cutting

Welding or flame cutting of the frame components is unacceptable because of the associated loss of fatigue strength. This restriction applies not only to the heat-treated components, but also the high strength low alloy (HSLA) and low carbon steel components.

Exceptions to this are cases with Navistar Engineering approval or for repair operations as described in this service manual section.

**TO AVOID SERIOUS PERSONAL INJURY, DEATH OR POSSIBLE ENGINE DAMAGE, WHEN WELDING OR USING AN ACETYLENE TORCH ALWAYS WEAR WELDING GOGGLES AND GLOVES. INSURE THAT ACETYLENE AND OXYGEN TANKS ARE SEPARATED BY A METAL SHIELD AND ARE CHAINED TO A CART. DO NOT WELD OR HEAT AREAS NEAR FUEL TANKS OR FUEL LINES. UTILIZE PROPER SHIELDING AROUND HYDRAULIC LINES.**

## Reinforcement to Increase Capacity

Reinforcement of the chassis frame to support either additional loading or concentrated loading does not increase vehicle load carrying capacity unless it has been fully verified that all other vehicle components, such as the brake system, steering system, suspension system, etc. can properly and safely support the increased loading.

## Increase in Local Stress

In any modification of the chassis frame, the addition of holes, reinforcements, welds, clamps, splices, etc., may cause an increase in the local stress in the frame at the point of the modification, **THEREFORE CAUSING A STRESS CONCENTRATION IN THE FRAME SIDEMEMBER(S)**.

These local stress concentrations can significantly affect the life of the chassis frame. The specific effect which the stress concentrator will have on the life of the chassis frame is influenced by the location of the stress concentration, the frequency and severity of the loading, and the magnitude of stress concentration.

Deviation from the repair procedures in this section may void manufacturer's warranty.

## Identification of Frame Rail Material

International® chassis are manufactured with frame rails of different alloy steels and some are heat-treated. Each material must be handled in a specific manner to assure maximum service life; therefore, the frame material must be determined before attempting repair or modification.

International chassis are presently manufactured with frame rails of:

- High strength low alloy (HSLA) steel (50,000, 60,000 and 80,000 PSI yield strength)
- Heat treated steel (110,000 and 120,000 psi yield strength).

Each type has different repair procedures. The frame rail material can be determined by inspecting the frame and consulting the dealer vehicle lineset ticket and the sales data book.

Heat-treated rails are marked on the inside of the section with a decal which cautions against welding, flame cutting or the addition of holes in critical zones. These practices are restricted for all frame rails, however, **HEAT-TREATED** rails are much more sensitive to these alterations.

## Frame Damage

The major sources of frame damage are accidents, overloading the vehicle, and local overstressing due to a variety of causes. In accident cases, the reasons for the damage are readily apparent. Such damage may often be repaired by:

- Straightening and reinforcing the frame.
- Repairing the damaged area and reinforcing the frame sidemember.
- Replacing the frame sidemembers and crossmembers.

Damage to the chassis frame, such as a crack in the frame sidemember or crossmember, which is not associated with impact damage, may be an indication of overloading the vehicle. Damage to the chassis frame may also be an indication of the creation of locally high stresses due to operating conditions or equipment mounting practices. Examples of overloading are:

1. Exceeding either the gross vehicle weight rating (GVWR) or the gross axle weight rating (GAWR) (loading the frame beyond its design capacity).
2. Uneven load distribution.
3. Improper fifth wheel settings.
4. Using the vehicle in operating conditions or with equipment it was not designed for.

Examples of creation of locally high stresses are:

1. Mounting bodies or equipment in a manner that causes stress concentrations and/or abrasive wear in either the flange or web portion of the sidemember.
2. Improper modification or repair of frame components.
3. Equipment which is susceptible to resonant vibration due to excess flexibility of its mounting.

Frame damage may also be caused by corrosion resulting from the contact between dissimilar metals.

Damage to the chassis frame, which is not associated with impact damage, should not be repaired until the cause of the damage has been determined and corrective actions taken to prevent re-occurrence of the non-impact damage.

## Welding and Reinforcement

The guidelines below deal with the general procedures for weld repair and reinforcement. Because of the many variables associated with these repairs, it is recommended that your field service representative be consulted prior to undertaking the repair. This will also help to determine whether a specific set of recommendations has already been developed for the case in question.

The essential elements of repairing the sidemembers are the restoring of BOTH the shape and local strength so that the load capacity is at least as good as before the damage occurred. The sidemembers may *look* like new, but may have local strength reduction due to small cracks or material strength reduction. Even if the frame has acceptable alignment and there is no gross deformation, local deformations may reduce the strength in the area to be weld repaired. Examples of this are local bulges in the web (vertical portion) of the section and buckling of the flanges. These local deformations must be repaired by straightening before proceeding with the weld repair.

## Welding Precautions

When welding on any vehicle, care must be taken to prevent damage to the electronic components. Vehicles with ELECTRONIC ENGINE CONTROL SYSTEMS require additional precautions.

CAUTION: On any vehicle, disconnect both the positive and negative battery cables from the battery before welding on the vehicle. Attach the welder ground cable as close as possible to the part being welded.

**TO AVOID SERIOUS PERSONAL INJURY, DEATH OR POSSIBLE ENGINE DAMAGE, WHEN WELDING OR USING AN ACETYLENE TORCH ALWAYS WEAR WELDING GOGGLES AND GLOVES. INSURE THAT ACETYLENE AND OXYGEN TANKS ARE SEPARATED BY A METAL SHIELD AND ARE CHAINED TO A CART. DO NOT WELD OR HEAT AREAS NEAR FUEL TANKS OR FUEL LINES. UTILIZE PROPER SHIELDING AROUND HYDRAULIC LINES.**

With an electronic engine controller (such as Celect), do not connect the ground cable to the control module(s) or the cooling plate. To protect the control module(s), it is mandatory to remove all connectors going to the control modules.

The following is a general guideline for the steel frames:

Welding of the HSLA (50,000, 60,000 and 80,000 PSI yield strength) steel side member and the heat-treated (110,000 and 120,000 PSI yield strength) steel sidemember involves a significant reduction in the strength of the frame in the heat affected zones of the weldment. This means that the frame in the welded region is no longer capable of carrying the same load or stress as the original section.

To restore the strength of the frame rails after welding, the welded area must be reinforced using reinforcements as indicated in “Repair and Reinforcement Recommended Procedures”.

Welding must be done properly to make an effective repair. Therefore, only those who are properly trained and qualified should perform the welding repairs in this section.

## Reinforcement

Reinforcements (Figure 2.1 ) to increase load capacity are generally “full length”. The actual length of the reinforcement varies with the model. Shorter, (approximately 7') rear suspension tandem liner reinforcements are available for some tractor models. Inverted “L” and “C” channel reinforcements are available for most models. For models which do not have reinforcements necessary to contact Sales Engineering to obtain reinforcement recommendations.

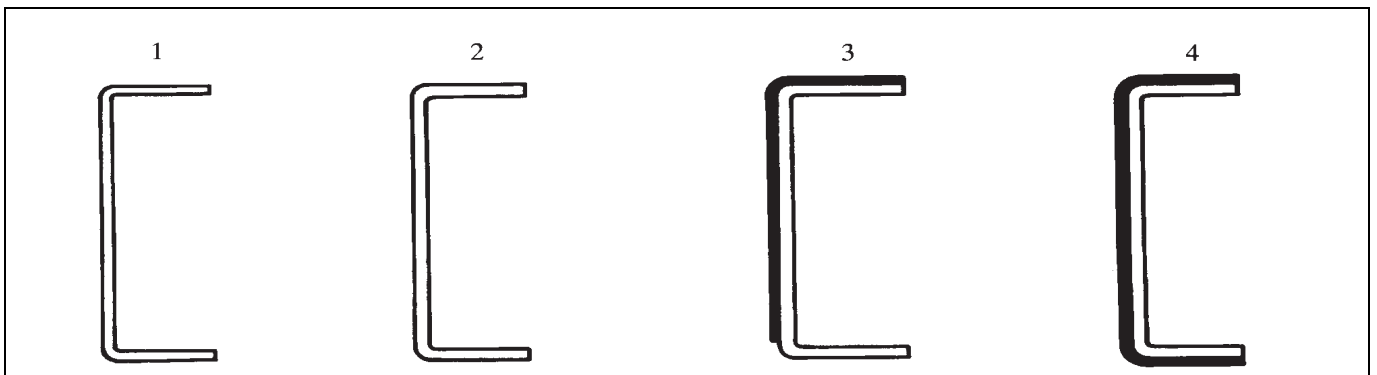



Figure 2.1 Frame Rails and Reinforcements (Typical) 01_0011

These reinforcements are generally installed on the outside of the sidemember, although certain models require “C” channel reinforcements installed to the inside of the sidemember. Contact your International® Truck dealer regarding the required type of reinforcement.

Depending on model application, there will be other parts affected, such as spring brackets for example, which are bolted to the flange as well as the web of the sidemember. To maintain proper alignment of the springs, these brackets may require replacement with new brackets designed to accept the reinforcements. These brackets are available through your International Truck dealer parts department.

When an inside reinforcement is added, the lengths of the crossmembers will be affected.

## Reinforcement Attachment

**THE REINFORCEMENTS MUST NEVER BE WELDED TO THE ORIGINAL CHASSIS SIDEMEMBERS.** High strength SAE Grade 8 bolts are to be used to fasten the reinforcement to the sidemember. Existing bolt holes in the sidemembers should be used whenever possible.

The reinforcements should be bolted to the chassis frame using high strength SAE Grade 8 bolts not less than 0.5 inch (13 mm) in diameter (refer to “Bolt and Torque Information”).

## Corrosion

If aluminum and steel are allowed to come into direct contact with each other, a galvanic cell can be formed. In order for the cell to form, the dissimilar metals must be in direct contact and an electrolyte, such as moisture, must be present. Aluminum is anodic with respect to steel and will corrode when in the presence of steel. Corrosion of aluminum frame crossmembers will reduce the load carrying capacity of the frame member and may eventually lead to the failure of the frame.

To prevent the formation of a galvanic cell, isolation techniques such as non-conductive or barrier type spacers or sealers must be used so that the steel and aluminum are not in direct contact.

It is recommended that a sealer, such as Tectyl 400C or equivalent, be painted onto the surface of both the aluminum and steel, as well as on the washers under the head of the bolts and nuts.

## Frame Alignment

The frame must be properly aligned as this affects body, axle and suspension mounting. If the vehicle has been involved in an accident or has been overloaded, it is recommended that the frame be checked for proper alignment.

## Pre-Alignment Inspection

Before checking alignment, park vehicle on level ground and set parking brake. Inspect frame assembly for loose parts, welds, cracks and bends. Be sure to make all necessary repairs before attempting to check frame alignment.

## Method of Checking Frame Alignment

A satisfactory method of checking the frame and axle alignment, particularly when a body and cab is on a chassis, is to:

1. Place a plumb bob against the point of measurement. All measurements must be taken with the plumb bob positioned against bare metal.

2. Tack or tape pieces of paper to the floor directly under each point of measurement on the chassis as indicated by the letter “K” in Figure 2.2.

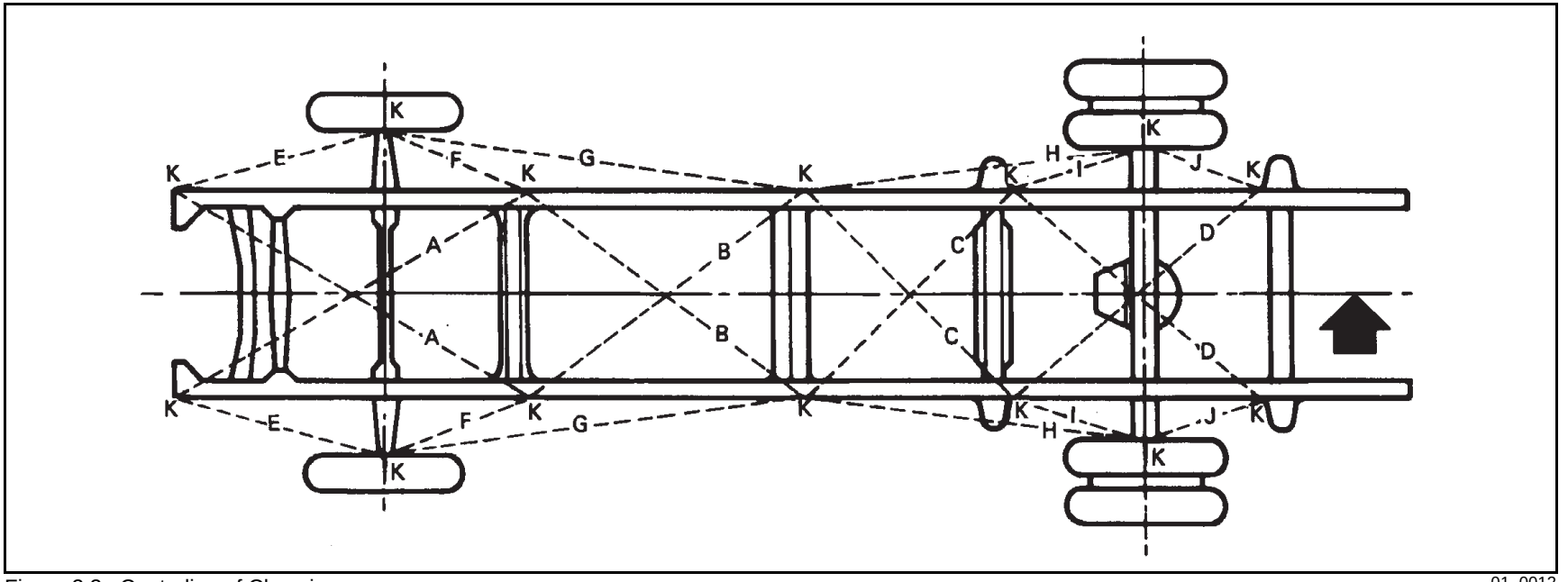



Figure 2.2 Centerline of Chassis

01_0012

**Method of Checking**

After each measurement point has been carefully marked on the floor, proceed as follows:

1. Locate centerline of chassis by measuring front and rear end widths, using marks on floor.

If frame widths are within specification, draw centerline on floor, the full length of the chassis and continue with step 2.

If frame widths are out of specification, lay out centerline as follows:

Centerline can be drawn through the intersection of any one pair of equal diagonals (A-A, B-B, C-C, D-D) and center point of one end of frame or through points of intersection of any two pairs of equal diagonals.

2. Measure distance from centerline to opposite points marked over entire length of frame. Measurements should not vary more than 0.12 inch (3.0 mm) at any point.

3. Measuring diagonals (A-A, B-B, C-C, D-D) will indicate point where misalignment occurs. If diagonals in each pair are within 0.12 inch (3.0 mm), that part of the frame included between points of measurement may be considered in satisfactory alignment. These diagonals should intersect within 0.12 inch (3.0 mm) of the centerline.

If the diagonals are not within specification, try loosening and re-tightening all cross-members. Then re-check alignment. Refer to the “Bolt Torque Chart (Phosphate and Oil Coated)”. If frame is still out of alignment, the vehicle must be taken to a suitable frame alignment establishment to confirm frame misalignment. If misalignment is confirmed, suitable measures must be taken to repair the damage.

**SIDE ELEVATION DIMENSIONS**

Dimensions for side elevation of the frame should be checked at the points indicated and should not vary more than 0.12 inch (3.0 mm) from side to side. (They will differ fore and aft due to typical frame rake.)

## Axle Alignment With Frame

After determining that the frame is properly aligned, the axle alignment with the frame should be checked by comparing diagonals.

If necessary, adjust axle-to-frame alignment.

## Frame Straightening

Frame straightening should only be performed by a qualified frame alignment facility. Under no circumstance should frame alignment be performed by inexperienced or unqualified service personnel.

**DO NOT USE HEAT TO STRAIGHTEN.**

Use of heat is not recommended when straightening heat-treated frame sidemembers. Heat will weaken these frame members, consequently, all straightening should be done at room temperature. Add reinforcement per section if heat straightening is done.

Frame members which are bent or buckled sufficiently to show cracks or weakness after straightening should be replaced or reinforced. **HEAT-TREATED FRAME MEMBERS MUST NOT BE INTERMIXED WITH NON-HEAT-TREATED MEMBERS.**

If one sidemember is to be replaced, the new member must match the former frame member in both cross-section and material strength.

## Repair and Reinforcement Recommended Procedures

In some cases of frame damage, the sidemembers must be replaced rather than repaired. Examples of this are:

1. When sidemember cracks caused complete separation or a visible deformation of the section.
2. When the sidemembers are extensively deformed. Consult with your field service representative and frame repair specialists if in doubt.

## Preparation of Frame for Repair

### Bevel Crack to Weld

To assure complete weld penetration, bevel the crack from one side when welding from one side. Bevel the crack from both sides when welding from both sides. The existing crack in the sidemember must be entirely removed (Figure 2.3). Widen the crack its full length to 1/8 inch (3 mm). If required, a rubber backed disc grinder or high speed steel burr may be used.

### Clean Surface to Weld

Surfaces to be welded and surfaces adjacent to the weld must be free of loose scale, slag, rust, grease, moisture, paint or other material that could contribute to poor quality welds.

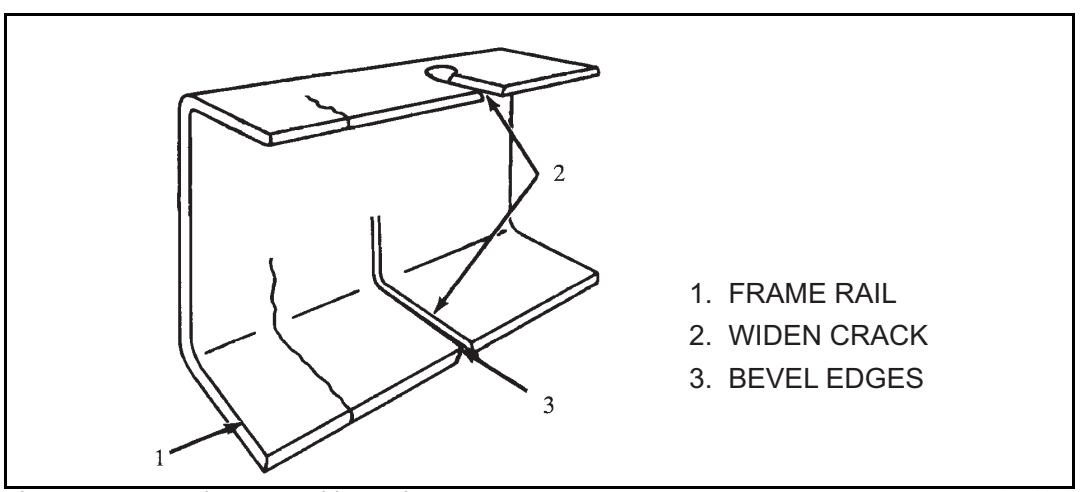



Figure 2.3 Preparing For Weld Repair 01_0013

## Welding

Electric arc-welding is recommended for repair of steel frames. The shielded arc method should be used because the heat generated during welding is localized and burning of material is minimized using this method. Additional advantages are that the finished weld can be ground flush and drilled as necessary.

Shielded metal arc welding (SMAW); gas metal arc welding (GMAW), also known as metal inert gas (MIG) welding; gas tungsten arc welding (GTAW), also known as tungsten inert gas (TIG) welding; or flux cored arc welding (FCAW) are recommended methods for repair of steel frame members.

**TO AVOID SERIOUS PERSONAL INJURY, DEATH OR POSSIBLE ENGINE DAMAGE, WHEN WELDING OR USING AN ACETYLENE TORCH ALWAYS WEAR WELDING GOGGLES AND GLOVES. INSURE THAT ACETYLENE AND OXYGEN TANKS ARE SEPARATED BY A METAL SHIELD AND ARE CHAINED TO A CART. DO NOT WELD OR HEAT AREAS NEAR FUEL TANKS OR FUEL LINES. UTILIZE PROPER SHIELDING AROUND HYDRAULIC LINES.**

## General Recommendations

**IMPORTANT: To properly perform the repair procedure, the following rules must be observed:**

**All Steel Sidemembers**

1. Welding should not be performed when surfaces are wet or exposed to rain, snow, high wind or when repair personnel are exposed to inclement conditions. Frames exposed to inclement weather must be thoroughly cleaned and dried before the repair is made.
2. Surface areas and edges to be joined must be clean and free of oil, grease, loose scale, rust, moisture, paint or other material that could contribute to poor quality welds.
3. Always avoid craters, notching and undercutting.
4. Peen new welds prior to grinding to relieve stresses caused by shrinkage.
5. Grind all welds flush with the surrounding surfaces. Use a coarse grinder followed by smooth grind at 90° to the crack direction to remove all of the coarse grind marks.
6. Inspect the weld repaired area carefully after grinding. Grind out any remaining cracks, notches or undercuts and repeat the finishing and inspections.
7. For welding cracks to the edge of the sidemember flange, locate a run-off block at the edge as in to obtain a continuous weld without undercuts. After welding, the run-off block should be cut off and the weld should be ground and inspected as in steps 5 and 6 above.

8. Weld to the edges of the holes: The weld should continue into the hole to form a plug weld with a copper chill block on the opposite side to help form the plug. The weld should then be finished as in steps 5 and 6 above and redrilled. Chamfer the hole edges. If the hole was open and unused, install a Grade 8 bolt to help attach the weld repair reinforcement.

**NVISIBLE ULTRAVIOLET AND INFRARED RAYS EMITTED IN WELDING CAN INJURE UNPROTECTED EYES AND SKIN. PROTECTION SUCH AS WELDER'S HELMET WITH DARK COLORED FILTER LENSES OF THE PROPER DENSITY MUST BE USED. GTAW OR TIG WELDING WILL PRODUCE INTENSE RADIATION, THEREFORE, FILTER PLATE LENSES OF THE DEEPEST SHADE PROVIDING ADEQUATE VISIBILITY ARE RECOMMENDED. IT IS STRONGLY RECOMMENDED THAT PERSONS WORKING IN THE WELD AREA WEAR FLASH SAFETY GOGGLES. ALSO WEAR PROTECTIVE CLOTHING.**

9. Electrodes: Only low hydrogen electrodes should be used. These should be purchased in hermetically sealed containers or dried for two hours at a temperature between 450° F (232° C) and 500° F (260° C).

After drying, the electrodes should be stored in an oven at a temperature of at least 250° F (121° C). If exposed to the atmosphere for more than four (4) hours, the electrodes should be dried before use. ANY MOISTURE INTRODUCED INTO THE WELD COULD DEVELOP POROSITY OR EMBRITTLEMENT, LEADING TO FURTHER CRACKING. Welding procedures will vary among different frame materials. Outlined below are recommendations for welding of the various types of frames.

1. Preheat the frame member along the prepared weld joint to 500 to 600° F (260 to 316° C). Insure the area is clean and any moisture present is eliminated.

2. Permit heated area to cool to 200° F (93° C) or below before welding is started. The weld repair area must be clean before welding.

3. Either alternating current or direct current reversed polarity, combined with a short arc and beading or narrow weave technique, may be used. Direct current reversed polarity is recommended.

4. Slag should be removed after each pass and an interpass temperature of 200° F (93° C) should be maintained.

5. Grind smooth and flush with surrounding sidemember material. Grind the weld in a direction that is 90° to crack direction (Figure 2.4 D).

6. Add reinforcement.

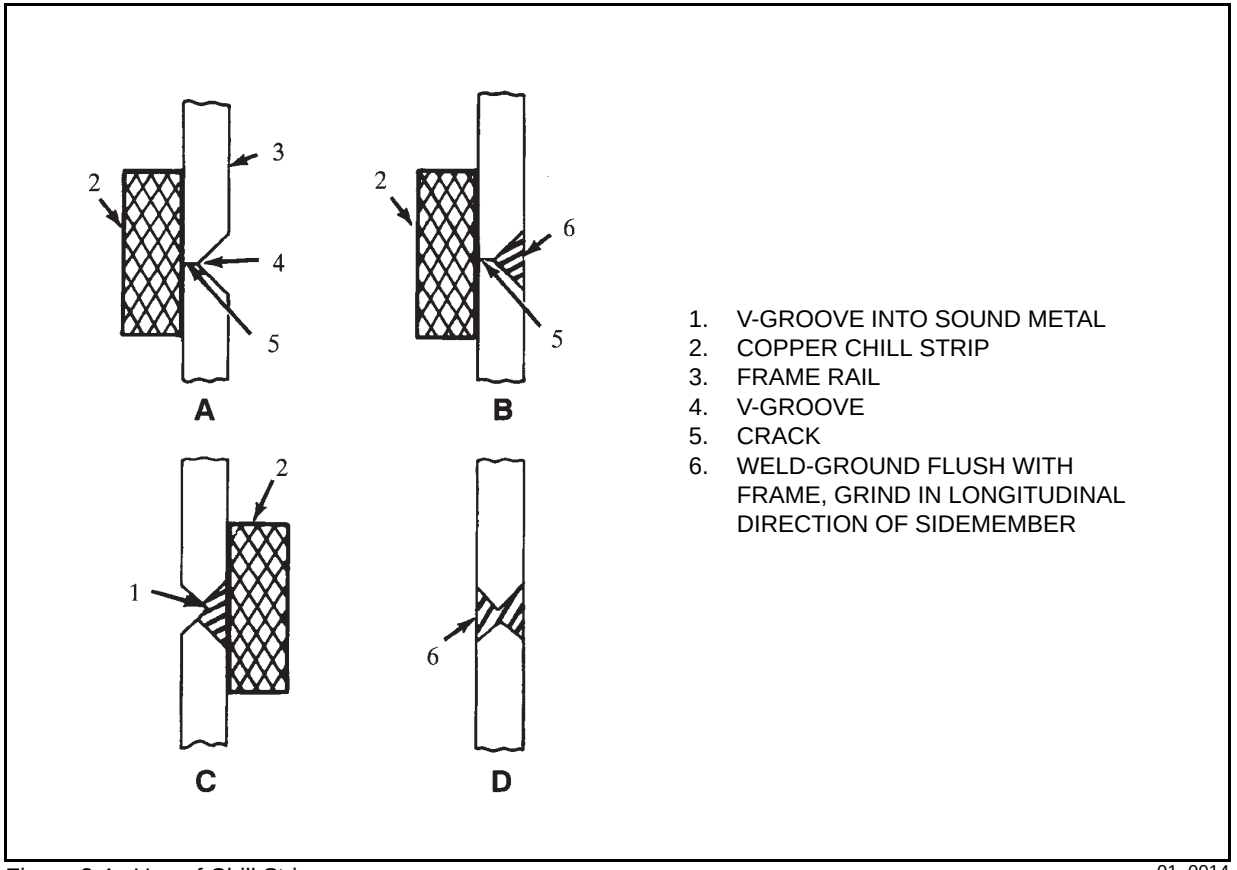



Figure 2.4 Use of Chill Strip 01_0014

**High Strength Low Alloy Steel Frames (50,000, 60,000 and 80,000 PSI Yield Strength)**

Any of the electric arc methods previously described may be used. The choice of a suitable electrode or wire depends somewhat upon the equipment available for welding and the method selected.

The SMAW and the GMAW methods are preferred for welding the HSLA frames. The use of low hydrogen electrodes is recommended. Refer to Table 2.1 for selection of recommended electrodes and wires, or refer to A.W.S. A.5 standard available from www.aws.org for equivalent strength electrodes, wires or rods and power leads to be used in the welding methods. The double V-notch weld preparation using the weld procedure shown in Figure 2.4 is the preferred welding method.

Table 2.1 Recommended Electrodes and Wires

| MATERIAL STRENGTH PSI | RECOMMENDED ELECTRODE AND WIRE | |
|---|---|---|
| | SMAW | GMAW |
| 50,000 | E7018 | E70S-3 |
| 60,000 | – | E70S-1B |
| 80,000 | E8018 | E80S-D2 |

Amperage and voltage recommendations for welding are shown in Table 2.2 and Table 2.3

Table 2.2 SMAW Method (HSLA Frames)

| POSITION | ELECTRODE SIZES INCH | WELDING CURRENT | | SPEED (INCH/MIN.) |
|---|---|---|---|---|
| | | AMPERES | VOLTS | |
| Flat | .125 | – | – | – |
| Horizontal and Vertical | .125 | 110/140 | 20/14 | 24 |

Table 2.3 GMAW Method (HSLA Frames)

| POSITION | ELECTRODE SIZES INCH | WELDING CURRENT | | SPEED (INCH/MIN.) |
|---|---|---|---|---|
| | | AMPERES | VOLTS | |
| Flat | .035 | – | – | 350/400 |
| Horizontal and Vertical | .035 | 190/220 | 20/30 | 350/400 |

7. Preheat frame rail along the weld joint to 500 to 600° F (260 to 316° C) to insure any moisture present is eliminated and to prevent too rapid cooling of weld metal.
8. Direct current, reversed polarity is preferred. Weld using a short arc and a beading or narrow weave technique.
9. Slag should be removed after each pass and an interpass temperature of 200° F (93° C) should be maintained.
10. Grind smooth and flush with surrounding sidemember material. Grind the weld in a direction that is at 90° to crack direction (Figure 2.4 D).
11. Add reinforcement.

**Heat Treated Frames (110,000 and 120,000 PSI Yield Strength)**

When welding Heat Treated Frames (110,000 PSI and 120,000 Yield Strength), use low hydrogen electrodes which have superior crack resistance and notch toughness similar to AWS-E-11018. This type electrode should be stored in a moisture-free container to avoid porosity during welding.

Amperage and voltage recommendations for welding are shown in Table 2.4.

Table 2.4 SMAW Method (Heat-treated Frames)

| POSITION | AMPERES | VOLTAGE |
|---|---|---|
| Downhand | 130/140 | 21/23 |
| Overhead | 130/140 | 21/23 |
| Vertical Up | 110/120 | 22/24 |

A heavy copper “chill” strip should be clamped to the rail side away from the groove to help control the temperature and cooling rate during welding (Figure 2.4). Short lengths of discarded heavy copper electrical bus bars make suitable chill strips.

Preheat the frame rail along the crack area to 500-600° F (260-316° C). Either alternating current or direct current reversed polarity, combined with a short arc and a beading or narrow weave technique may be used. Direct current reversed polarity is recommended.

Slag should be removed after each pass and an interpass temperature of 200° F (93° C) should be maintained. Grind smooth and flush with surrounding sidemember material, in a direction that is parallel to the longitudinal axis of the sidemember (Figure 2.4 D).

A V-groove is ground from the side opposite the repair and the procedure outlined above repeated. “Chill” strips should be used whenever possible. The V-groove ground on the opposite side of the repair should be deep enough to enter the sound metal of the first weld repair as shown in Figure 2.4 C.

## Reinforcement

The strength of the sidemember in the weld joint repair region has been reduced by welding and this region must be reinforced sufficiently to insure that the service life of the frame is not shortened. Reinforcement of the frame after welding is intended to reduce the stresses in the weld repair region to a lower level than was previously permitted. Improper drilling will also reduce the strength of the sidemembers. Refer to “Drilling or Notching”.

**THE TYPE, LENGTH, MATERIAL AND ATTACHMENT TECHNIQUES FOR REINFORCEMENTS VARY WITH THE TYPE AND LOCATION OF THE CRACK AND WITH THE LOADING CONDITIONS ASSOCIATED WITH THE CRACK.** It is not practical to give specific recommendations for all cases of frame cracking,

therefore the various types of reinforcements are identified with general descriptions of their applications and installation procedures. To aid in making the distinctions between the more critical flange area and the less critical web area, critical zones are defined as shown (Figure 2.5 D).

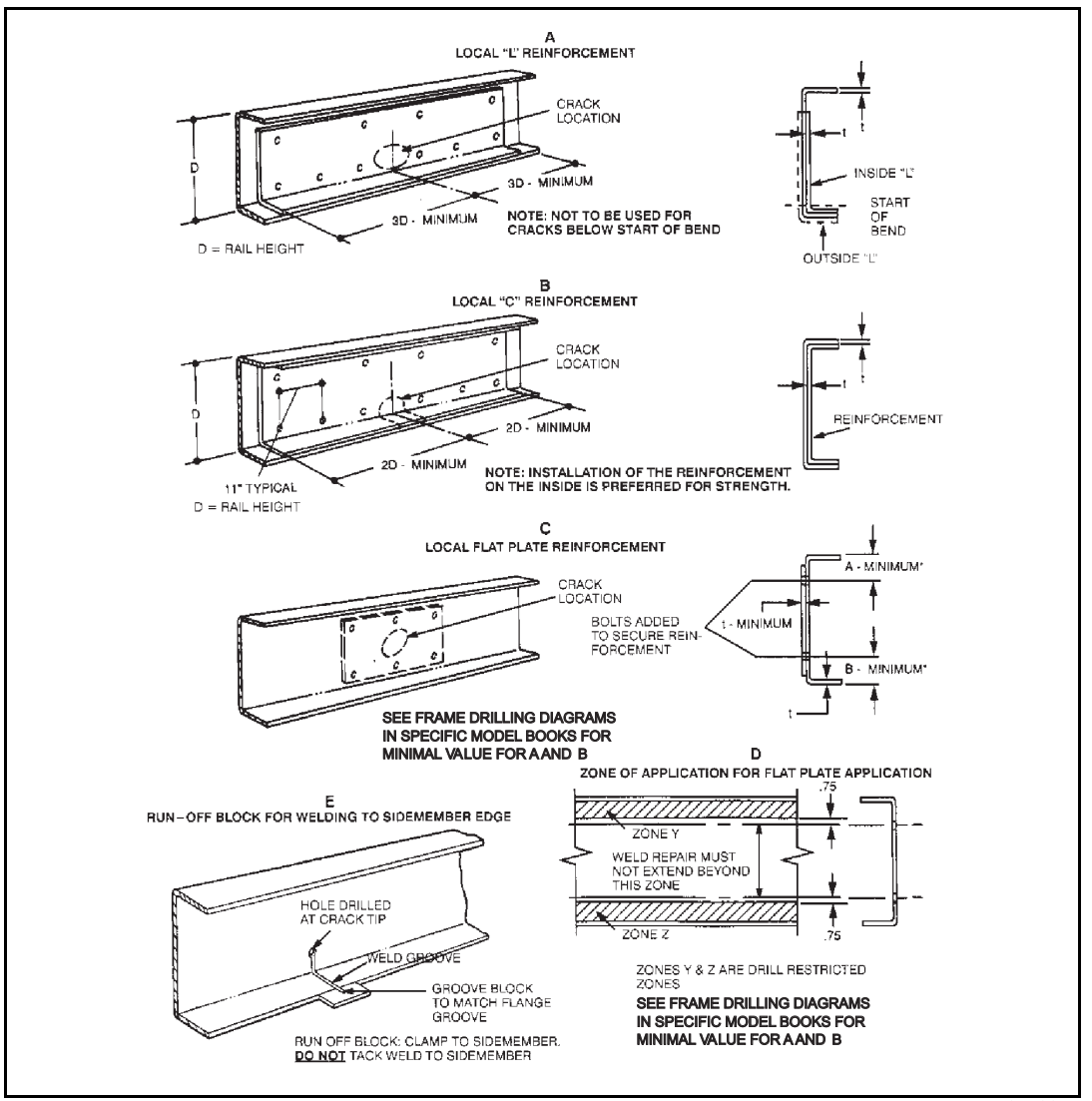



Figure 2.5 Reinforcement Application

01_0015

Cracks which occur in the critical zones have a greater probability of growing vertically through the section, and the reduced strength after weld repair necessitates a more substantial reinforcement.

These guidelines potentially affect the structural integrity of the frame assembly and are intended for those who have the equipment and experience required to qualify as frame repair specialists.

## General Weld Repair Reinforcement Procedures

1. The thickness and material strength of the local plate, “L” and channel reinforcements should match the section being reinforced.
2. The corners of the reinforcements which will be in contact with the sidemember along the reinforcement edges must be chamfered to prevent damage to the sidemember.
3. All sidemember reinforcements must be bolted to the web section within the zone shown in the frame drilling guidelines in the specific model body builder book. The bolts must be of SAE Grade 8 or better, with integral flanges or with hardened flat washers and must be tightened to Grade 8 levels.
4. Crossmember modification or replacement may be required if the reinforcement is on the same side as the crossmember.
5. Consider the potential effects of the reinforcements on the various components mounted to the frame. Check clearances for suspension, wiring, plumbing and other controls.
6. For attachment of reinforcements, use existing bolts wherever this is practical.
7. The weld repaired area of the sidemember and all of the reinforcement should be primed and painted before reinforcement installation. For corrosive environments, additional treatment of the interface may be needed.

## Full Length Channel Weld Repair Reinforcements

“Full length” channel reinforcements are available through International® dealers for most models. The actual length, starting location and ending location vary from model to model. Different length reinforcements may also be available.

When applied as a repair reinforcement, these reinforcements DO NOT increase the load capacity of the vehicle. Their advantage in this case is their availability. A disadvantage of this type is that it is likely to affect more of the components which mount to the frame. In some cases this disadvantage may be offset by cutting the full length reinforcement to create a local reinforcement.

**Recommended Applications**

1. Cases of repair of vertical cracks in either the top or bottom flanges at very low mileage.

2. Cases in which the weld repair is accompanied by extensive straightening of heat treated sidemembers.

## Full Length “L” Weld Repair Reinforcements

Steps 1 and 2 above also apply to the full length “L” reinforcements available from International. All of these are the inverted “L” type and are designed for installation on the outside of the sidemember section (except 9000 Series) (Figure 2.5 A).

**Recommended Applications**

This type of reinforcement is recommended for cases of cracking at very low mileage where a web crack has extended beyond the range for a flat plate reinforcement but ends short of the bend radius. It is also applicable to cases in which the cracking is accompanied by flange buckling.

**Application Procedures**

1. For custom-fabricated full length “L” reinforcements, the section should be oriented up or down so that the flange is on the same side as the damaged area.
2. For maximum strength the flange should be on the outside of the section.
3. Follow the general recommendations above for attachment of the reinforcement.

## Local Channel Weld Repair Reinforcements

This type of reinforcement must be custom-fabricated either by cutting lengths from “full length” reinforcements or by forming from flat stock (Figure 2.5 B).

**Recommended Applications**

1. Cases in which the weld repair extends into the sidemember flange after substantial service life.
2. Cases accompanied by extensive abrasive wear of the sidemember section. In these cases the length of the wear area should be added to the length recommendations below.

**Application Procedures**

1. The channel should be installed on the outside of the section for greater strength.
2. Figure 2.5 B gives recommended dimensional data and attachment specifications for a typical installation. Holes drilled for the attachment must be within the frame drilling guidelines in the specific model body builder book.

## Local "L" or Inverted "L" Weld Repair Reinforcements

This type of reinforcement is also generally custom-fabricated. It has a greater tendency to loosen than a channel reinforcement because, for vertical deflections of the frame assembly, it tends to bend about an axis different from that of the main sidemember section. Because of this its length and/or attachment specifications are typically greater than for the channel type.

**Recommended Applications**

This type of reinforcement is recommended for cases in which the weld repair is confined to the web of the section but extends beyond the application zone of the flat plate reinforcements shown in Figure 2.5 D.

**Application Procedures**

1. Figure 2.5 A shows a typical installation for an "L" reinforcement on the inside of a sidemember section along with minimum recommended dimensions.
2. The flange of the reinforcement should be oriented up or down so that flange is on the same side as the damaged area.
3. For maximum strength the reinforcement should be installed on the outside of the sidemember section.

## Flat Plate Weld Repair Reinforcements

This reinforcement is intended for the less critical, web portion of the sidemember section where typical cracking is due to local stresses which tend to "diaphragm" or "dish" the web without creating appreciable stresses for overall bending of the section. Typical crack patterns radiate out from the edge of a mounting bracket or crossmember or from a hole in the web. Cracks which radiate from a web hole occupied by a fastener are frequently an indication of a defective joint, whether by the loosening of the fastener or poor joint design (Figure 2.5 C).

**Recommended Applications**

The flat plate reinforcements are recommended for weld repairs in which the weld does not extend beyond the zone defined in Figure 2.5 D.

**Application Procedures**

1. A typical installation is shown in Figure 2.5 C. The length and height of the plate will vary with the size of the weld repair area. In general it should be such that it will accommodate an array of reinforcement attachment bolts at a typical 3 to 5 inch (76 to 127 mm) spacing all around the weld repair area.
2. The plate should generally be installed on the side opposite the component which transferred the local bending load into the web.
3. The edges of the plate should be staggered with respect to the edges of other relatively stiff web mounted components to avoid the creation of stress concentrations.

## Bolt and Torque Information

Most frames are assembled with bolts and nuts. Others are riveted. **BOLTS MUST ALWAYS BE USED WHEN ATTACHING A REINFORCEMENT.** Rivets should be replaced by bolts as required when the frame is repaired and reinforced.

In bolted joints, the majority of the load is transferred by frictional force or clamping force between the members of the joint. The bolts must be properly tightened to develop and maintain the desired clamping force. Operation of the joint with loose or improperly tightened bolts can lead to failure of the joint. The bolts and nuts should be inspected periodically to insure that proper torque is maintained.

Bolts of high strength material conforming to SAE Grade 8 bolts should be used on all frames. For installation of reinforcements, 0.5 inch (13 mm) diameter flange head bolts are recommended. The SAE Grade 8 bolt is identified by six radial line markings on the head of the bolt (Figure 2.6). Nuts must be Grade 8 flange type.

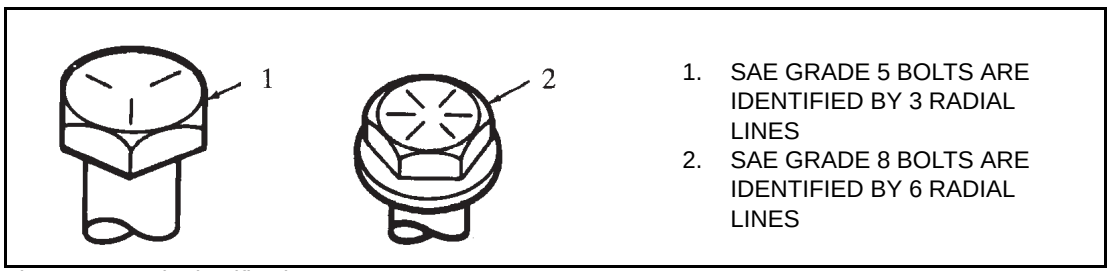



Figure 2.6 Bolt Identification 01_0016

These bolts, 0.5 inch (13 mm) diameter flange head type, should be tightened to 110 to 120 ft-lbs. (149 to 163 Nm) based on new bolts and nuts lubricated with engine oil. Whenever possible, hold the bolt and tighten the nut.

If frame components are aluminum, flange head bolts and nuts, or bolts with hardened flat washers must be used. If modification or repair requires replacement of existing bolts with new bolts or bolts of a greater length, the old flange head nuts should not be used with new standard bolts.

Careful consideration is given to the number, location and sizes of frame bolt holes in the design of a vehicle. The number, location and sizes of additional bolt holes put in the frame subsequent to manufacture of the vehicle can adversely affect frame strength. The adverse effect of additional bolt holes can be minimized by following the guidelines.

## Huckbolt Fasteners (HP 8)

Huckbolt HP 8 fasteners are used in various positions in frame rail construction. Advantages to this style fastener are consistent clamp load and a high resistance to loosening due to vibration. The need to recheck fastener torque is eliminated.

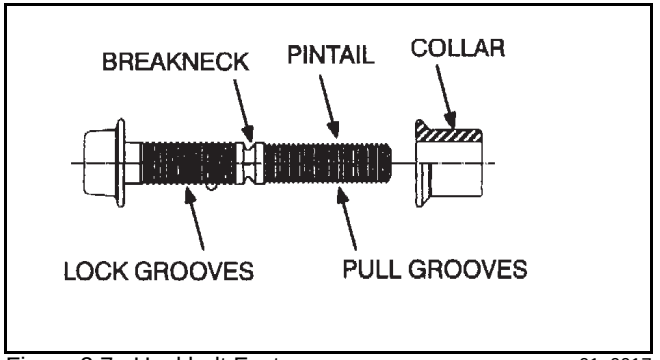



Figure 2.7 Huckbolt Fasteners 01_0017

**Removal**

The swaged collar cannot be unscrewed due to the locking grooves on the HP 8 fastener. Removal requires a Huck Collar Cutter or the collar can be split with an air chisel while supporting the opposite side of the collar. When the collar is split, the fastener can be driven out with a punch.

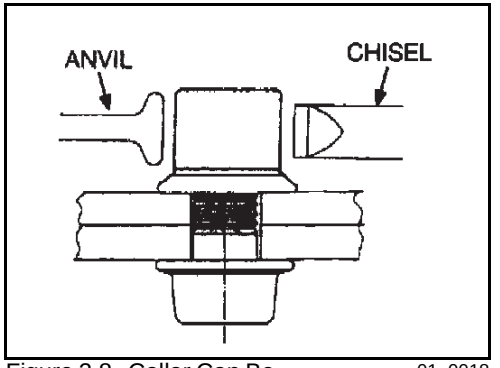



Figure 2.8 Collar Can Be Split With an Air Chisel 01_0018

CAUTION: The HP 8 fastener is not intended for re-use. To do so can result in damage to the vehicle frame or components attached to the frame.

CAUTION: In the event that Huck fasteners are removed, in order to retain the same joint integrity, it is strongly recommended that new Huck fasteners be used for attachment/reattachment of components.

**Installation**

NOTE: Huckbolt HP 8 fasteners cannot be installed without Huck installation equipment.

1. Install the HP 8 fastener into the component and frame hole.
2. Place the collar over the fastener pintail (See Figure 2.9)

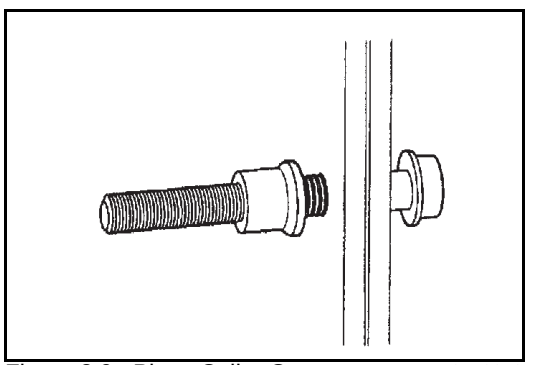


Figure 2.9 Place Collar Over Fastener Pintail 01_0019

3. Place the Huck installation tool over the HP 8 fastener pintail (See Figure 2.10)

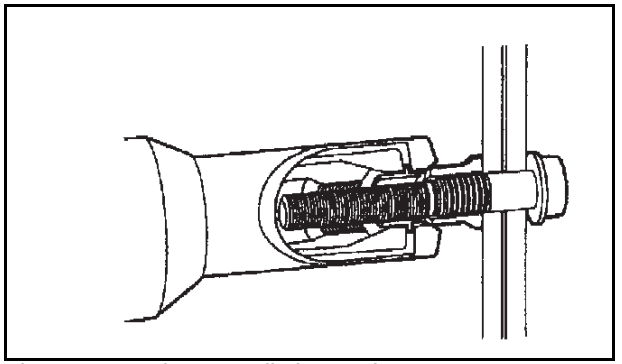


Figure 2.10 Place Installation Tool Over Fastener Pintail 01_0020

4. Activate the Huck installation tool.

The Huck installation tool creates a pulling force on the fastener, seating the bolt head and closing the gap between the mating surfaces. The collar is swaged into the pintail locking grooves developing clamping force (See Figure 2.11). As pulling forces further increase, the body of the fastener separates at the breakneck (See Figure 2.12), completing installation.

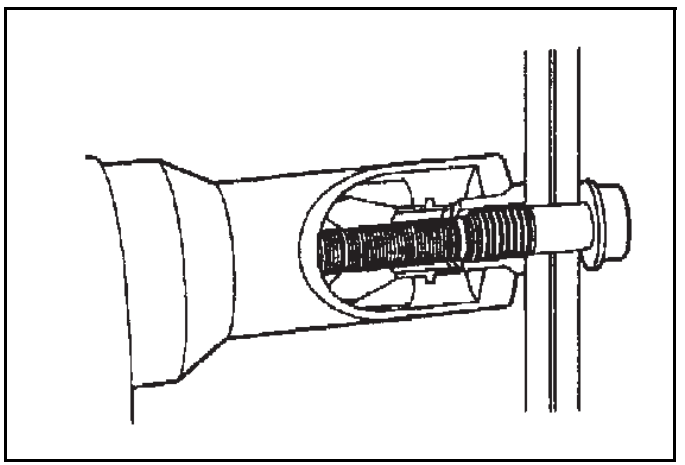


Figure 2.11 Clamping Force is Developed 01_0021

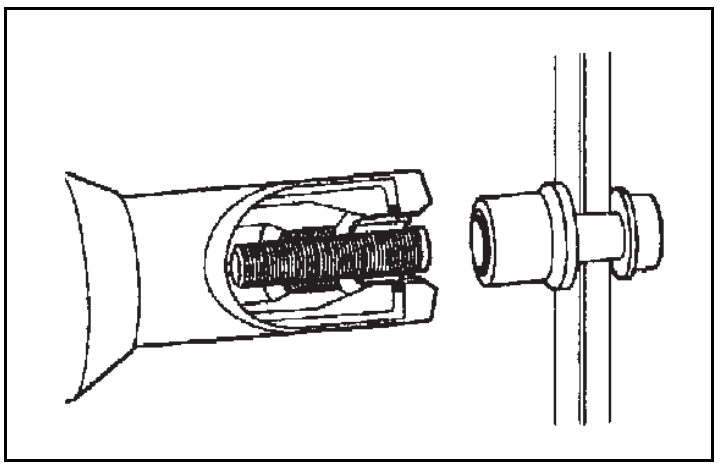


Figure 2.12 Body of Fastener Separates at Breakneck 01_0022

## Huck-Spin Fasteners

### Description

Huck-Spin fasteners are used in various positions in frame rail construction. The installed fastener has a collar that is cold-worked or swaged over the grooved pin Figure 2.13. Advantages to this style fastener are consistent clamp load and a high resistance to loosening due to vibration. The need to recheck fastener torque is eliminated.

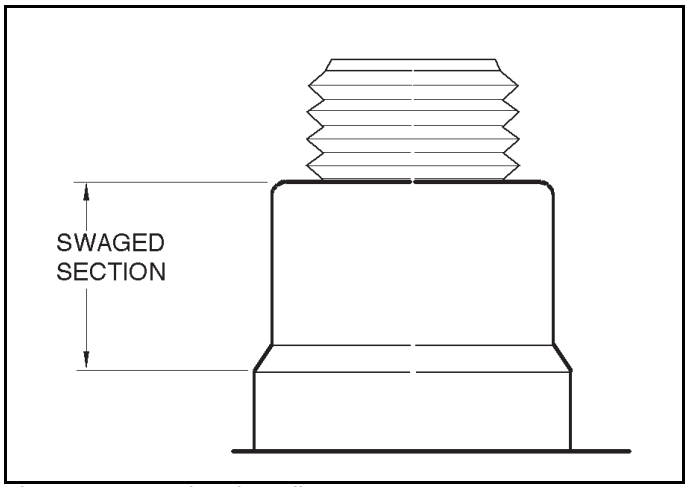



Figure 2.13 Huck-Spin Collar 01_0023

**Remove**

The collar cannot be removed by twisting or hammering. The collar must be cut longitudinally to the extent of the swaged section. This can be accomplished with a small wheel grinder (Figure 2.14).

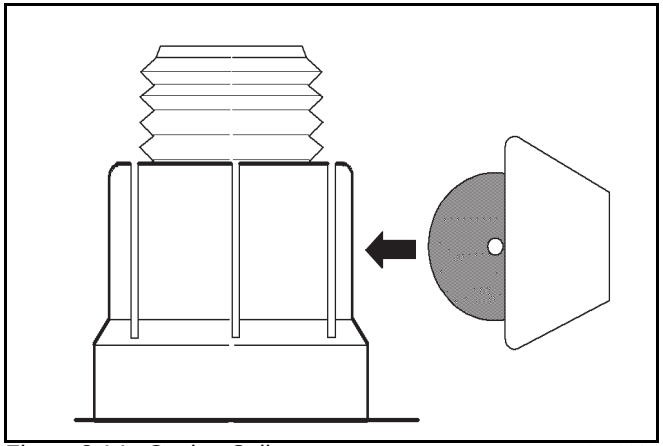


Figure 2.14 Cutting Collar with Wheel Grinder 01_0024

Drilling on opposite sides of the collar may also be used (Figure 2.15).

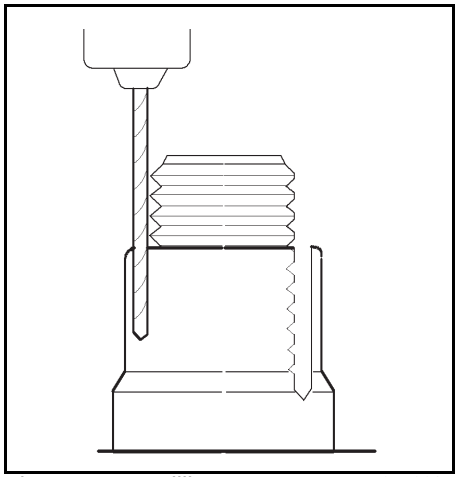


Figure 2.15 Drilling the Collar 01_0025

Another method of splitting the collar is to chisel the walls of the collar (Figure 2.16).

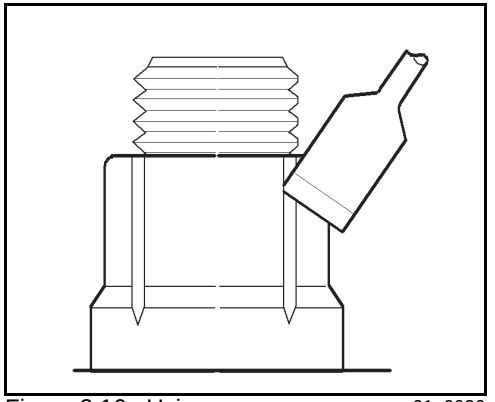


Figure 2.16 Using a Chisel to Split the Collar 01_0026

When the collar has been opened over the length of the swaged portion on two opposite sides (Figure 2.17), the fastener can be removed. The fastener may need to be hammered to remove the collar.

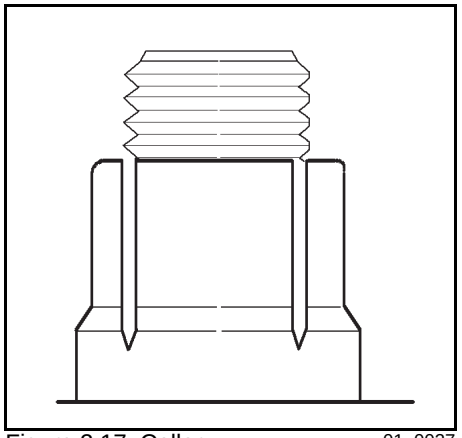


Figure 2.17 Collar with Reliefs for Removal 01_0027

In the event the collar doesn't come loose, use a chisel or suitable tool to peel the collar sections back (Figure 2.18).

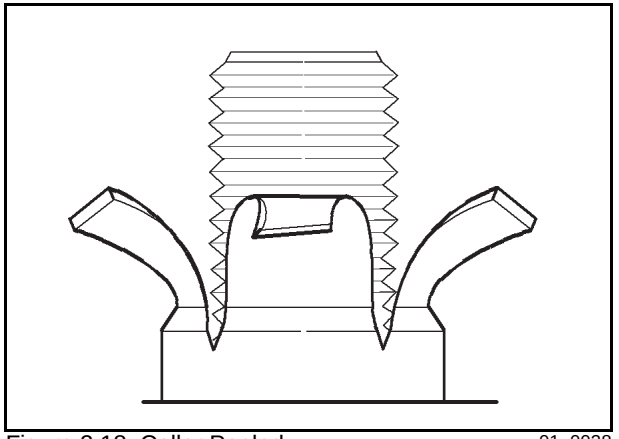


Figure 2.18 Collar Peeled Back to Assist Removal 01_0028

The fastener will come free when sufficient collar material has been pulled away (Figure 2.19).

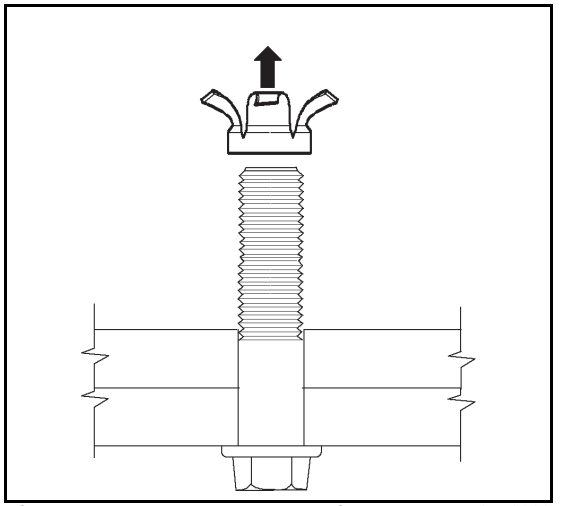


Figure 2.19 Fastener Removed 01_0029

**Install**

The Huck-Spin is installed by spinning the collar onto the fastener. The pulling action of the Huck-Spin installation tool swages the collar into the grooves of the fastener and then automatically disengages from the fastener (Figure 2.20).

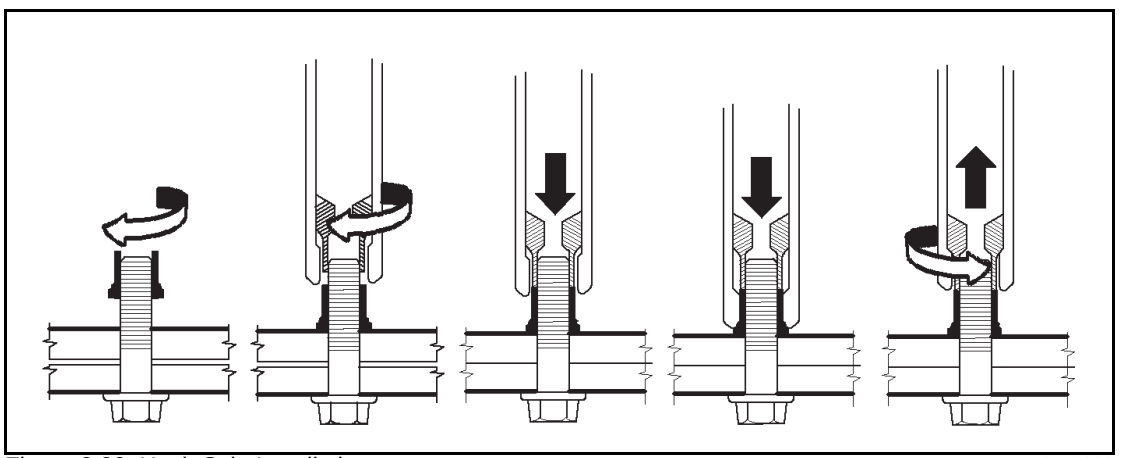


Figure 2.20 Huck-Spin Installation 01_0030

## Special Service Tools

### Hydraulic Unit – Model No. 940

Used for removal and installation of the Huck Bolt.

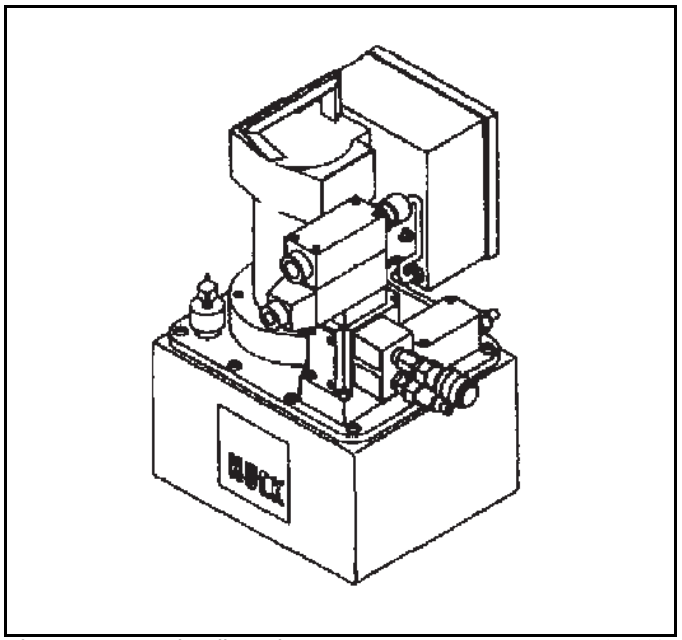



Figure 2.21 Hydraulic Unit 01_0031

Nose Assembly Tool

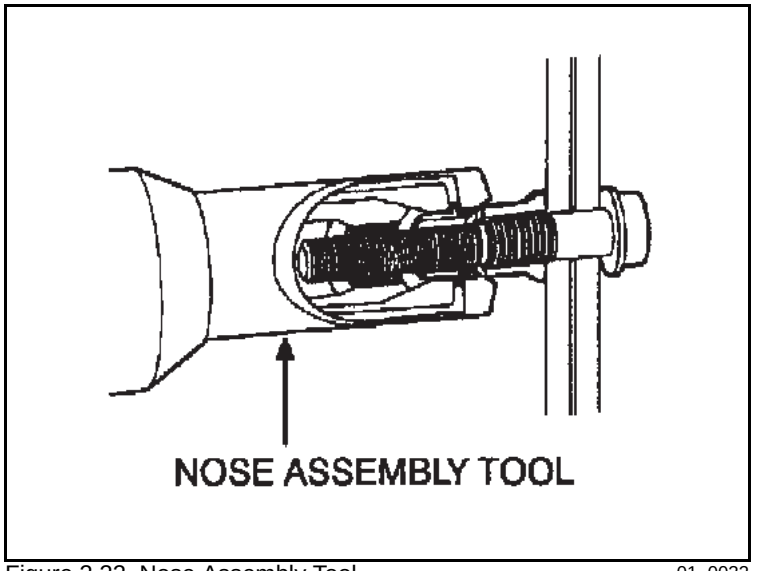



Figure 2.22 Nose Assembly Tool 01_0032

Table 2.5 Nose Assembly Tool

| DESCRIPTION | TOOL NUMBER |
|---|---|
| For 1/2 Dia. Fastener | 99-1484 |
| For 5/8 Dia. Fastener | 99-1481 |

## Hydraulic Installation Tool

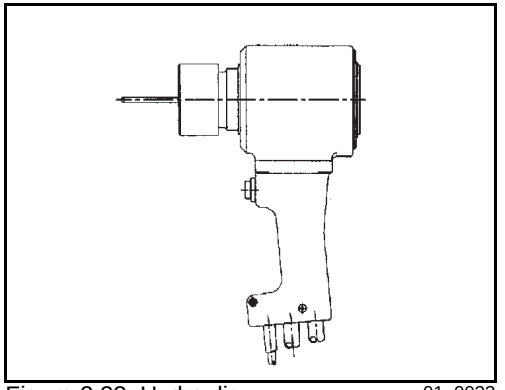


Figure 2.23 Hydraulic Installation Tool 01_0033

Table 2.6 Hydraulic Installation Tool

| DESCRIPTION | TOOL NUMBER |
|---|---|
| For 1/2 Dia. Fasteners | 557 |
| For 5/8 Dia. Fasteners | 585 |

## Collar Removal Tool

Table 2.7 Collar Removal Tool

| DESCRIPTION | TOOL NUMBER |
|---|---|
| For 1/2 Dia. Fasteners | 516 |
| For 5/8 Dia. Fasteners | 520 |

**ORDER TOOLS FROM:**

| | |
|---|---|
| Huck International, Inc. | Phone: (800) 431-3091 |
| P.O. Box 2270, One Corporate Drive | Phone: (914) 331-7300 |
| Kingston, NY 12401 | Fax: (914) 334-7333 |

## Aftermarket Modifications

Cutting the frame behind the rear axle to shorten the frame is acceptable. Mechanical cutting or sawing is preferred to torch cutting. Whenever it is necessary to cut the frame, the sidemember should be cut at an angle of 90° to the longitudinal axis.

For information on cutting of the frames to lengthen the frames or modify the wheelbase, refer to “Wheelbase Alterations”.

Where mounting angles are to be welded to fifth wheel assemblies, refer to fifth wheel manufacturer's recommendations.

In some cases, specialized equipment such as hoists, winches, lifts, snowplows, pusher and tag axles are added to the vehicle by distributors, installers or dealers. Unless otherwise specified by the customer at the time of assembly, the vehicle is generally equipped with a standard chassis frame and the manufacturer has not made special allowances for the special equipment which is being added.

The addition or installation of this special equipment on the vehicle can significantly affect the loading of the chassis frame. In some cases, it may be necessary to reinforce the frame. Care must be exercised to insure that the gross vehicle weight rating (GVWR) and/or the gross axle weight ratings (GAWR) are not exceeded.

Installation of this special equipment may involve State and Federal requirements which affect vehicle certification for noise emissions, exhaust emissions, brake requirements, lighting system requirements, etc. The specialized equipment installer is responsible for the safety and durability of their product and, in addition, is responsible to insure that the equipment and its installation comply with all applicable State and Federal Department of Transportation requirements and OSHA regulations.

Addition of specialized equipment may have a significant effect on other vehicle components, such as the brake system, steering system, suspension system, etc. Simple reinforcement of the chassis frame may not be adequate to provide safe operation of the vehicle.

In any modification of the chassis frame, the addition of holes, reinforcements, welds, clamps, splices, etc. may cause an increase in the local stress in the frame at the point of the modification. These local stress concentrations can significantly affect the life of the chassis frame. The specific effect which the stress concentrator will have on the life of the chassis frame is influenced by the location of the stress concentration, the frequency and severity of the loading, and the type of stress concentration. Any modification of the frame may void the manufacturer's warranty.

Refer to “Welding and Reinforcement” information.

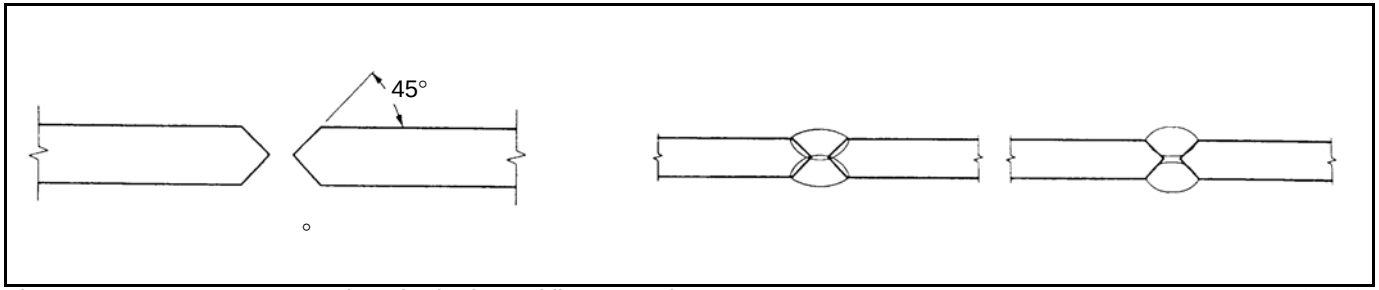



Figure 2.24 Frames – Preparation of Joint for Welding Extension 01_0034

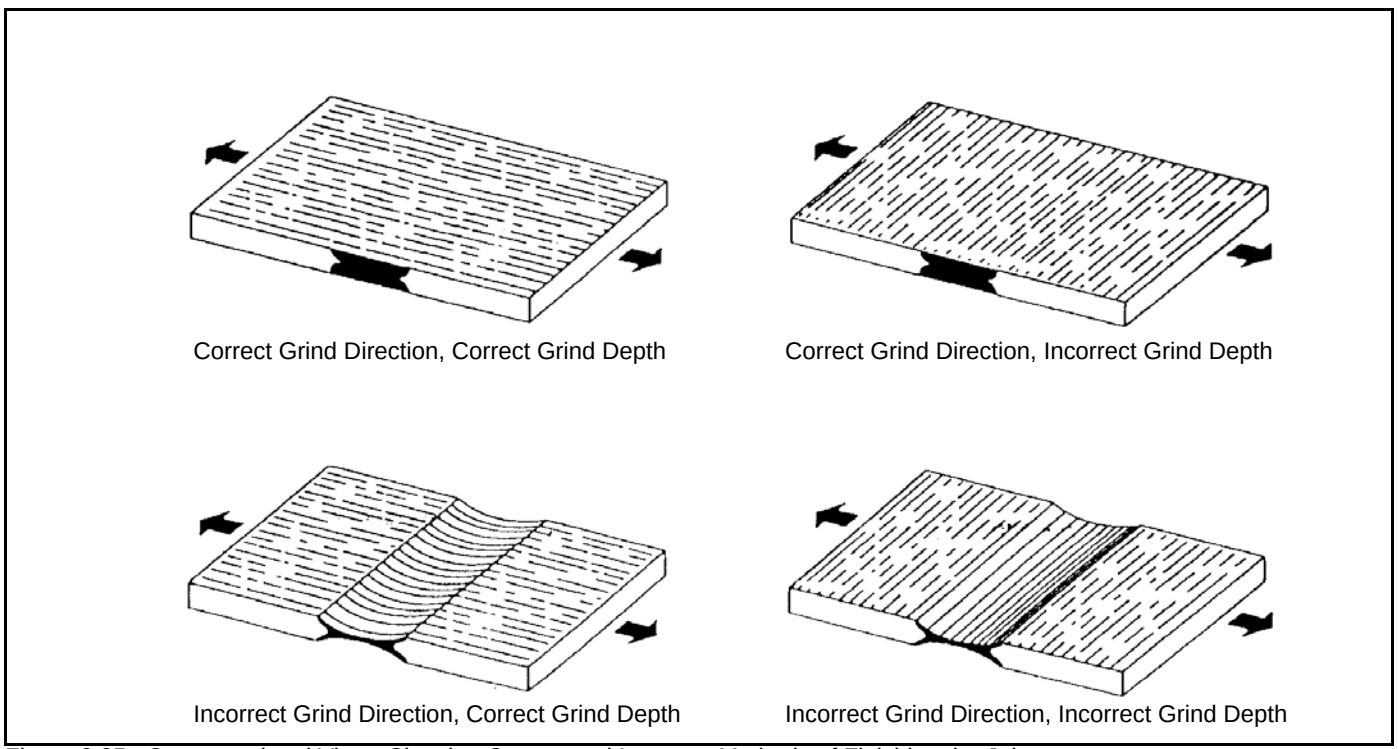



Figure 2.25 Cross-sectional Views Showing Correct and Incorrect Methods of Finishing the Joint 01_0035

## Wheelbase Alterations

Shortening or lengthening a wheelbase is an added expense for the customer. Therefore, it is often to the customer's benefit to order a chassis from the factory with the desired wheelbase rather than to alter the wheelbase of the chassis on-site.

The preferred method for altering the wheelbase is to slide the rear axle forward or rearward as required. Invariably, this requires the lengthening or shortening of air lines, brake lines, electrical lines, and driveline. Extreme care should be taken in the modification of the air lines, brake lines, electrical lines and driveline to insure that they operate as reliably as those with which the vehicle was manufactured.

If the wheelbase is lengthened, a reinforcement may be required. Consult your International® dealer before lengthening the wheelbase.

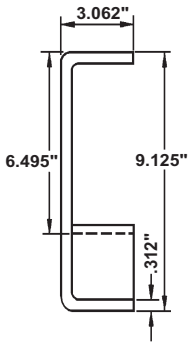
In those instances when it is necessary to cut and weld the frame to alter the wheelbase, the frame must be reinforced with a channel-type reinforcement of the same strength as the original frame material in the area where the frame has been cut, extending at least two feet on either side of the cut and bolted as specified in Figure 2.5 D shown earlier in this section.

If the frame was built with both a main frame and a reinforcement, the reinforcement should be removed before cutting the main frame. **IT IS ESSENTIAL THAT A NEW ONE-PIECE OUTER CHANNEL REINFORCEMENT BE OBTAINED RATHER THAN CUTTING AND RE-USING THE ORIGINAL REINFORCEMENT.** The original frame should also be reinforced with an inner channel reinforcement, extending at least two feet beyond the cut(s) on either side of the cut(s). The reinforcement must be of the same material as the original frame. Blank and pre-punched chassis channel reinforcements are available through your dealer parts department.

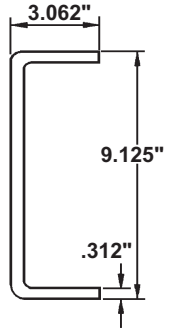
On both medium and high strength aluminum frames, **RE-WELDING TO LENGTHEN THE FRAME IS NOT RECOMMENDED**. Refer to “Reinforcement” and “Reinforcement Attachment” for additional information.

## *FRAME RAIL CROSS-SECTIONS*

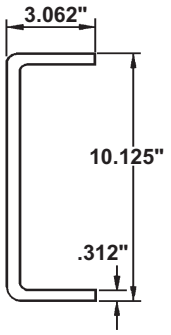
### *ALL MODELS*



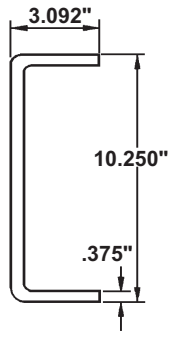
01CAA
01_0053



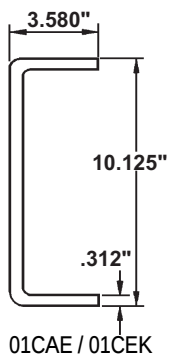
01CAB
01_0054



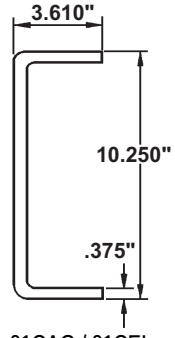
01CAC
01_0055



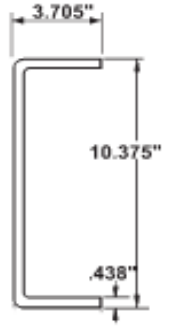
01CAD
01_0056



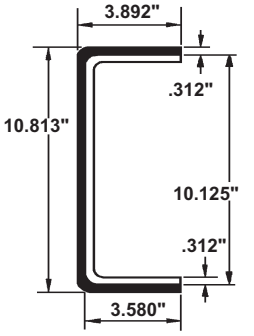
01CAE / 01CEK
01_0057



01CAG / 01CEL
01_0058



01CAH / 01CEM
01_0059



01CAE / 01GBP
01_0086

| Frame Key Code | Side Rail & *Reinforcement* Descriptions [2] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Dimensions (inches) | | | Yield Strength Nominal (psi) | Material # | Section Modulus [1] (inches$^3$) | | Resisting Bending Moment (In.-Lbs.) | |
| | Depth | Width | Thickness | | | Maximum | Nominal | Maximum | Design |
| Straight Channel Side Rail – Kick-Up at Rear Suspension Rearward [3] | | | | | | | | | |
| 01CAA | 9.125 | 3.062 | 0.312 | 80,000 | B | 11.47 | 10.74 | 917,600 | 859,200 |
| Straight Channel Side Rail | | | | | | | | | |
| 01CAB | 9.125 | 3.062 | 0.312 | 80,000 | B | 11.47 | 10.74 | 917,600 | 859,200 |
| 01CAC | 10.125 | 3.062 | 0.312 | 50,000 | B | 13.31 | 12.64 | 665,500 | 632,000 |
| 01CAD | 10.250 | 3.092 | 0.375 | 80,000 | B | 15.94 | 15.14 | 1,275,200 | 1,211,200 |
| 01CAE, 01CEK[4] | 10.125 | 3.580 | 0.312 | 120,000 | C | 14.85 | 14.18 | 1,782,000 | 1,701,600 |
| 01CAG, 01CEL[4] | 10.250 | 3.610 | 0.375 | 120,000 | C | 17.79 | 16.98 | 2,134,800 | 2,037,600 |
| 01CAH, 01CEM[4] | 10.375 | 3.705 | 0.438 | 120,000 | C | 21.05 | 20.11 | 2,526,000 | 2,413,200 |
| Straight Channel Side Rail with Outer “C”Channel Reinforcement | | | | | | | | | |
| 01CAE<br>*01GBP* | 10.125<br>*10.813* | 3.580<br>*3.892* | 0.312<br>*0.312* | 120,000<br>*120,000* | C<br>*C* | 31.72 | 29.84 | 3,806,400 | 3,580,800 |

**NOTES:**

B = High Strength Low Alloy Steel C = Heat Treated Alloy Steel

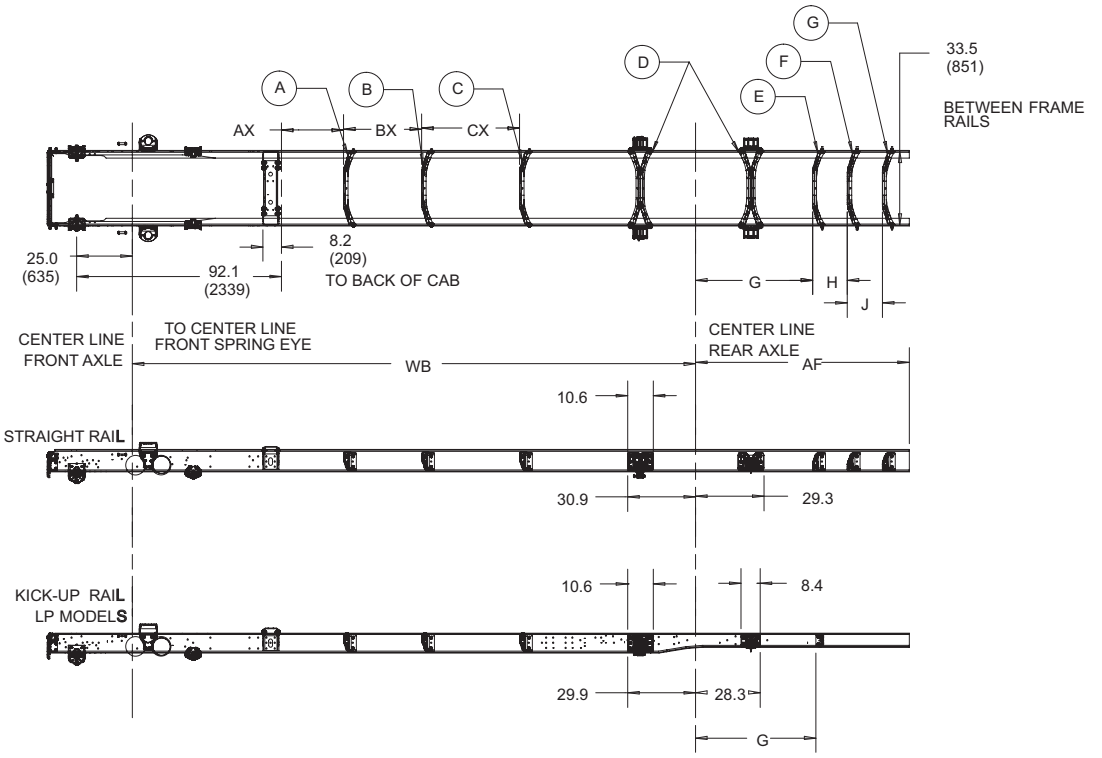
[1]=Section Modulus: Nominal – Calculated using design dimensions; indicates the design load capacity of the frame
Maximum Tolerance – All frame dimensions are at maximum tolerance; used by some competitors as advertised values.
[2]=Reinforcement dimensions and specifications are shown in italics
[3]=Rail depth given is for base rail… depth of kick-up in AF section is 6.495"
[4]=33,000-lb GVWR only

## *INTERMEDIATE CROSSMEMBER LOCATION*

### *LP and 4x2 - Standard Cab*

| Wheelbase Range | | AX | BX [3] | CX |
|---|---|---|---|---|
| Min | Max | | | |
| Inches (Millimeters) | | | | |
| up to 138 (3500) | | – | – | – |
| 140 (3550) | 156 (3950) | 19 (489) | – | – |
| 158 (4000) | 169 (4300) | 28 (713) | – | – |
| 171 (4350) | 183 (4650) | 37 (937) | – | – |
| 185 (4700) | 195 (4950) | 43 (1161) [1]<br>19 (489) [2] | – [1]<br>35 (896) [2] | – |
| 197 (5000) | 211 (5350) | 37 (937) | 35 (896) | – |
| 213 (5400) | 224 (5700) | | 53 (1344) | – |
| 226 (5750) | 236 (6000) | | | – |
| 238 (6050) | 254 (6450) | 46 (1161) [1]<br>28 (713) [2] | 62 (1568) [1]<br>35 (896) [2] | – [1]<br>44 (1120) [2] |
| 256 (6500) | 266 (6750) | 37 (937) | 44 (1120) | 44 (1120) |
| 268 (6800) | 280 (7100) | | 53 (1344) | |
| 282 (7150) | 293 (7450) | | | 62 (1568) |
| 295 (7500) | 307 (7800) | | 62 (1568) | |
| 309 (7850) | 321 (8150) | | | 71 (1792) |
| 323 (8200) | 331 (8400) | | | |

[1] With I6 Engines [2] With V8 Engines, 4x2 Models only




(A)(B)(C) SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE UP AND WEB FORWARD

(D) REAR SUSPENSION CROSSMEMBER

(E) WITH STRAIGHT RAILS – SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE DOWN AND WEB FORWARD. WITH KICK-UP RAILS – C-CHANNEL AF CROSSMEMBER

(F)(G) WITH STRAIGHT RAILS – SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE DOWN AND WEB FORWARD

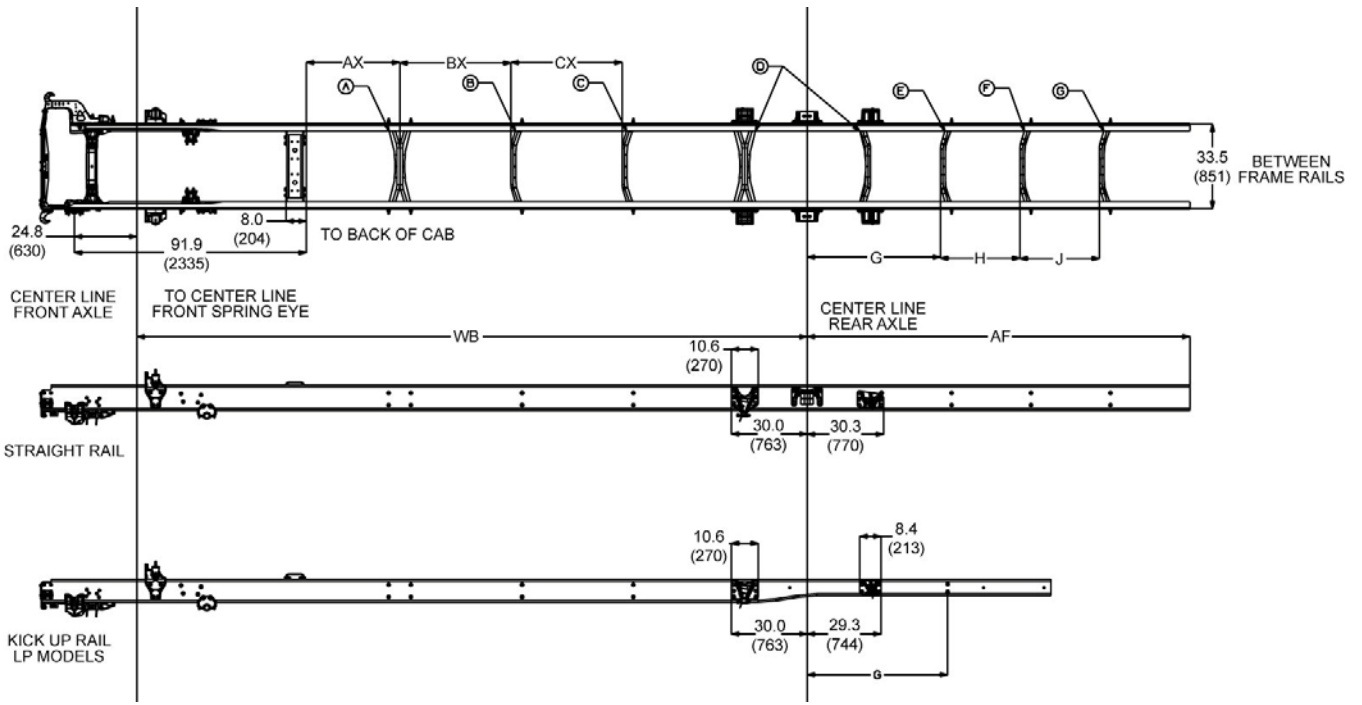
01_0060

## *INTERMEDIATE CROSSMEMBER LOCATION*

### *4x2 - Standard Cab with Staggered Fuel Tanks*

| Wheelbase Range | | AX | BX [3] | CX |
|---|---|---|---|---|
| Min | Max | | | |
| Inches (Millimeters) | | | | |
| up to 138 (3500) | | – | – | – |
| 140 (3550) | 169 (4300) | 22 (567) | – | – |
| 171 (4350) | 183 (4650) | 31 (791) | – | – |
| 177 (4500)[1] | – | 27 (695) | – | – |
| 185 (4700) | 195 (4950) | 40 (1015) | – | – |
| 197 (5000) | 211 (5350) | 31 (791) | 41 (1042) | – |
| 212 (5400) | 236 (6000) | | 59 (1490) | – |
| 238 (6050) | 254 (6450) | 40 (1015) | 67 (1714) | – |
| 256 (6500) | 266 (6750) | 31 (791) | (1266) | 44 (1120) |
| 268 (6800) | 280 (7100) | | 59 (1490) | |
| 282 (7150) | 293 (7450) | | | 62 (1568) |
| 295 (7500) | 307 (7800) | | 67 (1714) | |
| 309 (7850) | 321 (8150) | | | 71 (1792) |
| 323 (8200) | 331 (8400) | | | |

[1] With 04WZA




durastar_ddcrossmember

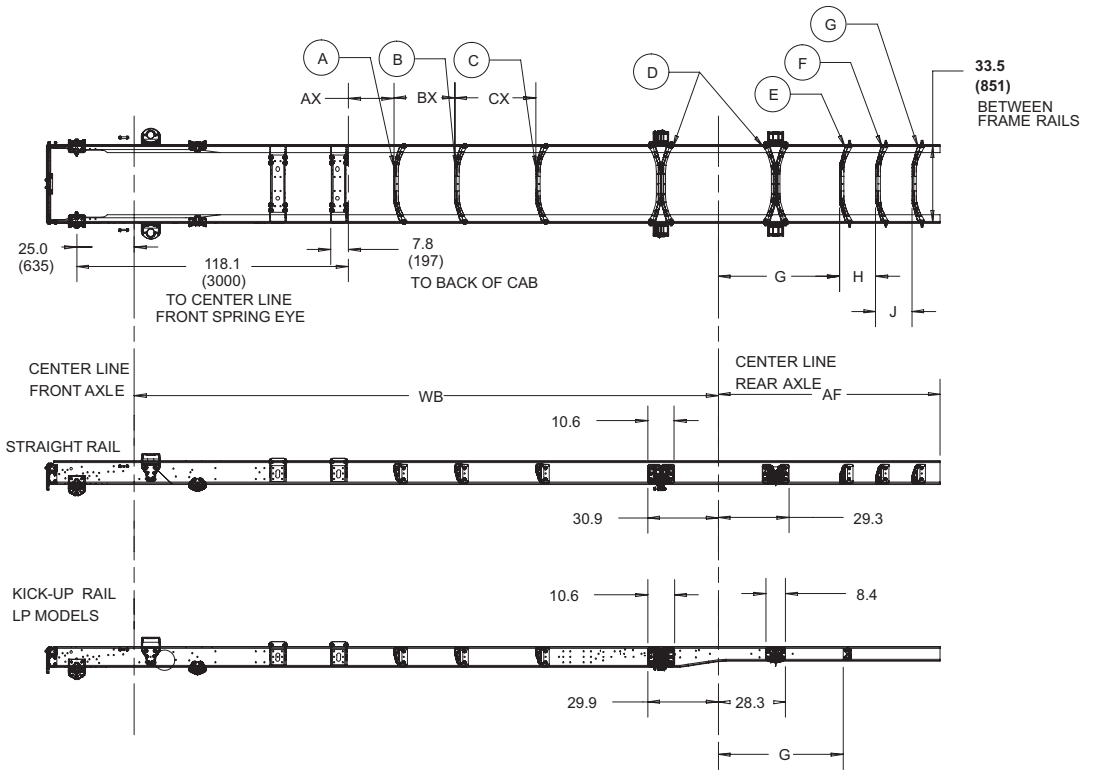
## *INTERMEDIATE CROSSMEMBER LOCATION*

### *LP and 4x2 - Extended Cab*

| Wheelbase Range | | AX | BX | CX |
|---|---|---|---|---|
| Min | Max | | | |
| Inches (Millimeters) | | | | |
| up to 169 (4300) | | – | – | – |
| 171 (4350) | 183 (4650) | 11 (277) | – | – |
| 185 (4700) | 195 (4950) | 20 (501) [1]<br>29 (725) [2] | – | – |
| 197 (5000) | 211 (5350) | 11 (277) | 35 (896) | – |
| 213 (5400) | 224 (5700) | | 53 (1344) | |
| 226 (5750) | 236 (6000) | | | – |
| 238 (6050) | 254 (6450) | 20 (501) [1]<br>37 (949) [2] | 62 (1568) [1]<br>44 (1120) [2] | – |
| 256 (6500) | 266 (6750) | 11 (277) | 44 (1120) | 44 (1120) |
| 268 (6800) | 280 (7100) | | 53 (1344) | |
| 282 (7150) | 293 (7450) | | | 62 (1568) |
| 295 (7500) | 307 (7800) | | 62 (1568) | |
| 309 (7850) | 311 (7900) | 20 (501) | | 53 (1344) |

[1] With I6 Engines

[2] With V8 Engines




(A)(B)(C) SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE UP AND WEB FORWARD

(D) REAR SUSPENSION CROSSMEMBER

(E) WITH STRAIGHT RAILS – SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE DOWN AND WEB FORWARD. WITH KICK-UP RAILS – C-CHANNEL AF CROSSMEMBER

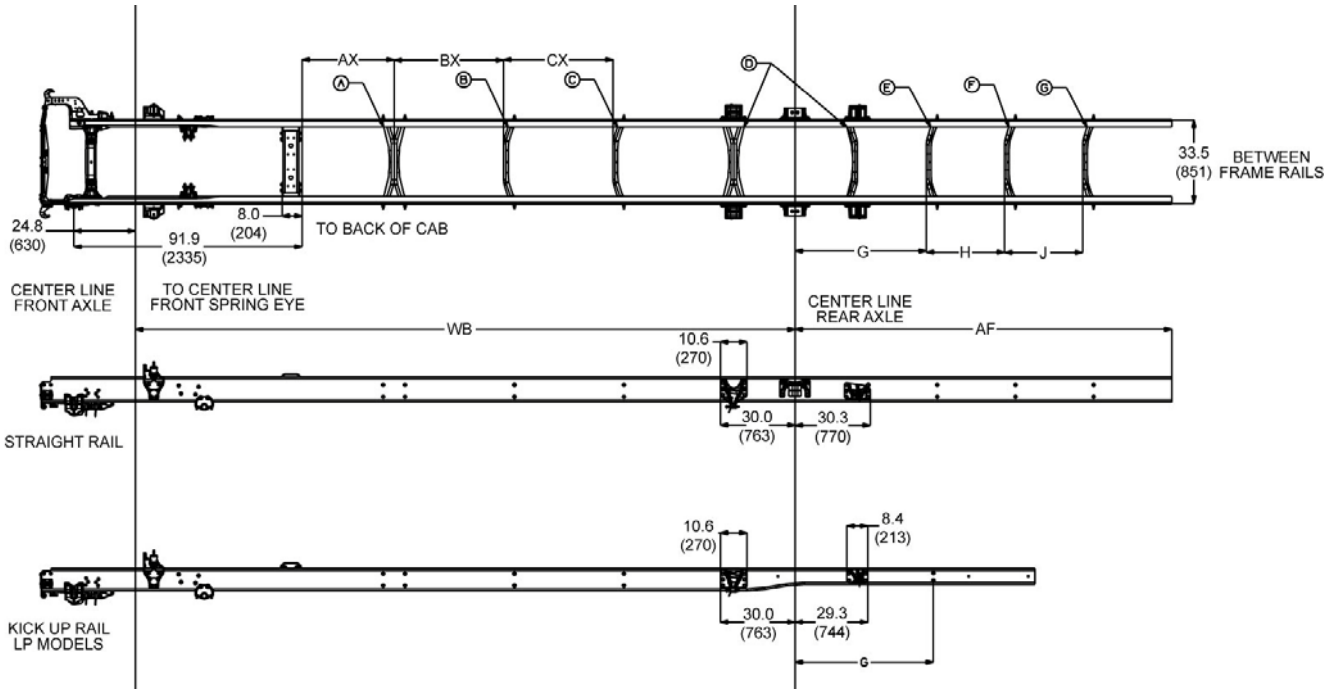
(F)(G) WITH STRAIGHT RAILS – SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE DOWN AND WEB FORWARD

01_0061

## *INTERMEDIATE CROSSMEMBER LOCATION*

### *4x2 - Extended Cab with Staggered Fuel Tanks*

| Wheelbase Range | | AX | BX | CX |
|---|---|---|---|---|
| Min | Max | | | |
| Inches (Millimeters) | | | | |
| up to 169 (4300) | | – | – | – |
| 171 (4350) | 195 (4950) | 14 (355) | – | – |
| 197 (5000) | 211 (5350) | | 32 (818) | – |
| 213 (5400) | 236 (6000) | | 50 (1266) | – |
| 238 (6050) | 254 (6450) | | 67 (1714) | – |
| 256 (6500) | 266 (6750) | | 41 (1042) | 44 (1120) |
| 268 (6800) | 280 (7100) | | 50 (1266) | |
| 282 (7150) | 293 (7450) | | | 62 (1568 |
| 295 (7500) | 307 (7800) | | 59 (1490) | |
| 309 (7850) | 311 (7900) | | 68 (1714) | 53 (1344) |

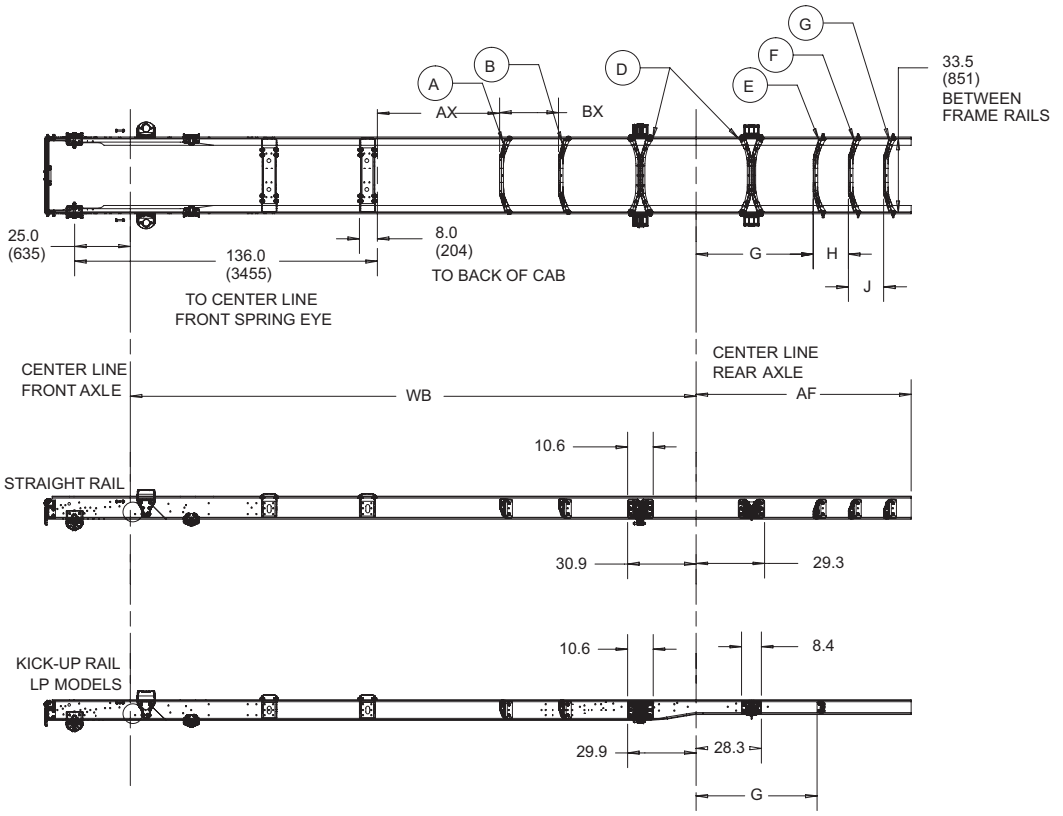



durastar_ddcrossmember

## *INTERMEDIATE CROSSMEMBER LOCATION*

### *LP and 4x2 - Crew Cab*

| Wheelbase Range | | AX | BX |
|---|---|---|---|
| Min | Max | | |
| Inches (Millimeters) | | | |
| up to 183 (4650) | | – | – |
| 185 (4700) | 195 (5000) | 19 (494) | – |
| 197 (5050) | 211 (5350) | 28 (718) | – |
| 213 (5400) | 224 (5700) | 37 (942) | – |
| 226 (5750) | 236 (6100) | 55 (1390) | – |
| 238 (6150) | 254 (6450) | 19 (494) | 44 (1120) |
| 256 (6500) | 266 (6750) | 37 (942) | |
| 268 (6800) | 280 (7100) | 46 (1166) | |
| 282 (7150) | 293 (7450) | 55 (1390) | 53 (1344) |
| 295 (7500) | 321 (8150) | | 62 (1568) |




(A) (B) SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE UP AND WEB FORWARD

(D) REAR SUSPENSION CROSSMEMBER

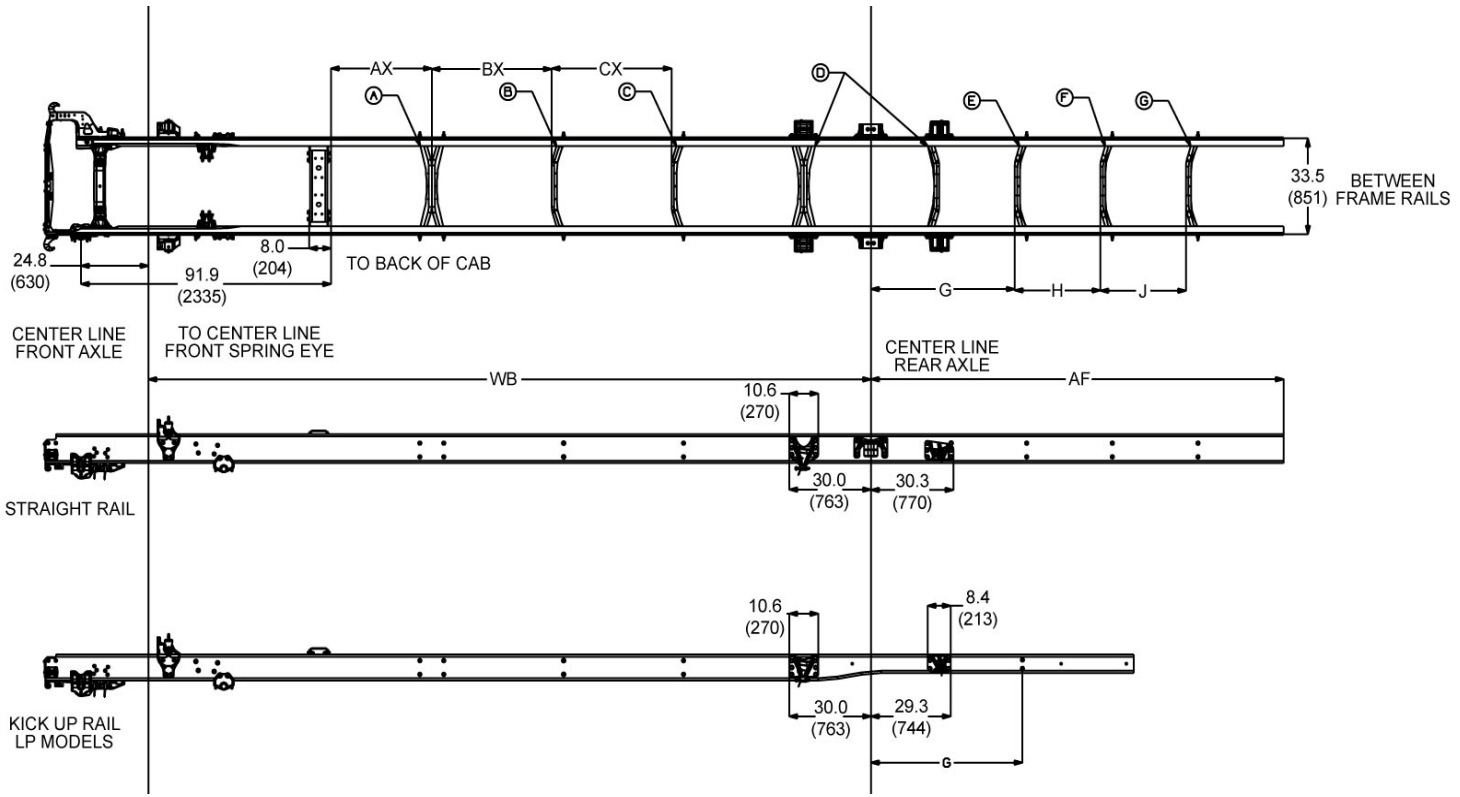
(E) WITH STRAIGHT RAILS – SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE DOWN AND WEB FORWARD. WITH KICK-UP RAILS – C-CHANNEL AF CROSSMEMBER

(F) (G) WITH STRAIGHT RAILS – SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE DOWN AND WEB FORWARD

## *INTERMEDIATE CROSSMEMBER LOCATION*

### *4x2 - Crew Cab with Staggered Fuel Tanks*

| Wheelbase Range | | AX | BX |
|---|---|---|---|
| Min | Max | | |
| Inches (Millimeters) | | | |
| up to 183 (4650) | | – | – |
| 185 (4700) | 195 (5000) | 19 (494) | – |
| 197 (5050) | 211 (5350) | 28 (718) | – |
| 213 (5400) | 224 (5700) | 37 (942) | – |
| 226 (5750) | 236 (6100) | 55 (1390) | – |
| 238 (6150) | 254 (6450) | 19 (494) | 44 (1120) |
| 256 (6500) | 266 (6750) | 37 (942) | |
| 268 (6800) | 280 (7100) | 46 (1166) | |
| 282 (7150) | 293 (7450) | 55 (1390) | 53 (1344) |
| 295 (7500) | 321 (8150) | | 62 (1568) |

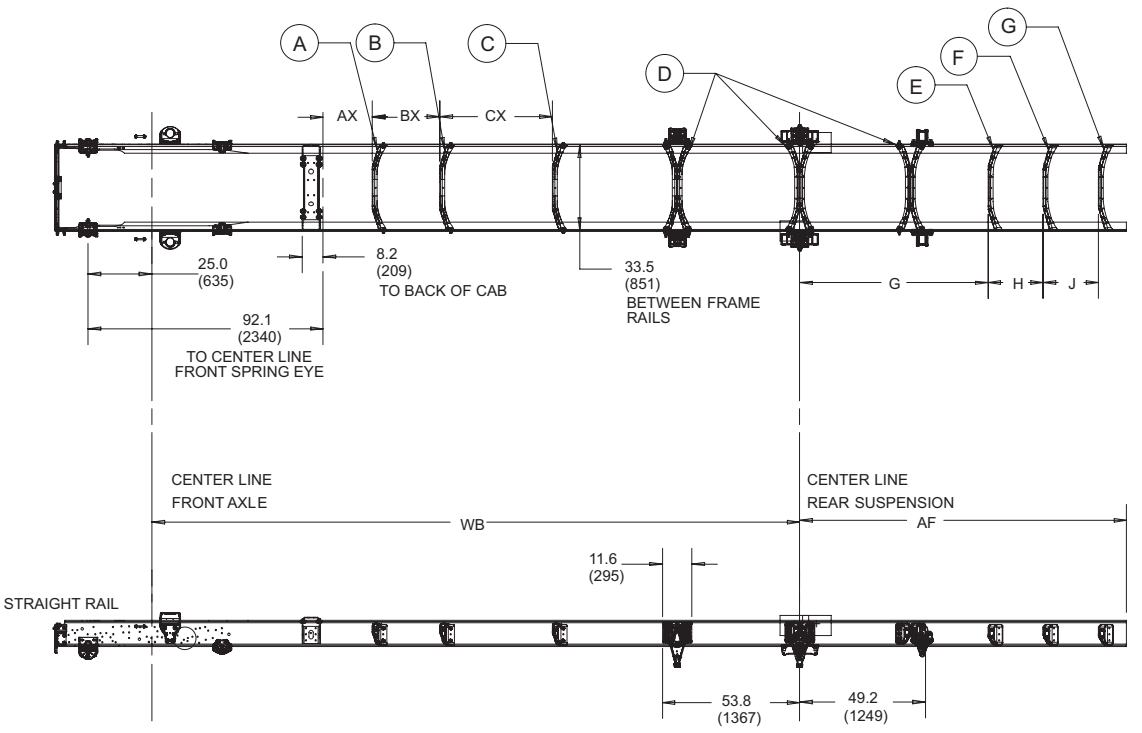



durastar_ddcrossmember

## *INTERMEDIATE CROSSMEMBER LOCATION*

### *6x4 - Standard Cab*

| Wheelbase Range | | AX | BX | CX |
|---|---|---|---|---|
| Min | Max | | | |
| Inches (Millimeters) | | | | |
| up to 158 (4000) | | – | – | – |
| 160 (4050) | 197 (5000) | 19 (489) | – | – |
| 199 (5050) | 211 (5350) | 37 (937) | – | – |
| 213 (5400) | 224 (5700) | 46 (1161) | – | – |
| 226 (5750) | 238 (6050) | 37 (937) | 35 (896) | – |
| 240 (6100) | 252 (6400) | | 44 (1120) | – |
| 254 (6450) | 266 (6750) | 46 (1161) | | – |
| 268 (6800) | 280 (7100) | | 53 (1344) | – |
| 282 (7150) | 293 (7450) | | 62 (1568) | 26 (672) |
| 295 (7500) | 307 (7800) | 37 (937) | 35 (896) | 53 (1344) |
| 309 (7850) | 321 (8150) | | 44 (1120) | |
| 323 (8200) | 331 (8400) | | 53 (1344) | 62 (1568) |




(A) (B) (C) SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE UP AND WEB FORWARD

(D) REAR SUSPENSION CROSSMEMBER – DOUBLE STAMPED CROSSMEMBER

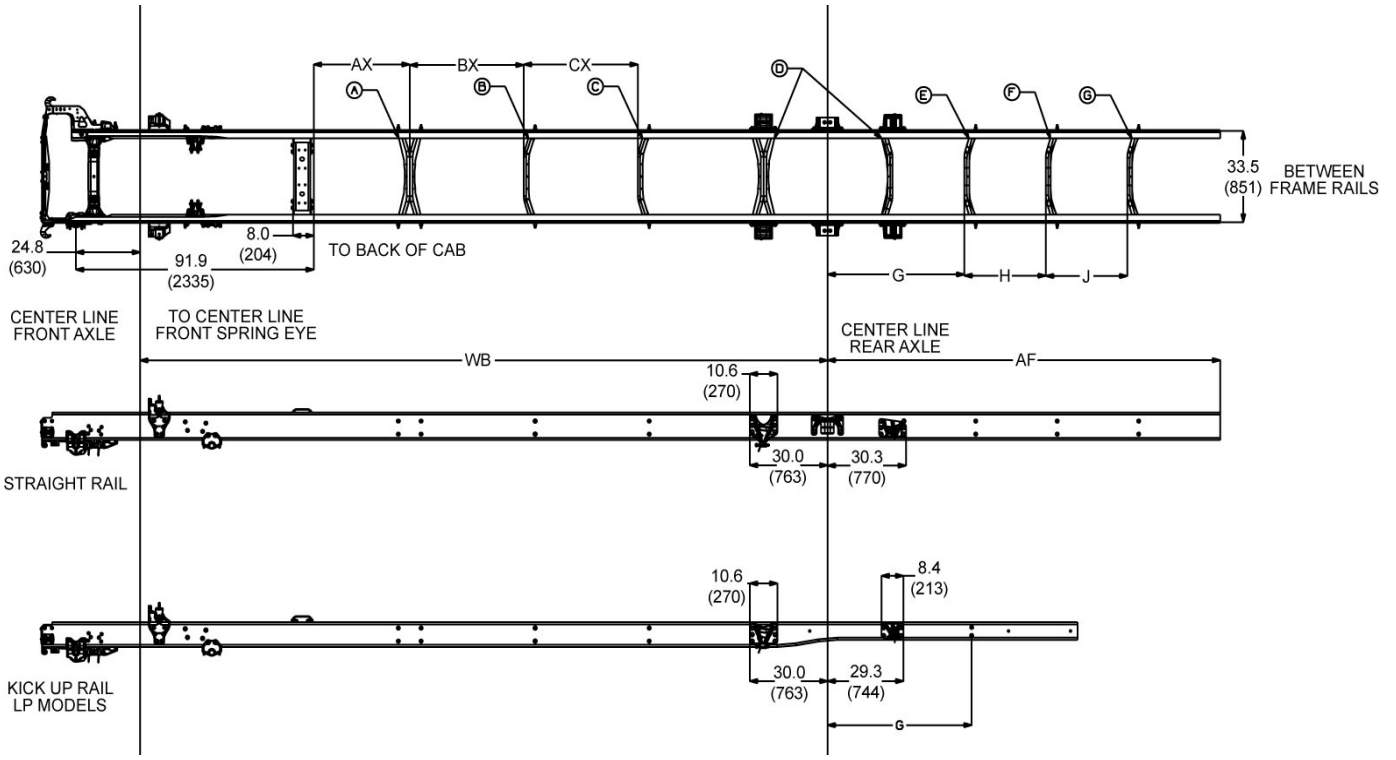
(E) (F) (G) STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE UP

01_0063

## *INTERMEDIATE CROSSMEMBER LOCATION*

### *6x4 - Standard Cab with Staggered Fuel Tanks*

| Wheelbase Range | | AX | BX | CX |
|---|---|---|---|---|
| Min | Max | | | |
| Inches (Millimeters) | | | | |
| up to 157 (4000) | | – | – | – |
| 160 (4050) | 197 (5000) | 23 (567) | – | – |
| 199 (5050) | 211 (5350) | 31 (791) | – | – |
| 213 (5400) | 224 (5700) | 40 (1015) | – | – |
| 226 (5750) | 238 (6050) | 31 (791) | 41 (1042) | – |
| 240 (6100) | 252 (6400) | | 50 (1266) | – |
| 254 (6450) | 266 (6750) | 40 (1015) | | – |
| 268 (6800) | 280 (7100) | | 59 (1490) | – |
| 282 (7150) | 293 (7450) | | 67 (1714) | 26 (672) |
| 295 (7500) | 307 (7800) | 31 (791) | 41 (1042) | 53 (1344) |
| 309 (7850) | 321 (8150) | | 50 (1266) | |
| 323 (8200) | 331 (8400) | | 59 (1490) | 62 (1568) |

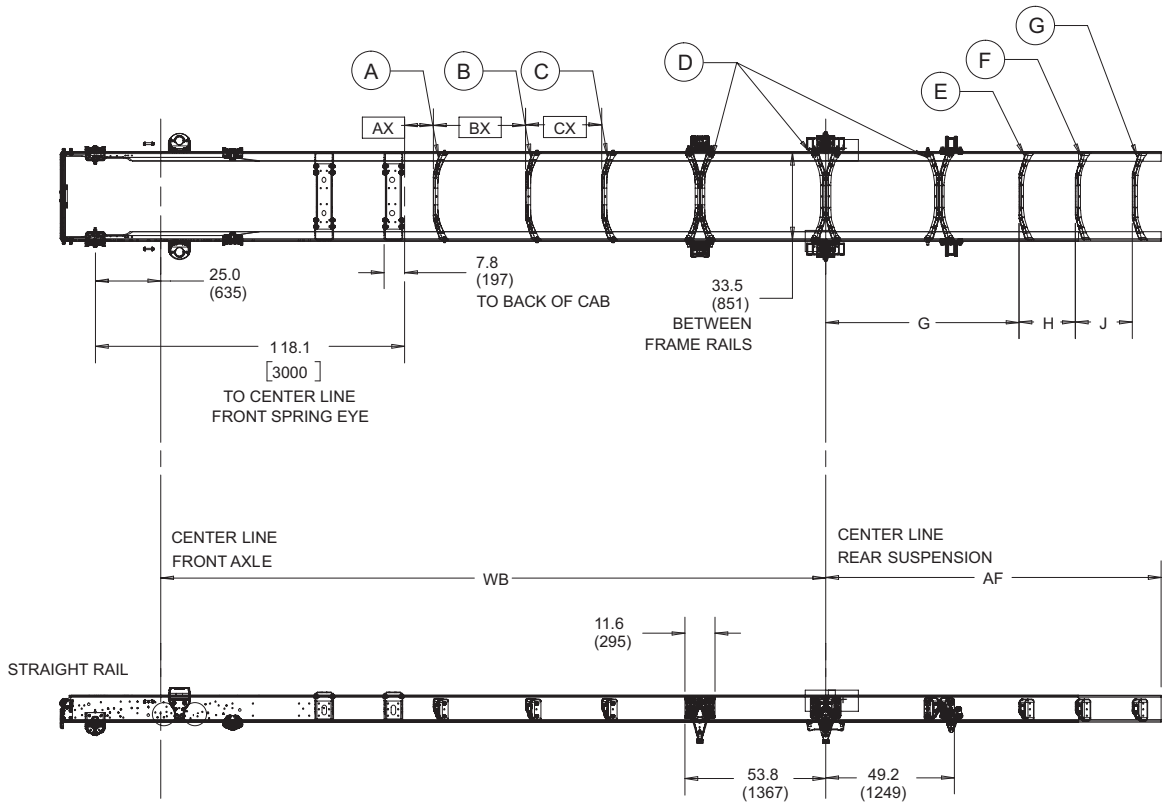



durastar_ddcrossmember

## *INTERMEDIATE CROSSMEMBER LOCATION*

### *6x4 - Extended Cab*

| Wheelbase Range | | AX | BX | CX |
|---|---|---|---|---|
| Min | Max | | | |
| Inches (Millimeters) | | | | |
| up to 197 (5000) | | – | – | – |
| 199 (5050) | 211 (5350) | 11 (277) | – | – |
| 213 (5400) | 224 (5700) | 20 (501) | – | – |
| 226 (5750) | 238 (6050) | 11 (277) | 35 (896) | – |
| 240 (6100) | 252 (6400) | | 44 (1120) | – |
| 254 (6450) | 266 (6750) | 20 (501) | | – |
| 268 (6800) | 280 (7100) | | 53 (1344) | – |
| 282 (7150) | 293 (7450) | | 62 (1568) | 26 (672) |
| 295 (7500) | 307 (7800) | 11 (277) | 35 (896) | 53 (1344) |
| 309 (7850) | 321 (8150) | | 44 (1120) | |
| 323 (8200) | 331 (8400) | | 53 (1344) | 62 (1568) |




(A) (B) (C) SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE UP AND WEB FORWARD

(D) REAR SUSPENSION CROSSMEMBER – DOUBLE STAMPED CROSSMEMBER

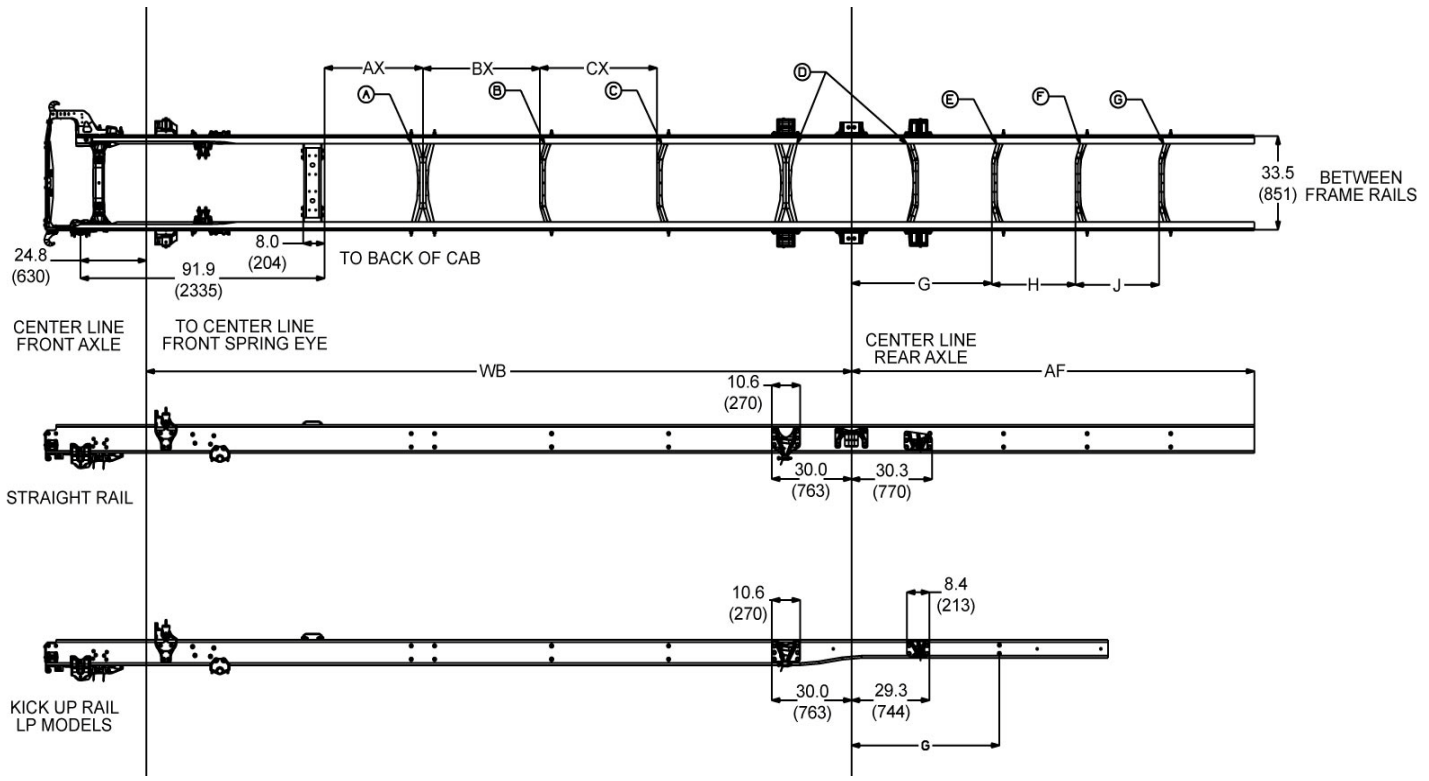
(E) (F) (G) STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE UP

01_0064

## *INTERMEDIATE CROSSMEMBER LOCATION*

### *6x4 - Extended Cab with Staggered Fuel Tanks*

| Wheelbase Range | | AX | BX | CX |
|---|---|---|---|---|
| Min | Max | | | |
| Inches (Millimeters) | | | | |
| up to 224 (5700) | | 14 (355) | – | – |
| 226 (5750) | 238 (6050) | | 32 (818) | – |
| 240 (6100) | 252 (6400) | | 41 (1042) | – |
| 254 (6450) | 266 (6750) | | 50 (1266) | – |
| 268 (6800) | 280 (7100) | | 59 (1490) | – |
| 282 (7150) | 293 (7450) | | 67 (1714) | 26 (672) |
| 295 (7500) | 307 (7800) | | 32 (818) | 53 (1344) |
| 309 (7850) | 321 (8150) | | 41 (1042) | |
| 323 (8200) | 331 (8400) | | 50 (1266) | 62 (1568) |

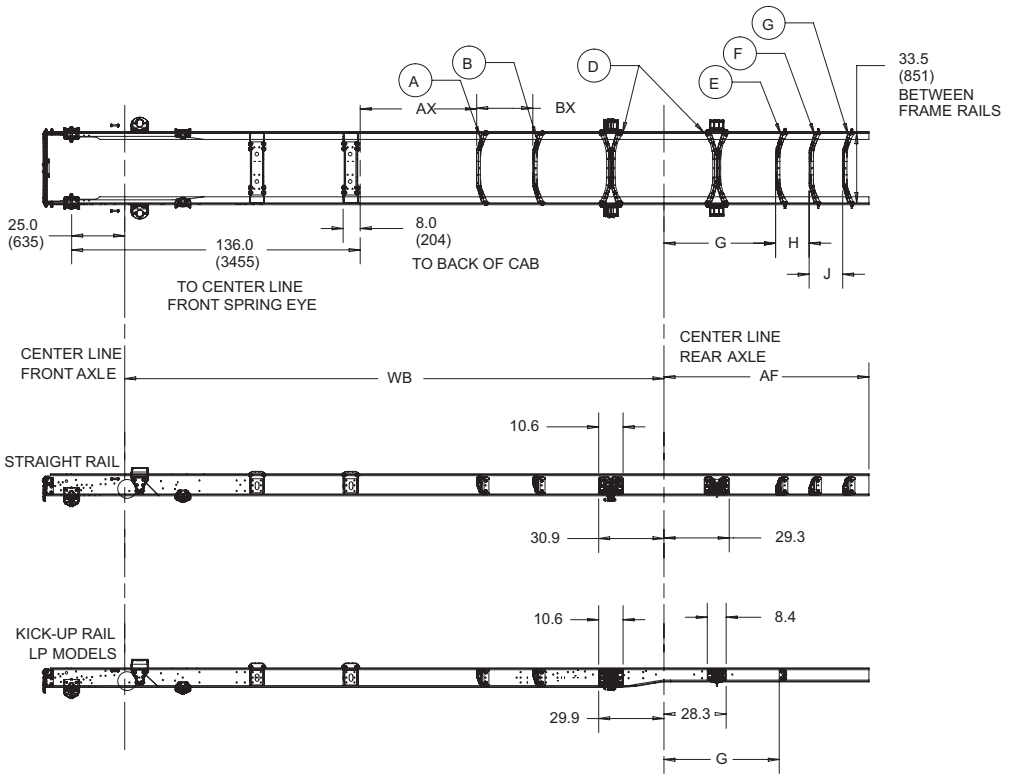



durastar_ddcrossmember

## INTERMEDIATE CROSSMEMBER LOCATION

### 6x4 - Crew Cab

| Wheelbase Range | | AX | BX |
|---|---|---|---|
| Min | Max | | |
| Inches (Millimeters) | | | |
| up to 211 (5350) | | – | – |
| 213 (5400) | 224 (5700) | 28 (718) | – |
| 226 (5750) | 238 (6050) | | – |
| 240 (6100) | 252 (6400) | 37 (942) | – |
| 254 (6450) | 266 (6750) | 46 (1166) | – |
| 268 (6800) | 280 (7100) | 55 (1390) | 26 (672) |
| 282 (7150) | 293 (7450) | 28 (718) | 44 (1120) |
| 295 (7500) | 307 (7800) | | 53 (1344) |
| 309 (7850) | 321 (8150) | 37 (942) | |




(A) (B) SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE UP AND WEB FORWARD

(D) REAR SUSPENSION CROSSMEMBER

(E) WITH STRAIGHT RAILS – SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE DOWN AND WEB FORWARD. WITH KICK-UP RAILS – C-CHANNEL AF CROSSMEMBER

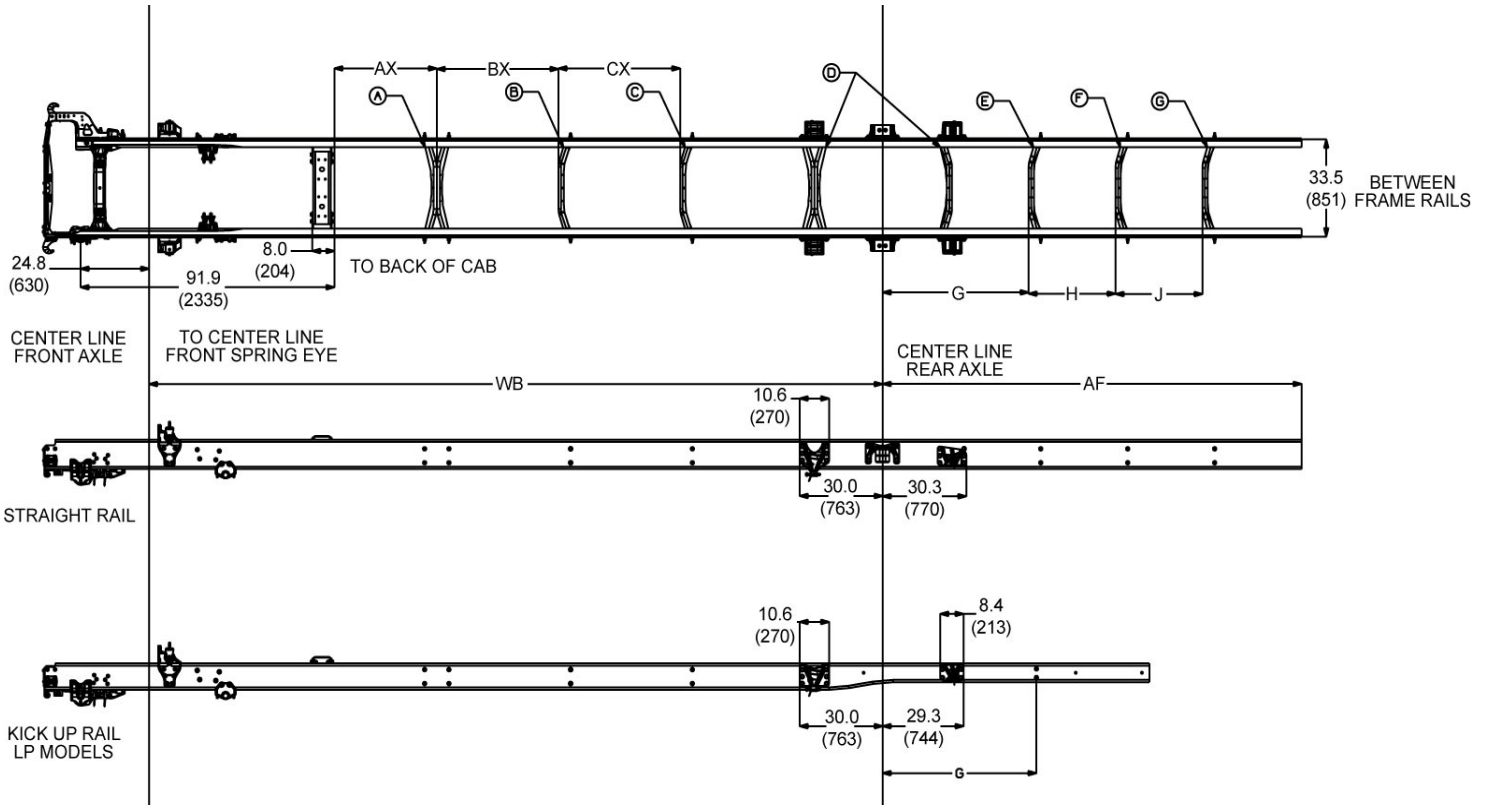
(F) (G) WITH STRAIGHT RAILS – SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE DOWN AND WEB FORWARD

01_0060

## *INTERMEDIATE CROSSMEMBER LOCATION*

### *6x4 - Crew Cab with Staggered Fuel Tanks*

| Wheelbase Range | | AX | BX |
|---|---|---|---|
| Min | Max | | |
| Inches (Millimeters) | | | |
| up to 211 (5350) | | – | – |
| 213 (5400) | 224 (5700) | 28 (718) | – |
| 226 (5750) | 238 (6050) | | – |
| 240 (6100) | 252 (6400) | 37 (942) | – |
| 254 (6450) | 266 (6750) | 46 (1166) | – |
| 268 (6800) | 280 (7100) | 55 (1390) | 26 (672) |
| 282 (7150) | 293 (7450) | 28 (718) | 44 (1120) |
| 295 (7500) | 307 (7800) | | 53 (1344) |
| 309 (7850) | 321 (8150) | 37 (942) | |




durastar_ddcrossmember

# AF CROSSMEMBER LOCATIONS

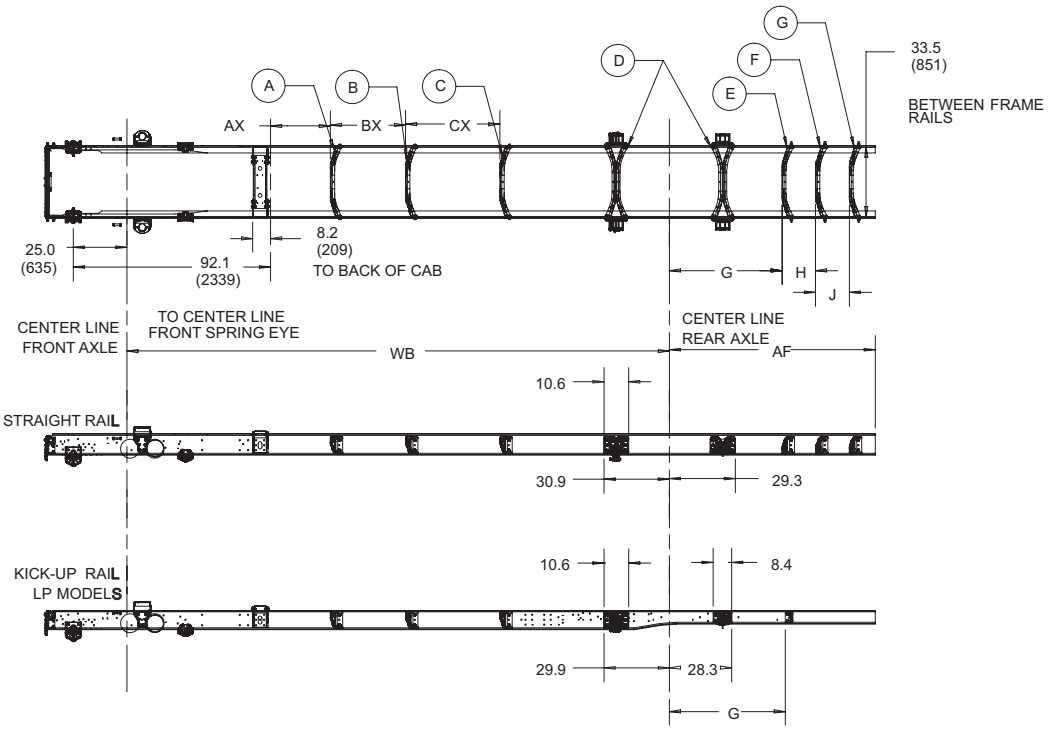
## LP and 4x2

### WITH STRAIGHT RAILS

| Crossmember | AF Range | | G | H | J |
|---|---|---|---|---|---|
| | Min | Max | | | |
| | Inches (Millimeters) | | | | |
| 1 | 85 (2150) | 175 (4450) | 53 (1338) | – | – |
| 2 | 116 (2950) | | | 31 (800) | – |
| 3 | 144 (3650) | | | | 31 (800) |

### WITH LP RAILS

| Crossmember | AF | G |
|---|---|---|
| | Inches (Millimeters) | |
| 1 | 96 (2450) | 51 (1298) |




(A)(B)(C) SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE UP AND WEB FORWARD

(D) REAR SUSPENSION CROSSMEMBER

(E) WITH STRAIGHT RAILS – SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE DOWN AND WEB FORWARD. WITH KICK-UP RAILS – C-CHANNEL AF CROSSMEMBER

(F)(G) WITH STRAIGHT RAILS – SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE DOWN AND WEB FORWARD

01_0060

## AF Crossmember Locations

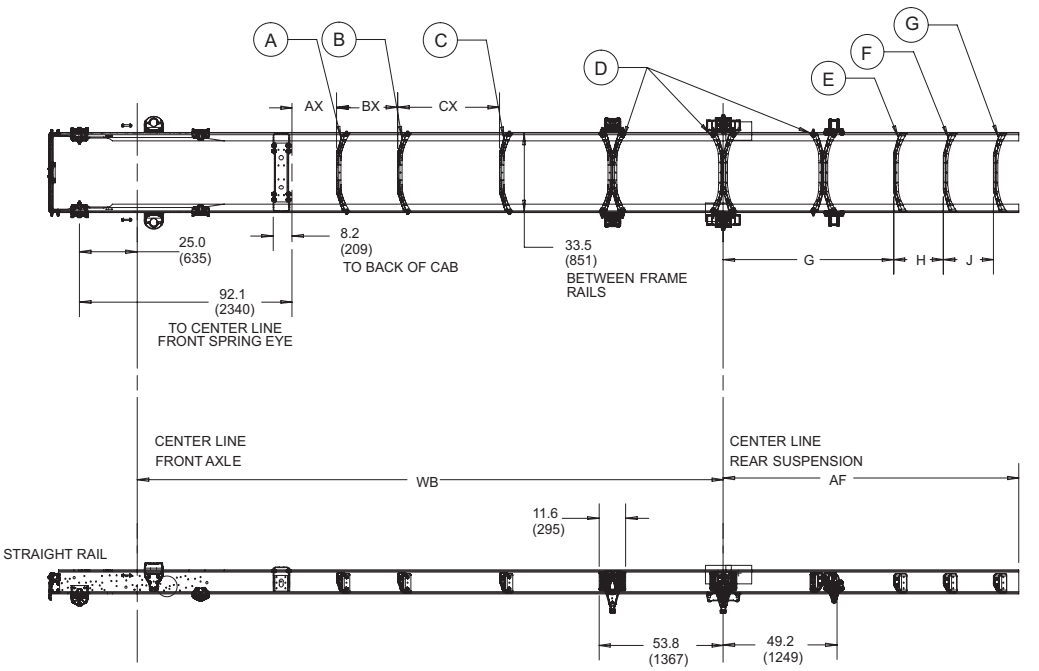
### 6x4

**With 52" Spread Suspension**

| Crossmember | AF Range | | G | H | J |
|---|---|---|---|---|---|
| | Min | Max | | | |
| | Inches (Millimeters) | | | | |
| 1 | 104 (2650) | 175 (4450) | 72 (1838) | – | – |
| 2 | 134 (3400) | | | 30 (750) | – |
| 3 | 163 (4150) | | | | 30 (750) |

**With 55" and 60" Spread Suspension**

| Crossmember | AF Range | | G | H | J |
|---|---|---|---|---|---|
| | Min | Max | | | |
| | Inches (Millimeters) | | | | |
| 1 | 112 (2650) | 175 (4450) | 80 (2038) | – | – |
| 2 | 142 (3600) | | | 30 (750) | – |
| 3 | 171 (4350) | | | | 30 (750) |




(A) (B) (C) SINGLE STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE UP AND WEB FORWARD

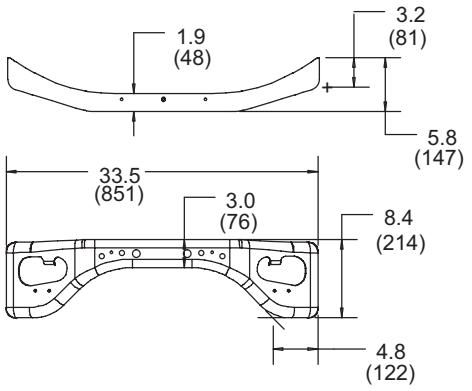
(D) REAR SUSPENSION CROSSMEMBER – DOUBLE STAMPED CROSSMEMBER

(E) (F) (G) STAMPED CROSSMEMBER MOUNTED WITH FLAT FLANGE UP

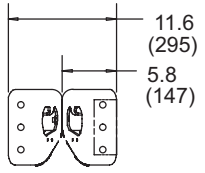
01_0063

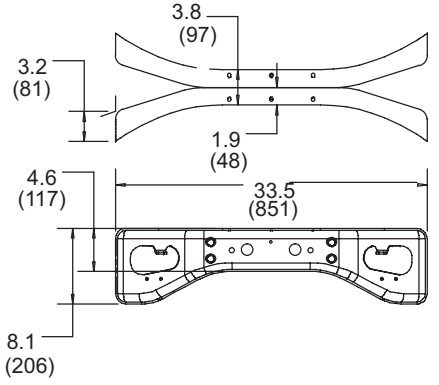
## CROSSMEMBERS

### All Models

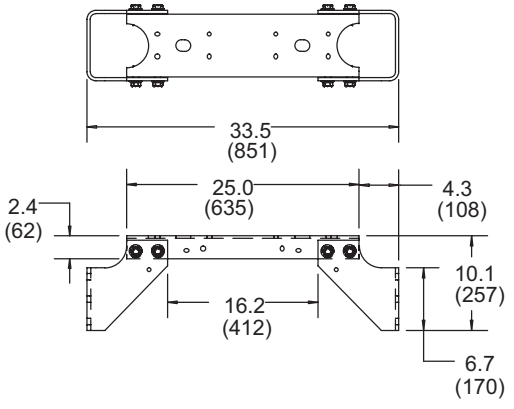



SINGLE STAMPED CROSSMEMBER

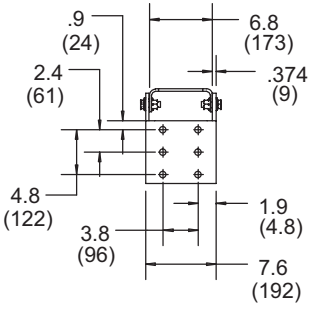


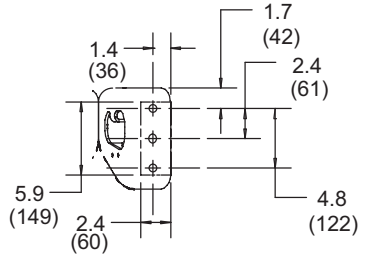

DOUBLE STAMPED CROSSMEMBER




REAR CAB MOUNTING CROSSMEMBER




MATL THK

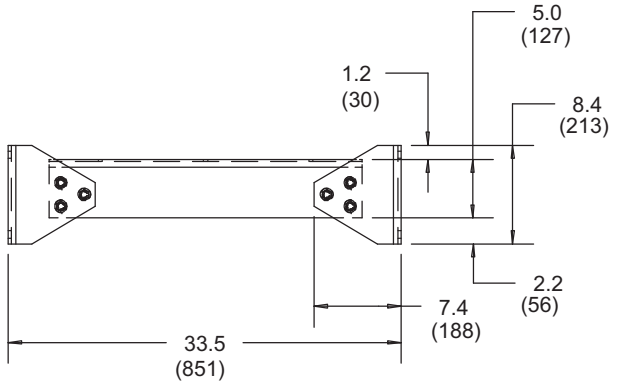


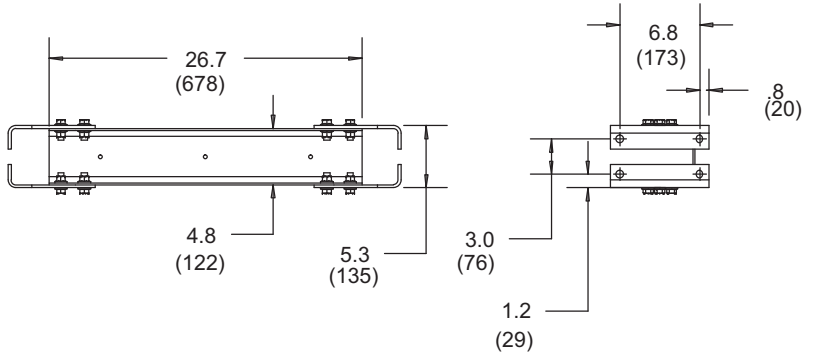

END FACE FLAT AREA

01_0066

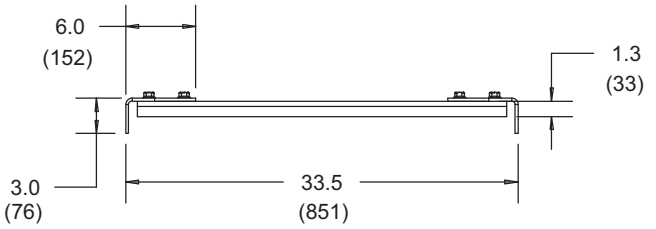
## *Crossmembers With Tapered Rails*

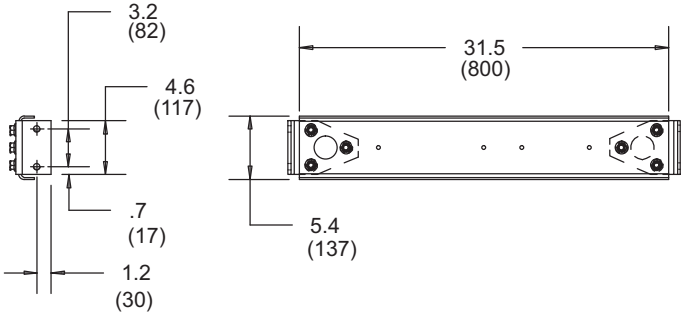
### *LP*




"C" CHANNEL REAR SUSPENSION CROSSMEMBER




"C" CHANNEL AF CROSSMEMBER

01_0067

# *FRAME DRILLING GUIDELINES*

## *All Models*

The drilling of the frame sidemember presents no unusual difficulty. Standard high speed steel drills of good quality will serve provided they are sharpened properly and not overheated during sharpening or use.

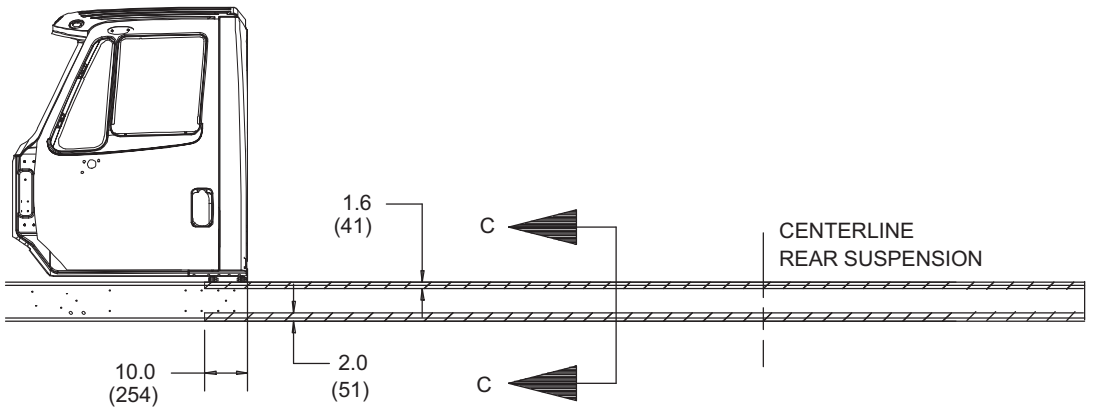
## Hole Location Guidelines

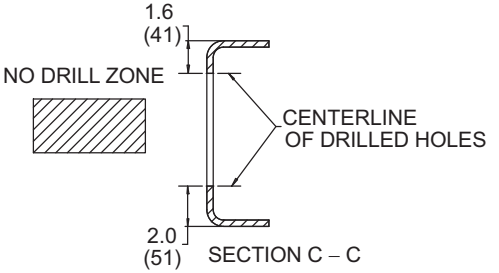
1. Never drill holes into the restricted areas of the frame rails. Refer to diagrams on the following pages.
2. Use existing holes whenever possible.
3. Maintain a minimum of 0.75 inch (19 mm) of material between holes.
4. There should not be more than three holes located on a vertical line.
5. Bolt holes should be no larger than is required for the size of bolts being used, in no instance larger than 11/16 (.688 inch).
6. If reinforcements are used, avoid drilling holes closer than 2.0 inches (51 mm) from the ends of the reinforcement.
7. Bolts must be periodically checked to insure that the proper torque and clamping force is maintained.
8. Never drill any holes in the flanges of the frame rail.

## *FRAME DRILLING RESTRICTIONS*

### *4300 4x2, 4400 4x2 and 6x4*

#### ***Straight Rails/Straight Trucks***



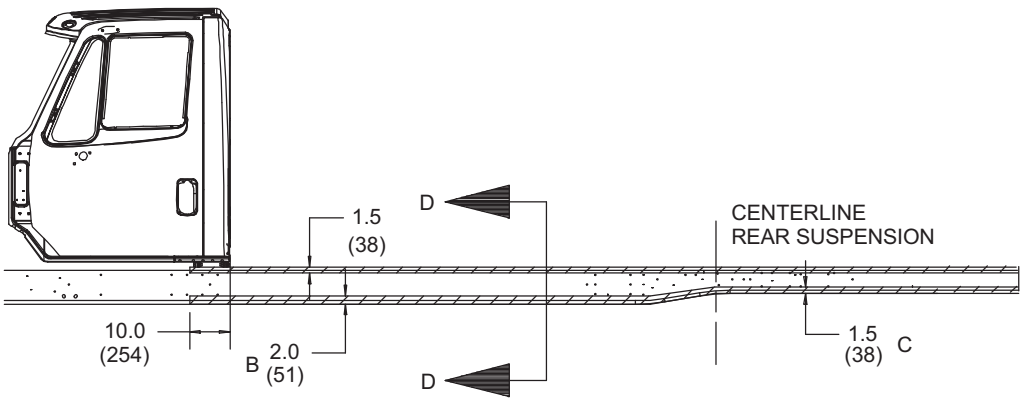



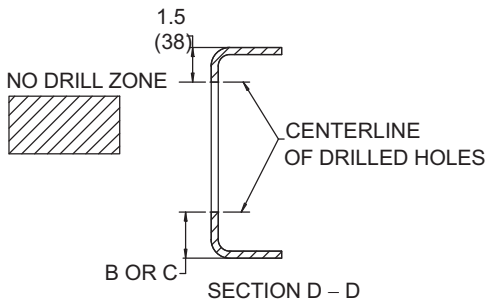

01_0068

## FRAME DRILLING RESTRICTIONS

### LP

#### *Tapered Rails*




01_0069

## *MAXIMUM WHEELBASE FRAME STRETCHING*

### *All Models*

| Frames – Maximum Wheelbase Figures For Changing Wheelbase | | | | |
|---|---|---|---|---|
| Frame Code | Frame Description | Maximum Frame GVW Rating (Lbs) | Maximum Front Axle/Susp. Capacity (Lbs) | Maximum Wheelbase |
| 01CAA | 5/16" x 9 1/8" Tapered Rail 80 psi Yield Strength | 29,000 | 8,000 | 254 |
| 01CAB | 5/16" x 9 1/8" Straight Rail 80 psi Yield Strength | 25,999 | 8,000 | 285 |
| | | | 10,000/12,000 | 262 |
| 01CAC | 5/16" x 10 1/8" Straight Rail 50 psi Yield Strength | 25,999 | 8,000 | 311 |
| | | | 10,000/12,000 | 293 |
| | | 29,000 | 8,000 | 285 |
| | | 32,900 | 10,000 | 260 |
| | | | 12,000 | 171 |
| 01CAD | 3/8" x 10 1/4" Straight Rail 80 psi Yield Strength | 32,900 | 10,000 | 311 |
| | | | 12,000 | 272 |
| | | 33,000 | 10,000 | 260 |
| | | 38,000 | 12,000 | 171 |
| 01CAE/01CEK | 5/16" x 10 1/8" Straight Rail 120 psi Yield Strength | 50,000 | 10,000 | 283 |
| | | 52,000 | 12,000 | 238 |
| | | 54,000 | 14,000 | 167 |
| 01CAG/01CEL | 3/8" x 10 1/4" Straight Rail 120 psi Yield Strength | 50,000 | 10,000 | 311 |
| | | 52,000 | 12,000 | 266 |
| | | 54,000 | 14,000 | 230 |
| 01CAH/01CEM | 7/16" x 10 3/8" Straight Rail 120 psi Yield Strength | 50,000 | 10,000 | 311 |
| | | 52,000 | 12,000 | 293 |
| | | 54,000 | 14,000 | 256 |
| 01CAE w/01GBP | 5/16" x 10 1/8" Straight Rail with 5/16" x 10-13/16" Outer "C" Channel Reinforcement 120 psi Yield Strength | 54,000 | 14,000 | 311 |

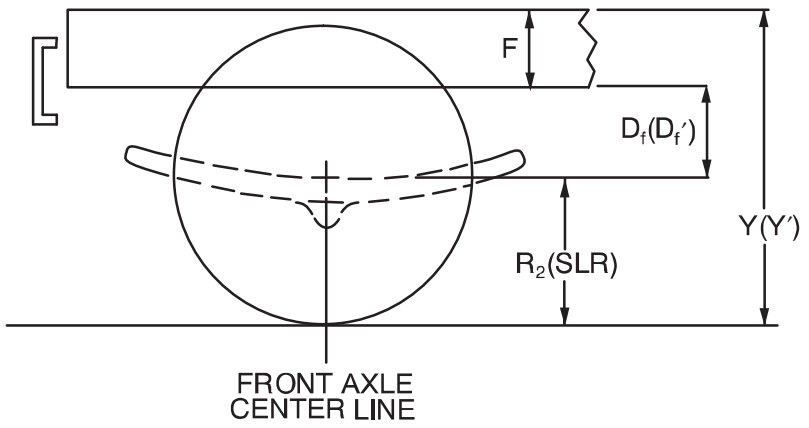
Contact your local International dealer for approval if your wheelbase or axle load exceeds the values given.

See General Frame information – Aftermarket Modifications, earlier in this section.

## *FRAME HEIGHT CALCULATION – AT CENTERLINE OF FRONT AXLE*

### *All Models*

The front frame height (@ the centerline of the front axle) may be calculated using the following equations. Refer to the illustration for a visual explanation of the symbols used in these calculations.




01_0071

**$D_f$ =** Wheel axis to bottom of frame in unladen position. Refer to tabulated data.

**$D_f'$ =** Wheel axis to bottom of frame in loaded position. Refer to tabulated data.

**F =** Frame rail height. Refer to tabulated data.

**SLR =** Static Loaded Radius. The distance from the wheel axis to the ground for a properly inflated, fully loaded (loaded to its maximum capacity) tire. To obtain tire dimensions, contact the tire manufacturer.

**$R_1$ =** Tire Radius (one half of tire outside diameter) **NOT** mounted on the vehicle. To obtain tire dimensions, contact the tire manufacturer.

**$R_2$ =** Calculated Tire Radius on an unloaded chassis. The value of **$R_2$** is calculated using the following method.

$$R_2 = R_1 - .2(R_1 - SLR)$$

**Y =** Front Frame Height at the front axle centerline in unloaded condition.

**Y′=** Front Frame Height at the front axle centerline in loaded condition.

$$Y = D_f + R_2 + F$$ (for unloaded condition)

$$Y' = D_f' + SLR + F$$ (for loaded condition)

Values calculated for **Y** and **Y′** are strictly for the frame height at the front axle centerline. For frame heights at the front of the frame rail, refer to **“**

**”**.

## *FRAME HEIGHT DATA – FRONT*

### *All Models*

| Front Suspension | | | Spindle To Bottom Of Frame | | Model | | |
|---|---|---|---|---|---|---|---|
| Type | Capacity | Code | Unloaded – $D_r$ | Loaded – $D_r'$ | LP | 4x2 | 6x4 |
| Parabolic | 8,000-lb | 03ADA | 5.5" | 4.5" | X | X | |
| | | | 12.4” | 12.2” | | | |
| | 9,000-lb | 03AGW | 6.6” | 5.6” | X | X | |
| | 10,000-lb | 03ADB | 7.1" | 5.5" | X | X | |
| | | | 12.4” | 11.5” | | | |
| | 11,000-lb | 03AGE | 7.1” | 5.5” | | X | |
| | 12,000-lb | 03ADC | 7.5" | 5.6" | | X | |
| | 13,000-lb | 03AGS | 7.1” | 5.5” | | X | |
| | 14,000-lb | 03ADD | 7.4" | 5.7" | | X | |
| | 14,600-lb | 03AGT | 7.58” | 6.1” | | X | |

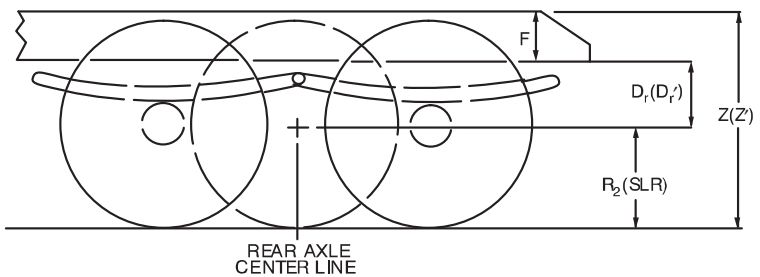
* Top of standard frame in model
Adjust dimensions for optional frame reinforcements – See Frame Section

| Frame Code | Frame Description | Frame Rail Height (F) |
|---|---|---|
| 01CAA | 5/16" x 9 1/8" Tapered Rail – 80 psi Yield Strength | 9.125" |
| 01CAB | 5/16" x 9 1/8" Straight Rail – 80 psi Yield Strength | 9.125" |
| 01CAC | 5/16" x 10 1/8" Straight Rail – 50 psi Yield Strength | 10.125" |
| 01CAD | 3/8" x 10 1/4" Straight Rail – 80 psi Yield Strength | 10.250" |
| 01CAE/01CEK | 5/16" x 10 1/8" Straight Rail – 120 psi Yield Strength | 10.125" |
| 01CAG/01CEL | 3/8" x 10 1/4" Straight Rail – 120 psi Yield Strength | 10.250" |
| 01CAH/01CEM | 7/16" x 10 3/8" Straight Rail – 120 psi Yield Strength | 10.375" |

## *FRAME HEIGHT CALCULATION – AT CENTERLINE OF REAR AXLE*

### *All Models*

The rear frame height (@ the centerline of the rear axle) may be calculated using the following equations. Refer to the illustration for a visual explanation of the symbols used in these calculations.




01_0072

**$D_r$ =** Wheel axis to bottom of frame in unladen position. Refer to tabulated data.

**$D_r'$ =** Wheel axis to bottom of frame in loaded position. Refer to tabulated data.

**F =** Frame rail height. Refer to tabulated data.

**SLR =** Static Loaded Radius. The distance from the wheel axis to the ground for a properly inflated, fully loaded (loaded to its maximum capacity) tire. To obtain tire dimensions, contact the tire manufacturer.

**$R_1$ =** Tire Radius (one half of tire outside diameter) **NOT** mounted on the vehicle. To obtain tire dimensions, contact the tire manufacturer.

**$R_2$ =** Calculated Tire Radius on an unloaded chassis. The value of **$R_2$** is calculated using the following method.

$$R_2 = R_1 - .2(R_1 - SLR)$$

Rear Frame Height at the rear axle centerline in unloaded condition.

**Z'=** Rear Frame Height at the rear axle centerline in loaded condition.

$$Z = D_r + R_2 + F$$ (for unloaded condition)

$$Z' = D_r' + SLR + F$$ (for loaded condition)

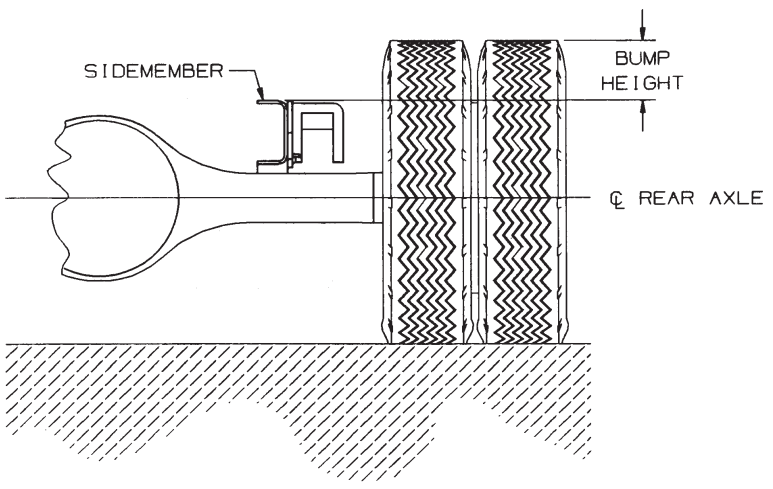
NOTE: Values calculated for **Z** and **Z'** are strictly for the frame height at the rear axle centerline. For frame heights at the rear of the frame rail, refer to “ ”.

## *BUMP HEIGHTS – REAR*

### *All Models*

"Bump Height" refers to the maximum distance of the tires above the side rails as the rear axle of the truck travels over an object. Bump Heights are important in the selection of truck bodies since it may be necessary to incorporate wheelwells into the body floor to allow adequate clearance for tire travel.

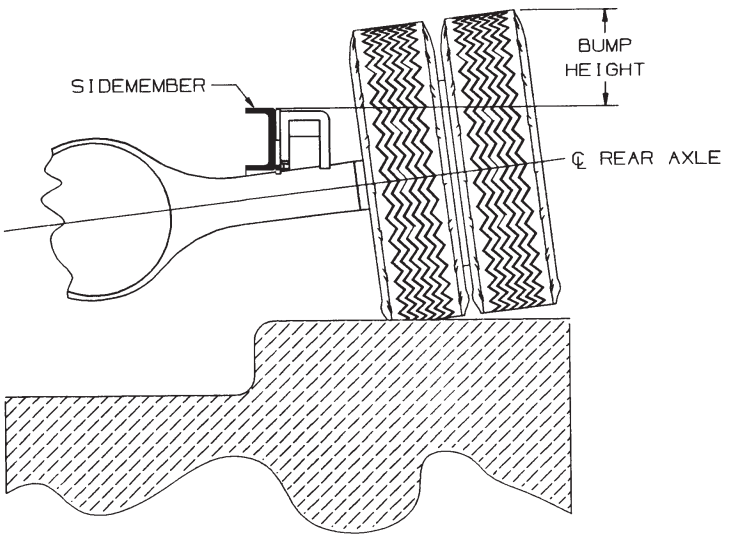
**STRAIGHT BUMP HEIGHT IS USED WHEN BOTH SETS OF WHEELS TRAVEL OVER AN OBJECT AT THE SAME TIME, SUCH AS A PARKING LOT SPEED BUMP.**




STRAIGHT BUMP HEIGHT

01_0073

**COCKED BUMP HEIGHT REFERS TO THE CONDITION THAT EXISTS WHEN ONLY ONE SET OF REAR WHEELS TRAVELS OVER AN OBJECT — AN EXAMPLE OF THIS WOULD BE CLIMBING OVER A CURB WHEN TURNING A CORNER. THE COCKED BUMP HEIGHT CHARTS PRESENTED HERE ASSUME A 7° DEFLECTION FROM HORIZONTAL.**




COCKED BUMP HEIGHT (@ 7 ° DEFLECTION)

01_0074

″= Wheel Axis to bottom of frame in straight bump position. Refer to tabulated data.
Tire radius (one-half of tire outside diameter) **NOT** mounted on the vehicle. To obtain tire dimensions, contact the tire manufacturer.
Frame Rail Height.

| |
|---|
| Straight Bump Height = $R_1$ - $D_r$″ - F |
| Cocked Bump Height = Straight Bump Height + 3.5 In. |

## *FRAME AND BUMP HEIGHT DATA – REAR*

### *All Models*

| Model | Frame Code | Frame Rail Height (F) | Rear Suspension | | Spindle to Bottom of Sidemember | | |
|---|---|---|---|---|---|---|---|
| | | | Type | Capacity | Unloaded – $D_r$ | Loaded – $D_r'$ | Bump – $D_r''$ |
| LP | 01CAA | 9.125" | Air | 12,000 | 5.30" ± .25" | – | – |
| | | | | 15,500 | | | |
| | | | | 18,500 | | | |
| 4x2 (non-LP) | 01CAC | 10.125" | Air | 20,000 to 23,000 | 9.26" ± .25" | 9.26" ± .25" | – |
| | 01CAD | 10.250" | | | 9.38" ± .25" | 9.38" ± .25" | |
| | 01CAE | 10.125" | | | 9.26" ± .25" | 9.26" ± .25" | |
| | 01CAG | 10.250" | | | 9.38" ± .25" | 9.38" ± .25" | |
| | 01CAH | 10.375" | | | 9.51" ± .25" | 9.51" ± .25" | |
| 6x4 | 01CAE | 10.125" | Air | 40,000 | 9.26" ± .25" | 9.26" ± .25" | – |
| | 01CAG | 10.250" | | | 9.38" ± .25" | 9.38" ± .25" | |
| | 01CAH | 10.375" | | | 9.51" ± .25" | 9.51" ± .25" | |
| LP | 01CAA | 9.125" | Vari-Rate | 13,500 | 6.6" ± .50" | 3.75" ± .50" | 1.9" ± .50" |
| 4x2 (non-LP) | 01CAB | 9.125" | Vari-Rate | 13,500 | 7.31" ± .50" | – | – |
| | 01CAC | 10.125" | | | 8.31" ± .50" | | |
| | 01CAD | 10.250" | | | 8.43" ± .50" | | |
| | 01CAE | 10.125" | | | 8.31" ± .50" | | |
| | 01CAG | 10.250" | | | 8.43" ± .50" | | |
| | 01CAH | 10.375" | | | 8.56" ± .50" | | |
| LP | 01CAA | 9.125" | Vari-Rate | 15,500 | 6.66" ± .50" | 4.01" ± .50" | 1.81" ± .50" |
| 4x2 (non-LP) | 01CAB | 9.125" | Vari-Rate | 15,500 | 6.37" | 3.79" | 1.59" |
| | 01CAC | 10.125" | | | 7.37" | 4.79" | 2.59" |
| | 01CAD | 10.250" | | | 7.49" | 4.92" | 2.72" |
| | 01CAE | 10.125" | | | 7.37" | 4.79" | 2.59" |
| | 01CAG | 10.250" | | | 7.49" | 4.92" | 2.72" |
| | 01CAH | 10.375" | | | 7.62" | 5.04" | 2.84" |

## *FRAME AND BUMP HEIGHT DATA – REAR (CONTINUED)*

| Model | Frame Code | Frame Rail Height (F) | Rear Suspension | | Spindle to Bottom of Sidemember | | |
|---|---|---|---|---|---|---|---|
| | | | Type | Capacity | Unloaded – $D_r$ | Loaded – $D_r'$ | Bump – $D_r''$ |
| LP | 01CAA | 9.125" | Vari-Rate | 18,500 | 7.78" | 4.48" | 2.2" |
| 4x2 (non-LP) | 01CAB | 9.125" | Vari-Rate | 18,500 | 7.81" | 5.03" | 2.83" |
| | 01CAC | 10.125" | | | 8.81" | 6.03" | 3.83" |
| | 01CAD | 10.250" | | | 8.93" | 6.16" | 3.96" |
| | 01CAE | 10.125" | | | 8.81" | 6.03" | 3.83" |
| | 01CAG | 10.250" | | | 8.93" | 6.16" | 3.96" |
| | 01CAH | 10.375" | | | 9.06" | 6.28" | 4.08" |
| LP | 01CAA | 9.125" | Vari-Rate | 20,000 | 8.125" | 4.75" | 2.5" |
| 4x2 (non-LP) | 01CAB | 9.125" | Vari-Rate | 20,000 | 8.26" ± .50" | 5.31" | 3.13" |
| | 01CAC | 10.125" | | | 9.26" ± .50" | 6.31" | 4.13" |
| | 01CAD | 10.250" | | | 9.38" ± .50" | 6.44" | 4.26" |
| | 01CAE | 10.125" | | | 9.26" ± .50" | 6.31" | 4.13" |
| | 01CAG | 10.250" | | | 9.38" ± .50" | 6.44" | 4.26" |
| | 01CAH | 10.375" | | | 9.51" ± .50" | 6.56" | 4.38" |
| 4x2 (non-LP) | 01CAB | 9.125” | Vari-Rate | 23,500 | | | |
| | 01CAC | 10.125" | | | 9.68" | 6.13" | 3.93" |
| | 01CAD | 10.250" | | | 9.81" | 6.26" | 4.06" |
| | 01CAE | 10.125" | | | 9.68" | 6.13" | 3.93" |
| | 01CAG | 10.250" | | | 9.81" | 6.26" | 4.06" |
| | 01CAH | 10.375" | | | 9.93" | 6.38" | 4.18" |

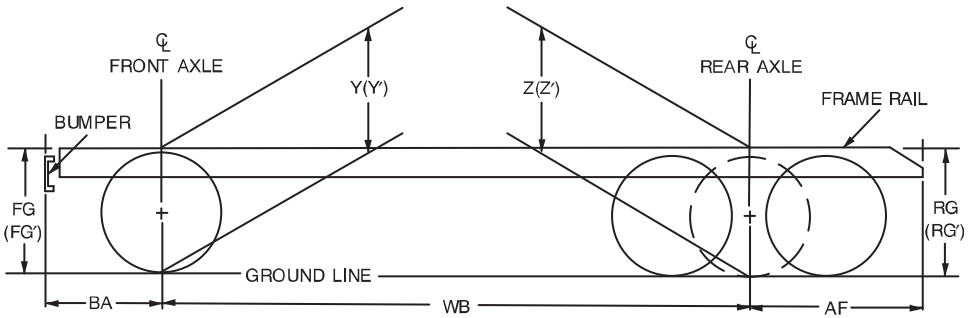
## *FRAME AND BUMP HEIGHT DATA – REAR (CONTINUED)*

| Model | Frame Code | Frame Rail Height (F) | Rear Suspension | | Spindle to Bottom of Sidemember | | |
|---|---|---|---|---|---|---|---|
| | | | Type | Capacity | Unloaded – $D_r$ | Loaded – $D_r'$ | Bump – $D_r''$ |
| 4x2 (non-LP) | 01CAD | 10.250" | Vari-Rate | 31,000 | 10.18" | 6.24" | 4.24" |
| | 01CAE | 10.125" | | | 10.06" | 6.12" | 4.12" |
| | 01CAG | 10.250" | | | 10.18" | 6.24" | 4.24" |
| | 01CAH | 10.375” | | | 10.43” | 6.49” | 4.49” |
| 4x2 (non LP) | 01CAE | 10.125” | Chalmers 1030 | 30,000 | | | |
| 6x4 | 01CAE | 10.125” | Multileaf | 34,000 | | | |
| | 01CAG | 10.250” | | | | | |
| | 01CAH | 10.375” | | | | | |
| 6x4 | 01CAE | 10.125" | Multileaf | 40,000 | 10.88" ± .50" | 9.50" ± .50" | 8.10" ± .50" |
| | 01CAG | 10.250" | | | 11.03" ± .50" | 9.63" ± .50" | 8.23" ± .50" |
| | 01CAH | 10.375" | | | 11.15" ± .50" | 9.75" ± .50" | 8.35" ± .50" |

## *FRAME HEIGHT CALCULATION – AT FRONT AND REAR RAIL ENDS*

### *All Models*

Now that we have learned to calculate the frame height at both the front and rear axle centerlines, we can determine the frame height values at both rail ends.




**FIRST WE MUST DETERMINE THE RAKE OF THE FRAME (I.E., THE SLOPE OF THE FRAME FROM FRONT END TO REAR END). IF THE FRONT END OF THE FRAME IS HIGHER THAN THE REAR END (I.E., > OR Y′> ′) THEN THE TRUCK IS SAID TO HAVE A NEGATIVE RAKE. IN THIS SITUATION, THE EQUATIONS FOR DETERMINING THE FRAME HEIGHT AT THE RAIL ENDS ARE:**

Frame Height @ Front End of Rail:

$$FG = Y + \left(\frac{Y - Z}{WB} \times BA\right)$$ **(FOR UNLOADED CONDITION)**

$$FG' = Y' + \left(\frac{Y' - Z'}{WB} \times BA\right)$$ **(FOR LOADED CONDITION)**

Frame Height @ Rear End of Rail:

$$RG = Z - \left(\frac{Y - Z}{WB} \times AF\right)$$ **(FOR UNLOADED CONDITION)**

$$RG' = Z' - \left(\frac{Y' - Z'}{WB} \times AF\right)$$ **(FOR LOADED CONDITION)**

**FOR SITUATIONS WHERE THE RAKE IS POSITIVE (I.E., Y<Z OR Y′<Z′) THE EQUATIONS FOR DETERMINING FRAME HEIGHT AT THE RAIL ENDS ARE:**

Frame Height @ Front End of Rail:

$$FG = Y - \left(\frac{Z - Y}{WB} \times BA\right)$$ **(FOR UNLOADED CONDITION)**

$$FG' = Y' - \left(\frac{Z' - Y'}{WB} \times BA\right)$$ **(FOR LOADED CONDITION)**

Frame Height @ Rear End of Rail:

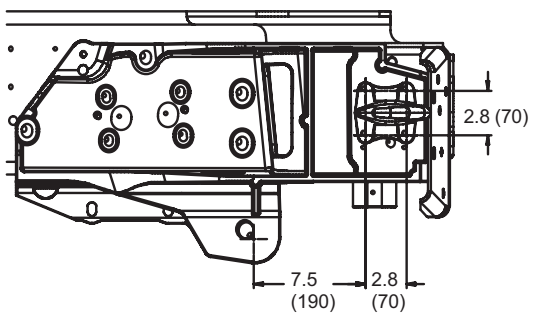
$$RG = Z + \left(\frac{Z - Y}{WB} \times AF\right)$$ **(FOR UNLOADED CONDITION)**

$$RG' = Z' + \left(\frac{Z' - Y'}{WB} \times AF\right)$$ **(FOR LOADED CONDITION)**

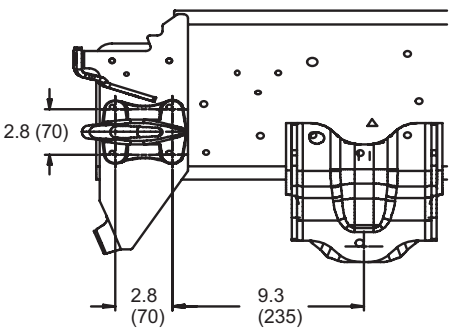
# FRONT BUMPER AND TOW HOOKS

## 4300 and LP

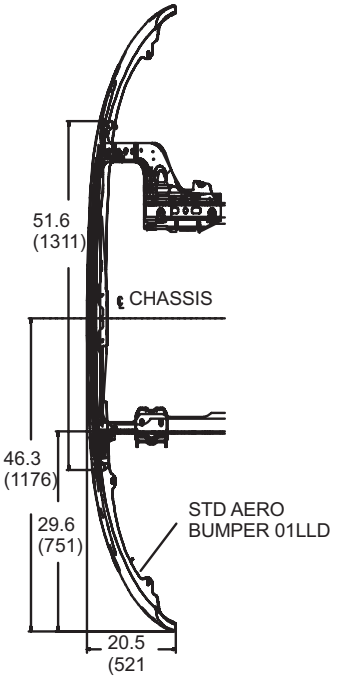
### Front Aero Bumper (01LLD) and Front Tow Hooks (01570)

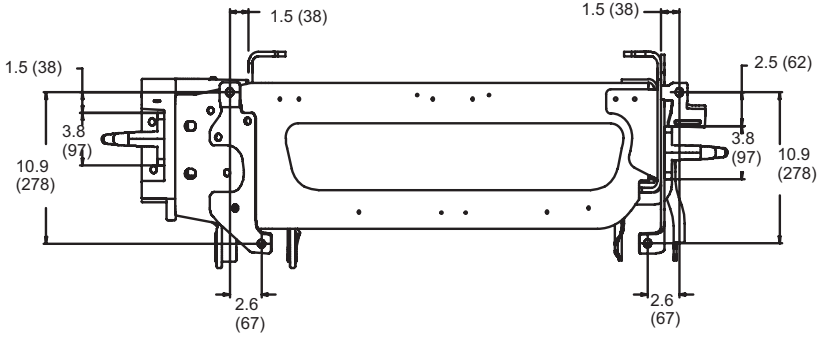


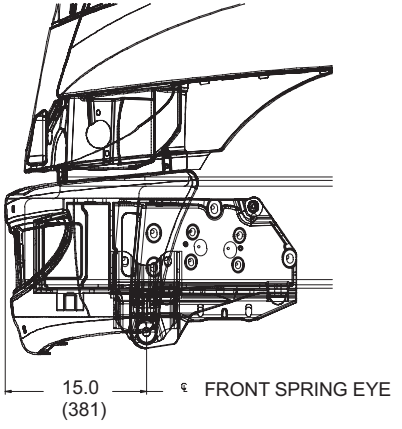

RIGHT SIDE




LEFT SIDE



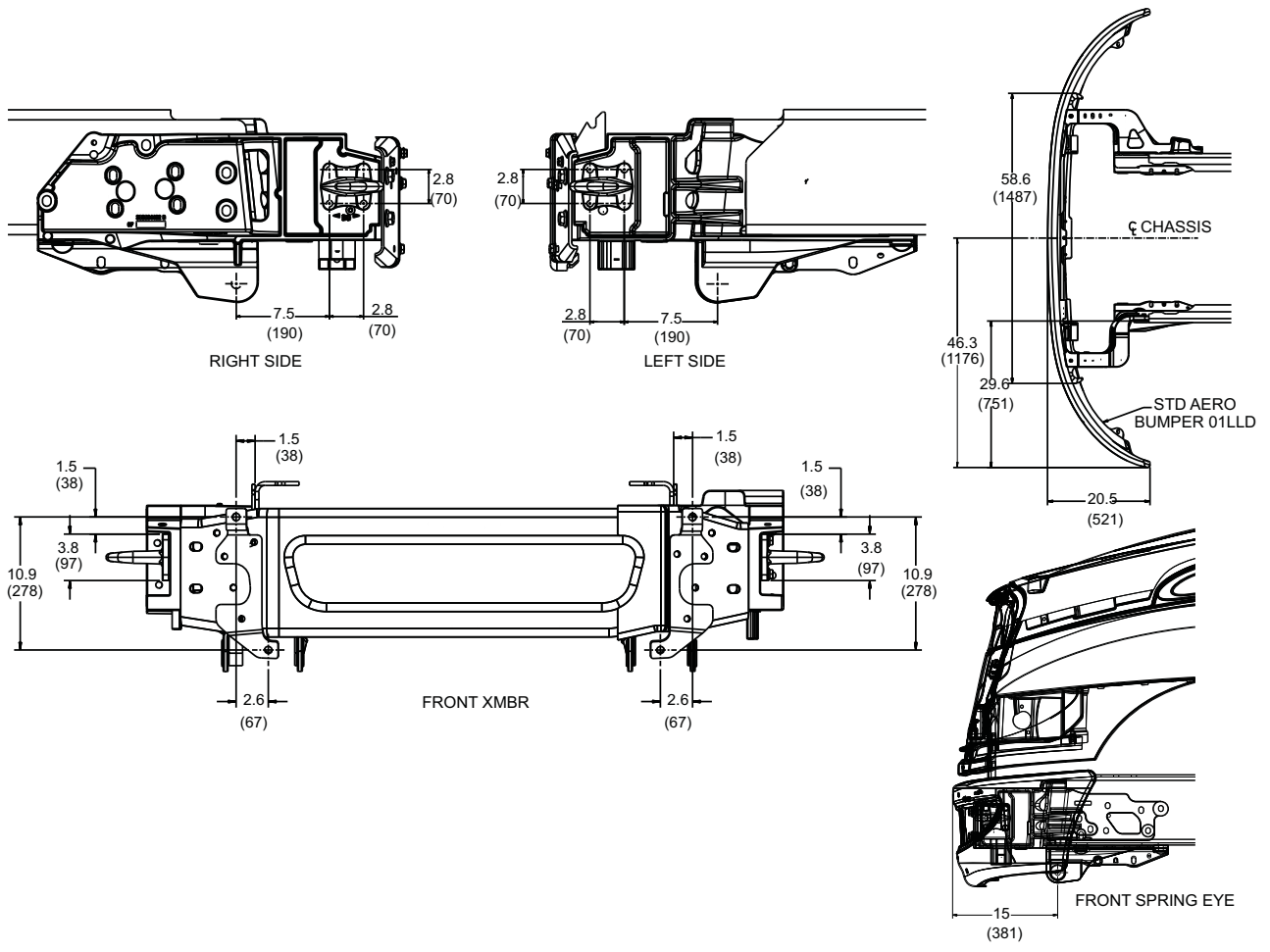




01_0076

## *4400*

### ***Front Aero Bumper (01LLD) and Front Tow Hooks (01570)***

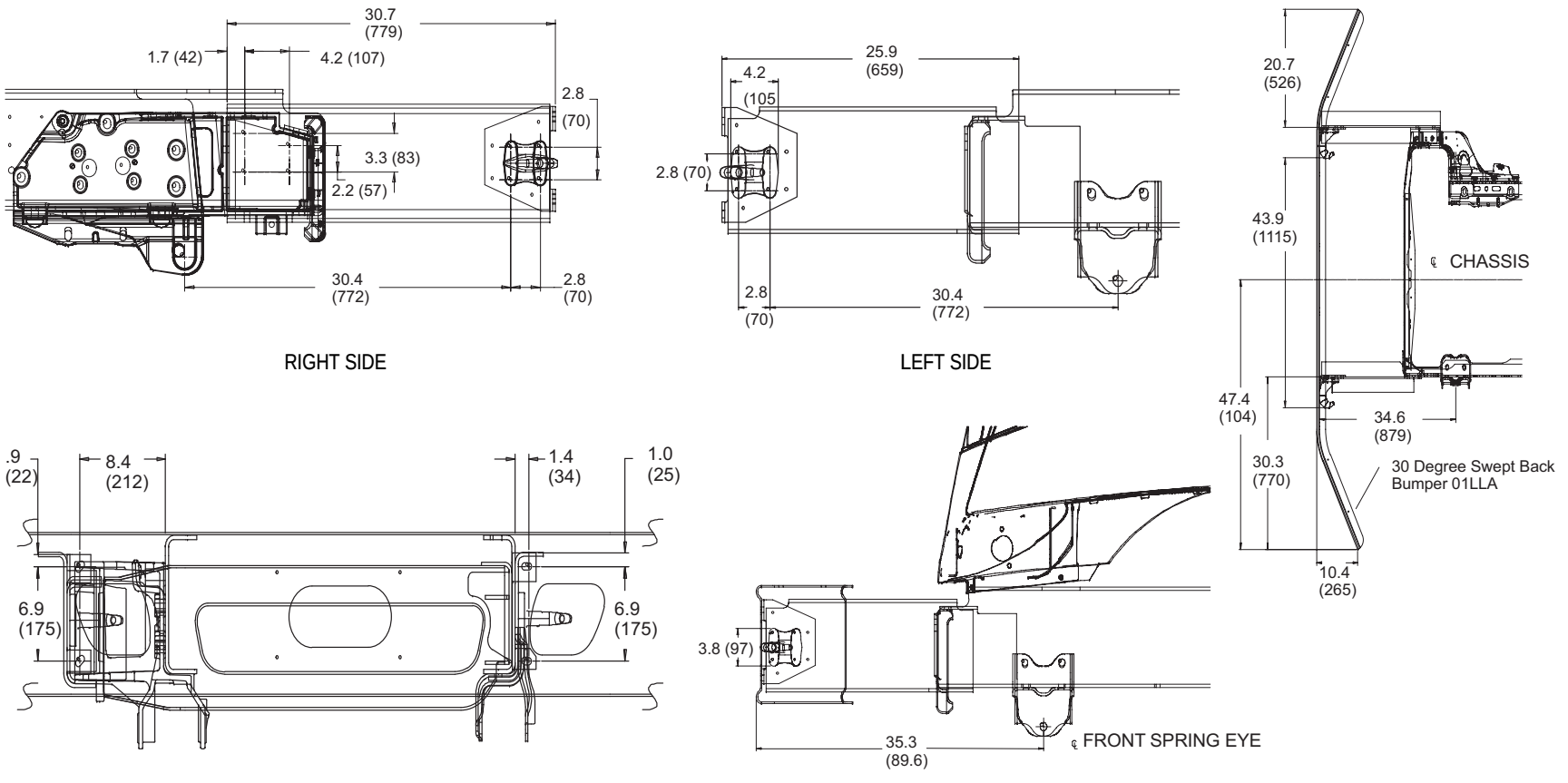



01_0237

# *Front Bumper, Tow Hooks and Extensions*

## *4300 and LP*

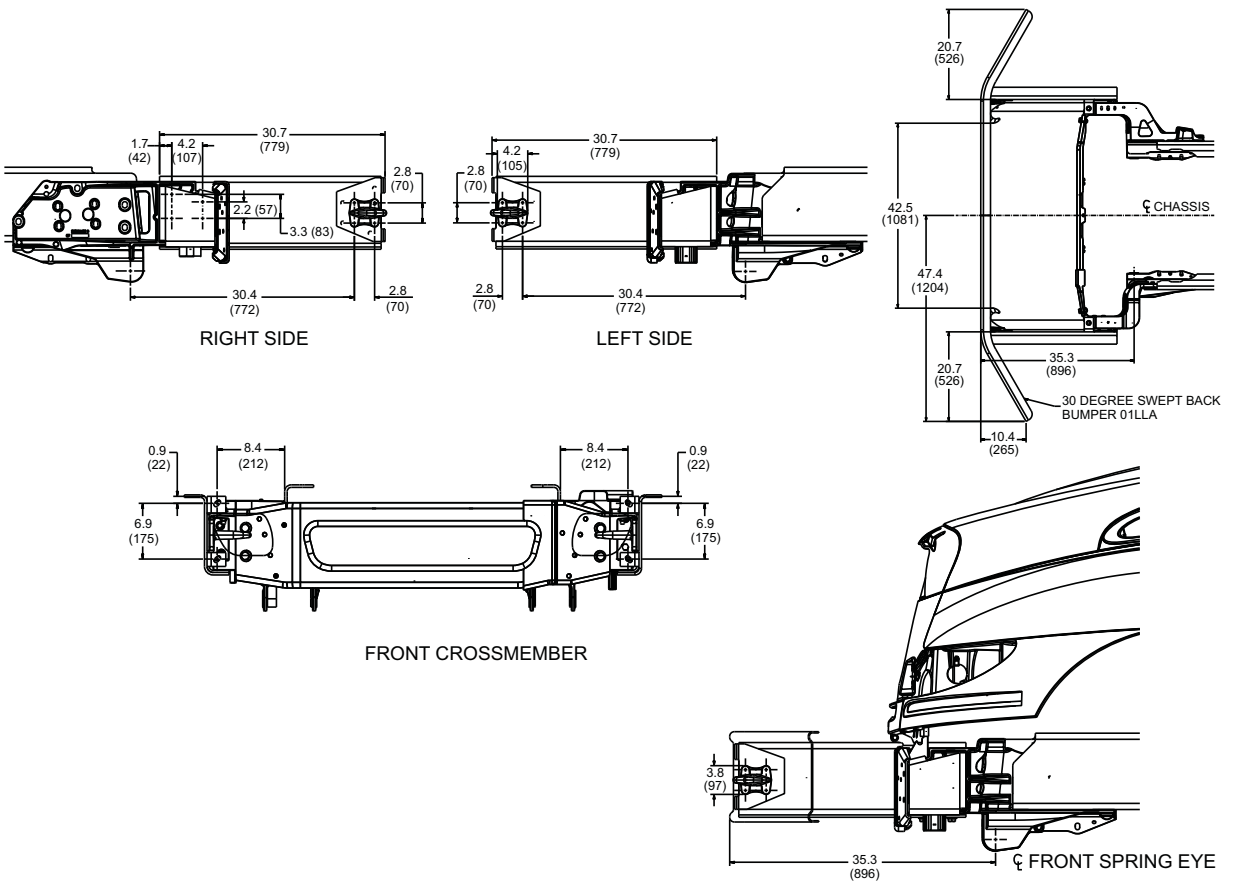
### ***Swept Back Front Bumper (01LLA), Front Tow Hook (01570) and Bolt-On Front Frame Extension (01WDR)***




01_0077

## *4400*

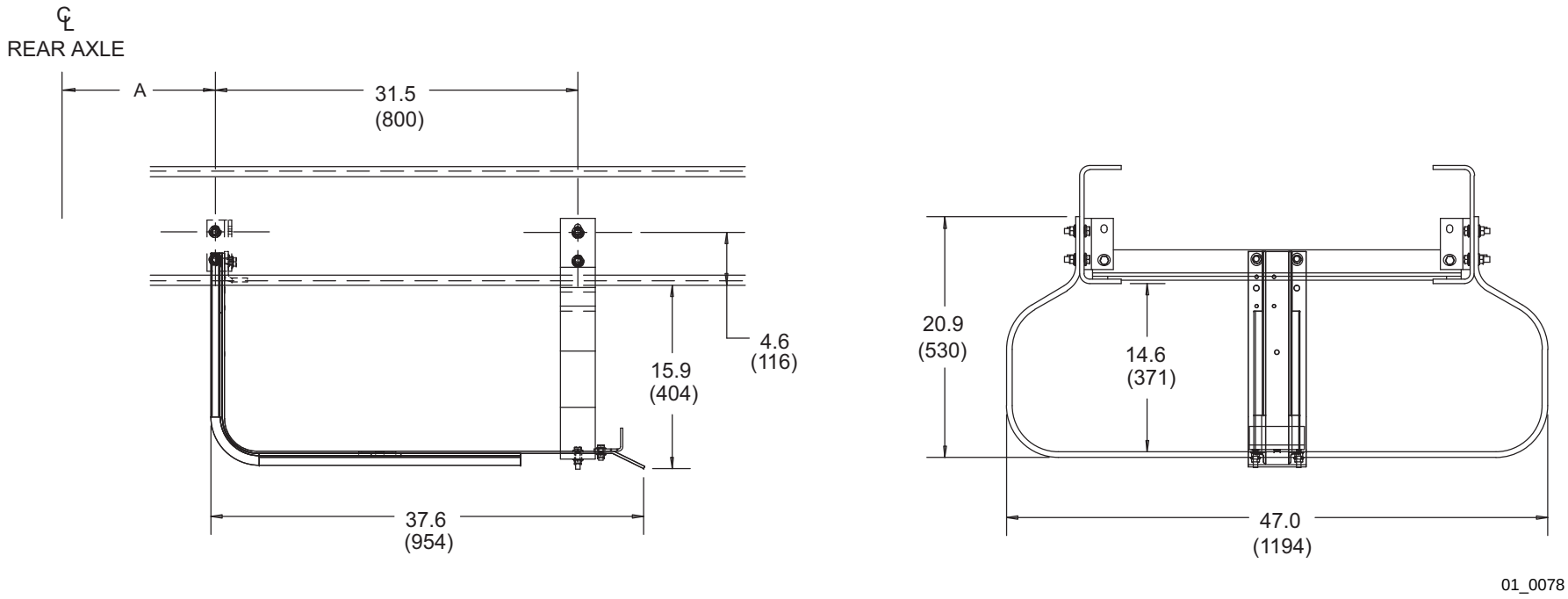
### ***Swept Back Front Bumper (01LLA), Front Tow Hook (01570) and Bolt-On Front Frame Extension (01WDR)***




01_0238

## TIRE CARRIER

### All Models




| Dimensions From Rear Axle Centerline | |
|---|---|
| Suspension | A |
| All 4x2 | 40.6" (1030) |
| 6x4 52" Air/4-Spring | 59.8" (1520) |
| 6x4 55", 60" Air | 63.9" (1622) |

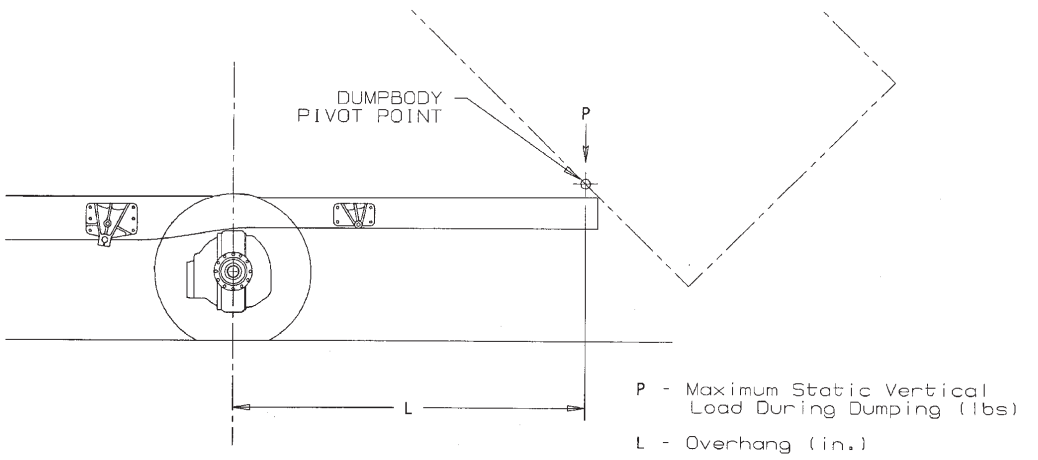
## *OVERHANG LIMITS FOR REFUSE/RECYCLER BODIES*

### *LP*

Dump, and other similar pivoting bodies, impose a great deal of stress on the frame rails in the rear suspension area. The body installer has the responsibility for determining the pivot pin load and for establishing operating guidelines to prevent exceeding this load.

The limits shown in this chart are for equal loading on both sidemembers, i.e. the center of gravity of the raised body is ideally centered and the chassis is on solid, level ground. If the center of gravity is laterally offset due either to uneven loading, uneven ground, or both, the bending moment on one of the rails could increase substantially. For this reason the body installer should derate the overhang limits to account for the lateral shift if either of these factors apply.

| "P" (-lb) | Overhang Limit, "L" (in.) | |
|---|---|---|
| | LP – 80,000 PSI | |
| | Steel Leaf Springs | Air Suspension |
| 6,000 | 95 | 90 |
| 8,000 | 82 | 71 |
| 10,000 | 68 | 61 |
| 12,000 | 59 | 53 |
| 14,000 | 52 | 47 |



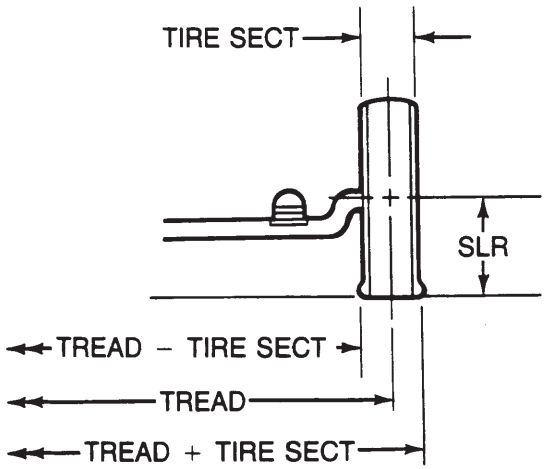

01_0079


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# FRONT AXLES

## *ALL MODELS*

### *Front Axle Tread*




02_0004

| | |
|---|---|
| TREAD | = DISTANCE (WIDTH) BETWEEN VERTICAL CENTERLINES OF SINGLE TIRES AT OPPOSITE ENDS OF AXLE, OR BETWEEN VERTICAL CENTERLINES OF DUAL SPACING (D.S.) AT OPPOSITE ENDS OF AXLE. |
| (Tire Section) | = OVERALL WIDTH OF NEW TIRE AT TOP OF TIRE UNDER MAXIMUM LOAD, INCLUDING 24-HOUR INFLATION GROWTH, AND INCLUDING PROTECTIVE SIDE RIBS, BARS AND DECORATIONS RECOMMENDED BY TIRE MANUFACTURER. |
| (Tread plus Tire Section) | = OVERALL WIDTH OF AXLE, RIM, AND TIRE ASSEMBLY AT TOP OF TIRES UNDER MAXIMUM LOAD RECOMMENDED BY TIRE MANUFACTURER. |
| (Tread minus Tire Section) | = DISTANCE (WIDTH) BETWEEN NEAR SIDES OF TIRES AT OPPOSITE ENDS OF AXLE AT TOP OF TIRE UNDER MAXIMUM LOAD RECOMMENDED BY THE TIRE MANUFACTURER. |
| (Static Loaded Radius) | = DISTANCE FROM GROUND TO CENTERLINE OF HUB WHEN TIRES ARE CORRECTLY INFLATED AND UNDER MAXIMUM LOAD RECOMMENDED BY TIRE MANUFACTURER. |

The chart shown here lists tread information for various wheel/axle combinations. Tread dimensions are not dependent on tire size. Other dimensions explained here are related to tread and require tire dimensions. Please contact your tire supplier (or consult the Component Book, PDB-70000) for tire dimensions.

## *FRONT AXLE TREAD*

### *All Models Where Applicable*

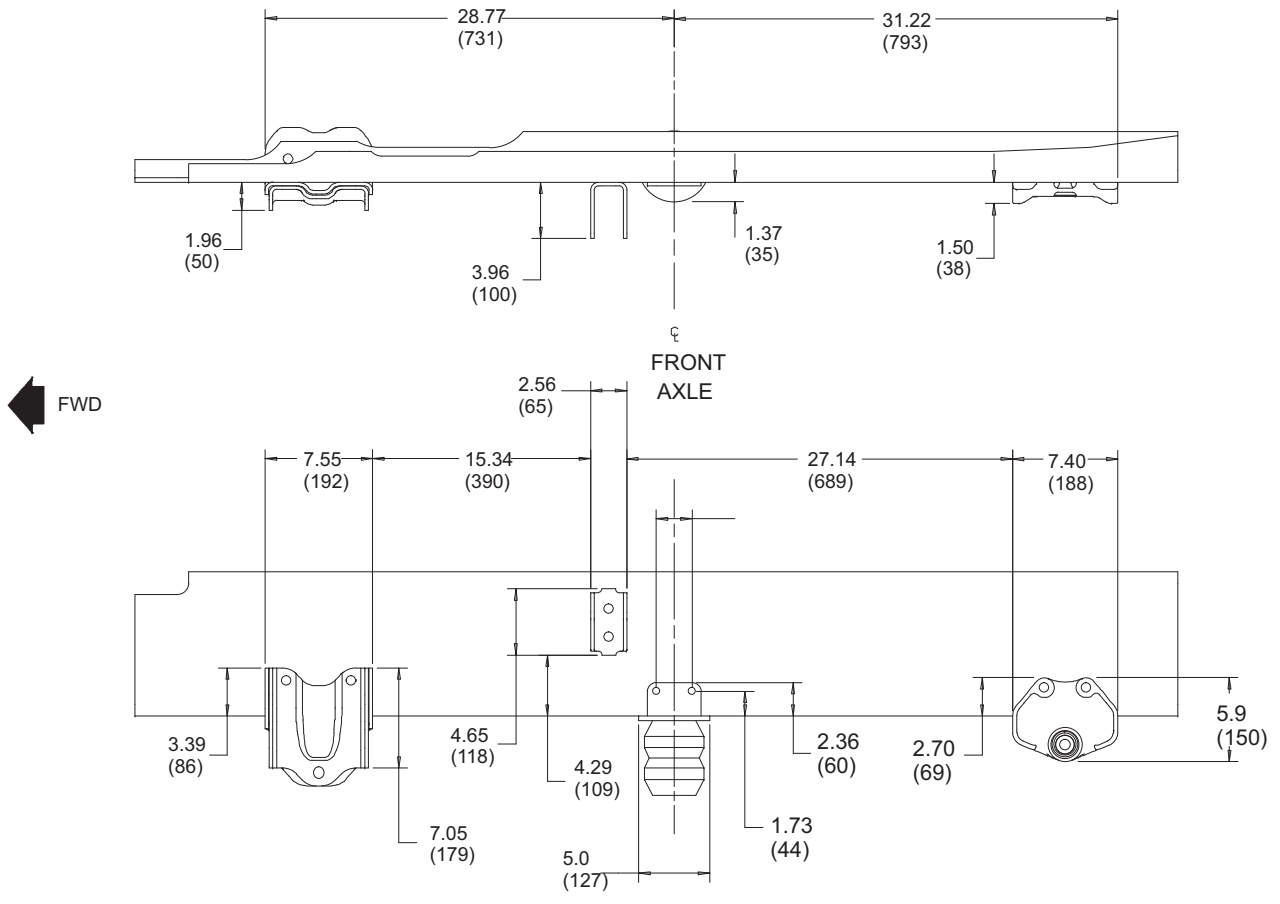
| Wheel/Rim | | | Axle Code (Front Non-Driving) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Type | Size | Material | 02AEZ, 02AGB, 02AGG, 02AGM, 02AHY, 02AHZ, 02AJA, 02ATE, 02AYD, 02ATL | | 02AEM | | 02ATK | | 02AGC, 02AGE, 02AHD, 02ARV, 02ARW, 02ARX, 02ASM, 02ATD, 02ATG | |
| | | | Air Brake | Hydraulic Brake | Air Brake | Hydraulic Brake | Air Brake | Hydraulic Brake | Air Brake | Hydraulic Brake |
| Disc | 19.5 x 6.75 | Steel | – | – | – | 83.60 | – | 84.60 | – | – |
| | 19.5 x 7.50 | Steel (10-285) | – | – | – | – | – | – | – | – |
| | | Aluminum (8-275) | – | – | – | 83.01 | – | 82.01 | – | – |
| | | Aluminum (10-285) | – | – | – | – | – | – | – | – |
| | 22.5 x 7.50 | Steel | – | 79.73 | – | 80.44 | – | 79.44 | – | 77.23 |
| | 22.5 x 8.25 | Steel | – | 79.41 | – | 80.12 | – | 79.12 | – | 76.91 |
| | | Aluminum | – | 80.31 | – | 81.01 | – | 80.01 | – | 82.81 |
| | 22.5 x 9.00 | Steel (5.25 offset) | – | – | – | – | – | – | – | – |
| | | Steel (7.00 offset) | – | – | – | – | – | – | – | – |
| | | Aluminum | – | – | – | – | – | – | – | – |
| | 22.5 x 12.25 | Steel | – | – | – | – | – | – | – | – |

# FRONT SUSPENSIONS

## *FRONT SUSPENSION BRACKETS*

### *MODELS 4300 AND LP*

#### ***Left Side Rails***

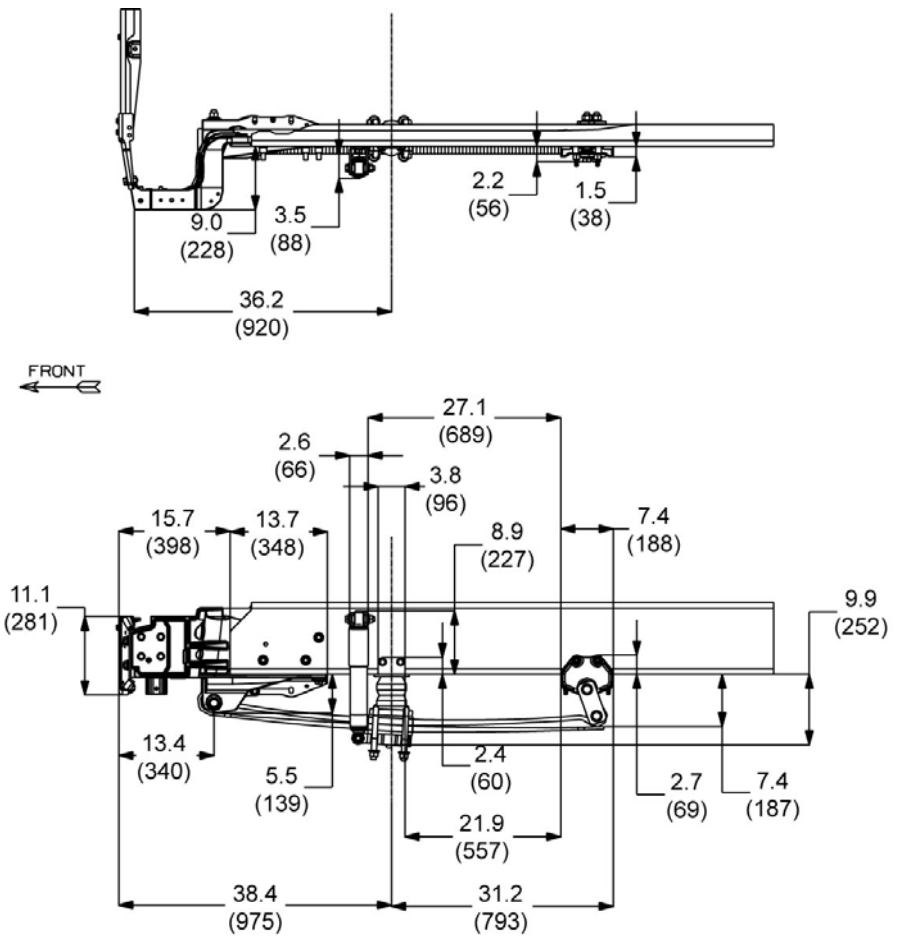



03_0004

# FRONT SUSPENSION BRACKETS

## MODEL 4400

### *Left Side Rails*

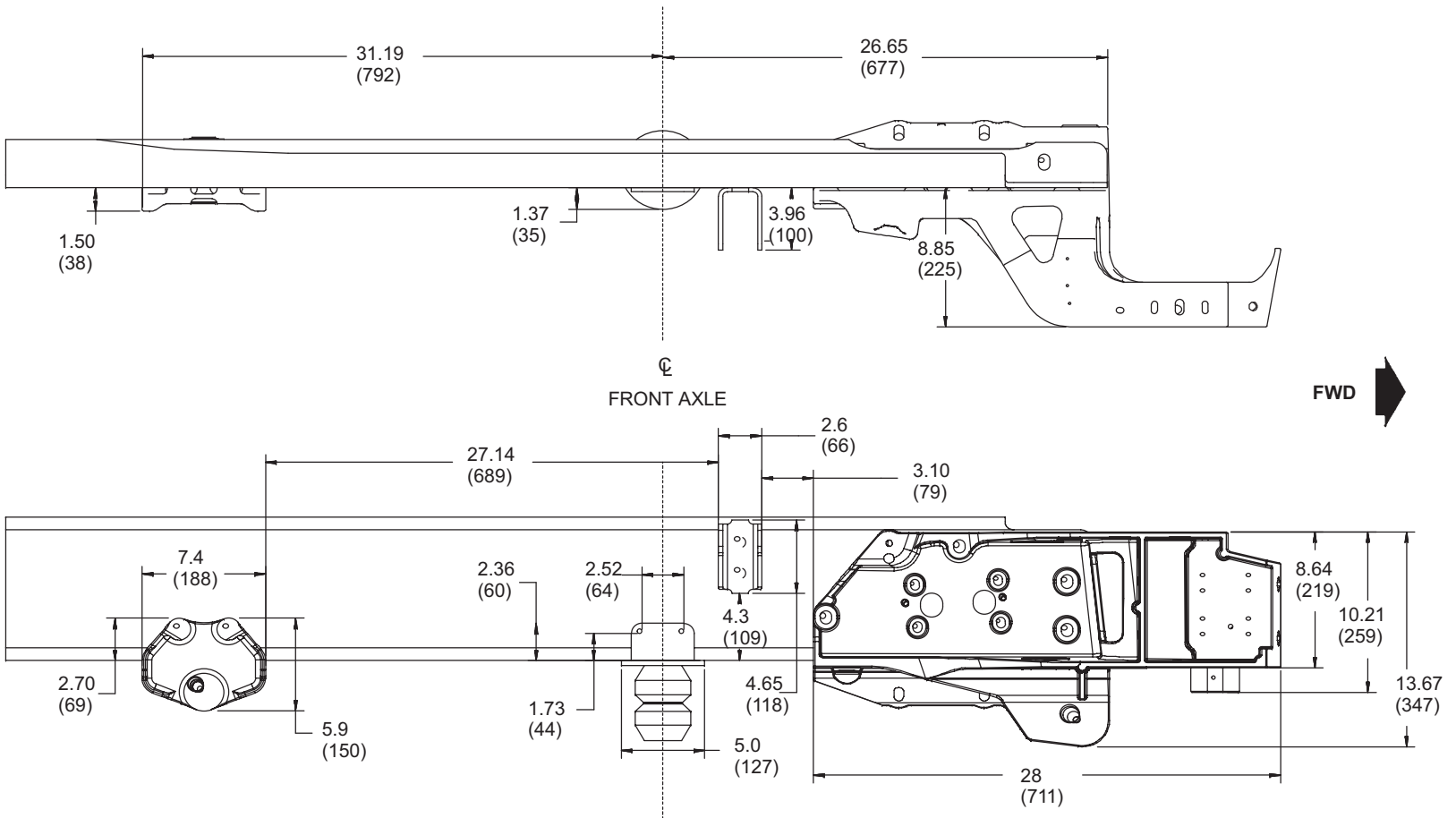



durastar_4400_front_suspension_bracket

## *FRONT SUSPENSION BRACKETS*

### *ALL MODELS*

#### ***Right Side Rails***




03_0005


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# BRAKES

## *ALL MODELS*

### *Air Brake Modifications*

*Certification Procedures For DOT FMVSS-121*

The Federal Department of Transportation's Motor Vehicle Safety Standard 121 required that virtually all trucks equipped with air brakes and manufactured on or after March 1, 1975 must comply with a comprehensive set of design and performance parameters concerning the air brakes and related systems.

Of the many requirements of FMVSS 121, two are of primary concern between the truck manufacturer and the body and allied equipment manufacturer. The first concern is the center of gravity location on a truck used for compliance testing and the second involves the tubing and air flow design of the brake system.

Cautions - FMVSS-121 Air Brake System Modifications

**CAUTION:** If wheelbase alterations are made to International vehicles with FMVSS-121 brakes:

- ***DO NOT*** make alterations to air lines with hose, piping or fittings of sizes other than those currently in use on the truck.
- ***DO NOT*** allow sharp bends or other constrictions in hosing.
- ***DO NOT*** exceed the minimum or maximum wheelbase available from the factory for that model after lengthening or shortening the wheelbase. For wheelbases longer or shorter than those available from the factory, International will provide verbal opinion (through contacting your local International dealer). International will be available to provide certification testing and documentation of compliance or non-compliance with FMVSS-121 for the specific situation at an additional cost.

**CAUTION:** Air reservoirs may be relocated providing these guidelines are followed:

- ***DO NOT*** make alterations to air lines with hose, piping or fittings of sizes other than those currently in use on the truck.
- ***DO NOT*** allow sharp bends or other constrictions in hosing.
- ***DO NOT*** alter brake line to port location.

**CAUTION:** Air-operated auxiliary attachments may be added to International FMVSS-121 vehicles if you:

- ***DO NOT*** use air tap locations other than those shown on these drawings for these models.
- PRESSURE PROTECTION VALVES ARE REQUIRED WHERE SHOWN AND SHOULD BE MOUNTED WITH THE VENT PORT DOWNWARD. ALL NEW PARTS ARE AVAILABLE FROM INTERNATIONAL TRUCK DEALERS. Since the FVMSS-121 has very specific criteria for the time allowed for air to reach and release the brakes, it is obvious that the tubing design is very critical and that the allowable sources for air tap must necessarily be restricted. Consult FMVSS-121 for criteria for time allowed for apply and release of brakes.

*ALL MODELS*

## Brake Restrictions

*Safety Measures*

Should it be necessary to modify the braking system, for example in connection with a wheelbase alteration, the following must always be observed:

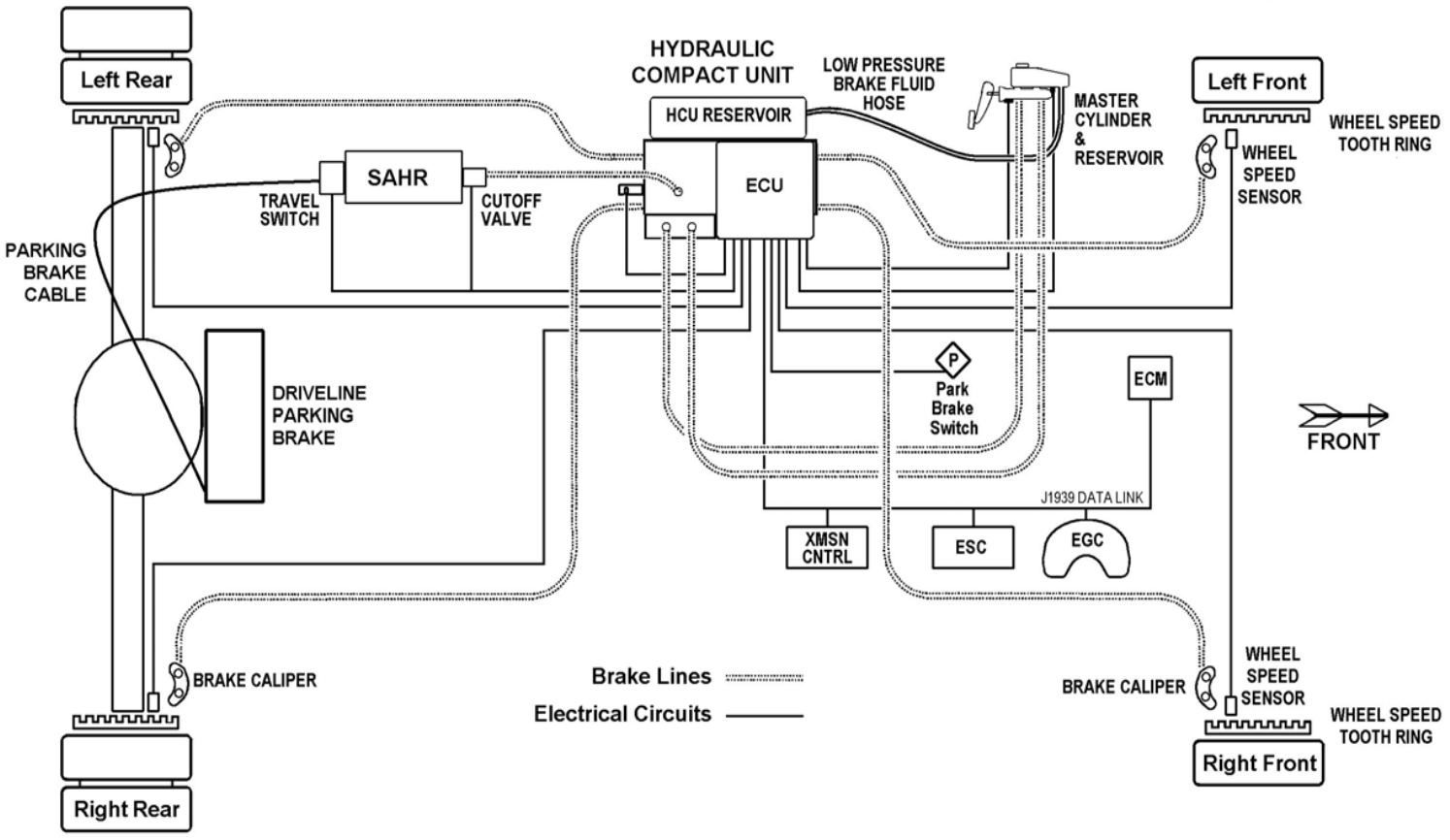
- Make sure that the brake circuits are not altered. Before any part of the braking system is dismantled, mark the brake pipes and connections concerned, or make a sketch showing the original routing.
- Avoid joints, preferably change the entire brake pipe.
- Preferably, use bent brake pipes instead of elbow unions so as not to affect the brake application/release times.
- Install the brake pipes in positions where they are protected against damage and heat.
- Install the air tanks so that the drain valves still function well and are easy to reach.

**CAUTION:** When a brake pipe is replaced or jointed, use only genuine International parts of the correct type.

**NOTE:** On trucks with ABS brakes, the sensor cable must not be jointed. If necessary, it must be completely replaced.

## *FULL POWER HYDRAULIC BRAKE SYSTEM SCHEMATIC*

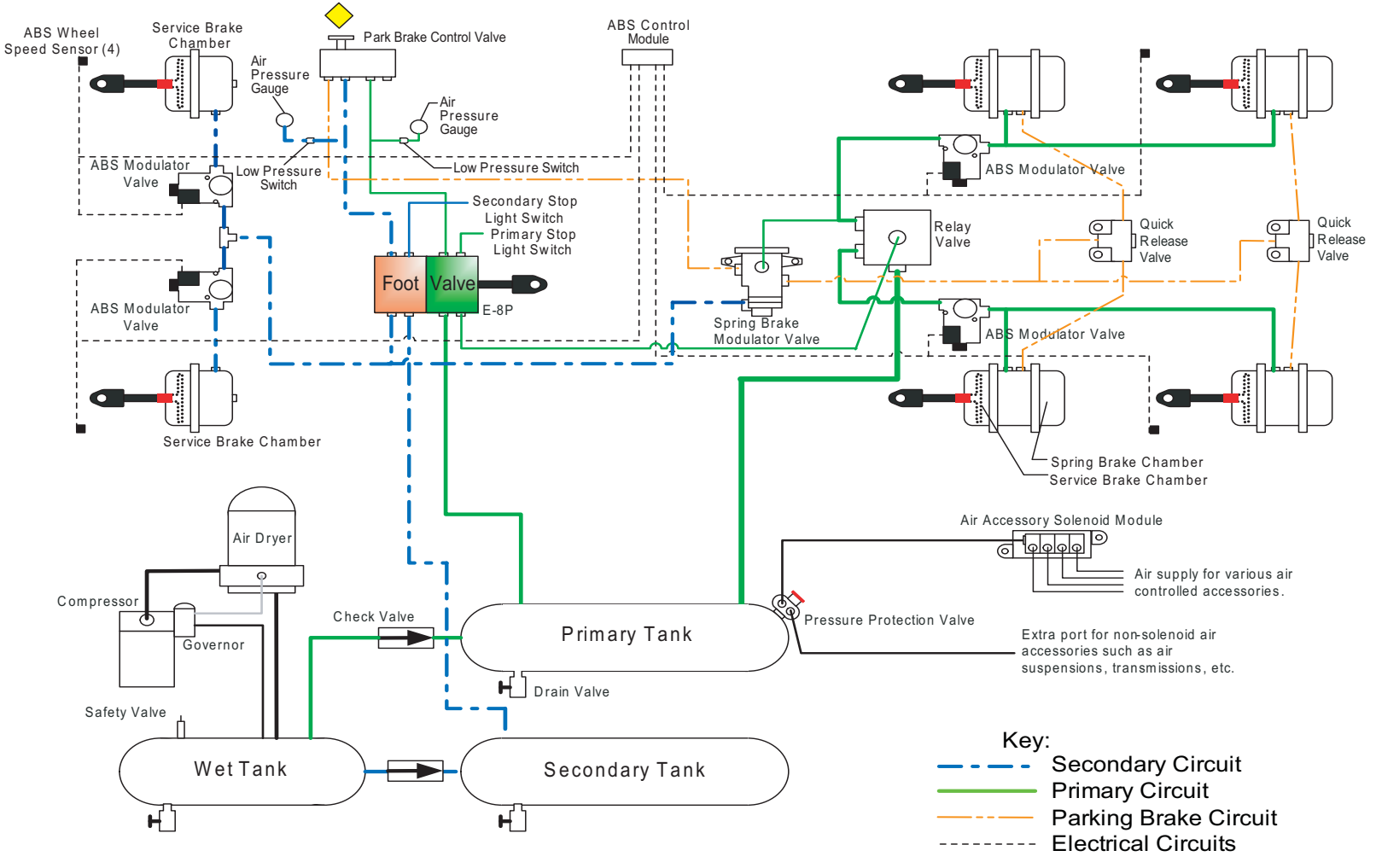
### *with Truck Brake System Code 04085*




04_0081

## *ANTILOCK AIR BRAKE SYSTEM SCHEMATIC*

### *with Truck Brake System Code 04091*




04_0102

## *ROUTING GUIDELINES*

### *All Models*

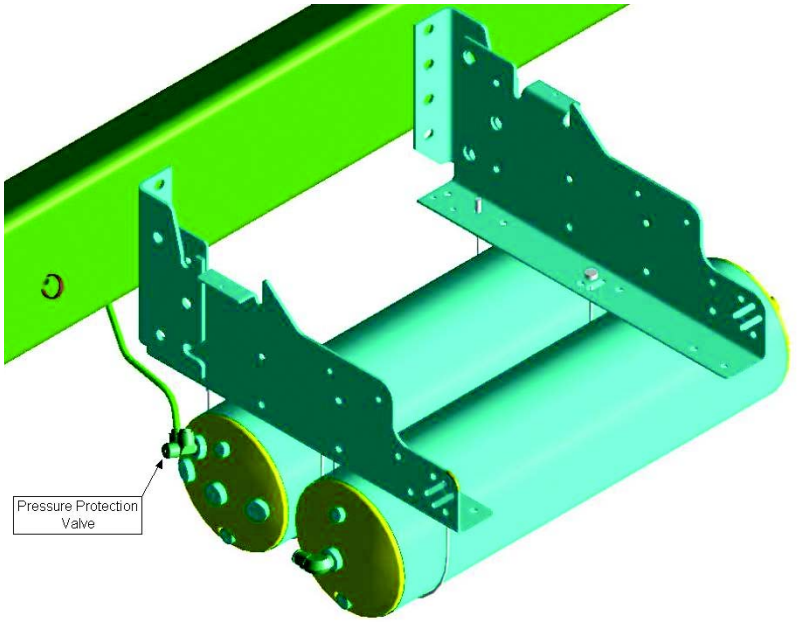
If modifications are made to International vehicles with the addition or re-routing of tubing the following guidelines found in the Federal Motor Carrier Safety Regulations Pocketbook, section 393.45, should be followed:

- Be designed and constructed in a manner that insures proper, adequate, and continued functioning of the tubing or hose.
- Be installed in a manner that insures proper continued functioning of the tubing or hose.
- Be long and flexible enough to accommodate without damage all normal motions of the part to which it is attached.
- Be suitably secured against chafing, kinking, or other mechanical damage.
- Be installed in a manner that prevents it from contacting the vehicle's exhaust system or any other source of high temperatures.

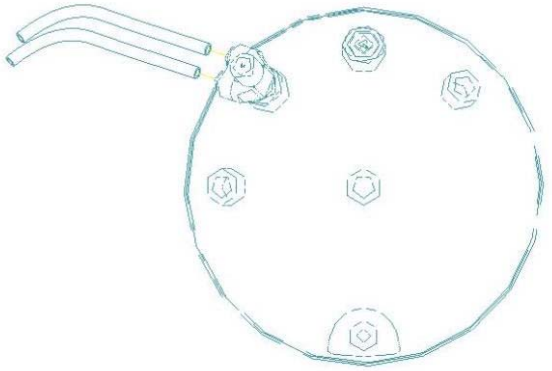
## AIR-OPERATED AUXILIARY ATTACHMENTS

### ALL MODELS

- The primary air reservoir has a dedicated port for a two-port pressure protection valve (PPV). If no air-operated features are ordered on the vehicle, then this port is plugged from the factory. A PPV can be ordered from an International dealer if a PPV is needed.
- The PPV will come installed from the factory if an air suspension or other air-operated device is ordered (i.e., fifth wheel slide, air suspension dump, etc.). Depending on vehicle ordered features; one port may be open. If this is the case, then unplug that port and use the port.
- If all of the ports on the PPV are utilized, then a Quality Connect tee should be installed into the one of the used ports. The recommended tee - 3/8-inch x 3/8-inch x 3/8-inch stem (International part number 2024458C1) – can be ordered from an International dealer.




04_0005



View displaying Pressure protection valve in end of Primary air tank with two supply tubes.

04_0006

# *TUBE FITTING INSTALLATION INSTRUCTIONS*

## *All Models*

The majority of tube fitting connections in the air braked chassis utilize a Quality Connect fitting (fitting integral to an air brake component or plastic fitting) or an PTC fitting (fitting threaded into an air brake component). Both of these fitting types are comprised of a collet which bites into the tube to hold it firmly in place and a fitting O-ring which seals the tube to the valve, manifold or tee body to prevent leakage. To aid in service, a kit is available with tools for each port and tube size used by International.

To assure standardization of tubing used on International vehicles, the following table illustrates tubing color, abbreviations and where that color is used.

| Color | Abbreviation | Where Used |
|---|---|---|
| Black | BK | MV-3, PPDC Exhaust<br>Air Seat<br>Air Horn<br>Air Dryer to Wet Tank<br>Wet tank to Governor |
| Blue | BL | Trailer Service, 1st Pusher Delivery |
| Brown | BN | Air Suspension system, 2nd Pusher Delivery |
| Green | GN | Primary Brake system |
| Orange | OR | Secondary Brake system |
| Purple | PL | 1st Tag Delivery |
| Red | RD | Trailer emergency |
| Silver | SIL | PDL control, 2nd Pusher Supply<br>Governor to Dryer |
| Tan | TN | Locking differential, 1st Pusher Supply<br>Traction differential<br>Two-speed axle |
| White | WH | Solenoid Pack Supply Load Sensing Gauge, 1st Tag Supply |
| Yellow | YL | Spring Brake System, Cab Air Suspension |

## *Removal and Insertion Procedures for Tubing in QC or PTC Fittings*

### *All Models*

**WARNING:** **Do not attempt to disassemble tubing from fittings with air pressure in the system. Failure to drain system of air pressure before removing components may cause personal injury or death.**

*Removal of Tube from Fitting*

- Use the tube release tool (see graphic 1 below) to remove the tube.
- Push down on the release tool, then pull on the tube. Pushing the tool depresses the fitting collet, allowing it to release the tube. Sometimes the brass tube support will be pulled out of the fitting when the tube is removed. Be sure to reinstall a tube support when installing the tube.

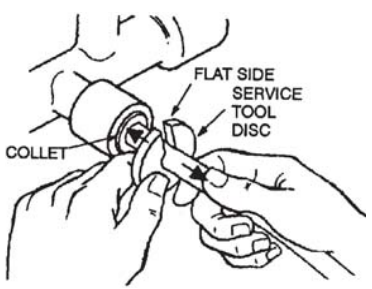
*Preparation of Tube for Installation*

- Inspect the tube end for external scratches, burrs, or cracks. If it is damaged, trim the damaged portion off at an insertion depth mark (see graphic 2 below) or replace the tube. **DO NOT** reuse a damaged end.

**IMPORTANT:** Use the tube cutter (supplied in the tool kit) to ensure that the cut is square within 15° to help prevent leakage. Do not use a dull or heavy cutting tool such as side cutters, pocket knife or hack saw which could collapse (flatten) the tube or create O-ring damaging burrs. Do not use the tube cutter to cut anything other than nylon air line tubing. Replace the blade or cutter if the cutting edge becomes dull.

*Installing Tube Into The Fitting*

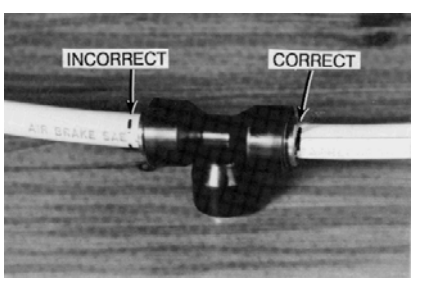
- Lubricate the tube end and install it to the correct insertion depth (see graphic 3 below). Install the tube by pushing it straight into the fitting. The insertion depth mark should be flush with the face of the fitting (see graphic 3 below). Gently tug on the tube to make sure it is secured in the fitting.
- Test to make sure the assembly is free from leaks using a soap solution and clean, dry air at system pressure. When performing a bubble test, leakage should not exceed a soap bubble of 1/2-inch (12 mm) in 3 seconds with system air pressure of 100 to 130 psi. If a leak exceeding the above specification is still present, remove and replace the valve, manifold or tee.




**1– Remove Tube** 04_007



**2 – Prepare for Installation** 04_008

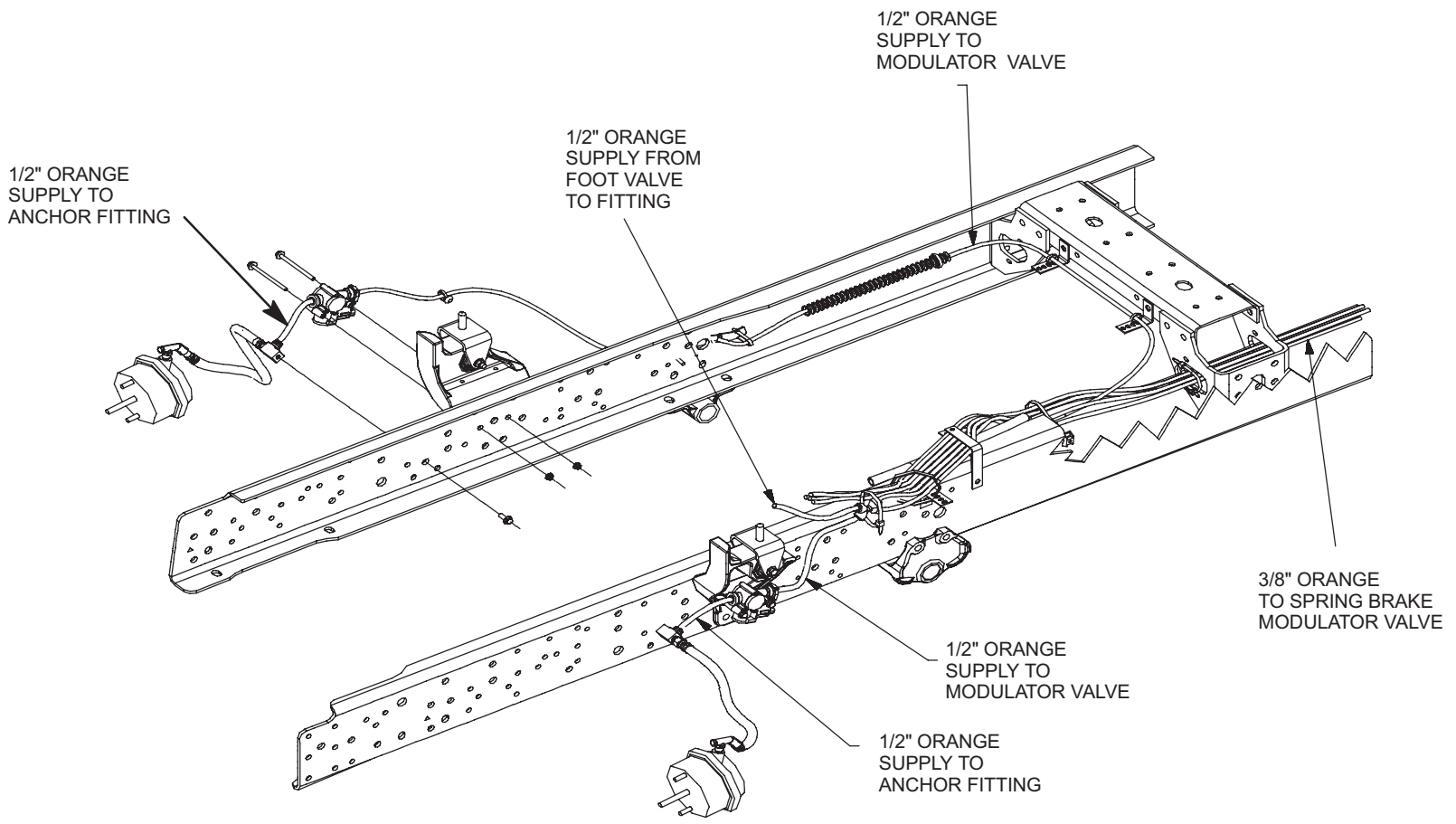



**3 – Install Tube into the Fitting** 04_009

# AIR BRAKE TUBING

## All Models

### Front Section

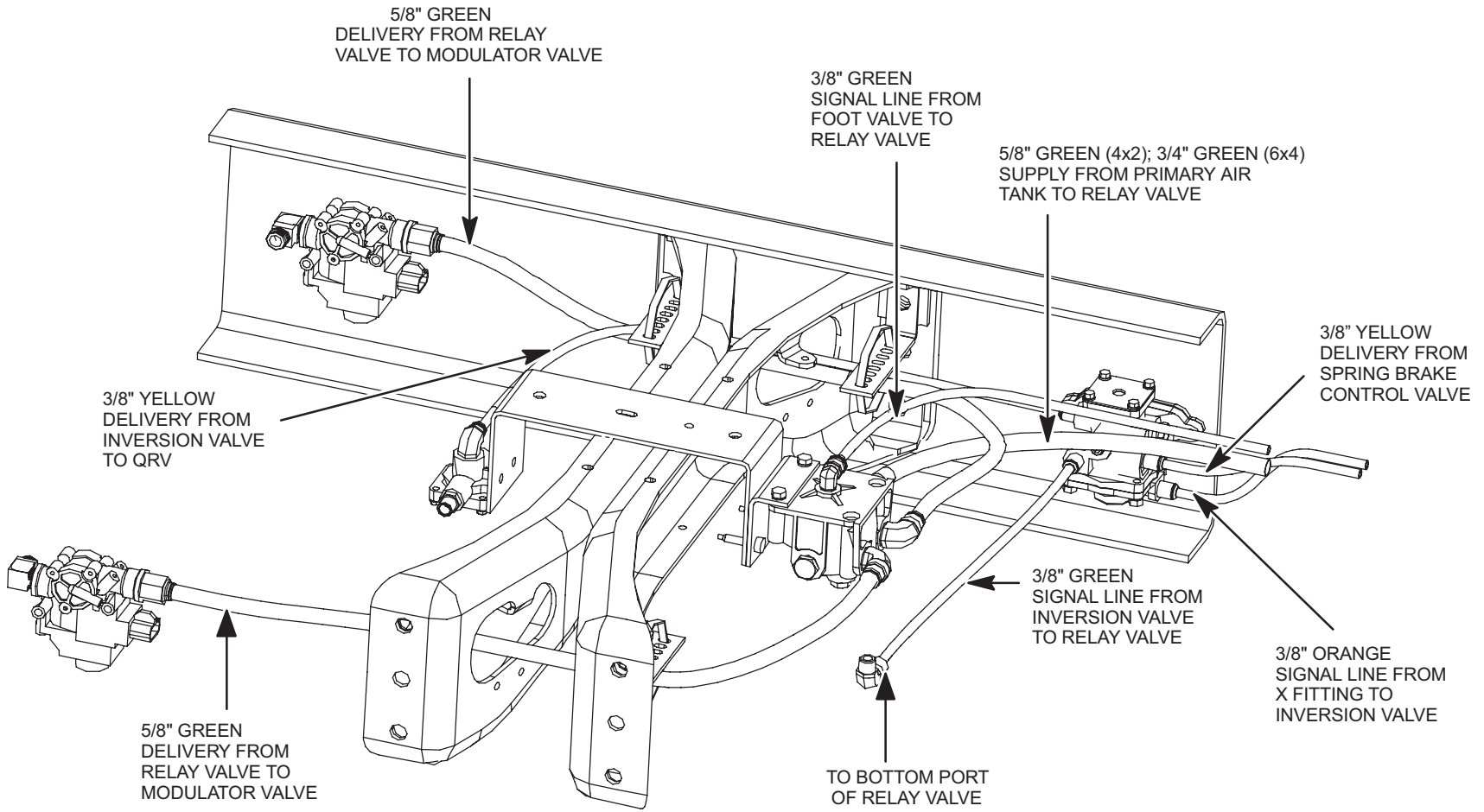



04_0010

## *AIR BRAKE TUBING*

### *All Models*

#### ***Rear Section – Truck Brakes***

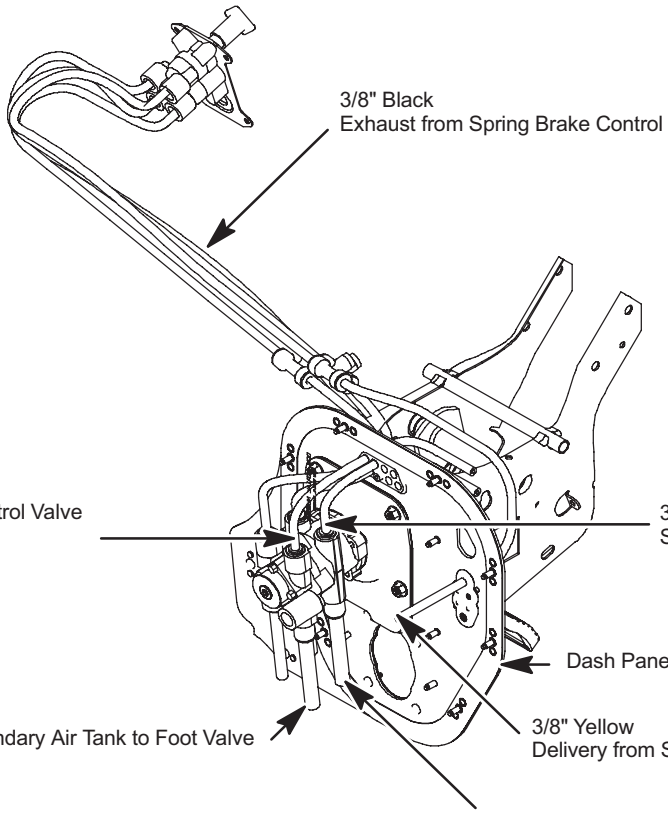



04_0012

# *INSIDE CAB & FOOT VALVE PLUMBING*

## *All Models*

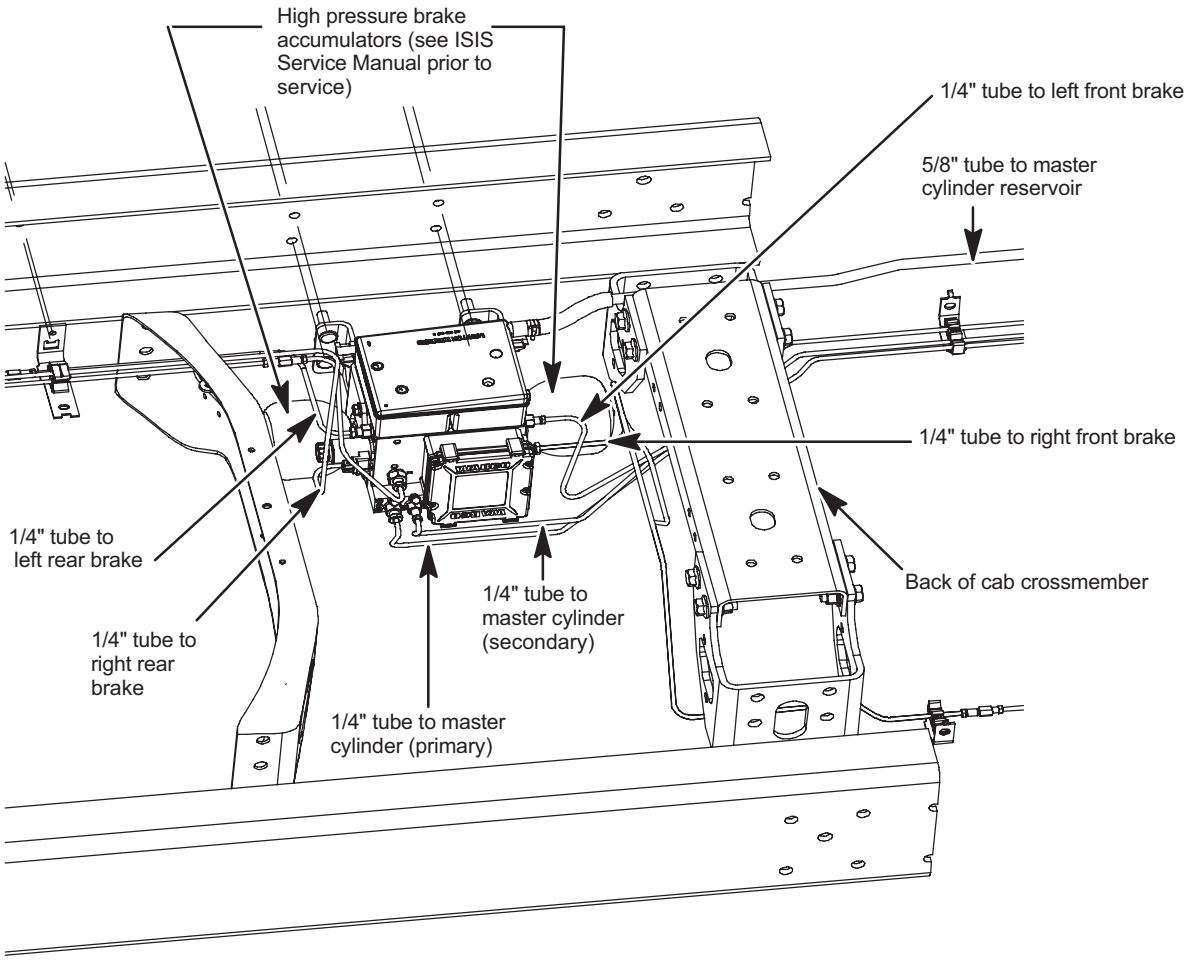
For connections not shown, please refer to the appropriate schematic in the CT-400 General Information book.




04_0013

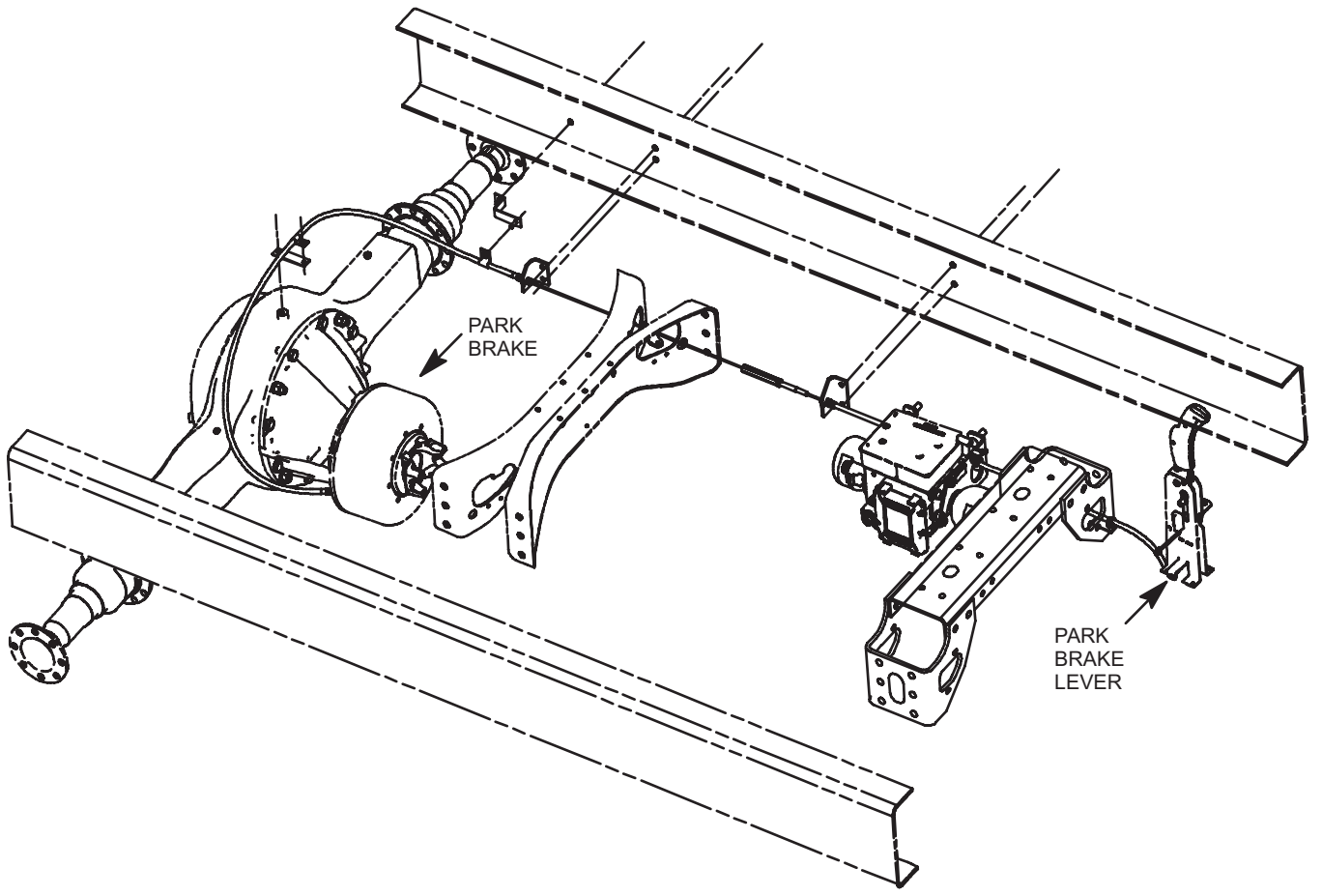
## *HYDRAULIC CONTROL UNIT PLUMBING*

### *All Models*



## *PARKING BRAKE ASSEMBLY WITH HYDRAULIC BRAKES*

### *All Models*

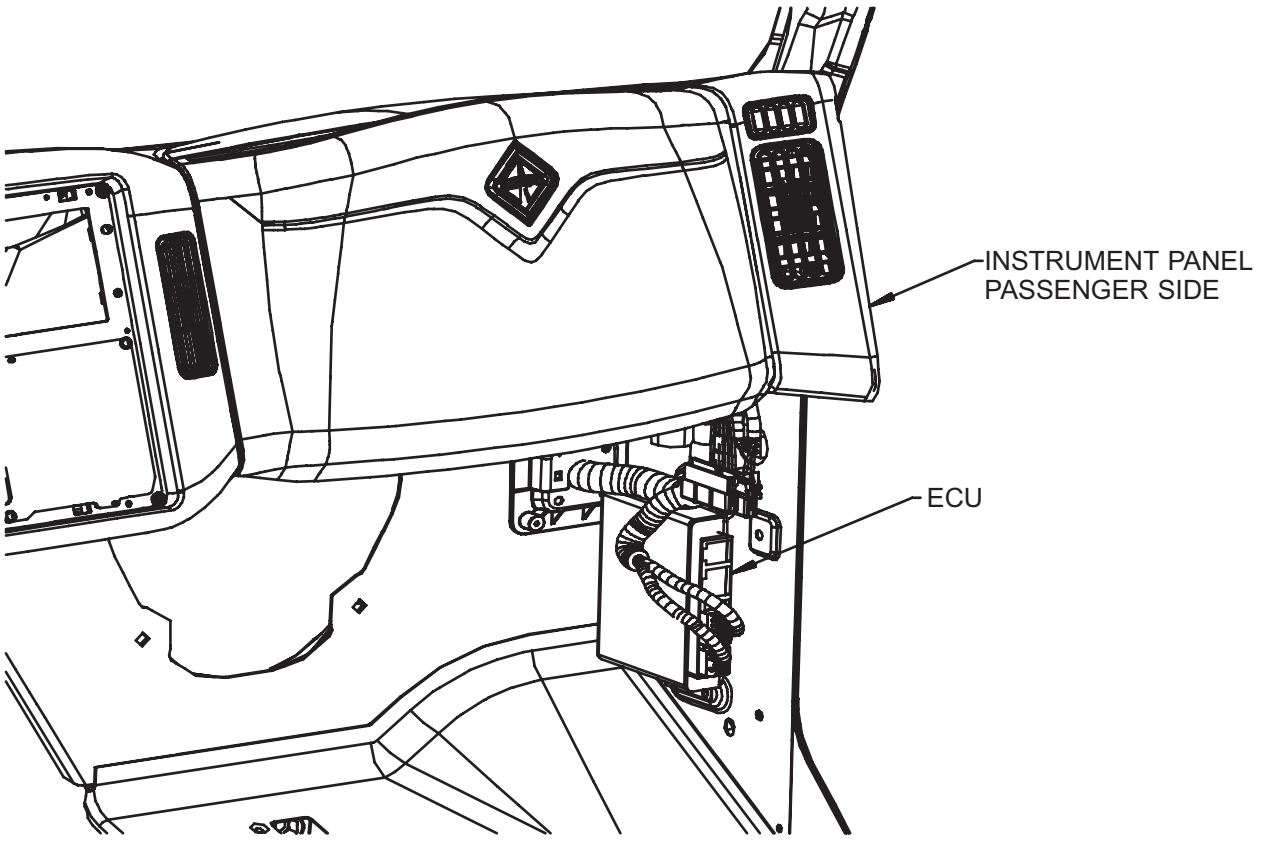



04_0015

With hydraulic brakes, the park brake assembly is attached to the rear axle. It is mechanically actuated through the use of a three-section cable. Due to the construction of the cables, it is not possible to alter the length.

## AIR ABS ECU (ELECTRICAL CONTROL UNIT)

### All Models

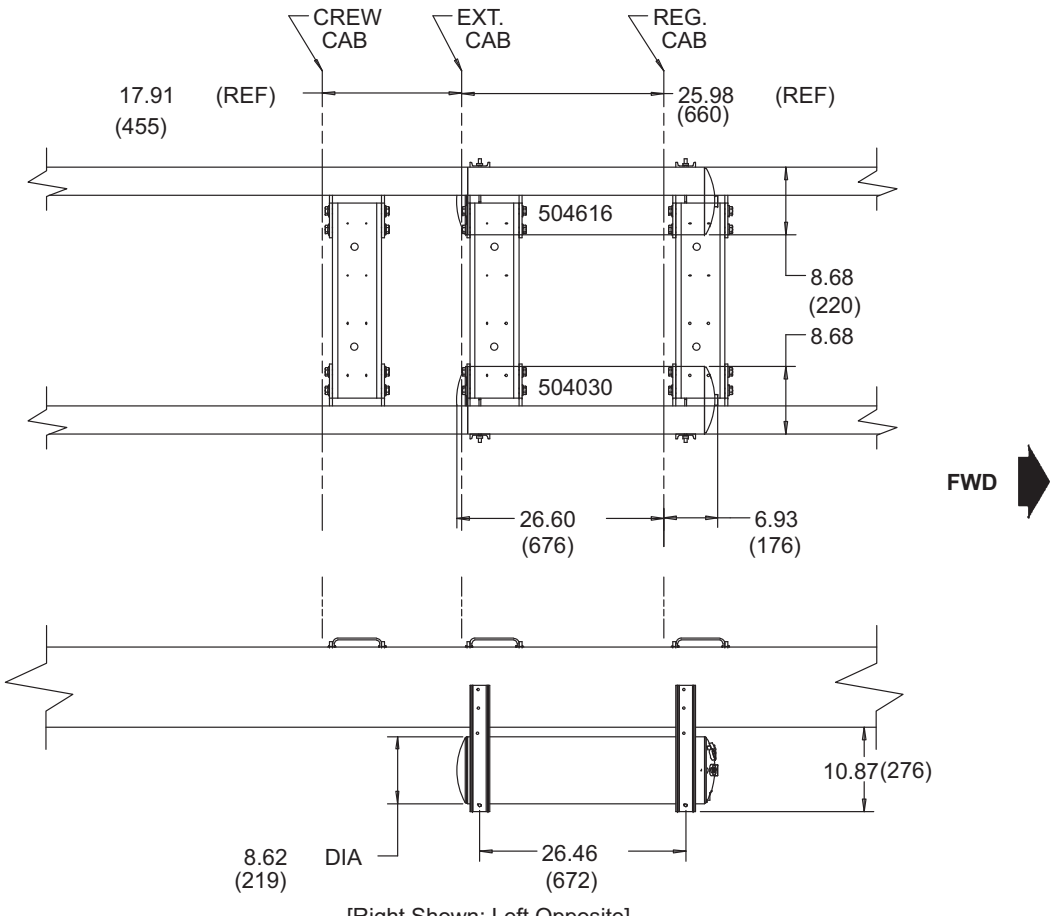



04_0016

## AIR TANK LOCATION (EGR)

### All Models

***With Hydraulic Brakes and Air Effects Right (504030) and Left (504616) Side Mounted***



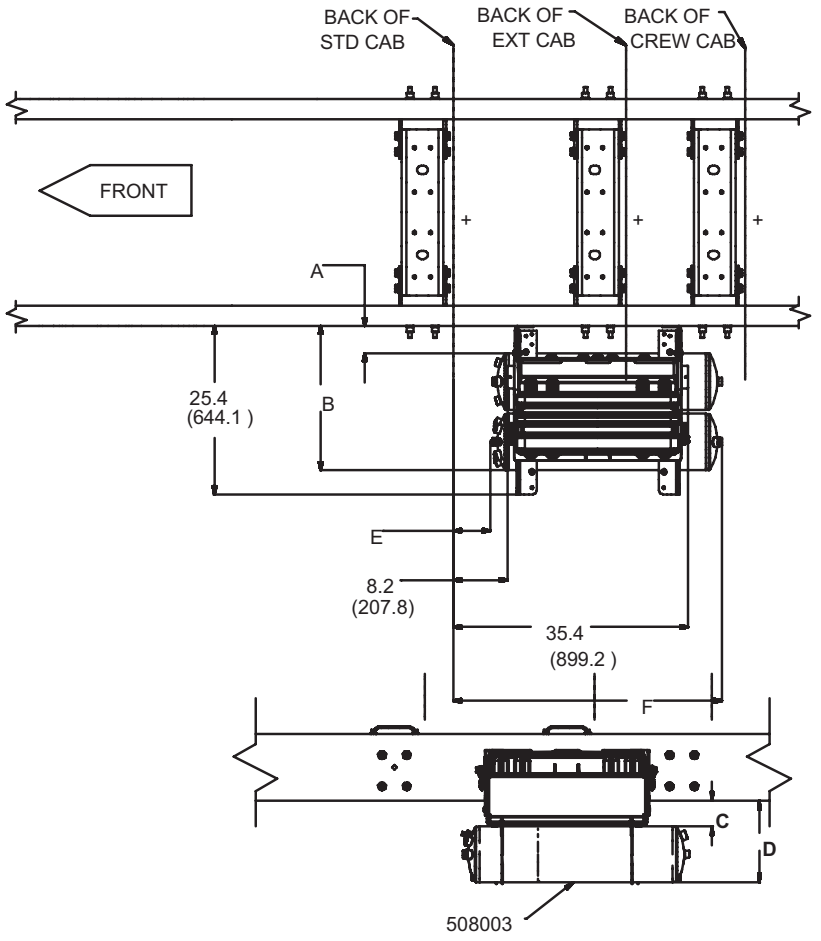

[Right Shown; Left Opposite]

04_0017

## *AIR TANK LOCATION (EGR)*

### *All Models*

***With Air Brakes Left (508003) Side Mounted Under Battery Box, Back of Cab***



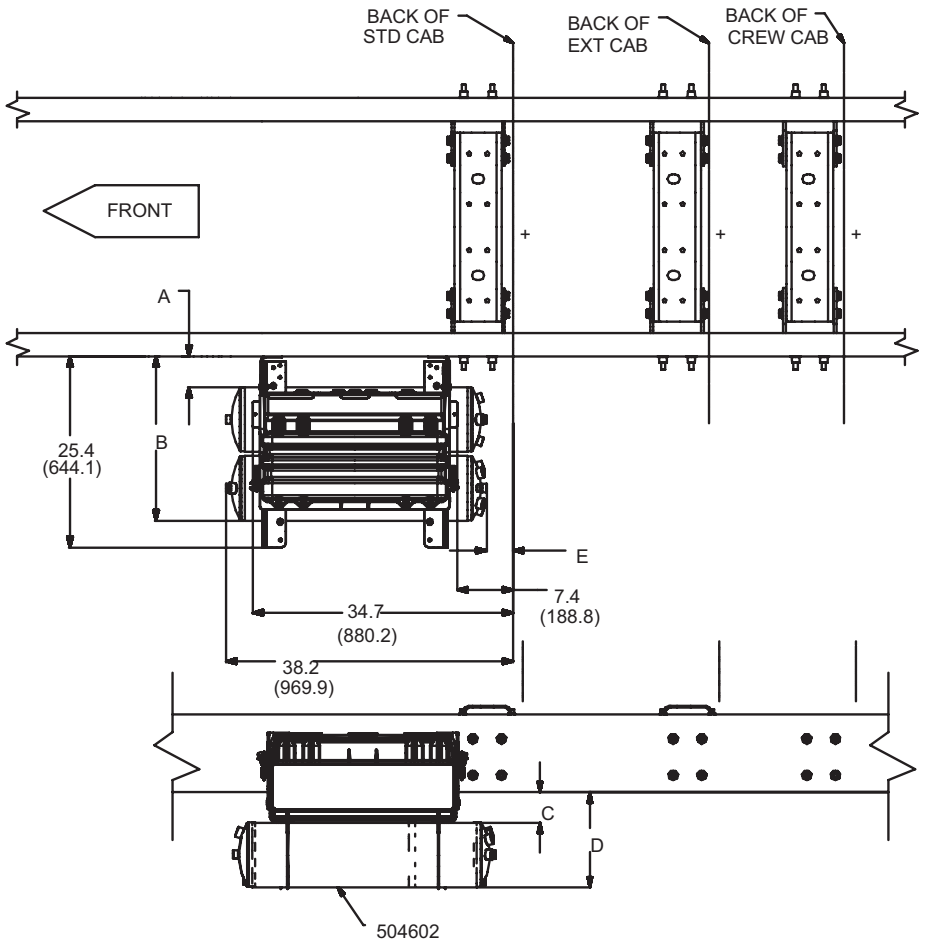

04_0018

| Key | 8.5" Tank | 11" Tank |
|---|---|---|
| | Inch (Millimeter) | |
| A | 4.1 (103.8) | 1.6 (41.7) |
| B | 21.8 (553.7) | 24.2 (614.7) |
| C | 3.8 (96.7) | 23.9 (606.6) |
| D | 12.5 (318.3) | 14.9 (379.2) |
| E | 5.6 (142.3) | 5.4 (137.4) |
| F | 40.5 (1029.3) | 41.3 (1048.3) |

# AIR TANK LOCATION (EGR)

## All Models

### With Air Brakes Left (504602) Side Mounted Under Battery Box, Under Cab



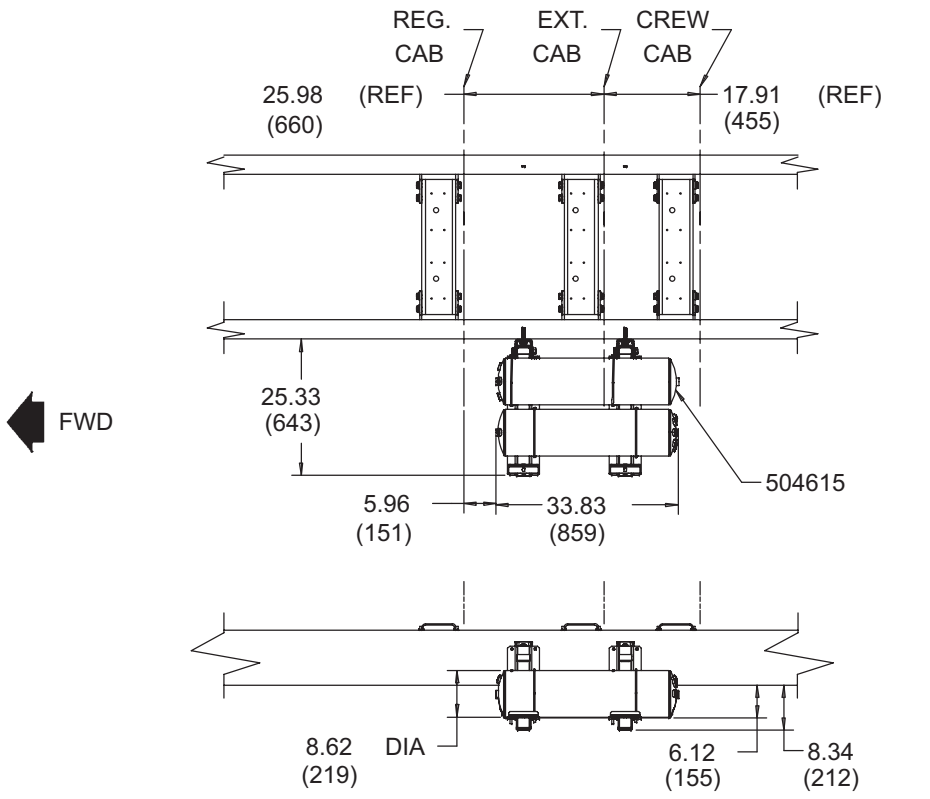

| Key | 8.5" Tank | 11" Tank |
|---|---|---|
| | Inch (Millimeter) | |
| A | 4.1 (103.8) | 1.6 (41.7) |
| B | 21.8 (553.7) | 24.2 (614.7) |
| C | 4.0 (102.4) | 3.8 (96.7) |
| D | 12.5 (318.3) | 14.9 (379.2) |
| E | 3.5 (89.9) | 2.3 (59.0) |

04_0019

## *AIR TANK LOCATION (EGR)*

### *Models LP and 4x2*

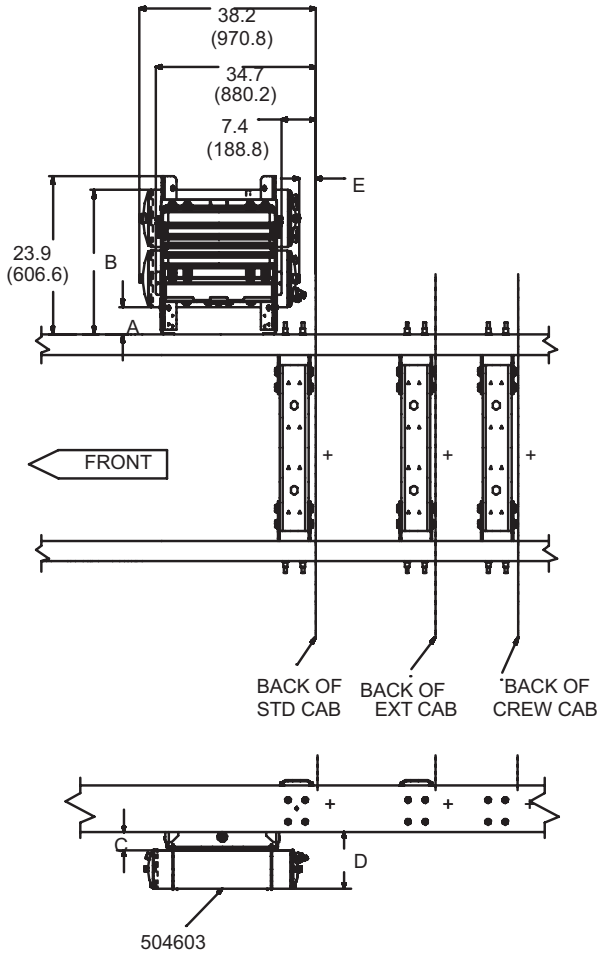
***With Air Brakes Left (504615) Side Mounted, Back of Cab, With 19.5" Diameter Wheels***



# AIR TANK LOCATION (EGR)

## All Models

### With Air Brakes Right (504603) Side Mounted Under Battery Box, Under Cab



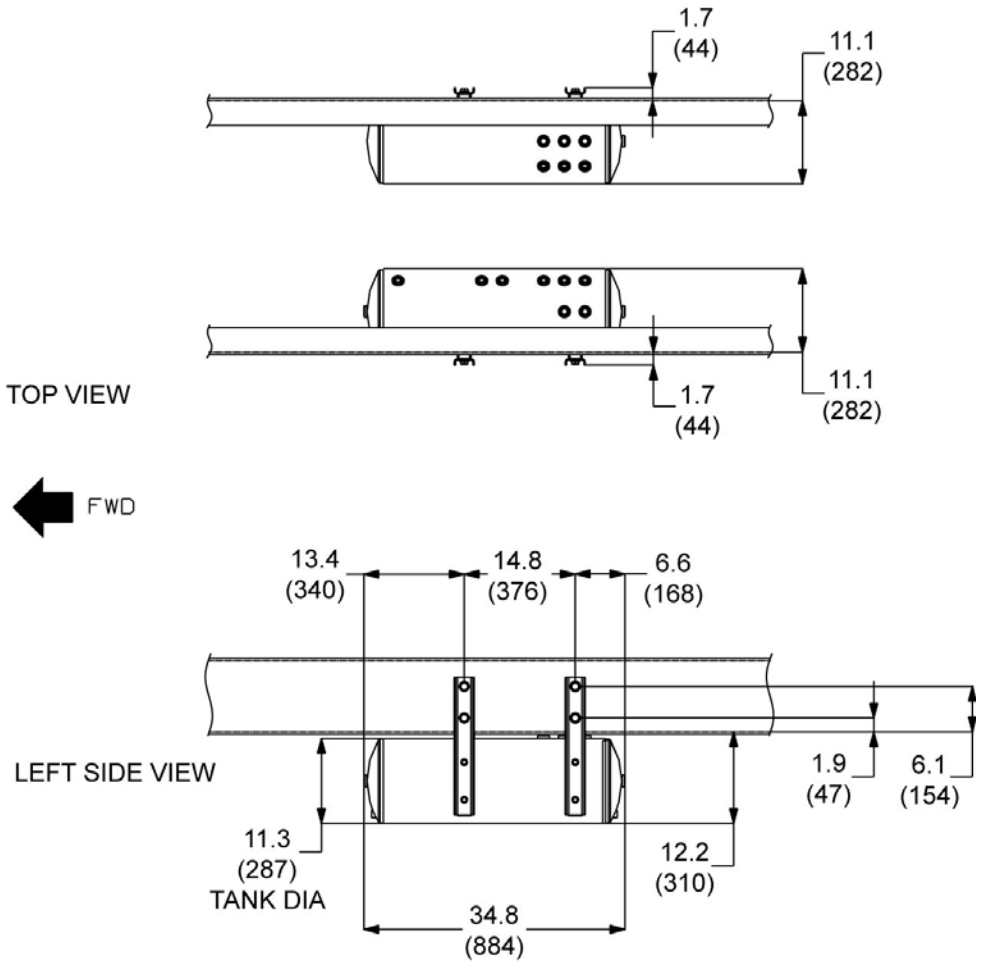

| Key | 8.5" Tank | 11" Tank |
|---|---|---|
| | Inch (Millimeter) | |
| A | 4.1 (103.8) | 1.6 (41.7) |
| B | 21.8 (553.7) | 24.2 (616.7) |
| C | 4.0 (102.4) | 3.8 (96.7) |
| D | 12.5 (318.3) | 14.9 (379.2) |
| E | 3.5 (89.9) | 2.3 (59.0) |

04_0021

## *AIR TANK LOCATION (SCR)*

### *All Models*

***Air Tank Location (04WZJ) with Air Tank Mounting (504090), not with Drain Valve (04WRP)***

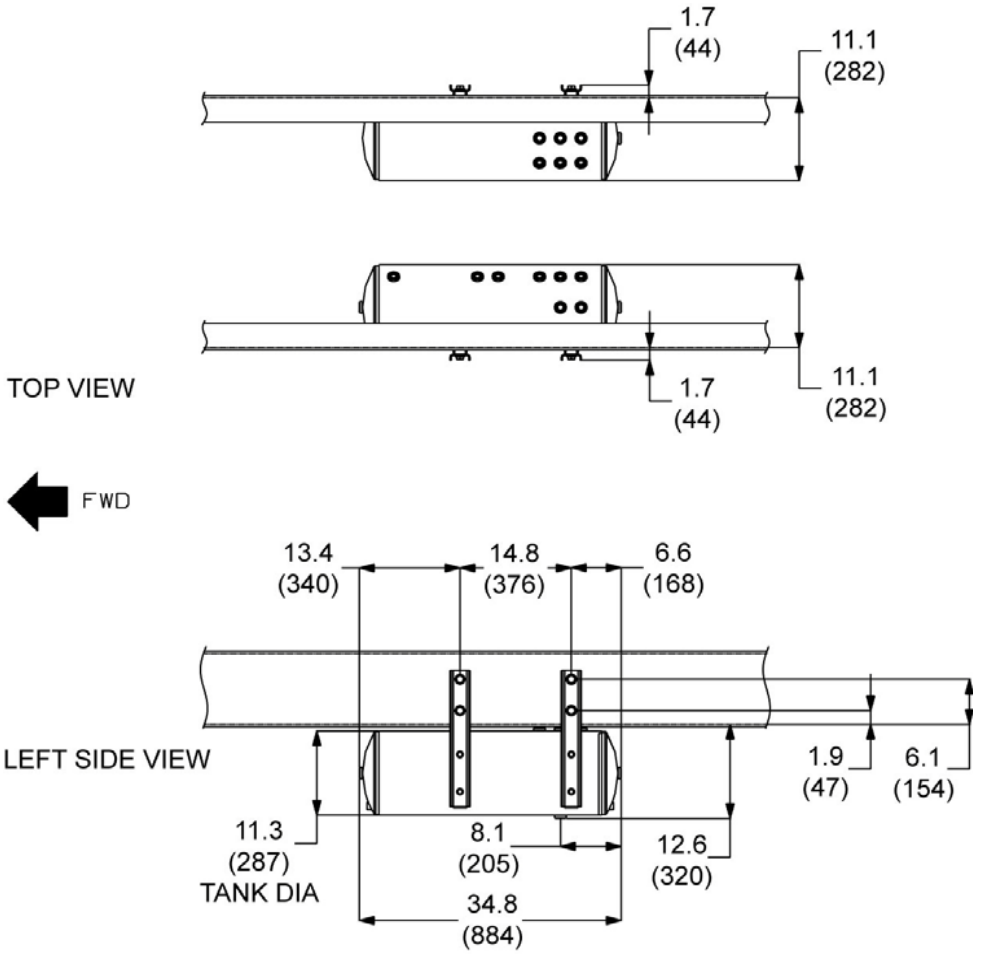



durastar_504090_nw_04wrp

# AIR TANK LOCATION (SCR)

## All Models

***Air Tank Location (04WZJ) with Air Tank Mounting (504090), with Drain Valve (04WRP)***

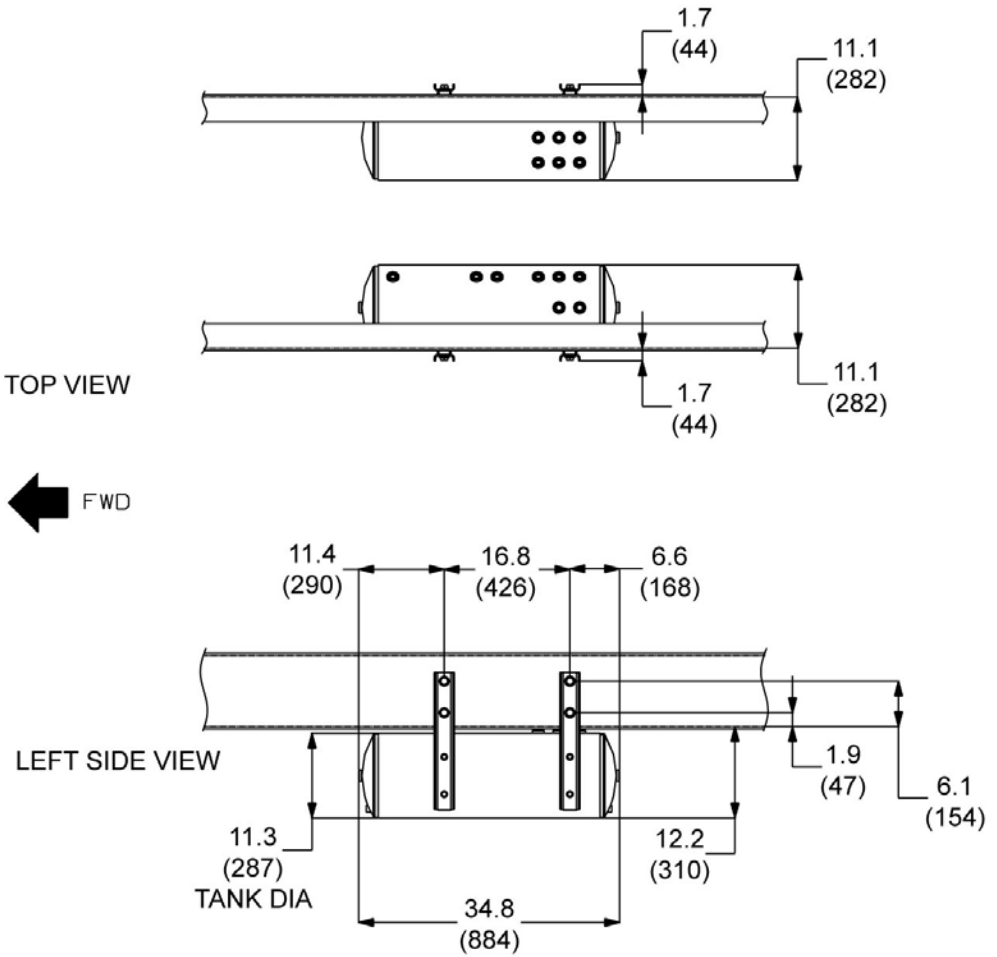



durastar_504090_w_04wrp

## *AIR TANK LOCATION (SCR)*

### *All Models*

***Air Tank Location (04WZJ) with Air Tank Mounting (504091), not with Drain Valve (04WRP)***

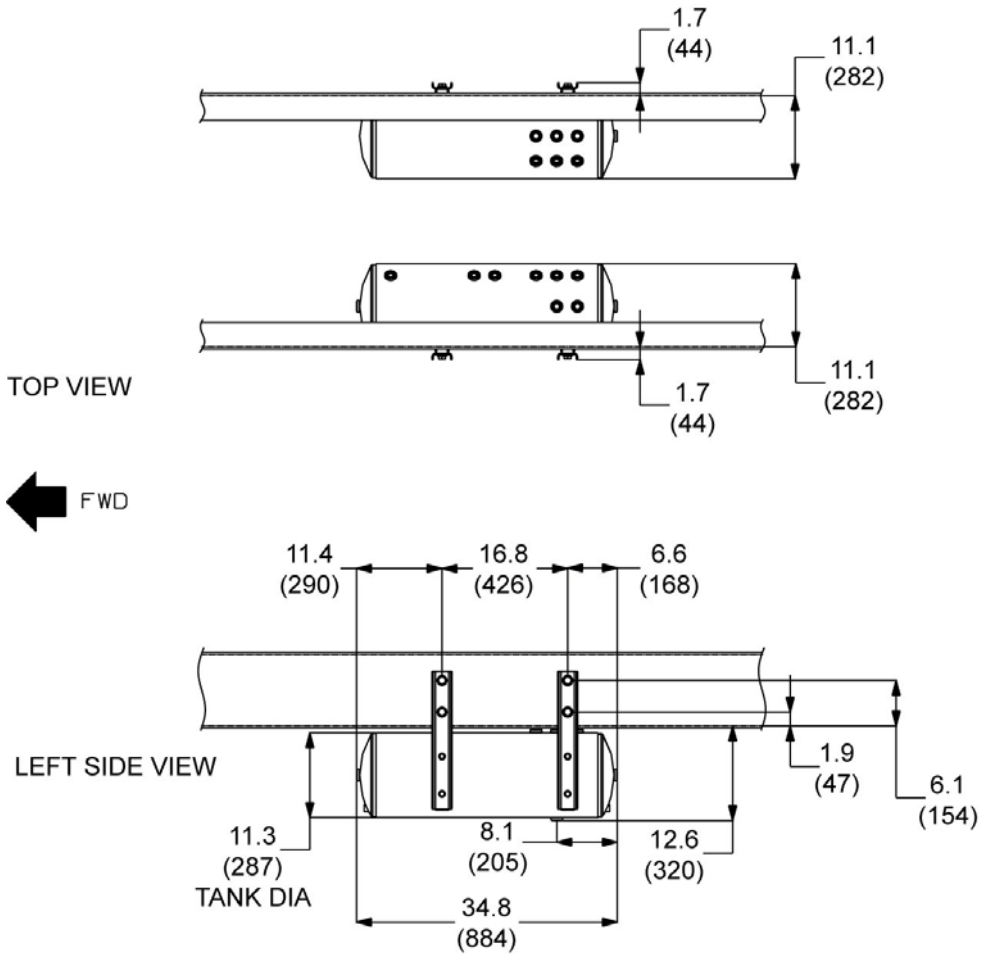



durastar_504091_nw_04wrp

# AIR TANK LOCATION (SCR)

## All Models

### *Air Tank Location (04WZJ) with Air Tank Mounting (504091), with Drain Valve (04WRP)*

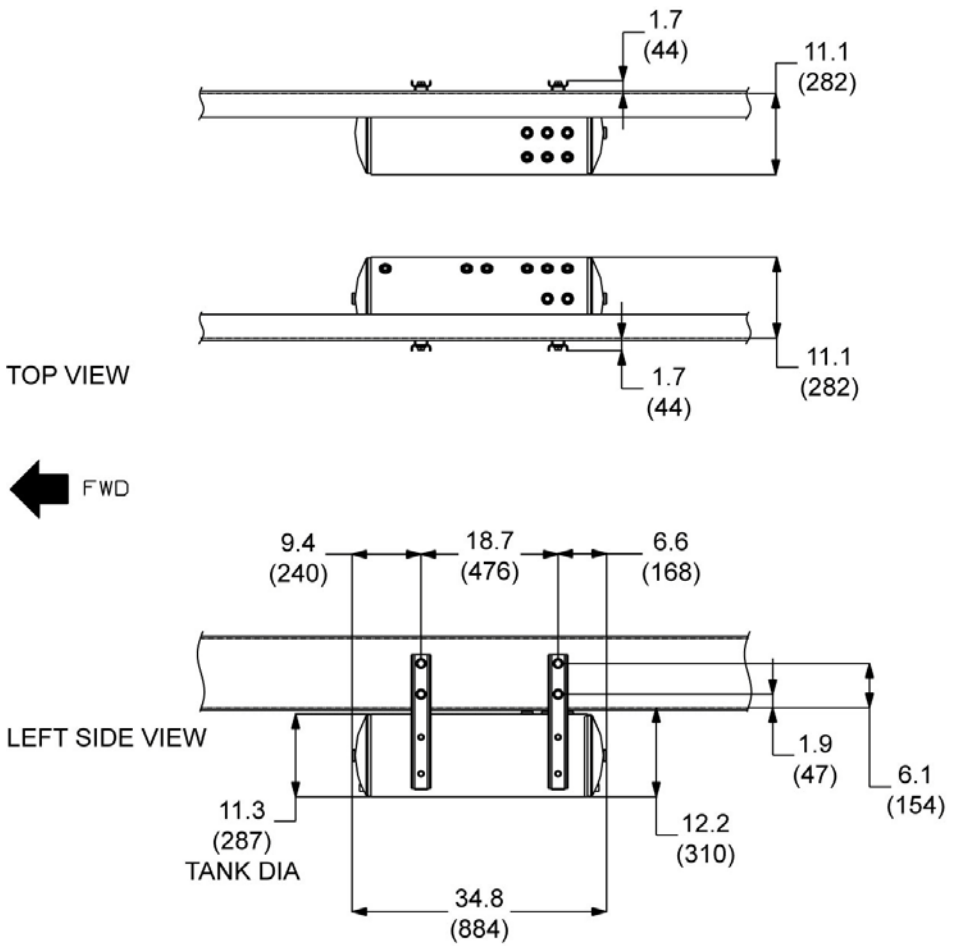



durastar_504091_w_04wrp

## *AIR TANK LOCATION (SCR)*

### *All Models*

***Air Tank Location (04WZJ) with Air Tank Mounting (504092), not with Drain Valve (04WRP)***

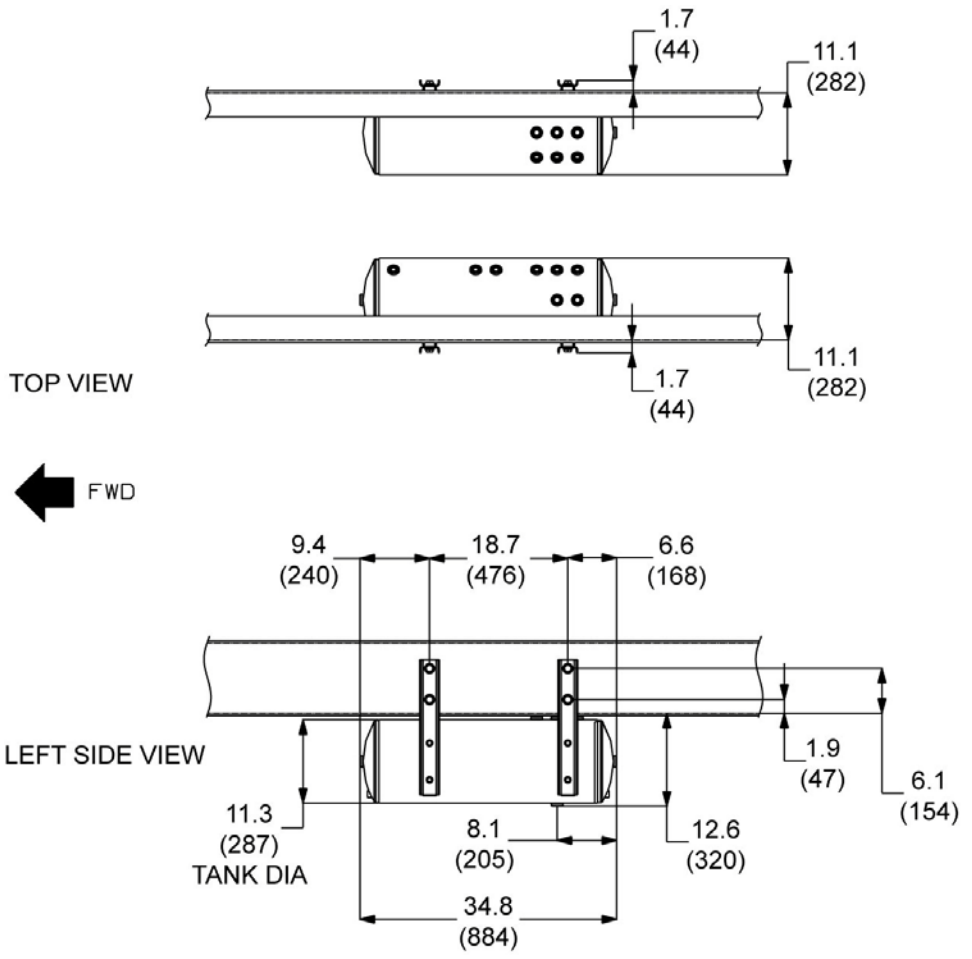



durastar_504092_nw_04wrp

# AIR TANK LOCATION (SCR)

## All Models

### *Air Tank Location (04WZJ) with Air Tank Mounting (504092), with Drain Valve (04WRP)*

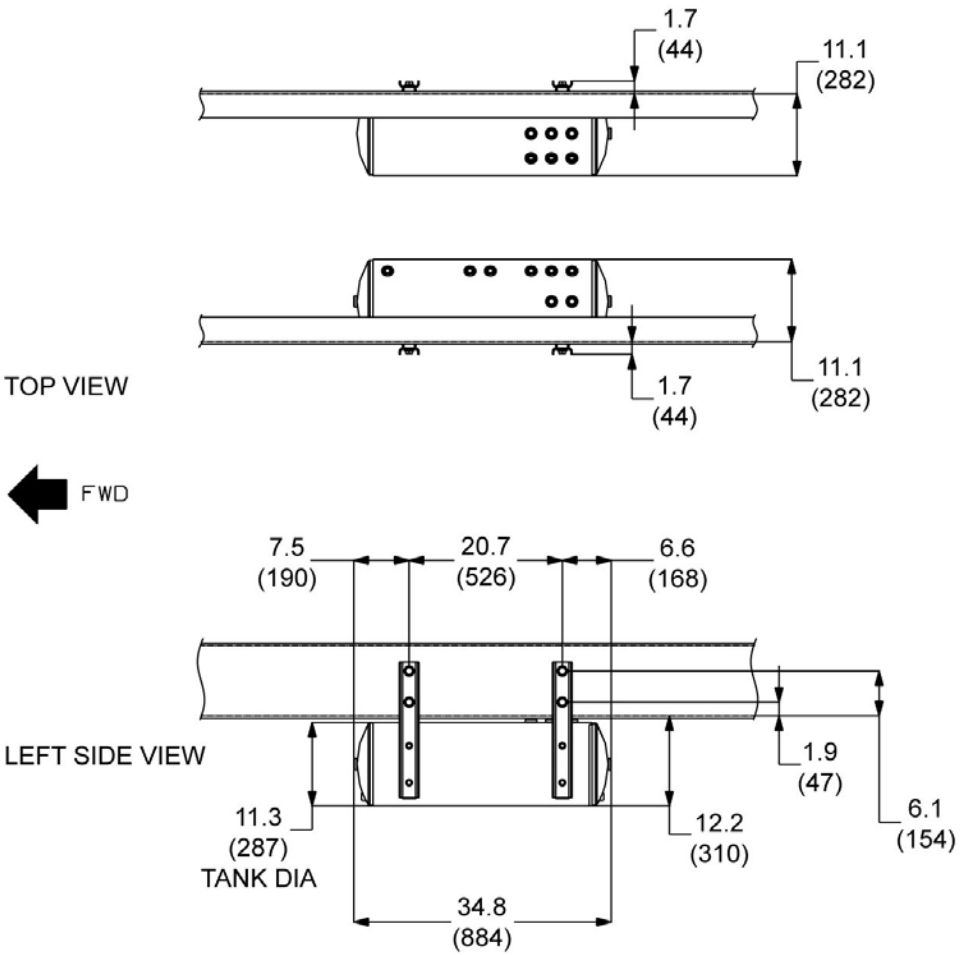



durastar_504092_w_04wrp

## *AIR TANK LOCATION (SCR)*

### *All Models*

***Air Tank Location (04WZJ) with Air Tank Mounting (504093), not with Drain Valve (04WRP)***

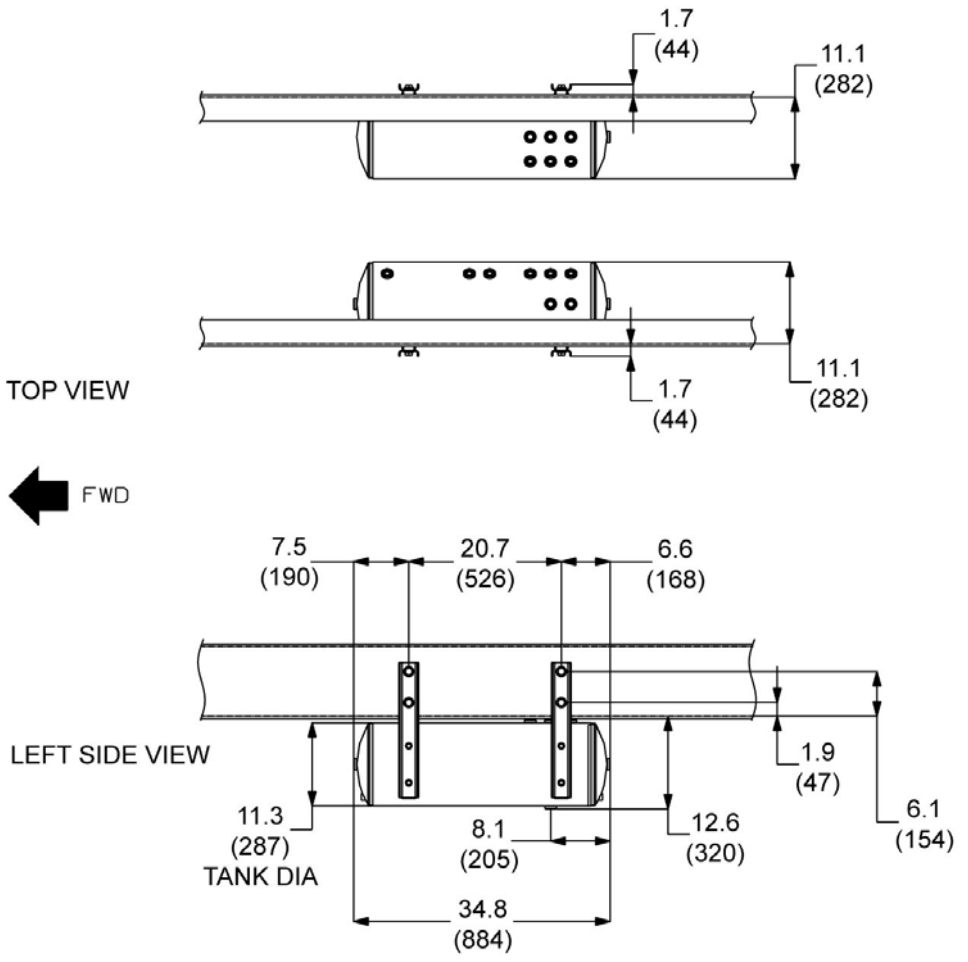



durastar_504093_nw_04wrp

# AIR TANK LOCATION (SCR)

## All Models

### *Air Tank Location (04WZJ) with Air Tank Mounting (504093), with Drain Valve (04WRP)*

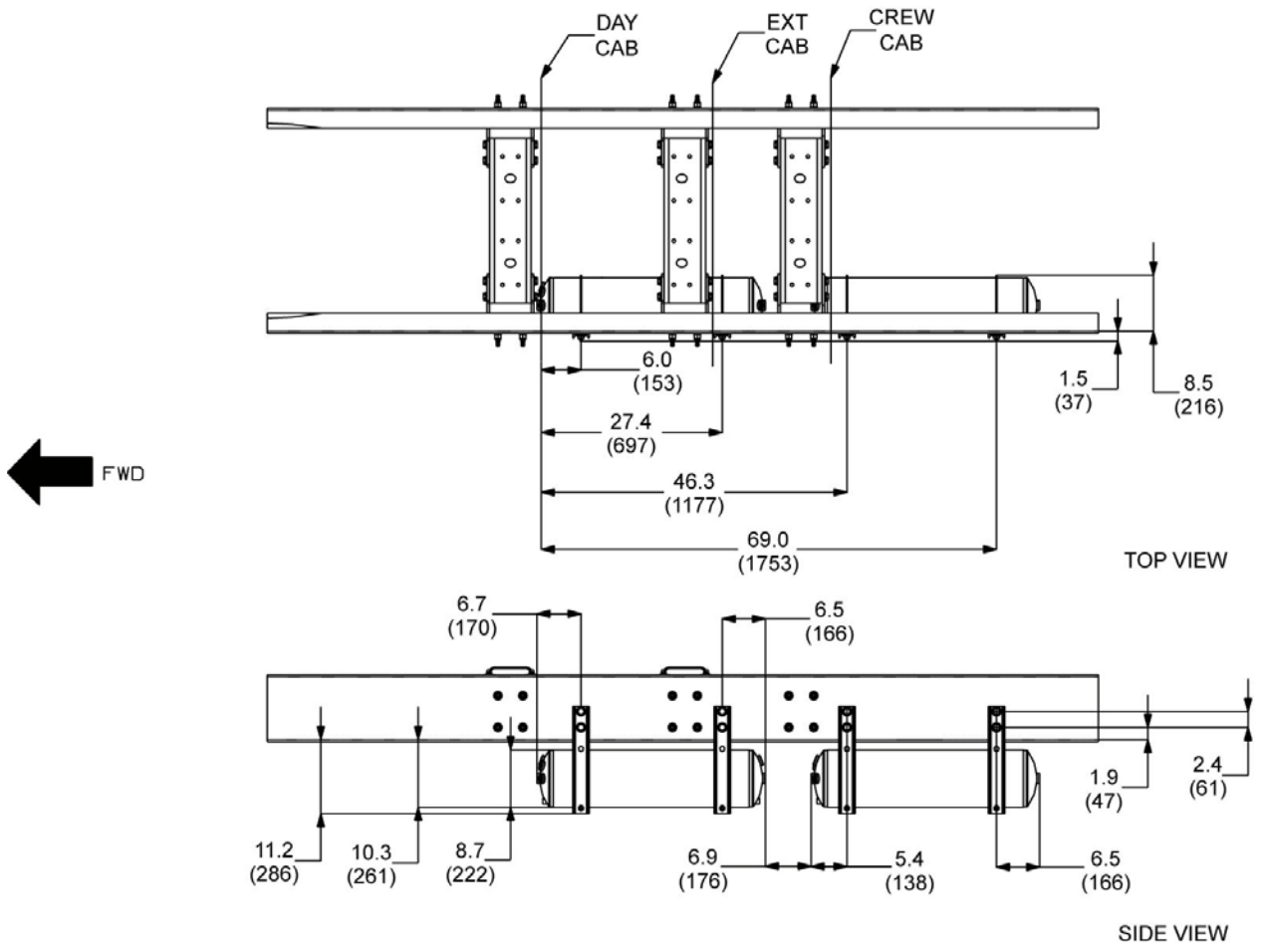



durastar_504093_w_04wrp

## AIR TANK LOCATION (SCR)

### All Models

***Air Tank Location (04VJE with Battery Box 08XDU)***

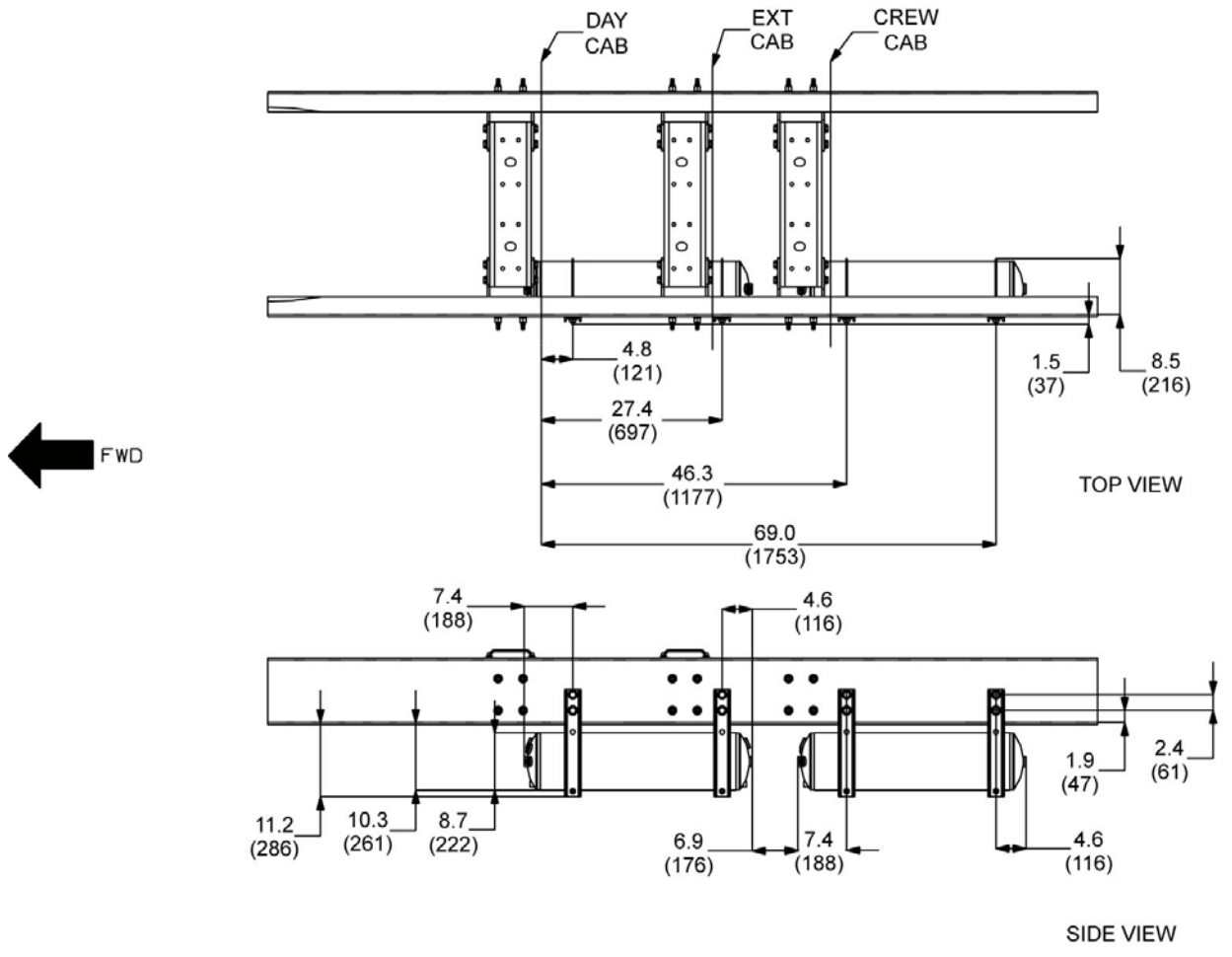



durastar_04vje_with_08xdu

# AIR TANK LOCATION (SCR)

## All Models

### Air Tank Location (04VJE with Battery Boxes 08VUT, 08VUU, or 508004)

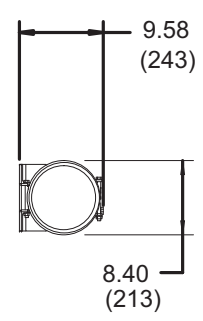



durastar_04vje_with_08vut_08vuu_508004

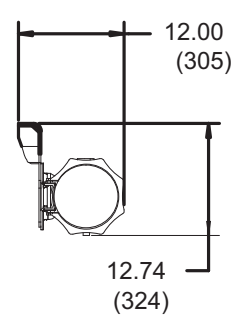
## *AIR DRYER LOCATION*

### *All Models*

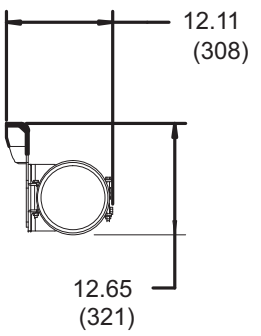
#### ***04EBD, 04EBS, 04EBT***



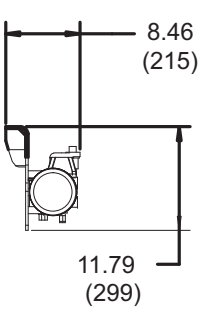

04EBT



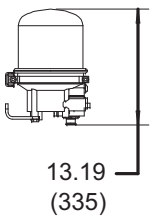

04EBS




04EBT



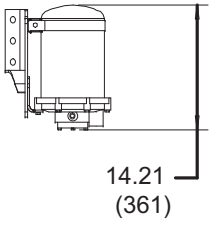

04EBD



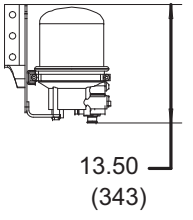

LOCATION CODES

504393
04VBC

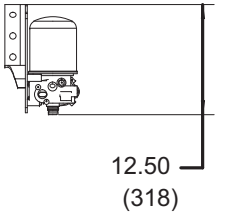
BATTERY BOX MOUNTED




504395
504396




504395
504396




504395
504396

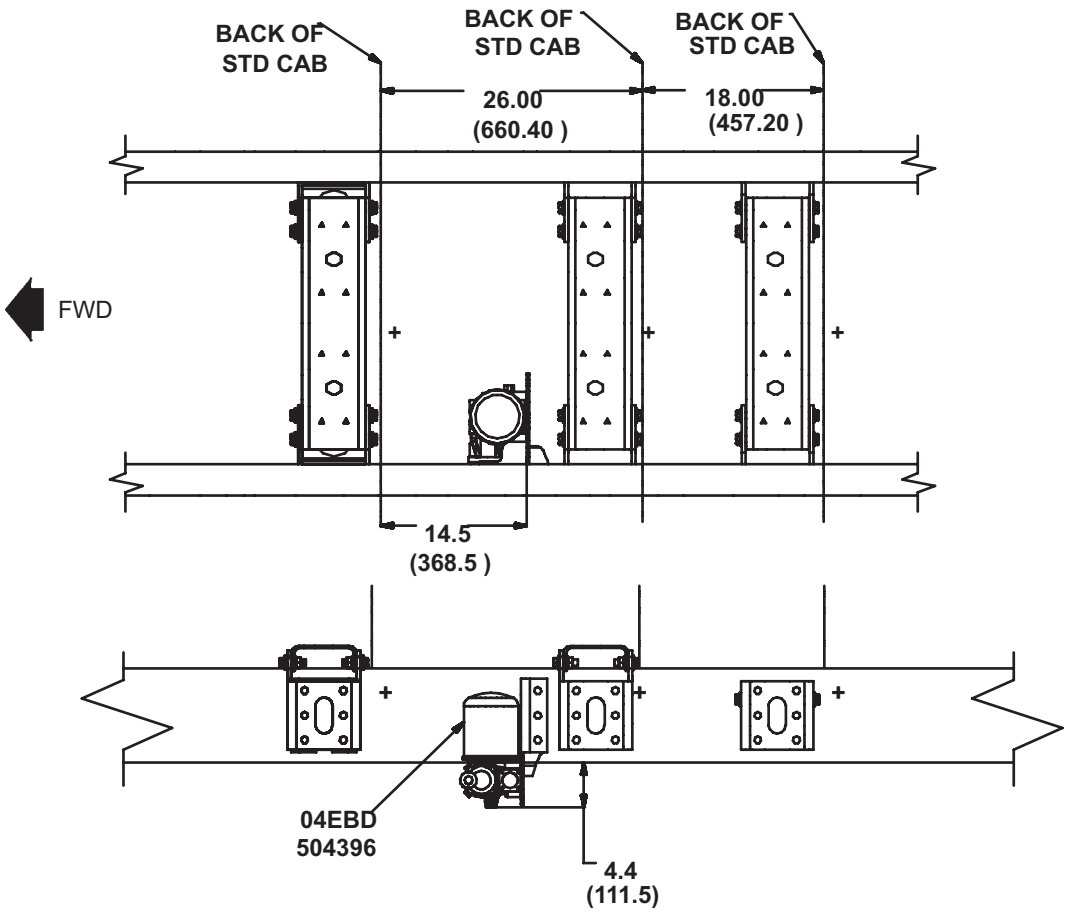
FRAME MOUNTED

04_0022

## AIR DRYER LOCATION

### All Models

***Air Dryer 04EBD with Location 504396; Mounted Left Side Inside Rail, Back of Regular Cab***

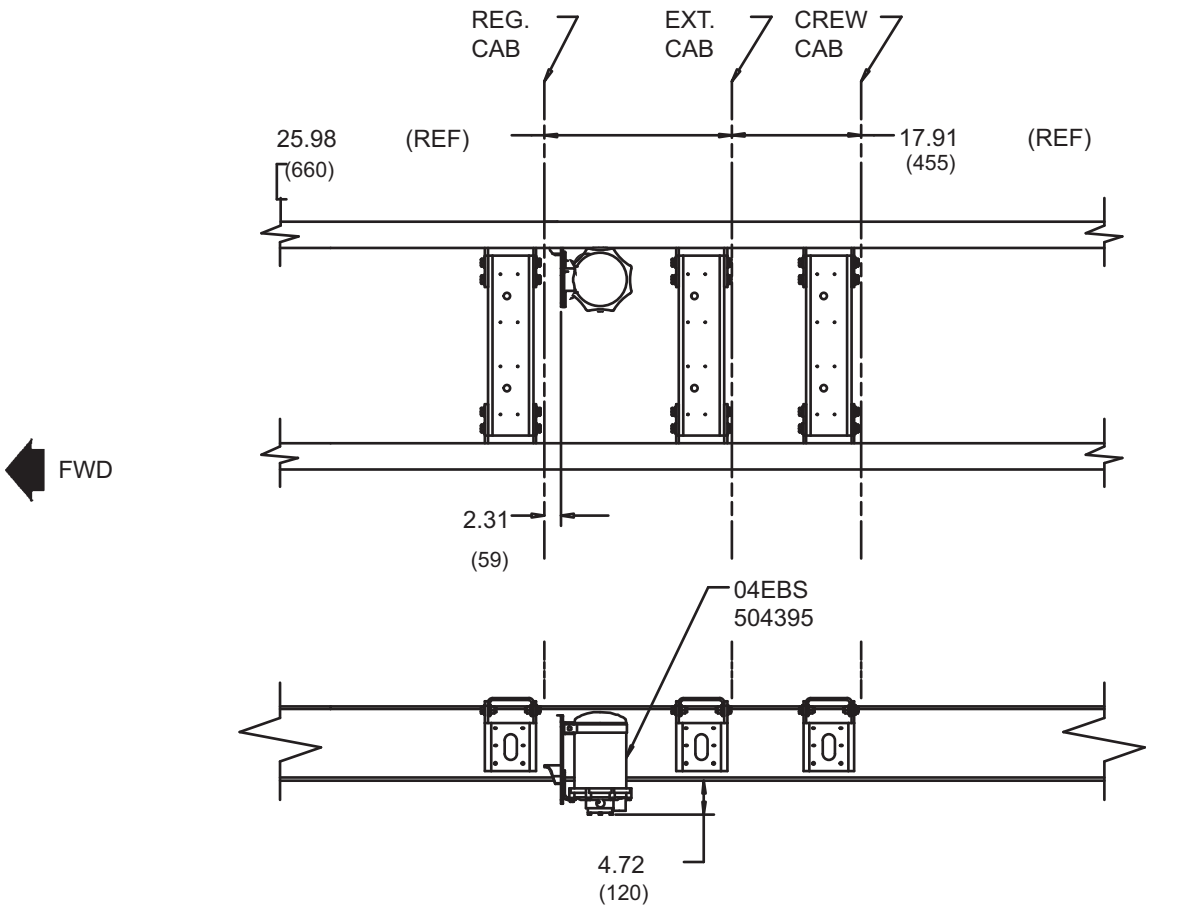



04_0023

## *AIR DRYER LOCATION*

### *All Models*

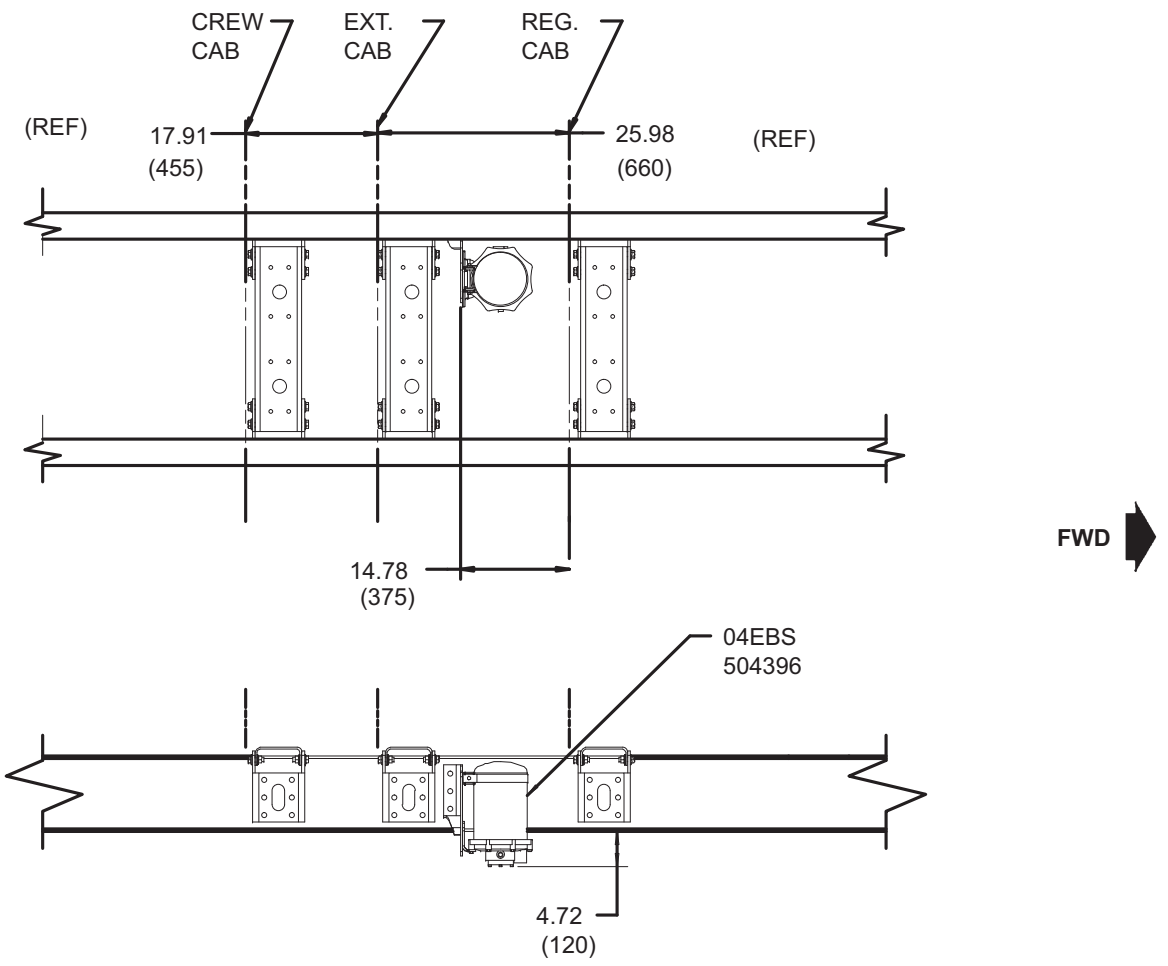
***Air Dryer 04EBS with Location 504395; Mounted Right Side Inside Rail, Back of Standard Cab***



## AIR DRYER LOCATION

### All Models

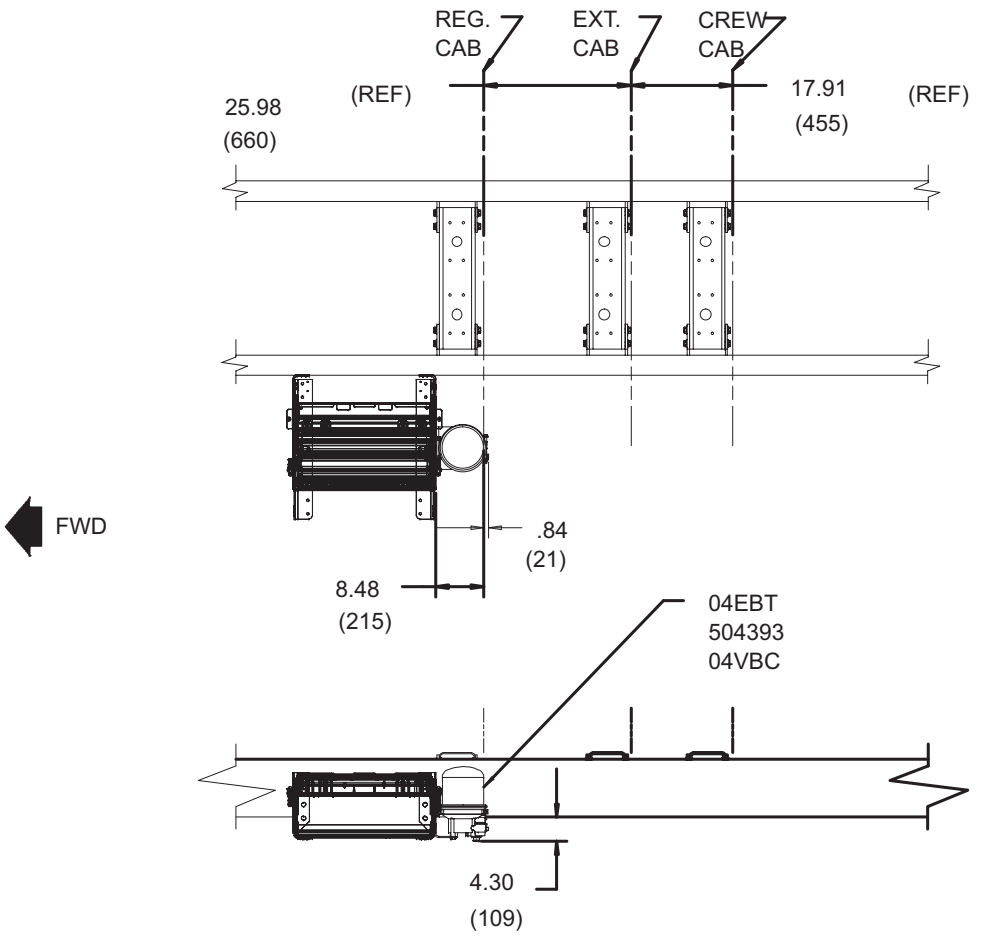
***Air Dryer 04EBS with Location 504396; Mounted Left Side Inside Rail, Back of Standard Cab***




04_0025

## All Models

### Air Dryer 04EBT with Locations 04VBC or 504393; Mounted Left Side, Back of Battery Box, Under Cab




04_0026

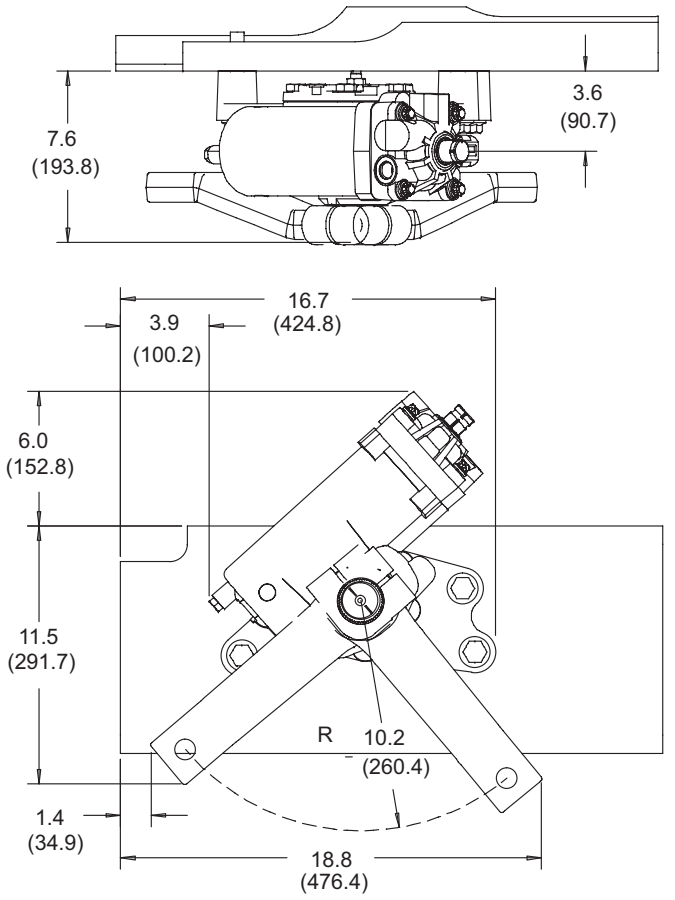
A NAVISTAR COMPANY

# STEERING

## *STEERING GEAR LOCATION/DIMENSIONS*

### *Models 4300 4x2 and LP*

***Code 05PRG***

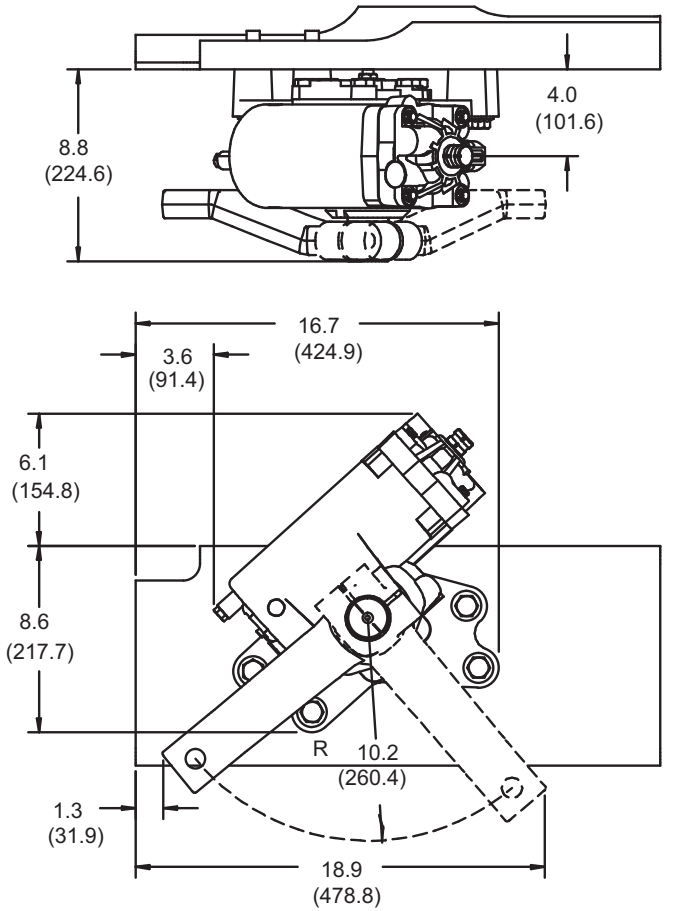



05_0006

## *STEERING GEAR LOCATION/DIMENSIONS*

### *Model 4300*

***Code 05PRR***

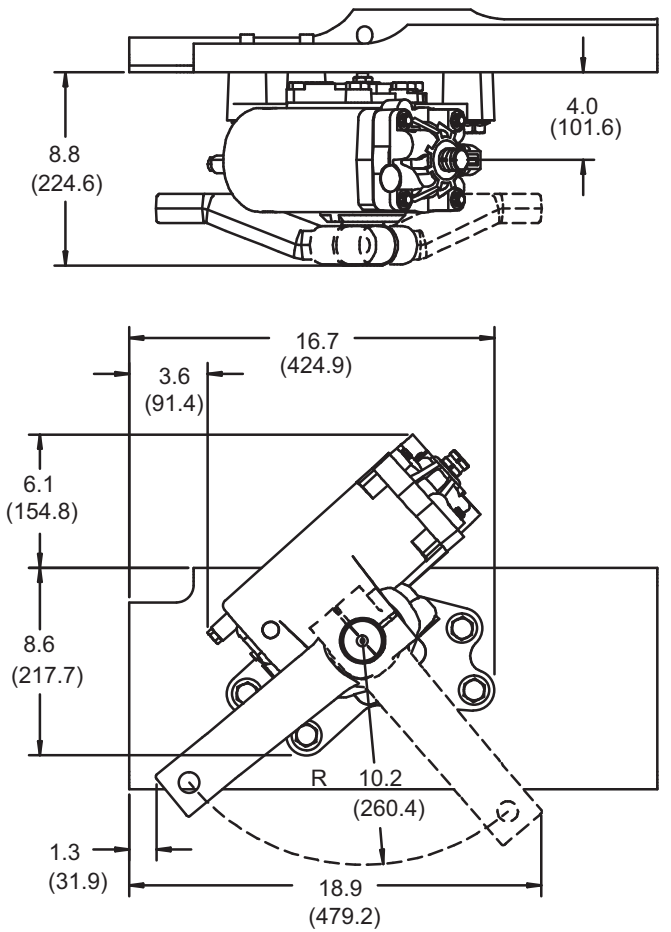



05_0007

## *STEERING GEAR LOCATION/DIMENSIONS*

### *All Models*

***Code 05PSA***

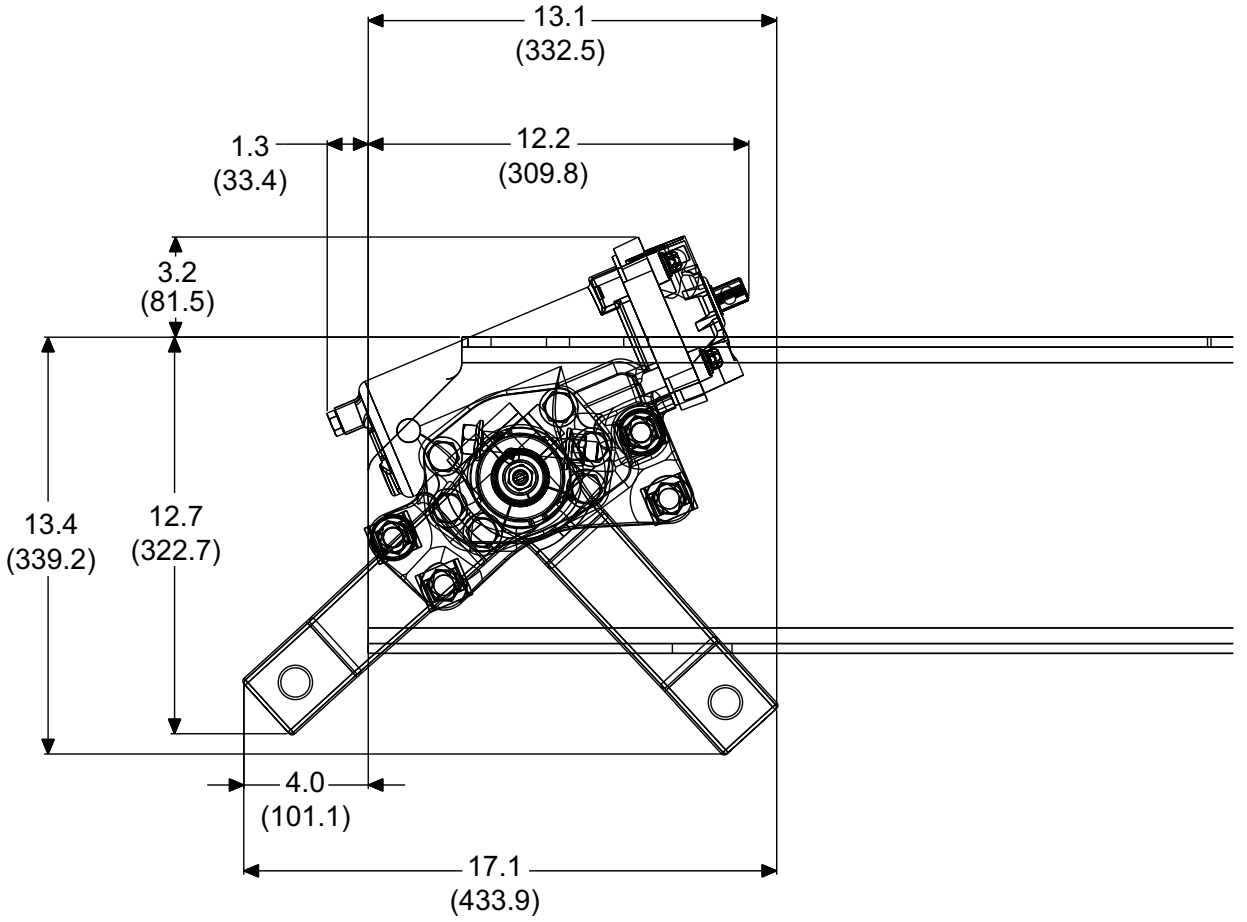



05_0008

## *STEERING GEAR LOCATION/DIMENSIONS*

### *Models 4400 4x2 and LP*

***Code 05PRU***

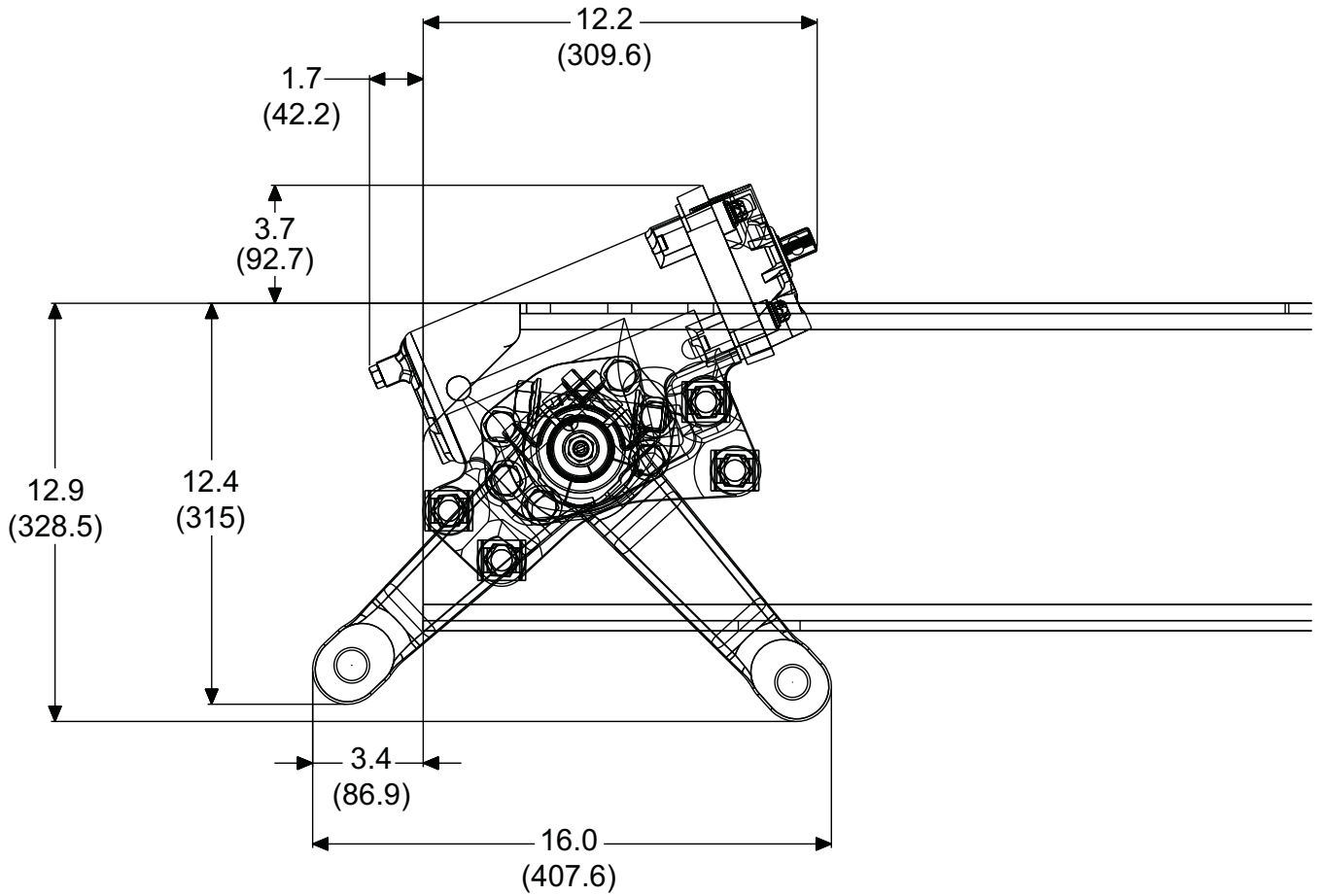



05PRU

## *STEERING GEAR LOCATION/DIMENSIONS*

### *Models 4300 and 4400*

***Code 05PRV***

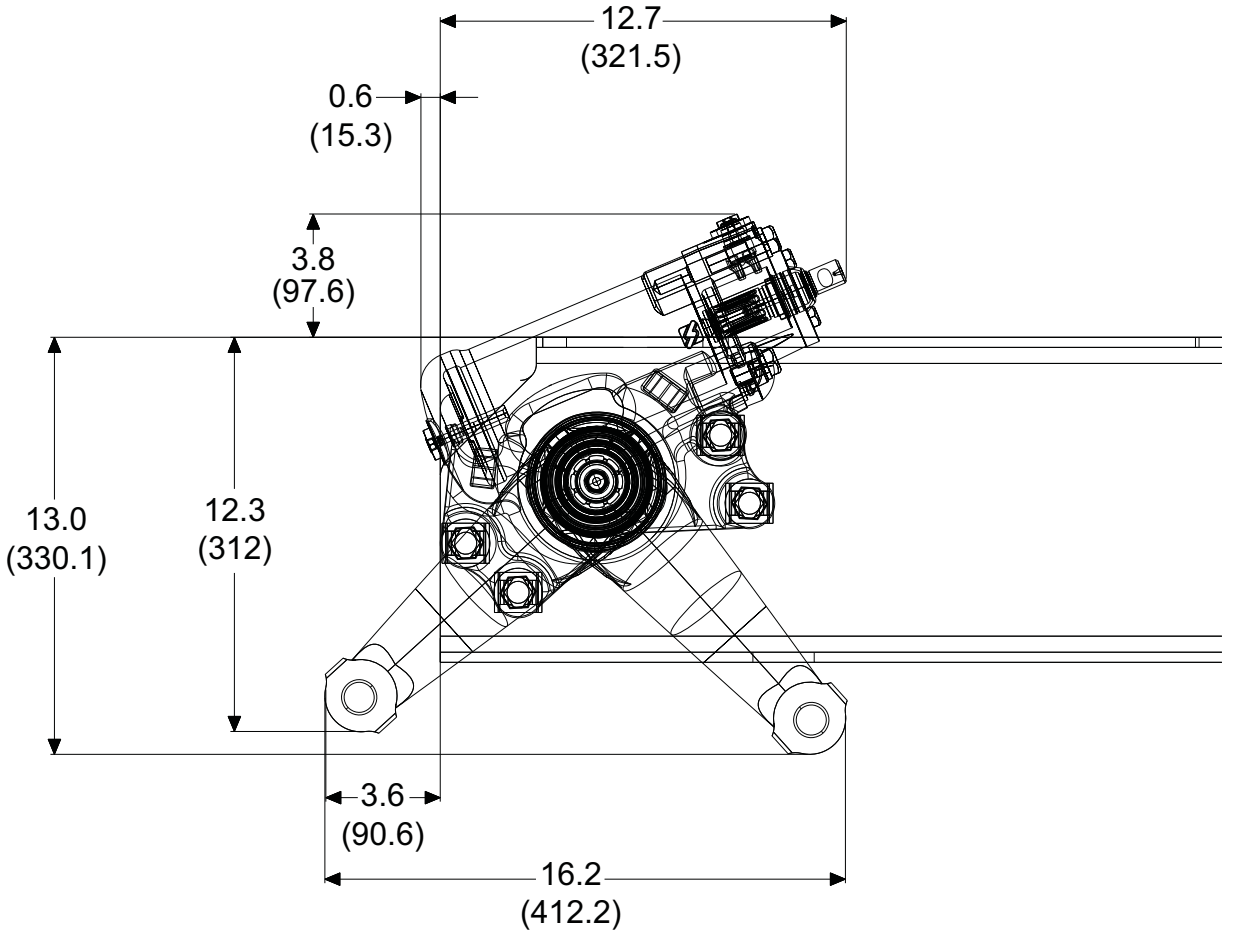



05PRV

## *STEERING GEAR LOCATION/DIMENSIONS*

### *Models 4300 and 4400*

***Code 05PSM***




05PSM

# EXHAUST SYSTEM (EGR)

## *GUIDELINES FOR AFTERTREATMENT MODIFICATIONS*

### *All Models*

Navistar, Inc. has a responsibility to supply, install and ensure that the engines and aftertreatment emission control devices comply with the certification requirements of the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (ARB). The aftertreatment devices may include a combination of particulate filters, catalysts, catalytic converter, and temperature and pressure sensors, along with other components.

Proper long-term operation of these components requires controlling exhaust stream temperatures and the exhaust flow pattern throughout the system. This controls the required location of the components as well as the insulation of the various parts of the system.

For this reason, application guidelines for aftertreatment and tailpipe installations are much more complex and restrictive than in the past. Navistar, Inc. will ensure correct factory installation of aftertreatment devices to assure compliance with the certification requirements.

Modified systems could damage the engine, aftertreatment system and other truck systems and void the warranty coverage. In that regard, Navistar, Inc. will make it a policy to procure and correctly install the appropriate aftertreatment devices pursuant to applicable specifications and application guidelines. That brings with it the benefit of certified systems that will be fully covered under warranty provided the vehicle is properly maintained and not modified beyond the extent allowed by the Body Builder book.

The following guidelines are meant to clarify the allowable modifications for aftertreatment systems installed on US 2010 EPA compliant vehicles. Please consult applicable federal, state and local laws and requirements in conjunction with this document to ensure compliance to those requirements. Also, refer to applicable vehicle warranty information before performing any modifications to the vehicle. Non-compliance to the requirements of the warranty may nullify it in its entirety.

- Where possible, trucks first and foremost should be ordered directly from the factory that meets the body installation requirements so that the minimum, or no modification of the exhaust system will be required.
- Where this is not possible, if another exhaust configuration is available from the factory that closer meets the need of the body installation, it is permissible to completely replace one exhaust configuration with the better choice exhaust system provided that would have been available with the same engine, and the clearance guidelines in this reference are followed.
- Exhaust Gas Temperatures may be as high as 800$^{o}$ C during vehicle operation. Precautions should be taken to ensure that materials used in the vicinity of the exhaust system and exhaust gas stream can withstand these temperatures or are safely shielded.

## MEETING LEGAL REQUIREMENTS

**It is the responsibility of the person performing modifications to the vehicle to ensure that the vehicle, in its final configuration, conforms to any applicable law regarding emission control, noise level and applicable safety standards.**

### TURBO PIPE

*The function of the Turbo Pipe is to deliver exhaust gases from the engine to the Aftertreatment Module so that temperature losses are minimized and so that the flow pattern of the exhaust gases maximizes the efficiency of the Aftertreatment Module. In addition for 2010, the I6 turbo pipe includes a Pre-Diesel Oxidation Catalyst (PDOC). This functions to increase heat in the turbo pipe to the Diesel Oxidation Catalyst (DOC) and must remain as installed from the factory. Any modifications to this piping without written approval of Navistar, Inc. may significantly reduce the performance of the Aftertreatment Module and VOID any applicable warranty.*

All Modifications to Turbo Pipe Location, Geometry and Materials MUST be approved by Navistar, Inc.

If so equipped, heat shields and protective wraps must be maintained on the vehicle to ensure the proper performance of the Aftertreatment Module and for the protection of the installed truck systems.

Never mount any additional harnesses or other equipment to the Aftertreatment Module.

### AFTERTREATMENT MODULE

*The function of the Aftertreatment Module is to catch soot exhausted from the engine and convert it to ash. It is critical that the temperature and pressure sensors' wiring remain intact for the Aftertreatment Module to perform as designed. It is critical to maintain the location of the Aftertreatment Module as installed from the factory to ensure its proper operation. Any modifications to the Aftertreatment Module without the written approval of Navistar, Inc. may significantly reduce the performance of the Aftertreatment Module and VOID any applicable warranty.*

All Modifications to Aftertreatment Module Location, Geometry, Materials, Wiring, Sensors or Tubing MUST be approved by Navistar, Inc.

If so equipped, heat shields and protective wraps must be maintained on the vehicle to ensure the proper performance of the Aftertreatment Module and for the protection of the installed truck systems.

Never mount any additional harnesses or other equipment to the Aftertreatment Module.

## TEMPERATURE CONTROL DEVICE

*The function of the Temperature Control Device (if so equipped) is to reduce the exit exhaust gas temperature emitted from the Aftertreatment Device. This device has been specifically designed to draw in cooler air to mix with the hotter exhaust gases. It is critical that the openings in the device that draw in cooler air remain unblocked of debris or other equipment. This device is critical to ensure that the emitted temperatures of the exhaust are minimized. Any modifications to the Temperature Control Device without the written approval of Navistar, Inc. may significantly reduce the efficiency of the Temperature Control Device and significantly increase the emitted gas temperatures, and VOID any applicable warranty.*

If so equipped, any installed Temperature Control Device MUST remain as part of the exhaust piping.

Changes to the location of the Temperature Control Device relative to the Aftertreatment Module must meet federal emissions, noise and safety requirements. The responsibility for demonstrating that legal requirements are met when modifications have been made belongs to the modifier of the system.

IF CHANGING THE LOCATION, SPECIAL ATTENTION MUST BE GIVEN TO MAINTAINING CLEARANCES AROUND THE EXHAUST PIPING, AS WELL AS MAINTAINING THE STRUCTURAL INTEGRITY AND EXHAUST BACKPRESSURE OF THE SYSTEM. TABLES INCLUDED IN THIS DOCUMENT PROVIDE RECOMMENDED CLEARANCES AND BACK PRESSURE ESTIMATION PROCEDURES.

## EXHAUST PIPING MODIFICATIONS

Never modify the internal structure of the Turbo Pipe, Aftertreatment Module or the Temprature Control Device.

When lengthening or shortening tailpipes beyond the Aftertreatment Module, observe the following precautions:

1. Use the same size and material to extend or shorten the original pipe.
    - *Refer to* Table 3.1 *for proper material and sizing of pipes when extending or shortening tailpipe sections.*
2. Adding additional extensions and bends will change internal exhaust gas pressure, which could result in damage to the Aftertreatment Module or other engine components as well as a reduction in fuel economy.
    - *Use the worksheets provided to compute the change in backpressure of the modified exhaust piping. Ensure that the limits within the worksheet are met to avoid performance issues and to maintain warranty of the engine and aftertreatment system.*
3. Support additional piping using rubber mounts approved by International Truck and Engine Corporation (P/N 3533072C1 Isolator and P/N 3561980C1 Metal Sleeve). Add one additional support for every 4 linear feet of exhaust piping added, evenly spaced along the length of the chassis.

The exhaust piping should be routed so that the Temperature Control Device, if so equipped, is at the end of the exhaust pipe and oriented in the same manner as received from the factory.

Route all piping with minimum clearances to other chassis components as shown in Table 3.2.

MOUNTING OF BODY EQUIPMENT

In comparison to vehicles produced prior to 2007, exhaust components surface temperatures and exhaust gas temperatures will typically be higher.

As a result of the increased temperatures, clearances to exhaust components will need to be increased compared to pre 2007 model year clearances.

Typical installation clearances used for pre 2007 model year engines and exhaust systems should be increased by 40% to ensure that body equipment is not damaged by the increased heat of these systems.

Do not mount any Body Equipment within 8 inches (200mm) of the exhaust pipe outlet to avoid damage from hot exhaust gases.

When modifying other chassis systems, maintain clearances shown in Table 3.2.

| MaxxForce® DT/9 | |
|---|---|
| Pipe Material | 409 Stainless Steel |
| Pipe Diameter | 4” |
| Wall Thickness | 0.065” |

| Component | Minimum Clearance, mm (in) |
|---|---|
| Electric Harness | 150 (6.0) |
| Electric Harness (w. heat guard) | 100 (4.0) |
| Mechanical Cable | 50 (2.0) |
| Fuel Tube, metal | 150 (6.0) |
| Fuel Tube, rubber or plastic | 150 (6.0) |
| Brake Tube, metal | 100 (4.0) |
| Brake Tube, rubber or plastic | 100 (4.0) |
| Tire | 100 (4.0) |
| Fuel Tank | 100 (4.0) |

## *ALLOWABLE BACKPRESSURE TAILPIPE MODIFICATION WORKSHEET*

**Engine:** **MaxxForce® DT**

**Exhaust Configuration:** **Horizontal - Horizontal**

| | | | | | |
|---|---|---|---|---|---|
| **A** | Qty of 90× elbows added | ____ | **X** | **0.10 =** | _____ |
| **B** | Qty of 60× elbows added | ____ | **X** | **0.08 =** | _____ |
| **C** | Qty of 45× elbows added | ____ | **X** | **0.07 =** | _____ |
| **D** | Qty of 30× elbows added | ____ | **X** | **0.06 =** | _____ |
| **E** | Feet of straight pipe added | ____ | **X** | **0.02 =** | _____ |
| **F** | Temperature Control Device Pressure | | | | **0.60** |
| **G** | Pipe Exit Pressure | | | | **0.28** |

Total Modification Backpressure (Add a-g) _____

Allowable Backpressure Limit **5.7**

Is allowable Backpressure Limit **GREATER** than Total Modification Backpressure?

If **YES**, Modifications **MEET** Engine Manufacturer's Guidelines and **CAN** be performed.

If **NO**, Modifications will **NOT MEET** Engine Manufacturer's Guidelines and **CANNOT** be performed.

## *Allowable Backpressure Tailpipe Modification Worksheet*

**Engine:** **MaxxForce® DT**

**Exhaust Configuration:** **Under Cab - Vertical**

| | | | | | |
|---|---|---|---|---|---|
| **A** | Qty of 90× elbows added | _____ | **x** | **0.10 =** | _____ |
| **B** | Qty of 60× elbows added | _____ | **x** | **0.08 =** | _____ |
| **C** | Qty of 45× elbows added | _____ | **x** | **0.07 =** | _____ |
| **D** | Qty of 30× elbows added | _____ | **x** | **0.06 =** | _____ |
| **E** | Feet of straight pipe added | _____ | **x** | **0.02 =** | _____ |
| **F** | Temperature Control Device Pressure | | | | **.60** |
| **G** | Pipe Exit Pressure | | | | **0.28** |

Total Modification Backpressure (Add a-g) _____

Allowable Backpressure Limit **5.2**

Is allowable Backpressure Limit **GREATER** than Total Modification Backpressure?

If **YES**, Modifications **MEET** Engine Manufacturer's Guidelines and **CAN** be performed.

If **NO**, Modifications will **NOT MEET** Engine Manufacturer's Guidelines and **CANNOT** be performed.

## *ALLOWABLE BACKPRESSURE TAILPIPE MODIFICATION WORKSHEET*

**Engine:** **MaxxForce® DT**

**Exhaust Configuration:** **Vertical - Vertical**

| | | | | | |
|---|---|---|---|---|---|
| **A** | Qty of 90× elbows added | ____ | **X** | **0.10 =** | _____ |
| **B** | Qty of 60× elbows added | ____ | **X** | **0.08 =** | _____ |
| **C** | Qty of 45× elbows added | ____ | **X** | **0.07 =** | _____ |
| **D** | Qty of 30× elbows added | ____ | **X** | **0.06 =** | _____ |
| **E** | Feet of straight pipe added | ____ | **X** | **0.02 =** | _____ |
| **F** | Temperature Control Device Pressure | | | | **.60** |
| **G** | Pipe Exit Pressure | | | | **0.28** |

Total Modification Backpressure (Add a-g) _____

Allowable Backpressure Limit **5.9**

Is allowable Backpressure Limit **GREATER** than Total Modification Backpressure?

If **YES**, Modifications **MEET** Engine Manufacturer's Guidelines and **CAN** be performed.

If **NO**, Modifications will **NOT MEET** Engine Manufacturer's Guidelines and **CANNOT** be performed.

## *Allowable Backpressure Tailpipe Modification Worksheet*

**Engine:** **MaxxForce® 9**

**Exhaust Configuration:** **Horizontal - Horizontal**

| | | | | | |
|---|---|---|---|---|---|
| **A** | Qty of 90× elbows added | _____ | **x** | **0.17 =** | _____ |
| **B** | Qty of 60× elbows added | _____ | **x** | **0.15 =** | _____ |
| **C** | Qty of 45× elbows added | _____ | **x** | **0.12 =** | _____ |
| **D** | Qty of 30× elbows added | _____ | **x** | **0.10 =** | _____ |
| **E** | Feet of straight pipe added | _____ | **x** | **0.03 =** | _____ |
| **F** | Temperature Control Device Pressure | | | | **1.00** |
| **G** | Pipe Exit Pressure | | | | **0.50** |

Total Modification Backpressure (Add a-g) _____

Allowable Backpressure Limit **4.1**

Is allowable Backpressure Limit **GREATER** than Total Modification Backpressure?

If **YES**, Modifications **MEET** Engine Manufacturer's Guidelines and **CAN** be performed.

If **NO**, Modifications will **NOT MEET** Engine Manufacturer's Guidelines and **CANNOT** be performed.

## *ALLOWABLE BACKPRESSURE TAILPIPE MODIFICATION WORKSHEET*

**Engine:** **MaxxForce® 9**

**Exhaust Configuration:** **Under Cab - Vertical**

| | | | | | |
|---|---|---|---|---|---|
| **A** | Qty of 90× elbows added | ____ | **x** | **0.17 =** | _____ |
| **B** | Qty of 60× elbows added | ____ | **x** | **0.15 =** | _____ |
| **C** | Qty of 45× elbows added | ____ | **x** | **0.12 =** | _____ |
| **D** | Qty of 30× elbows added | ____ | **x** | **0.10 =** | _____ |
| **E** | Feet of straight pipe added | ____ | **x** | **0.03 =** | _____ |
| **F** | Temperature Control Device Pressure | | | | **1.00** |
| **G** | Pipe Exit Pressure | | | | **0.50** |

Total Modification Backpressure (Add a-g) _____

Allowable Backpressure Limit **3.3**

Is allowable Backpressure Limit **GREATER** than Total Modification Backpressure?

If **YES**, Modifications **MEET** Engine Manufacturer's Guidelines and **CAN** be performed.

If **NO**, Modifications will **NOT MEET** Engine Manufacturer's Guidelines and **CANNOT** be performed.

## *Allowable Backpressure Tailpipe Modification Worksheet*

**Engine:** **MaxxForce® 9**

**Exhaust Configuration:** **Vertical - Vertical**

| | | | | | |
|---|---|---|---|---|---|
| **A** | Qty of 90× elbows added | ____ | **x** | **0.17 =** | _____ |
| **B** | Qty of 60× elbows added | ____ | **x** | **0.15 =** | _____ |
| **C** | Qty of 45× elbows added | ____ | **x** | **0.12 =** | _____ |
| **D** | Qty of 30× elbows added | ____ | **x** | **0.10 =** | _____ |
| **E** | Feet of straight pipe added | ____ | **x** | **0.03 =** | _____ |
| **F** | Temperature Control Device Pressure | | | | **1.00** |
| **G** | Pipe Exit Pressure | | | | **0.50** |

Total Modification Backpressure (Add a-g) _____

Allowable Backpressure Limit **4.4**

Is allowable Backpressure Limit **GREATER** than Total Modification Backpressure?

If **YES**, Modifications **MEET** Engine Manufacturer's Guidelines and **CAN** be performed.

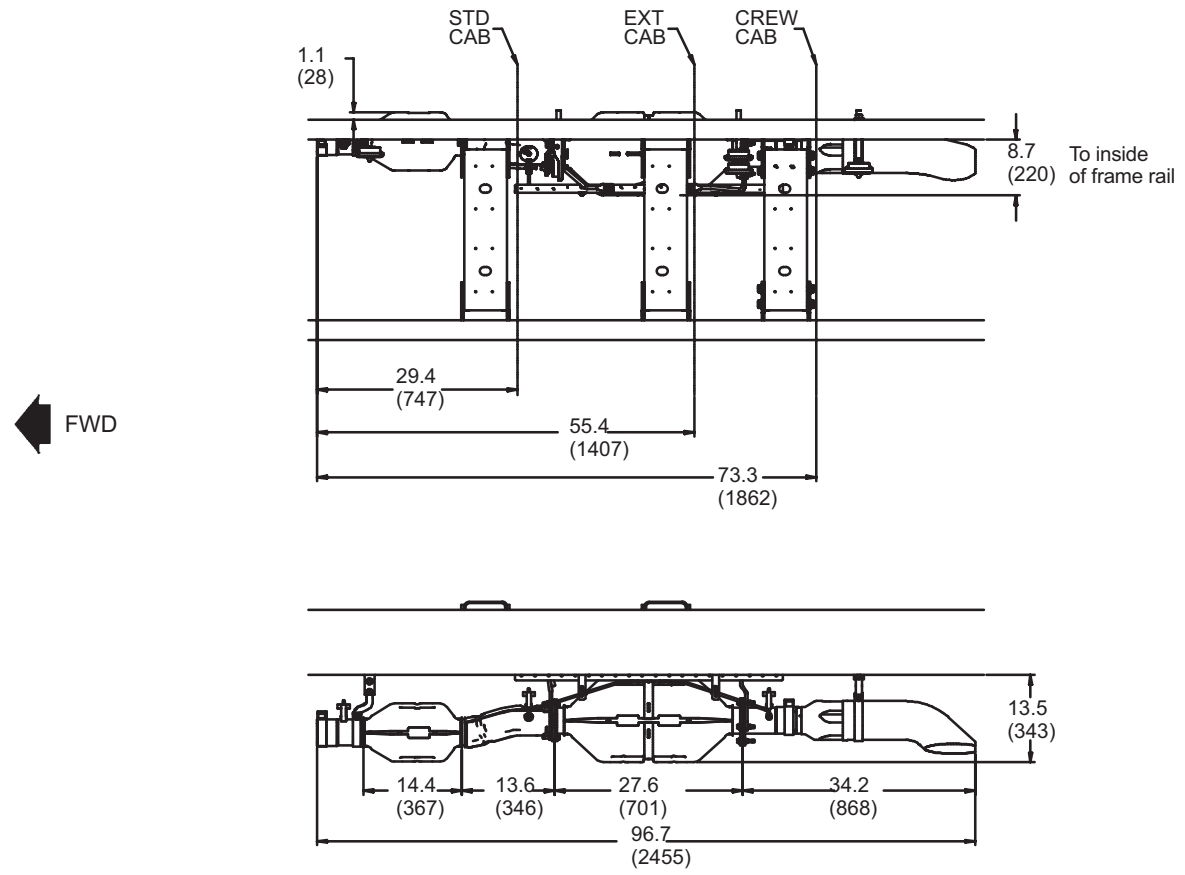
If **NO**, Modifications will **NOT MEET** Engine Manufacturer's Guidelines and **CANNOT** be performed

- *Use the backpressure values from the engine data sheets to compute the backpressure of the modified exhaust piping. Ensure that the limits are within the data sheet when tested per the backpressure test procedure.*

## *AFTERTREATMENT DIAGRAMS*

### *Horizontal Aftertreatment - LP and 4x2 Models*

#### ***07BDA; Right Side Mounted***

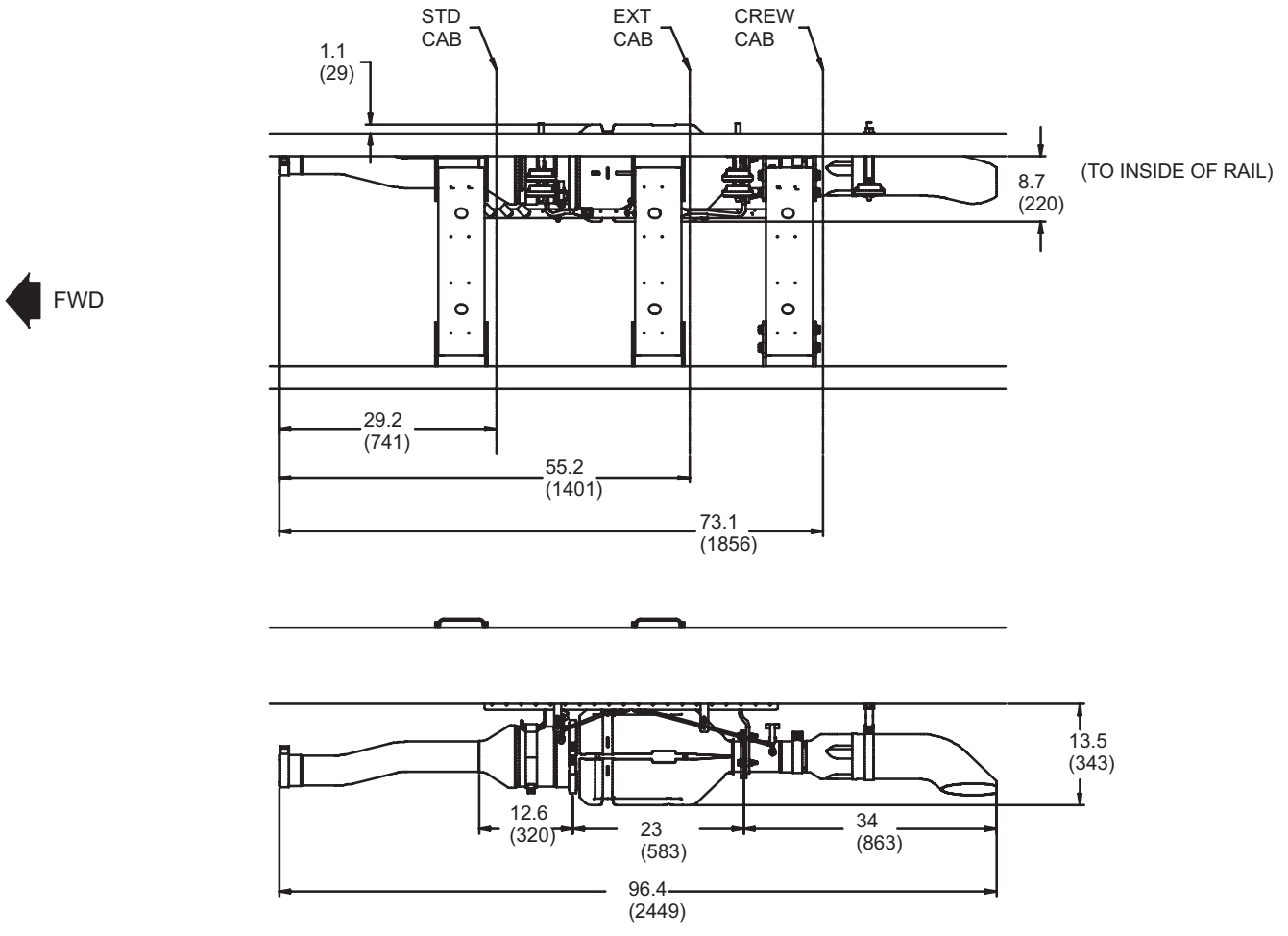



07_0005

## *HORIZONTAL AFTERTREATMENT*

### *6x4 Models*

#### ***07BDA; Right Side Mounted***

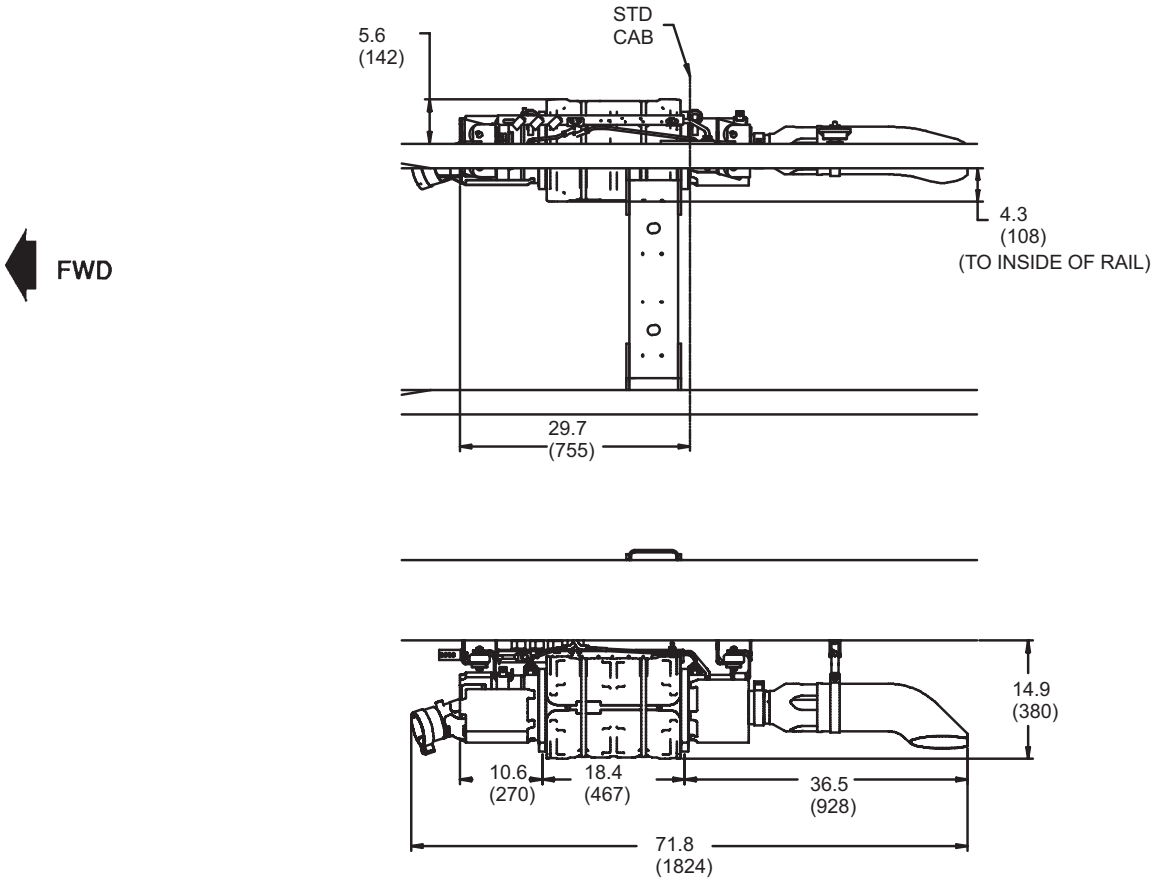



07_0006

## *HORIZONTAL AFTERTREATMENT*

*4300 4x2, 4400 4x2 and 6x4 Models*

***07BDB; Right Side Mounted***

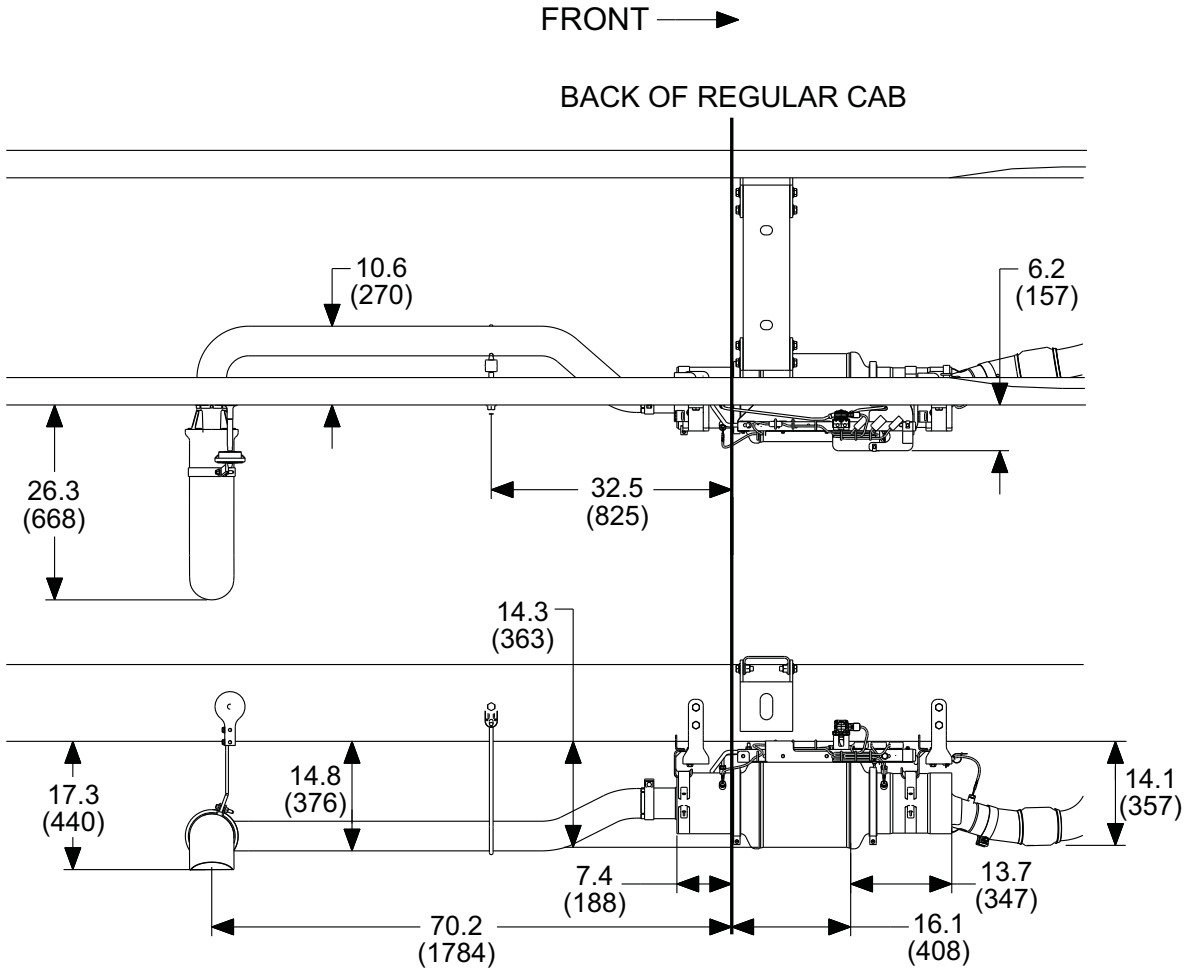



07_0015

## *HORIZONTAL AFTERTREATMENT AND LONG TAIL PIPE*

### *4300 4x2, 4400 4x2 and 6x4 Models*

#### ***07BDB with 07WCA; Right Side Mounted***

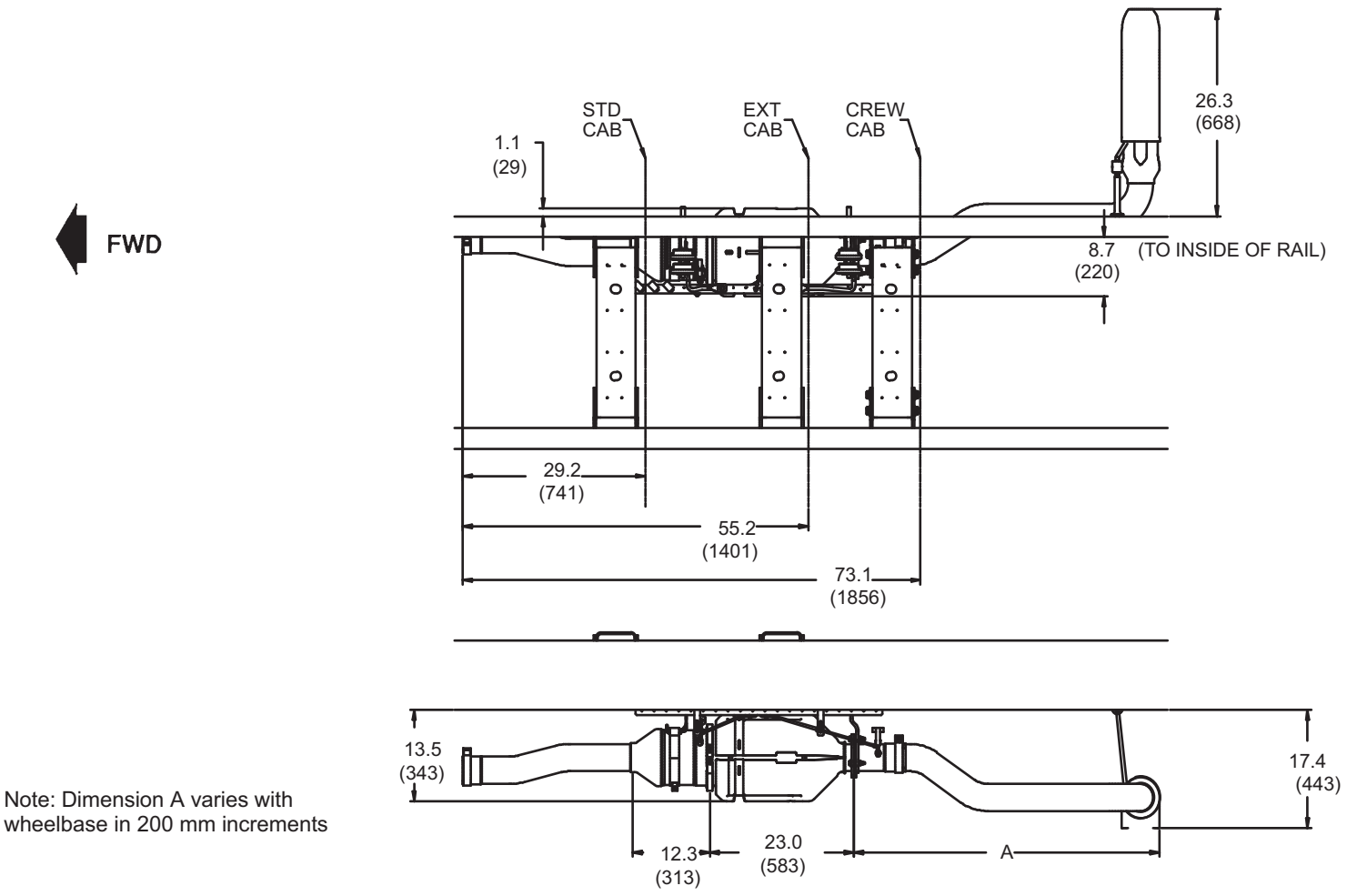



07BDB_07WCA

## *HORIZONTAL AFTERTREATMENT*

*4300 4x2, 4400 4x2 and 6x4 Models*

***07BDC; Right Side Mounted***



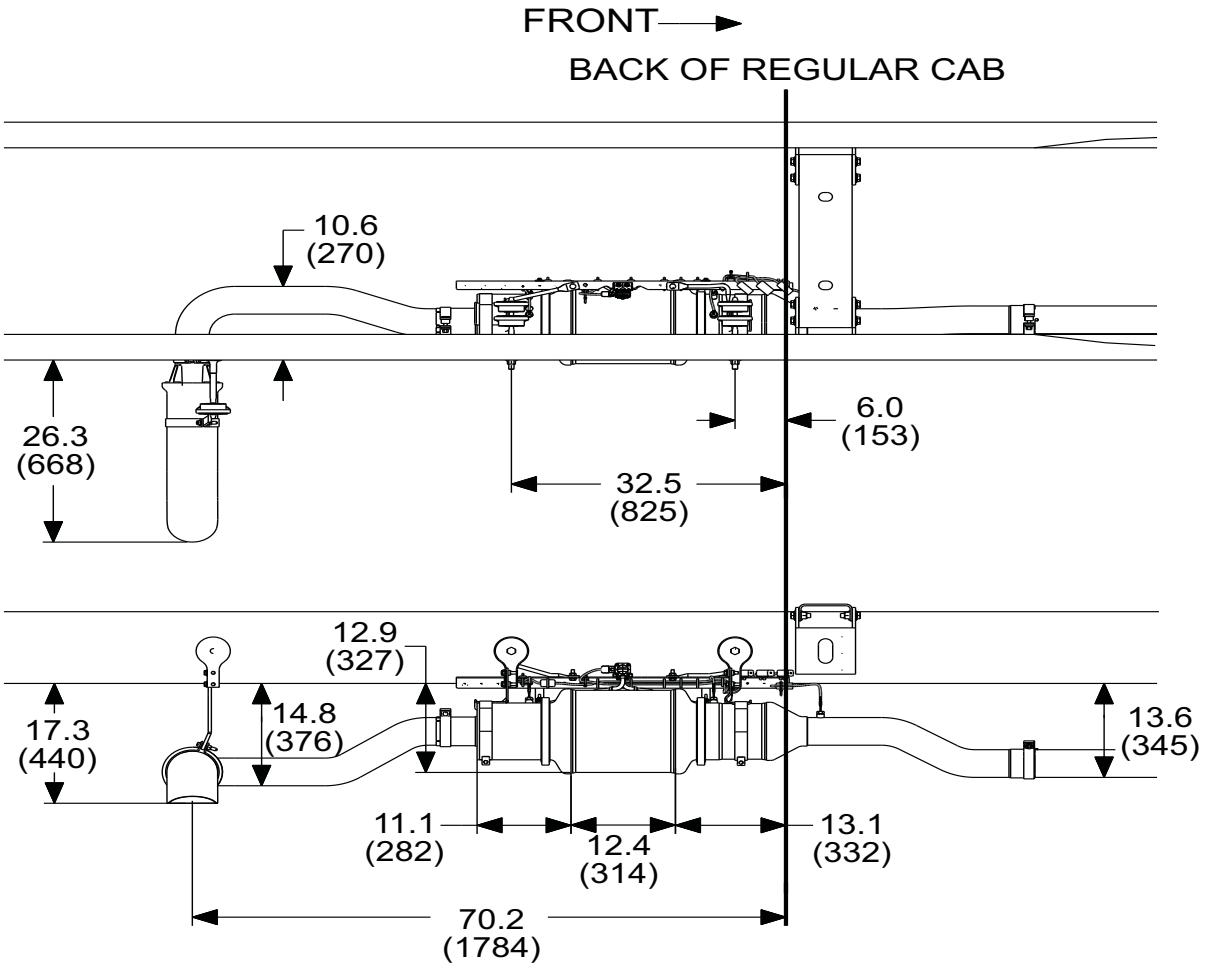

Note: Dimension A varies with wheelbase in 200 mm increments

07_0007

*HORIZONTAL AFTERTREATMENT AND LONG TAIL PIPE*

*4300 4x2, 4400 4x2 and 6x4 Models*

***07BDC with 07WCA; Right Side Mounted***

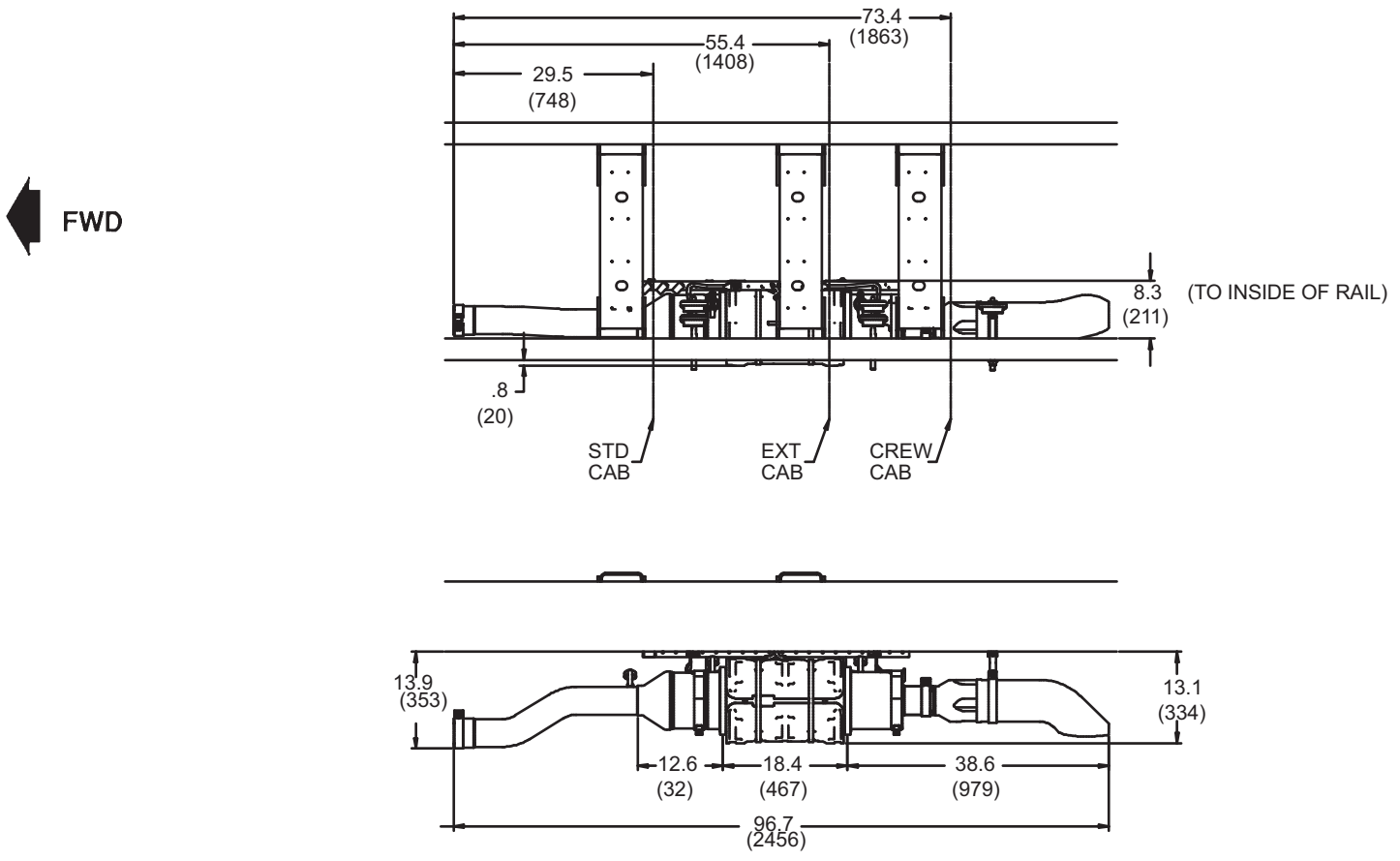



07BDC_07WCA

## *HORIZONTAL AFTERTREATMENT*

### *All Models*

#### ***07BDE – Left Side Mounted***

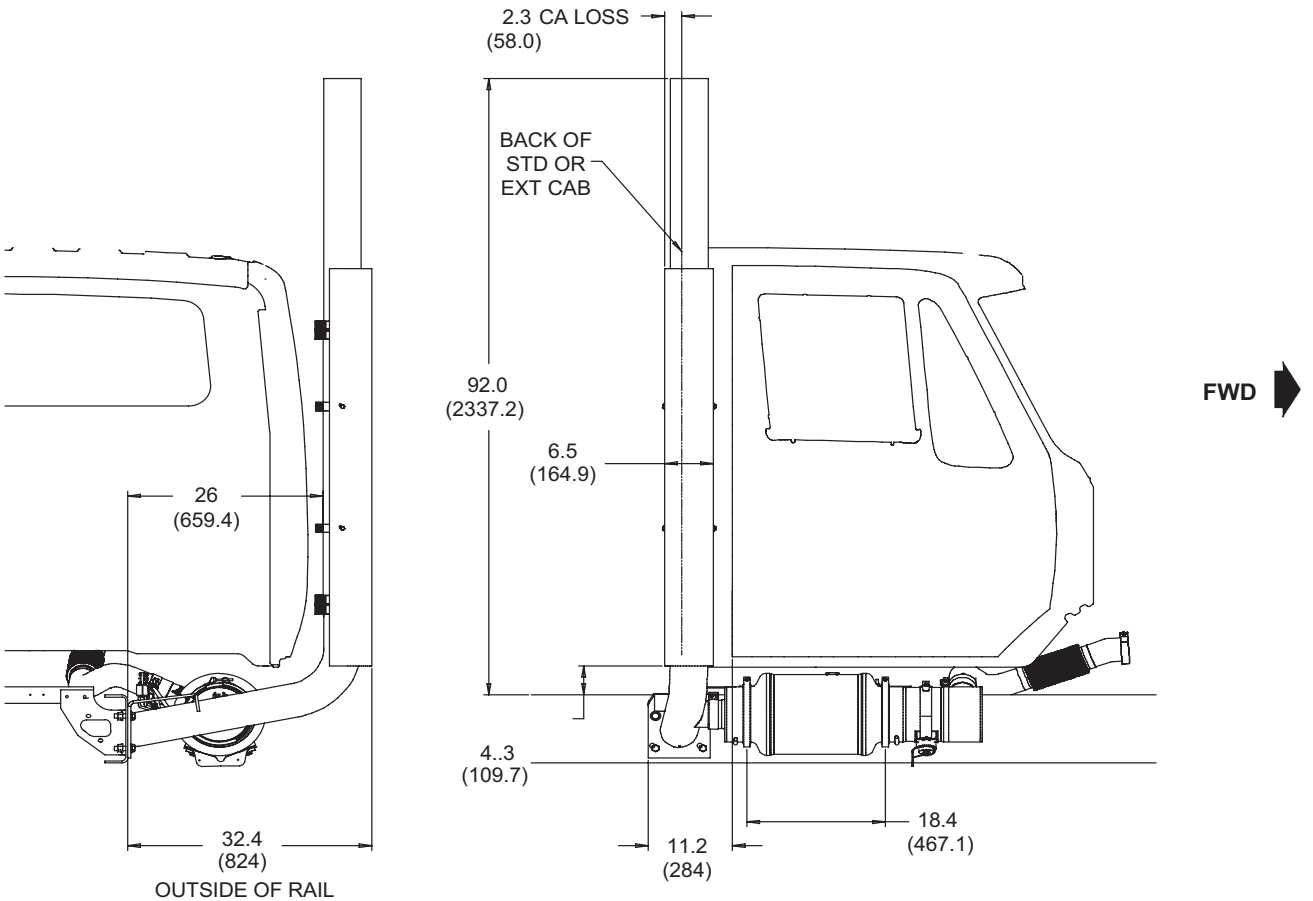



07_0008

## *HORIZONTAL AFTERTREATMENT AND VERTICAL TAIL PIPE*

*4300 4x2, 4300 LP, 4400 4x2 and 4400 6x4 Models*

***07BEJ; Right Side Mounted Under Cab***

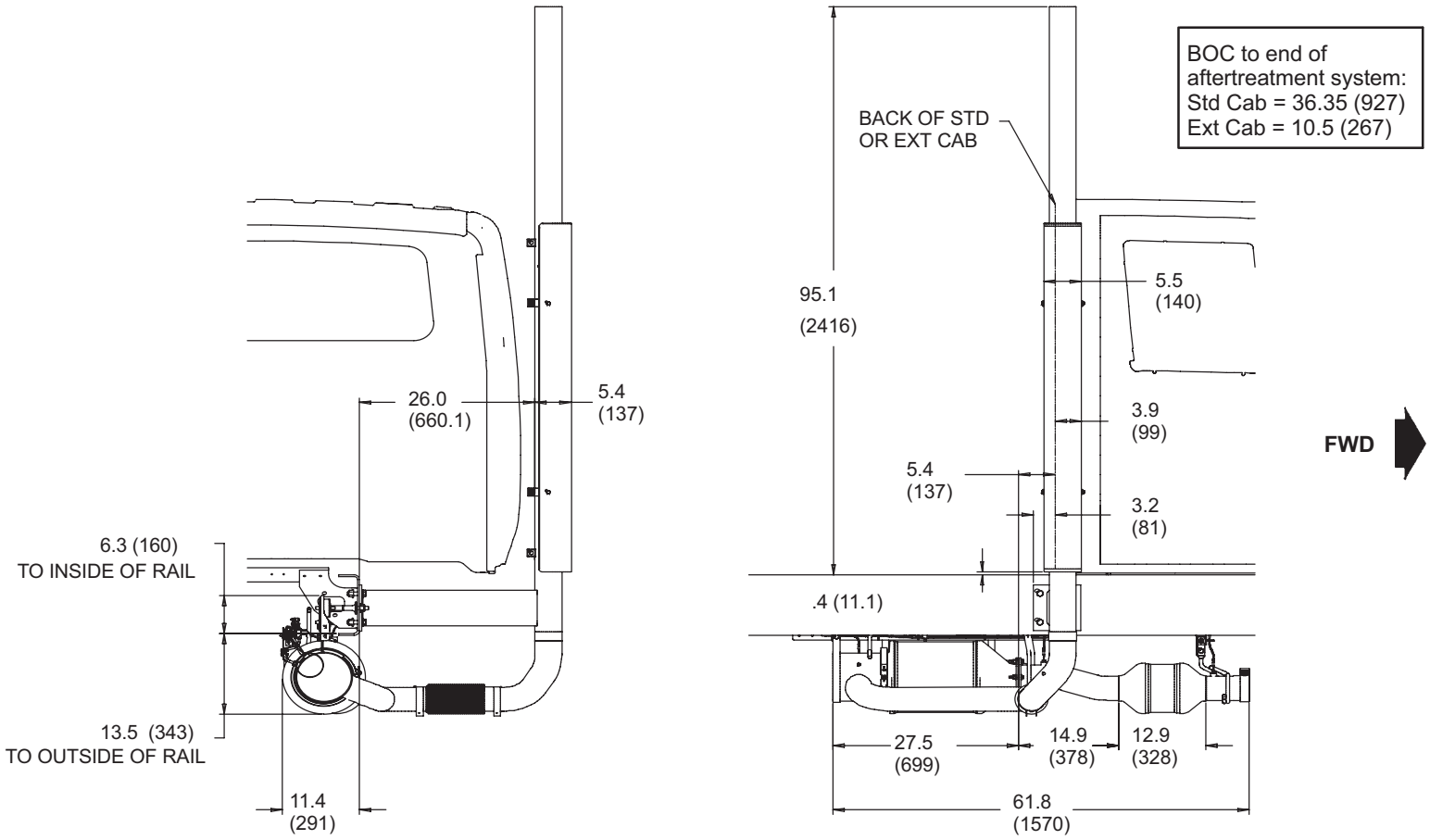



07_0025

## *HORIZONTAL AFTERTREATMENT AND VERTICAL TAIL PIPE*

### *LP, 4x2 and 6x4 Models*

#### ***07BHU (Day Cab); Right Side Mounted***

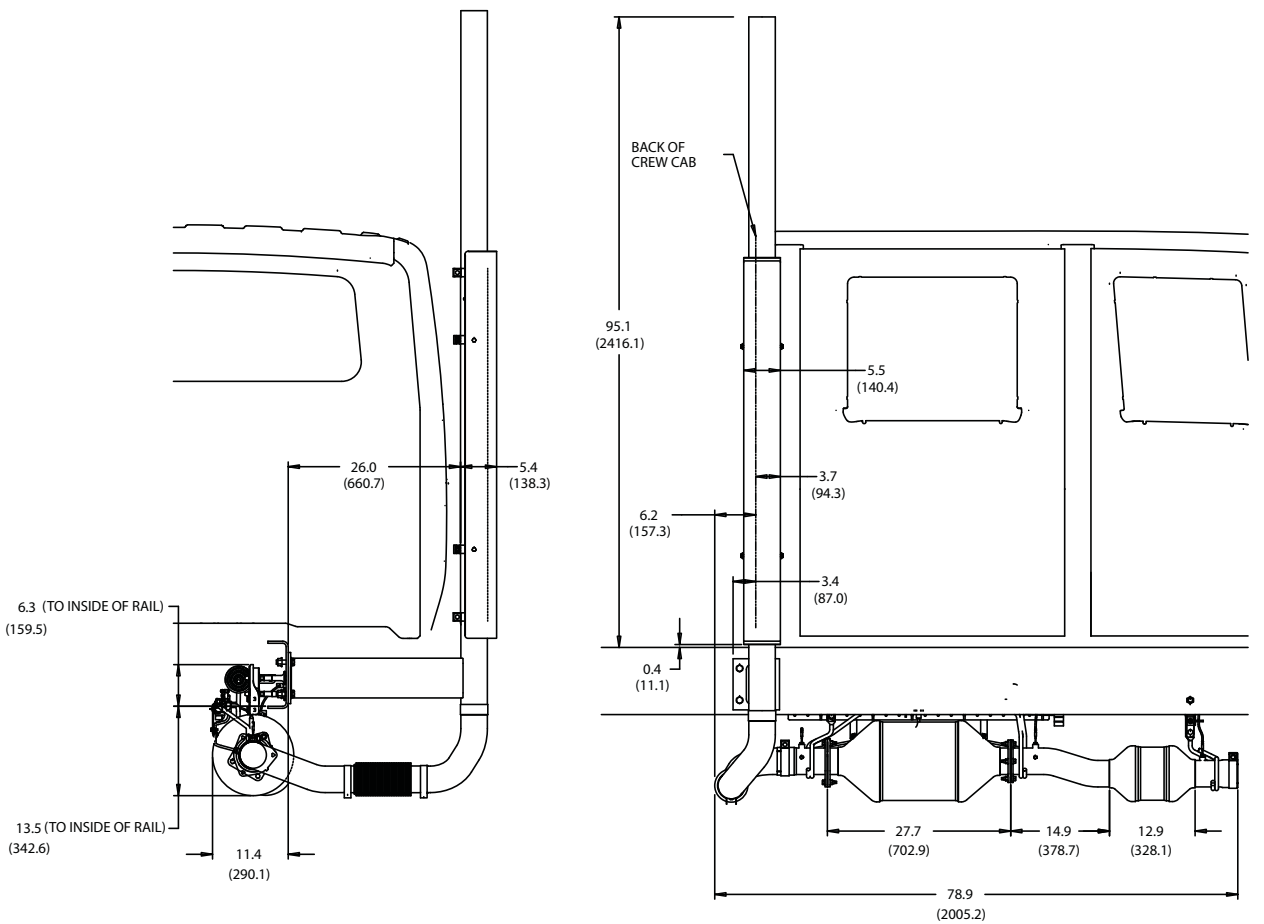



07_0009

## *HORIZONTAL AFTERTREATMENT AND VERTICAL TAIL PIPE*

### *LP and 4x2 Models*

#### ***07BHU (Crew Cab); Right Side Mounted***

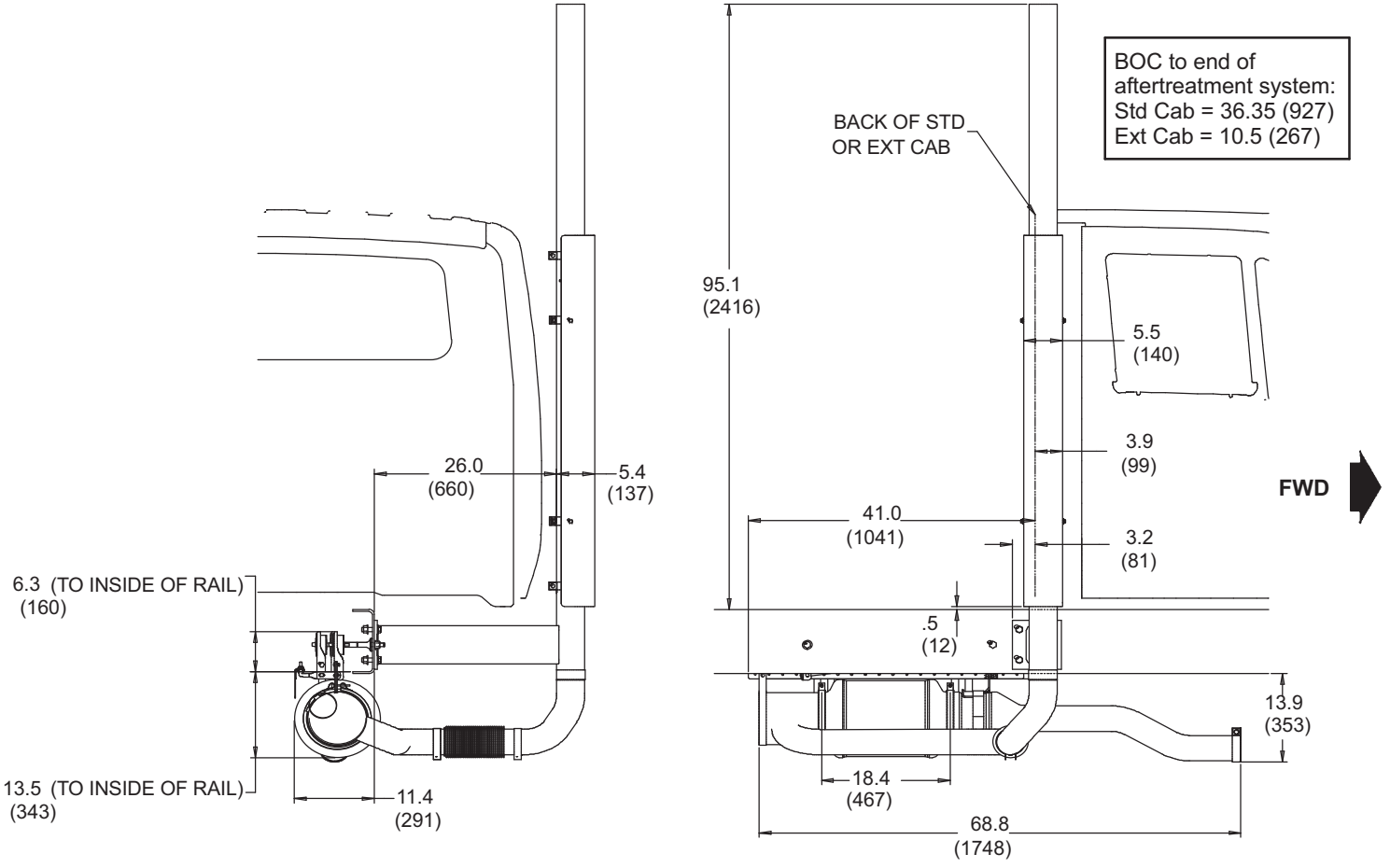



07_0061

## *HORIZONTAL AFTERTREATMENT AND VERTICAL TAIL PIPE*

### *4x2, 6x4 and LP Models*

#### ***07BHU (Day and Extended Cab); Right Side Mounted***

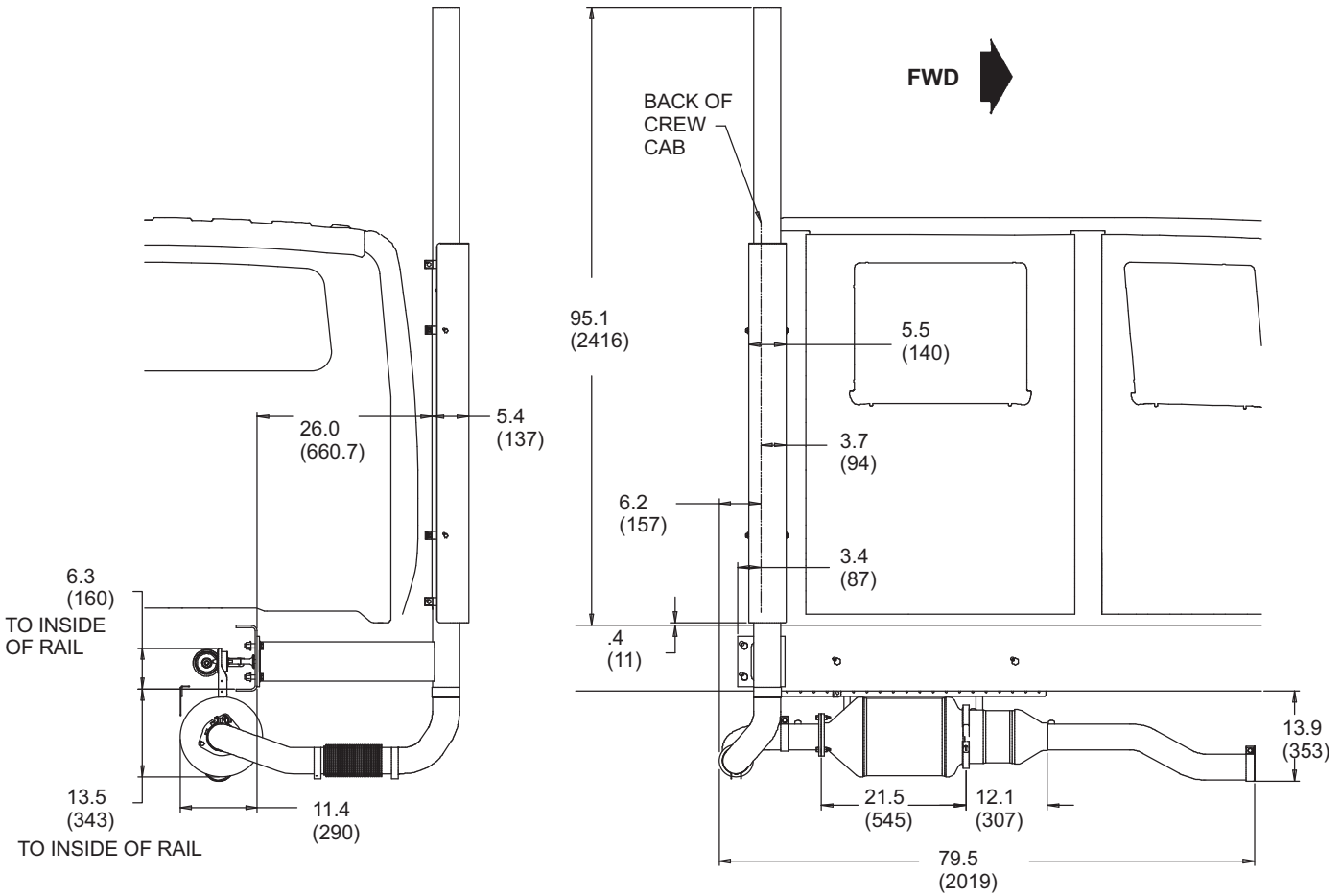



07_0011

## *HORIZONTAL AFTERTREATMENT AND VERTICAL TAIL PIPE*

### *4x2, 6x4 and LP Models*

#### ***07BHU (Crew Cab); Right Side Mounted***

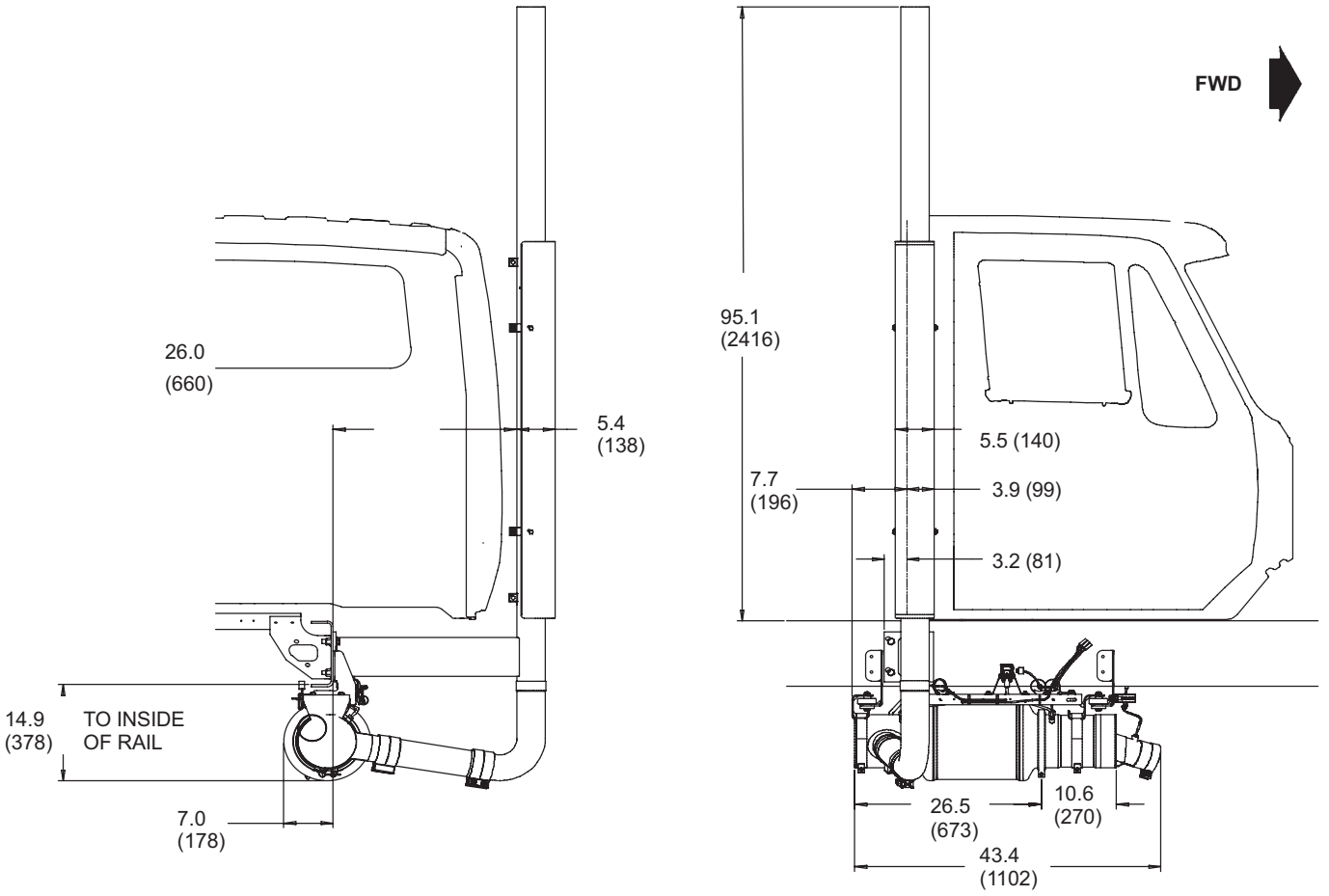



07_0012

## *HORIZONTAL AFTERTREATMENT AND VERTICAL TAIL PIPE*

### *4300 4x2, 4400 4x2 and 6x4 Models*

#### ***07BHT; Right Side Mounted Under Cab***

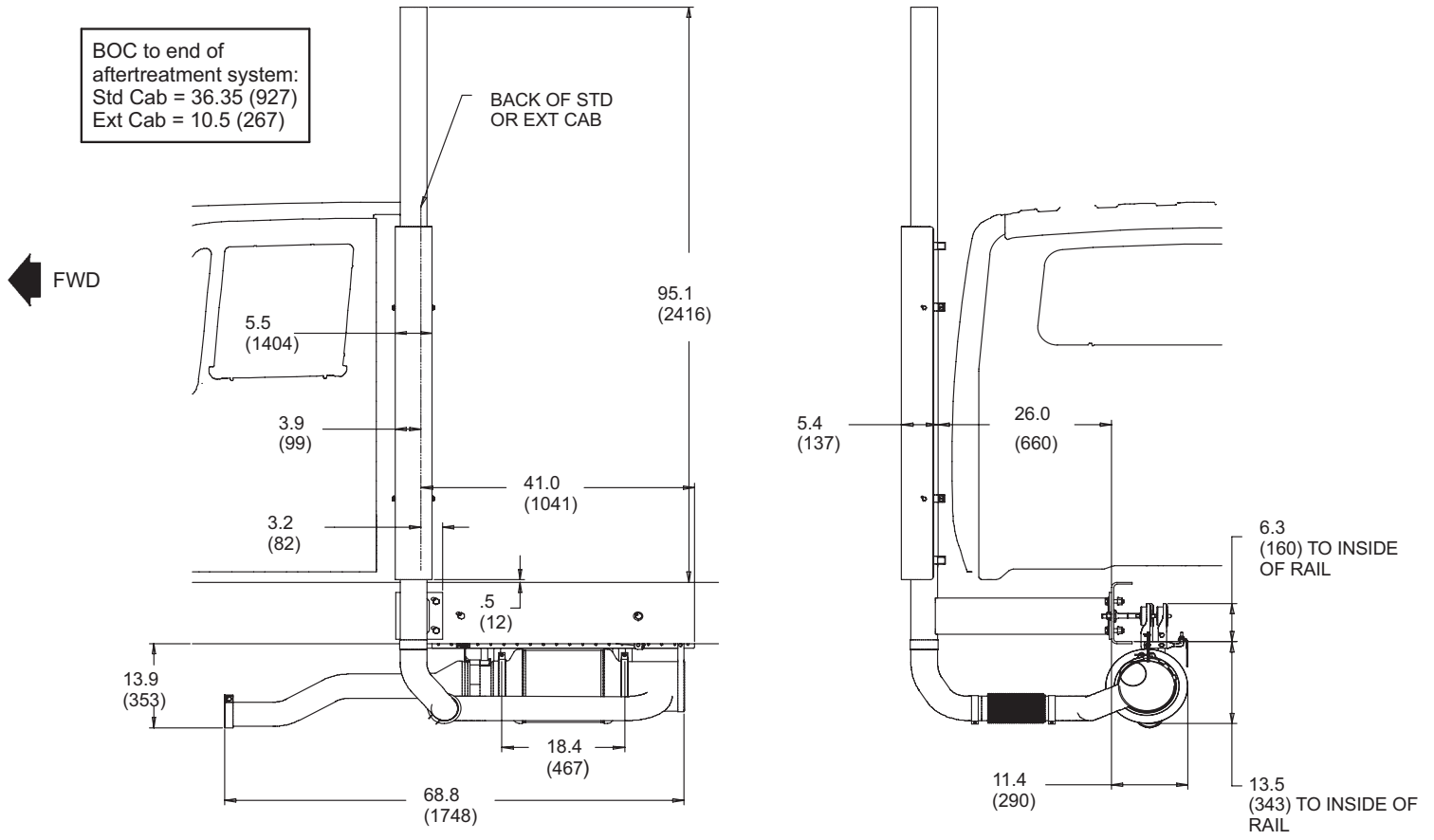



07_0016

## *Horizontal Aftertreatment and Vertical Tail Pipe*

### *4300 and 4400 Models*

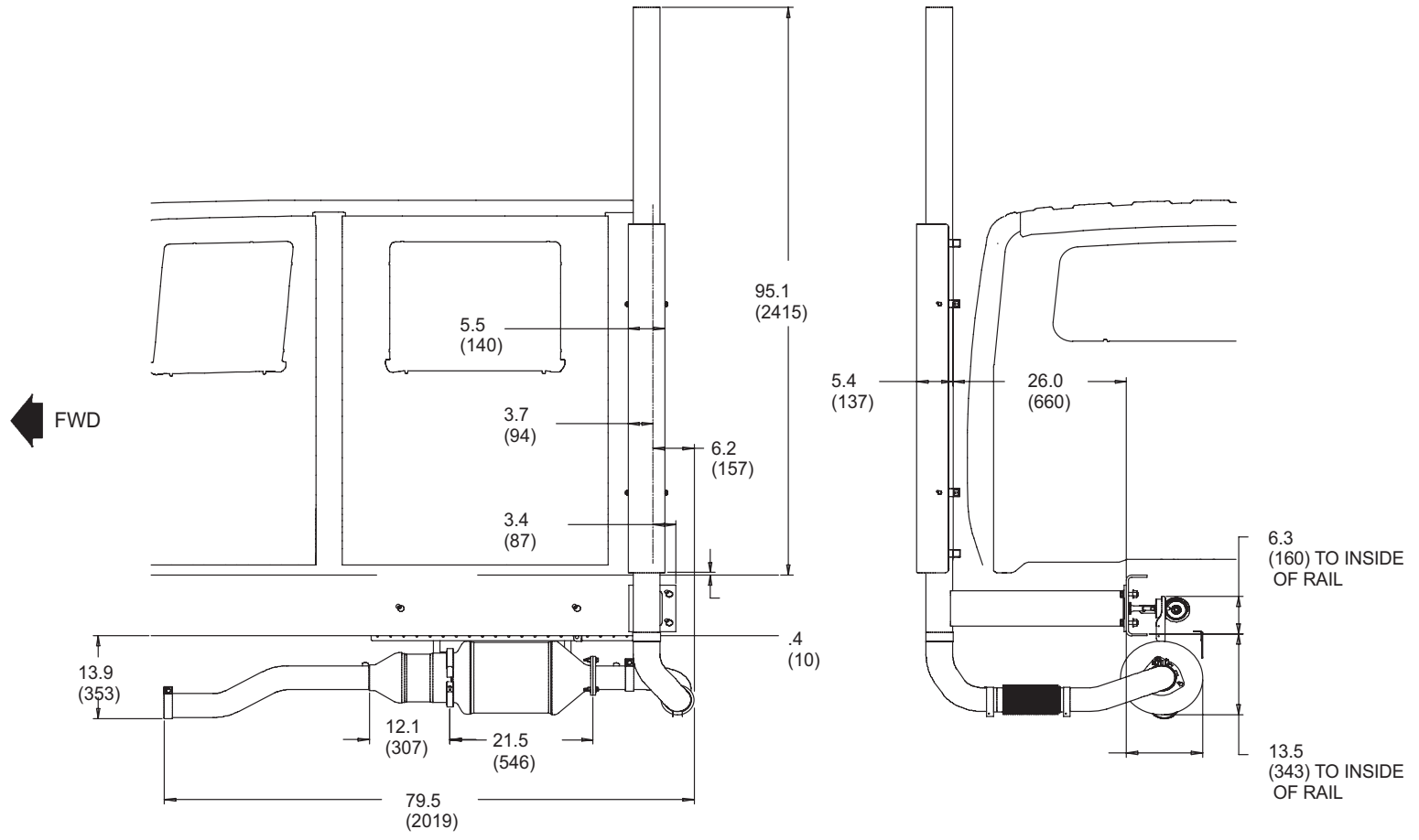
#### ***07BHS (Day and Extended Cab); Left Side Mounted***



## *HORIZONTAL AFTERTREATMENT AND VERTICAL TAIL PIPE*

### *4300 and 4400 Models*

#### ***07BHS; Left Side Mounted - Crew Cab***

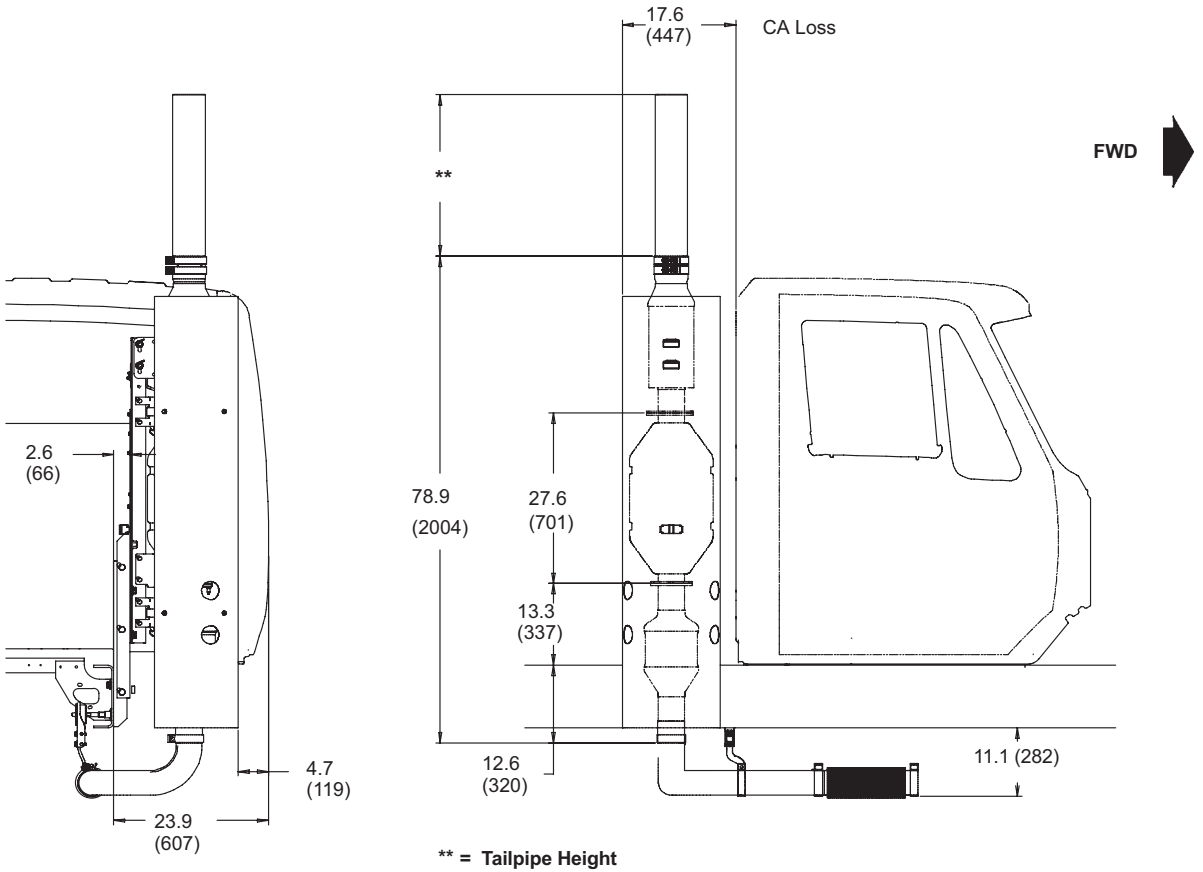



07_0014

## *VERTICAL AFTERTREATMENT AND VERTICAL TAIL PIPE*

### *4300 4x2, 4400 4x2 AND 6x4 MODELS*

***07BDS; Right Side Mounted***



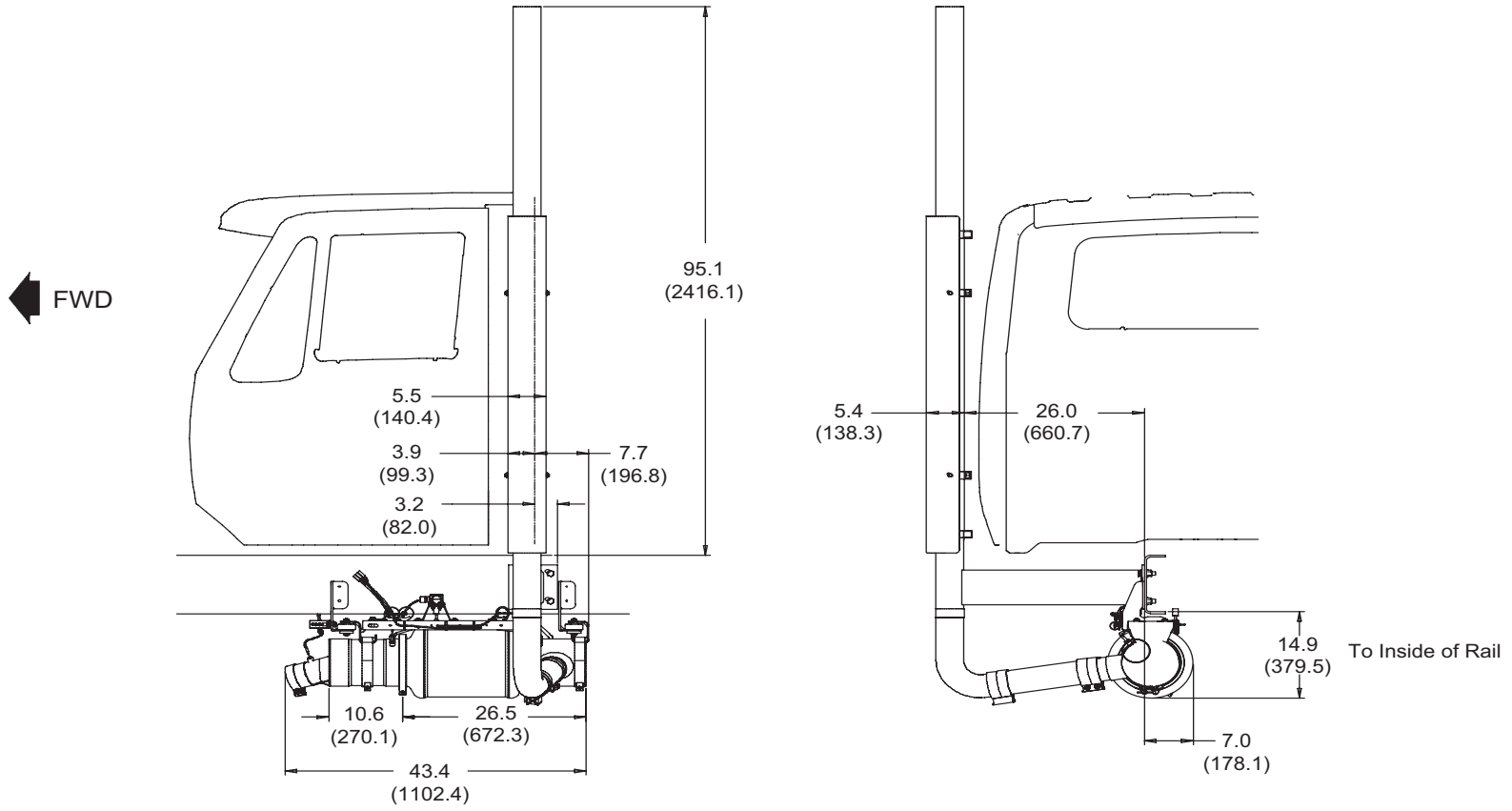

** = Tailpipe Height

07_0017

## *HORIZONTAL AFTERTREATMENT AND VERTICAL TAIL PIPE*

*4300 4x2, 4400 4x2 and 6x4 Models*

***07BHR; Left Side Mounted Under Cab***




07_0033

# EXHAUST SYSTEM (SCR)

## *GUIDELINES FOR AFTERTREATMENT MODIFICATIONS*

### *All Models*

Navistar, Inc. has a responsibility to supply, install and ensure that the engines and aftertreatment emission control devices comply with the certification requirements of the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (ARB). The aftertreatment devices may include a combination of particulate filters, catalysts, catalytic converter, and temperature and pressure sensors, along with other components.

Proper long-term operation of these components requires controlling exhaust stream temperatures and the exhaust flow pattern throughout the system. This controls the required location of the components as well as the insulation of the various parts of the system.

For this reason, application guidelines for aftertreatment and tailpipe installations are much more complex and restrictive than in the past. Navistar, Inc. will ensure correct factory installation of aftertreatment devices to assure compliance with the certification requirements.

Modified systems could damage the engine, aftertreatment system and other truck systems and void the warranty coverage. In that regard, Navistar, Inc. will make it a policy to procure and correctly install the appropriate aftertreatment devices pursuant to applicable specifications and application guidelines. That brings with it the benefit of certified systems that will be fully covered under warranty provided the vehicle is properly maintained and not modified beyond the extent allowed by the Body Builder book.

The following guidelines are meant to clarify the allowable modifications for aftertreatment systems. Please consult applicable federal, state and local laws and requirements in conjunction with this document to ensure compliance to those requirements. Also, refer to applicable vehicle warranty information before performing any modifications to the vehicle. Non-compliance to the requirements of the warranty may nullify it in its entirety.

- Where possible, trucks first and foremost should be ordered directly from the factory that meets the body installation requirements so that the minimum, or no modification of the exhaust system will be required.
- Relocation or modification of the Aftertreatment system or the turbo outlet piping is NOT permitted without approval from Navistar, Inc. and the engine manufacturer. Requests for relocation or modification will be reviewed on a case by case basis.
- Exhaust Gas Temperatures may be as high as 800× C during vehicle operation. Precautions should be taken to ensure that materials used in the vicinity of the exhaust system and exhaust gas stream can withstand these temperatures or are safely shielded.

MEETING LEGAL REQUIREMENTS

**It is the responsibility of the person performing modifications to the vehicle to ensure that the vehicle, in its final configuration, conforms to any applicable law regarding emission control, noise level and applicable safety standards.**

## *TURBO PIPE*

*The function of the Turbo Pipe is to deliver exhaust gases from the engine to the Aftertreatment Module so that temperature losses are minimized and so that the flow pattern of the exhaust gases maximizes the efficiency of the Aftertreatment Module. Relocation or modification of the turbo outlet piping is NOT permitted without approval from Navistar, inc. and the engine manufacturer. Requests for relocation or modification will be reviewed on a case by case basis. Any modification to this piping without written approval of Navistar, Inc. will significantly reduce the performance of the Aftertreatment Module and VOID any applicable warranty.*

If so equipped, heat shields and protective wraps must be maintained on the vehicle to ensure the proper performance of the Aftertreatment Module and for the protection of the installed truck systems.

## *AFTERTREATMENT MODULE*

*The function of the Aftertreatment Module is to catch soot exhausted from the engine and convert it to ash. In conjunction, it reduces oxides of nitrogen (NOx) through SCR. It is critical that the all sensors and pressure monitoring wiring remain intact for the Aftertreatment Module to perform as designed. It is critical to maintain the location of the Aftertreatment Module and all sensors as installed from the factory to ensure proper operation. Relocation or modification of the Aftertreatment Module is NOT permitted without approval from Navistar, Inc. and the engine manufacturer. Requests for relocation or modification will be reviewed on a case by case basis. Any modification to this Aftertreatment Module without written approval of Navistar, inc. will significantly reduce the performance of the Aftertreatment module and VOID any applicable warranty.*

If so equipped, heat shields and protective wraps must be maintained on the vehicle to ensure the proper performance of the Aftertreatment Module and for the protection of the installed truck systems. In addition, heat shields and protective coverings may not be added to the Aftertreatment module which would restrict airflow to the system.

Never mount any additional harnesses or other equipment to the Aftertreatment Module.

## *Temperature Control Device*

*The function of the Temperature Control Device (if so equipped) is to reduce the exit exhaust gas temperature emitted from the Aftertreatment Device. This device has been specifically designed to draw in cooler air to mix with the hotter exhaust gases. It is critical that the openings in the device that draw in cooler air remain unblocked of debris or other equipment. This device is critical to ensure that the emitted temperatures of the exhaust are minimized. Any modifications to the Temperature Control Device without the written approval of Navistar, Inc. may significantly reduce the efficiency of the Temperature Control Device and significantly increase the emitted gas temperatures, and VOID any applicable warranty.*

If so equipped, any installed Temperature Control Device MUST remain as part of the exhaust piping.

Changes to the location of the Temperature Control Device relative to the Aftertreatment Module must meet federal emissions, noise and safety requirements. The responsibility for demonstrating that legal requirements are met when modifications have been made belongs to the modifier of the system.

If changing the location, special attention must be given to maintaining clearances around the exhaust piping, as well as maintaining the structural integrity and exhaust backpressure of the system. Tables included in this document provide recommended clearances and back pressure estimation procedures.

## *Exhaust Piping Modifications*

Never modify the internal structure of the Turbo Pipe, the Aftertreatment Module or the Temperature Control Device.

When lengthening or shortening tailpipes beyond the Aftertreatment Module, observe the following precautions:

1. Use the same size and material to extend or shorten the original pipe.
    - *Refer to* Table 3 *for proper material and sizing of pipes when extending or shortening tailpipe sections.*
2. Adding additional extensions and bends will change internal exhaust gas pressure, which could result in damage to the Aftertreatment Module or other engine components as well as a reduction in fuel economy.
    - *Use the backpressure values from the engine data sheets to compute the backpressure of the modified exhaust piping. Ensure that the limits are within the data sheet when tested per the backpressure test procedure.*

3. Additional piping should be supported so that minimal stress is placed on the Aftertreatment Module outlet. The bending moment on the outlet of the Aftertreatment Module cannot exeed 10 N-m @ 1 G acceleration. As a guide, one additional support should be included for every 4 linear feet of exhaust piping added, evenly spaced along the length of the chassis.

The exhaust piping should be routed so that the Temperature Control Device, if so equipped, is at the end of the exhaust pipe and oriented in the same manner as received from the factory.

Route all piping with minimum clearances to other chassis components as shown in Table 4.

## *MOUNTING OF BODY EQUIPMENT*

In comparison to vehicles produced prior to 2007, exhaust components surface temperatures and exhaust gas temperatures will typically be higher.

As a result of the increased temperatures, clearances to exhaust components will need to be increased compared to pre-2007 model year clearances.

Typical installation clearances used for pre-2007 model year engines and exhaust systems should be increased by 40% to ensure that body equipment is not damaged by the increased heat of these systems.

Do not mount any Body Equipment within 8 inches (200mm) of the exhaust pipe outlet to avoid damage from hot exhaust gases.

When modifying other chassis systems, maintain clearances shown in Table 4.

Table 3

Tailpipe Extension, Material and Pipe Sizing

| Navistar N9 | |
|---|---|
| Pipe Material | 409 Stainless Steel |
| Pipe Diameter | 4” |
| Wall Thickness | 0.065” |
| **Cummins ISB** | |
| 409 Stainless Steel | 409 Stainless Steel |
| 4” | 4” |
| 0.065” | 0.065” |

| Table 4 | |
|---|---|
| Minimum Clearances Between Exhaust System Components and Other Chassis Components | |
| Component | Minimum Clearance, mm (in) |
| Electric Harness | 150 (6.0) |
| Electric Harness (w. heat guard) | 100 (4.0) |
| Mechanical Cable | 50 (2.0) |
| Fuel Tube, metal | 150 (6.0) |
| Fuel Tube, rubber or plastic | 150 (6.0) |
| Brake Tube, metal | 100 (4.0) |
| Brake Tube, rubber or plastic | 150 (6.0) |
| Tire | 100 (4.0) |
| Fuel Tank | 100 (4.0) |

# *BACKPRESSURE DATA SHEETS*

## *Maximum Backpressure Values*

Navistar N9

| Engine Rating | Maximum Backpressure | |
|---|---|---|
| HP | Clean DPF - Worst Case Configuration (in-Hg) | Clean DPF - Worst Case Configuration (kPa) |
| 275 | 10.4 | 35.3 |
| 300 | 11.2 | 37.8 |
| 315 | 11.6 | 39.4 |
| 330 | 12.1 | 40.9 |

Cummins ISB

| HP | (in-Hg) | (kPa) |
|---|---|---|
| 200 | 8.9 | 30 |
| 220 | 9.7 | 33 |
| 240 | 10.4 | 35 |
| 250 | 10.9 | 37 |
| 260 | 11.0 | 37 |
| 280 | 12.6 | 43 |
| 300 | 13.5 | 46 |
| 325 | 14.5 | 49 |
| 340 | 15.8 | 53 |
| 360 | 17.0 | 57 |

Refer to the “Backpressure Test Procedure” on page 35.

## *BACKPRESSURE TEST PROCEDURE*

### *Test Method for Measuring Exhaust Backpressure*

NOTE: The exhaust backpressure is required for a fully assembled system including DPF, SCR device and any diffuser device installed.

- Perform a non-mission regeneration on the DPF system to ensure it is clean prior to checking exhaust backpressure
- Connect a manometer or pressure gauge which reads up to 272 in H2O, 20 in Hg, 10 psi. 508 mm Hg or 68 kPa in a straight section of 4 inch diameter exhaust pipe, 3 to 4 pipe diameters downstream of the exhaust engine outlet flange. Turbulence in the exiting gas flow from VGT turbochargers results in the need to measure exhaust backpressure at this distance from the outlet flange. The port in the exhaust pipe should be smooth and free of burrs to give an accurate pressure reading.
- Determine the engine speed which delivers the maximum exhaust flow. This is the engine speed which should be used for this test. Testing should be conducted at ambient temperatures between 21 to 38 deg C (70 - 100 deg F).
- Run the engine at full power output on a vehicle chassis dynamometer or a long uphill climb at the correct engine speed for at least 10 minutes or until stabilized power output is achieved, and record the exhaust backpressure reading.
- For industrial engines, load the engine to the speed at which the maximum exhaust flow occurs for at least 10 minutes and record the exhaust backpressure reading.
- If this testing is done on a long hill climb, it may be necessary to repeat the test in different gears or use the vehicle brakes to achieve the desired engine speed. If testing on road, the hill used must be steep enough that with the engine at full throttle, the vehicle speed is steady or dropping when the exhaust backpressure is recorded to ensure the engine is at full power output.
- If engine turbocharger boost pressure is also recorded during this test, the pressure at the turbo compressor outlet can be compared to the Turbo Compressor Outlet Pressure on the Engine Data Sheet to ensure the engine is at full power output. The measured turbocharger boost pressure should be within 75mm Hg (3 in Hg) of the value on the Engine Data Sheet with the engine at full power.

## *BACKPRESSURE TEST PROCEDURE (CONT'D)*

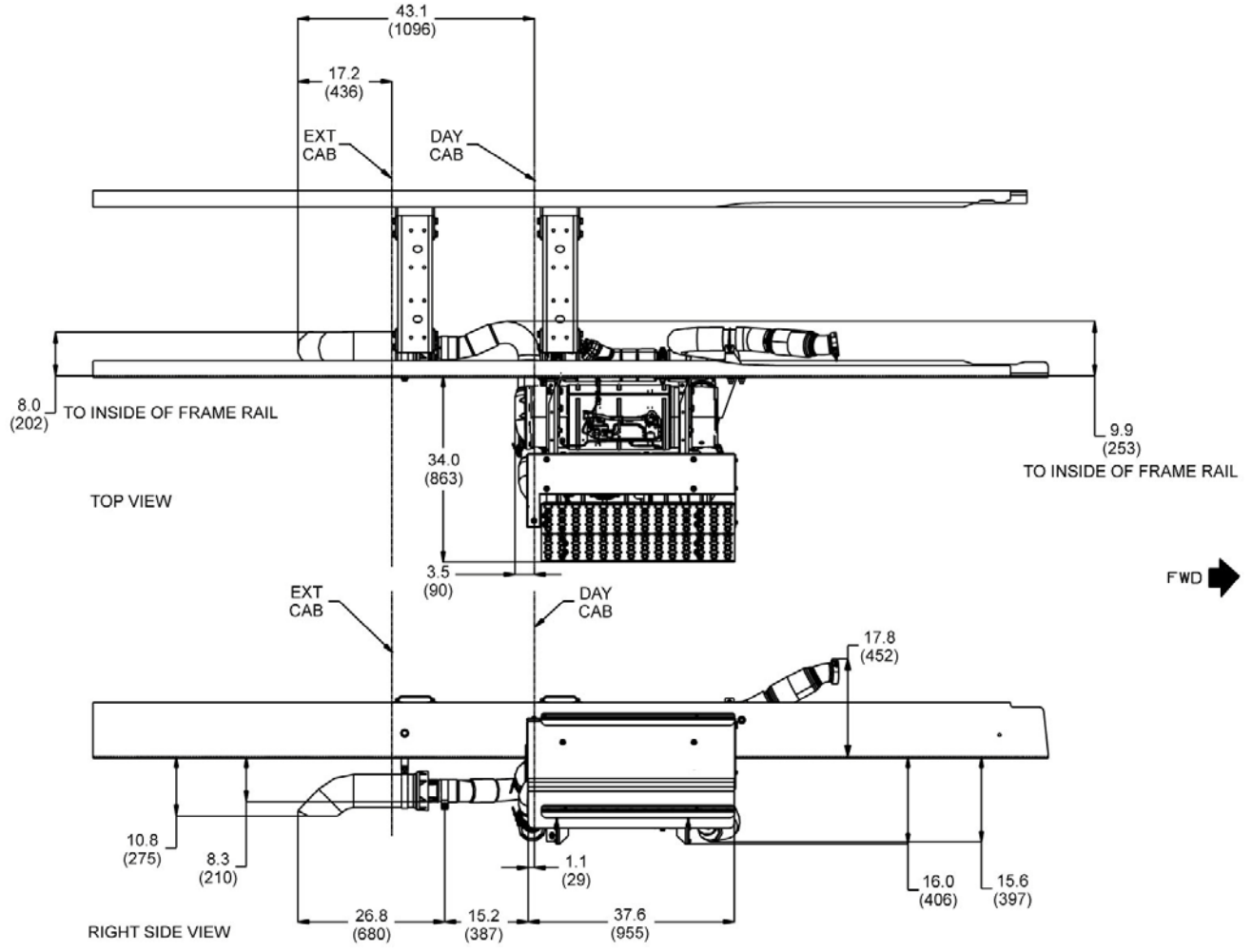
### *Exhaust Backpressure Test Results*

| | |
|---|---|
| Engine Model and Power Rating | |
| Engine Sped for Maximum Exhaust Flow | |
| Measured Exhaust Back Pressure at Full Power Output: | |
| -in H2O | |
| -in Hg | |
| -psi | |
| -mm Hg | |
| -kPa | |
| Test Location: | |
| -On Dynamometer? | |
| -On Road? | |

NOTE: When the exhaust back pressure measurement is taken in a pipe diameter other than 4 inches, then the measured values must be adjusted to account for the change.

## *HORIZONTAL AFTERTREATMENT*

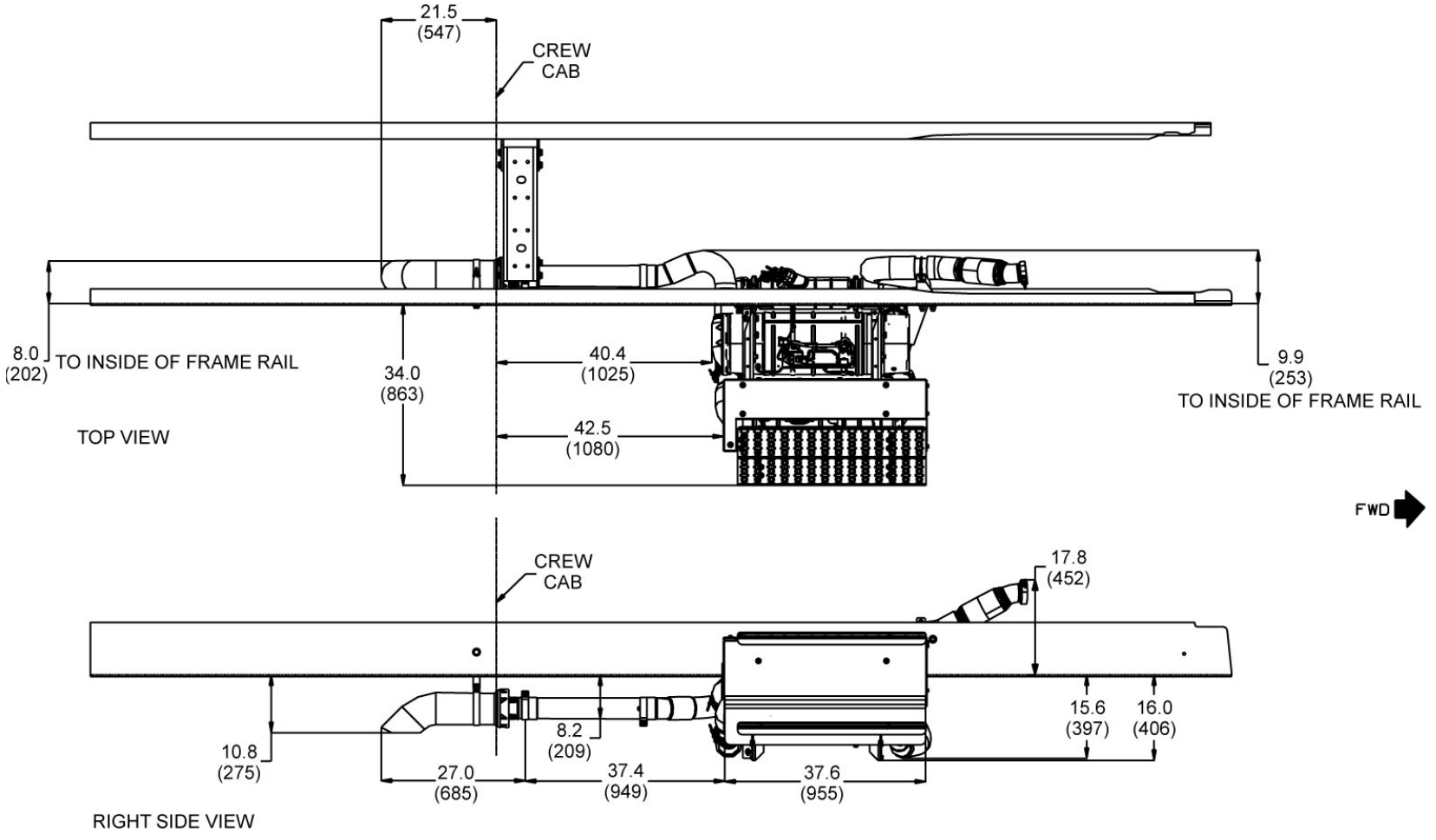
### *07BEM (Day and Extended Cab); Switchback Horizontal with Short Horizontal Tailpipe Mounted Right Side BOC*




durastar_07bem_day_ext

## *HORIZONTAL AFTERTREATMENT*

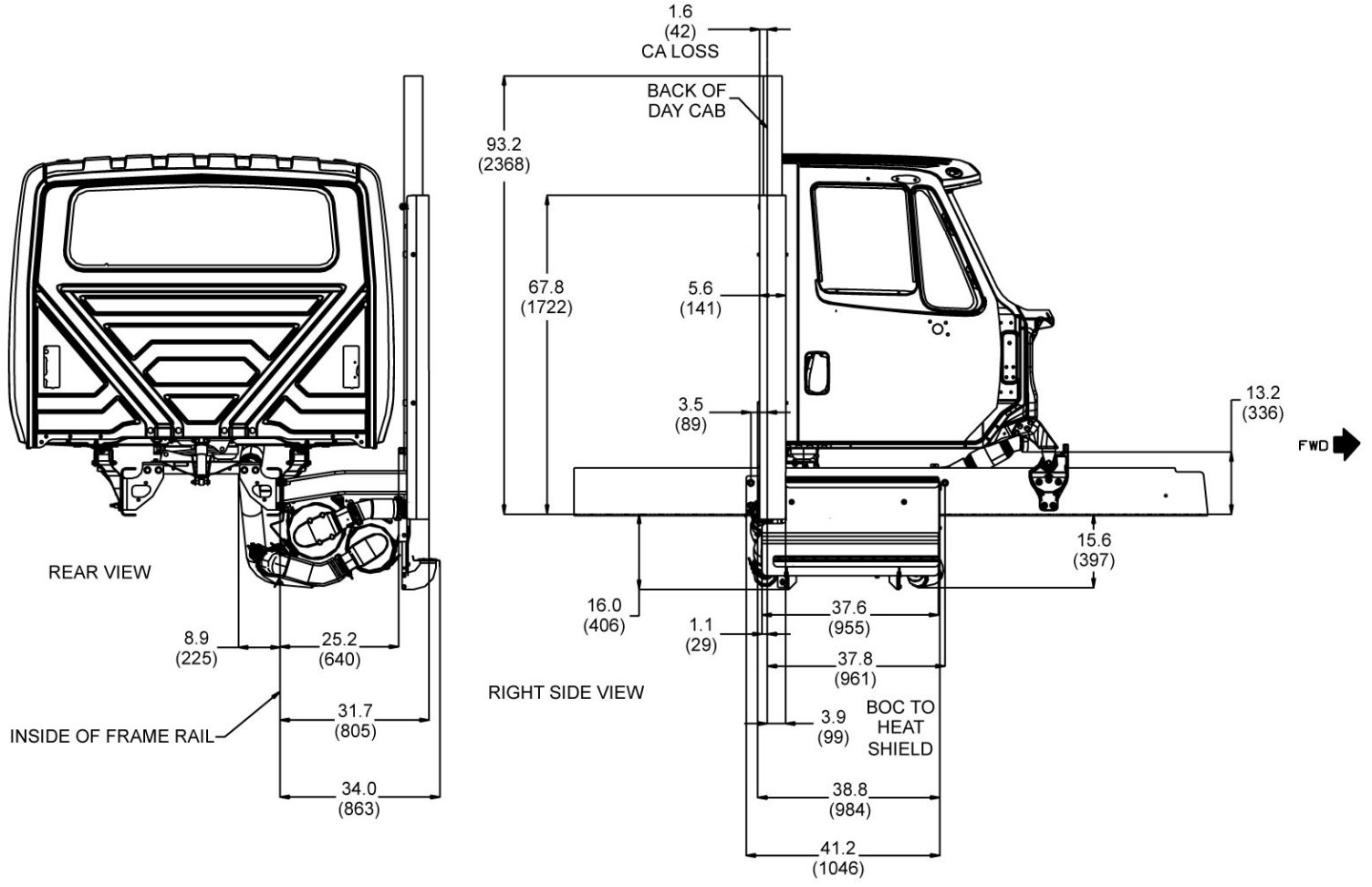
### *07BEM (Crew Cab); Switchback Horizontal with Short Horizontal Tailpipe Mounted Right Side BOC*




durastar_07bem_crew

## *HORIZONTAL AFTERTREATMENT*

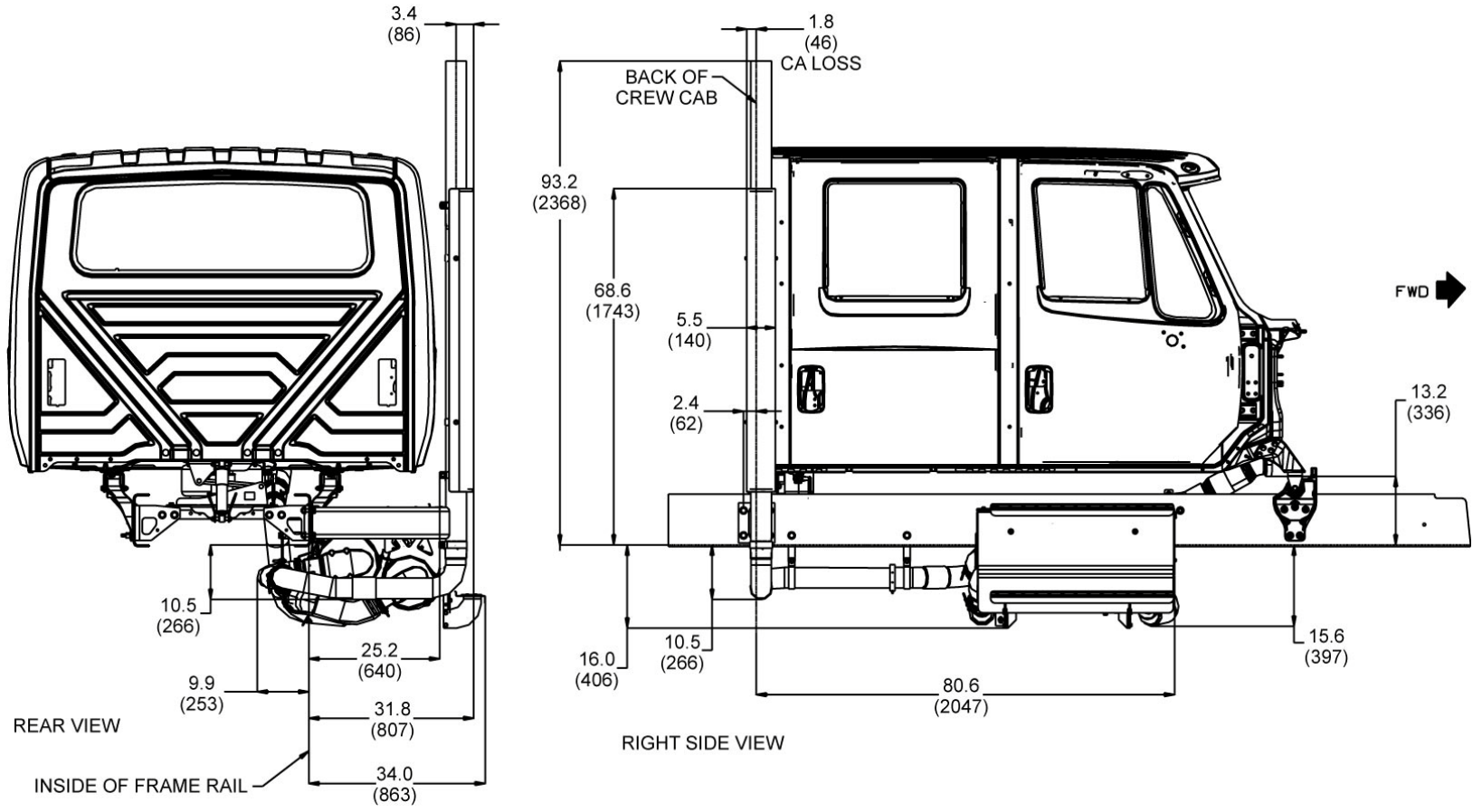
### *07BEP (Day Cab); Switchback Horizontal with Single Vertical Tailpipe Mounted Right Side BOC*




durastar_07bep_day

## *HORIZONTAL AFTERTREATMENT*

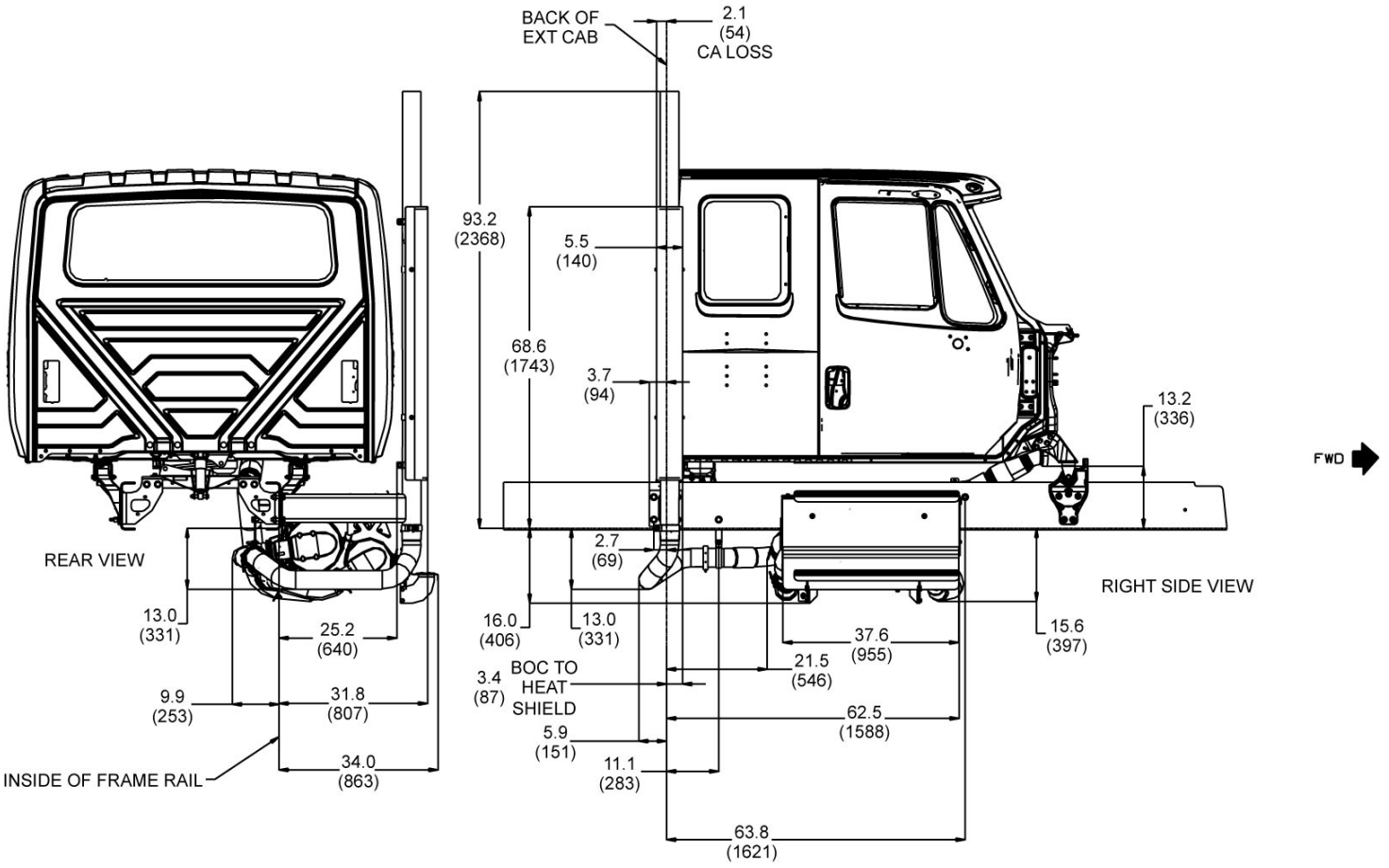
### *07BEP (Crew Cab); Switchback Horizontal with Single Vertical Tailpipe Mounted Right Side BOC*




durastar_07bep_crew

## *HORIZONTAL AFTERTREATMENT*

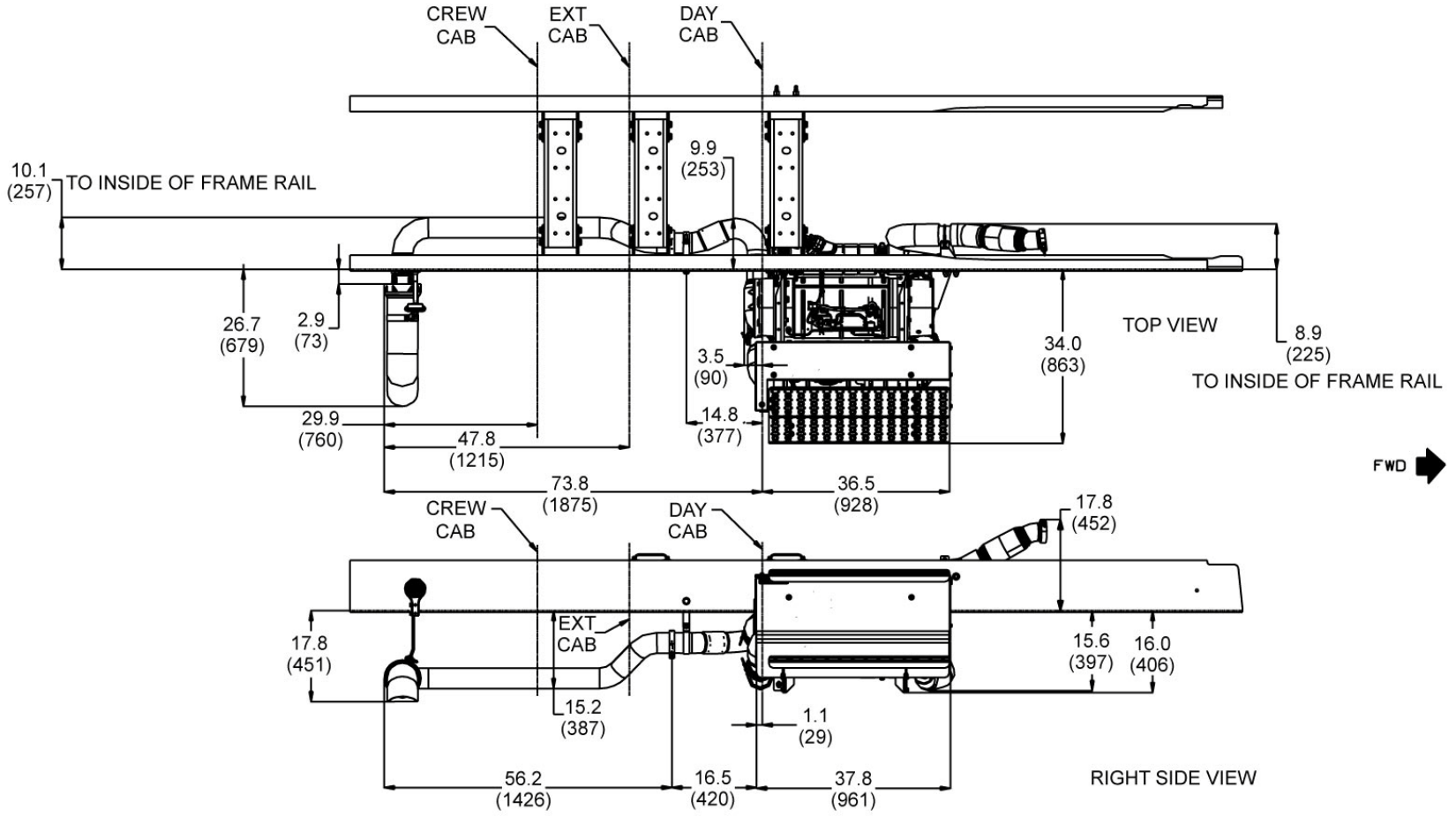
### *07BEP (Extended Cab); Switchback Horizontal with Single Vertical Tailpipe Mounted Right Side BOC*




durastar_07bep_ext

## *HORIZONTAL AFTERTREATMENT*

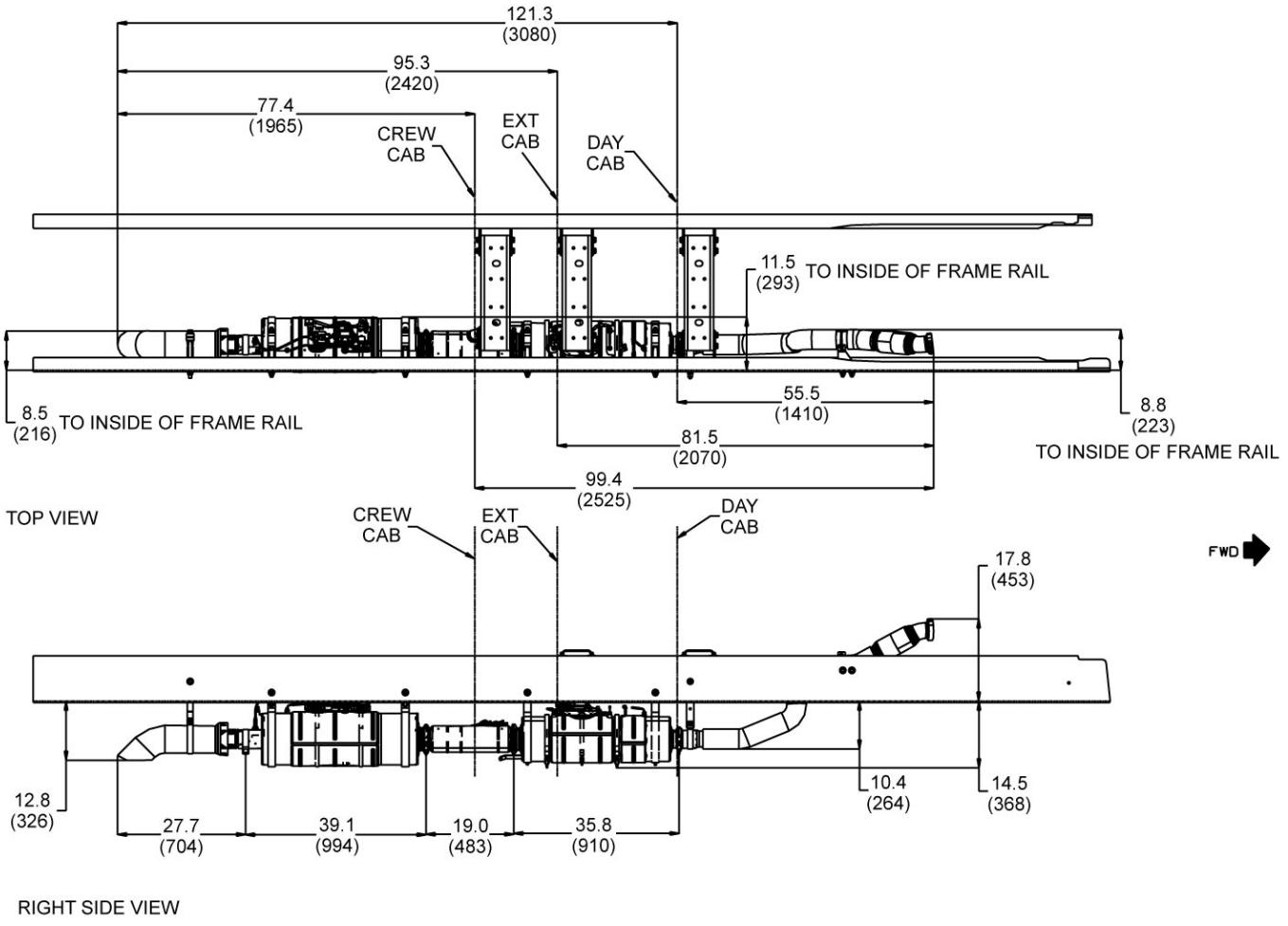
### *07BET; Switchback Horizontal with Long Horizontal Tailpipe Mounted Right Side Under Cab*




durastar_07bet_day_ext_crew

## *HORIZONTAL AFTERTREATMENT*

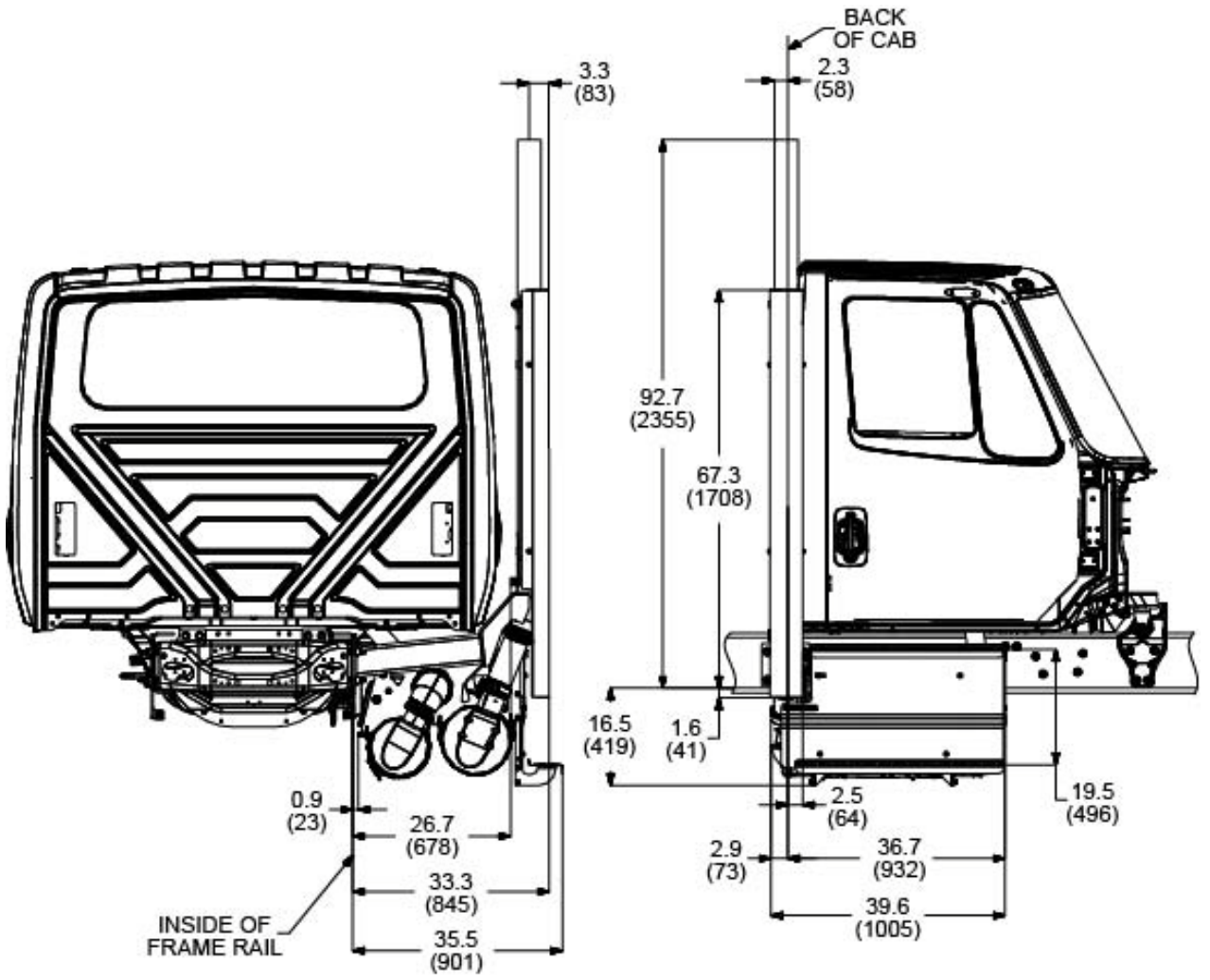
### *07BJY; Inline Horizontal with Short Horizontal Tailpipe Mounted Right Side*




durastar_07bjy_day_ext_crew

## *HORIZONTAL AFTERTREATMENT*

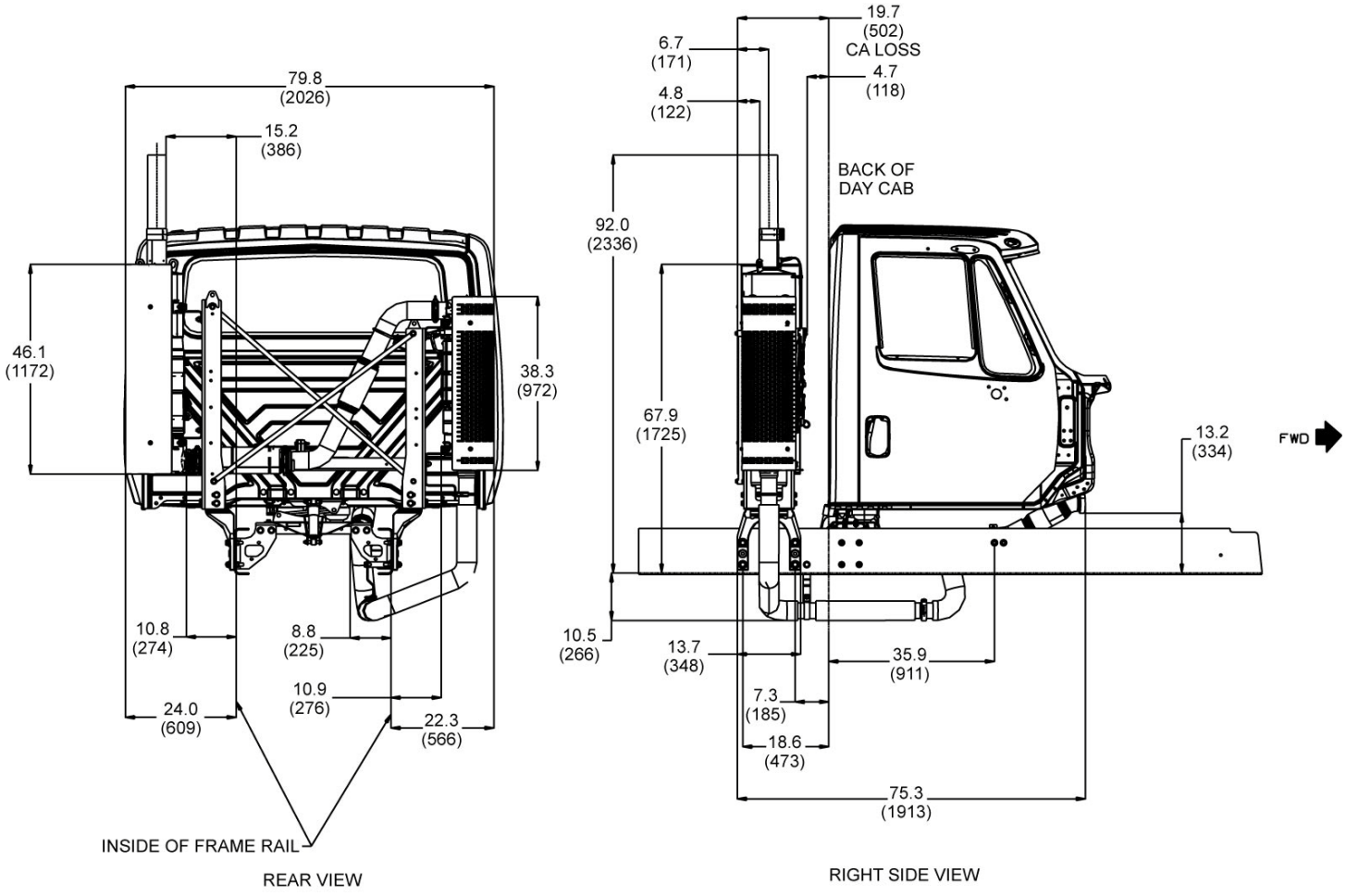
### *07BKM (4300 4x2, Non-LP Models); Inline Horizontal with Short Horizontal Tailpipe Frame Mounted Right Side*




durastar_4300_4x2_07bkm_nonLP

## *VERTICAL AFTERTREATMENT*

### *07BJX (Day Cab); Switchback Vertical with Single Vertical Tailpipe Mounted Left and Right Side*

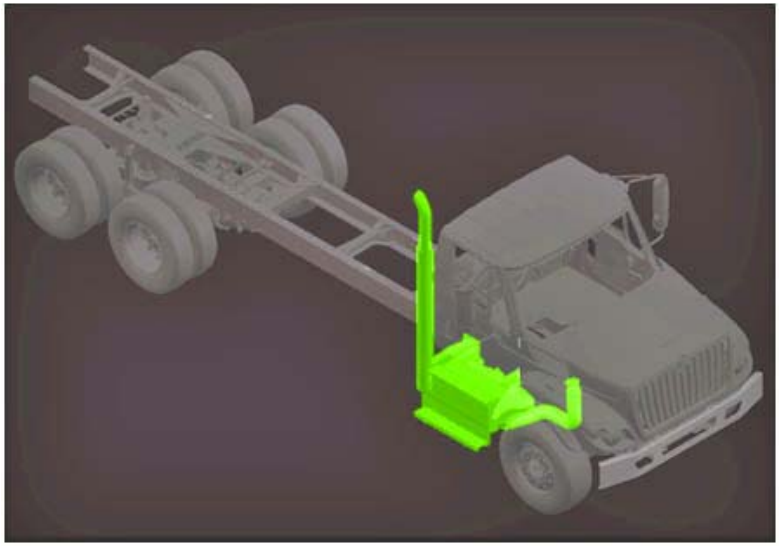



durastar_07bjx_day

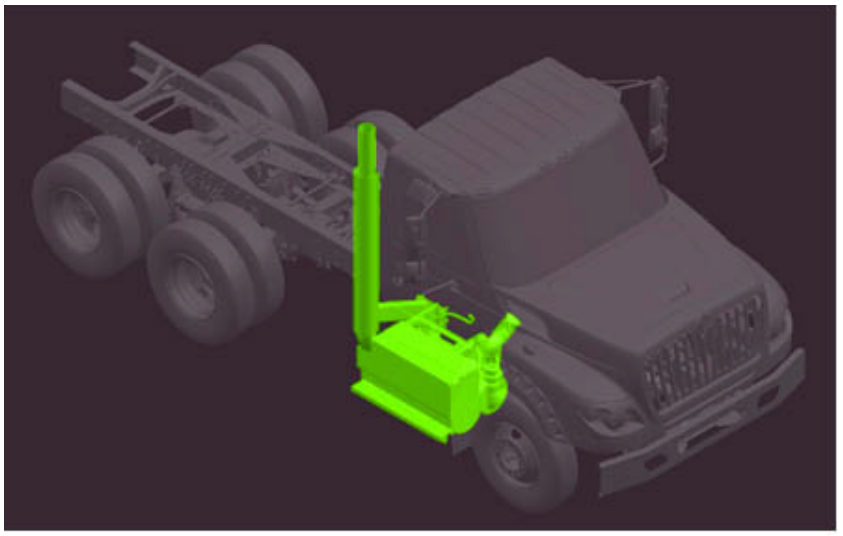
# *GENERAL EXHAUST INFORMATION*

## *SCR Models*

Navistar will offer three main DPF and SCR exhaust systems. A right hand under cab DPF and SCR system (switchback) with horizontal or vertical tailpipes, with both catalyst located underneath the cab access steps. A horizontal DPF and SCR with horizontal or vertical tailpipes, which is installed along the right hand rail. A vertical/vertical independent DPF and SCR located vertically back of cab on stanchion brackets.

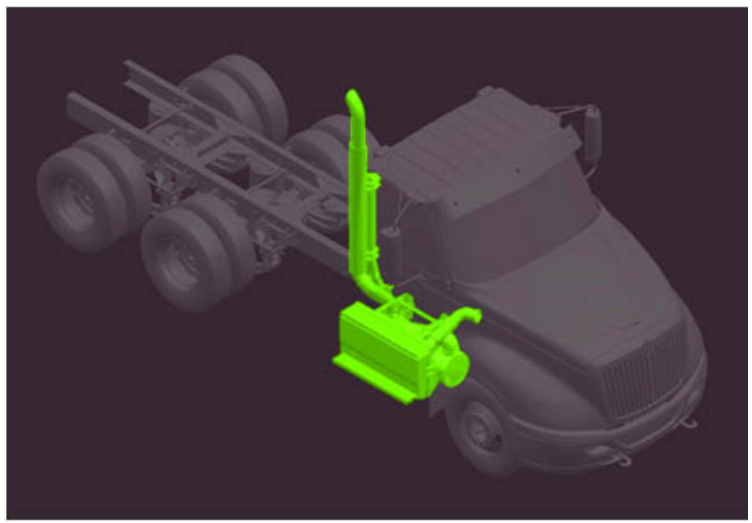


Medium Duty with Switchback with Vertical Tailpipe 15_0210



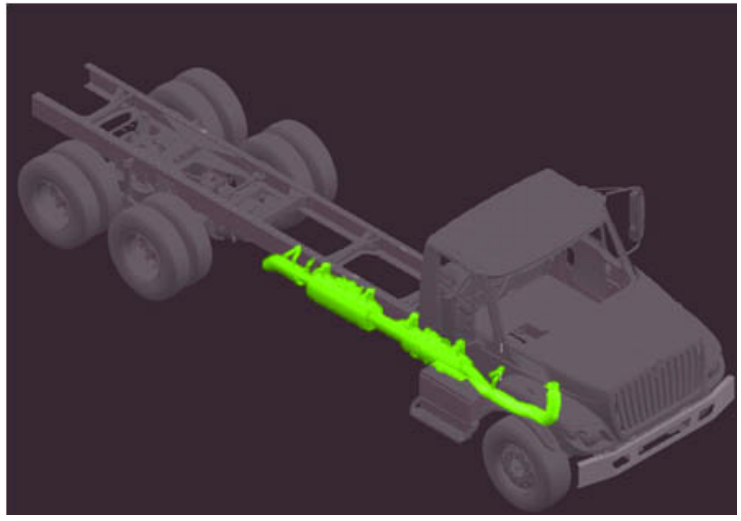
Havy Duty Severe Service with Swichback with Vertical Tailpipe

15_0211



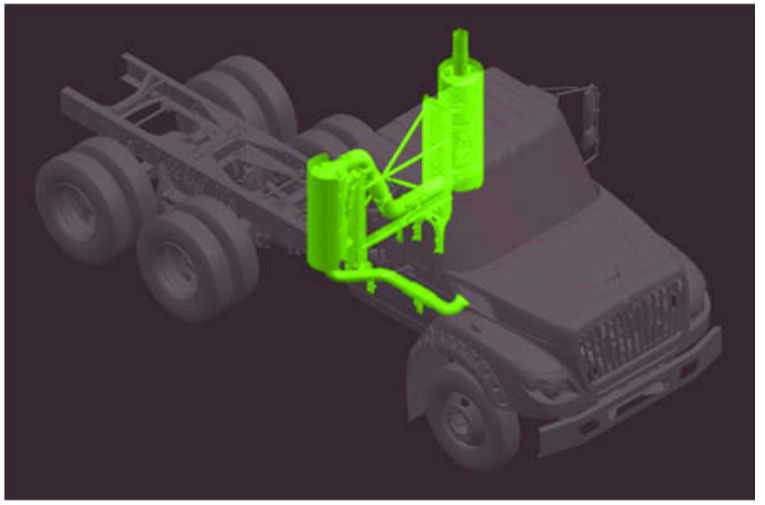
Heavy Duty Line Haul with Switchback with Vertical Tailpipe

15_0212



Medium Duty with Inline with Horizontal Tailpipe

15_0213



Heavy Duty with Vertical Vertical with Vertical Tailpipe 15_0214

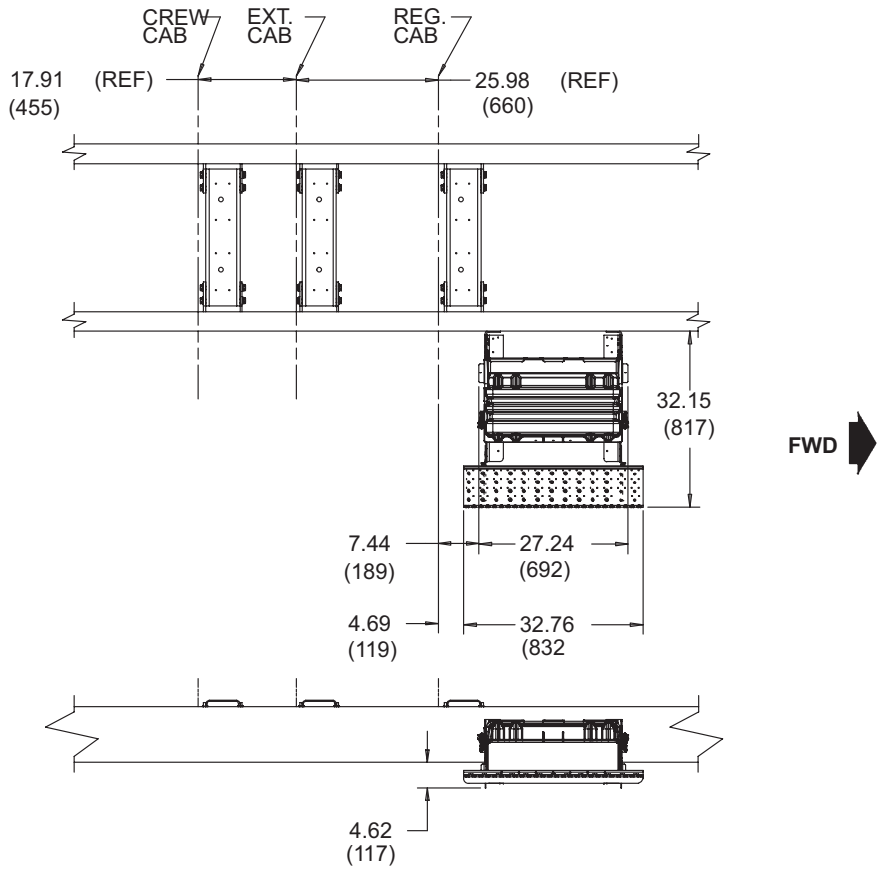
Body Builders **must not** modify (including altering, substituting, and relocating) the DPF/SCR catalyst and the pre DPF/SCR exhaust piping. The downstream SCR catalyst exhaust may be modified, however using smaller diameter piping or piping with numerous bends is not recommend as the backpressure specification of the system may be exceeded causing engine power loss or shutdown.

# ELECTRICAL

## *BATTERY BOX LOCATION (EGR)*

### *All Models*

#### ***Mounted Right Side Under Cab, With Rectangular Style Fuel Tanks***

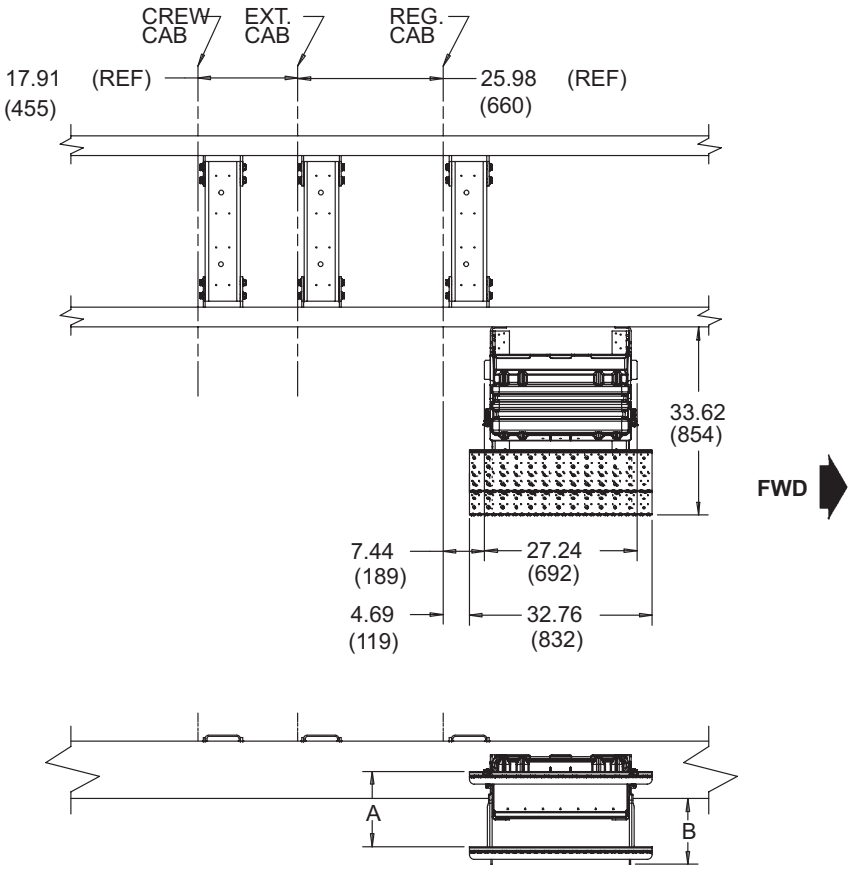



08_0010

# BATTERY BOX LOCATION (EGR)

## All Models

### Mounted Right Side Under Cab, With Rectangular Style Fuel Tanks




08_0011

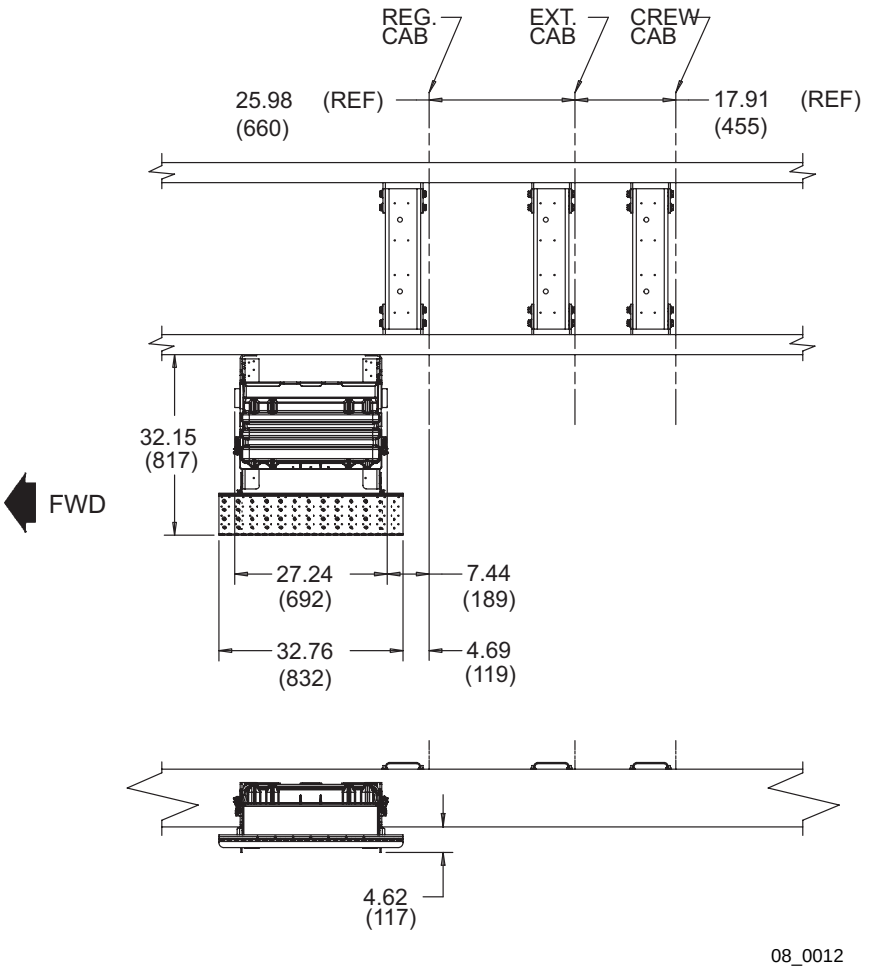
A = 13.47 (342) with “D” Style 50 Gallon Fuel Tanks
16.17 (411) with “D” Style 70 Gallon Fuel Tanks

B = 11.72 (298) with “D” Style 50 Gallon Fuel Tanks
14.42 (366) with “D” Style 70 Gallon Fuel Tanks

## *BATTERY BOX LOCATION (EGR)*

### *All Models*

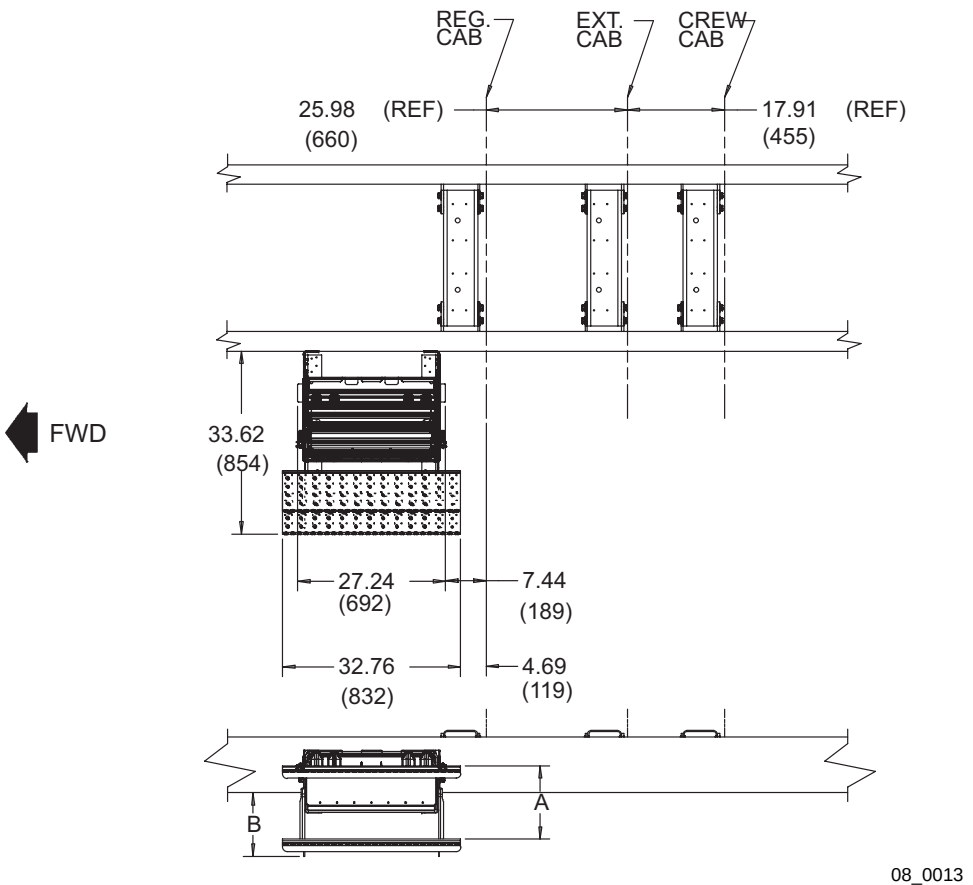
***Mounted Left Side Under Cab, With Rectangular Style Fuel Tanks***



# BATTERY BOX LOCATION (EGR)

## All Models

### Mounted Left Side Under Cab, With "D" Style Fuel Tanks



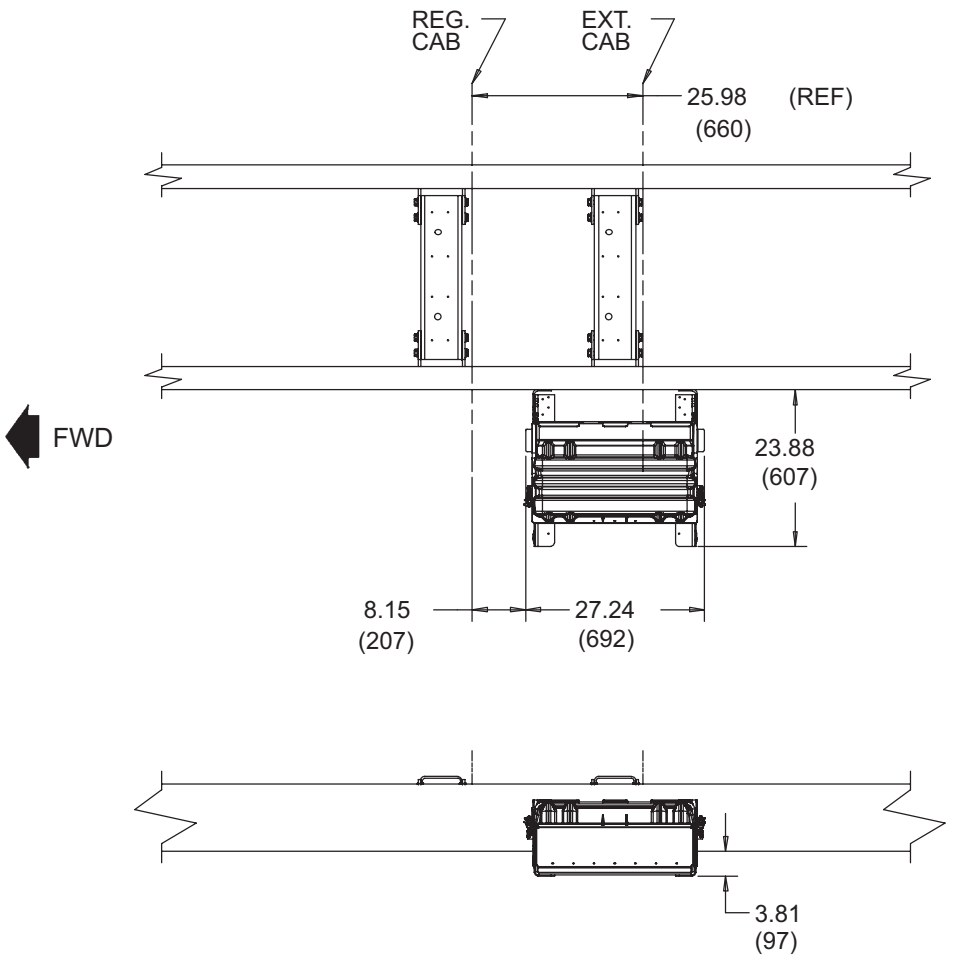

A = 13.47 (342) with "D" Style 50 Gallon Fuel Tanks
16.17 (411) with "D" Style 70 Gallon Fuel Tanks

B = 11.72 (298) with "D" Style 50 Gallon Fuel Tanks
14.42 (366) with "D" Style 70 Gallon Fuel Tank

## *BATTERY BOX LOCATION (EGR)*

### *Day or Extended Cab*

***Mounted Left Side Back of Cab, With Dual Fuel Tanks***

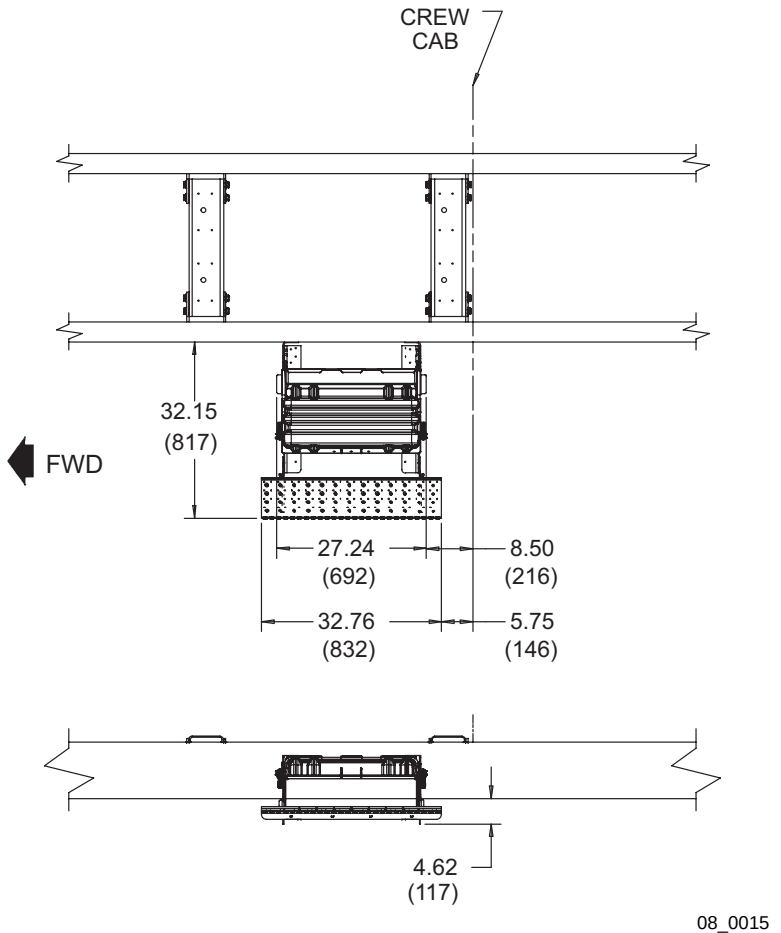



08_0014

# *BATTERY BOX LOCATION (EGR)*

## *Crew Cab*

### ***Mounted Left Side Under Cab, With Rectangular Style Fuel Tanks***

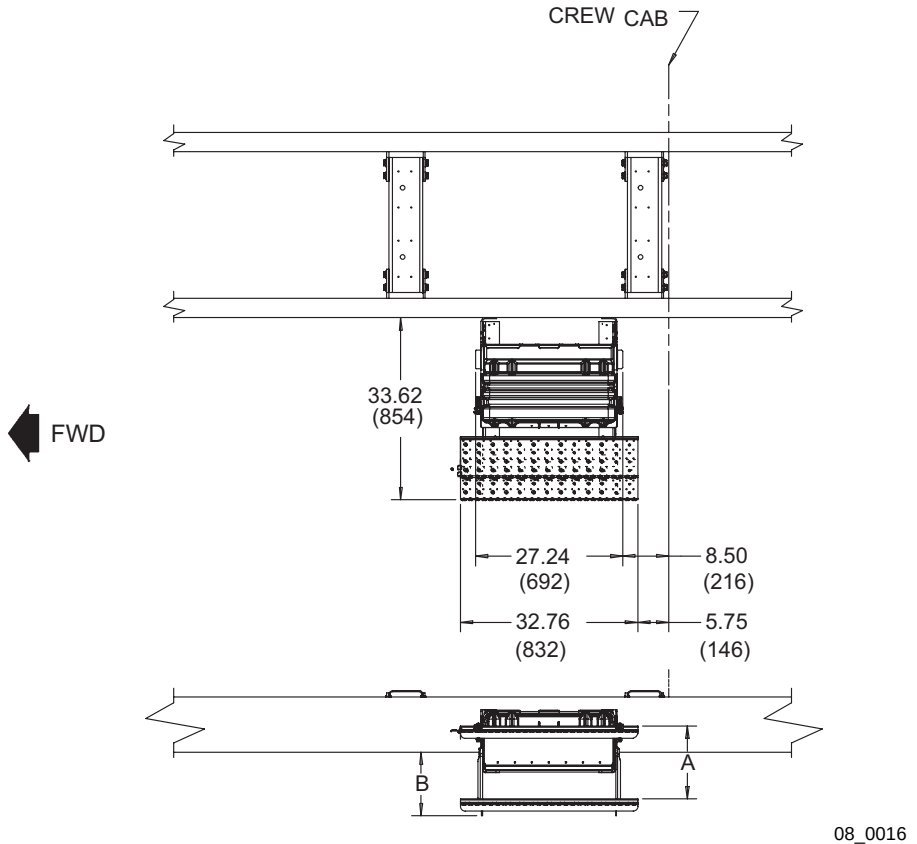



08_0015

## *BATTERY BOX LOCATION (EGR)*

### *Crew Cab*

#### ***Mounted Left Side Under Cab, With "D" Style Fuel Tanks***



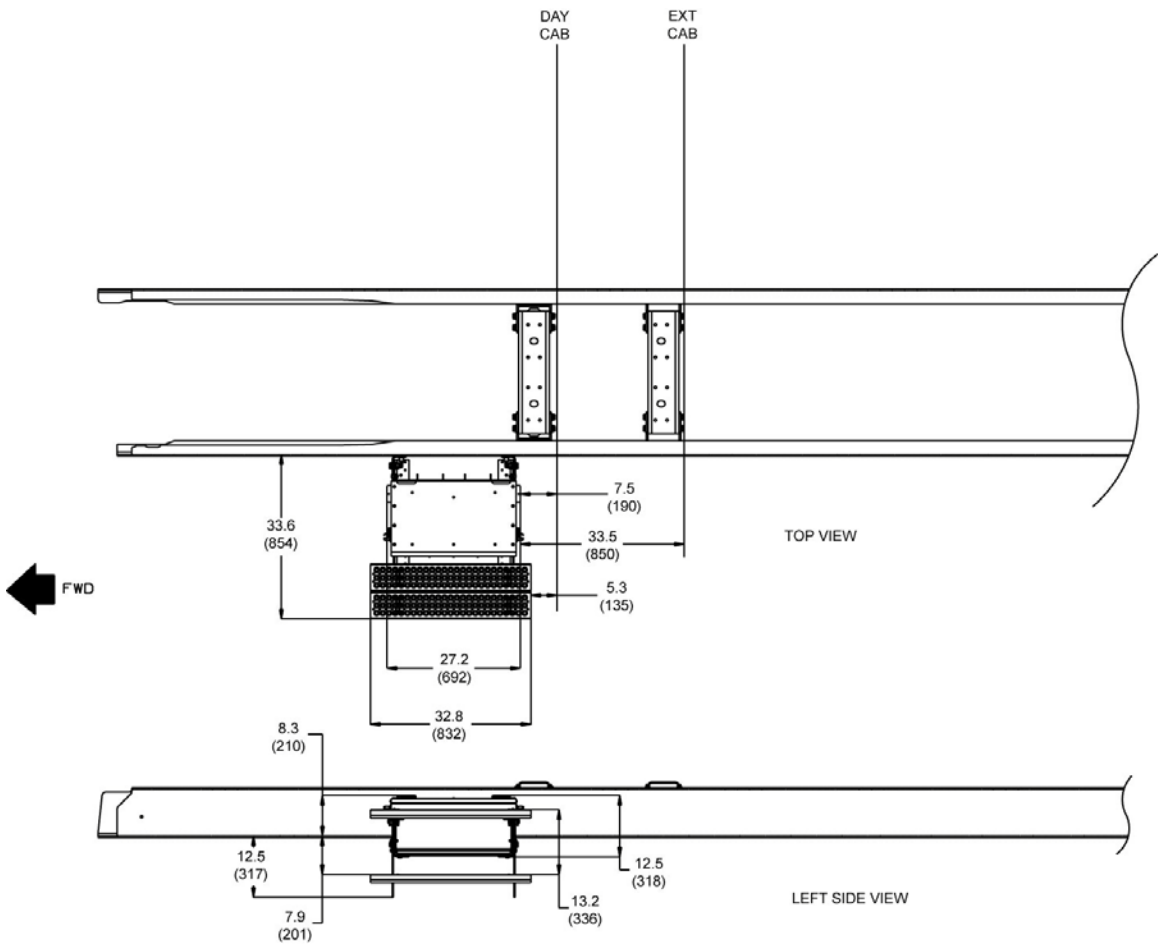

A = 13.47 (342) with "D" Style 50 Gallon Fuel Tanks
16.17 (411) with "D" Style 70 Gallon Fuel Tanks

B = 11.72 (298) with "D" Style 50 Gallon Fuel Tanks
14.42 (366) with "D" Style 70 Gallon Fuel Tanks

# BATTERY BOX LOCATION (SCR)

## Day and Extended Cab

### *Mounted Left Side Under Cab, 25” Wide, 2 or 3 Battery Capacity (08VTJ)*

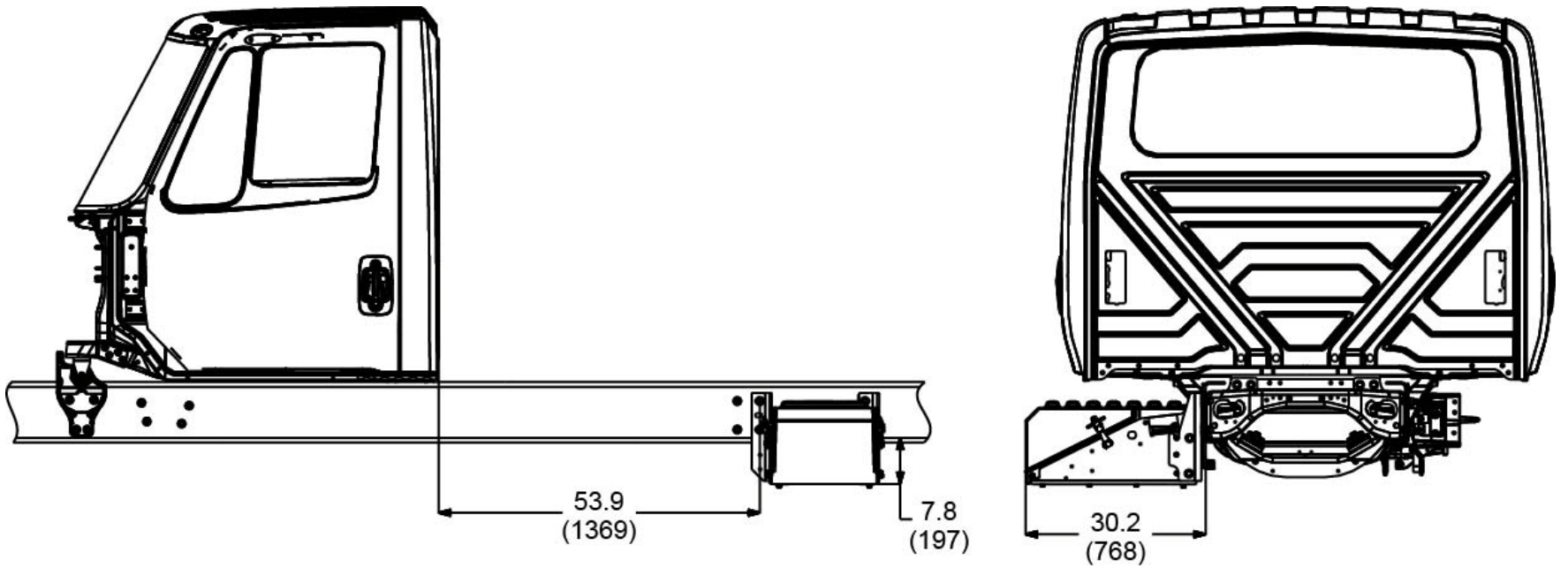



durastar_08vtj_day_ext_top_side_view

## *BATTERY BOX LOCATION (SCR)*

### *4300 4x2 (non LP)*

***Mounted 53" Back of Cab, Left Side Perpendicular to Frame Rail (08VUN)***

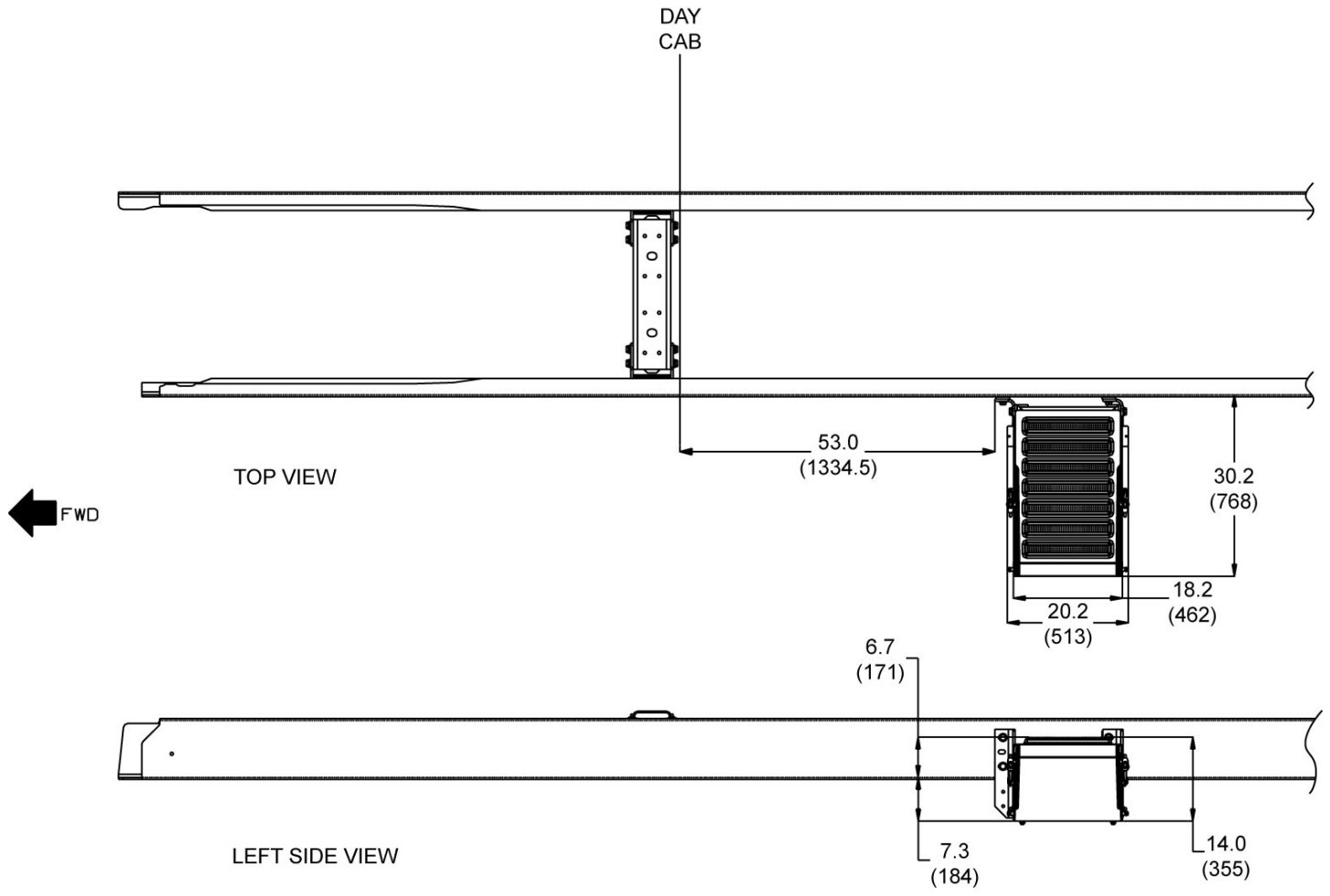



durastar_08vtj_day_ext_top_side_view

# *BATTERY BOX LOCATION (SCR)*

## *Day Cab*

### ***Mounted 53" Back of Cab, Left Side Perpendicular to Frame Rail (08WJJ)***

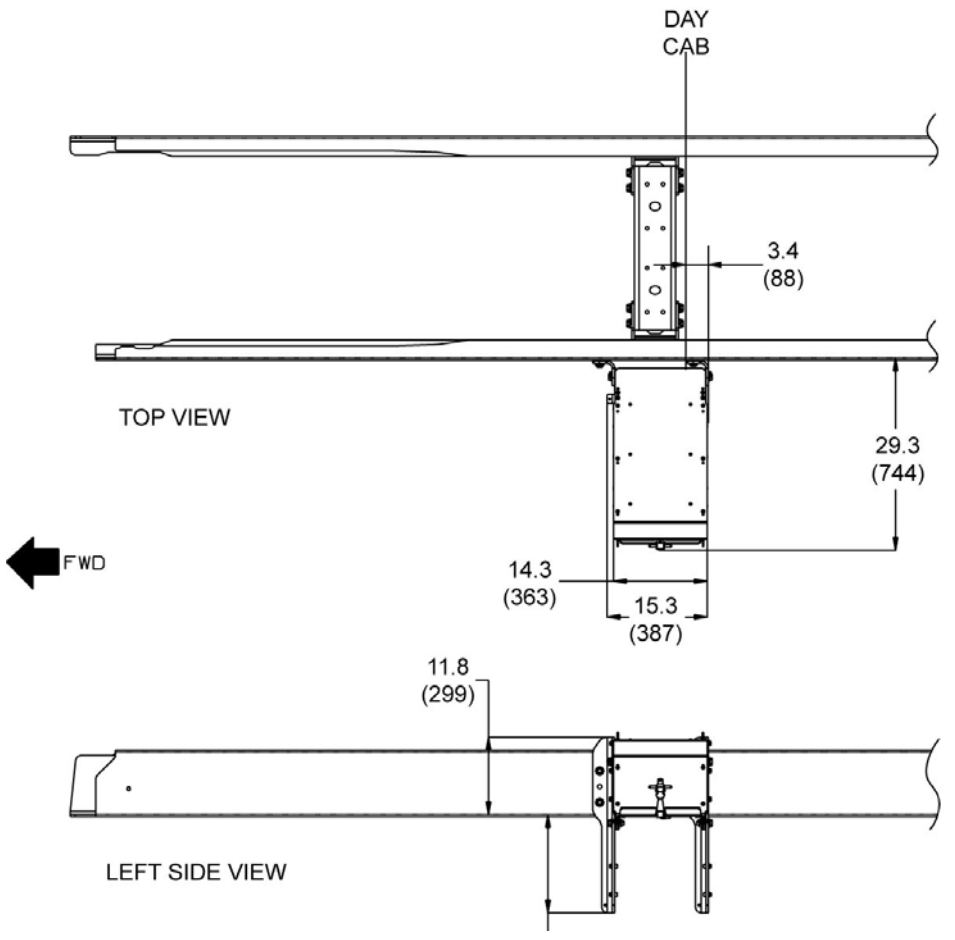



durastar_08wjj_day_cab_top_&_left_view

## *BATTERY BOX LOCATION (SCR)*

### *Day Cab*

***Mounted Left Side Under Cab, 14" Wide, 3 Battery Capacity (08XDU)***



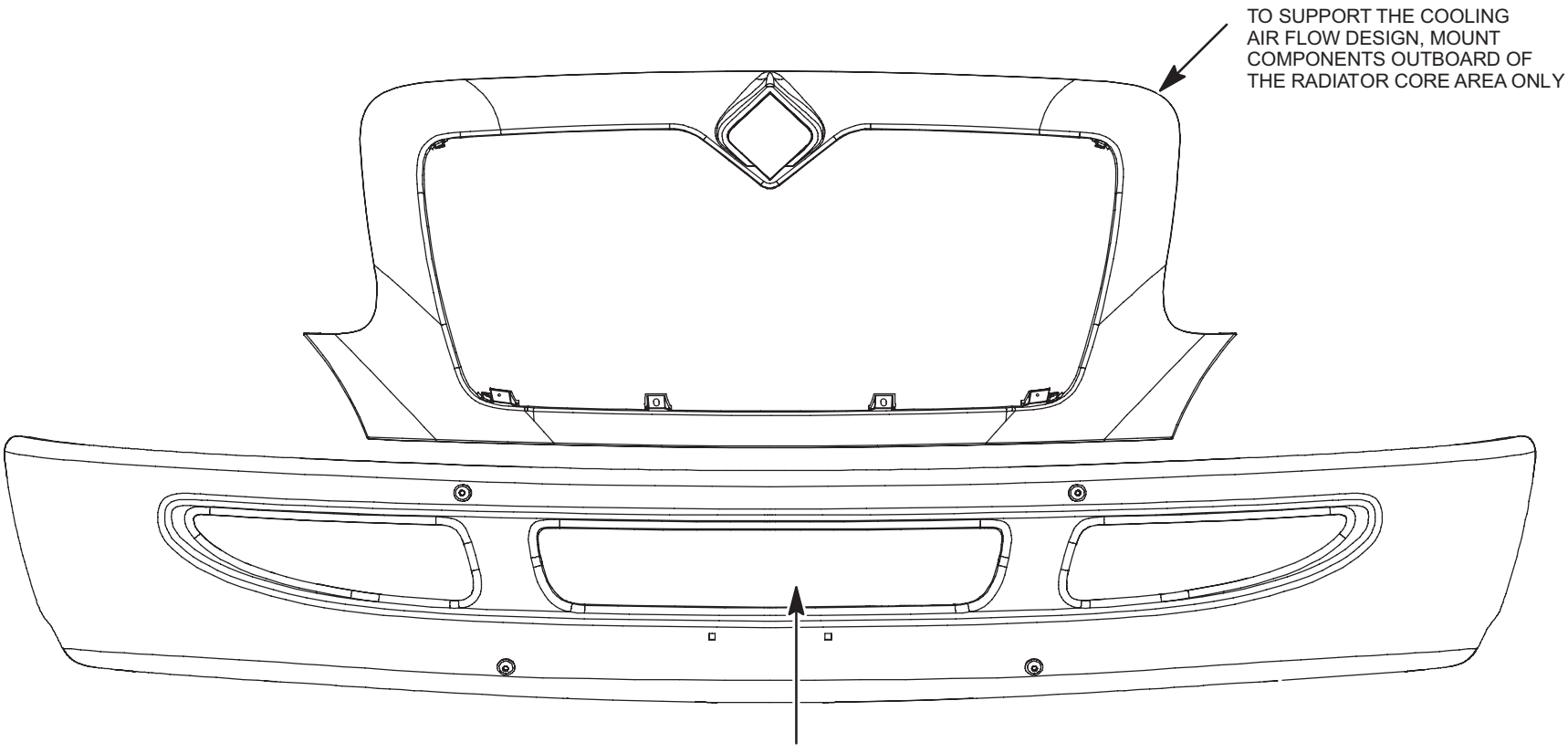

durastar_08xdu_day_cab_top_&_left_view

## *SCR ELECTRICAL CIRCUIT DIAGRAMS*

For electrical body builder integration, refer to Publication S8323, Electrical Systems Service Manual Body Builder.

## *COOLING OBSTRUCTION GUIDELINES*

### *All Models*

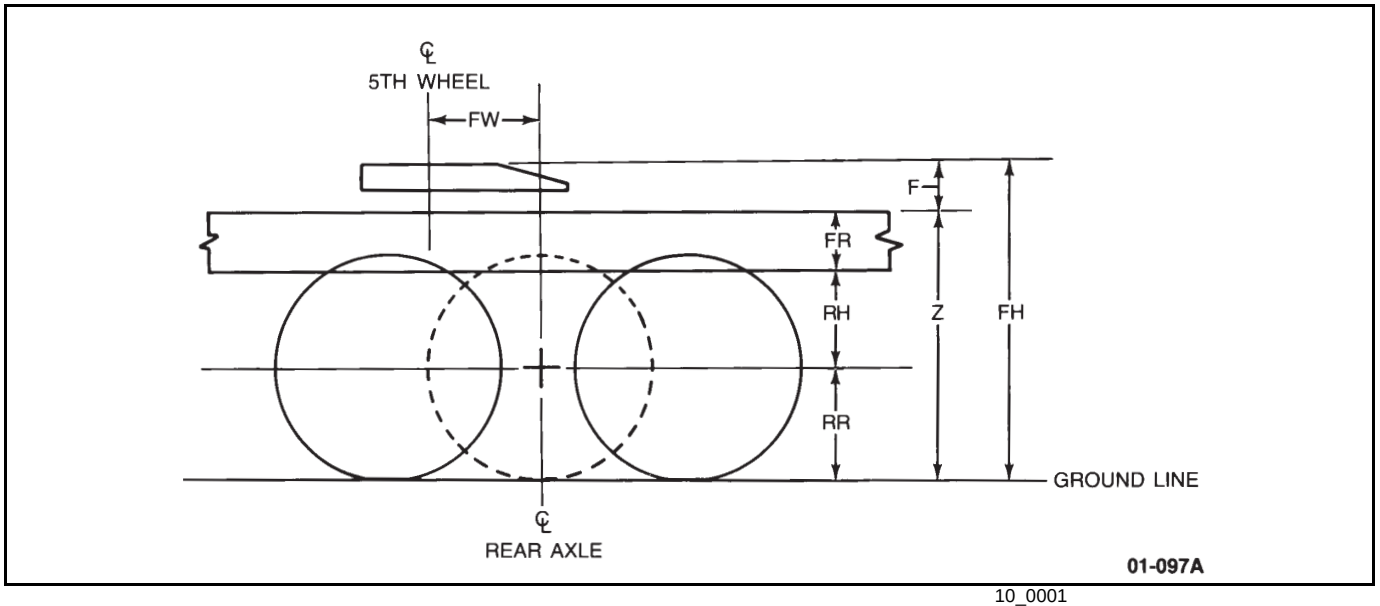



08_0024

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# FIFTH WHEEL

## *FIFTH WHEEL HEIGHT CALCULATIONS*




10_0001

Calculate the fifth wheel height (measured from the ground) using the following formula:

| FH = Z + F |
|---|

(for unloaded chassis)

where:

= Fifth Wheel Height (from ground to top of 5th wheel) - RR + RH + FR + F

= Frame Height (@ centerline oFf rear axle with an unloaded chassis)

= Distance from the top of the frame rails to the top of the fifth wheel

= Frame Rail – Overall Height

= Ride Height of Rear Suspension

= Rolling Radius

## *FIFTH WHEEL MOUNTING INFORMATION*

Outlined below are recommended guidelines for installation of fifth wheels on vehicles. The more common combinations of frame, suspension, fifth wheel and fifth wheel offset dimensions are covered in this section. For mounting applications not covered in this section, refer to the fifth wheel manufacturer for installation instructions.

**NOTE: It must be recognized that the ultimate responsibility for the durability and security of the fifth wheel mounting lies with the installer/user. Therefore, the installer/user is cautioned to consult the fifth wheel manufacturer's installation recommendations and whatever legal requirements and regulations are applicable.**

It is also the responsibility of the installer/user to make sure that the vehicle frame is adequate for the fifth wheel offset location from the centerline of the single rear axle (4 x 2 vehicles) or tandem rear axle (6 x 4 vehicles).

### Precautions

As with any after-market modification, care must be taken when installing a fifth wheel. The following precautions must be taken when installing a fifth wheel.

**CAUTION:** Do not weld or drill the top or bottom flanges of the vehicle frame. Welding or drilling the flanges will severely weaken the frame.

Do not drill frame sidemember(s) other than as specified in “FRAMES - Drilling or Notching”.

Fifth wheel attachments must not be welded directly to the sidemember.

### Maintenance

The fifth wheel should be properly maintained to ensure proper operation. The following is a general guideline for maintaining the fifth wheel.

1. Always keep the track of sliding fifth wheels as clean as possible.

Periodically lubricate all moving parts of fixed and sliding fifth wheels.

2. Inspect fifth wheel for proper operation.
3. Inspect fifth wheel for damaged or missing parts. Replace as required.
4. Be sure all bolts retaining fifth wheel assembly to vehicle frame are properly tightened.

## Replacement

### *REMOVE*

1. Remove all bolts retaining fifth wheel to mounting angle.
2. Remove fifth wheel assembly from vehicle frame.

### *INSTALL*

1. Position fifth wheel assembly on mounting angles. Be sure to properly align bolt holes in angle bracket to fifth wheel.
2. Install all retaining bolts and tighten to the specified torque.

## Mounting

### *MOUNTING ANGLES*

The use of mounting angles to mount the fifth wheel to the vehicle frame is recommended. Mounting angles provide for more direct transfer of the load to the frame sidemembers for better stress distribution. Some fifth wheels incorporate integral mounting angles as part of the fifth wheel assembly.

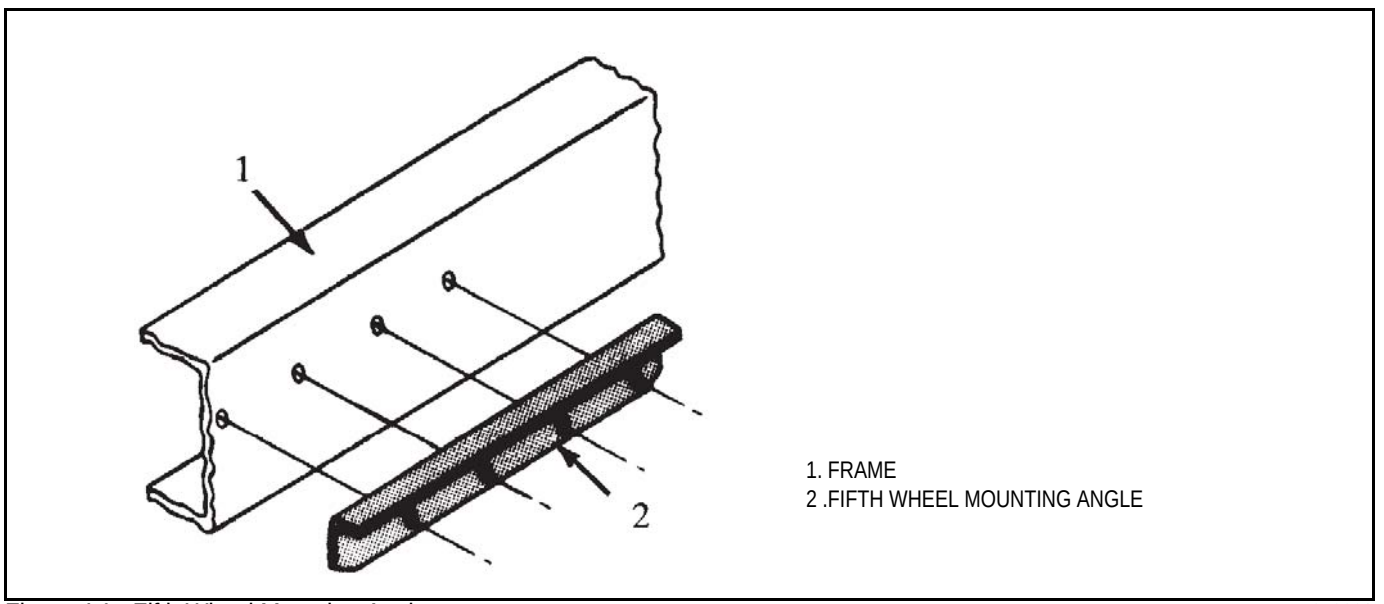



Figure 4.1 Fifth Wheel Mounting Angle 10_0002

Mounting angles must be made of steel conforming to SAE J410, grade 965X, 0.312 inch (8 mm) thick; or ASTM A572, grade 50, 0.38 inch (9.6 mm) thick; or conform to fifth wheel manufacturer's specifications that cover your particular circumstances.

It is permissible to cut mounting angles to provide clearance for spring mounting brackets, etc. Cutouts in the vertical flanges of the mounting angles should be minimized in number and size. Cutouts must be rounded at the inside corners. Inner radii of cutouts should be 0.5 inch (13 mm) minimum; 0.75 inch (19.0 mm) radii are preferred.

To make cutouts in mounting angles, drill holes at radii of cutouts. Then, saw or torch cut to remove remaining material. Cut edges should be ground smooth.

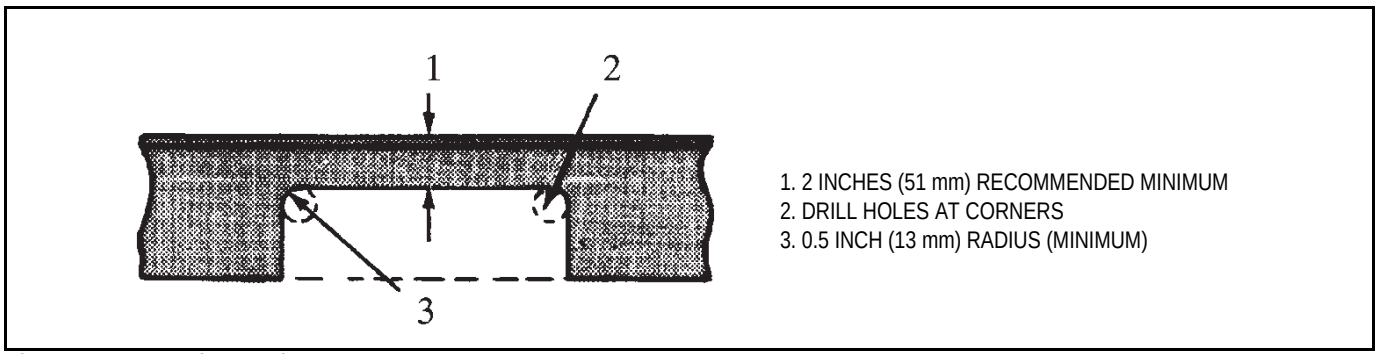



Figure 4.2 Mounting Angle Cutout 10_0003

Some vehicles have spring mounting brackets designed to permit installation of fifth wheel mounting angle between the spring bracket and vehicle frame. Remove factory installed spacers to install mounting angles. Re-tighten bolts as specified in the Torque Chart.

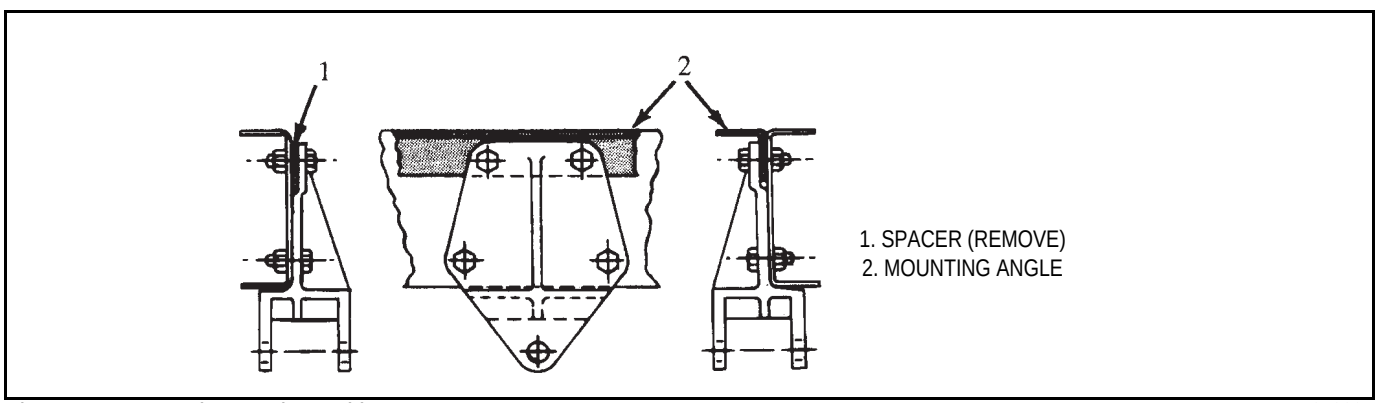



Figure 4.3 Mounting Angle Position 10_0004

Mounting angles should be secured to frame sidemembers using quantity and spacing of bolts as determined by following the guidelines provided in this section.

## *MOUNTING BOLTS*

The use of phosphate and oil coated SAE Grade 8 flanged fasteners is recommended. Where flanged fasteners are not available, the use of hardened steel flat washers under bolt head and nut is recommended.

Where locations of mounting bolts are limited by cutouts, the new bolt pattern should conform as closely as possible to recommendations in terms of number of fasteners, edge distances and spacings.

For horizontal bolt applications (mounting angle-to-frame sidemember), use 5/8-inch (16 mm) diameter bolts. Tighten nuts as specified in the “Bolt Torque Chart (Phosphate and Oil Coated)” (Table 4.1).

For vertical bolt applications (fifth wheel-to-mounting angle, fifth wheel-to-support plate, fifth wheel-to-cross tie, cross tie-to-mounting angle), use 3/4-inch (19 mm) diameter bolts. These bolts must be flanged head or hex head with hardened flat washers. Tighten nuts as specified in “Bolt Torque Chart (Phosphate and Oil Coated)” (Table 4.1).

**NOTE:** Some sliding and fixed fifth wheels are designed to use 5/8-inch (16 mm) diameter vertical bolts. These are acceptable where specified by design.

Care must be taken to prevent fretting (chafing) damage to frame top flange by sharp edges on fifth wheel mounting parts. Figure 4.4 illustrates methods of preventing fretting (chafing) damage at leading and trailing edges. These methods include:

1. Chamfering the edges of fifth wheel mounting parts contacting frame top flange.
2. Use of a “flex-lip” to gradually diminish contact forces.

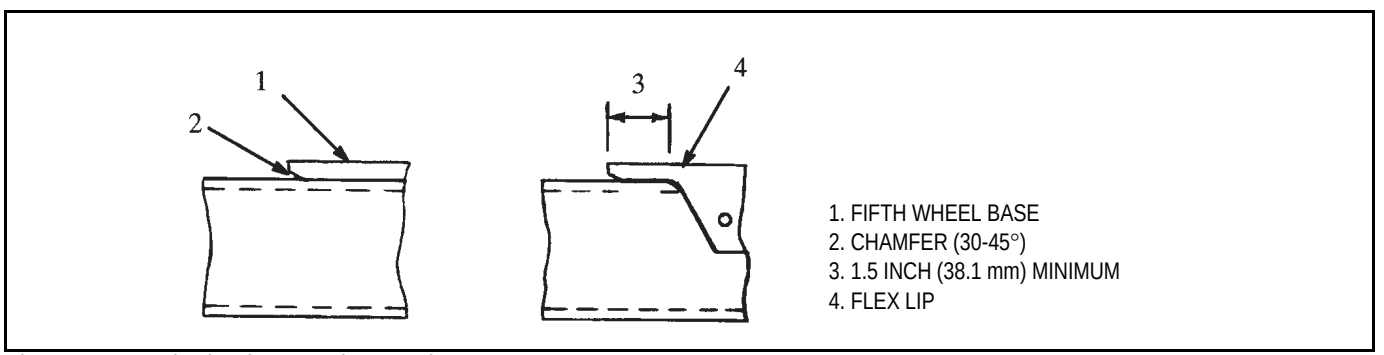



Figure 4.4 Methods of Preventing Fretting Damage 10_0005

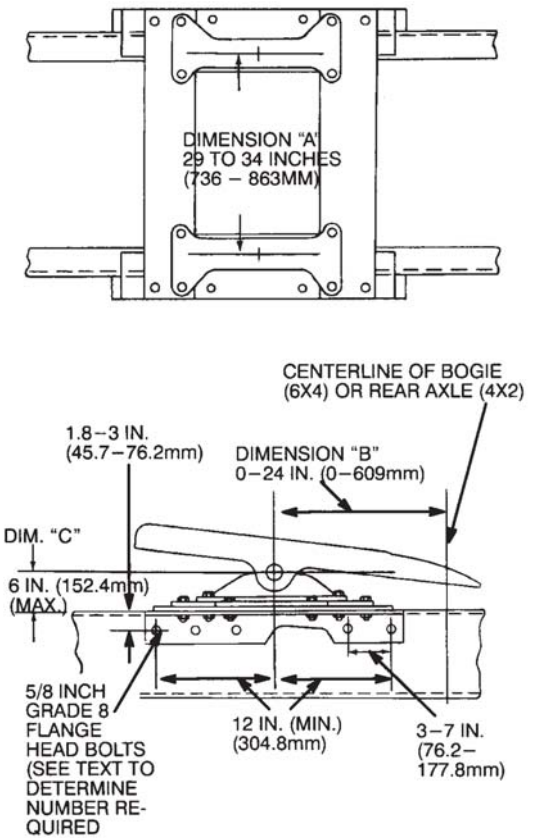
Fifth wheel and mounting parts should be positioned on the vehicle frame to provide maximum contact between the parts which transfer the vertical load onto the upper flange of the frame. Clamp to assure contact before tightening bolts.

## Fixed (Non-Sliding) Fifth Wheels

Typical installations of fixed (non-sliding) fifth wheels are illustrated in Figure 4.5, Figure 4.6, Figure 4.7, Figure 4.8, Figure 4.9, and Figure 4.10.

Mounting angles should be secured to frame sidemembers with a minimum of five bolts per side with bolt spacing as shown in Figure 4.5.

Recommended fixed fifth wheel mounting dimension limits are shown in Figure 4.5. These limits are as follows:




Dimension "A"
(Trunnion centerline spacing) 29 to 34 inches (736 to 863 mm).
Dimension "B"
(Fifth wheel offset with respect to rear axle or tandem rear axle centerline) 0 to 24 inches (0 to 609 mm).
Dimension "C"
(Fifth wheel pivot height above frame) 6 inches (152.4 mm) maximum.

Figure 4.5 Fixed Fifth Wheel Mounting Dimension Limits (Typical)

10_0006

## Fixed (Non-Sliding) Fifth Wheels (Continued)

Be sure to refer to the segments in this section for mounting angle and cutout information, bolt sizes and torque specifications and corrosion protection on aluminum frames.

**Failure to follow the recommended procedures in this section may result in damage to the vehicle frame and possible injury to the operator.**

For vehicle frame assemblies without bogie gussets or “C” channel frame reinforcements, install a set of flat cross ties as shown in Figure 4.6 and Figure 4.7.

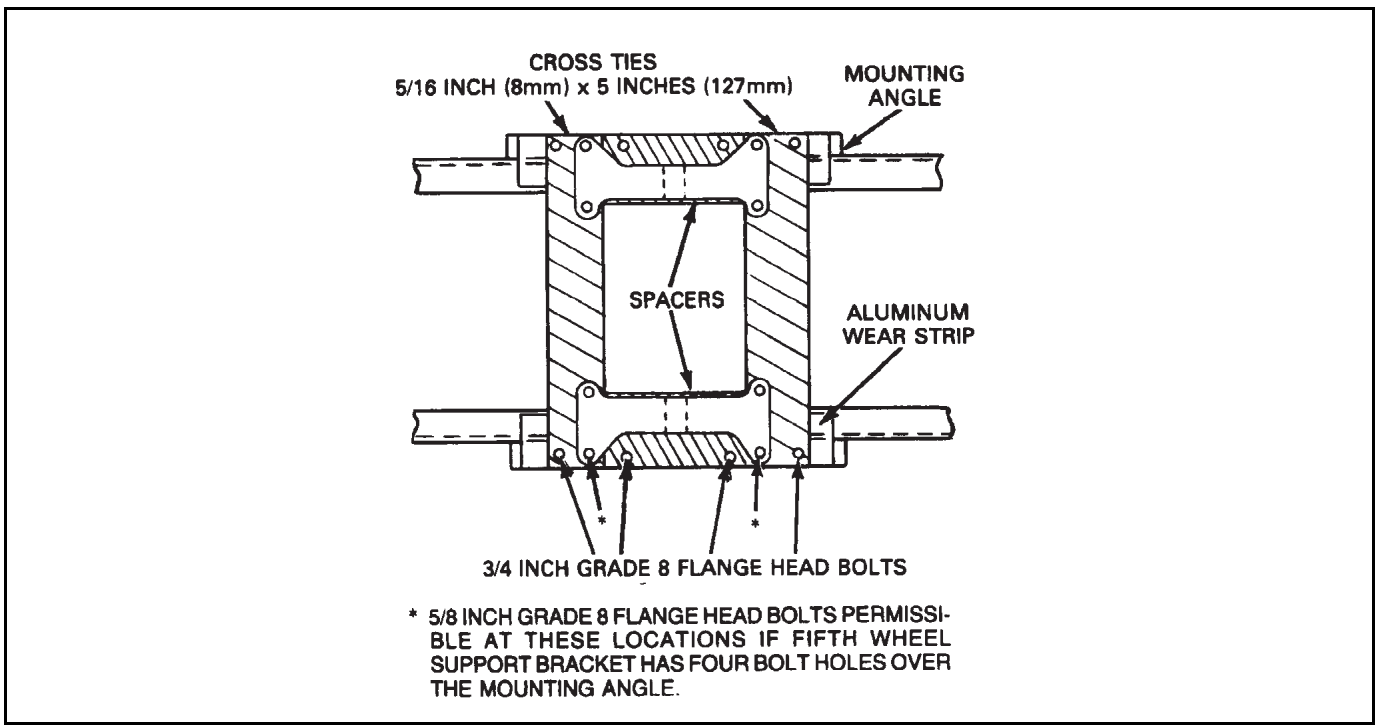



Figure 4.6 Cross Tie Installation (Typical)

10_0007

Fixed (Non-Sliding) Fifth Wheels (Continued)

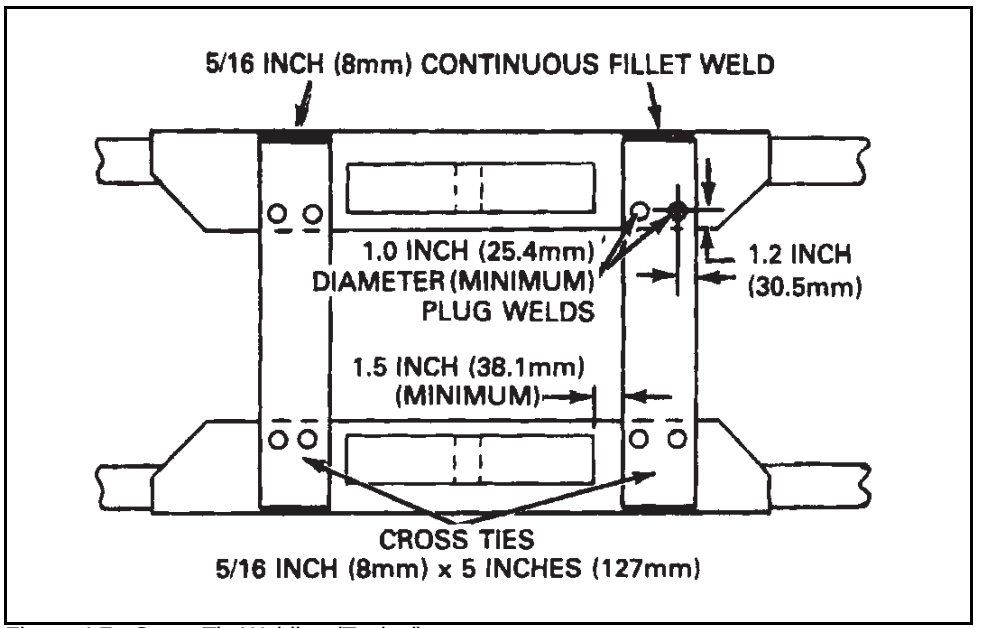



Figure 4.7 Cross Tie Welding (Typical) 10_0008

For bolted base type fifth wheels, bolt the cross ties and spacers as shown in Figure 4.6. For fifth wheels with integral mounting angle, weld the cross ties as shown in Figure 4.7.

Cross ties should be a minimum of 0.31 inch (8.0 mm) thick x 5 inches (127 mm) wide. Recommended material is 0.31 inch (8.0 mm) thick HSLA 80,000 PSI yield material (SAE 980X).

For bolted base type fifth wheels, a single flat plate or a corrugated plate can be used instead of cross ties. The flat plate should have the bolt pattern shown in Figure 4.8 (top view). The corrugated plate should be installed as shown in Figure 4.8.

For vehicle frame assemblies which have bogie gussets (such as a typical Hendrickson suspension) many fifth wheel installations may be made without cross ties as shown in Figure 4.9 and Figure 4.10. Cross ties may be required in some cases, as indicated.

Fixed (Non-Sliding) Fifth Wheels (Continued)

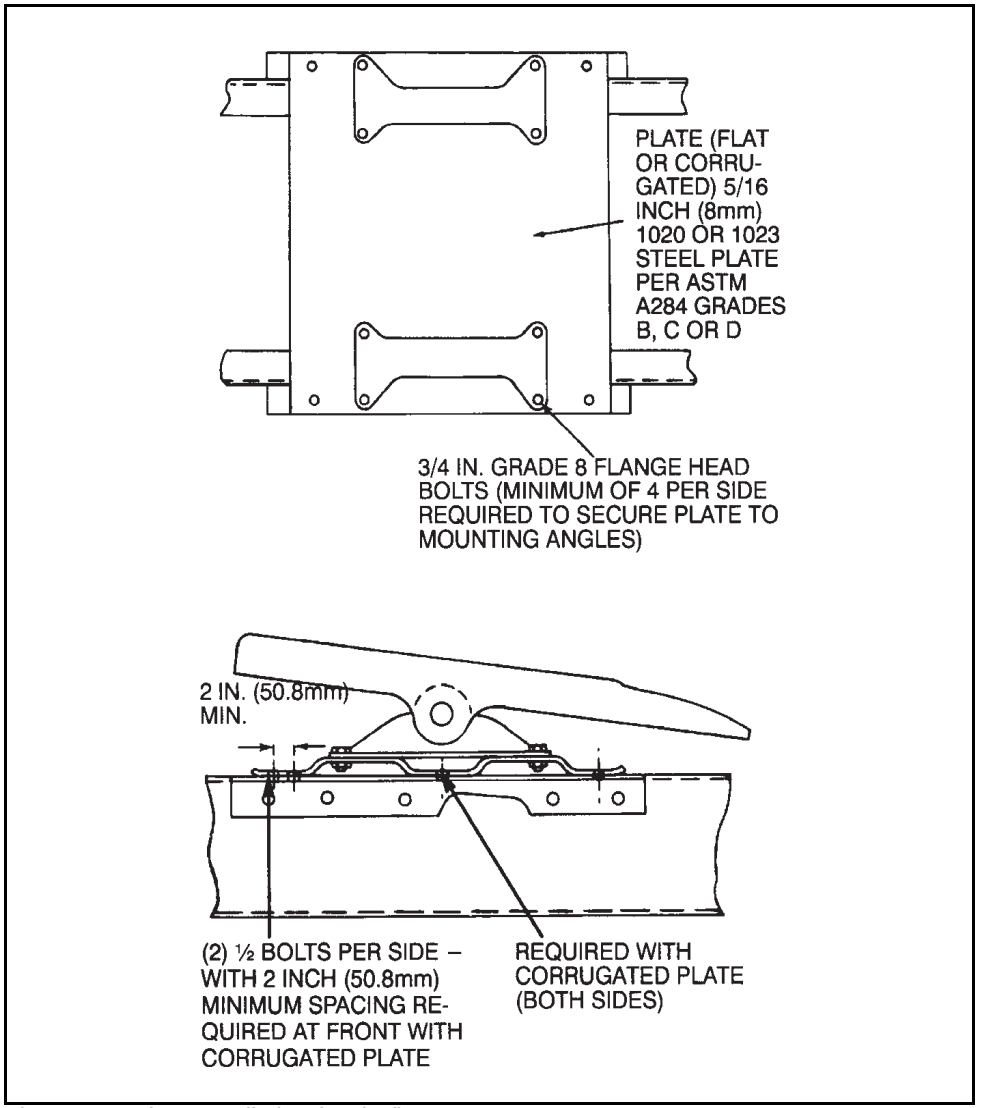



Figure 4.8 Plate Installation (Typical)

10_0009

Fixed (Non-Sliding) Fifth Wheels (Continued)

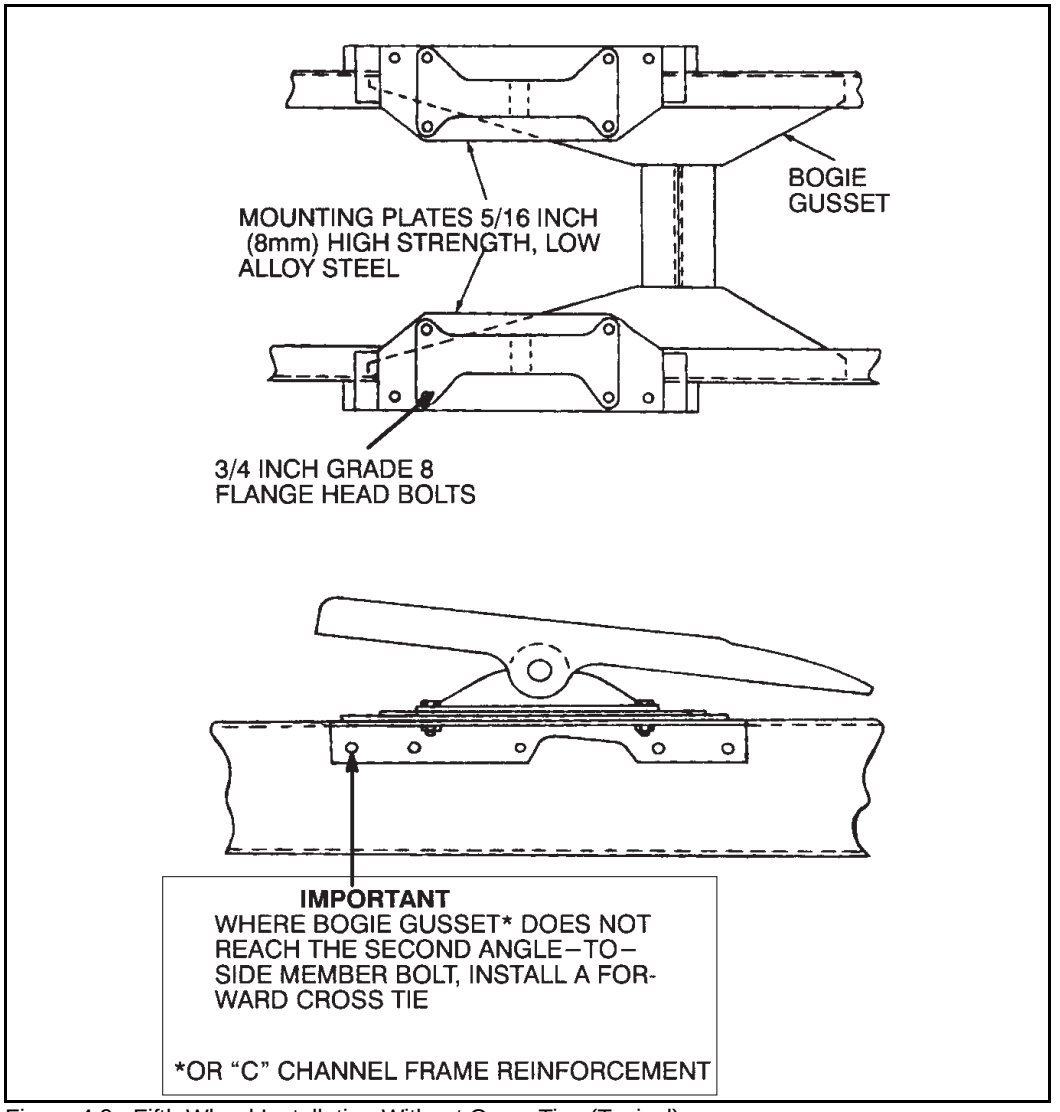



Figure 4.9 Fifth Wheel Installation Without Cross Ties (Typical)

10_0010

Fixed (Non-Sliding) Fifth Wheels (Continued)

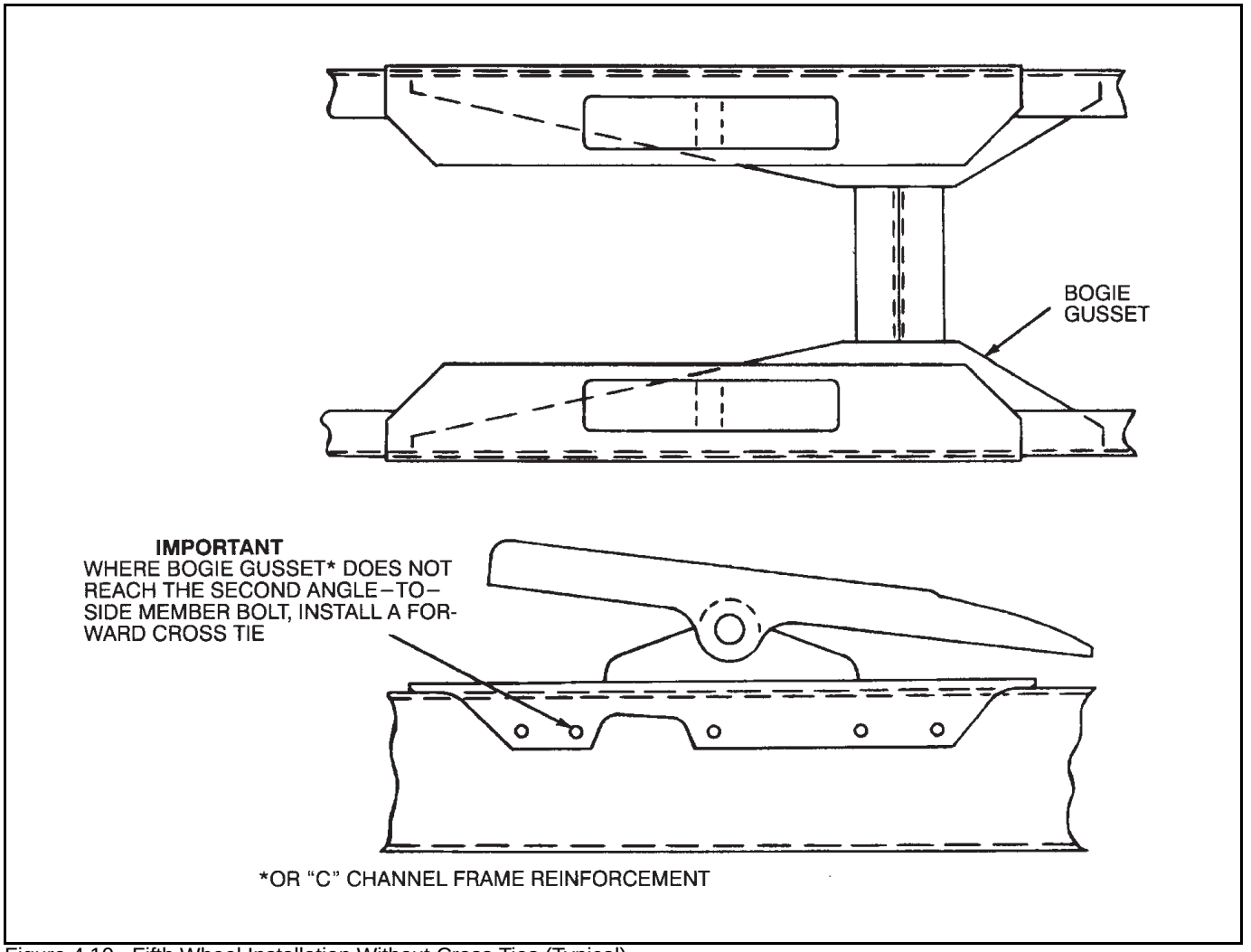



Figure 4.10 Fifth Wheel Installation Without Cross Ties (Typical)

10_0011

## Sliding Fifth Wheels

These guidelines apply to sliding fifth wheel assemblies where the rails or tracks are tied together on a mounting plate or with cross ties.

A typical installation of a sliding fifth wheel is illustrated in Figure 4.11.

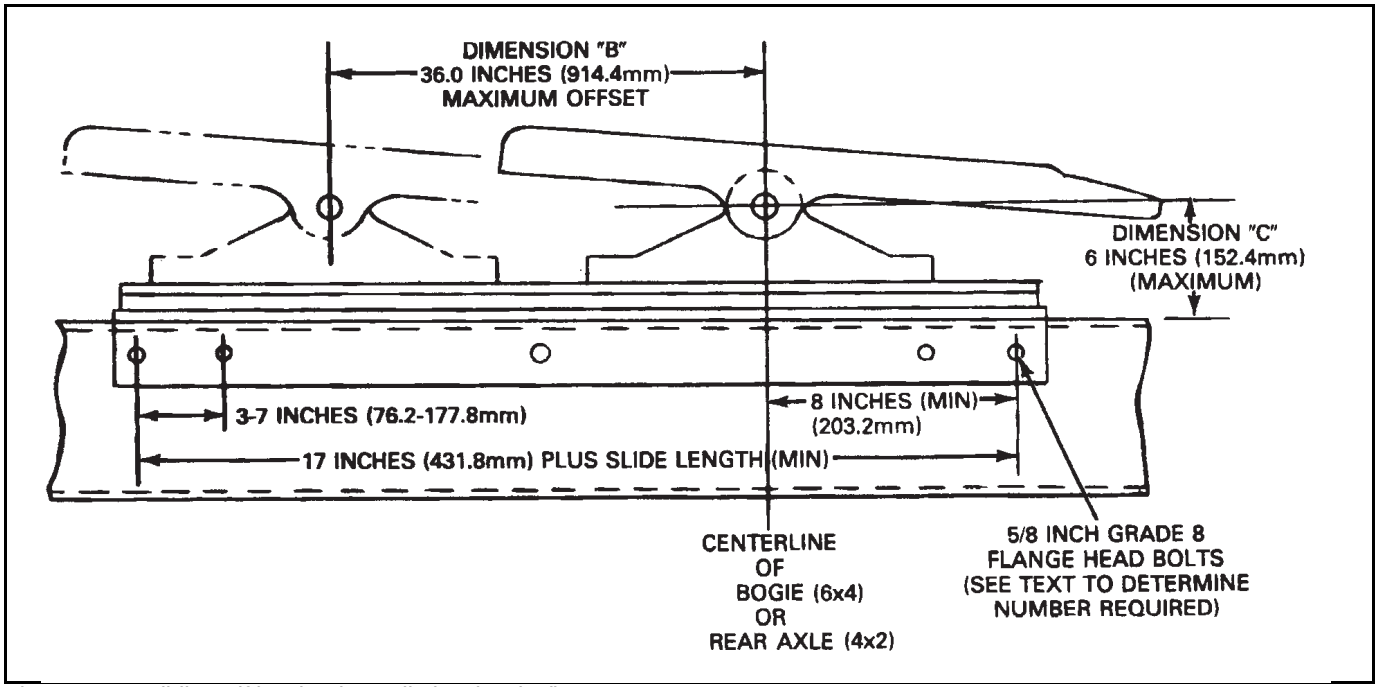



Figure 4.11 Sliding Fifth Wheel Installation (Typical) 10_0012

Mounting angles should be secured to frame sidemembers with bolts, the minimum number of which are to be determined by dividing the distance between the front and rear bolt holes, as shown in Figure 4.11, by 7.0 inches (177.8 mm) and adding 1.

Recommended sliding fifth wheel mounting dimension limits are as follows:

Dimension “B” (Fifth wheel offset with respect to bogie centerline) 0 to 36 inches (0 to 914 mm) maximum.

Dimension “C” (Fifth wheel pivot height above frame) 6.0 inches (152.4 mm) maximum.

Sliding fifth wheels, because of their length and construction techniques, are prone to warping and misalignment. This along with vehicle frame variations makes it necessary to check and correct for proper fit where needed.

## Torque

**Table 4.1**
Bolt Torque Chart (Phosphate and Oil Coated)

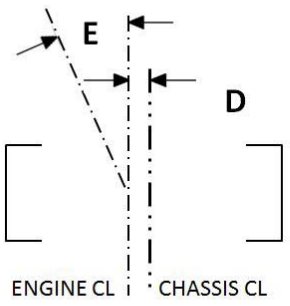
| Bolt Size (Type 8) | Specified Torque | | | |
|---|---|---|---|---|
| | Flange Head | | Hex Head | |
| | Ft-Lb. | N-m | Ft-Lb. | N-m |
| 5/8 | 200-240 | 271-325 | 145-175 | 197-237 |
| 3/4 | 300-370 | 406-502 | 250-300 | 339-406 |

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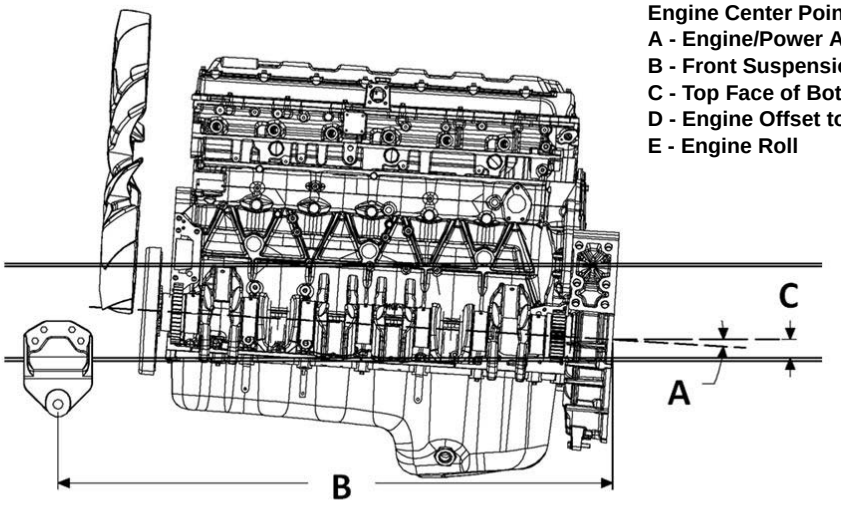
# ENGINE

## *ENGINE LOCATION*

### *All Models*




FRONT VIEW




SIDE VIEW

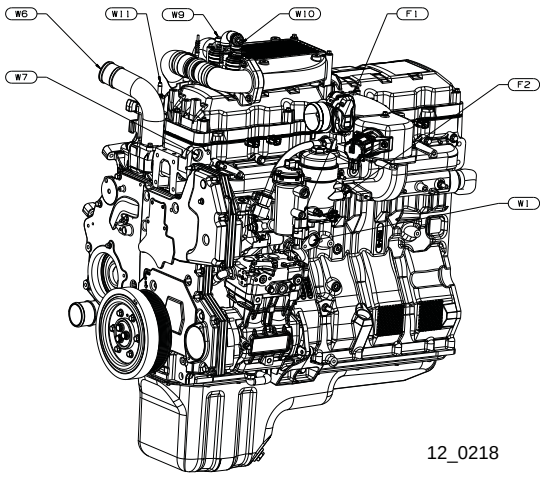
**Engine Center Point (ECP) = Center Point of Flywheel Hous**
**A - Engine/Power Angle**
**B - Front Suspension Eye to ECP**
**C - Top Face of Bottom Flange to ECP**
**D - Engine Offset to Chassis CL**
**E - Engine Roll**

12_0024

| Model | Engine | A | B | C | D | E |
|---|---|---|---|---|---|---|
| 4300, 4400 | MaxxForce® DT/9 (EGR) | 3.5° | 49.02" (1245 mm) | 2.20" (56 mm) | 0° | 0° |
| 4300 4x2 | Cummins® ISB (SCR) | 3.5° | 47.40" (1204 mm) | 1.27" (32.3 mm) | 0° | 0° |
| 4400 | Navistar® N9 (SCR) | 3.5° | 49.02" (1245 mm) | 2.20" (56 mm) | 0° | 0° |

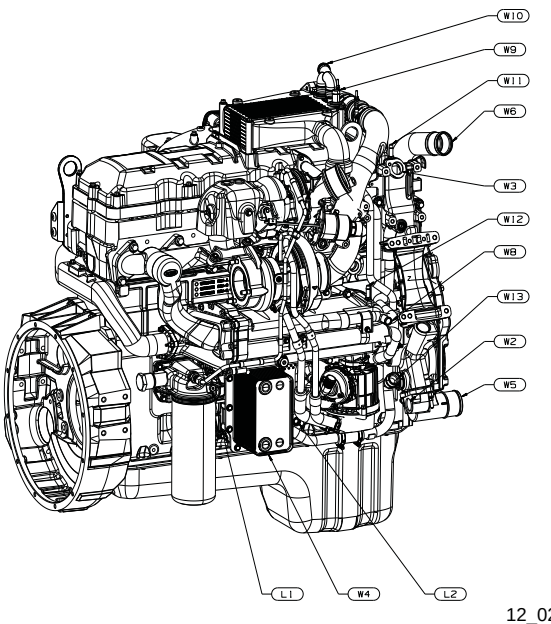
## *ENGINE PORT LOCATION (EGR)*

### *Models 4300 and 4400 (MaxxForce® DT/9 Engines)*




12_0218

LEFT SIDE



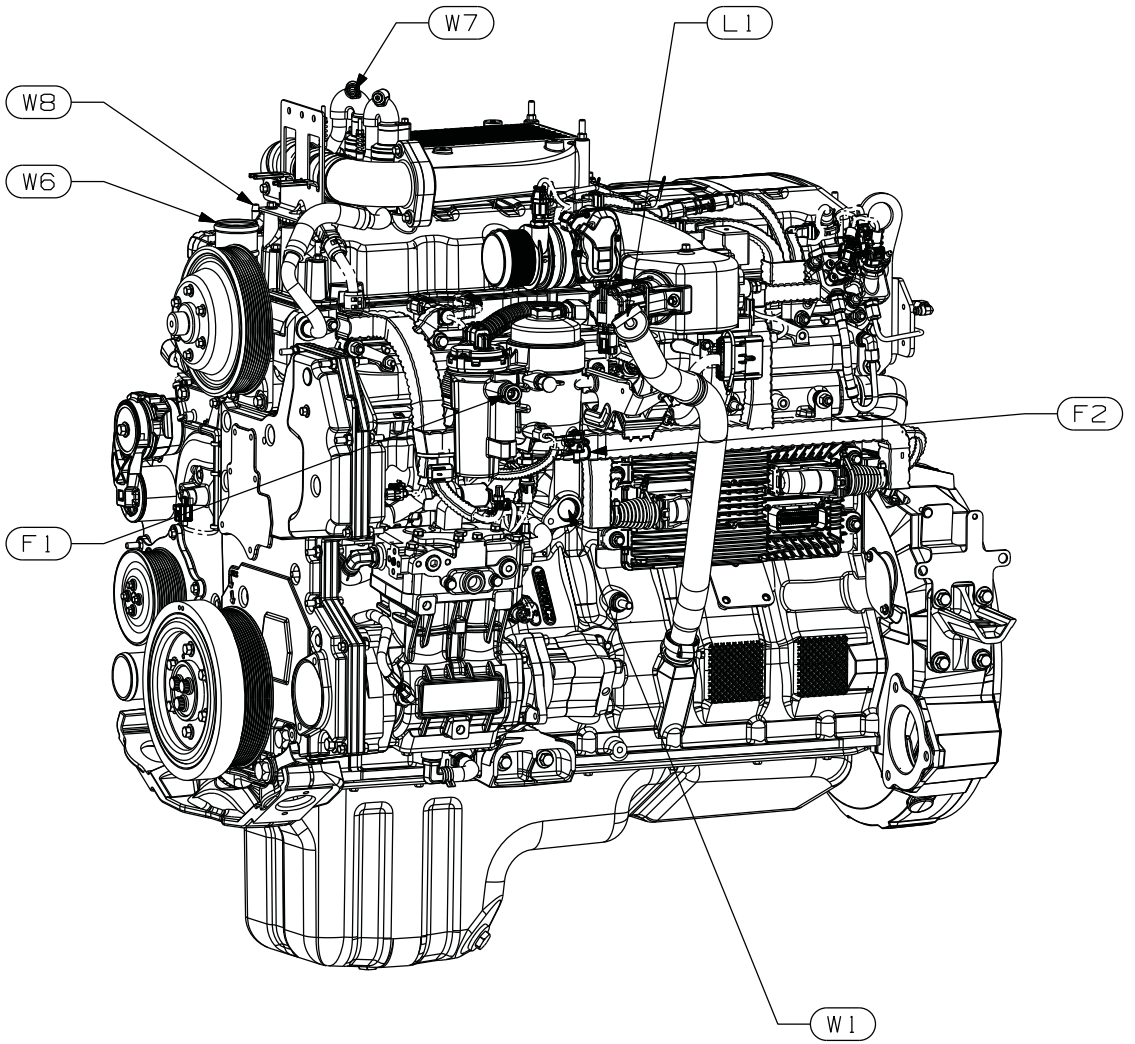

12_0219

RIGHT SIDE

| Type | NPTF | Usage |
|---|---|---|
| Water | | |
| W1 | – | BLOCK HEATER |
| W2 | M33 | CAB HEATER RETURN |
| W3 | – | CAB HEATER SUPPLY |
| W4 | M18 | OIL COOLER DRAIN |
| W5 | – | WATER INLET |
| W6 | – | WATER OUTLET |
| W7 | 1 inch hose barb | HEATER SUPPLY-OPTIONAL |
| W8 | – | LOW TEMP RADIATOR SUPPLY |
| W9 | – | LOW TEMP RADIATOR RETURN / INTERSTTAE COOLER INLET |
| W10 | – | INTERSTAGE COOLER VENT |
| W11 | – | CYLINDER HEAD VENT |
| W12 | – | EGR COOLER VENT |
| W13 | – | SURGE TANK RETURN |
| Oil | | |
| L1 | M12 | OIL FILTER SUPPLY – AUX. |
| L2 | M12 | OIL FILTER RETURN – AUX. |
| Fuel | | |
| F1 | – | FUEL INLET |
| F2 | – | FUEL RETURN |

## *Engine Port Location (SCR)*

### *Navistar N9 Engine (Front)*

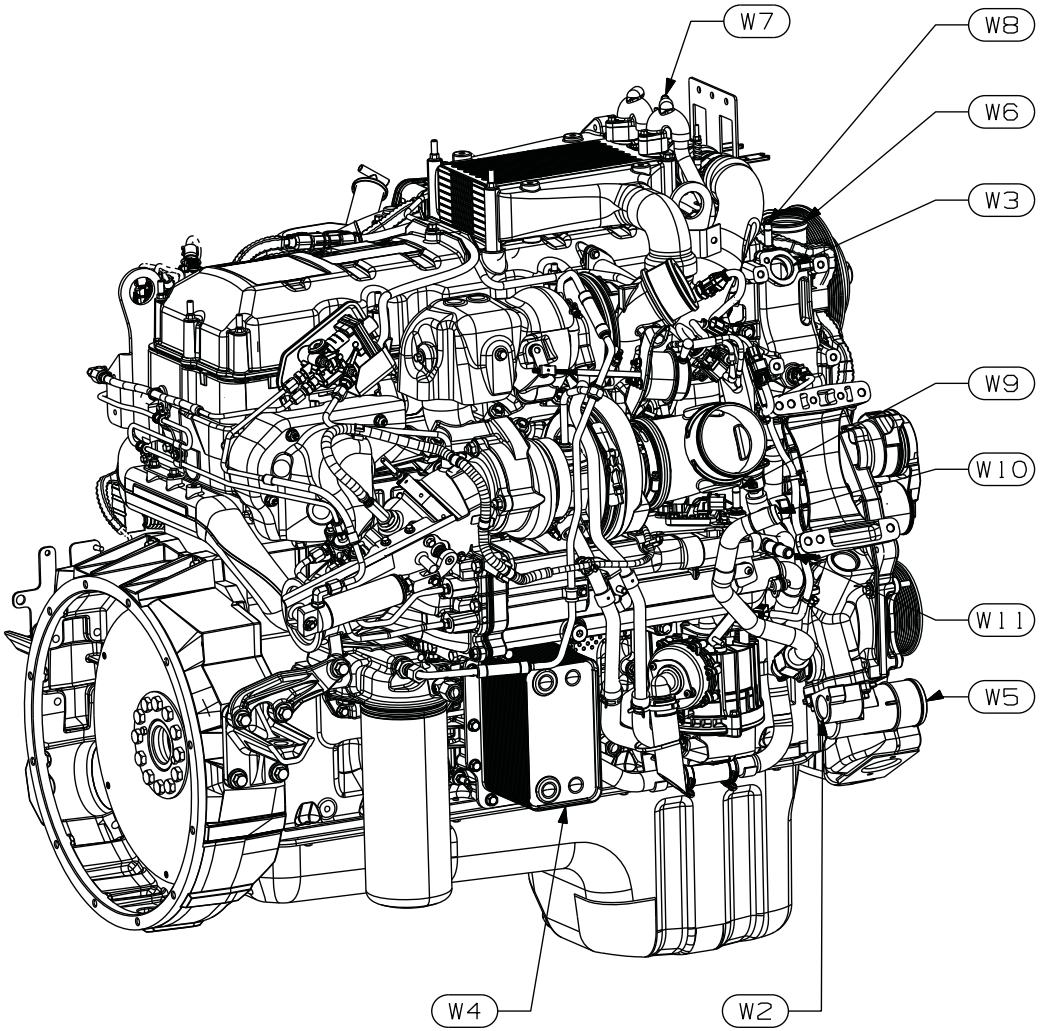



| Type | NPTF | Usage |
|---|---|---|
| Water | | |
| W1 | — | **Block Heater** |
| W6 | — | **Water Outlet** |
| W7 | — | **Interstage Cooler Vent** |
| W8 | — | **Cylinder Head Vent** |
| Fuel | | |
| F1 | — | **Fuel Inlet** |
| F2 | — | **Fuel Return** |
| Oil | | |
| L1 | — | **Oil Fill & Dipstick** |

N9_N10_Engine_Port_Front

## *ENGINE PORT LOCATION (SCR)*

### *Navistar N9 Engine (Rear)*

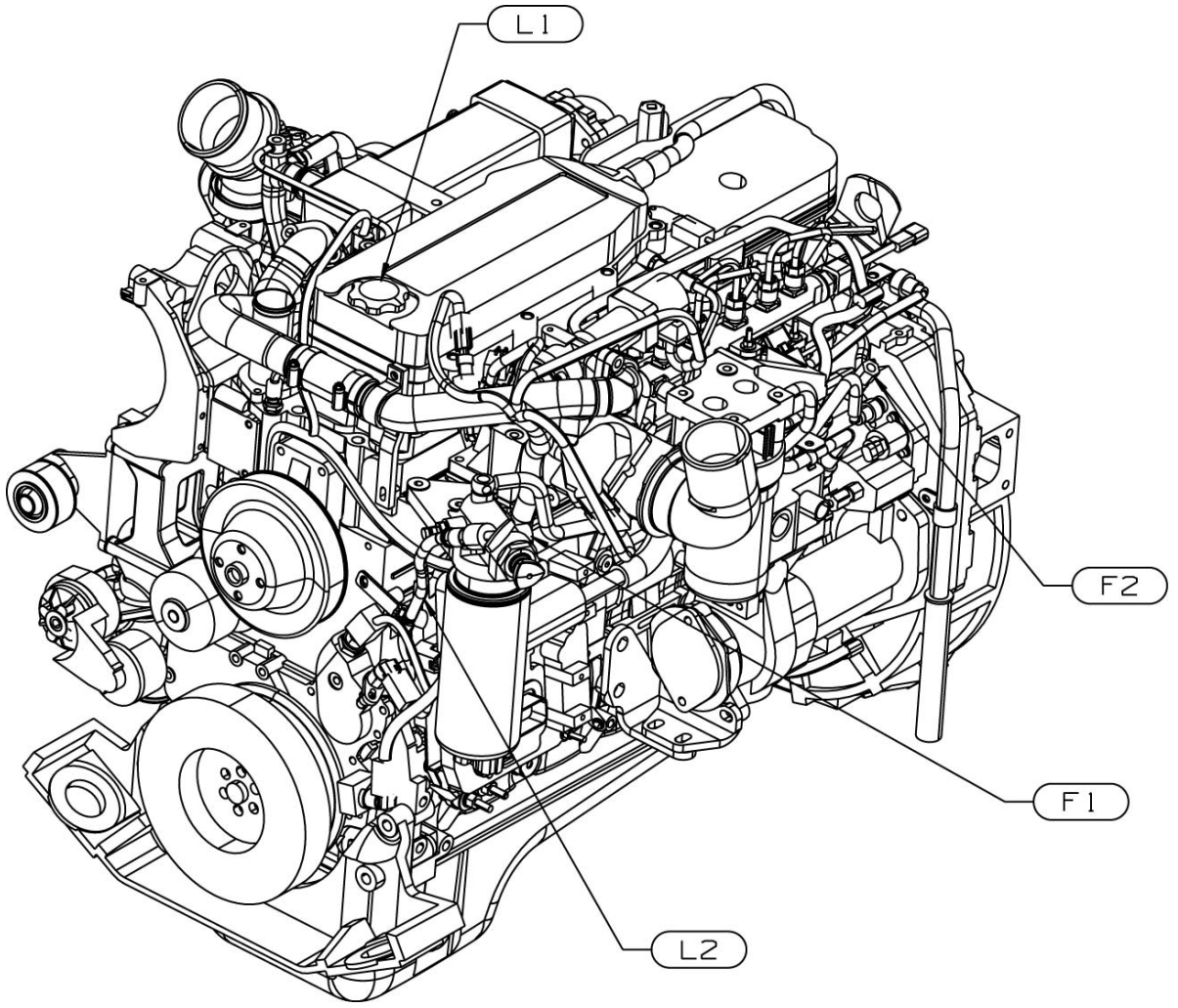



| Type | NPTF | Usage |
|---|---|---|
| Water | | |
| W2 | M33 | CAB HEATER RETURN |
| W3 | — | CAB HEATER SUPPLY |
| W4 | M16 | OIL COOLER DRAIN |
| W5 | — | WATER INLET |
| W6 | — | WATER OUTLET |
| W7 | — | INTERSTAGE COOLER VENT |
| W8 | — | CYLINDER HEAD VENT |
| W9 | — | EGR COOLER VENT |
| W10 | — | SURGE TANK RETURN |
| W11 | — | DO NOT USE THIS COOLING CIRCUIT |

N9_N10_Engine_Port_Rear

## *ENGINE PORT LOCATION (SCR)*

### *Cummins ISB Engine (Left Front)*

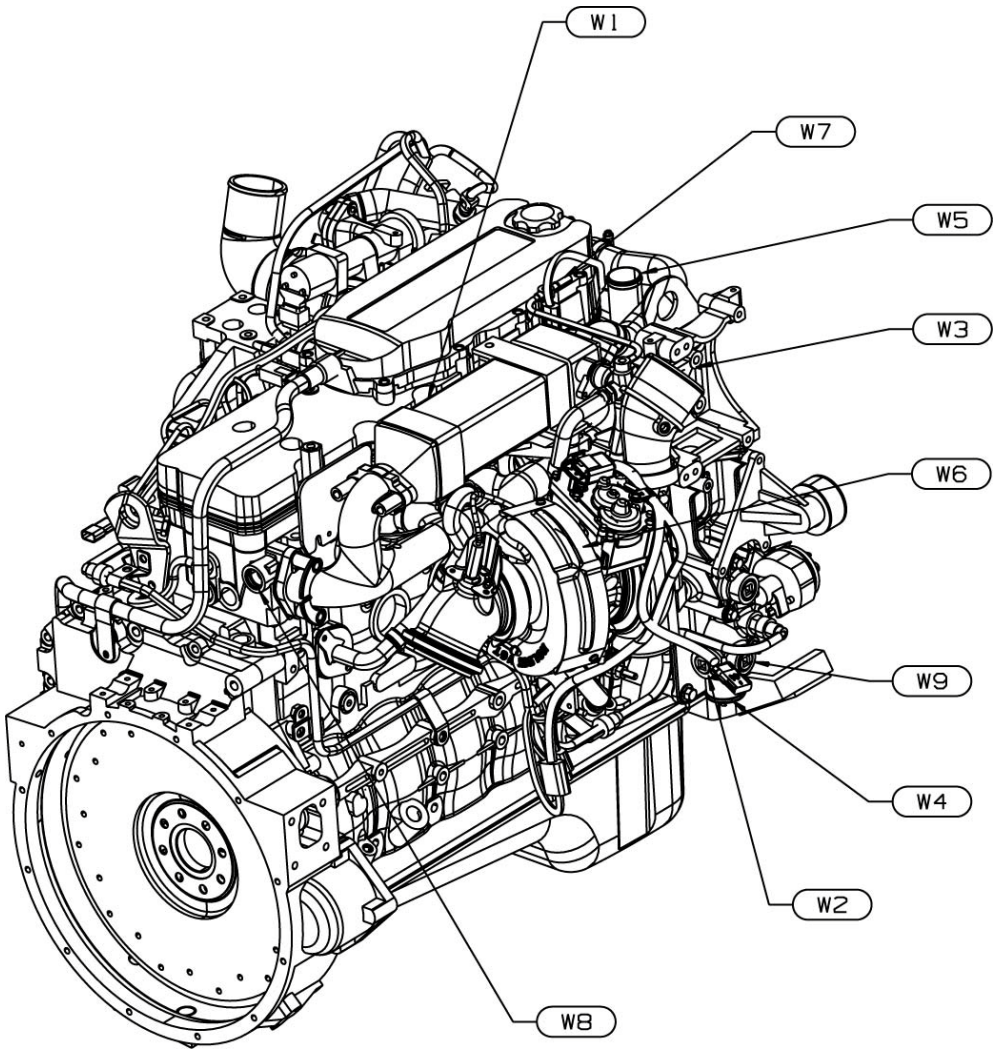



| Type | NPTF | Usage |
|---|---|---|
| Fuel | | |
| F1 | — | **FUEL INLET** |
| F2 | — | **FUEL RETURN** |
| Oil | | |
| L1 | — | **OIL FILL** |
| L2 | — | **DIPSTICK** |

Cummins_ISB_Left_Front

# *ENGINE PORT LOCATION (SCR)*

## *Cummins ISB Engine (Right Rear)*



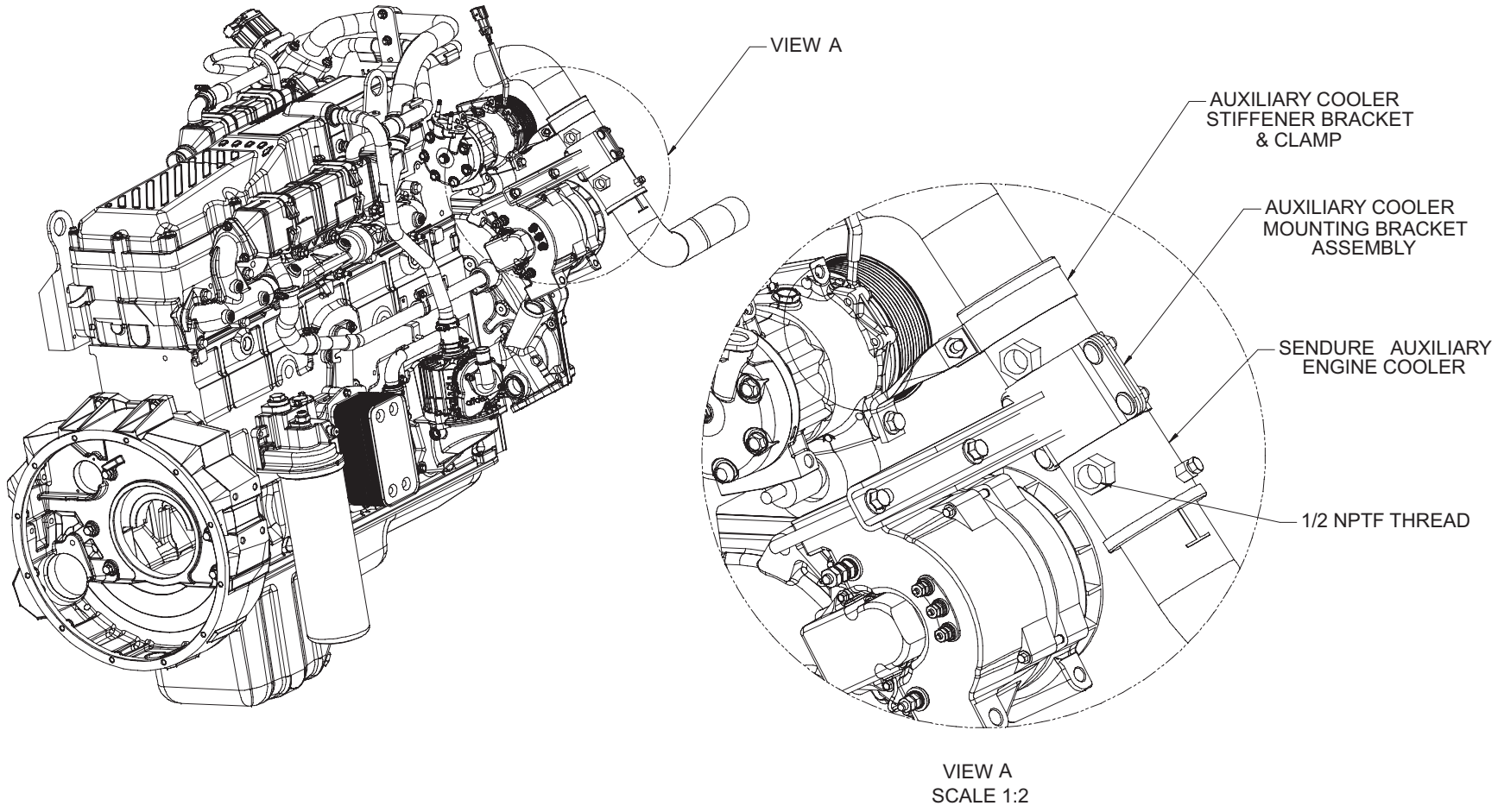

| Type | Usage |
|---|---|
| Water | |
| W1 | Heater Supply |
| W2 | Heater Return |
| W3 | Engine Vent |
| W4 | Coolant Inlet |
| W5 | Coolant Outlet |
| W6 | Block Heater |
| W7 | Surge Line |
| W8 | DEF Coolant Supply |
| W9 | DEF Coolant Return |

Cummins_ISB_Right_Rear

## *WATER COOLER MOUNTING*

### *Models 4400*

#### ***Codes 12WYK and 12WZG***




12_0016

INTERNATIONAL
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# Engine Parameters for Fire Pumper (Split Shaft & Transmission Mounted) - MaxxForce Engines DT, 9 and 10

This information is designed to be a guideline in setting up the parameters for a specific application and is not all-encompassing.
Email Questions or Concerns to performanceengineering@navistar.com

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| Engine Brake | Vehicle Retarder Control Mode | 70003 | 7000 | Determines the conditions that the engine brake feature will be functional. If set to:<br>0 - The engine brake functionality is disabled.<br>1, 3 or 4 - The engine brake is active after the accelerator pedal is released.<br>2 or 5 - The engine brake is active only while the service brake pedal is pressed.<br>6 - The engine brake is active when the accelerator pedal is released and cruise mode is active; in this mode, the engine brake acts to maintain a set speed (typically when traveling down a grade). | 0 - Disable<br>1 - Exhaust Brake Latched<br>2 - Exhaust Brake Coast<br>3 - Transmission Brake Latched<br>4 - Compression Brake Latched<br>5 - Compression Brake Coast<br>6 - Compression Brake with Cruise Control<br>7 - Exhaust Brake with Cruise Control<br><br>NOTE: Mode 7 is not functional for Inline applications but may show up in the Programming/Service Tool. | | | 2<br>*Customer Chosen - Depends on installed brake. |
| | VRE Disable when RPS Active | 70091 | 7009 | Allows the VRE to be disabled when the Remote Throttle is in use.<br><br>*Only a concern if there is a possibility that engine braking may interfere with remote throttle. | 0 - Enable VRE Control<br>1 - Disable VRE Control when Remote Throttle is active | | | Customer Chosen |
| Idle Shutdown Timer | Idle Shutdown Timer Mode | 74001 | 7400 | Determines the conditions under which the idle shutdown feature will be functional. If set to:<br>0 - The idle shutdown timer is disabled.<br>1 - The idle shutdown timer sequence will be prevented and the engine will not shut down while the PTO or any auxiliary engine speeds control is actively ramping the engine above normal engine idle speed.<br>2 - The engine may shutdown if PTO engine speed control is engaged. This allows the engine to stay running, for example, if the operator desires to have the engine speed ramped up during PTO operation. This mode also prevents the operator from setting the engine speed with a minimum load (e.g., 10% engine torque) without actually engaging the PTO with the intent of bypassing the idle shutdown timer.<br>3 - The engine may shutdown if PTO engine speed control is engaged. Puts the feature in tamper proofing mode. Refer to the tamper proofing section for more information. | 0 - Disable<br>1 - PTO Option<br>2 - No Load Option<br>3 - Tamper Proofing Option | | | 0 |
| | Engine Idle Shutdown Time | 74010 | 7401 | Sets the amount of engine idle time before the idle shutdown feature will initiate an engine shutdown.<br><br>NOTE: While the Electronic Service Tool is installed, this time may be extended regardless of the parameter setting.<br><br>*If in PTO operation mode, this will not start counting. | 2 | 120 | MIN | 15 |
| | Engine Idle Shutdown Maximum Intake Air Temperature | 74021 | 7402 | The idle shutdown feature will not shut down the engine above this temperature. This allows the engine to stay running when temperatures are high in order to allow the air conditioning to function for driver comfort, for example. | -40 | 302 | F | 100°F |
| | Engine Idle Shutdown Minimum Intake Air Temperature | 74031 | 7403 | The idle shutdown feature will not shut down the engine below this temperature. This allows the engine to stay running when temperatures are low in order to allow the engine to stay warm for engine protection, and to allow the heater to function for driver comfort, for example. | -40 | 302 | F | 45°F |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| PTO - In-Cab Engine Speed Control | **Parameters for Preset Engine Speed PTO Configuration** | | | | | | | |
| | Aux Throttle Control - I-Mode | 75001 | 7500 | Determines the conditions that the Engine Speed Control (PTO) feature will be functional. Set this parameter to enable PTO operation and to choose which inputs are used for control. If set to:<br>0 - The PTO functionality is disabled.<br>1 - Only the remote PTO inputs will be able to control PTO (See NOTE 2).<br>2 - Only the in-cab inputs will be able to control PTO.<br>3 - Both remote and in-cab inputs will be able to control PTO (See NOTE 1 & 2).<br><br>NOTE 1: The last input received will take priority when Mode 3 is selected.<br><br>NOTE 2: Mode 1 and the remote portion of Mode 3 are discussed in the Remote Engine Speed Control document. | 0 - Disable<br>1 - Remote Operation Only<br>2 - In-Cab Operation Only<br>3 - Remote and In-Cab Operation | | | 3 |
| | Aux Throttle Control - Maximum Vehicle Speed | 75011 | 7501 | This parameter is the maximum vehicle speed that the PTO will be allowed to operate.<br><br>NOTE: Set this parameter to the maximum vehicle speed that the PTO is typically used.<br><br>*Only applicable if in mobile variable mode for any speed above 0 MPH. | 0 | 20 | MPH | 5 |
| | Aux Throttle Control B26 - In-Cab Mode | 75021 | 7502 | Set this parameter after selecting In-Cab or Remote and In-Cab Operation to determine which PTO mode is active. If set to:<br>0 - The switches will not be used. Refer to the Remote Engine Speed Control document.<br>1 - The switches will be used to select up to 6 preset engine speeds. Refer to the Stationary Preset section for more information.<br>2 - The switches will be used to adjust the engine speed variably. Refer to the Stationary Variable section for more information.<br>3 - The switches will be used to adjust the engine speed to a desired set point to allow for vehicle movement. Refer to the Mobile Variable section for more information. | 0 - None<br>1 - Stationary Preset<br>2 - Stationary Variable<br>3 - Mobile Variable | | | 2 |
| | Aux Throttle Control - In-Cab Operator Interface | 75031 | 7503 | Select this parameter when accelerator, brake or clutch is desired to be ignored during engine speed control operation. If set to:<br>0 - The accelerator, brake, and clutch are inputs used for PTO operation.<br>1 - The accelerator, brake, and clutch will be ignored during PTO operation.<br><br>NOTE: Use parameters (7510), (7511) and (7513) to provide the specific input options. | 0 - Disable<br>1 - Enable | | | 1 |
| | Aux Throttle Control - Remote Pedal Enable | 75041 | 7504 | Sets the driveline mode for PTO operation.<br><br>NOTE: Set to 1 if engine speed is to be controlled by remote throttle pedal. | 0 - Disable<br>1 - Enable | | | 1 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| PTO - In-Cab Engine Speed Control (Continued) | Aux Throttle Control - Preset Engine Speed 1 (SET/COAST) | 75051 | 7505 | Sets the running engine speed set point that will be maintained when the first (1st) PTO preset speed is selected or when SET/COAST is pressed.<br><br>NOTE: Presets speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be one preset, and 2, 4, 6 can be another. | Range must be less than the following setting: PTO Maximum Engine Speed (7508) | | | 1000 |
| | Aux Throttle Control - Preset Engine Speed 2 (RESUME/ACCEL) | 75061 | 7506 | This parameter sets the running engine speed set point that will be maintained when the second (2nd) PTO preset speed is selected or when RESUME/ACCEL is pressed.<br><br>NOTE: Presets speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be one preset, and 2, 4, 6 can be another. | Range must be less than the following setting: PTO Maximum Engine Speed (7508) | | | 1500 |
| | Aux Throttle Control - Ramp Rate | 75071 | 7507 | This parameter sets the speed at which the engine will attempt to increase the engine speed.<br><br>NOTE 1: The engine only attempts to increase the engine speed at this rate because actual engine changes are influenced by other factors such as engine load and available engine power.<br><br>NOTE 2: This parameter should be set to provide a smooth transition to the desired engine speed to accommodate applicable PTO equipment.<br><br>*7507 is only active when variable modes are selected in 7502. | 1 | 1500 | RPM | 100 RPM/SEC |
| | Aux Throttle Control - Maximum Engine Speed | 75081 | 7508 | The maximum engine speed that can be reached using any PTO controls.<br><br>NOTE: This parameter must be set properly to protect PTO related equipment. | | | | 2200 |
| | Aux Throttle Control - Preset Engine Speed 3 | 75091 | 7509 | Sets the running engine speed set point that will be maintained when the third (3rd) PTO preset speed is selected or when SET/COAST is pressed twice.<br><br>NOTE: Presets speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more info.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be one preset, and 2, 4, 6 can be another. | Range must be less than the following setting: PTO Maximum Engine Speed (7508) | | | 1000 |
| | Aux Throttle Control - Preset Engine Speed 4 | 75101 | 7510 | This parameter sets the running engine speed set point that will be maintained when the fourth (4th) PTO preset speed is selected or when RESUME/ACCEL is pressed twice.<br><br>NOTE: Presets speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be one preset, and 2, 4, 6 can be another. | Range must be less than the following setting: PTO Maximum Engine Speed (7508) | | | 1500 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| PTO - In-Cab Engine Speed Control (Continued) | Aux Throttle Control - Preset Engine Speed 5 | 75111 | 7511 | Sets the running engine speed set point that will be maintained when the fifth (5th) PTO preset speed is selected or when SET/COAST is pressed three times.<br><br>NOTE: Presets speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be one preset, and 2, 4, 6 can be another. | Range must be less than the following setting: PTO Maximum Engine Speed (7508) | | | 1000 |
| | Aux Throttle Control - Preset Engine Speed 6 | 75121 | 7512 | Sets the running engine speed set point that will be maintained when the sixth (6th) PTO preset speed is selected or when RESUME/ACCEL is pressed three times.<br><br>NOTE: Presets speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be one preset, and 2, 4, 6 can be another. | Range must be less than the following setting: PTO Maximum Engine Speed (7508) | | | 1500 |
| | **Parameters for PTO Override Configurations** | | | | | | | |
| | Aux Throttle Control – Return to Zero | 75131 | 7513 | Sets the return to Zero requirements for the Remote Pedal. | 0 - Return to Zero Required<br>1 - Return to Zero Not Required | | | 1 |
| | Aux Throttle Control - Disable ATC with Service Brake | 75141 | 7514 | Allows operator to set the Service Brake to disable the In-Cab PTO. | 0 - Service Brake Disables PTO<br>1 - Service Brake Does Not Change PTO | | | 0 |
| | Aux Throttle Control - Disable ATC with Parking Brake Released | 75151 | 7515 | Allows the use of PTO without requiring the parking brake set.<br><br>NOTE: Depending on the calibration; some calibrations have the Parking Brake interactions with PTO disabled permanently. | 0 - Parking Brake Disables PTO<br>1 - Parking Brake Does Not Change PTO | | | 0 |
| | Aux Throttle Control - Disable ATC with Driveline Status | 75161 | 7516 | (7517) Allows operator to disable the ATC with In-Cab Controls. | 0 - Driveline Status Disables PTO operation<br>1 - Driveline Status Does Not Change PTO operation | | | 0 |
| | Aux Throttle Control - Disable ATC with In-Cab Controls | 75171 | 7517 | Control - Disable ATC with In-Cab Controls | 0 - In-Cab Controls Disables PTO<br>1 - In-Cab controls Do Not Change PTO | | | 0 |
| | Aux Throttle Control - Disable ATC with Vehicle Speed | 75181 | 7518 | Allows In-Cab PTO to be disabled with vehicle speed. | 0 - Vehicle Speed Limit Disables PTO<br>1 - Vehicle Speed Limit Does Not Change PTO | | | 0 |
| | Aux Throttle Control - SPDT Enable | 75191 | 7519 | This programmable parameter allows the operator to use a single switch to activate PTO PRESET 1 or 2.<br><br>NOTE 1: After PTO/ RPTO has been enabled, PTO and/ or RPTO will require a transition in the state of the PTO control switches (CC RESUME/ SET, or RVAR/ RPRE switches) to transition to a new PRESET mode from the current state. For example, a transition in the state of the PTO control switches would require a release of the CC SET switch then re-activation to transition from PRESET 1 to PRESET 3 while CC ON remains active.<br><br>NOTE 2: A combination of ON, RVAR or RPRE with SET will select PRESET 1. A combination of ON, RVAR, or RPRE with RESUME will select PRESET 2. | 0 - Disable the ability to activate the PTO enable signal (CC/PTO On, RPRE, RVAR) at the same time as the PTO incrementing signal (Set, Resume)<br>1 - Enable the ability to activate the PTO enable signal (CC/PTO On, RPRE, RVAR) at the same time as the PTO incrementing signal (Set, Resume) | | | 0 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| PTO - In-Cab Engine Speed Control (Continued) | Aux Throttle Control - Disable RP with Service Brake | 75201 | 7520 | Allows operator to set the Service Brake to disable the Remote PTO. | 0 - Service Brake Disables Remote Pedal Switch<br>1 - Service Brake Does Not Change Remote Pedal Switch | | | 0 |
| | Aux Throttle Control - Disable RP with Parking Brake Released | 75211 | 7521 | Allows the use of PTO without requiring the parking brake set.<br><br>NOTE: Depending on the calibration; some calibrations have the Parking Brake interactions with Remote PTO disabled permanently. | 0 - Parking Brake Disables Remote Pedal Switch<br>1 - Parking Brake Does Not Change Remote Pedal Switch | | | 0 |
| | Aux Throttle Control - Disable RP with Driveline Status | 75221 | 7522 | Allows the use of Remote PTO without requiring the Driveline Status indicate "driveline disengaged".<br><br>NOTE: For Automatic transmissions, "Driveline Status" refers to the gear selector; moving the gear selector from the Park/ Neutral position will cancel the current Remote PTO mode. For Manual transmissions, "Driveline Status" refers to the clutch switch or gear selector status; pressing the clutch or moving the gear selector from "Neutral" will cancel the current Remote PTO mode. | 0 - Driveline Status Disables Remote Pedal Switch<br>1 - Driveline Status Does Not Change Remote Pedal Switch | | | 1 |
| | Aux Throttle Control - Disable RP with In-Cab Controls | 75231 | 7523 | Allows operator to disable the RP with In-Cab Controls. | 0 - In-Cab Controls Disables Remote Pedal Switch<br>1 - In-Cab Controls Do Not Change Remote Change Remote Pedal Switch | | | 1 |
| | Aux Throttle Control - Disable RP with Vehicle Speed | 75241 | 7524 | Allows Remote PTO to be disabled with vehicle speed. | 0 - Vehicle Speed Limit Disables Remote Pedal Switch<br>1 - Vehicle Speed Limit Does Not Change Remote Pedal Switch | | | 0 |
| | Aux Throttle Control - Enable RP Overrides | 75251 | 7525 | Allows the operator to enable or disable RP overrides.<br><br>*If this is 0, all interlock overrides are disabled. | 0 - Disable<br>1 - Enable | | | 0 |
| | Aux Throttle Control - Enable ATC | 75261 | 7526 | Allows the operator to enable or disable In-Cab PTO overrides. | 0 - Disable the In-Cab PTO overrides<br>1 - Enable the In-Cab PTO overrides | | | 0 |
| Cruise Control | Min. Cruise Control Vehicle Speed | 76031 | 7603 | Minimum vehicle speed at which cruise control can be engaged. | 25 | 100 | MPH | 35 |
| | Max. Cruise Control Vehicle Speed | 76041 | 7604 | Maximum road speed at which the cruise will control the vehicle speed. | 30 | 127 | MPH | 60 |
| Engine Warning and Protection System | Engine Warning And Protection System Mode | 77002 | 7700 | Determines how the EWPS Feature reacts if critical engine operating limits are exceeded. If set to:<br>1 - The EWPS feature provides a visual and audible indication if critical engine operating limits exceed a threshold.<br>2 - The EWPS feature provides 2 levels of protection.<br>(Less Severe) - A visual and audible indication occurs if critical engine operating parameters exceed the 1st threshold.<br>(More Severe) - The EWPS feature will shut down the engine if critical engine operating parameters exceed the 2nd threshold. | 0 - Standard Warning (Overspeed)<br>1 - 3-way Warning (Overspeed, Overheat, Low Oil Pressure, Low Coolant)<br>2 - 3-way Protection (Overspeed, Overheat, Low Oil Pressure, Low Coolant)<br>3 - 2-way Warning (Overspeed, Overheat, Low Oil Pressure)<br>4 - 4-way Warning (Overspeed, Overheat, Low Oil Pressure, Genset Speed Control)<br>5 - 2-way Protection (Overspeed, Overheat, Low Oil Pressure) | | | Engine Group Suggested |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| Vehicle Speed Governor | Road Speed Limiting Control Mode | 79001 | 7900 | Required to be set to 1. | 0 - Disable<br>1 - Enable | | | 1 |
| | Engine Speed Limit with VSS Fault | 79011 | 7901 | Sets the maximum engine speed allowed when an active vehicle speed sensor (VSS) fault exits and PTO engine speed control is not active. This parameter might be useful in preventing the operator from exceeding the Max Vehicle Speed with Road Speed Limiting On (7902) parameter setting by tampering with the vehicle speed sensor. | 700 | 5000 | RPM | 2200 |
| | Max Vehicle Speed with Road Speed Limiting On | 79021 | 7902 | Sets the maximum accelerator controlled vehicle speed. The engine will not power the vehicle faster than this value. This parameter can be used to encourage driver behavior. | 1 | 99 | MPH | 60 |
| Vehicle Setup | Two Speed Axle Enable | 80001 | 8000 | Should be enabled if the vehicle is equipped with a 2-speed axle.<br><br>NOTE: This parameter can be used for a transfer case enable. | 0 - Disable<br>1 - Enable | | | Sales Tools Driven |
| | Tire Revs Per Mile | 80011 | 8001 | This value is provided by the tire manufacturer and is used in the vehicle speed calculation. | 300 | 676 | RPM | |
| | Rear Axle Ratio Low | 80020 | 8002 | This is the application specific final drive gear ratio.<br><br>NOTE 1: This is a “low speed” gear ratio if equipped with a 2-speed axle.<br><br>NOTE 2: If equipped with a single speed axle, then parameter (8002) and (8003) must be programmed to the same value. | 2.50 | 30.00 | | |
| | Rear Axle Ratio High | 80030 | 8003 | This is the application specific final drive gear ratio.<br><br>NOTE 1: This is a “high speed” gear ratio if equipped with a 2-speed axle.<br><br>NOTE 2: If equipped with a single speed axle, then parameter (8002) and (8003) must be programmed to the same value. | 2.50 | 30.00 | | |
| | Transmission Top Gear Ratio | 80041 | 8004 | The gear ratio of the highest gear in the transmission. | 0.6 | 20 | | |
| | Low Axle Ratio Pulses Per Mile Count | 80051 | 8005 | Indicates the low axle ratio pulses per mile (PPM). This is found by multiplying the following: [Tire Revs Per Mile (8001) x Rear Axle Ratio Low (8002) x Transmission Tailshaft GearTeeth (8007)] | 18,017 | 200,000 | PPM | |
| | High Axle Ratio Pulses Per Mile Count | 80061 | 8006 | Indicates the high axle ratio PPM. This is found by multiplying the following: [Tire Revs Per Mile (8001) x Rear Axle Ratio Low (8002) x Transmission Tailshaft GearTeeth (8007)] | 18,017 | 200,000 | PPM | |
| | Transmission Tailshaft Gear Teeth | 80071 | 8007 | Indicates the number of teeth on the transmission output or transfer case shaft. | 5 | 255 | | |
| | Low Idle Engine Speed | 82020 | 8202 | The engine speed in revolutions per minute (RPM) at normal low engine idle speed. | 650 | 750 | RPM | |
| Password Protection | Customer Password | 87002 | 8700 | The password locks the parameters so they cannot be changed without the password. | Up to 8 Alphanumeric characters required. | | | 0000 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| Engine Fan Control | Engine Fan Control Mode | 90001 | 9000 | Determines the functionality of the Engine Fan Control (EFC) feature. If set to:<br>1 - The feature includes: 1. Cooling fan turns ON at 100% and OFF based on engine coolant temperature. | 0 - Disable<br>1 - ON/OFF Coolant Temp Control<br>2 - ON/OFF Temp Control Retarder | | | 0 - Trans Mounted<br>1 - Split Shaft |
| | Fan ON Temperature for Engine Cooling Control | 90021 | 9002 | Sets the engine coolant temperature threshold for engine fan ON command; when the Engine Coolant Temperature (ECT) exceeds this threshold, the fan will turn ON.<br>WARNING: Changing of this parameter may have an adverse effect on the engine life if done improperly. | -40 | 302 | F | 212°F |
| | Fan OFF Temperature for Engine Cooling Control | 90031 | 9003 | Sets the engine coolant temperature threshold for engine fan OFF command; when the ECT drops below this threshold, the fan will turn OFF.<br>WARNING: Changing of this parameter may have an adverse effect on the engine life if done improperly. | -40 | 302 | F | 204°F |
| | Total Time Fan Duty Cycle Protection is Enabled | 90181 | 9018 | Sets the minimum time the fan will remain ON at each activation if the fan has been cycled ON-OFF-ON too frequently. This is to protect the fan drive lining from wear and tear due to excessive and rapid fan cycling. | 0 | 120 | SEC | 30 |
| | Extended Fan On Time During Fan Duty Cycle Protection | 90191 | 9019 | Sets the period of time where the extended fan ON time parameter (9018) is in effect. | 120 | 1800 | SEC | 120 |
| PTO - Split Shaft Operation | Driveline Status for Hydraulic Pressure Governor Operation | 93011 | 9301 | Sets the driveline mode for PTO operation: If set to:<br>0 - The ECM receives vehicle speed via SAE J1939 or hardwired from the transmission output shaft - vehicle speed sensor input.<br>1 - And the transfer case is engaged, the ECM receives wheel-based vehicle speed via SAE J1939 from the anti-lock brake system (ABS).<br><br>NOTE 1: The driveline must be disengaged at all times for operation of the split shaft feature.<br>NOTE 2: A transition in driveline status will cause the split shaft feature to be deactivated.<br><br>*Only for split shaft which is not typical. | 0 - Neutral Operation<br>1 - Split Shaft Operation | | | 0 - Trans Mounted<br>1 - Split Shaft |
| | Vehicle Speed Source Selection When Split Shaft is Active | 93071 | 9307 | Allows the operator to select the vehicle speed display. If set to:<br>0 - The ECM will transmit vehicle speed to the cluster based on the SAE J1939 output from the anti- lock brake system (ABS), the speedometer will not display a vehicle speed unless the vehicle wheels are rotating.<br>1 - The ECM will transmit vehicle speed to the cluster based on the signal from the transmission output shaft speed sensor, the speedometer will display a vehicle speed while the split shaft mode is operational based on the output shaft speed.<br><br>*Only for split shaft, which is not typical. | 0 - Wheel speed selected when split shaft is enabled<br>1 - Output shaft speed selected when split shaft is enabled | | | 0 - Trans Mounted<br>1 - Split Shaft |
| Cold Ambient Protection | Cold Ambient Protection Enable | 94001 | 9400 | Enables the Cold Ambient Protection functionality.<br><br>NOTE: Low and High idle speeds are non-adjustable.<br><br>*Disabled as it would interfere with PTO operation. | 0 - Disable<br>1 - Enable | | | 0 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| Service Interval | Service Interval Mode | 95001 | 9500 | Enables or disables the service interval feature. If set to:<br>0 - The service interval feature is disabled.<br>1 - The feature will turn on the “Change Engine Oil” indication if the service interval has expired. | 0 - Disable<br>1 - Enable | | | 1 |
| | Fuel Used Service Interval | 95011 | 9501 | Determines the fuel used between the last service interval reset and when the “Change Engine Oil” indication occurs. Set this parameter to the value recommended in the “Maintenance Schedule and Service Procedures” section of the “Engine Operation and Maintenance Manual”.<br><br>NOTE: Set this parameter to 0 if a service interval based on fuel used is not desired. | 0 | 65,535 | GAL | 1500 |
| | Engine Hour Service Interval | 95021 | 9502 | Determines the engine hours between the last service interval reset and when the "Change Engine Oil" indication occurs. Set this parameter to the value recommended in the "Maintenance Schedule and Service Procedures" section of the "Engine Operation and Maintenance Manual".<br><br>NOTE: Set this parameter to 0 if a service interval based on engine hours is not desired. | 0 | 2000 | HRS | 450 |
| | Vehicle Distance Service Interval | 95031 | 9503 | Determines the vehicle distance between the last service interval reset and when the "Change Engine Oil" indication occurs. Set this parameter to the value recommended in the "Maintenance Schedule and Service Procedures" section of the "Engine Operation and Maintenance Manual".<br><br>NOTE: Set this parameter to 0 if a service interval based on vehicle distance is not desired. | 0 | 65,535 | GAL | 12000 |
| | Fuel Used Starting Value | 95041 | 9504 | This parameter is used to create an offset; the Service Interval -fuel used accumulator will not begin to increment until reaching this value. | 0 | 536,870,911 | GAL | 0 |
| | Engine Hour Starting Value | 95051 | 9505 | This parameter is used to create an offset; the Service Interval - engine hour accumulator will not begin to increment until reaching this value. | 0 | 214,748,364 | HRS | 0 |
| | Vehicle Distance Starting Value | 95061 | 9506 | This parameter is used to create an offset; the Service Interval - vehicle distance accumulator will not begin to increment until reaching this value. | 0 | 4,294,967,295 | MILES | 0 |
| | Service Soon Percent | 95071 | 9507 | Determines the functionality of the “Change Engine Oil” indication. If this parameter is set to 100%, the “Change Engine Oil” indication will occur when one or more intervals (hours, fuel, or distance) have fully expired. If the value is set to 50%, however; the "Change Engine Oil" indication occurs when half of the interval has accumulated.<br><br>NOTE: Refer to the "calculations" section and the examples at the end of this document to understand how to set this parameter. | 5 | 100 | % | 0 |
| | Change Oil Lamp Always On | 95081 | 9508 | Set this parameter to a value of 1 to ensure the change oil lamp will turn on and remain on once the oil change service interval has expired. | 0 - No<br>1 - Yes | | | 0 |
| | Service Interval Reset Request | 95101 | 9510 | Set this parameter to a value of 1 to reset the service interval and turn off the "Change Engine Oil" indication.<br><br>NOTE: The service interval may be reset by means of the cruise control switches. Refer to the Service Interval Reset section in this document for more information. | 0 - No<br>1 - Yes | | | 0 |

# Engine Parameters for Loader and Rear Packer - MaxxForce Engines DT, 9 and 10

This information is designed to be a guideline in setting up the parameters for a specific application and is not all-encompassing.

Email Questions or Concerns to performanceengineering@navistar.com

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| Engine Brake | Vehicle Retarder Control Mode | 70003 | 7000 | Determines the conditions under which the engine brake feature will be functional.<br>If set to:<br>0 - The engine brake functionality is disabled.<br>1, 3 or 4 - The engine brake is active after the accelerator pedal is released.<br>2 or 5 - The engine brake is active only while the service brake pedal is pressed.<br>6 - The engine brake is active when the accelerator pedal is released and cruise mode is active; in this model, the engine brake acts to maintain a set speed (typically when traveling down a grade).<br><br>*Engine brake not allowed in a community area. If needed, select option 2. | 0 - Disable<br>1 - Exhaust Brake Latched<br>2 - Exhaust Brake Coast<br>3 - Transmission Brake Latched<br>4 - Compression Brake Latched<br>5 - Compression Brake Coast<br>6 - Compression Brake with Cruise Control<br>7 - Exhaust Brake with Cruise Control<br><br>NOTE: Mode 7 is not functional for Inline applications but may show up in the Programming/ Service Tool. | | | 2 |
| | VRE Disable when RPS Active | 70091 | 7009 | Allows the VRE to be disabled when the Remote Throttle is in use.<br><br>*Only a concern if there is a possibility that engine braking may interfere with remote throttle. | 0 - Enable VRE Control<br>1 - Disable VRE Control when Remote Throttle is active | | | Customer Chosen |
| Idle Shutdown Timer | Idle Shutdown Timer Mode | 74001 | 7400 | Determines the conditions under which the idle shutdown feature will be functional.<br>If set to:<br>0 - The idle shutdown timer is disabled.<br>1 - The idle shutdown timer sequence will be prevented and the engine will not shut down while the PTO or any auxiliary engine speeds control is actively ramping the engine above normal engine idle speed.<br>2 - The engine may shutdown if PTO engine speed control is engaged. This allows the engine to stay running, for example, if the operator desires to have the engine speed ramped up during PTO operation. This mode also prevents the operator from setting the engine speed with a minimum load (e.g., 10% engine torque) without actually engaging the PTO with the intent of bypassing the idle shutdown timer.<br>3 - The engine may shutdown if PTO engine speed control is engaged. Puts the feature in tamper proofing mode. Refer to the tamper proofing section for more information.<br><br>*California vehicles receive a 1. All others receive a 0. | 0 - Disable<br>1 - PTO Option<br>2 - No Load Option<br>3 - Tamper Proofing Option | | | 0 |
| | Engine Idle Shutdown Time | 74010 | 7401 | Sets the amount of engine idle time before the idle shutdown feature will initiate an engine shutdown.<br><br>NOTE: While the Electronic Service Tool is installed, this time may be extended regardless of the parameter setting.<br><br>*If your in PTO operation mode, this will not start counting. | 2 | 120 | MIN | 5 |
| | Engine Idle Shutdown Maximum Intake Air Temperature | 74021 | 7402 | The Idle Shutdown feature will not shut down the engine above this temperature. This allows the engine to stay running when temperatures are high in order to allow the air conditioning to function for driver comfort, for example. | -40 | 302 | F | 100°F |
| | Engine Idle Shutdown Minimum Intake Air Temperature | 74031 | 7403 | The Idle Shutdown feature will not shut down the engine below this temperature. This allows the engine to stay running when temperatures are low in order to allow the engine to stay warm for engine protection, and to allow the heater to function for driver comfort, for example. | -40 | 302 | F | 45°F |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| PTO - In-Cab Engine Speed Control | **Parameters for Preset Engine Speed PTO Configuration** | | | | | | | |
| | Aux Throttle Control - I-Mode | 75001 | 7500 | Determines the conditions that the Engine Speed Control (PTO) feature will be functional. Set this parameter to enable PTO operation and to choose which inputs are used for control. If set to:<br>0 - The PTO functionality is disabled.<br>1 - Only the remote PTO inputs will be able to control PTO (See NOTE 2).<br>2 - Only the in-cab inputs will be able to control PTO.<br>3 - Both remote and in-cab inputs will be able to control PTO (See NOTE 1 & 2).<br><br>NOTE 1: The last input received will take priority when Mode 3 is selected.<br><br>NOTE 2: Mode 1 and the remote portion of Mode 3 are discussed in the Remote Engine Speed Control document. | 0 - Disable<br>1 - Remote Operation Only<br>2 - In-Cab Operation Only<br>3 - Remote and In-Cab Operation | | | 1 |
| | Aux Throttle Control - Maximum Vehicle Speed | 75011 | 7501 | The maximum vehicle speed that the PTO will be allowed to operate.<br><br>NOTE: Set this parameter to the maximum vehicle speed that the PTO is typically used.<br><br>*Only applicable if in mobile variable mode for any speed above 0 mph. | 0 | 20 | MPH | 3 |
| | Aux Throttle Control B26 - In-Cab Mode | 75021 | 7502 | Set this parameter after selecting In-Cab Or Remote and In-Cab Operation to determine which PTO mode is active. If set to:<br>0 - The switches will not be used. Refer to the Remote Engine Speed Control document.<br>1 - The switches will be used to select up to 6 preset engine speeds. Refer to the Stationary Preset section for more information.<br>2 - The switches will be used to adjust the engine speed variably. Refer to the Stationary Variable section for more information.<br>3 - The switches will be used to adjust the engine speed to a desired set point to allow for vehicle movement. Refer to the Mobile Variable section for more information. | 0 - None<br>1 - Stationary Preset<br>2 - Stationary Variable<br>3 - Mobile Variable | | | 0 |
| | Aux Throttle Control - In-Cab Operator Interface | 75031 | 7503 | Select this parameter when accelerator, brake or clutch is desired to be ignored during engine speed control operation. If set to:<br>0 - The accelerator, brake, and clutch are inputs used for PTO operation.<br>1 - The accelerator, brake, and clutch will be ignored during PTO operation.<br><br>NOTE: Use parameters (7510), (7511) and (7513) to provide the specific input options. | 0 - Disable<br>1 - Enable | | | 0 |
| | Aux Throttle Control - Remote Pedal Enable | 75041 | 7504 | Sets the driveline mode for PTO operation:<br><br>NOTE: Set to 1 if engine speed is to be controlled by remote throttle pedal. | 0 - Disable<br>1 - Enable | | | 0 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| PTO - In-Cab Engine Speed Control (Continued) | Aux Throttle Control - Preset Engine Speed 1 (SET/COAST) | 75051 | 7505 | Sets the running engine speed point that will be maintained when the first PTO preset speed is selected or when SET/ COAST is pressed.<br><br>NOTE: Preset speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be one preset, and 2, 4, 6 can be another. | Range must be less than the following setting - PTO Maximum Engine Speed (7508) | | | 1000 |
| | Aux Throttle Control - Preset Engine Speed 2 (RESUME/ACCEL) | 75061 | 7506 | Sets the running engine speed point that will be maintained when the second PTO preset speed is selected or when RESUME/ACCEL is pressed.<br><br>NOTE: Preset speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be one preset, and 2, 4, 6 can be another. | Range must be less than the following setting - PTO Maximum Engine Speed (7508) | | | 1000 |
| | Aux Throttle Control - Ramp Rate | 75071 | 7507 | Sets the speed at which the engine will attempt to increase the engine speed.<br><br>NOTE 1: The engine only attempts to increase the engine speed at this rate because actual engine changes are influenced by other factors such as engine load and available engine power.<br><br>NOTE 2: This parameter should be set to provide a smooth transition to the desired engine speed to accommodate applicable PTO equipment.<br><br>*7507 is only active when variable modes are selected in 7502. | 1 | 1500 | RPM | 500 RPM/SEC |
| | Aux Throttle Control - Maximum Engine Speed | 75081 | 7508 | The maximum engine speed that can be reached using any PTO controls.<br><br>NOTE: This parameter must be set properly to protect PTO related equipment. | | | | 2200 |
| | Aux Throttle Control - Preset Engine Speed 3 | 75091 | 7509 | Sets the running engine speed point that will be maintained when the third PTO preset speed is selected or when SET/COAST is pressed twice.<br><br>NOTE: Preset speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be one preset, and 2, 4, 6 can be another. | Range must be less than the following setting - PTO Maximum Engine Speed (7508) | | | 1000 |
| | Aux Throttle Control - Preset Engine Speed 4 | 75101 | 7510 | Sets the running engine speed point that will be maintained when the fourth PTO preset speed is selected or when RESUME/ACCEL is pressed twice.<br><br>NOTE: Preset speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be one preset, and 2, 4, 6 can be another. | Range must be less than the following setting - PTO Maximum Engine Speed (7508) | | | 1000 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| PTO - In-Cab Engine Speed Control (Continued) | Aux Throttle Control - Preset Engine Speed 5 | 75111 | 7511 | Sets the running engine speed point that will be maintained when the fifth PTO preset speed is selected or when SET/COAST is pressed three times.<br><br>NOTE: Preset speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be one preset, and 2, 4, 6 can be another. | Range must be less than the following setting - PTO Maximum Engine Speed (7508) | | | 1000 |
| | Aux Throttle Control - Preset Engine Speed 6 | 75121 | 7512 | Sets the running engine speed point that will be maintained when the sixth PTO preset speed is selected or when RESUME/ACCEL is pressed three times.<br><br>NOTE: Preset speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be one preset, and 2, 4, 6 can be another. | Range must be less than the following setting - PTO Maximum Engine Speed (7508) | | | 1000 |
| | **Parameters for PTO Override Configurations** | | | | | | | |
| | Aux Throttle Control - Return to Zero | 75131 | 7513 | Sets the return to zero requirements for the Remote Pedal. | 0 - Return to Zero Required<br>1 - Return to Zero Not Required | | | 1 |
| | Aux Throttle Control - Disable ATC with Service Brake | 75141 | 7514 | Allows the operator to set the Service Brake to disable the In-Cab PTO. | 0 - Service Brake Disables PTO<br>1 - Service Brake Does Not Change PTO | | | 0 |
| | Aux Throttle Control - Disable ATC with Parking Brake Released | 75151 | 7515 | Allows the use of PTO without requiring the parking brake set.<br><br>NOTE: Depending on the calibration; some calibrations have the Parking Brake interactions with PTO disabled permanently. | 0 - Parking Brake Disables PTO<br>1 - Parking Brake Does Not Change PTO | | | 0 |
| | Aux Throttle Control - Disable ATC with Driveline Status | 75161 | 7516 | (7517) Allows the operator to disable the ATC with In-Cab Controls. | 0 - Driveline Status Disables PTO operation<br>1 - Driveline Status Does Not Change PTO operation | | | 0 |
| | Aux Throttle Control - Disable ATC with In-Cab Controls | 75171 | 7517 | Control - Disable ATC with In-Cab Controls | 0 - In- Cab Controls Disables PTO<br>1 - In- Cab controls Do Not Change PTO | | | 0 |
| | Aux Throttle Control - Disable ATC with Vehicle Speed | 75181 | 7518 | Allows the In-Cab PTO to be disabled with vehicle speed. | 0 - Vehicle Speed Limit Disables PTO<br>1 - Vehicle Speed Limit Does Not Change PTO | | | 0 |
| | Aux Throttle Control - SPDT Enable | 75191 | 7519 | Allows the operator to use a single switch to activate PTO PRESET 1 or 2.<br><br>NOTE 1: After PTO/ RPTO has been enabled, PTO and/ or RPTO will require a transition in the state of the PTO control switches (CC RESUME/SET, or RVAR/ RPRE switches) to transition to a new PRESET mode from the current state. For example, a transition in the state of the PTO control switches would require a release of the CC SET switch then re-activation to transition from PRESET 1 to PRESET 3 while CC ON remains active.<br><br>NOTE 2: A combination of ON, RVAR or RPRE with SET will select PRESET 1. A combination of ON, RVAR, or RPRE with RESUME will select PRESET 2. | 0 - Disable the ability to activate the PTO enable signal (CC/PTO On, RPRE, RVAR) at the same time as the PTO incrementing signal (SET, RESUME)<br><br>1 - Enable the ability to activate the PTO enable signal (CC/PTO On, RPRE, RVAR) at the same time as the PTO incrementing signal (SET, RESUME) | | | 1 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| PTO - In-Cab Engine Speed Control (Continued) | Aux Throttle Control - Disable RP with Service Brake | 75201 | 7520 | Allows the operator to set the Service Brake to disable the Remote PTO. | 0 - Service Brake Disables Remote Pedal Switch<br>1 - Service Brake Does Not Change Remote | | | 0 |
| | Aux Throttle Control - Disable RP with Parking Brake Released | 75211 | 7521 | Allows the use of PTO without requiring the parking brake set.<br><br>NOTE: Depending on the calibration; some calibrations have the Parking Brake interactions with Remote PTO disabled permanently. | 0 - Parking Brake Disables Remote Pedal Switch<br>1 - Parking Brake Does Not Change Remote Pedal Switch | | | 0 |
| | Aux Throttle Control - Disable RP with Driveline Status | 75221 | 7522 | Allows the use of Remote PTO without requiring the Driveline Status to indicate "Driveline Disengaged".<br><br>NOTE: For Automatic transmissions, "Driveline Status" refers to the gear selector; moving the gear selector from the Park/ Neutral position will cancel the current Remote PTO mode. For Manual transmissions, "Driveline Status" refers to the clutch switch or gear selector status; pressing the clutch or moving the gear selector from "Neutral" will cancel the current Remote PTO mode. | 0 - Driveline Status Disables Remote Pedal Switch<br>1 - Driveline Status Does Not Change Remote Pedal Switch | | | 0 |
| | Aux Throttle Control - Disable RP with In-Cab Controls | 75231 | 7523 | Allows the operator to disable the RP with In-Cab Controls. | 0 - In-Cab Controls Disables Remote Pedal Switch<br>1 - In-Cab Controls Do Not Change Remote | | | 0 |
| | Aux Throttle Control - Disable RP with Vehicle Speed | 75241 | 7524 | Allows Remote PTO to be disabled with vehicle speed. | 0 - Vehicle Speed Limit Disables Remote Pedal Switch<br>1 - Vehicle Speed Limit Does Not Change | | | 0 |
| | Aux Throttle Control - Enable RP Overrides | 75251 | 7525 | Allows the operator to enable or disable RP overrides.<br><br>*If this is 0, all interlock overrides are disabled. | 0 - Disable<br>1 - Enable | | | 0 |
| | Aux Throttle Control - Enable ATC | 75261 | 7526 | Allows the operator to enable or disable In-Cab PTO overrides. | 0 - Disable the In-Cab PTO overrides<br>1 - Enable the In-Cab PTO overrides | | | 0 |
| Cruise Control | Min. Cruise Control Vehicle Speed | 76031 | 7603 | Minimum vehicle speed at which cruise control can be engaged. | 25 | 100 | MPH | 35 |
| | Max. Cruise Control Vehicle Speed | 76041 | 7604 | Maximum road speed at which the cruise will control the vehicle speed. | 30 | 127 | MPH | 63 |
| Engine Warning and Protection System | Engine Warning and Protection System Mode | 77002 | 7700 | Determines how the EWPS Feature reacts if critical engine operating limits are exceeded. If set to:<br>1 - The EWPS feature provides a visual and audible indication if critical engine operating limits exceed a threshold.<br>2 - The EWPS feature provides 2 levels of protection. Less Severe – A visual and audible indication occurs if critical engine operating parameters exceed the 1st threshold. More Severe – The EWPS feature will shut down the engine if critical engine operating parameters exceed the 2nd threshold. | 0 - Standard Warning (Overspeed)<br>1 - 3-way Warning (Overspeed, Overheat, Low Oil Pressure, Low Coolant)<br>2 - 3-way Protection (Overspeed, Overheat, Low Oil Pressure, Low Coolant)<br>3 - 2-way Warning (Overspeed, Overheat, Low Oil Pressure)<br>4 - 4-way Warning (Overspeed, Overheat, Low Oil Pressure, Genset Speed Control)<br>5 - 2-way Protection (Overspeed, Overheat, Low Oil Pressure) | | | 1 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| Vehicle Speed Governor | Road Speed Limiting Control Mode | 79001 | 7900 | This parameter is required to be set to 1. | 0 - Disable<br>1 - Enable | | | 1 |
| | Engine Speed Limit with VSS Fault | 79011 | 7901 | Sets the maximum engine speed allowed when an active vehicle speed sensor (VSS) fault exits and PTO engine speed control is not active. This parameter might be useful in preventing the operator from exceeding the Max Vehicle Speed with Road Speed Limiting On (7902) parameter setting by tampering with the vehicle speed sensor. | 700 | 5000 | RPM | 2200 |
| | Max Vehicle Speed with Road Speed Limiting On | 79021 | 7902 | Sets the maximum accelerator controlled vehicle speed. The engine will not power the vehicle faster than this value. This parameter can be used to encourage driver behavior. | 1 | 99 | MPH | 63 |
| | PTO - Vehicle Speed Override | 75181 | 7518 | If the PTO is engaged, this is the allowable speed the PTO will be able to operate. | 0-Disabled<br>1- Enabled | | | 1 |
| Vehicle Setup | Two Speed Axle Enable | 80001 | 8000 | This parameter should be enabled if the vehicle is equipped with a 2-speed axle.<br><br>NOTE: This parameter can be used for a transfer case enable. | 0 - Disable<br>1 - Enable | | | Sales Tools Driven |
| | Tire Revs Per Mile | 80011 | 8001 | This value is provided by the tire manufacturer and is used in the vehicle speed calculation | 300 | 676 | RPM | |
| | Rear Axle Ratio Low | 80020 | 8002 | This is the application specific final drive gear ratio.<br><br>NOTE 1: This is a “low speed” gear ratio if equipped with a 2-speed axle.<br><br>NOTE 2: If equipped with a single speed axle, then parameter (8002) and (8003) must be programmed to the same value. | 2.50 | 30.00 | | |
| | Rear Axle Ratio High | 80030 | 8003 | This is the application specific final drive gear ratio.<br><br>NOTE 1: This is a “high speed” gear ratio if equipped with a 2-speed axle.<br><br>NOTE 2: If equipped with a single speed axle, then parameter (8002) and (8003) must be programmed to the same value. | 2.50 | 30.00 | | |
| | Transmission Top Gear Ratio | 80041 | 8004 | The gear ratio of the highest gear in the transmission. | 0.6 | 20 | | |
| | Low Axle Ratio Pulses Per Mile Count | 80051 | 8005 | Indicates the low axle ratio pulses per mile (PPM). This is found by multiplying the following: [Tire Revs Per Mile (8001) x Rear Axle Ratio Low (8002) x Transmission Tailshaft Gear Teeth (8007)] | 18,017 | 200,000 | PPM | |
| | High Axle Ratio Pulses Per Mile Count | 80061 | 8006 | Indicates the high axle ratio PPM. This is found by multiplying the following: [Tire Revs Per Mile (8001) x Rear Axle Ratio Low (8002) x Transmission Tailshaft Gear Teeth (8007)] | 18,017 | 200,000 | PPM | |
| | Transmission Tailshaft Gear Teeth | 80071 | 8007 | Indicates the number of teeth on the transmission output or transfer case shaft. | 5 | 255 | | |
| | Low Idle Engine Speed | 82020 | 8202 | The engine speed in revolutions per minute (RPM) at normal low engine idle speed. | 650 | 750 | RPM | |
| Password Protection | Customer Password | 87002 | 8700 | The password locks the parameters so they cannot be changed without the password. | Up to 8 Alphanumeric characters required. | | | 0000 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| Engine Fan Control | Engine Fan Control Mode | 90001 | 9000 | Determines the functionality of the Engine Fan Control (EFC) feature. If set to:<br>1 - Cooling fan turns ON at 100% and OFF based on engine coolant temperature. | 0 - Disable<br>1 - ON/OFF Coolant Temp Control<br>2 - ON/OFF Temp Control Retarder | | | Chosen based on the fan type installed on the vehicle. |
| | Fan ON Temperature for Engine Cooling Control | 90021 | 9002 | Sets the engine coolant temperature threshold for engine fan ON command; when the Engine Coolant Temperature (ECT) exceeds this threshold, the fan will turn ON. WARNING: Changing of this parameter may have an adverse effect on the engine life if done improperly. | -40 | 302 | F | 212°F |
| | Fan OFF Temperature for Engine Cooling Control | 90031 | 9003 | Sets the engine coolant temperature threshold for engine fan OFF command; when the ECT drops below this threshold, the fan will turn OFF. WARNING: Changing of this parameter may have an adverse effect on the engine life if done improperly. | -40 | 302 | F | 204°F |
| | Total Time Fan Duty Cycle Protection is Enabled | 90181 | 9018 | Sets the minimum time the fan will remain ON at each activation if the fan has been cycled ON-OFF-ON too frequently. This is to protect the fan drive lining from wear and tear due to excessive and rapid fan cycling. | 0 | 120 | SEC | 30 |
| | Extended Fan On Time During Fan Duty Cycle Protection | 90191 | 9019 | Sets the period of time where the extended fan ON time parameter (9018) is in effect. | 120 | 1800 | SEC | 120 |
| PTO - Split Shaft Operation | Driveline Status for Hydraulic Pressure Governor Operation | 93011 | 9301 | Sets the driveline mode for PTO operation: If set to<br>0 - The ECM receives vehicle speed via SAE J1939 or hardwired from the transmission output shaft - vehicle speed sensor input.<br>1 - and the transfer case is engaged – The ECM receives wheel-based vehicle speed via SAE J1939 from the anti-lock brake system (ABS).<br><br>NOTE 1: The driveline must be disengaged at all times for operation of the split shaft feature.<br>NOTE 2: A transition in driveline status will cause the split shaft feature to be deactivated.<br><br>*Only for split shaft which is not typical. | 0 - Neutral Operation<br>1 - Split Shaft Operation | | | 0 |
| | Vehicle Speed Source Selection When Split Shaft is Active | 93071 | 9307 | Allows the operator to select the vehicle speed display. If set to:<br>0 - The ECM will transmit vehicle speed to the cluster based on the SAE J1939 output from the anti- lock brake system (ABS), the speedometer will not display a vehicle speed unless the vehicle wheels are rotating.<br>1 - The ECM will transmit vehicle speed to the cluster based on the signal from the transmission output shaft speed sensor, the speedometer will display a vehicle speed while the split shaft mode is operational based on the output shaft speed.<br><br>*Only for split shaft which is not typical. | 0 - Wheel speed selected when split shaft is enabled<br>1 - Output shaft speed selected when split shaft is enabled | | | 0 |
| Cold Ambient Protection | Cold Ambient Protection Enable | 94001 | 9400 | This parameter enables the Cold Ambient Protection functionality.<br><br>NOTE: Low and High idle speeds are non-adjustable.<br><br>*Disabled as it would interfere with PTO operation. | 0 - Disable<br>1 - Enable | | | 0 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| Service Interval | Service Interval Mode | 95001 | 9500 | This parameter enables or disables the service interval feature. • If set to (0): – The service interval feature is disabled. • If set to (1): – The feature will turn on the "Change Engine Oil" indication if the service interval has expired. | 0 - Disable<br>1 - Enable | | | 0 |
| | Fuel Used Service Interval | 95011 | 9501 | Determines the fuel used between the last service interval reset and when the "Change Engine Oil" indication occurs. Set this parameter to the value recommended in the "Maintenance Schedule and Service Procedures" section of the "Engine Operation and Maintenance Manual".<br><br>NOTE: Set this parameter to 0 if a service interval based on fuel used is not desired. | 0 | 65,535 | GAL | 1500 |
| | Engine Hour Service Interval | 95021 | 9502 | Determines the engine hours between the last service interval reset and when the "Change Engine Oil" indication occurs. Set this parameter to the value recommended in the "Maintenance Schedule and Service Procedures" section of the "Engine Operation and Maintenance Manual".<br><br>NOTE: Set this parameter to 0 if a service interval based on engine hours is not desired. | 0 | 2000 | HRS | 450 |
| | Vehicle Distance Service Interval | 95031 | 9503 | Determines the vehicle distance between the last service interval reset and when the "Change Engine Oil" indication occurs. Set this parameter to the value recommended in the "Maintenance Schedule and Service Procedures" section of the "Engine Operation and Maintenance Manual".<br><br>NOTE: Set this parameter to 0 if a service interval based on vehicle distance is not desired. | 0 | 65,535 | GAL | 12000 |
| | Fuel Used Starting Value | 95041 | 9504 | Used to create an offset; the Service Interval - fuel used accumulator will not begin to increment until reaching this value. | 0 | 536,870,911 | GAL | 0 |
| | Engine Hour Starting Value | 95051 | 9505 | Used to create an offset; the Service Interval - engine hour accumulator will not begin to increment until reaching this value. | 0 | 214,748,364 | HRS | 0 |
| | Vehicle Distance Starting Value | 95061 | 9506 | Used to create an offset; the Service Interval - vehicle distance accumulator will not begin to increment until reaching this value. | 0 | 4,294,967,295 | MILES | 0 |
| | Service Soon Percent | 95071 | 9507 | Determines the functionality of the "Change Engine Oil" indication. If this parameter is set to:<br>100% - the "Change Engine Oil" indication will occur when one or more intervals (hours, fuel, or distance) have fully expired.<br>50% - however; the "Change Engine Oil" indication occurs when half of the interval has accumulated.<br><br>NOTE: Refer to the "calculations" section and the examples at the end of this document to understand how to set this parameter. | 5 | 100 | % | 0 |
| | Change Oil Lamp Always On | 95081 | 9508 | Set this parameter to:<br>1 to ensure the change oil lamp will turn on and remain on once the oil change service interval has expired. | 0 - No<br>1 - Yes | | | 0 |
| | Service Interval Reset Request | 95101 | 9510 | Set this parameter to:<br>1 to reset the service interval and turn off the "Change Engine Oil" indication.<br><br>NOTE: The service interval may be reset by means of the cruise control switches. Refer to the Service Interval Reset section in this document for more information. | 0 - No<br>1 - Yes | | | 0 |

# Engine Parameters for Rollback Recovery - MaxxForce Engines DT, 9 and 10

This information is designed to be a guideline in setting up the parameters for a specific application and is not all-encompassing.

Email Questions or Concerns to performanceengineering@navistar.com

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| Engine Brake | Vehicle Retarder Control Mode | 70003 | 7000 | Determines the conditions that the engine brake feature will be functional. If set to:<br>0 - The engine brake functionality is disabled.<br>1, 3 or 4 - The engine brake is active after the accelerator pedal is released.<br>2 or 5 - the engine brake is active only while the service brake pedal is pressed.<br>6 - The engine brake is active when the accelerator pedal is released and cruise mode is active; in this mode, the engine brake acts to maintain a set speed (typically when traveling down a grade). | 0 - Disable<br>1 - Exhaust Brake Latched<br>2 - Exhaust Brake Coast<br>3 - Transmission Brake Latched<br>4 - Compression Brake Latched<br>5 - Compression Brake Coast<br>6 - Compression Brake with Cruise Control<br>7 - Exhaust Brake with Cruise Control<br><br>NOTE: Mode 7 is not functional for inline applications but may show up in the Programming/ Service Tool. | | | 0<br><br>*Customer chosen based on installed brake. |
| | VRE Disable when RPS Active | 70091 | 7009 | Allows the VRE to be disabled when the Remote Throttle is in use.<br><br>*Only a concern if there is a possibility that engine braking may interfere with remote throttle. | 0 - Enable VRE Control<br>1 - Disable VRE Control when Remote Throttle is active | | | Customer Chosen |
| Idle Shutdown Timer | Idle Shutdown Timer Mode | 74001 | 7400 | Determines the conditions under which the idle shutdown feature will be functional. If set to:<br>0 - The idle shutdown timer is disabled.<br>1 - The idle shutdown timer sequence will be prevented and the engine will not shut down while the PTO or any auxiliary engine speeds control is actively ramping the engine above normal engine idle speed.<br>2 - The engine may shutdown if PTO engine speed control is engaged. This allows the engine to stay running, for example, if the operator desires to have the engine speed ramped up during PTO operation. This mode also prevents the operator from setting the engine speed with a minimum load (e.g., 10% engine torque) without actually engaging the PTO with the intent of bypassing the idle shutdown timer.<br>3 - The engine may shutdown if PTO engine speed control is engaged. Puts the feature in tamper proofing mode. Refer to the tamper proofing section for more information. | 0 - Disable<br>1 - PTO Option<br>2 - No Load Option<br>3 - Tamper Proofing Option | | | 1 |
| | Engine Idle Shutdown Time | 74010 | 7401 | Sets the amount of engine idle time before the idle shutdown feature will initiate an engine shutdown.<br><br>NOTE: While the Electronic Service Tool is installed, this time may be extended regardless of the parameter setting.<br><br>*If in PTO operation mode, this will not start counting. | 2 | 120 | MIN | 15 |
| | Engine Idle Shutdown Maximum Intake Air Temperature | 74021 | 7402 | The idle shutdown feature will not shut down the engine above this temperature. This allows the engine to stay running when temperatures are high in order to allow the air conditioning to function for driver comfort, for example. | -40 | 302 | F | 100°F |
| | Engine Idle Shutdown Minimum Intake Air Temperature | 74031 | 7403 | The idle shutdown feature will not shut down the engine below this temperature. This allows the engine to stay running when temperatures are low in order to allow the engine to stay warm for engine protection, and to allow the heater to function for driver comfort, for example. | -40 | 302 | F | 45°F |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| PTO In Cab - Engine Speed Control | **Parameters for Preset Engine Speed PTO Configuration** | | | | | | | |
| | Aux Throttle Control - I-Mode | 75001 | 7500 | Determines the conditions that the Engine Speed Control (PTO) feature will be functional. Set this parameter to enable PTO operation and to choose which inputs are used for control. If set to:<br>0 - The PTO functionality is disabled.<br>1 - Only the remote PTO inputs will be able to control PTO (See NOTE 2).<br>2 - Only the in-cab inputs will be able to control PTO.<br>3 - Both remote and in-cab inputs will be able to control PTO (See NOTE 1 & 2).<br><br>NOTE 1: The last input received will take priority when Mode 3 is selected.<br><br>NOTE 2: Mode 1 and the remote portion of Mode 3 are discussed in the Remote Engine Speed Control document. | 0 - Disable<br>1 - Remote Operation Only<br>2 - In-Cab Operation Only<br>3 - Remote and In-Cab Operation | | | 3 |
| | Aux Throttle Control - Maximum Vehicle Speed | 75011 | 7501 | This parameter is the maximum vehicle speed that the PTO will be allowed to operate.<br><br>NOTE: Set this parameter to the maximum vehicle speed that the PTO is typically used.<br><br>*Only applicable if in mobile variable mode for any speed above 0 MPH. | 0 | 20 | MPH | 2 |
| | Aux Throttle Control B26 - In-Cab Mode | 75021 | 7502 | Set this parameter after selecting In-Cab Or Remote and In-Cab Operation to determine which PTO mode is active. If set to:<br>0 – The switches will not be used. Refer to the Remote Engine Speed Control document.<br>1 – The switches will be used to select up to 6 preset engine speeds. Refer to the Stationary Preset section for more information.<br>2 – The switches will be used to adjust the engine speed variably. Refer to the Stationary Variable section for more information.<br>3 – The switches will be used to adjust the engine speed to a desired set point to allow for vehicle movement. Refer to the Mobile Variable section for more information. | 0 - None<br>1 - Stationary Preset<br>2 - Stationary Variable<br>3 - Mobile Variable | | | 1 |
| | Aux Throttle Control - In-Cab Operator Interface | 75031 | 7503 | Select this parameter when accelerator, brake or clutch is desired to be ignored during engine speed control operation. If set to:<br>0 - The accelerator, brake, and clutch are inputs used for PTO operation.<br>1 - The accelerator, brake, and clutch will be ignored during PTO operation.<br><br>NOTE: Use parameters (7510), (7511) and (7513) to provide the specific input options. | 0 - Disable<br>1 - Enable | | | 0 |
| | Aux Throttle Control - Remote Pedal Enable | 75041 | 7504 | This parameter sets the driveline mode for PTO operation:<br><br>NOTE: Set to 1 if engine speed is to be controlled by remote throttle pedal. | 0 - Disable<br>1 - Enable | | | 0 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| PTO In Cab - Engine Speed Control (Continued) | Aux Throttle Control - Preset Engine Speed 1 (SET/COAST) | 75051 | 7505 | This parameter sets the running engine speed set point that will be maintained when the first (1st) PTO preset speed is selected or when SET/COAST is pressed.<br><br>NOTE: Presets speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be preset, and 2, 4, 6 can be another. | Range must be less than the following setting - PTO Maximum Engine Speed (7508) | | | 1000 |
| | Aux Throttle Control - Preset Engine Speed 2 (RESUME/ACCEL) | 75061 | 7506 | Sets the running engine speed set point that will be maintained when the second (2nd) PTO preset speed is selected or when RESUME/ACCEL is pressed.<br><br>NOTE: Presets speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be preset, and 2, 4, 6 can be another. | Range must be less than the following setting - PTO Maximum Engine Speed (7508) | | | 1200 |
| | Aux Throttle Control - Ramp Rate | 75071 | 7507 | Sets the speed at which the engine will attempt to increase the engine speed.<br><br>NOTE 1: The engine only attempts to increase the engine speed at this rate because actual engine changes are influenced by other factors such as engine load and available engine power.<br><br>NOTE 2: This parameter should be set to provide a smooth transition to the desired engine speed to accommodate applicable PTO equipment.<br><br>*7507 is only active when variable modes are selected in 7502. | 1 | 1500 | RPM | 500 RPM/SEC |
| | Aux Throttle Control - Maximum Engine Speed | 75081 | 7508 | The maximum engine speed that can be reached using any PTO controls.<br><br>NOTE 1: This parameter must be set properly to protect PTO related equipment. | | | | 1600 |
| | Aux Throttle Control - Preset Engine Speed 3 | 75091 | 7509 | Sets the running engine speed set point that will be maintained when the third (3rd) PTO preset speed is selected or when SET/COAST is pressed twice.<br><br>NOTE: Presets speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be preset, and 2, 4, 6 can be another. | Range must be less than the following setting - PTO Maximum Engine Speed (7508) | | | 1000 |
| | Aux Throttle Control - Preset Engine Speed 4 | 75101 | 7510 | This parameter sets the running engine speed set point that will be maintained when the fourth (4th) PTO preset speed is selected or when RESUME/ACCEL is pressed twice.<br><br>NOTE 1: Presets speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be preset, and 2, 4, 6 can be another. | Range must be less than the following setting - PTO Maximum Engine Speed (7508) | | | 1000 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| PTO In Cab - Engine Speed Control (Continued) | Aux Throttle Control - Preset Engine Speed 5 | 75111 | 7511 | Sets the running engine speed set point that will be maintained when the fifth (5th) PTO preset speed is selected or when SET/COAST is pressed three times.<br><br>NOTE 1: Presets speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be preset, and 2, 4, 6 can be another. | Range must be less than the following setting - PTO Maximum Engine Speed (7508) | | | 1000 |
| | Aux Throttle Control - Preset Engine Speed 6 | 75121 | 7512 | Sets the running engine speed set point that will be maintained when the sixth (6th) PTO preset speed is selected or when RESUME/ACCEL is pressed three times.<br><br>NOTE: Presets speeds that will not be used can be set to 0 RPM. Refer to the Stationary Preset section for more information.<br><br>*All need to be set to the same value. 1200-1600 RPM (1400 to target the middle value). 1, 3, 5 can be preset, and 2, 4, 6 can be another. | Range must be less than the following setting - PTO Maximum Engine Speed (7508) | | | 1000 |
| | **Parameters for PTO Override Configurations** | | | | | | | |
| | Aux Throttle Control - Return to Zero | 75131 | 7513 | Set the return to Zero requirements for the Remote Pedal. | 0 - Return to Zero Required<br>1 - Return to Zero Not Required | | | 1 |
| | Aux Throttle Control - Disable ATC with Service Brake | 75141 | 7514 | Allows operator to set the Service Brake to disable the In-Cab PTO. | 0 - Service Brake Disables PTO<br>1 - Service Brake Does Not Change PTO | | | 0 |
| | Aux Throttle Control - Disable ATC with Parking Brake Released | 75151 | 7515 | Allows the use of PTO without requiring the parking brake set.<br><br>NOTE: Depending on the calibration; some calibrations have the Parking Brake interactions with PTO disabled permanently. | 0 - Parking Brake Disables PTO<br>1 - Parking Brake Does Not Change PTO | | | 0 |
| | Aux Throttle Control - Disable ATC with Driveline Status | 75161 | 7516 | (7517) This parameter allows operator to disable the ATC with In-Cab Controls. | 0 - Driveline Status Disables PTO operation<br>1 - Driveline Status Does Not Change PTO operation | | | 0 |
| | Aux Throttle Control - Disable ATC with In-Cab Controls | 75171 | 7517 | Control - Disable ATC with In-Cab Controls | 0 - In- Cab Controls Disables PTO<br>1 - In- Cab controls Do Not Change PTO | | | 0 |
| | Aux Throttle Control - Disable ATC with Vehicle Speed | 75181 | 7518 | Allows In-Cab PTO to be disabled with vehicle speed. | 0 - Vehicle Speed Limit Disables PTO<br>1 - Vehicle Speed Limit Does Not Change PTO | | | 0 |
| | Aux Throttle Control - SPDT Enable | 75191 | 7519 | Allows the operator to use a single switch to activate PTO PRESET 1 or 2.<br><br>NOTE 1: After PTO/ RPTO has been enabled, PTO and/or RPTO will require a transition in the state of the PTO control switches (CC RESUME/ SET, or RVAR/ RPRE switches) to transition to a new PRESET mode from the current state. For example, a transition in the state of the PTO control switches would require a release of the CC SET switch then re-activation to transition from PRESET 1 to PRESET 3 while CC ON remains active.<br><br>NOTE 2: A combination of ON, RVAR or RPRE with SET will select PRESET1. A combination of ON, RVAR, or RPRE with RESUME will select PRESET 2. | 0 - Disable the ability to activate the PTO enable signal (CC/PTO On, RPRE, RVAR) at the same time as the PTO incrementing signal (Set, Resume)<br><br>1 - Enable the ability to activate the PTO enable signal (CC/PTO On, RPRE, RVAR) at the same time as the PTO incrementing signal (Set, Resume) | | | 1 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| PTO In Cab - Engine Speed Control (Continued) | Aux Throttle Control - Disable RP with Service Brake | 75201 | 7520 | Allows operator to set the Service Brake to disable the Remote PTO. | 0 - Service Brake Disables Remote Pedal Switch<br>1 - Service Brake Does Not Change Remote | | | 0 |
| | Aux Throttle Control - Disable RP with Parking Brake Released | 75211 | 7521 | Allows the use of PTO without requiring the parking brake set.<br><br>NOTE: Depending on the calibration; some calibrations have the Parking Brake interactions with Remote PTO disabled permanently. | 0 - Parking Brake Disables Remote Pedal Switch<br>1 - Parking Brake Does Not Change Remote Pedal Switch | | | 0 |
| | Aux Throttle Control - Disable RP with Driveline Status | 75221 | 7522 | Allows the use of Remote PTO without requiring the Driveline Status indicate "driveline disengaged".<br><br>NOTE: For Automatic transmissions, "Driveline Status" refers to the gear selector; moving the gear selector from the Park/ Neutral position will cancel the current Remote PTO mode. For Manual transmissions, "Driveline Status" refers to the clutch switch or gear selector status; pressing the clutch or moving the gear selector from "Neutral" will cancel the current Remote PTO mode. | 0 - Driveline Status Disables Remote Pedal Switch<br>1 - Driveline Status Does Not Change Remote Pedal Switch | | | 0 |
| | Aux Throttle Control - Disable RP with In-Cab Controls | 75231 | 7523 | Allows operator to disable the RP with In-Cab Controls. | 0 - In-Cab Controls Disables Remote Pedal Switch<br>1 - In-Cab Controls Do Not Change Remote | | | 0 |
| | Aux Throttle Control - Disable RP with Vehicle Speed | 75241 | 7524 | Allows Remote PTO to be disabled with vehicle speed. | 0 - Vehicle Speed Limit Disables Remote Pedal Switch<br>1 - Vehicle Speed Limit Does Not Change | | | 0 |
| | Aux Throttle Control - Enable RP Overrides | 75251 | 7525 | Allows the operator to enable or disable RP overrides.<br><br>*If this is 0, all interlock overrides are disabled. | 0 - Disable<br>1 - Enable | | | 0 |
| | Aux Throttle Control - Enable ATC | 75261 | 7526 | Allows the operator to enable or disable In-Cab PTO overrides. | 0 - Disable the In-Cab PTO overrides<br>1 - Enable the In-Cab PTO overrides | | | 0 |
| Cruise Control | Min. Cruise Control Vehicle Speed | 76031 | 7603 | Minimum vehicle speed at which cruise control can be engaged. | 25 | 100 | MPH | 35 |
| | Max. Cruise Control Vehicle Speed | 76041 | 7604 | Maximum road speed at which the cruise will control the vehicle speed. | 30 | 127 | MPH | 68 |
| Engine Warning and Protection System | Engine Warning And Protection System Mode | 77002 | 7700 | Determines how the EWPS Feature reacts if critical engine operating limits are exceeded. If set to:<br>1 - The EWPS feature provides a visual and audible indication if critical engine operating limits exceed a threshold.<br>2 - The EWPS feature provides 2 levels of protection.<br>(Less Severe) - A visual and audible indication occurs if critical engine operating parameters exceed the 1st threshold.<br>(More Severe) - The EWPS feature will shut down the engine if critical engine operating parameters exceed the 2nd threshold. | 0 - Standard Warning (Overspeed)<br>1 - 3-way Warning (Overspeed, Overheat, Low Oil Pressure, Low Coolant)<br>2 - 3-way Protection (Overspeed, Overheat, Low Oil Pressure, Low Coolant)<br>3 - 2-way Warning (Overspeed, Overheat, Low Oil Pressure)<br>4 - 4-way Warning (Overspeed, Overheat, Low Oil Pressure, Genset Speed Control)<br>5 - 2-way Protection (Overspeed, Overheat, Low Oil Pressure) | | | 1 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| Vehicle Speed Governor | Road Speed Limiting Control Mode | 79001 | 7900 | Required to be set to 1. | 0 - Disable<br>1 - Enable | | | 1 |
| | Engine Speed Limit with VSS Fault | 79011 | 7901 | Sets the maximum engine speed allowed when an active vehicle speed sensor (VSS) fault exits and PTO engine speed control is not active. This parameter might be useful in preventing the operator from exceeding the Max Vehicle Speed with Road Speed Limiting On (7902) parameter setting by tampering with the vehicle speed sensor. | 700 | 5000 | RPM | 2200 |
| | Max Vehicle Speed with Road Speed Limiting On | 79021 | 7902 | Sets the maximum accelerator controlled vehicle speed. The engine will not power the vehicle faster than this value. This parameter can be used to encourage driver behavior. | 1 | 99 | MPH | 68 |
| Vehicle Setup | Two Speed Axle Enable | 80001 | 8000 | Should be enabled if the vehicle is equipped with a 2-speed axle.<br><br>NOTE: This parameter can be used for a transfer case enable. | 0 - Disable<br>1 - Enable | | | Sales Tools Driven |
| | Tire Revs Per Mile | 80011 | 8001 | This value is provided by the tire manufacturer and is used in the vehicle speed calculation. | 300 | 676 | RPM | |
| | Rear Axle Ratio Low | 80020 | 8002 | This is the application specific final drive gear ratio.<br><br>NOTE 1: This is a “low speed” gear ratio if equipped with a 2-speed axle.<br><br>NOTE 2: If equipped with a single speed axle, then parameter (8002) and (8003) must be programmed to the same value. | 2.50 | 30.00 | | |
| | Rear Axle Ratio High | 80030 | 8003 | This is the application specific final drive gear ratio.<br><br>NOTE 1: This is a “high speed” gear ratio if equipped with a 2-speed axle.<br><br>NOTE 2: If equipped with a single speed axle, then parameter (8002) and (8003) must be programmed to the same value. | 2.50 | 30.00 | | |
| | Transmission Top Gear Ratio | 80041 | 8004 | The gear ratio of the highest gear in the transmission. | 0.6 | 20 | | |
| | Low Axle Ratio Pulses Per Mile Count | 80051 | 8005 | Indicates the low axle ratio pulses per mile (PPM). This is found by multiplying the following: [Tire Revs Per Mile (8001) x Rear Axle Ratio Low (8002) x Transmission Tailshaft GearTeeth (8007)] | 18,017 | 200,000 | PPM | |
| | High Axle Ratio Pulses Per Mile Count | 80061 | 8006 | Indicates the high axle ratio PPM. This is found by multiplying the following: [Tire Revs Per Mile (8001) x Rear Axle Ratio Low (8002) x Transmission Tailshaft GearTeeth (8007)] | 18,017 | 200,000 | PPM | |
| | Transmission Tailshaft Gear Teeth | 80071 | 8007 | Indicates the number of teeth on the transmission output OR transfer case shaft. | 5 | 255 | | |
| | Low Idle Engine Speed | 82020 | 8202 | The engine speed in revolutions per minute (RPM) at normal low engine idle speed. | 650 | 750 | RPM | |
| Password Protection | Customer Password | 87002 | 8700 | The password locks the parameters so they cannot be changed without the password. | Up to 8 Alphanumeric characters required. | | | 0000 |

| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| Engine Fan Control | Engine Fan Control Mode | 90001 | 9000 | Determines the functionality of the Engine Fan Control (EFC) feature. If set to:<br>1 - The feature includes: 1. Cooling fan turns ON at 100% and OFF based on engine coolant temperature. | 0 - Disable<br>1 - ON/OFF Coolant Temp Control<br>2 - ON/OFF Temp Control Retarder | | | Chosen based on the fan type installed. |
| | Fan ON Temperature for Engine Cooling Control | 90021 | 9002 | Sets the engine coolant temperature threshold for engine fan ON command; when the Engine Coolant Temperature (ECT) exceeds this threshold, the fan will turn ON. WARNING: Changing of this parameter may have an adverse effect on the engine life if done improperly. | -40 | 302 | F | 212°F |
| | Fan OFF Temperature for Engine Cooling Control | 90031 | 9003 | Sets the engine coolant temperature threshold for engine fan OFF command; when the ECT drops below this threshold, the fan will turn OFF. WARNING: Changing of this parameter may have an adverse effect on the engine life if done improperly. | -40 | 302 | F | 204°F |
| | Total Time Fan Duty Cycle Protection is Enabled | 90181 | 9018 | Sets the minimum time the fan will remain ON at each activation if the fan has been cycled ON-OFF-ON too frequently. This is to protect the fan drive lining from wear and tear due to excessive and rapid fan cycling. | 0 | 120 | SEC | 30 |
| | Extended Fan On Time During Fan Duty Cycle Protection | 90191 | 9019 | Sets the period of time where the extended fan ON time parameter (9018) is in effect. | 120 | 1800 | SEC | 120 |
| PTO - Split Shaft Operation | Driveline Status for Hydraulic Pressure Governor Operation | 93011 | 9301 | Sets the driveline mode for PTO operation: If set to:<br>0 - The ECM receives vehicle speed via SAE J1939 or hardwired from the transmission output shaft - vehicle speed sensor input.<br><br>NOTE 1: The driveline must be disengaged at all times for operation of the split shaft feature. If set to:<br>1 - And the transfer case is engaged, the ECM receives wheel-based vehicle speed via SAE J1939 from the anti-lock brake system (ABS).<br><br>NOTE 2: A transition in driveline status will cause the split shaft feature to be deactivated. | 0 - Neutral Operation<br>1 - Split Shaft Operation | | | 0 |
| | Vehicle Speed Source Selection When Split Shaft is Active | 93071 | 9307 | Allows the operator to select the vehicle speed display. If set to:<br>0 - The ECM will transmit vehicle speed to the cluster based on the SAE J1939 output from the anti- lock brake system (ABS), the speedometer will not display a vehicle speed unless the vehicle wheels are rotating.<br>1 - The ECM will transmit vehicle speed to the cluster based on the signal from the transmission output shaft speed sensor, the speedometer will display a vehicle speed while the split shaft mode is operational based on the output shaft speed. | 0 - Wheel speed selected when split shaft is enabled<br>1 - Output shaft speed selected when split shaft is enabled | | | 0 |
| Cold Ambient Protection | Cold Ambient Protection Enable | 94001 | 9400 | Enables the Cold Ambient Protection functionality.<br><br>NOTE: Low and High idle speeds are non-adjustable.<br><br>*Disabled, as it would interfere with PTO operation. | 0 - Disable<br>1 - Enable | | | 0 |

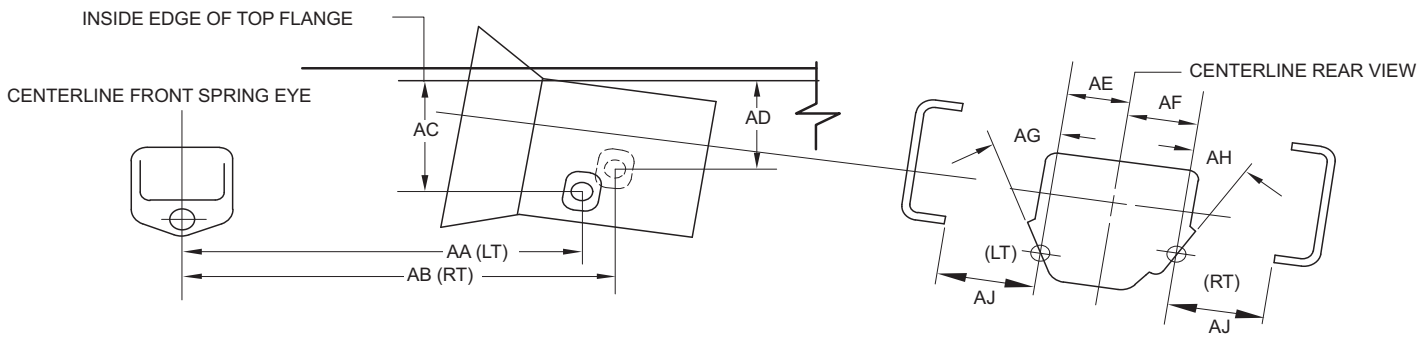
| | Parameter | Sequence ID | Parameter ID | Notes | Min | Max | UOM | Recommended Values |
|---|---|---|---|---|---|---|---|---|
| Service Interval | Service Interval Mode | 95001 | 9500 | Enables or disables the service interval feature. If set to:<br>0 - The service interval feature is disabled.<br>1 - The feature will turn on the "Change Engine Oil" indication if the service interval has expired. | 0 - Disable<br>1 - Enable | | | 1 |
| | Fuel Used Service Interval | 95011 | 9501 | Determines the fuel used between the last service interval reset and when the "Change Engine Oil" indication occurs. Set this parameter to the value recommended in the "Maintenance Schedule and Service Procedures" section of the "Engine Operation and Maintenance Manual".<br><br>NOTE: Set this parameter to 0 if a service interval based on fuel used is not desired. | 0 | 65,535 | GAL | 1500 |
| | Engine Hour Service Interval | 95021 | 9502 | Determines the engine hours between the last service interval reset and when the "Change Engine Oil" indication occurs. Set this parameter to the value recommended in the "Maintenance Schedule and Service Procedures" section of the "Engine Operation and Maintenance Manual". NOTE: Set this parameter to (0) if a service interval based on engine hours is not desired. | 0 | 2000 | HRS | 450 |
| | Vehicle Distance Service Interval | 95031 | 9503 | This parameter determines the vehicle distance between the last service interval reset and when the "Change Engine Oil" indication occurs. Set this parameter to the value recommended in the "Maintenance Schedule and Service Procedures" section of the "Engine Operation and Maintenance Manual". NOTE: Set this parameter to 0 if a service interval based on vehicle distance is not desired. | 0 | 65,535 | GAL | 8000 |
| | Fuel Used Starting Value | 95041 | 9504 | This parameter is used to create an offset; the Service Interval -fuel used accumulator will not begin to increment until reaching this value. | 0 | 536,870,911 | GAL | 0 |
| | Engine Hour Starting Value | 95051 | 9505 | This parameter is used to create an offset; the Service Interval - engine hour accumulator will not begin to increment until reaching this value. | 0 | 214,748,364 | HRS | 0 |
| | Vehicle Distance Starting Value | 95061 | 9506 | This parameter is used to create an offset; the Service Interval - vehicle distance accumulator will not begin to increment until reaching this value. | 0 | 4,294,967,295 | MILES | 0 |
| | Service Soon Percent | 95071 | 9507 | Determines the functionality of the "Change Engine Oil" indication. If this parameter is set to 100%, the "Change Engine Oil" indication will occur when one or more intervals (hours, fuel, or distance) have fully expired. If the value is set to 50%, however; the "Change Engine Oil" indication occurs when half of the interval has accumulated.<br><br>NOTE: Refer to the "calculations" section and the examples at the end of this document to understand how to set this parameter. | 5 | 100 | % | 0 |
| | Change Oil Lamp Always On | 95081 | 9508 | Set this parameter to a value of 1 to ensure the change oil lamp will turn on and remain on once the oil change service interval has expired. | 0 - No<br>1 - Yes | | | 0 |
| | Service Interval Reset Request | 95101 | 9510 | Set this parameter to a value of 1 to reset the service interval and turn off the "Change Engine Oil" indication.<br><br>NOTE: The service interval may be reset by means of the cruise control switches. Refer to the Service Interval Reset section in this document for more information. | 0 - No<br>1 - Yes | | | 0 |

# TRANSMISSION

## *TRANSMISSION PTO DATA*

### *All Models*

NOTE: Do not reuse PTO cover plate gaskets




13–0004

| Transmission | Engine | Clearance Provided for SAE Envelope | | Left PTO Location | | | | Right PTO Location | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Left PTO | Right PTO | AA | AC | AE | AG | AB | AD | AF | AH | AJ |
| 13APZ – Allison 5-Speed Automatic,1000_HS<br>13ARD – Allison 5-Speed Automatic, 1000_EVS<br>13ARC – Allison 5-Speed Automatic, 1000_RDS On/Off Hwy<br>13AVU – Allison 5-Speed Automatic,1000_HS<br>13AVW – Allison 5-Speed Automatic,1000_EVS_P | Cummins® ISB | A | A | N/A | N/A | N/A | N/A | 1569.9 | 205.17 | 144.0 | 0° | 211.6 |

# TRANSMISSION PTO DATA - ALL MODELS

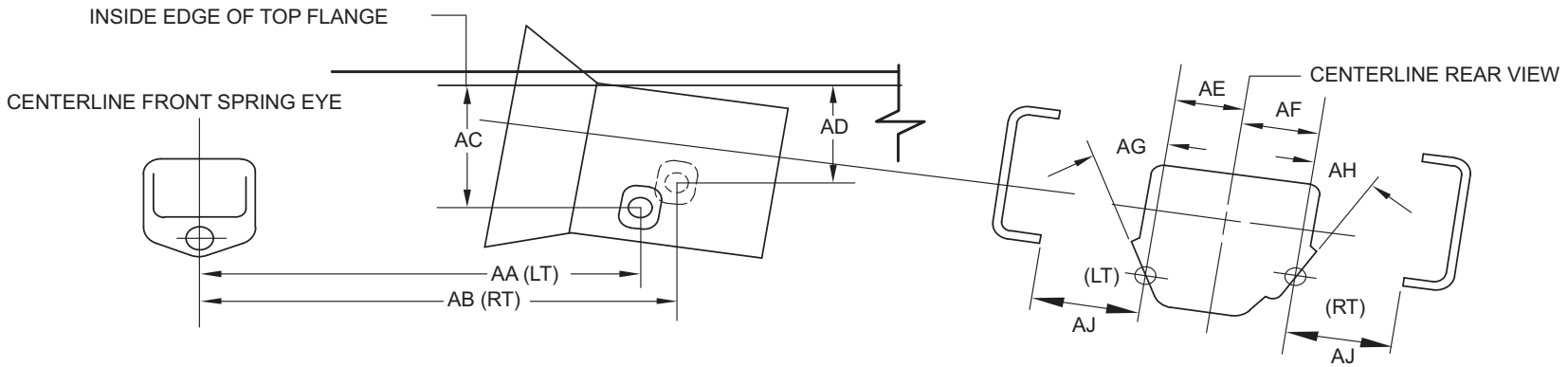
| Transmission | Engine | Clearance Provided for SAE Envelope | | Left PTO Location | | | | Right PTO Location | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Left PTO | Right PTO | AA | AC | AE | AG | AB | AD | AF | AH | AJ |
| 13ARB – Allison 5-Speed Automatic, 2100_EVS_P<br>13ARA – Allison 5-Speed Automatic, 2100 RDS_P On/Off Hwy<br>13ARE – Allison 5-Speed Automatic, 2200_HS<br>13ARJ – Allison 5-Speed Automatic, 2500_EVS_P<br>13ARH – Allison 5-Speed Automatic, 2200_EVS_P<br>13ASK – Allison 5-Speed Automatic, 2200_RDS_P On/Off Hwy<br>13ASL – Allison 5-Speed Automatic, 2500_HS<br>13ASM – Allison 5-Speed Automatic, 2500_RDS_P Refuse<br>13ASN – Allison 5-Speed Automatic, 2100_HS<br>13ASP – Allison 5-Speed Automatic, 2500_RDS (On/Off Highway)<br>13ASR – Allison 5-Speed Automatic, 2550_HS<br>13AST – Allison 5-Speed Automatic, 2500_EVS_P On/Off Hwy<br>13ASY – Allison 5-Speed Automatic, 2500_EVS_P<br>13ATA – Allison 5-Speed Automatic, 2200_HS<br>13ATB – Allison 5-Speed Automatic, 2200_RDS_P<br>13ATD – Allison 5-Speed Automatic, 2500_HS<br>13ATJ – Allison 5-Speed Automatic, 2550_RDS<br>13ATL – Allison 5-Speed Automatic, 3000_HS | MaxxForce® DT<br>Cummins® ISB | A | A | N/A | N/A | N/A | N/A | 1569.9 | 205.17 | 144.0 | 0° | 211.6 |
| 13AMY – Allison 5-Speed Automatic 2550_EVS_P<br>13AMX – Allison 5-Speed Automatic 2550_RDS_P On/Off Hwy | MaxxForce® DT | N/A | N/A | N/A | N/A | 144 | 0 | N/A | N/A | 144 | 0 | N/A |

A = SAE Type 1 (6–Bolt) B = SAE Type 2 (8–Bolt) C = Not Qualified

## *TRANSMISSION PTO DATA (CONTINUED)*

### *All Models*

NOTE: Do not reuse PTO cover plate gaskets



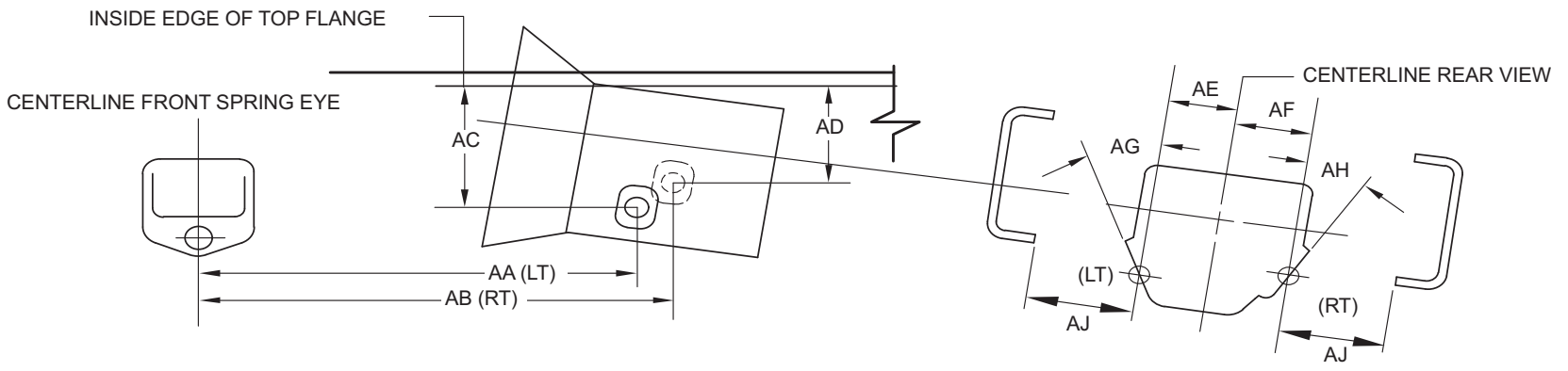

| Transmission | Engine | Clearance Provided for SAE Envelope | | Left PTO Location | | | | Right PTO Location | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Left PTO | Right PTO | AA | AC | AE | AG | AB | AD | AF | AH | AJ |
| 13ATG – Allison 6-Speed Automatic, 2100_RDS_P On/Off Hwy<br>13ATE – Allison 6-Speed Automatic, 2200_EVS_P<br>13ATH – Allison 6-Speed Automatic, 2500_RDS_P | MaxxForce® DT | N/A | N/A | N/A | N/A | 144 | 0 | N/A | N/A | 144 | 0 | N/A |

# TRANSMISSION PTO DATA - ALL MODELS

| Transmission | Engine | Clearance Provided for SAE Envelope | | Left PTO Location | | | | Right PTO Location | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Left PTO | Right PTO | AA | AC | AE | AG | AB | AD | AF | AH | AJ |
| 13ATK – Allison 6-Speed Automatic, 3000_TRV_P<br>13ATL – Allison 6-Speed Automatic, 3000_HS<br>13ATN – Allison 6-Speed Automatic, 3500_EVS_P<br>13ATS – Allison 6-Speed Automatic, 3000_TRV_P<br>13AUK – Allison 6-Speed Automatic, 3000_EVS_P<br>13AUL – Allison 6-Speed Automatic, 3000_EVS_P<br>13AUM – Allison 6-Speed Automatic, 3500_EVS_P<br>13AVE – Allison 6-Speed Automatic, 3000_HS<br>13AVG – Allison 6-Speed Automatic, 3500_RDS_P (On/Off Highway)<br>13AVH – Allison 6-Speed Automatic, 3500_RDS_P (Refuse/Mixer)<br>13AVJ – Allison 6-Speed Automatic, 3000_RDS_P (On/Off Highway)<br>13AVK – Allison 6-Speed Automatic, 3000_RDS_P<br>13AVL – Allison 6-Speed Automatic, 3500_RDS_P (On/Off Highway)<br>13AVP – Allison 6-Speed Automatic, 3500_RDS_P (Refuse/Mixer)<br>13AVR – Allison 6-Speed Automatic, 3000_RDS_P (On/Off Highway)<br>13AVS – Allison 6-Speed Automatic, 3000_RDS_P (Refuse) | Navistar® N9<br>Cummins® ISB | C | N/A | 1100 | 233 | 140.5 | 8° | N/A | N/A | N/A | N/A | N/A |

## *All Models*

NOTE: Do not reuse PTO cover plate gaskets



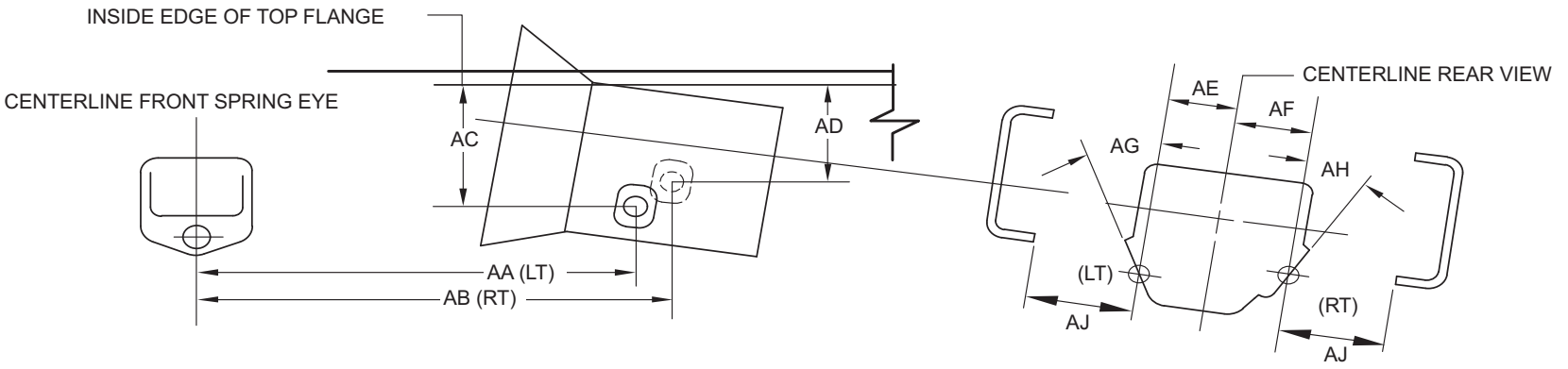

13–0004

| Transmission | Engine | Clearance Provided for SAE Envelope | | Left PTO Location | | | | Right PTO Location | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Left PTO | Right PTO | AA | AC | AE | AG | AB | AD | AF | AH | AJ |
| 13GRS – Eaton Fuller 5-Speed Manual, F_5405B<br>13GRZ – Eaton Fuller 5-Speed Manual, F_6405B-DM3 | MaxxForce® DT<br>Cummins® ISB | A | A | 1554.2 | 387.8 | 102.6 | 20.0° | 1554.2 | 387.8 | 102.6 | 20.0° | 253.8 |
| 13GSL –- Eaton Fuller 5-Speed Manual, F_5505B-DM3 | MaxxForce® DT<br>Cummins® ISB | N/A | N/A | N/A | N/A | 108.9 | 20 | N/A | N/A | 108.9 | 20 | N/A |
| 13GNG – Fuller 6-Speed Manual, FS_5406N<br>13GMS – Fuller 6-Speed Manual, FS_6406N | MaxxForce® DT<br>Cummins® ISB | A | A | 1331 | 384.4 | 102.5 | 20.3° | 1331 | 384.6 | 102.9 | 20.3° | 253.5 |
| 13GMJ – Fuller 6-Speed Manual, FWO_8406A | MaxxForce® DT/9 | A | A | 1554.2 | 387.8 | 102.9 | 20.3° | 1554.2 | 387.8 | 102.9 | 20.3° | 253.5 |
| 13GSM – Eaton Fuller 6-Speed Manual, FO_5506B-DM3<br>13GSP –- Eaton Fuller 6-Speed Manual, FO_6506B-DM3 | MaxxForce® DT<br>Cummins® ISB | N/A | N/A | N/A | N/A | 108.9 | 20 | N/A | N/A | 108.9 | 20 | N/A |
| 13GRT – Eaton Fuller 6-Speed Manual, FO_5406B-DM3<br>13GSA – Eaton Fuller 6-Speed Manual, FO_6406B-DM3 | MaxxForce® DT<br>Cummins® ISB | A | A | 1554.2 | 387.8 | 102.6 | 20.0° | 1554.2 | 387.8 | 102.6 | 20.0° | 253.8 |

## TRANSMISSION PTO DATA (CONTINUED)

### All Models

NOTE: Do not reuse PTO cover plate gaskets




13–0004

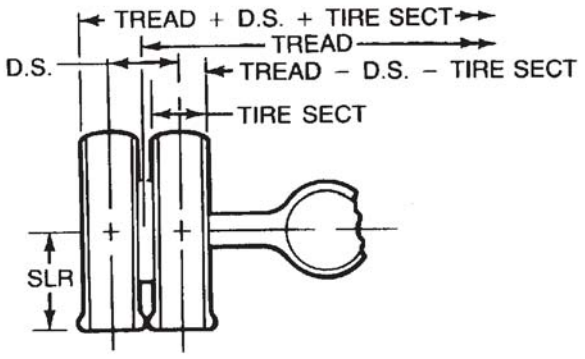
| Transmission | Engine | Clearance Provided For SAE Envelope | | Left PTO Location | | | | Right PTO Location | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Left PTO | Right PTO | AA | AC | AE | AG | AB | AD | AF | AH | AJ |
| 13GJT – Fuller 10-Speed Manual, FR-9210B<br>13GGK – Fuller 10-Speed Manual, FR-11210B<br>13GGM – Fuller 10-Speed Manual, FRO-11210C<br>14GHL - Fuller 10-Speed Manual, FRO-14210C | MaxxForce® DT/9<br>Navistar® N9 | B | A | 1499 | 369.6 | 140 | 90.0° | 1506 | 256 | 207.1 | 57.1° | 216.4 |

A = SAE Type 1 (6–Bolt) B = SAE Type 2 (8–Bolt) C = Not Qualified

# REAR AXLES & SUSPENSIONS

## *REAR AXLE TREAD*

### *All Models*




14_0008

| | |
|---|---|
| TREAD | = DISTANCE (WIDTH) BETWEEN VERTICAL CENTERLINES OF SINGLE TIRES AT OPPOSITE ENDS OF AXLE, OR BETWEEN VERTICAL CENTERLINES OF DUAL SPACING (D.S.) AT OPPOSITE ENDS OF AXLE. |
| (Tire Section) | = OVERALL WIDTH OF NEW TIRE AT TOP OF TIRE UNDER MAXIMUM LOAD, INCLUDING 24-HOUR INFLATION GROWTH, AND INCLUDING PROTECTIVE SIDE RIBS, BARS AND DECORATIONS RECOMMENDED BY TIRE MANUFACTURER. |
| (Dual Spacing) | = DIMENSION (WIDTH) BETWEEN VERTICAL CENTERLINES OF TWO TIRES (DUALS) ASSEMBLED AT ONE END OF AN AXLE. |
| (Tread plus Dual Spacing plus Tire Section) | = OVERALL WIDTH OF AXLE, DUAL RIMS, AND TIRE ASSEMBLY AT TOP OF TIRES UNDER LOAD. |
| (Tread minus Dual Spacing minus Tire Section) | = DISTANCE (WIDTH) BETWEEN NEAR SIDES OF INNER TIRES OF DUAL ASSEMBLY AT TOP OF TIRES UNDER LOAD. |
| (Static Loaded Radius) | = DISTANCE FROM GROUND TO CENTERLINE OF HUB WHEN TIRES ARE CORRECTLY INFLATED AND UNDER MAXIMUM LOAD RECOMMENDED BY TIRE MANUFACTURER. |

**Dual Tires**

The charts shown here list tread information for various wheel/axle combinations. Tread dimensions are not dependent on tire size. Other dimensions explained here are related to tread and require tire dimensions. For tire dimensions, please contact your tire supplier or refer to the Component Book (PDB-70000).

## *REAR AXLE TREAD DATA*

### *All Models (Except 6x4)*

| Wheel/Rim | | | | Single Axle Code | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Size | Material | Dual Spacing | 14AGA 14AGE 14AGG 14AGY 14CEG | | 14AET, 14AEW, 14AEY, 14AGR, 14AGX, 14AHA, 14AHB, 14AHC, 14AHK, 14AHL, 14AHM, 14AHP, 14AHR, 14AHW, 14AJG, 14AJH, 14ANW, 14ANX, 14ANV, 14ANY, 14ANZ, 14APA, 14ARB, 14ARK, 14ARY, 14ARZ, 14ASA, 14ASB, 14ASD,14ATE, 14ATY, 14ATZ, 14CDL, 14CVB, 14051 | | 14AHH 14AHJ | | 14AJC 14AJE 14ANP 14APL | | 14ANR 14ANS 14ANT 14ANU 14APJ 14APH | |
| | | | | Brake Type | | | | | | | | | |
| | | | | Air | Hyd | Air | Hyd | Air | Hyd | Air | Hyd | Air | Hyd |
| Disc | 19.5 x 6.75 | Steel | 11.2 | – | 71.98 | – | – | – | – | – | 71.98 | – | 72.50 |
| | 19.5 x 7.50 | Steel | 12.8 | – | – | – | – | – | – | – | – | – | – |
| | | Aluminum | 12.5 | – | 72.86 | – | – | – | – | – | 72.86 | – | 73.38 |
| | 22.5 x 7.50 | Steel | 12.9 | – | 71.98 | – | – | – | – | – | 71.98 | – | 72.50 |
| | 22.5 x 8.25 | Steel | 13.2 | – | 71.98 | – | – | – | – | – | 71.98 | – | 72.50 |
| | | Aluminum | 13.2 | – | 72.86 | – | – | – | – | – | 72.86 | – | 73.38 |
| | 22.5 x 9.00 | Steel | 14.0 | – | – | – | – | – | – | – | – | – | – |
| | | Aluminum | 14.0 | – | – | – | – | – | – | – | – | – | – |

## *REAR AXLE TREAD DATA*

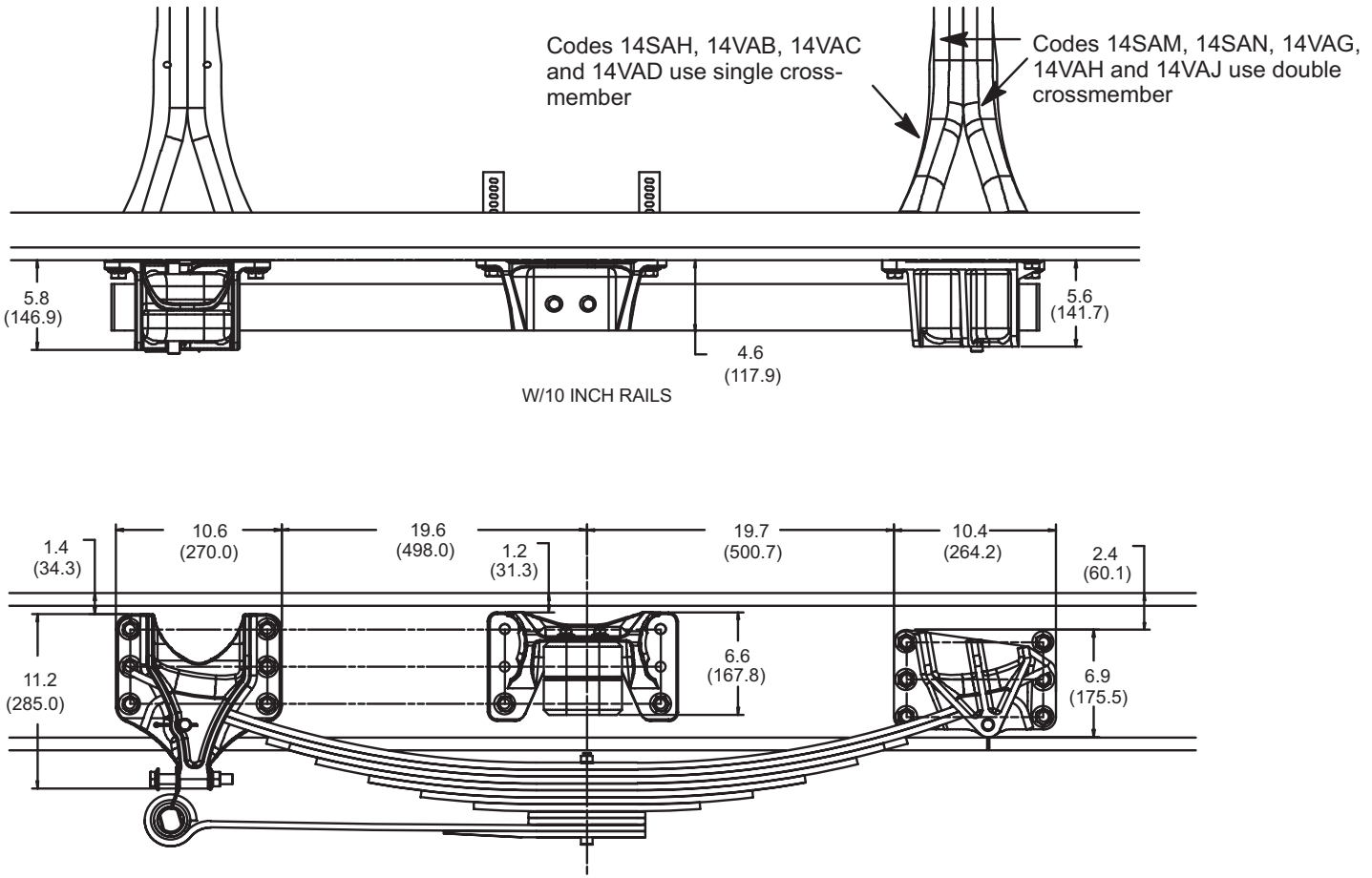
### *6x4 Models*

| Wheel/Rim | | | | Tandem Axle Code |
|---|---|---|---|---|
| Type | Size | Material | Dual Spacing | 14GEP, 14GER, 14GEZ, 14GGC, 14GGG, 14GGH, 14GGY, 14GJD, 14GJE. 14GJH, 14GJJ, 14GJK, 14GJL, 14GJM, 14GJN, 14GJR, 14GRD, 14GRP, 14GRR, 14GRS, 14GSX, 14GVE, 14GVY, 14GVK, 14GVL, 14GVN, 14GVR, 14GVU, 14GVX, 14GVY, 14GWY, 14GXC, 14HRC, 14HRE, 14HRL, 14HRM, 14HRS, 14HRW |
| | | | | Air Brake |
| Disc | 22.5 x 7.50 | Steel | 12.9 | 72.5 |
| | 22.5 x 8.25 | Steel | 13.2 | 72.5 |
| | | Aluminum | 13.2 | 73.4 |
| | 22.5 x 9.00 | Steel | 14.0 | 72.9 |
| | | Aluminum | 14.0 | 73.6 |

*REAR SUSPENSION*

## *Bracket Location - 4x2 Models*

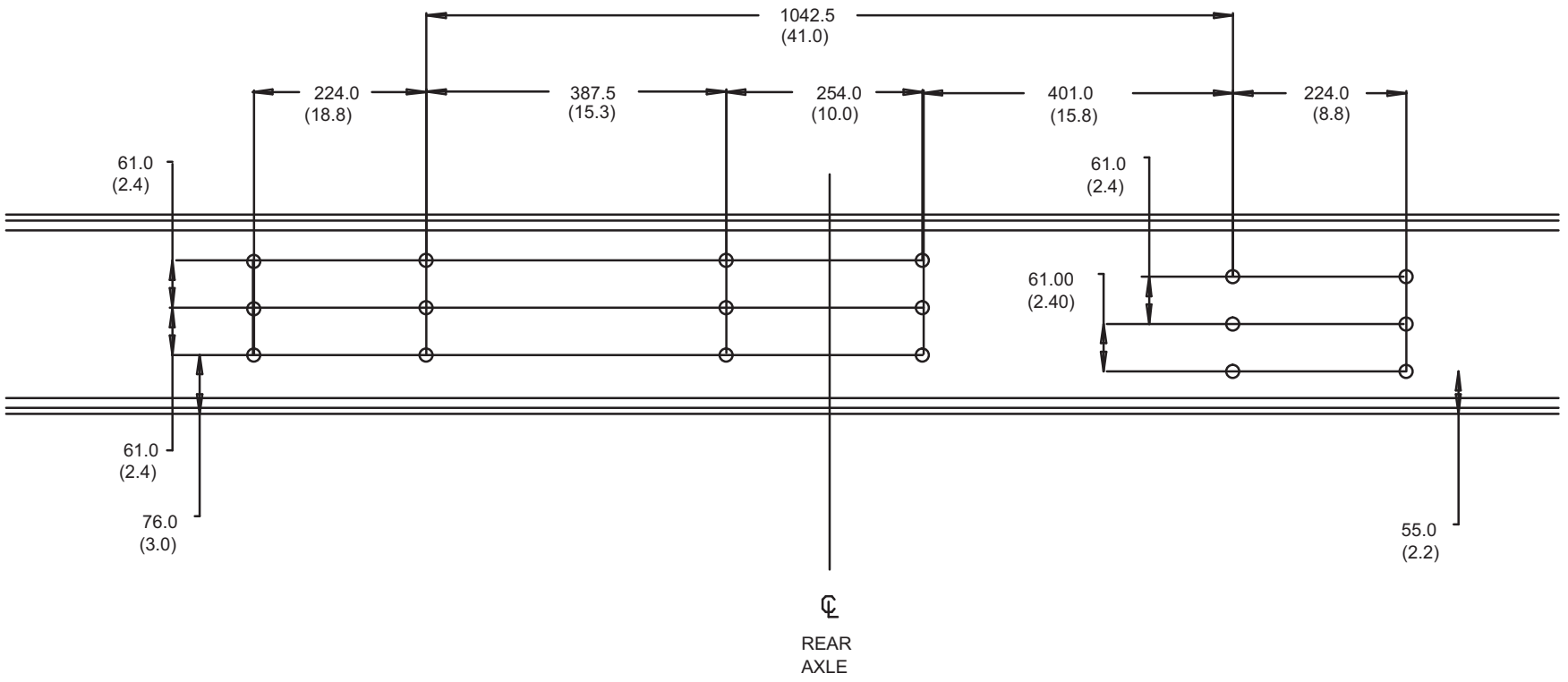
### *Vari-Rate Steel Suspension (14SAH, 14SAM, 14SAN, 14VAB, 14VAC, 14VAD, 14VAG, 14VAH, 14VAJ)*




14_0009

## *Hole Pattern - 4x2 Models*

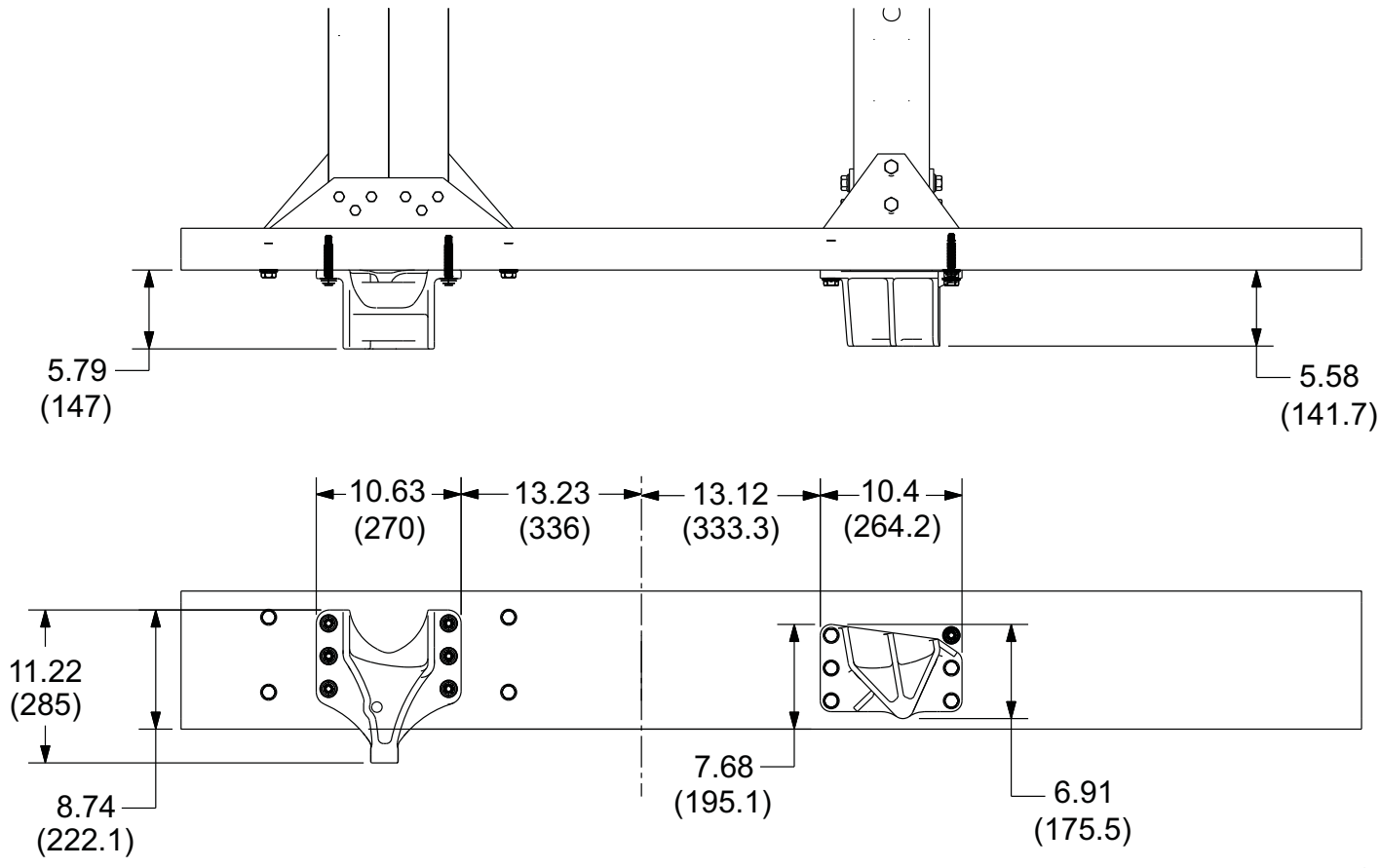
### ***Vari-Rate Steel Suspension (14SAH, 14SAM, 14SAN, 14VAB, 14VAC, 14VAD, 14VAG, 14VAH, 14VAJ)***



*REAR SUSPENSION*

## *Bracket Location - 4x2 Models*

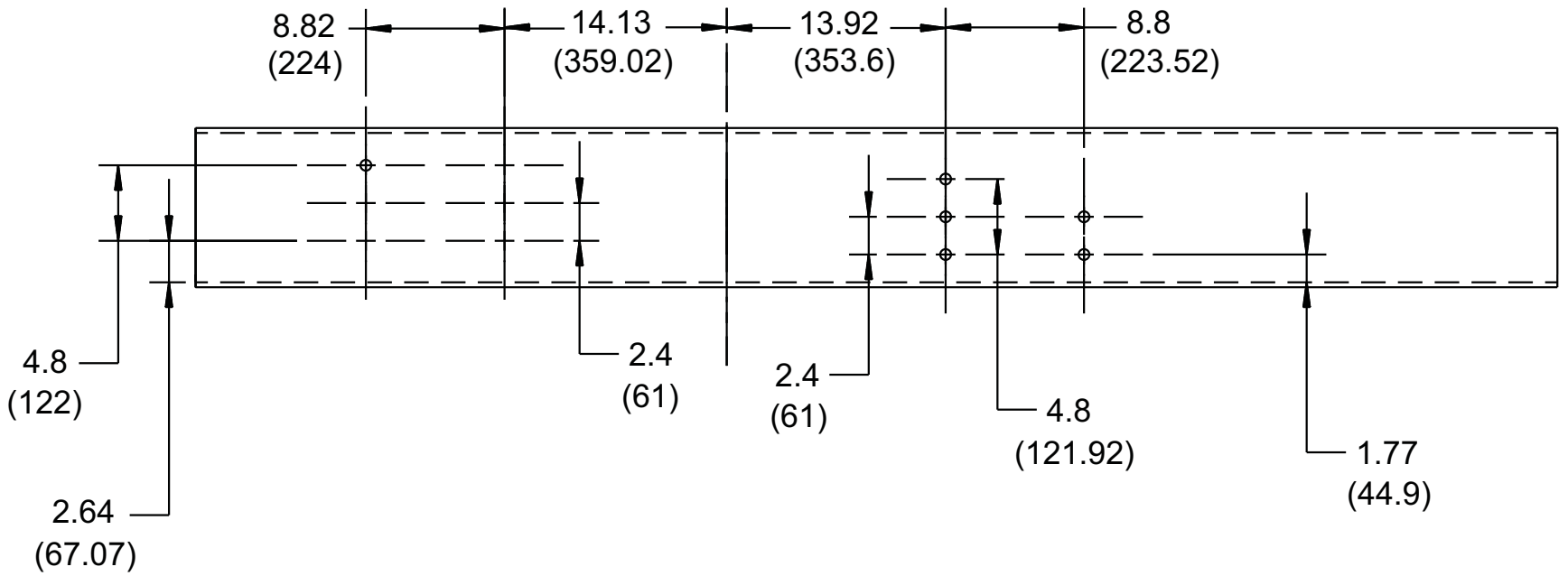
### *3-Rod Vari-Rate Steel Suspension (14SCD, 14SCE)*




14_3-rod_vari-rate_bracket

## *HOLE PATTERN - 4X2 MODELS*

### *3-Rod Vari-Rate Steel Suspension (14SCD, 14SCE)*

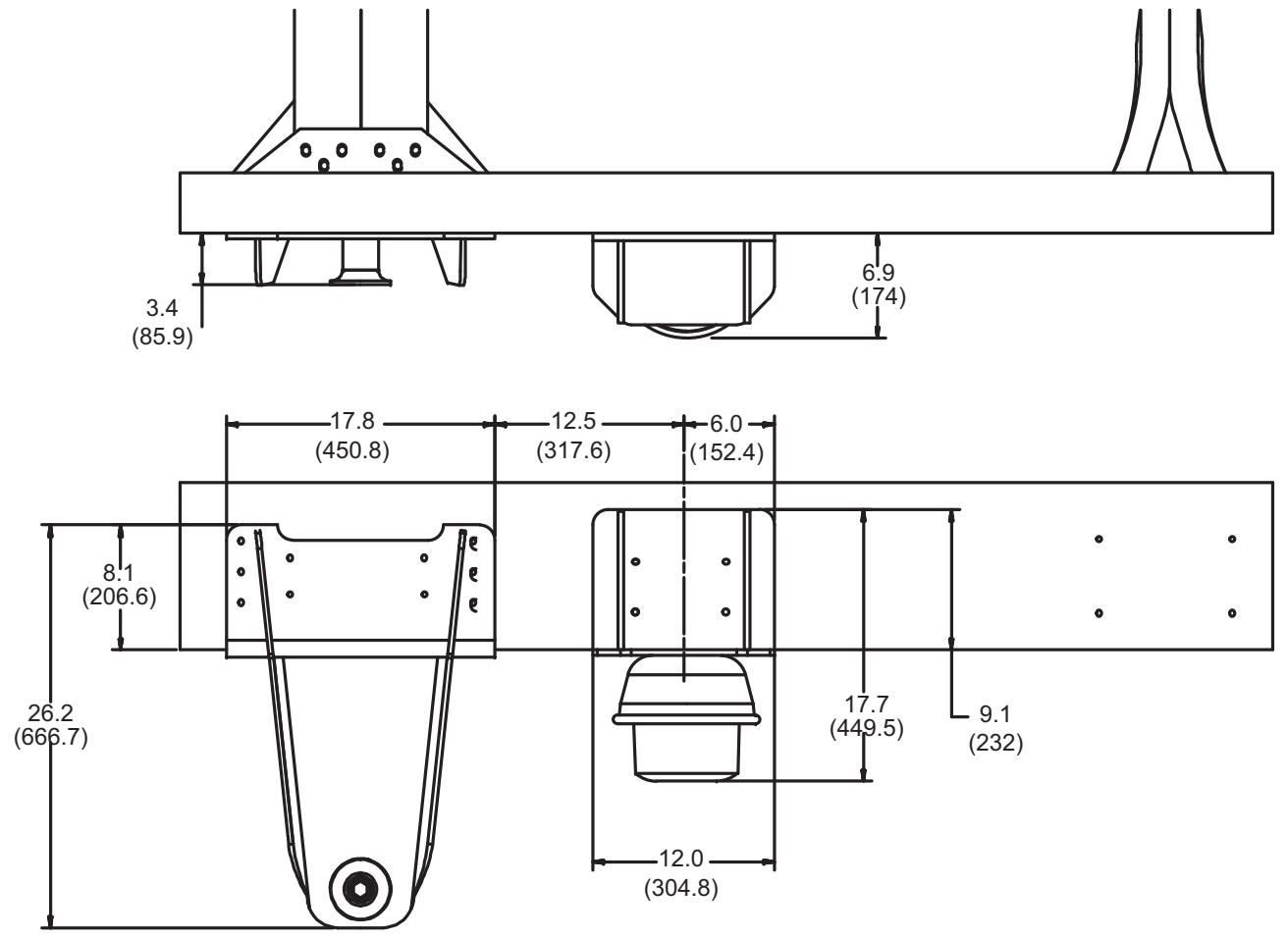



14_3-rod_vari-rate_hole

## REAR SUSPENSION

### BRACKET LOCATION - 4X2 MODELS

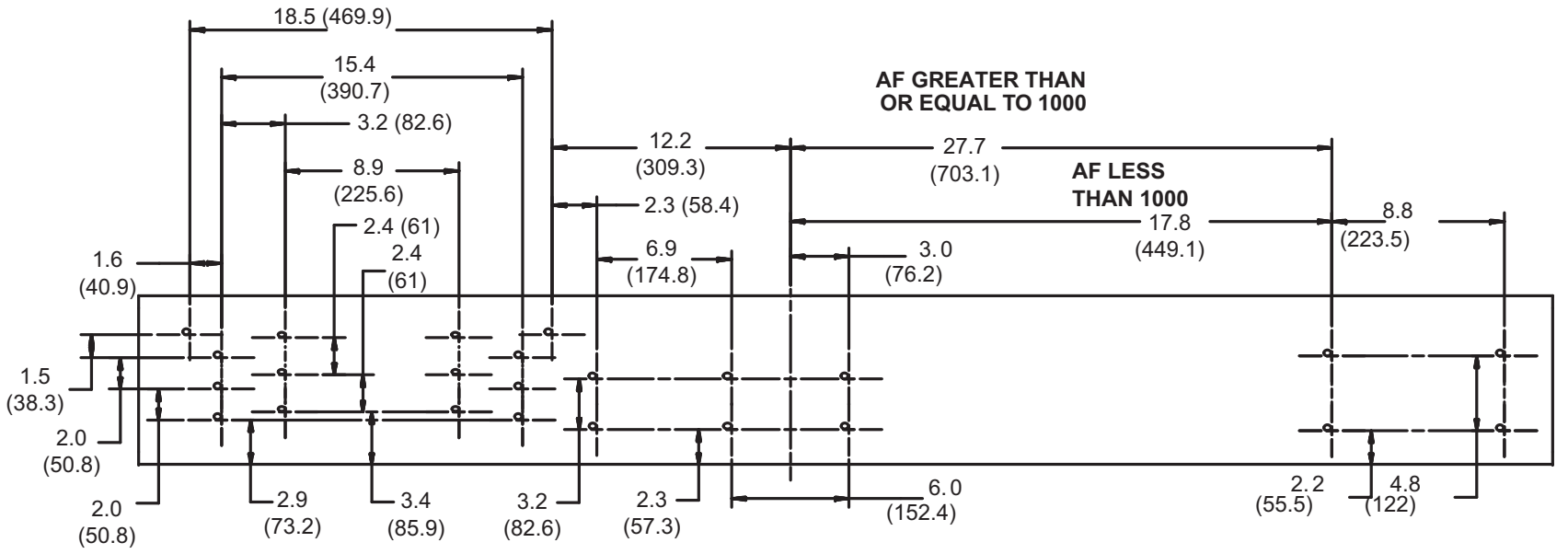
***Chalmers Suspension (14TBU)***




14_0076

## *HOLE PATTERN - 4X2 MODELS*

### ***Chalmers Suspension (14TBU)***

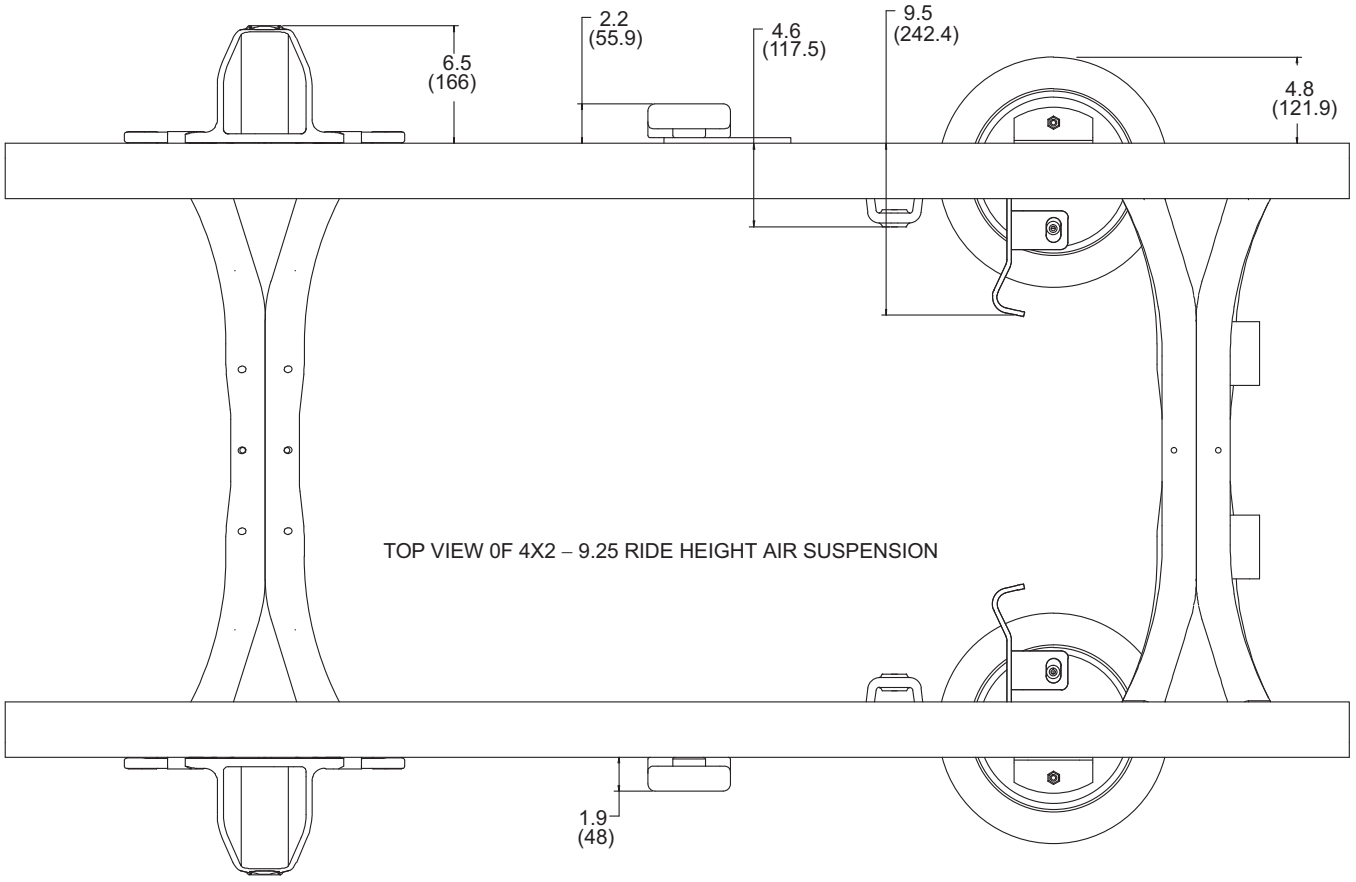



14_0079

## *REAR SUSPENSION*

### *Bracket Location - 4x2 Models*

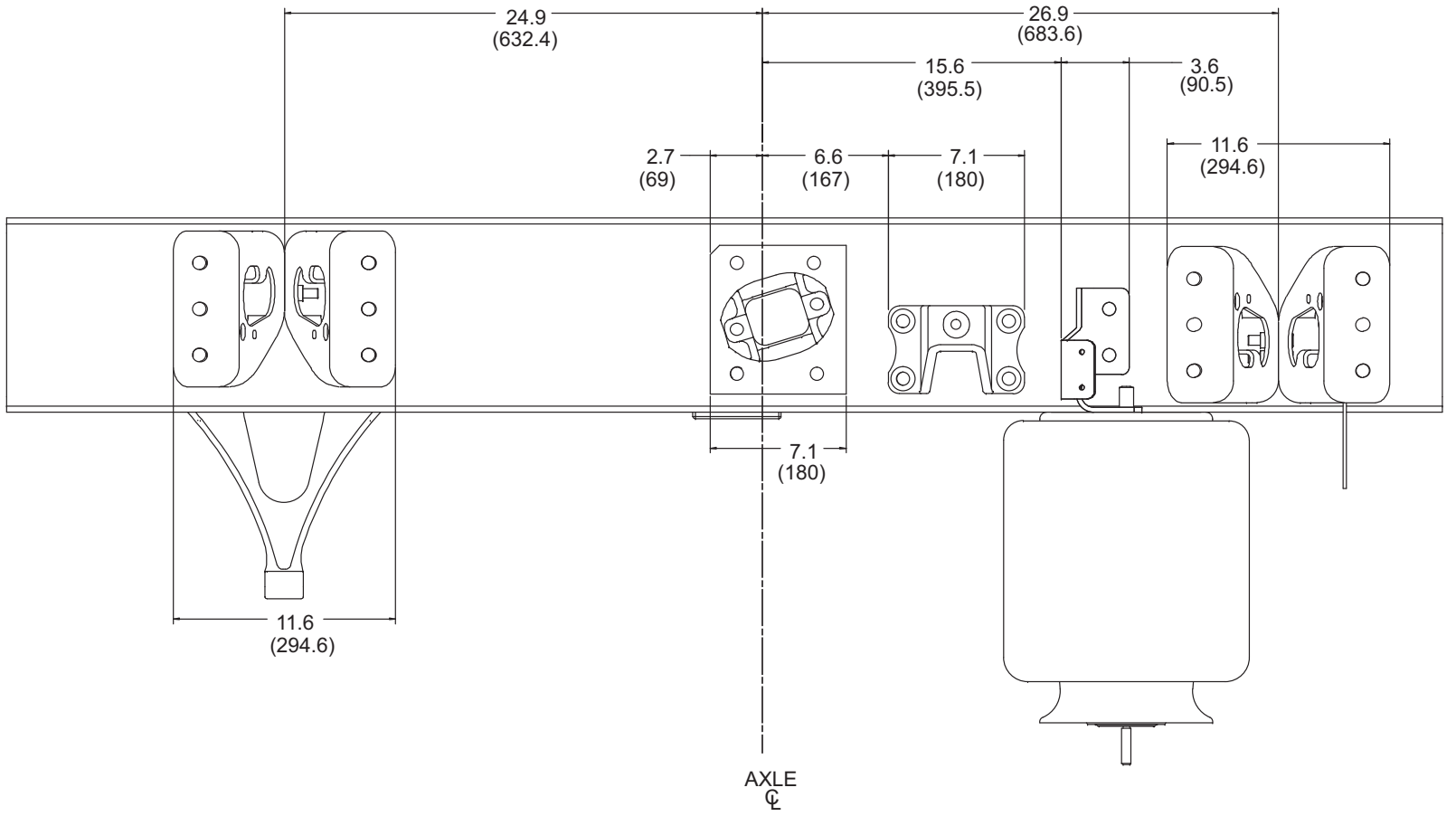
***International® Ride Optimized Air Suspension, 9.25" Ride Height – Top View (14TBJ, 14TBS)***




14_0015

## *BRACKET LOCATION - 4X2 MODELS*

### *International® Ride Optimized Air Suspension, 9.25" Ride Height – Right View (14TBJ, 14TBS)*

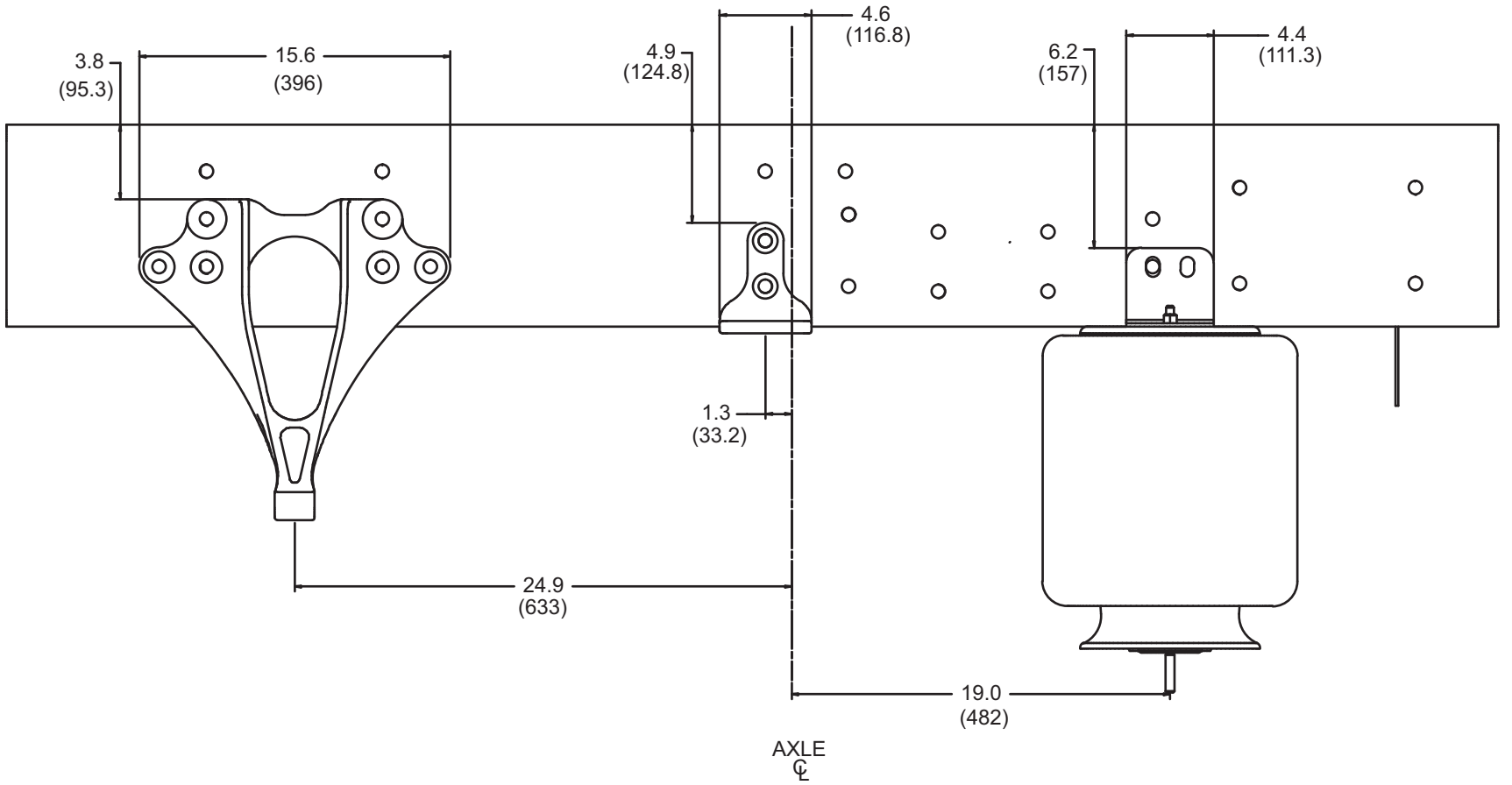



14_0016

## REAR SUSPENSION

### BRACKET LOCATION - 4X2 MODELS

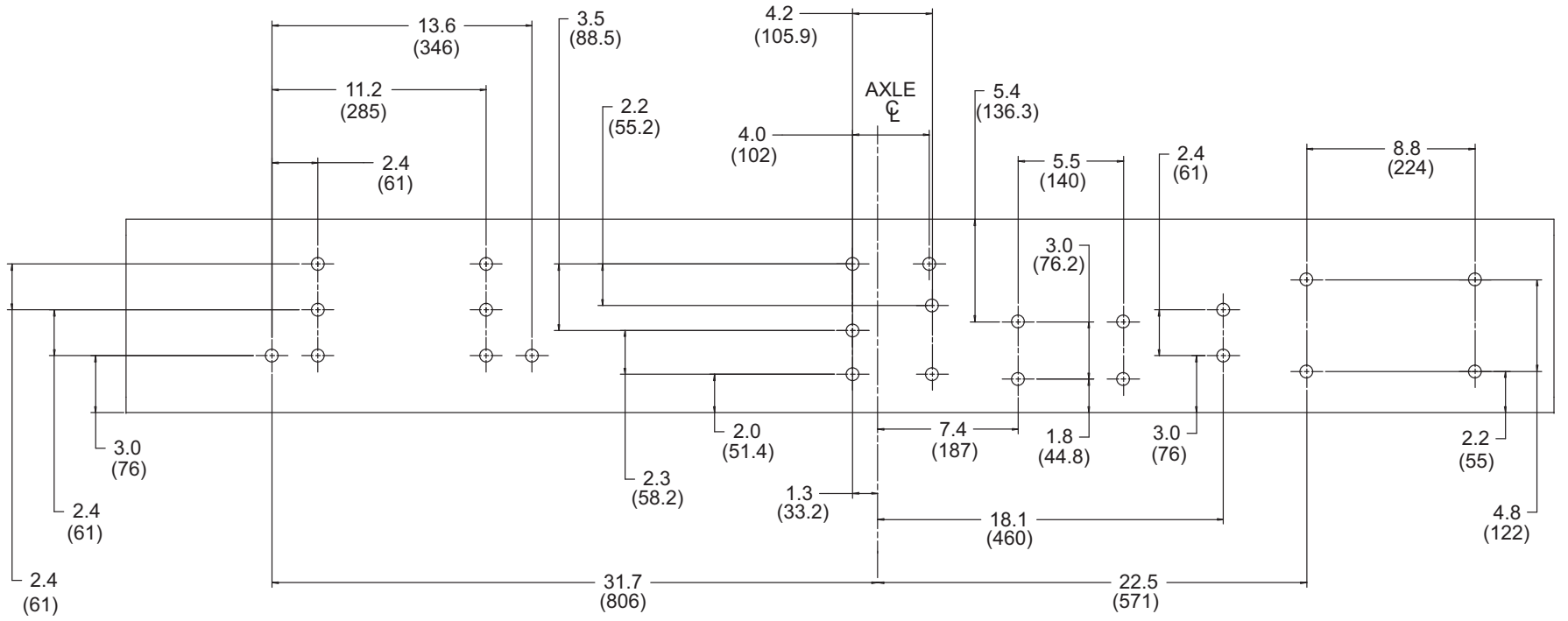
***International® Ride Optimized Air Suspension, 9.25" Ride Height – Left View (14TBJ, 14TBS)***




14_0017

## *Hole Pattern - 4x2 Models*

### ***International® Ride Optimized Air Suspension, 9.25" Ride Height – Right and Left Views (14TBJ, 14TBS)***

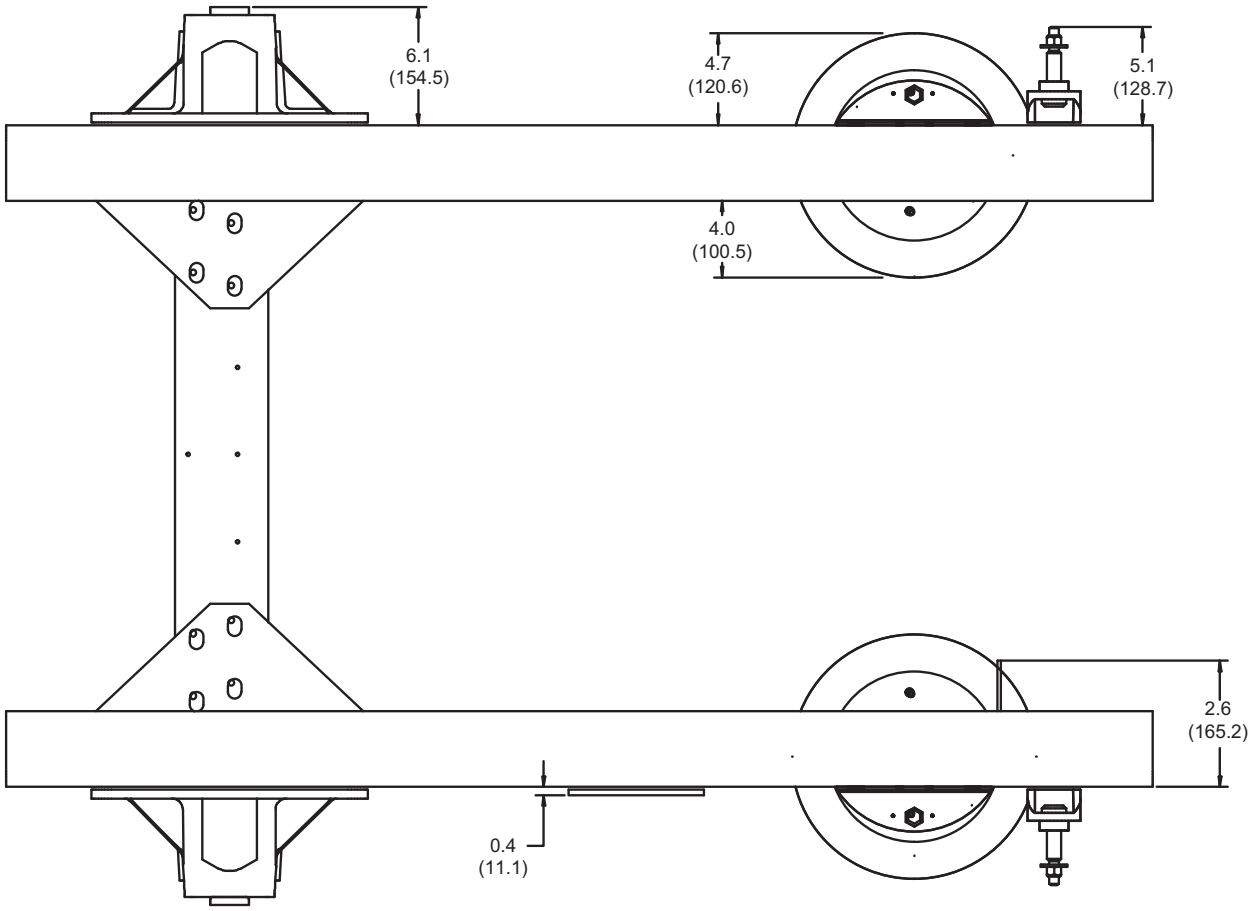



14_0018

## REAR SUSPENSION

### BRACKET LOCATION - 4X2 MODELS

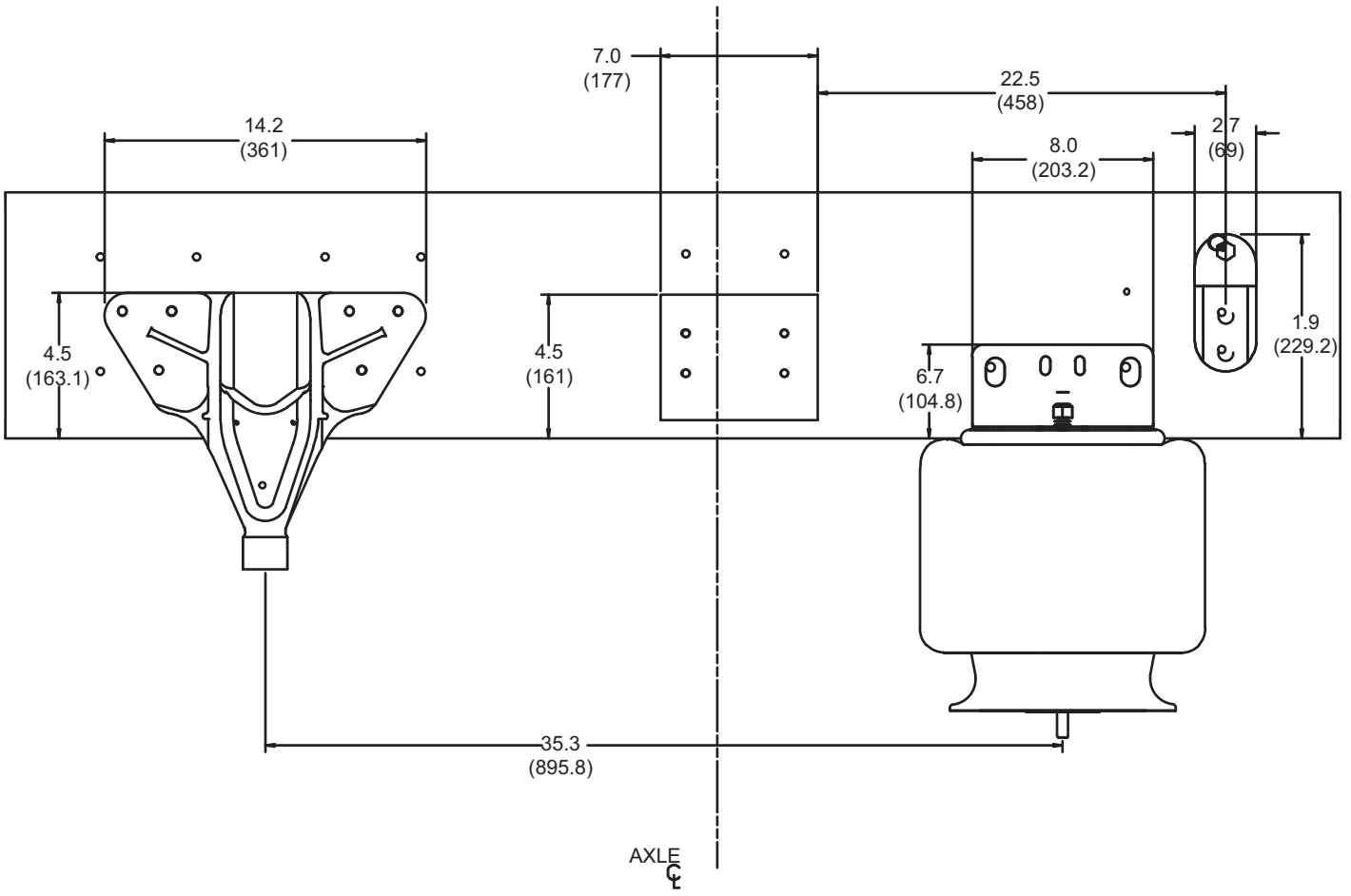
***Hendrickson Air Suspension, 9.5" Ride Height – Top View (14TAX)***




14_0051

## *BRACKET LOCATION - 4X2 MODELS*

### *Hendrickson Air Suspension, 9.5" Ride Height – Left View, Outside Rail (14TAX)*

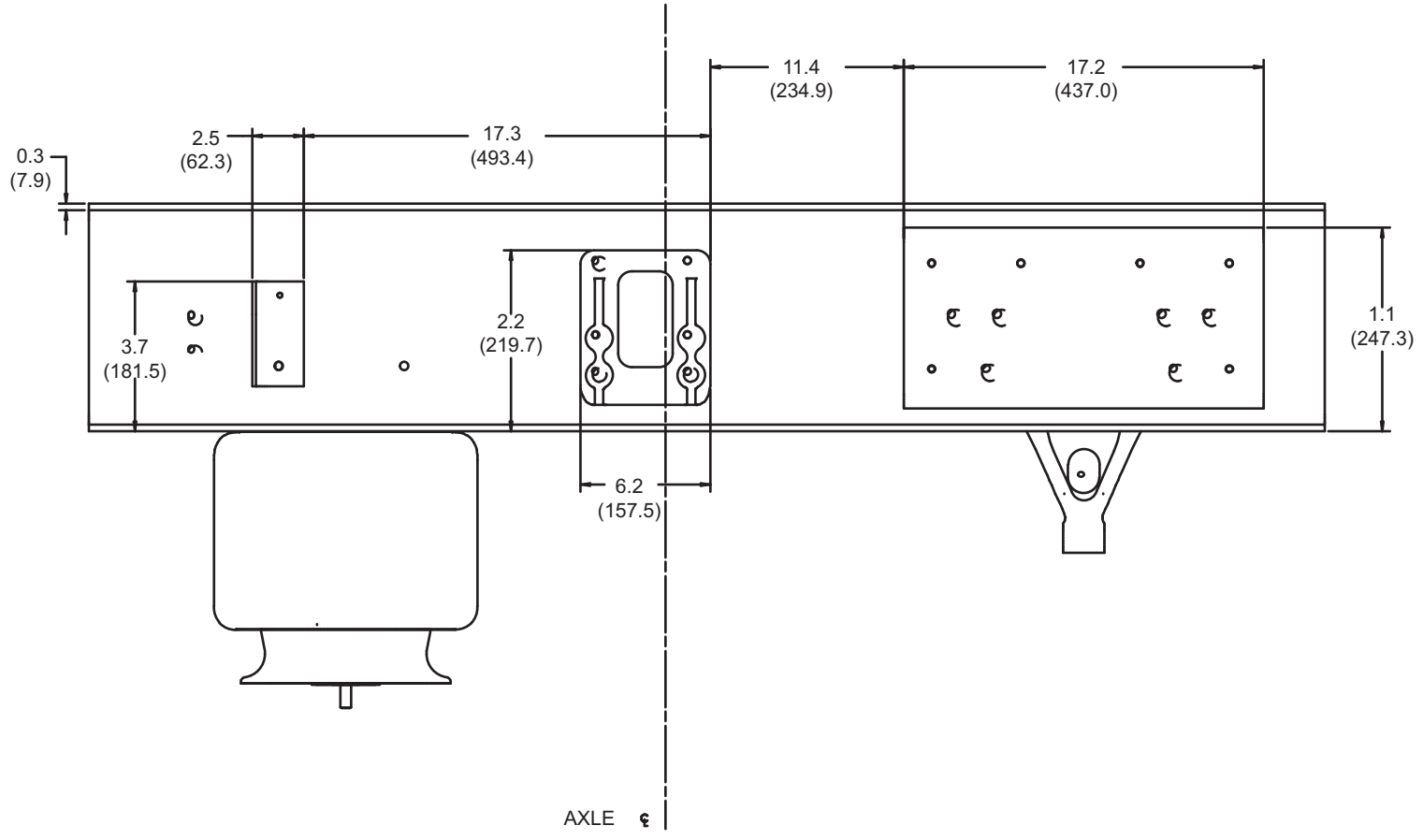



14_0052

## REAR SUSPENSION

### BRACKET LOCATION - 4X2 MODELS

***Hendrickson Air Suspension, 9.5" Ride Height – Left View, Inside Rail (14TAX)***

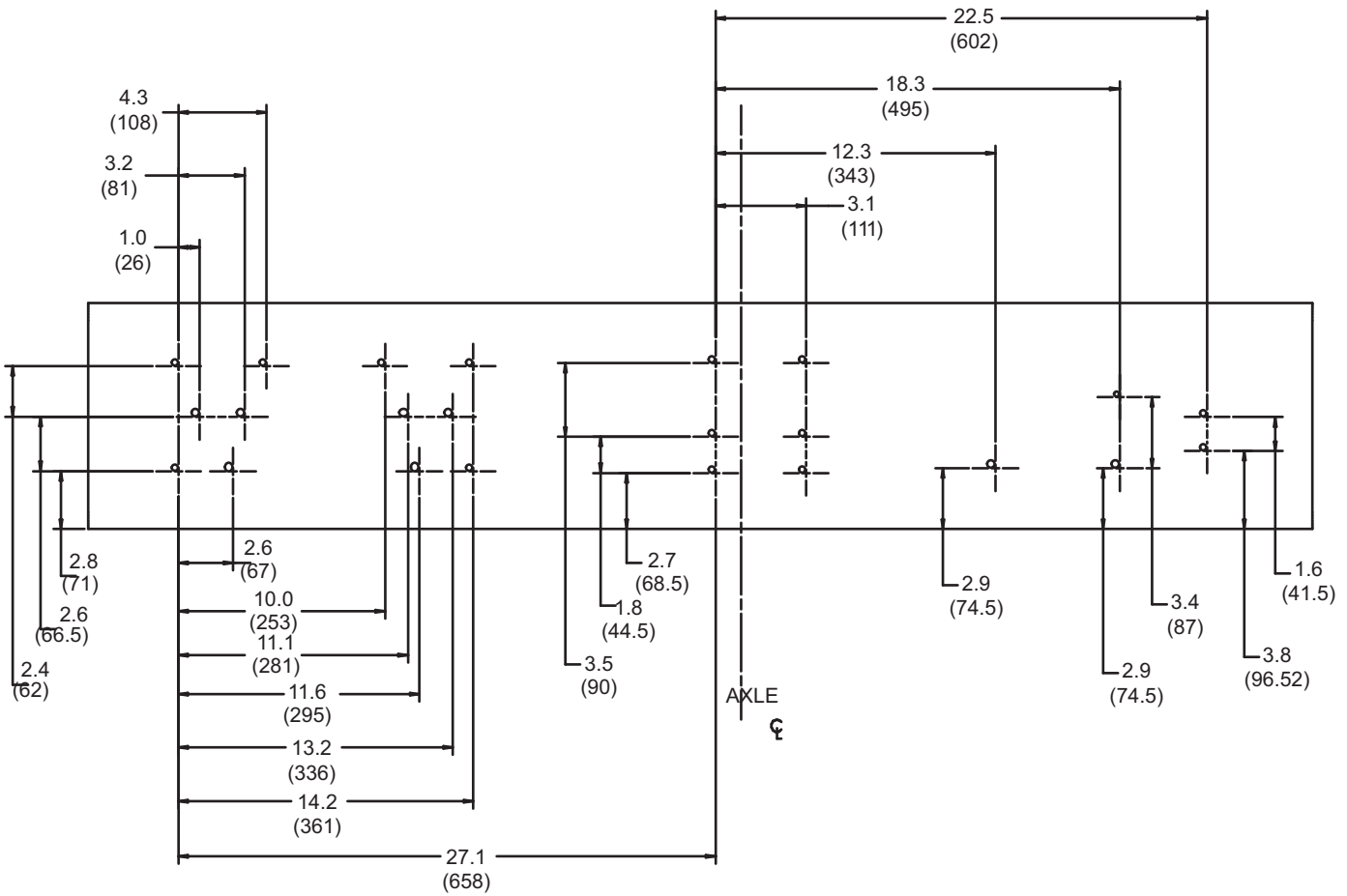



14_0053

## *Rear Suspension Hole Pattern*

### *Hole Pattern - 4x2 Models*

***Hendrickson Air Suspension, 9.5" Ride Height – Left View (14TAX)***

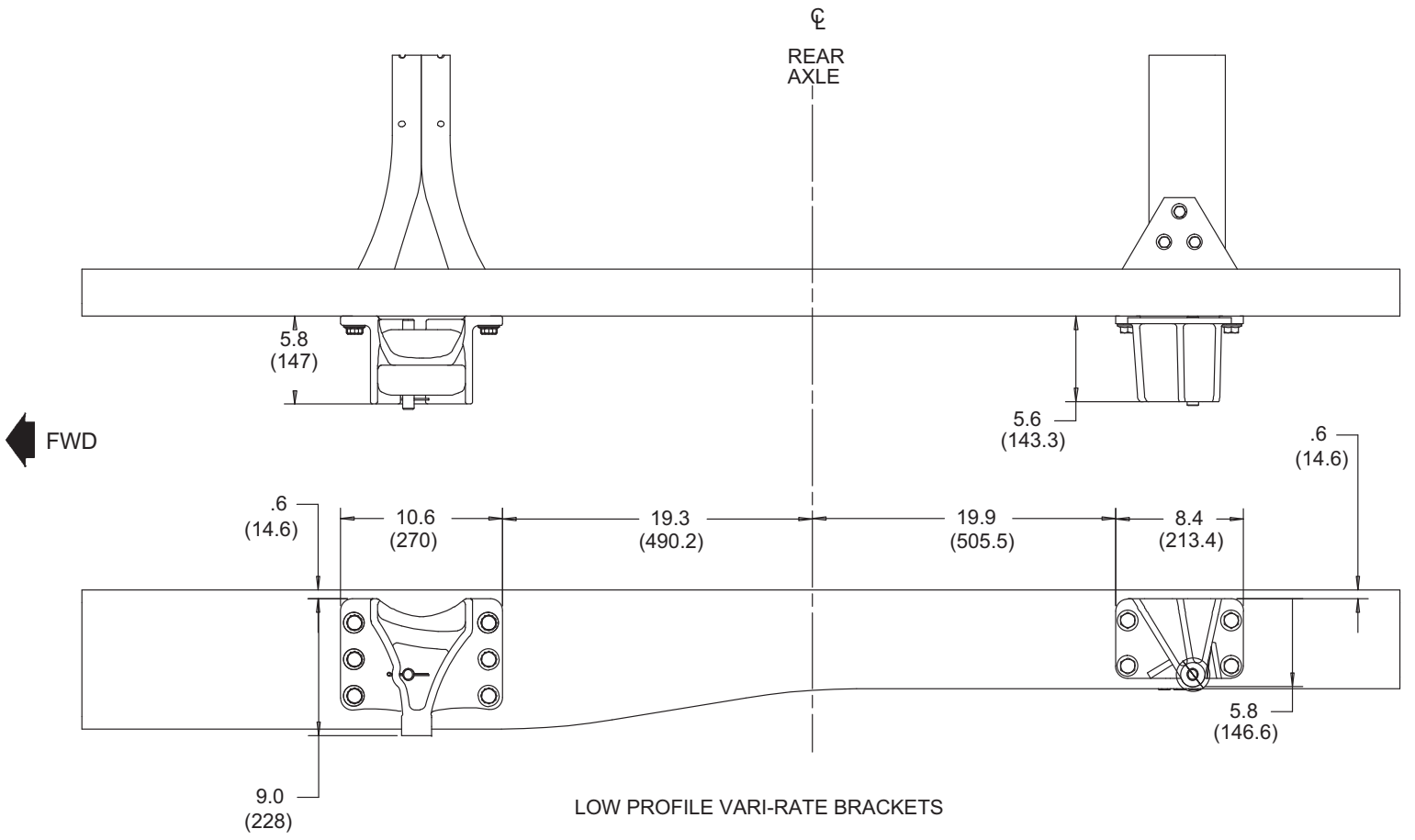



14_0054

## REAR SUSPENSION

### BRACKET LOCATION - LP MODELS

***Vari-Rate Steel Suspension (14SAC, 14SAE, 14SAH, 14SAM)***

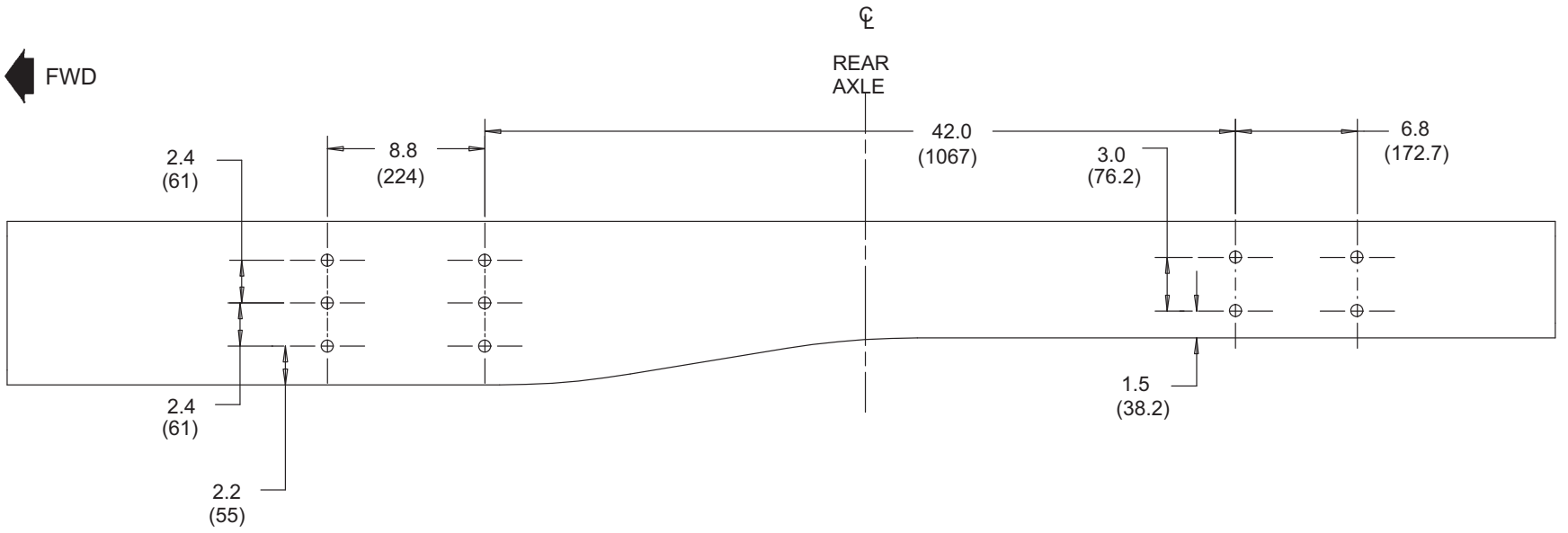



LOW PROFILE VARI-RATE BRACKETS

14_0011

## *HOLE PATTERN - LP MODELS*

### *Vari-Rate Steel Suspension (14SAC, 14SAE, 14SAH, 14SAM)*

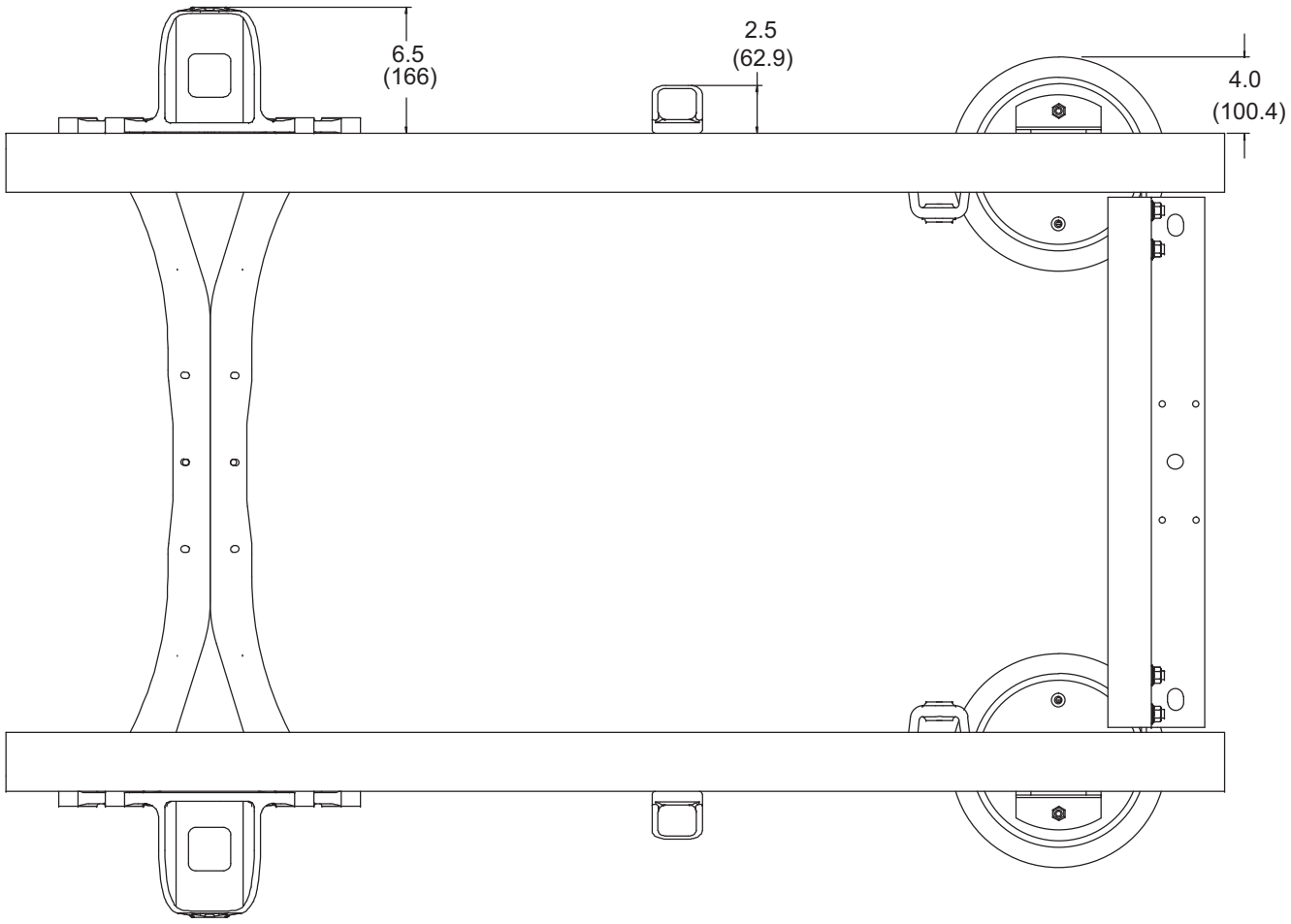



14_0012

## REAR SUSPENSION BRACKET LOCATION

### BRACKET LOCATION - LP MODELS

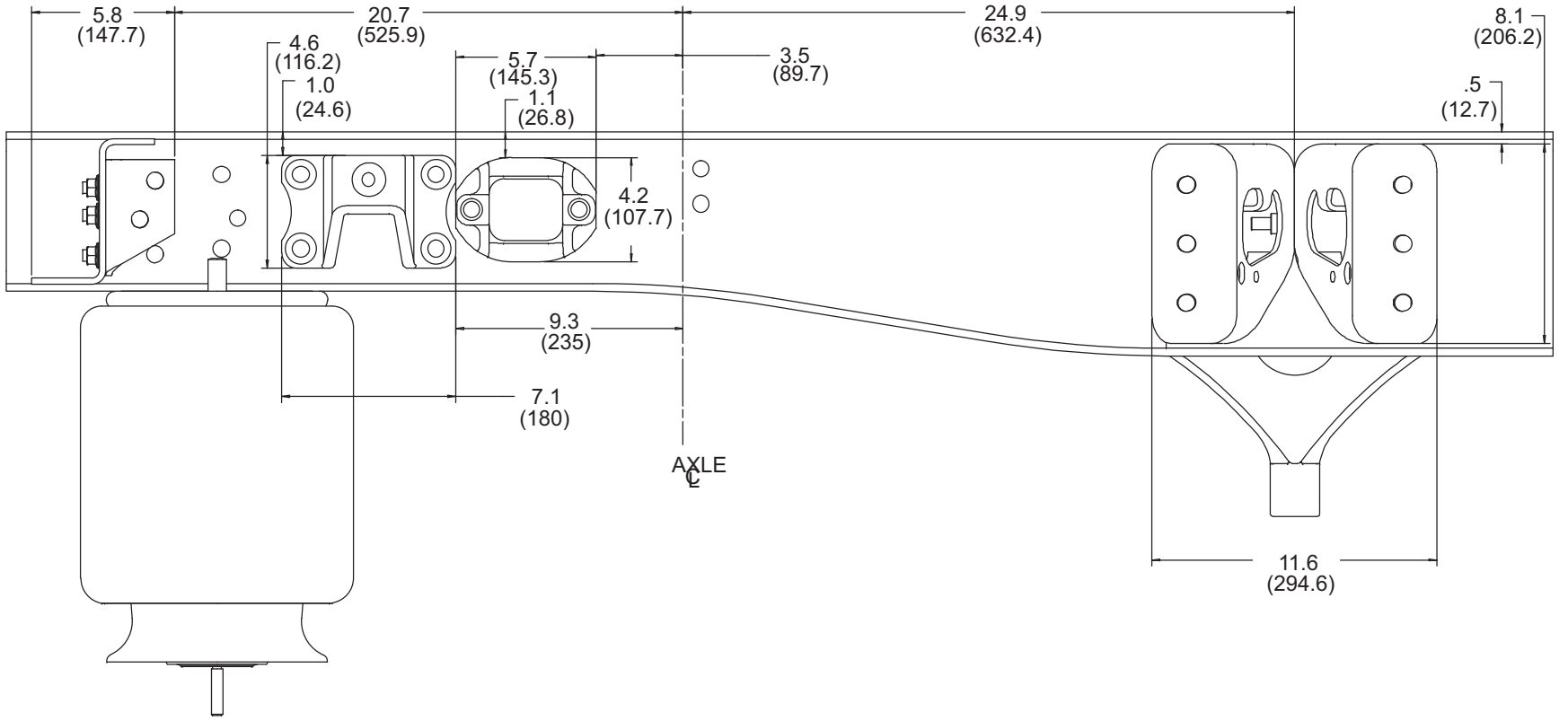
***International® Ride Optimized Air Suspension, 5.3" Ride Height – Top View (14TBL, 14TBM, 14TBN)***




14_0019

## *BRACKET LOCATION - LP MODELS*

***International® Ride Optimized Air Suspension, 5.3" Ride Height – Left View, Inside Rail (14TBL, 14TBM, 14TBN)***

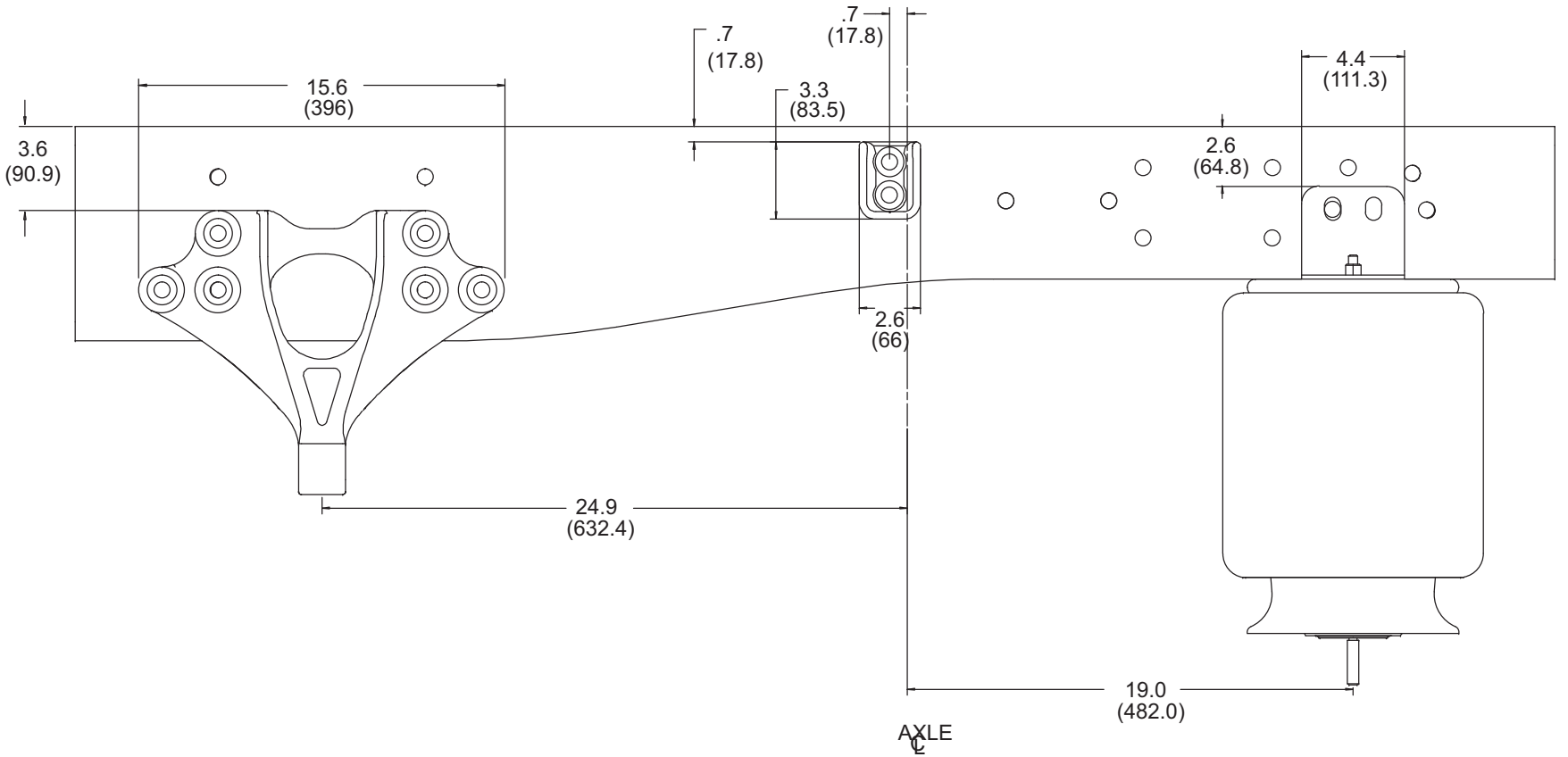



14_0020

## REAR SUSPENSION

### BRACKET LOCATION - LP MODELS

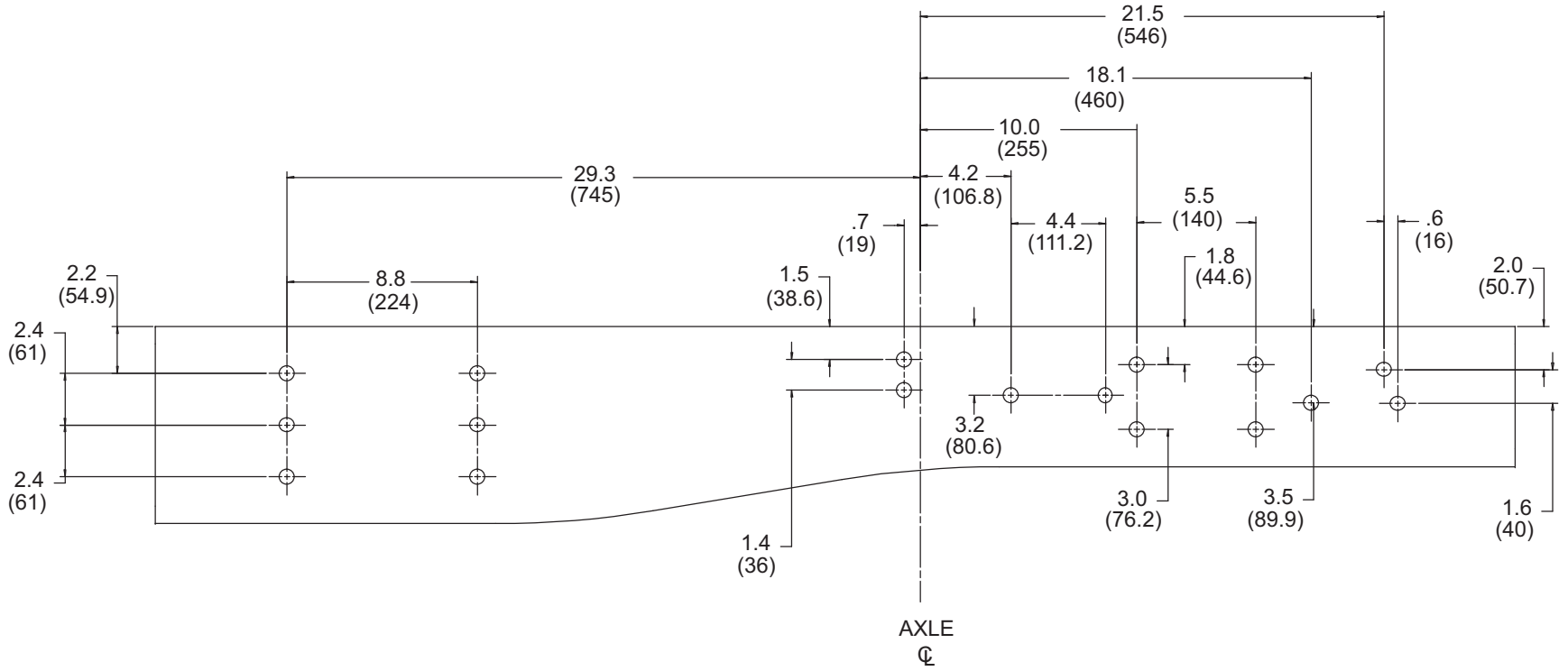
***International® Ride Optimized Air Suspension, 5.3" Ride Height – Right View, Outside Rail (14TBL, 14TBM, 14TBN)***




14_0021

## *HOLE PATTERN - LP MODELS*

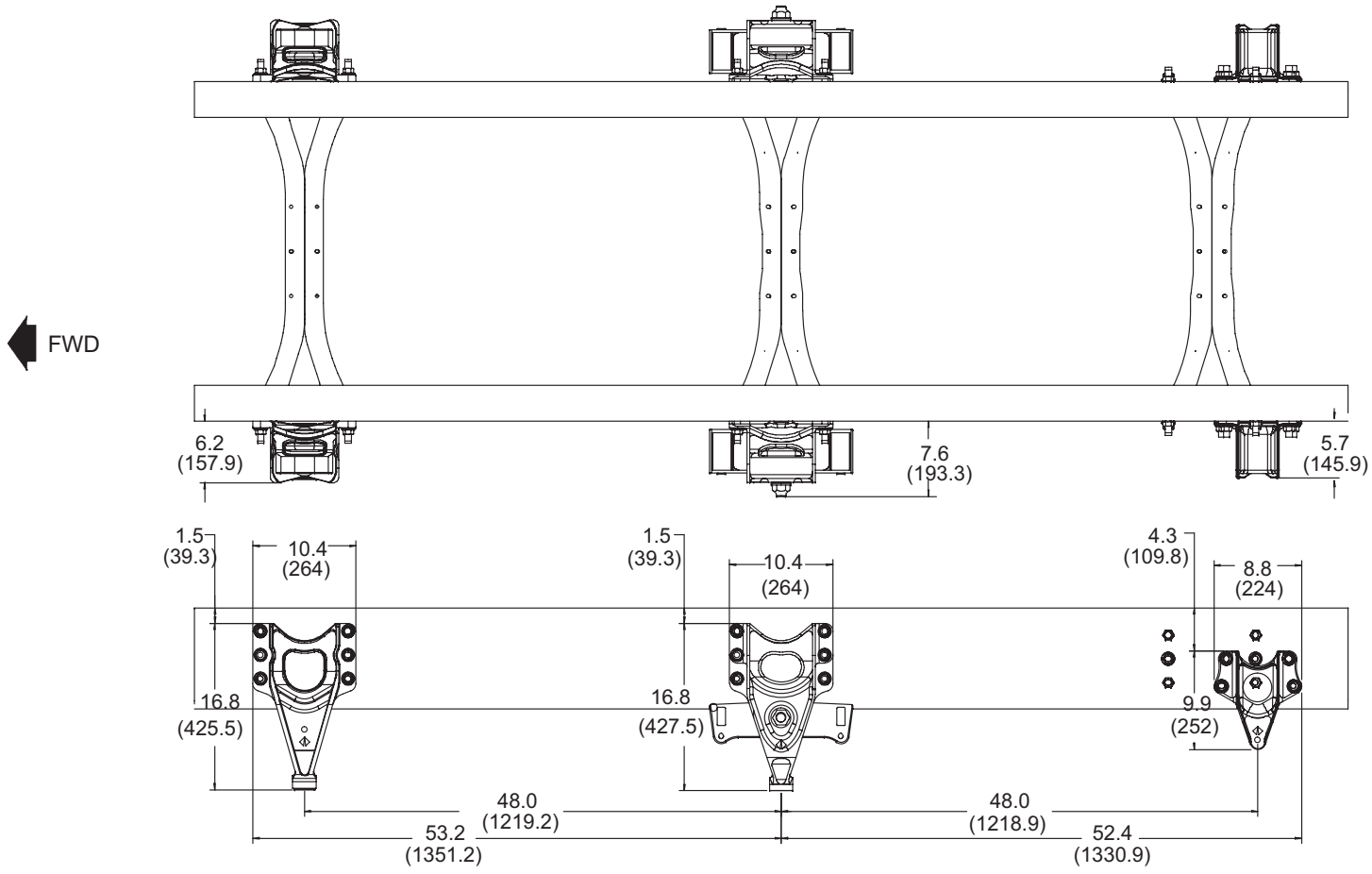
### *International® Ride Optimized Air Suspension, 5.3" Ride Height (14TBL, 14TBM, 14TBN)*



## REAR SUSPENSION

### BRACKET LOCATION - 6X4 MODELS

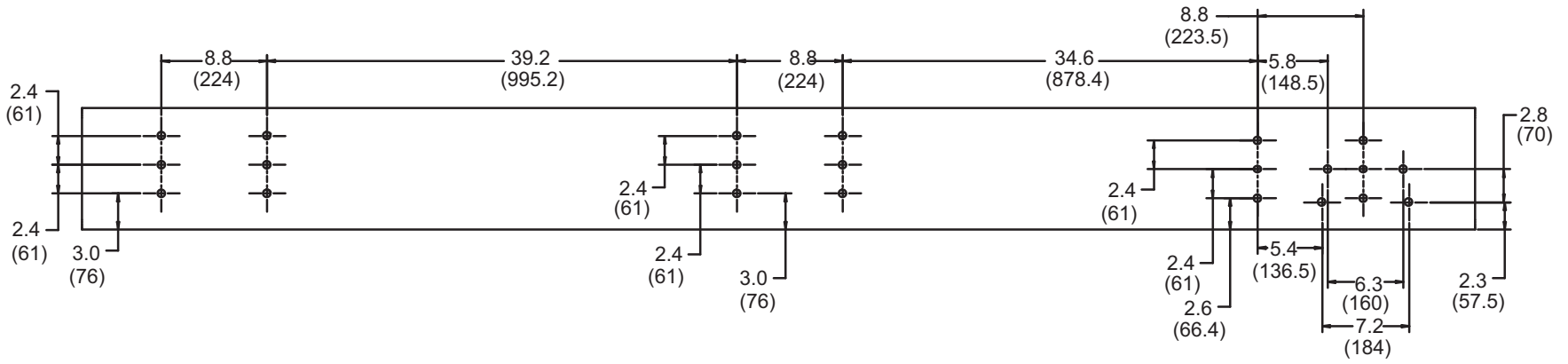
#### *4-Spring Suspension (14UNA, 14670)*




14_0013

## *HOLE PATTERN - 6X4 MODELS*

### *4-Spring Suspension (14UNA, 14670)*

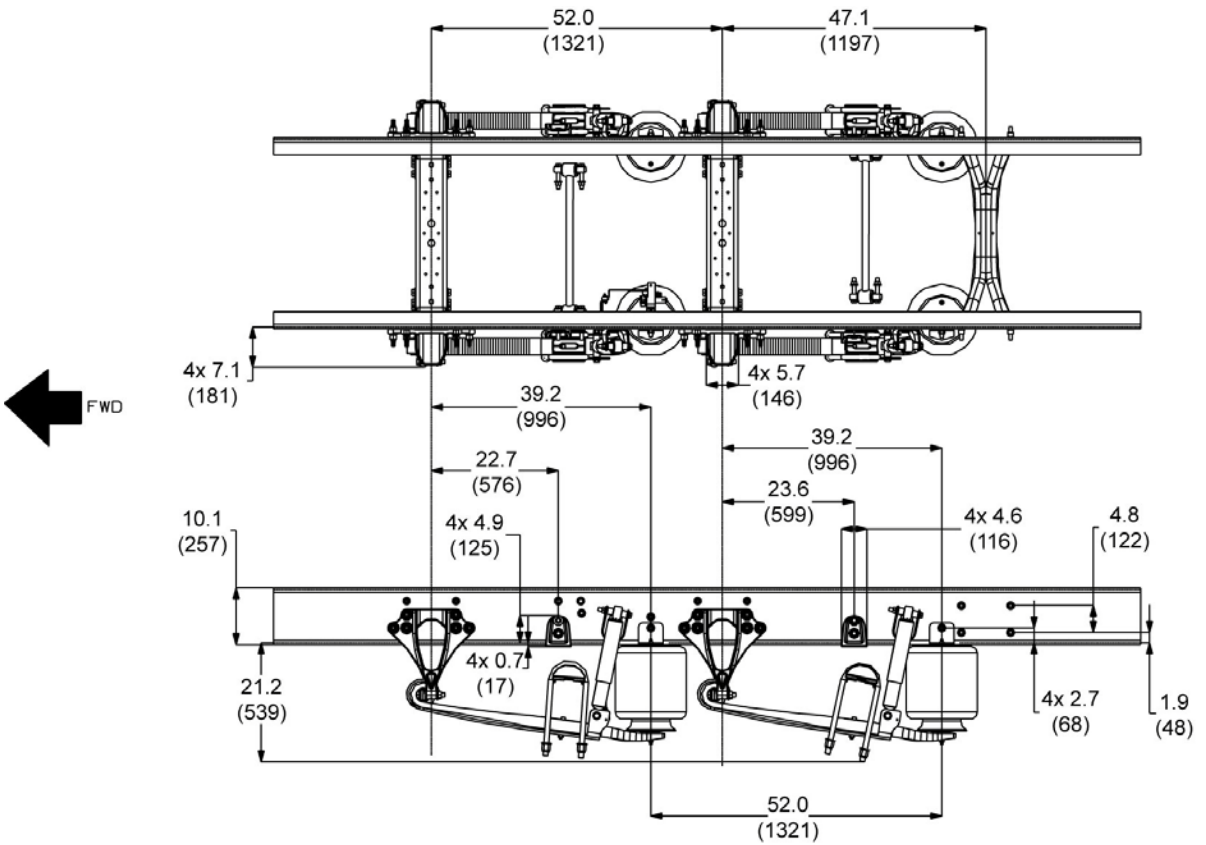



14_0014

## REAR SUSPENSION

### BRACKET LOCATION - 6X4 MODELS

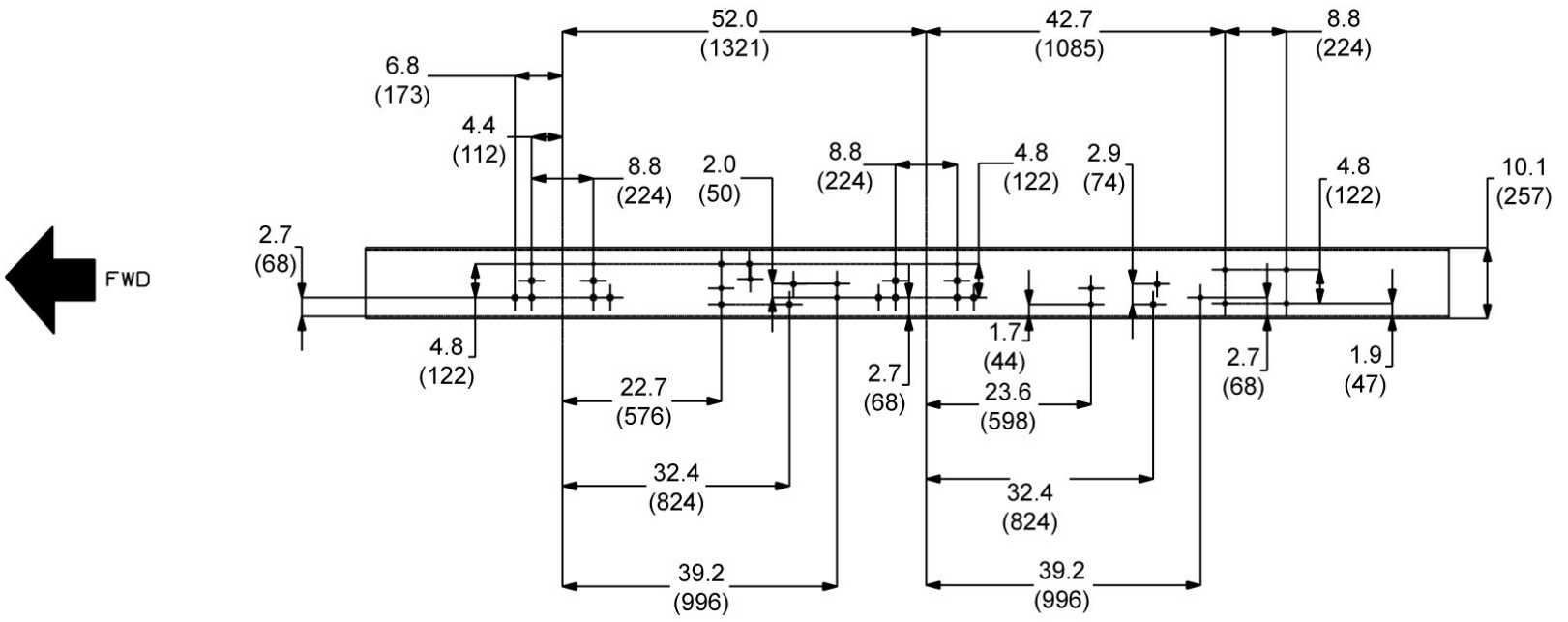
***International® 4-Spring 52" – Top and Left View (14UNU)***




durastar_14unu

## *HOLE PATTERN - 6X4 MODELS*

### ***International® 4-Spring 52" (14UNU)***




durastar_14uns_holes

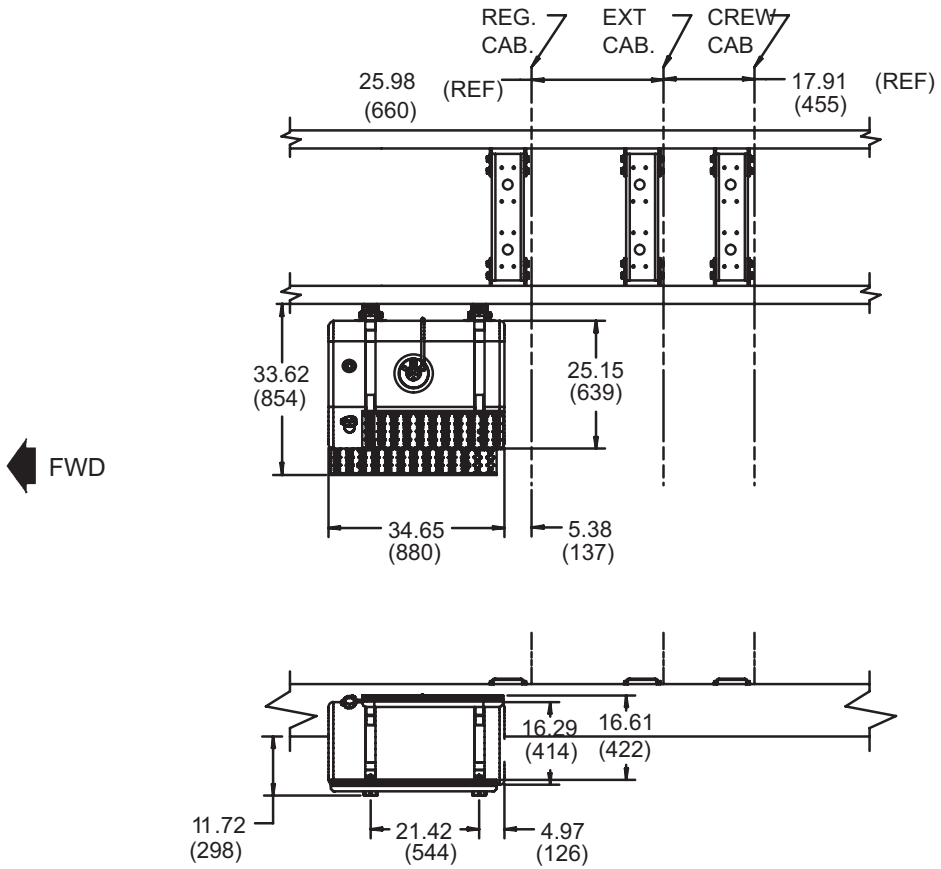
INTERNATIONAL
A NAVISTAR COMPANY

# FUEL TANKS

## *FUEL TANK LOCATION (EGR)*

### *Models 4300 and 4400*

#### ***Single 50 Gallon, "D" Style, Mounted Left Side Under Cab (15SGJ)***

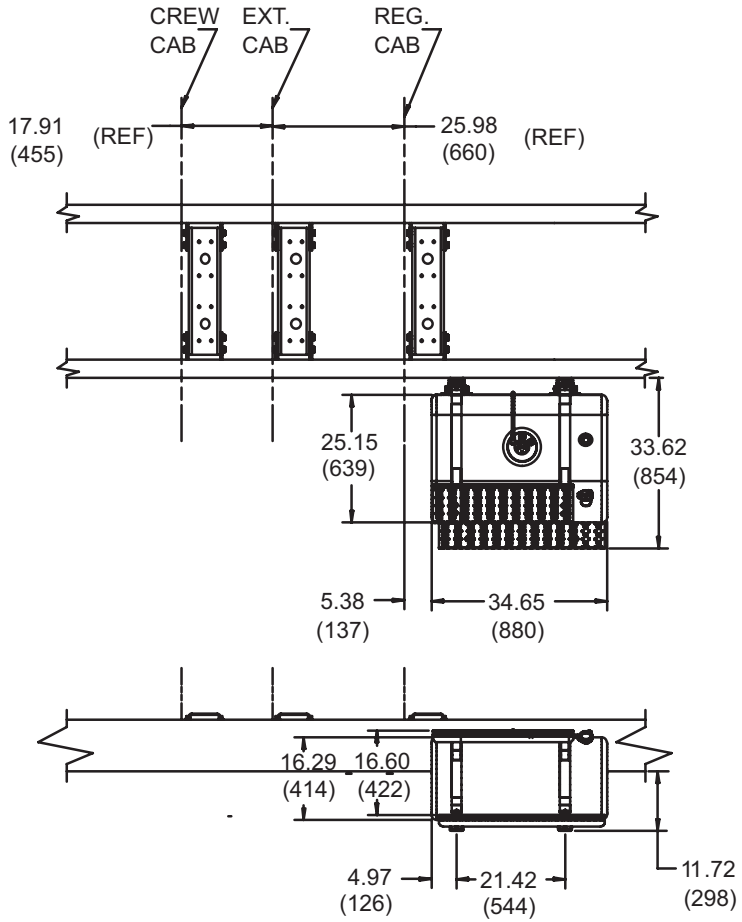



15_0010

# FUEL TANK LOCATION (EGR)

## All Models

### Single 50 Gallon, "D" Style, Mounted Right Side Under Cab (15SGK)

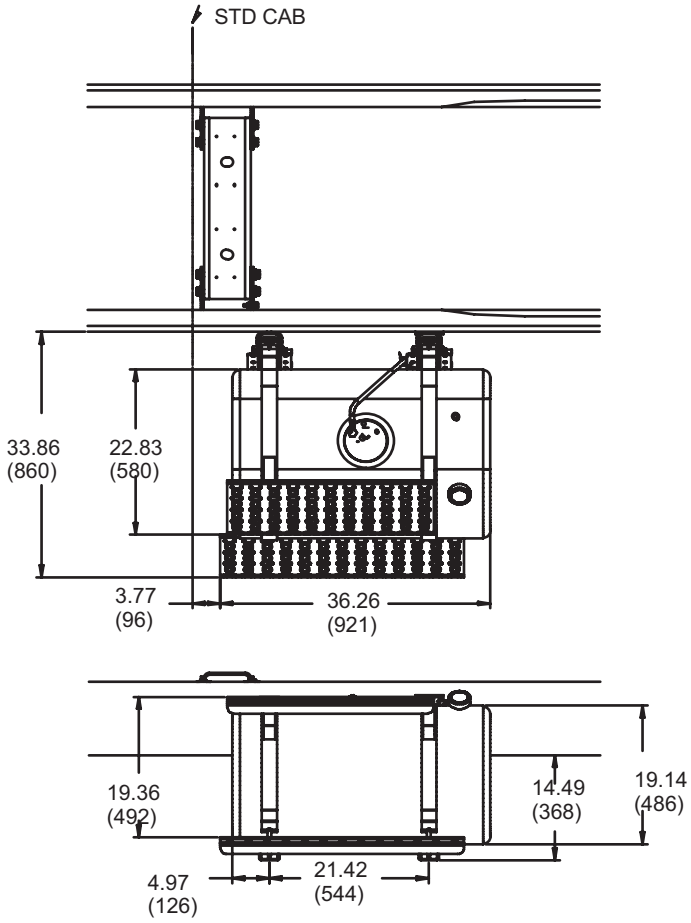



15_0009

## *FUEL TANK LOCATION (EGR)*

### *Models 4x2 and 6x4*

***Single 50 Gallon, "D" Style, Mounted Right Side Under Cab (15SNY, 15SNZ)***



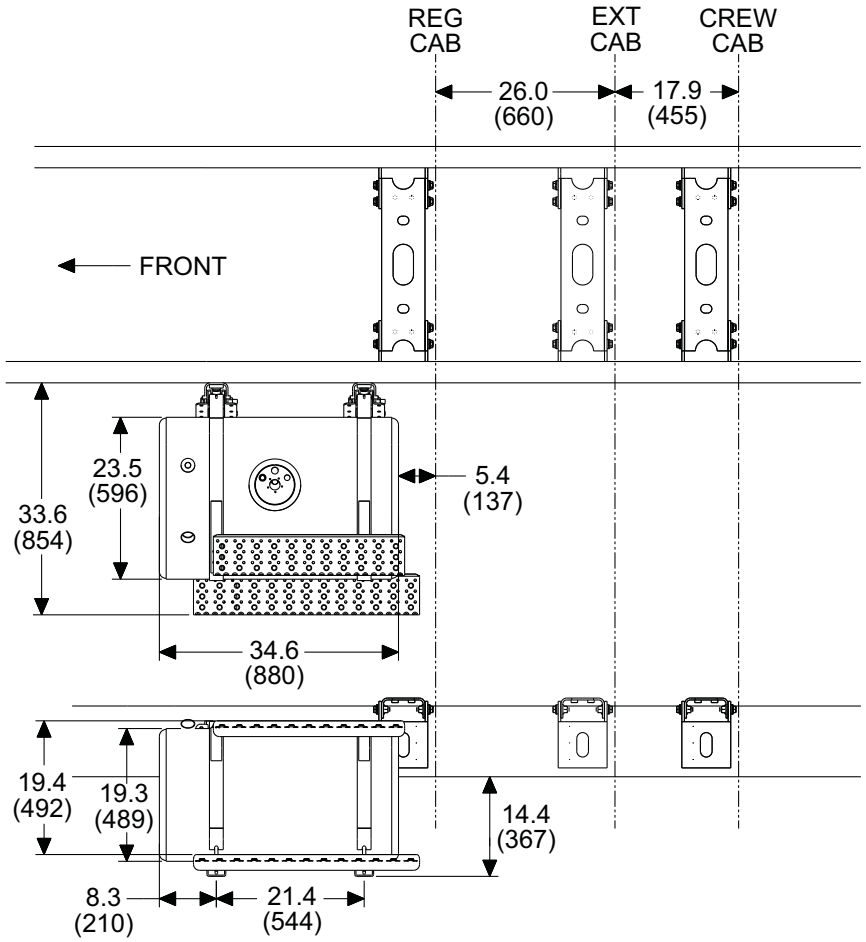

FWD

15_0014

# *FUEL TANK LOCATION (EGR)*

## *Models 4300 4x2, 4400 4x2 and 4400 6x4*

### ***Single 50 Gallon, "D" Style, Mounted Left Side Under Cab (15SPB, 15SPC)***

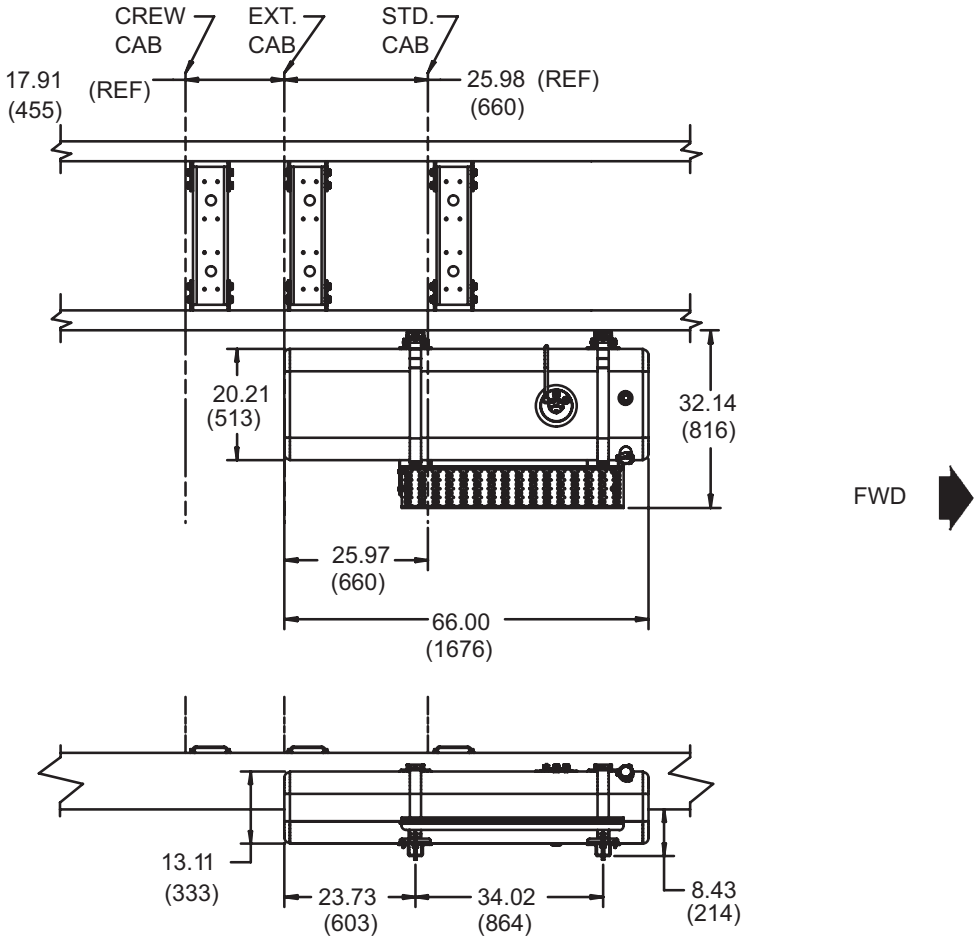



15SPB_15SPC

## *FUEL TANK LOCATION (EGR)*

### *Models 4300, 4400 4x2 and 4400 LP*

#### ***Single 65 Gallon, Rectangular, Mounted Right Side Under Cab (15SSE)***

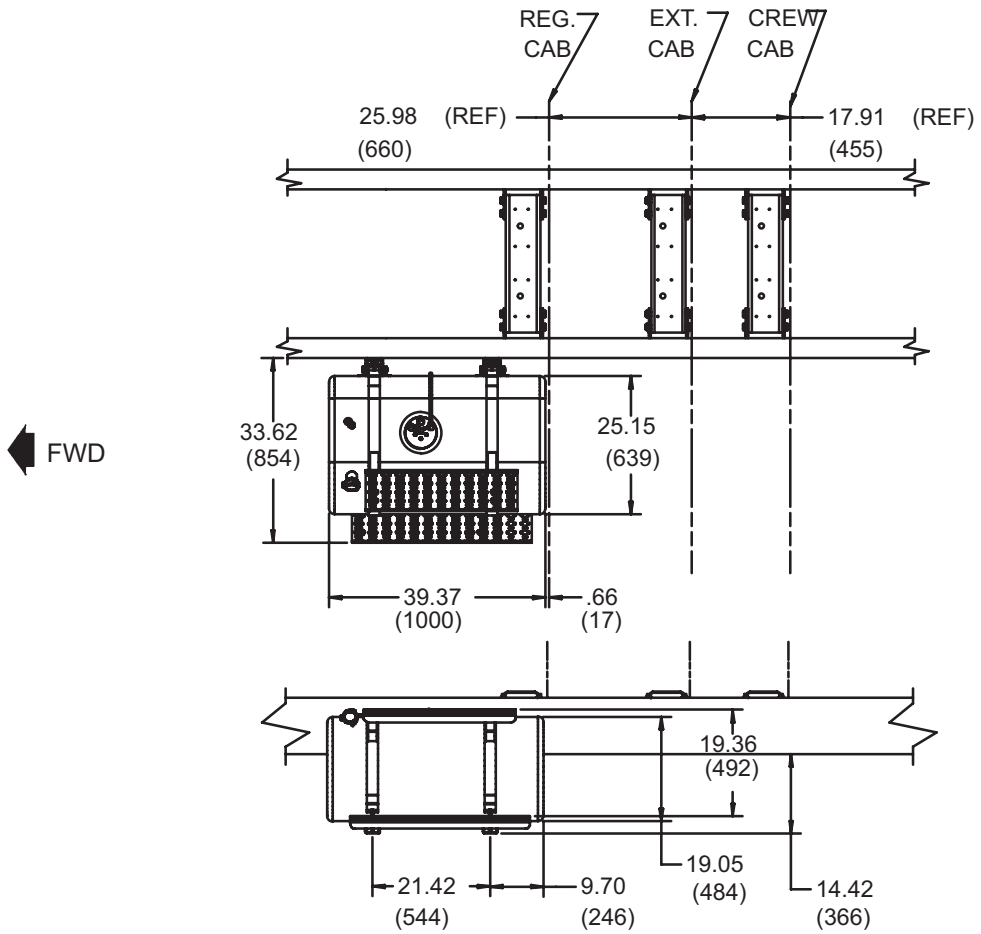



15_0011

# FUEL TANK LOCATION (EGR)

## Models 4300 and 4400

### *Single 70 Gallon, "D" Style, Mounted Left Side Under Cab (15SGG)*

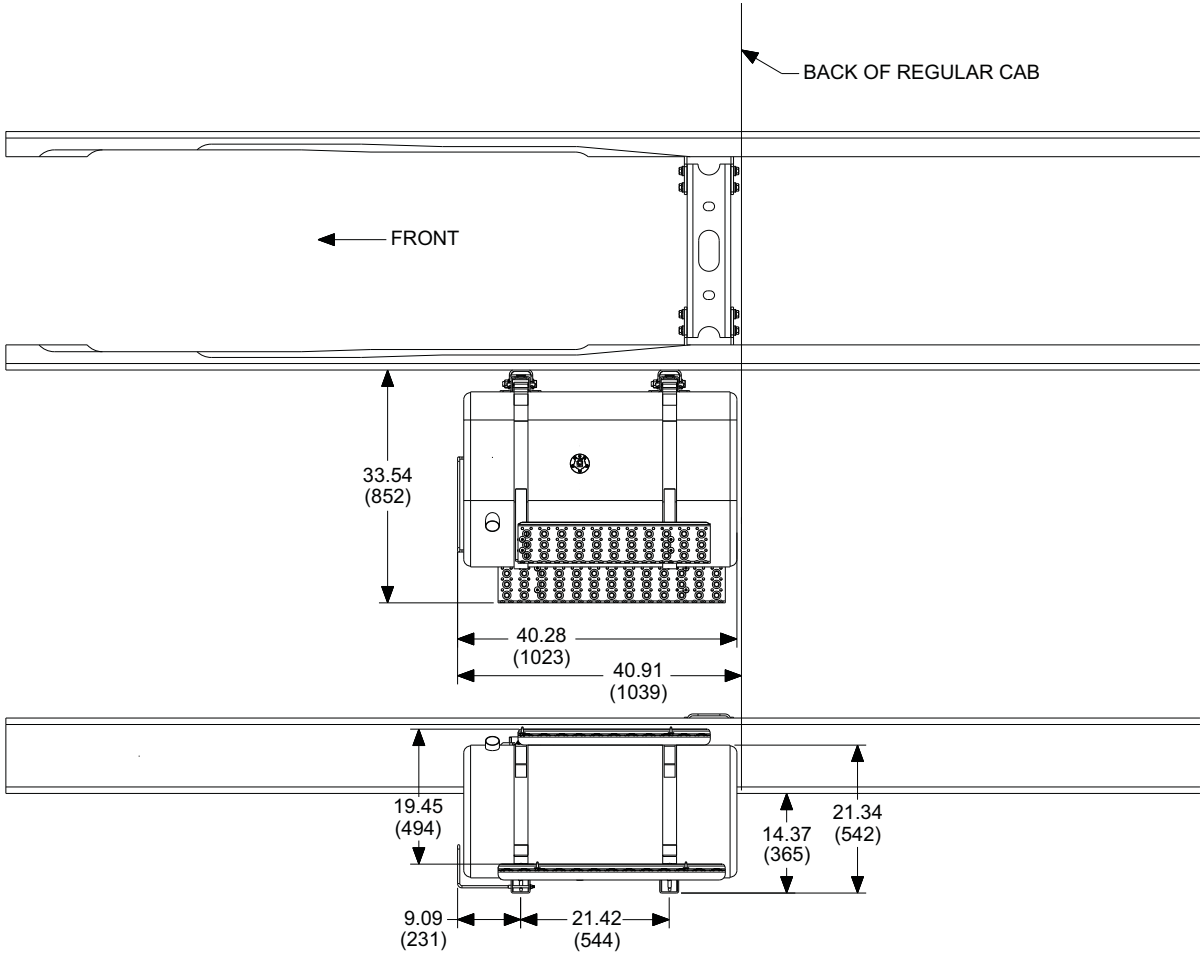



15_0012

## *FUEL TANK LOCATION (EGR)*

### *Models 4x2 and 6x4*

#### ***Single 70 Gallon, Mounted Left Side Under Cab (15SMD)***

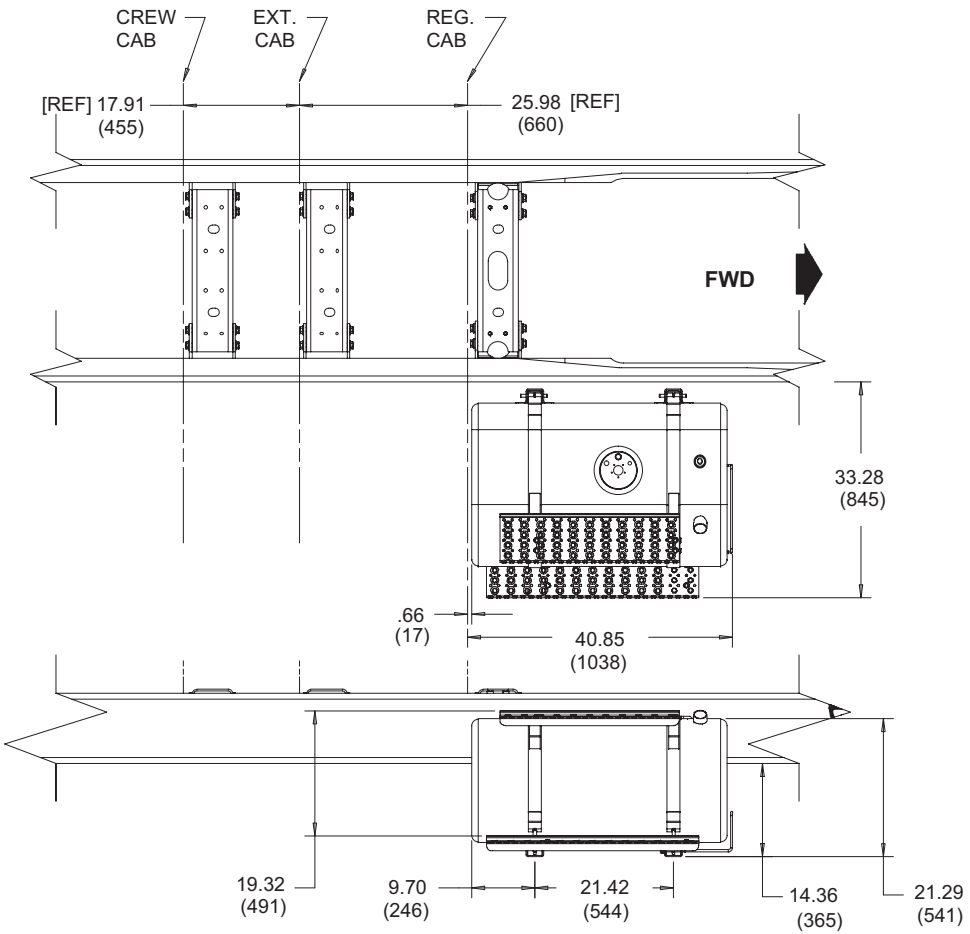



15smd

# FUEL TANK LOCATION (EGR)

## Models 4300 and 4400

### *Single 70 Gallon, "D" Style, Mounted Right Side Under Cab (15SGH)*

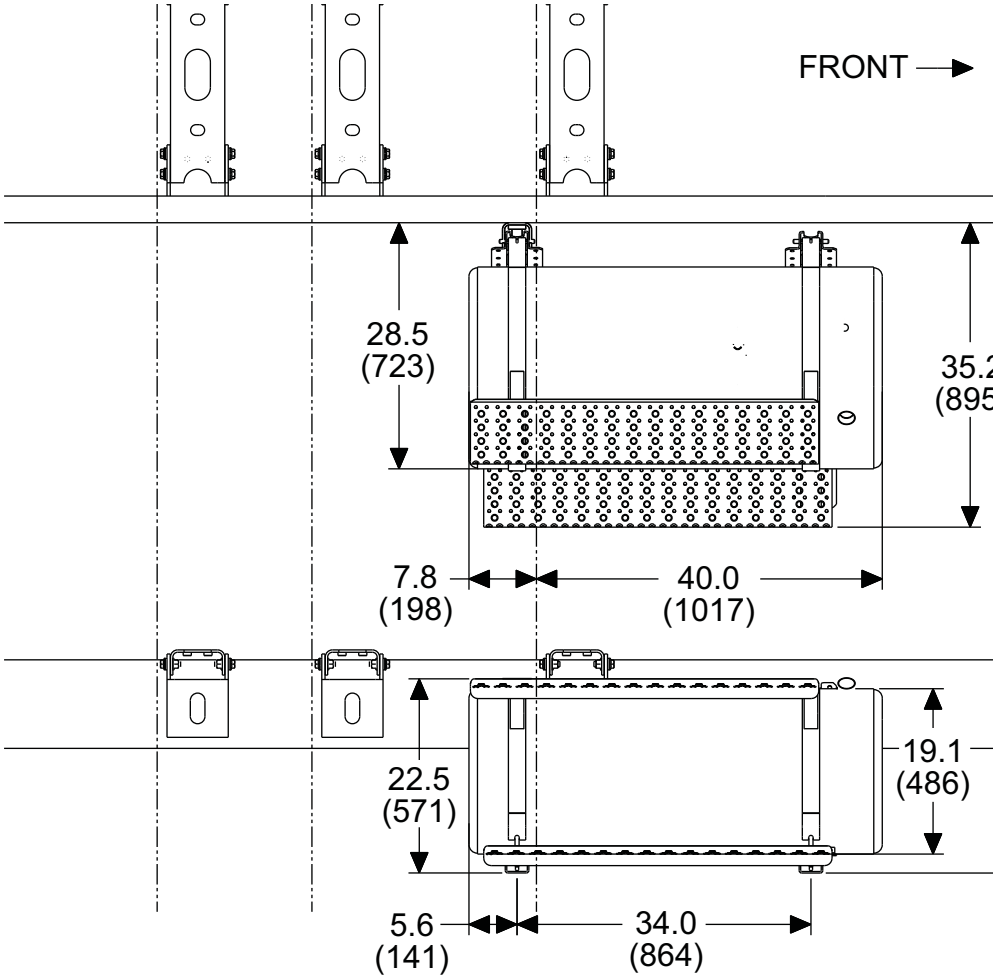



15_0030

## *FUEL TANK LOCATION (EGR)*

### *Models 4x2 and 6x4*

***Single 70 Gallon, "D" Style, Mounted Right Side Under Cab (15SRU)***

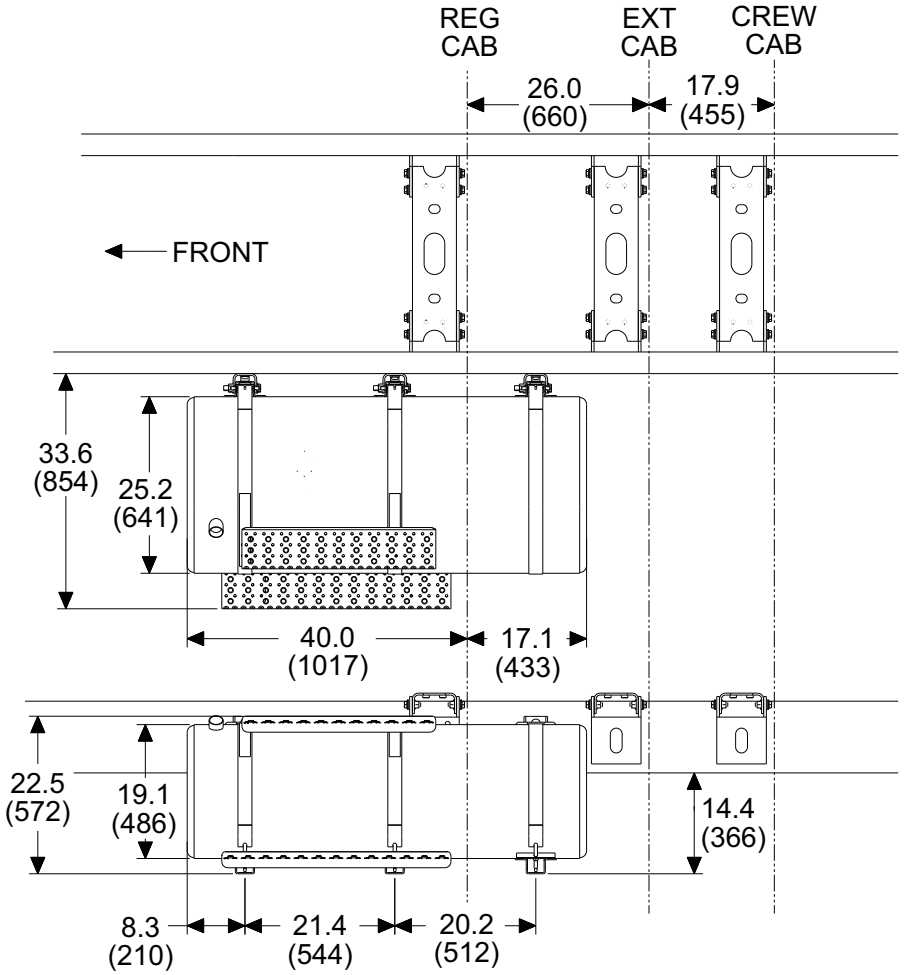



15_0013

# FUEL TANK LOCATION (EGR)

## Models 4x2 and 6x4

### *Single 100 Gallon, "D" Style, Mounted Left Side Under Cab (15SGD)*

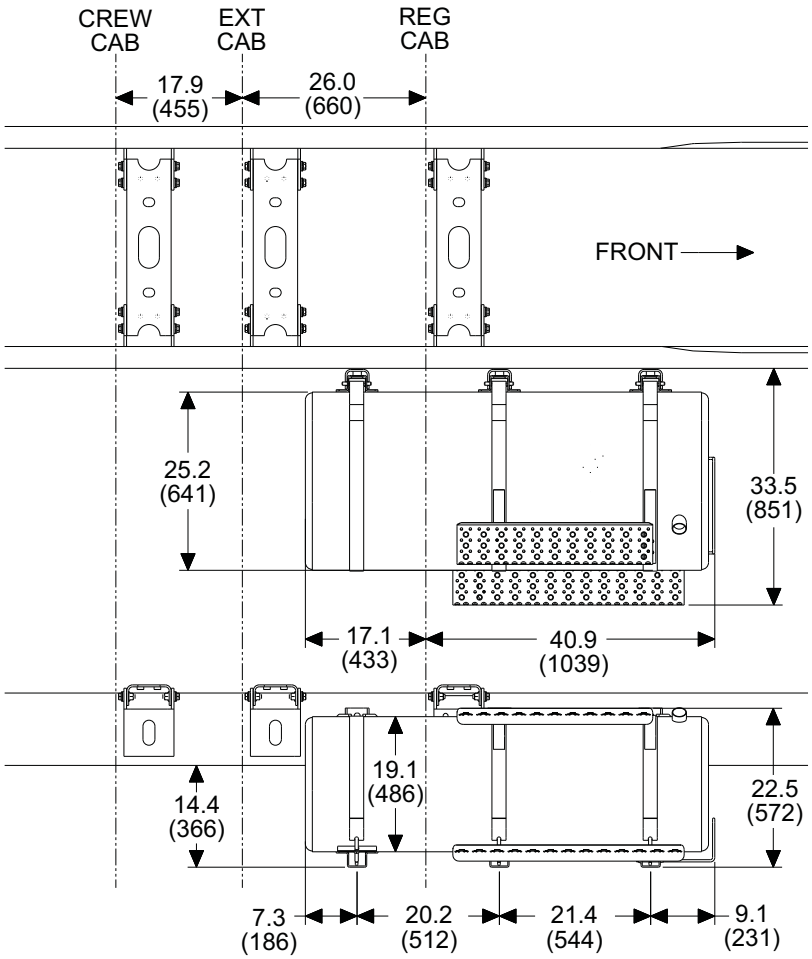



15SGD

## *FUEL TANK LOCATION (EGR)*

### *Models 4x2 and 6x4*

#### ***Single 100 Gallon, "D" Style, Mounted Right Side Under Cab (15SGE)***

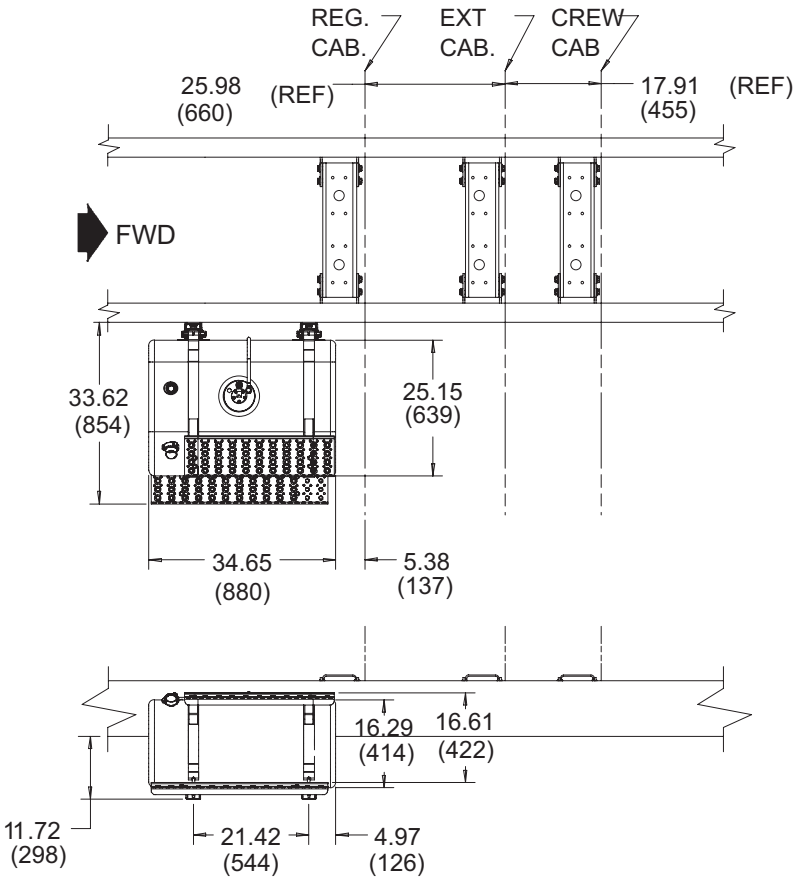



15SGE

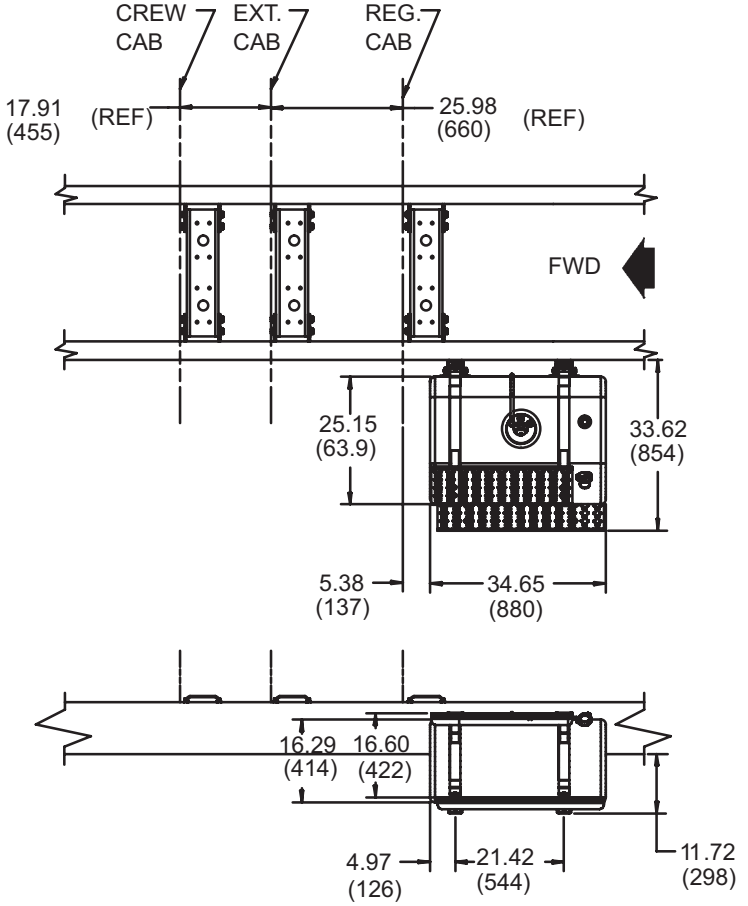
# FUEL TANK LOCATION (EGR)

## All Models

***Dual 100 Gallon Total Capacity, "D" Style, 50 Gallon Mounted Left Side Under Cab, 50 Gallon Mounted Right Side Under Cab (15DMW)***




15_0017

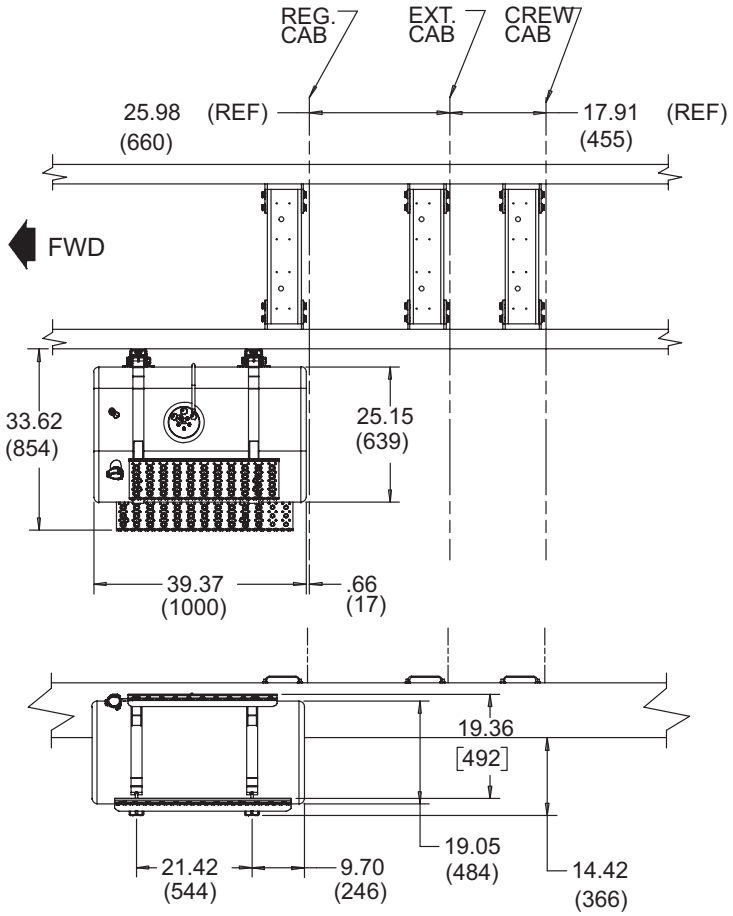



15_0018

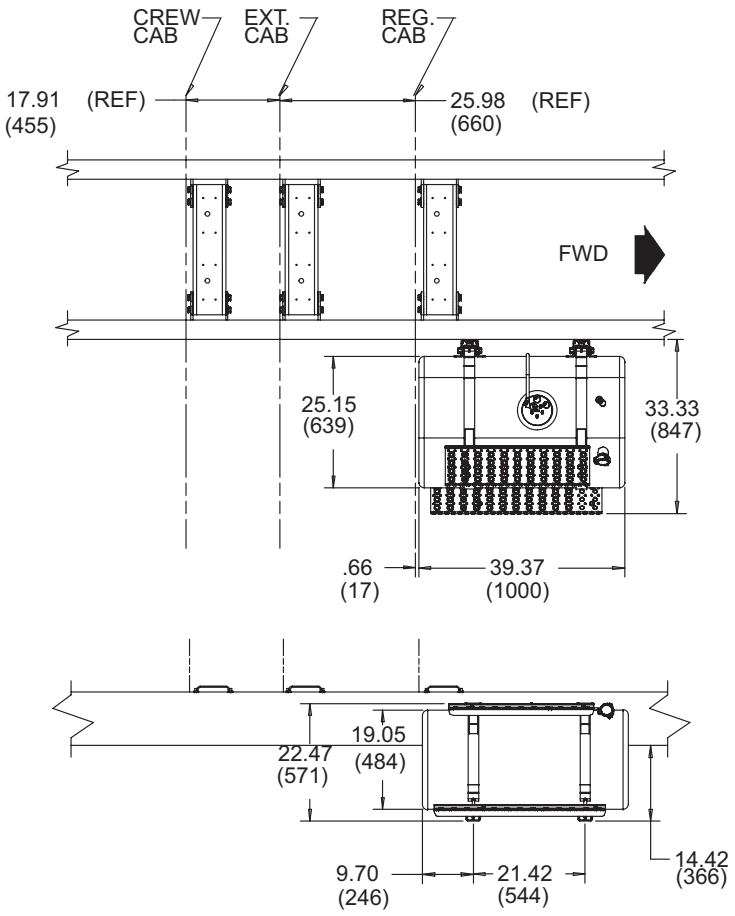
## *FUEL TANK LOCATION (EGR)*

### *Models 4300 and 4400*

***Dual 140 Gallon Total Capacity, "D" Style, 70 Gallon Mounted Left Side Under Cab, 70 Gallon Mounted Right Side Under Cab (15DMV)***




15_0019

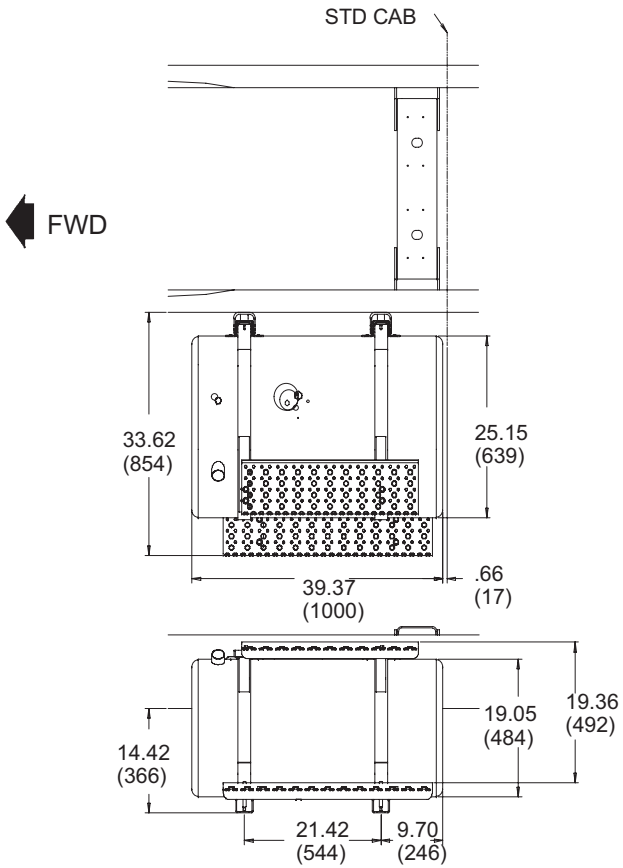



15_0020

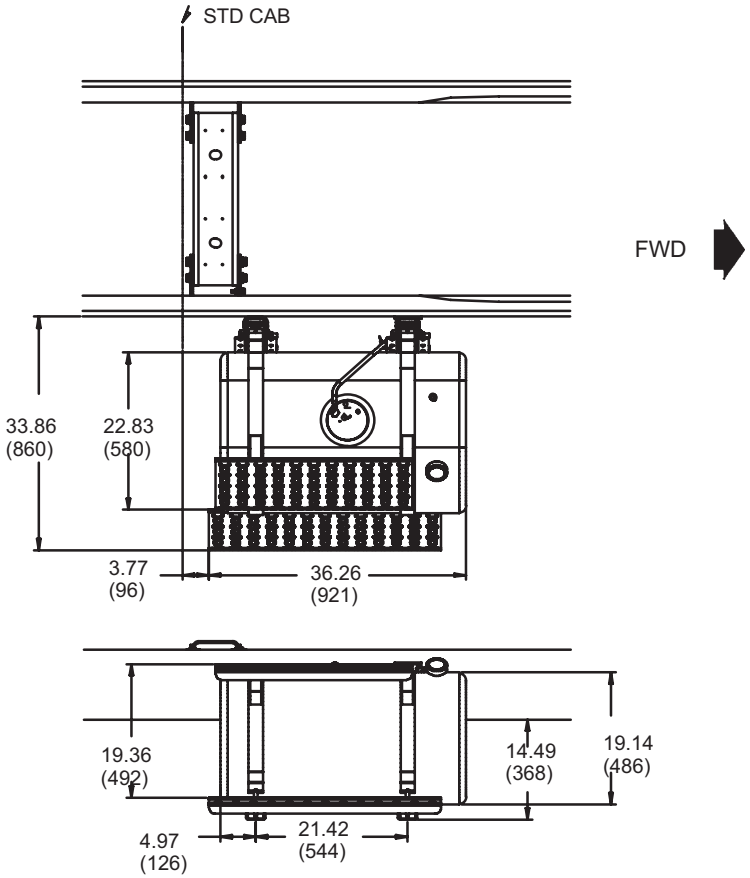
# FUEL TANK LOCATION (EGR)

## Models 4x2 and 6x4

***Dual 120 Gallon Total Capacity, "D" Style, 70 Gallon Mounted Under Cab Left Side, 70 Gallon Mounted Under Cab Right Side (15DUJ, 15DUK)***




15_0021

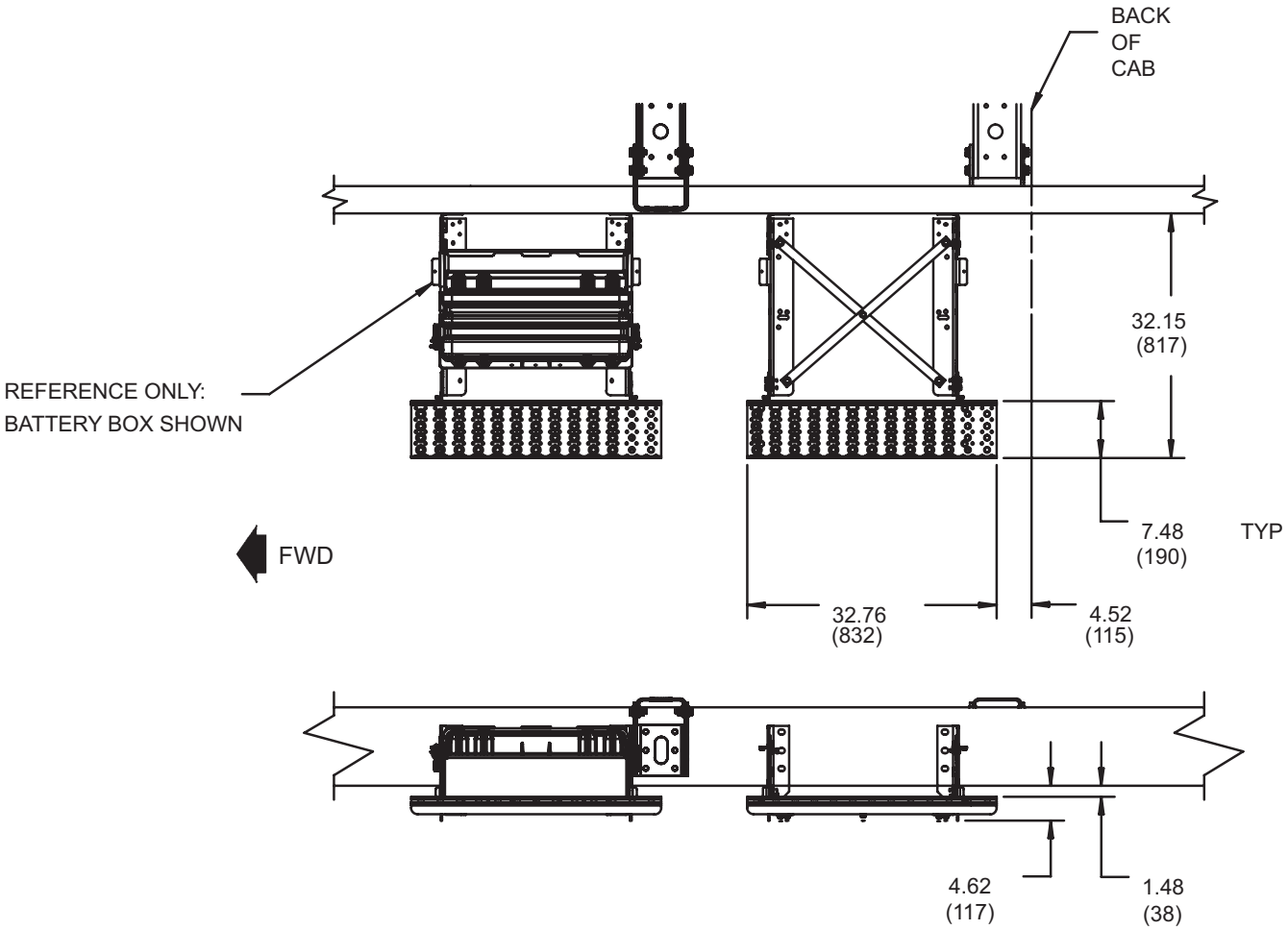



15_0022

## *UNDER CAB STEP LOCATION WITH CREW CAB (EGR)*

### *Models 4x2 and LP*

***Left Side Mount With One Step – With Rectangular Fuel Tanks (516006)***

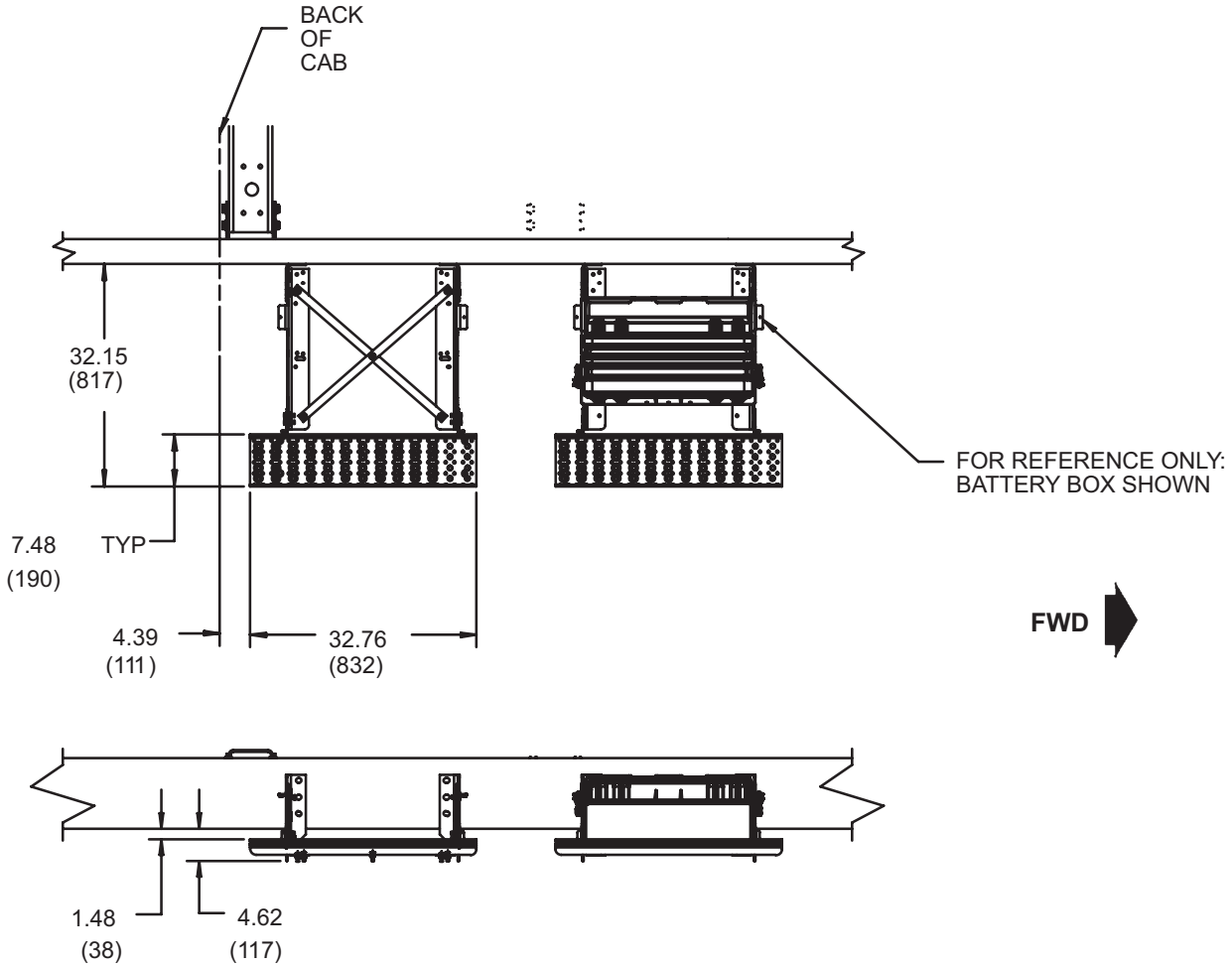



15_0023

## *UNDER CAB STEP LOCATION WITH CREW CAB (EGR)*

### *Models 4x2 and LP*

***Right Side Mount With One Step – With Rectangular Fuel Tanks***

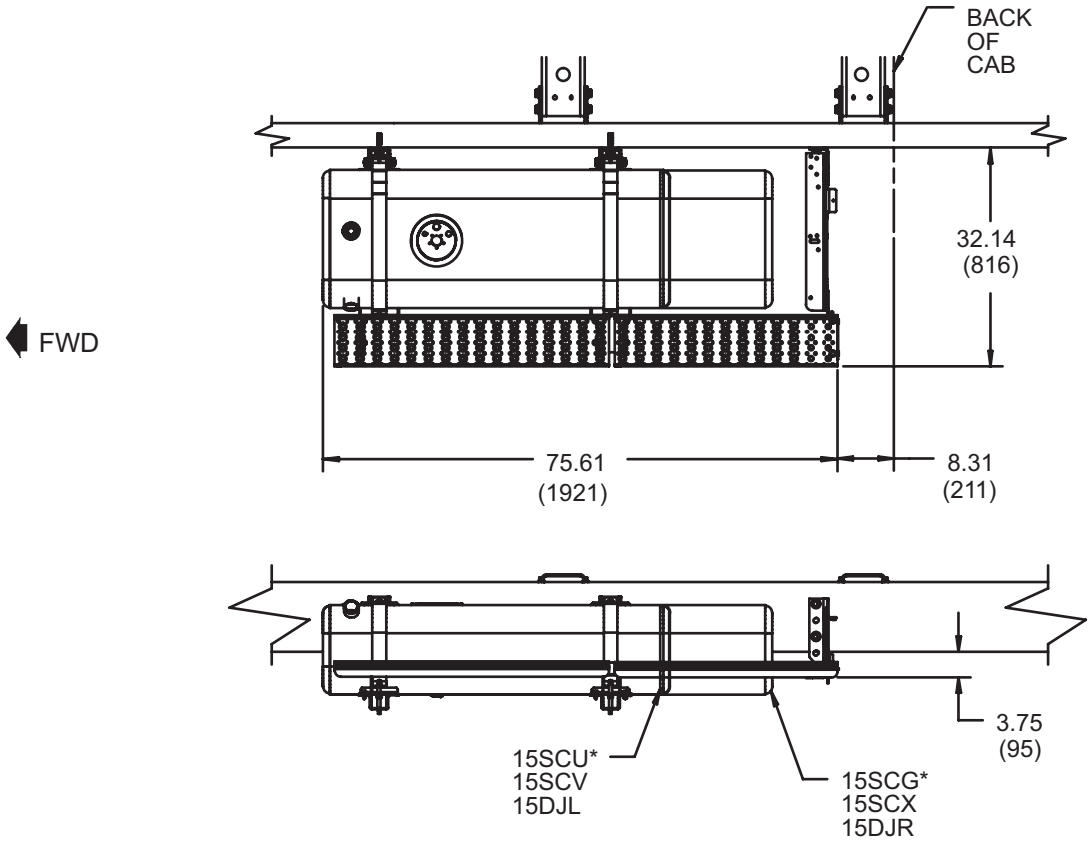



15_0024

## *UNDER CAB STEP LOCATION WITH CREW CAB (EGR)*

### *Models 4x2 and LP*

***Left Side Mount With One Step – With 50 and 65 Gallon Rectangular Fuel Tanks***



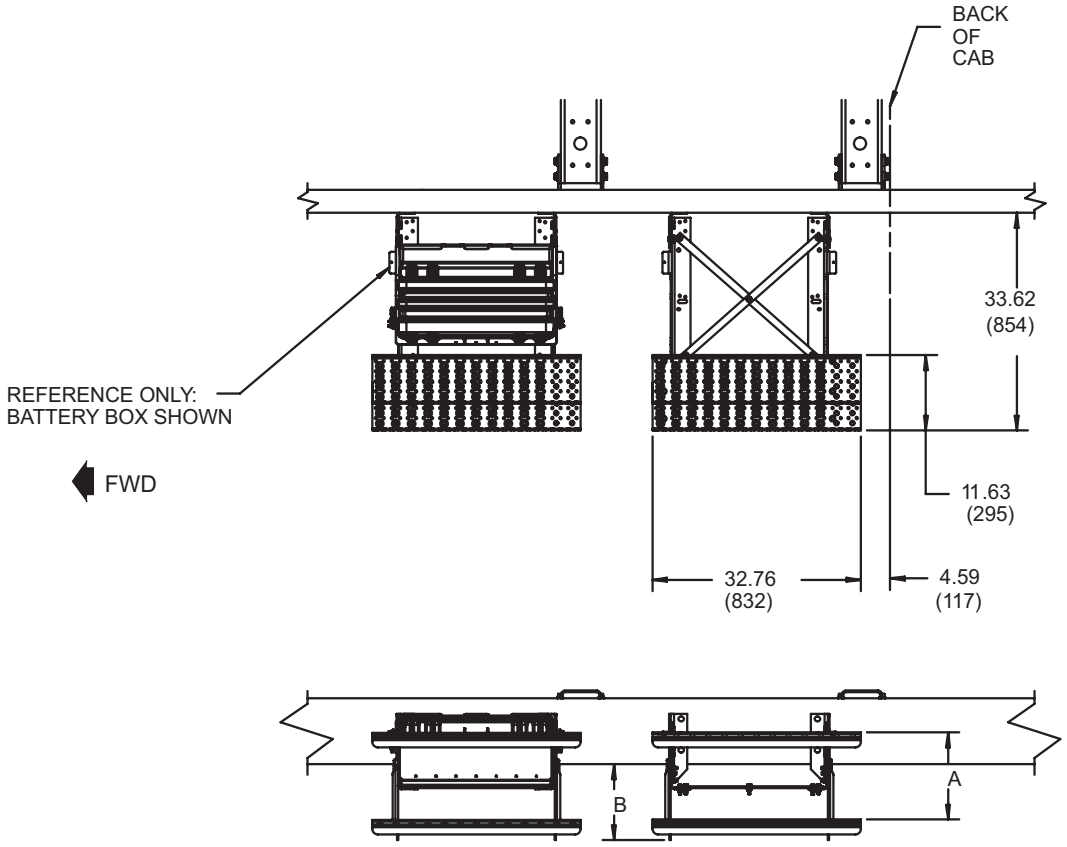

15_0025

* For fuel tank dimensions see fuel tank sections – left shown, right opposite

# UNDER CAB STEP LOCATION WITH CREW CAB (EGR)

## All Models

### *Left Side Mount With Two Steps – With "D" Style Fuel Tanks*




15_0026

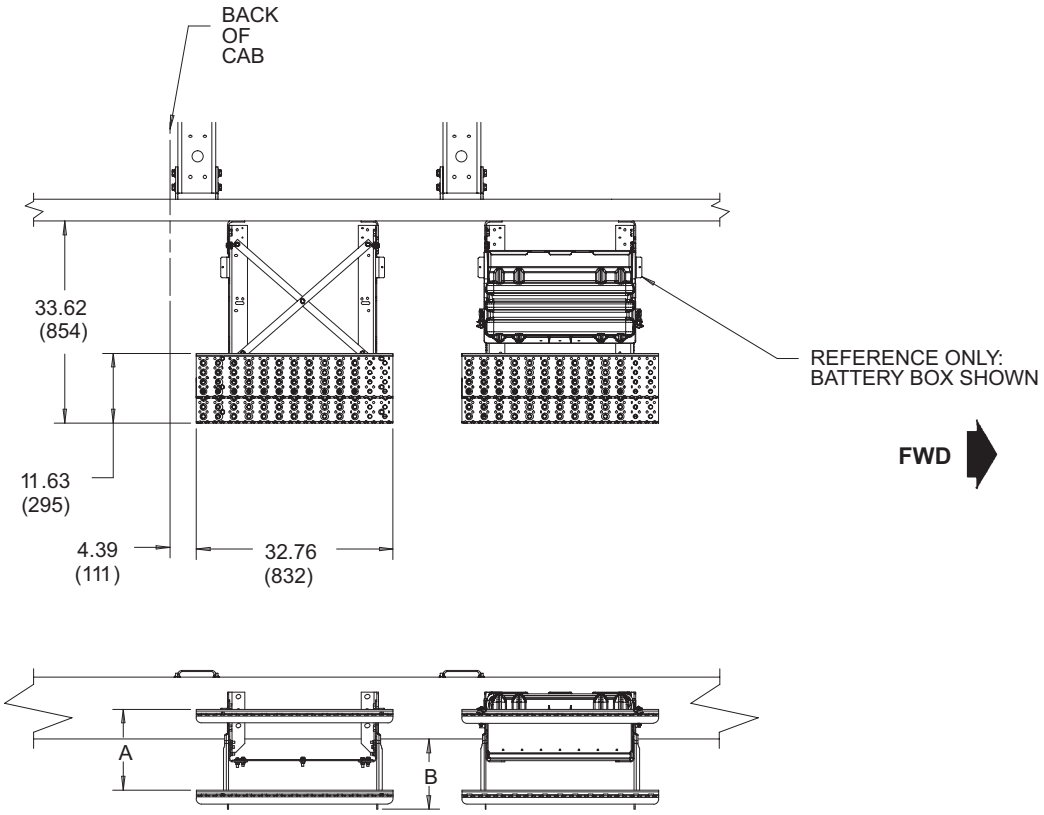
A = 13.47 (342) with "D" Style 50 Gallon Fuel Tanks
16.17 (411) with "D" Style 70 Gallon Fuel Tanks

B = 11.72 (298) with "D" Style 50 Gallon Fuel Tanks
14.42 (366) with "D" Style 70 Gallon Fuel Tanks

## *UNDER CAB STEP LOCATION WITH CREW CAB (EGR)*

### *All Models*

#### ***Right Side Mount With Two Steps – With "D" Style Fuel Tanks***




15_0027

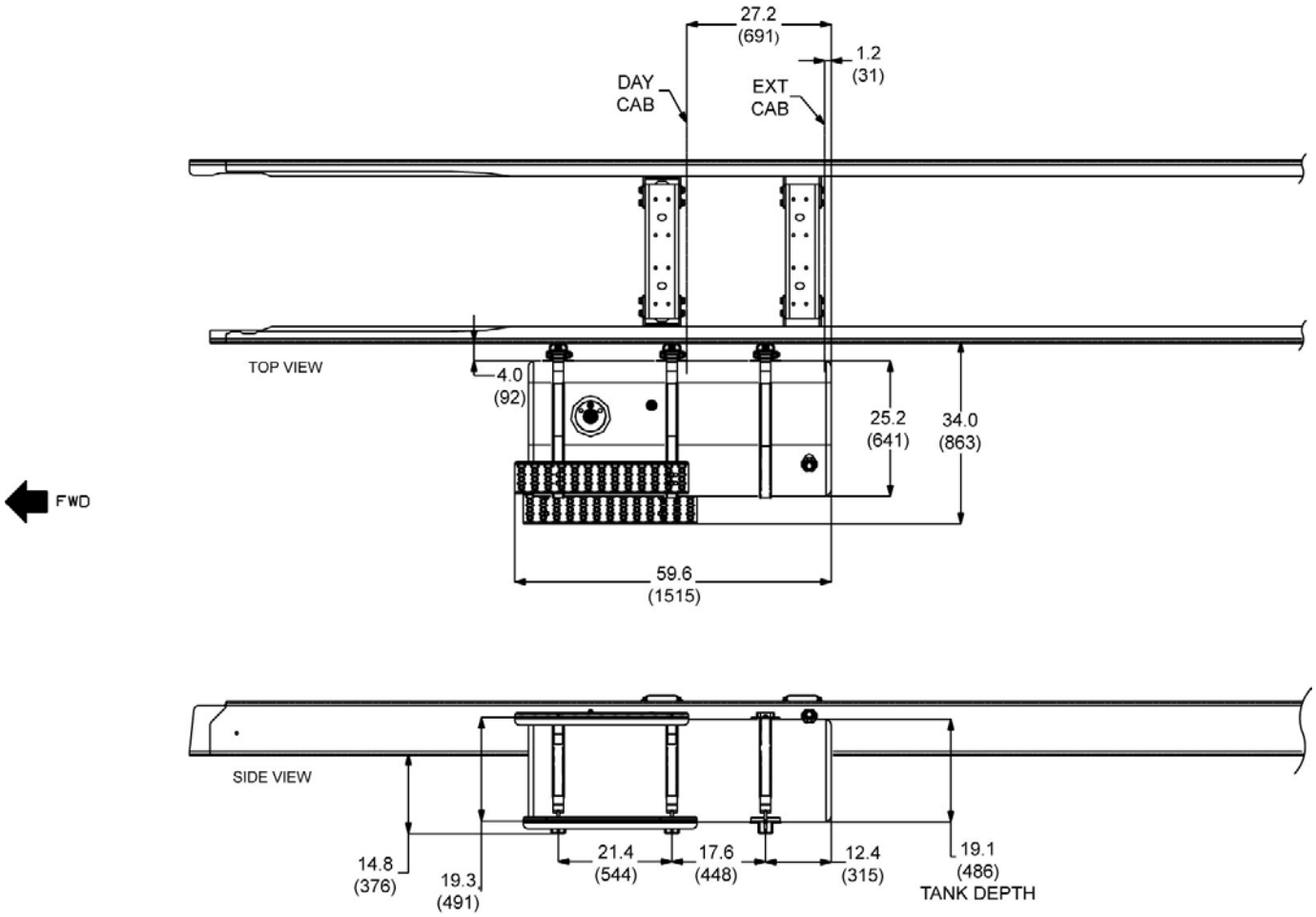
A = 13.47 (342) with "D" Style 50 Gallon Fuel Tanks
16.17 (411) with "D" Style 70 Gallon Fuel Tanks

B = 11.72 (298) with "D" Style 50 Gallon Fuel Tanks
14.42 (366) with "D" Style 70 Gallon Fuel Tanks

# *FUEL TANK AND STEP LOCATION (SCR)*

## *All Models (except 4300 SBA LP 4x2)*

### ***Single 100 Gallon Total Capacity, 19" "D" Style, Mounted Right Side Under Cab (15SGD)***

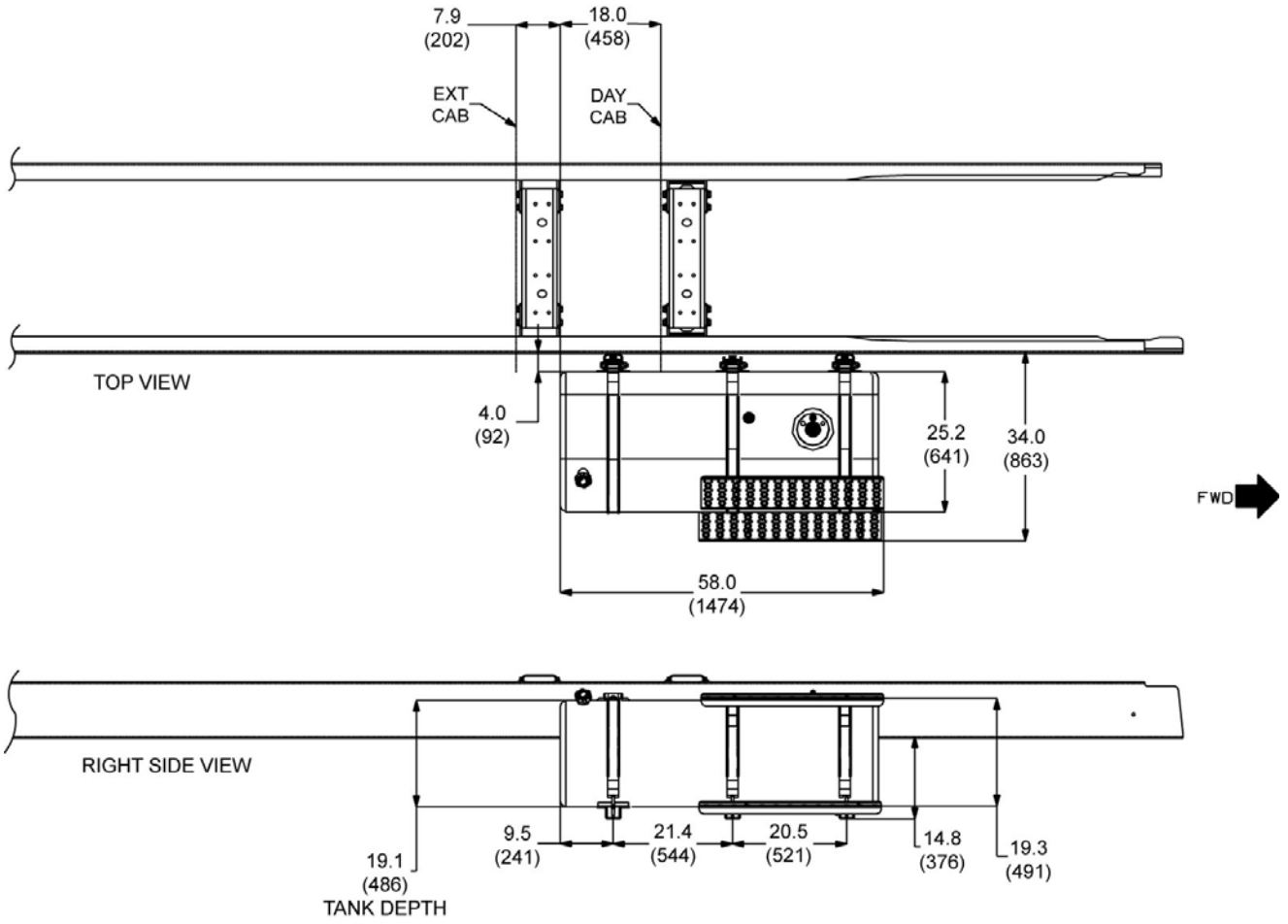



durastar_15sgd

## *FUEL TANK AND STEP LOCATION (SCR)*

### *All Models (except 4300 SBA LP 4x2)*

***Single 100 Gallon Total Capacity, 19" "D" Style, Mounted Right Side Under Cab (15SGE)***

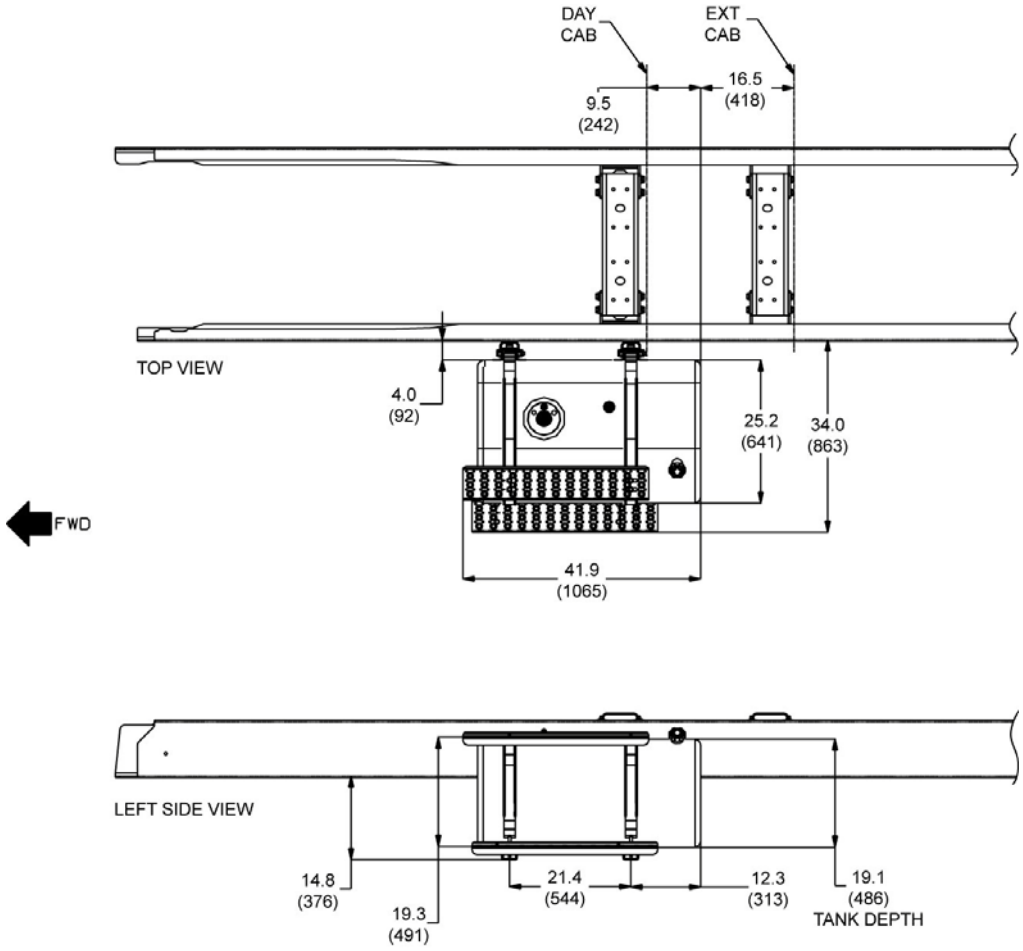



durastar_15sge

# *FUEL TANK AND STEP LOCATION (SCR)*

## *All Models (except 4300 SBA LP 4x2)*

### ***Single 70 Gallon Total Capacity, 19" "D" Style, Mounted Left Side Under Cab with Under Cab Def Tank (15SGG, 15SMD)***

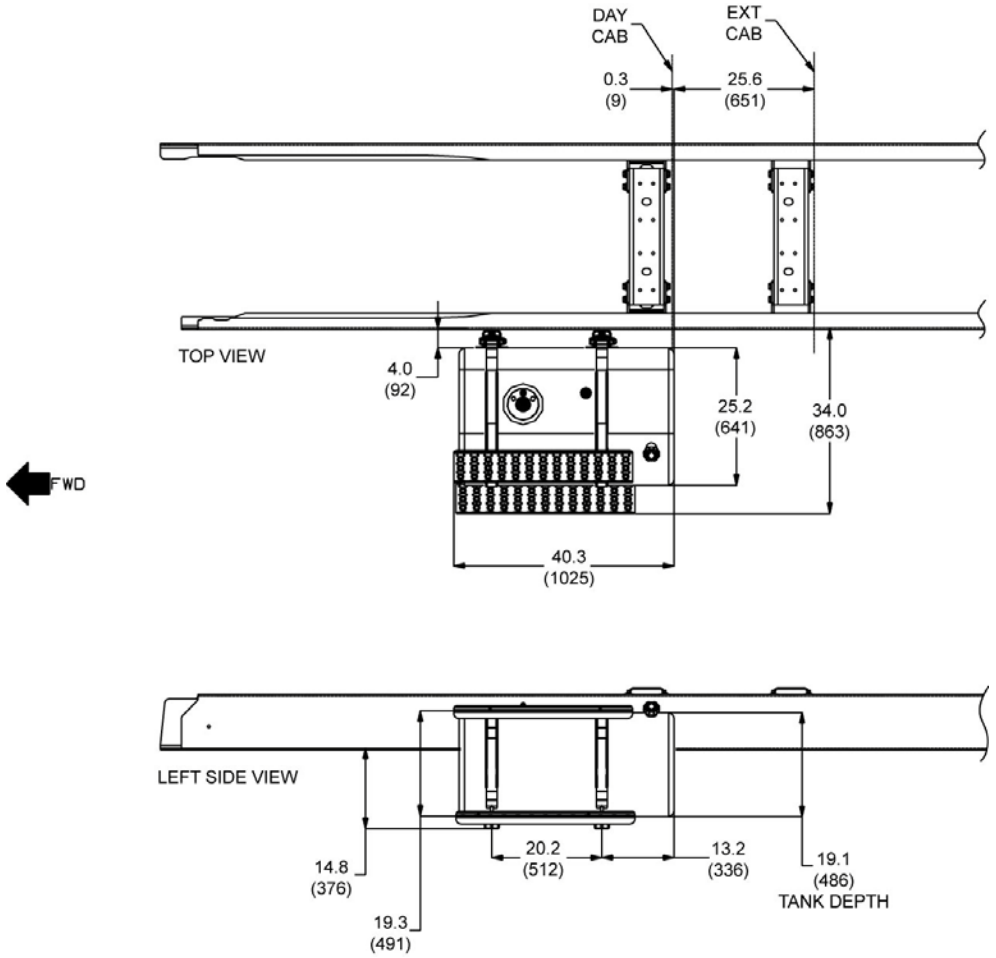



durastar_15sgg_15smd_with_uc_def

## *Fuel Tank and Step Location (SCR)*

### *All Models (except 4300 SBA LP 4x2)*

***Single 70 Gallon Total Capacity, 19" "D" Style, Mounted Left Side Under Cab with BOC Def Tank (15SGG, 15SMD)***

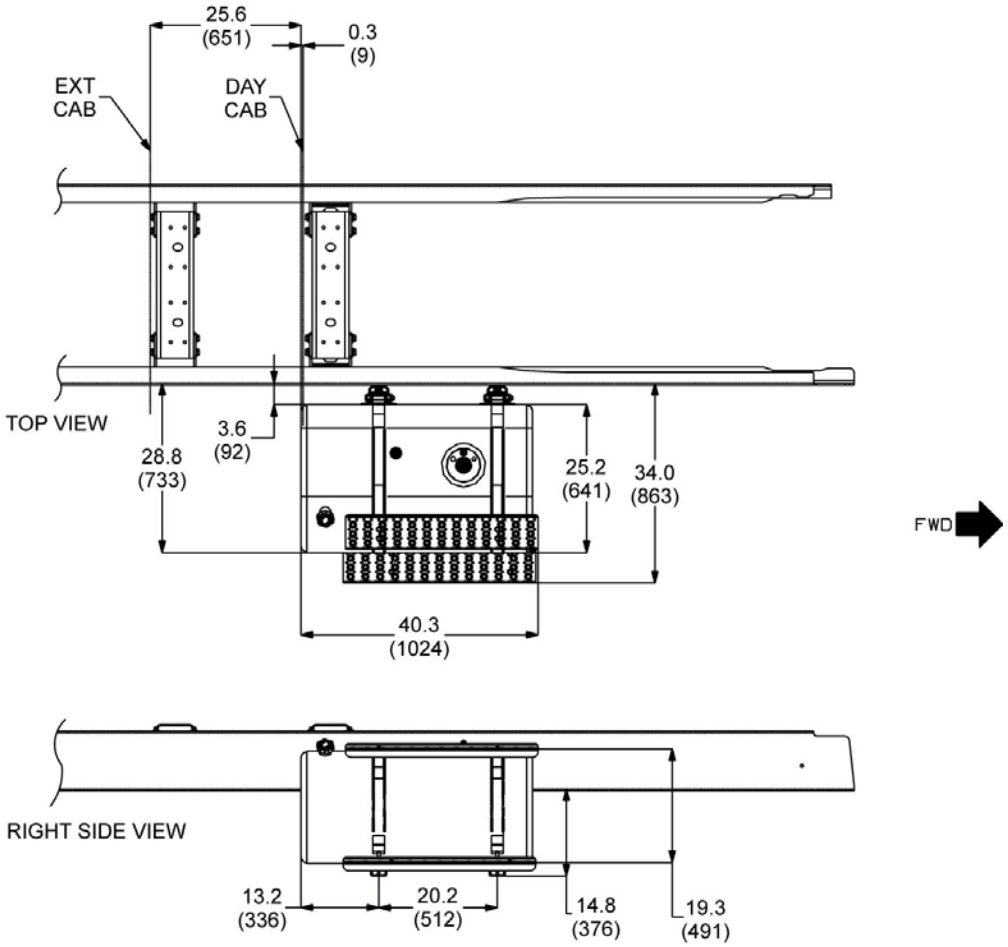



durastar_15sgg_15smd_with_boc_def

# FUEL TANK AND STEP LOCATION (SCR)

## All Models

### Single 70 Gallon Total Capacity, 19" "D" Style, Mounted Right Side Under Cab (15SGH, 15SME)

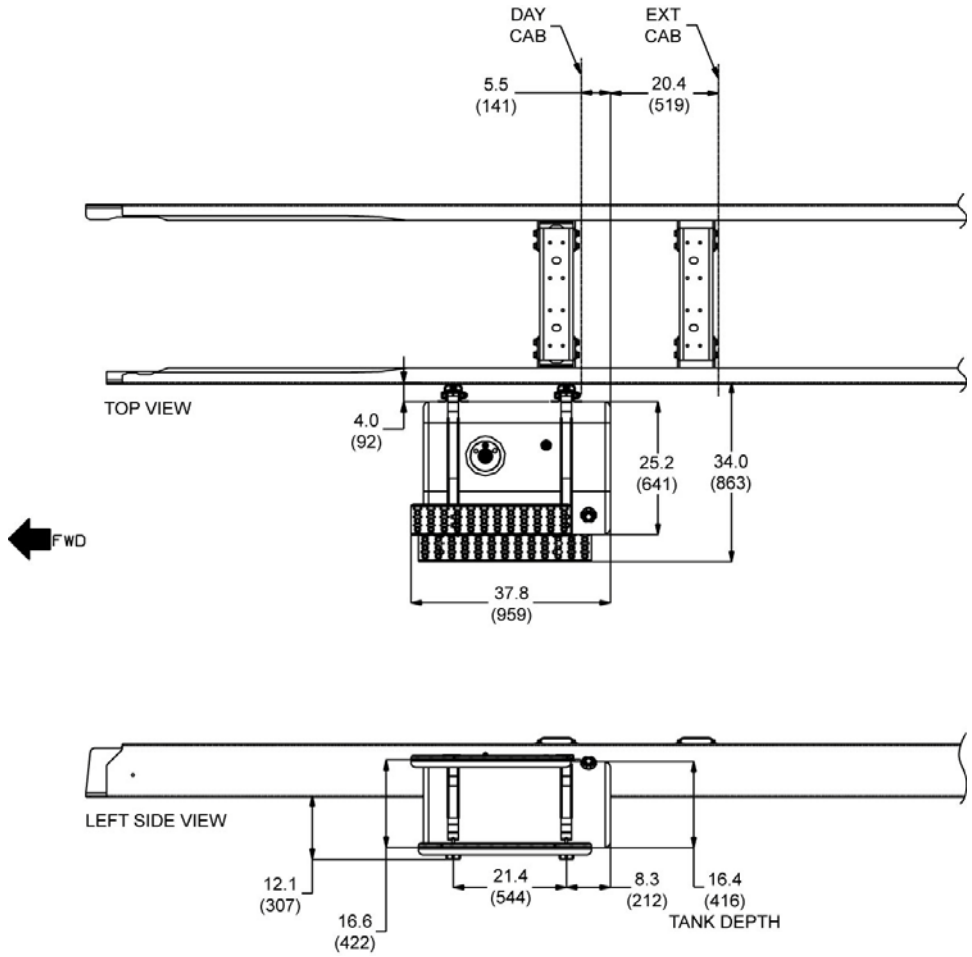



durastar_15sgh_15sme

## *FUEL TANK AND STEP LOCATION (SCR)*

### *All Models (except 4300 SBA LP 4x2)*

***Single 50 Gallon Total Capacity, 16" "D" Style, Mounted Left Side Under Cab with Under Cab Def Tank (15SGJ)***

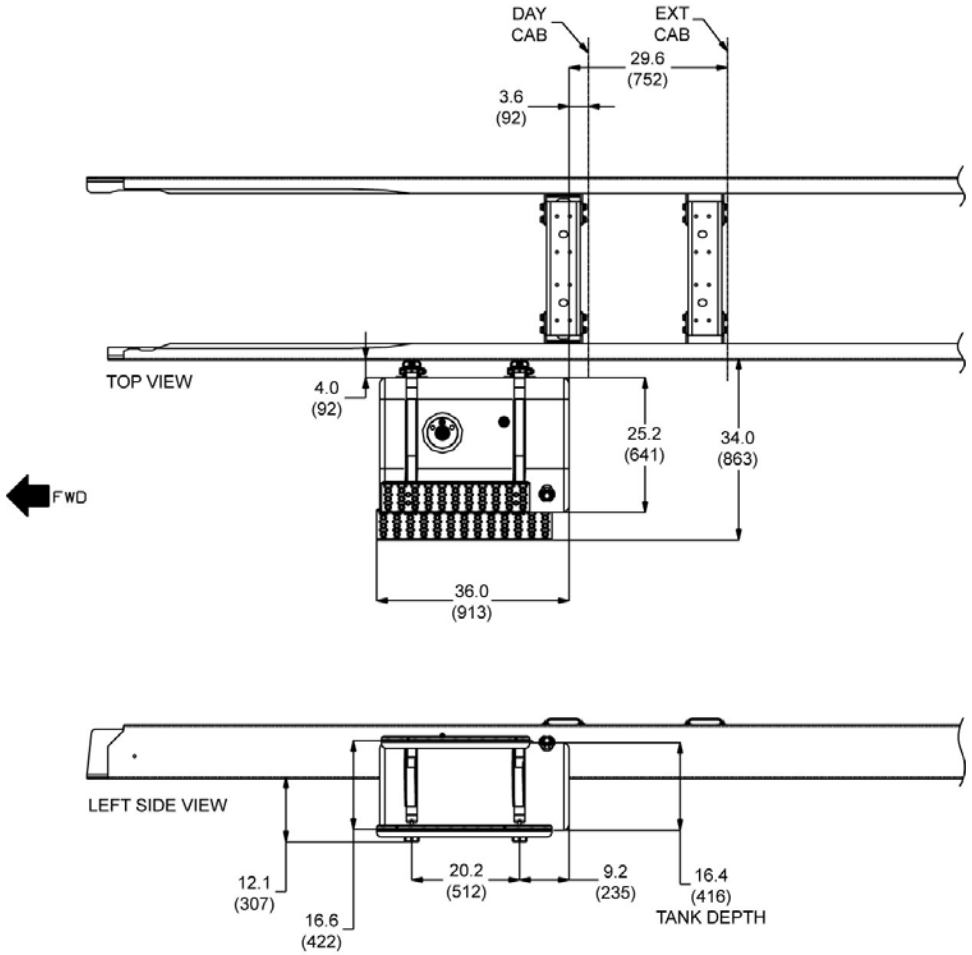



durastar_15sgj_with_uc_def

# *FUEL TANK AND STEP LOCATION (SCR)*

## *All Models (except 4300 SBA LP 4x2)*

### ***Single 50 Gallon Total Capacity, 16" "D" Style, Mounted Left Side Under Cab with BOC Def Tank (15SGJ)***

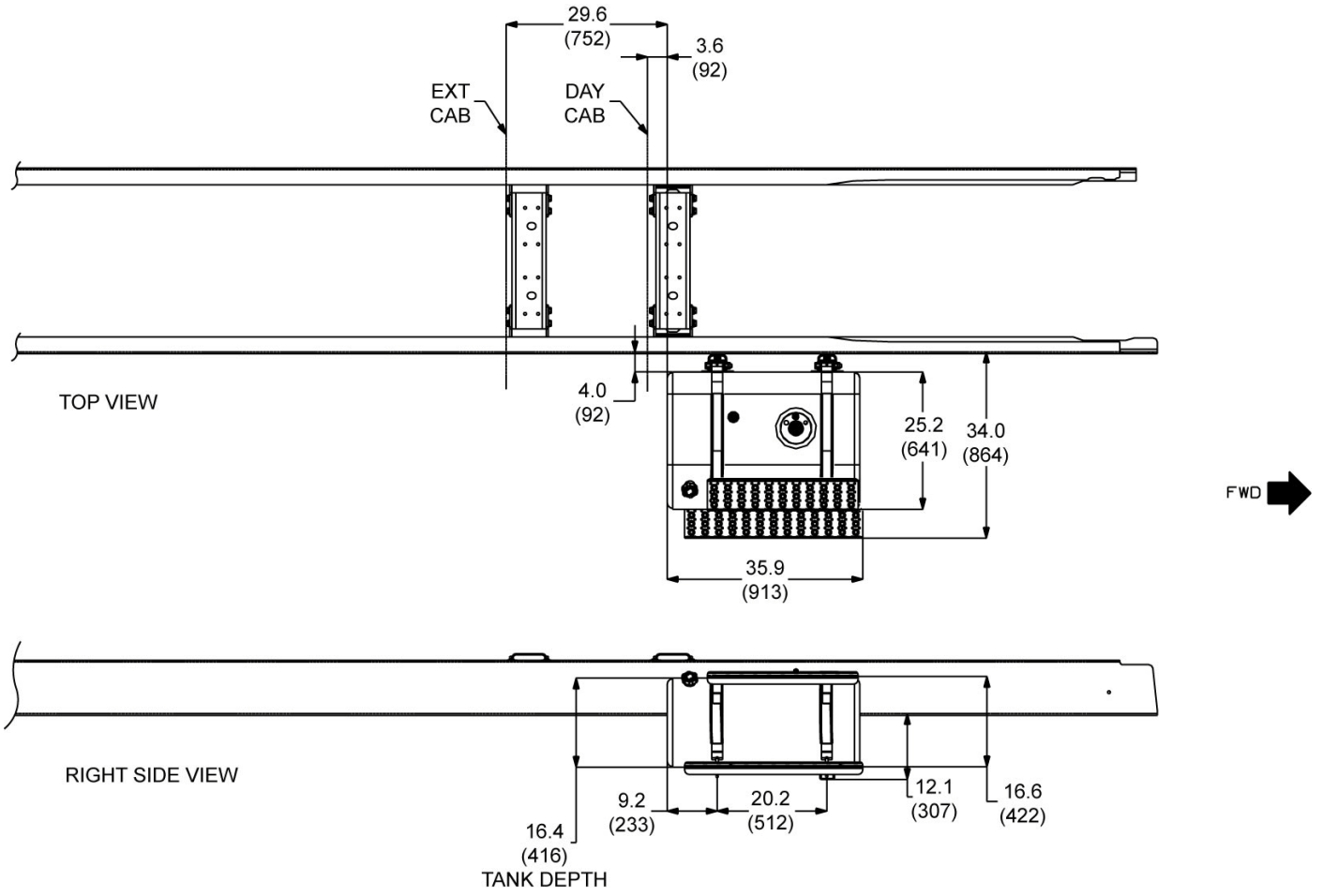



durastar_15sgj_with_boc_def

## *FUEL TANK AND STEP LOCATION (SCR)*

### *All Models (except 4300 SBA LP 4x2)*

#### ***Single 50 Gallon Total Capacity, 16" "D" Style, Mounted Right Side Under Cab (15SGK)***

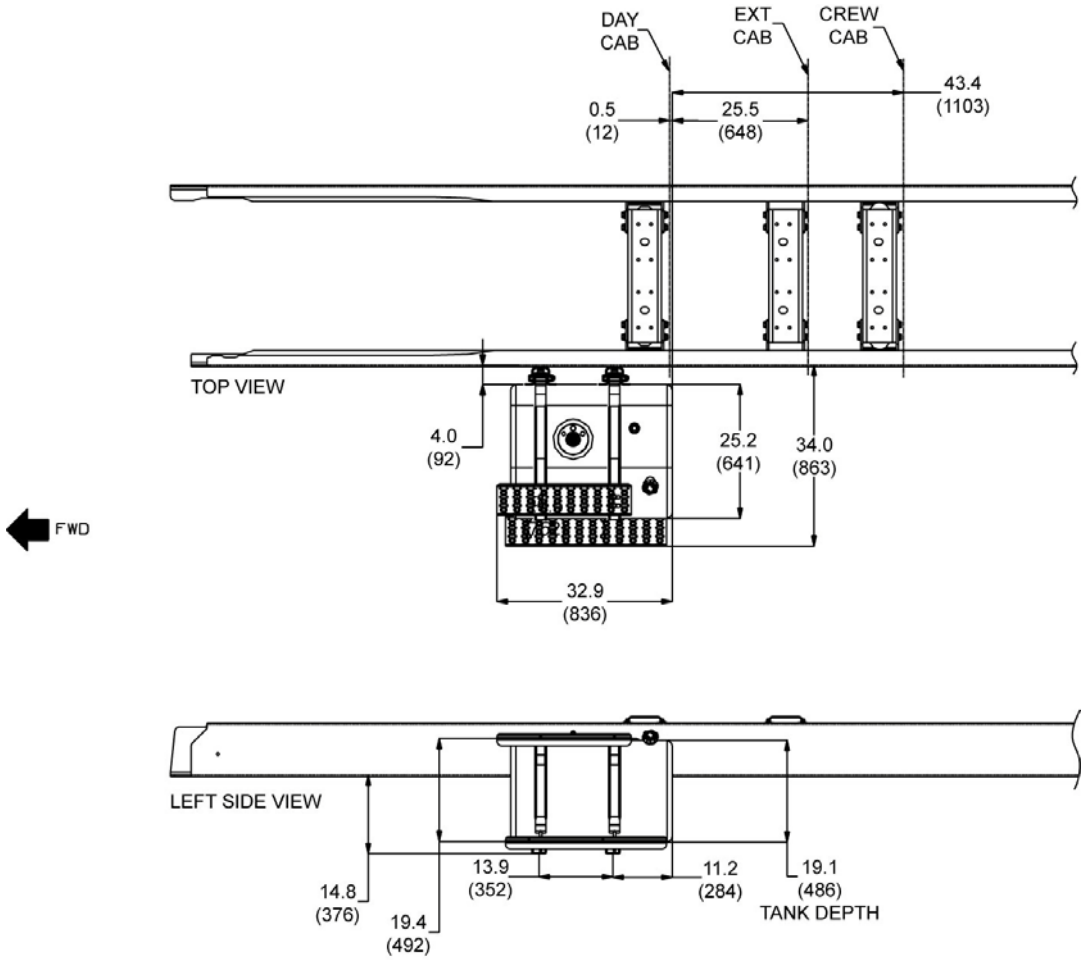



durastar_15sgk

# *FUEL TANK AND STEP LOCATION (SCR)*

## *All Models (except 4300 SBA LP 4x2)*

### ***Single 50 Gallon, 19" "D" Style, Mounted Left Side Under Cab (15SRE, 15SWY)***

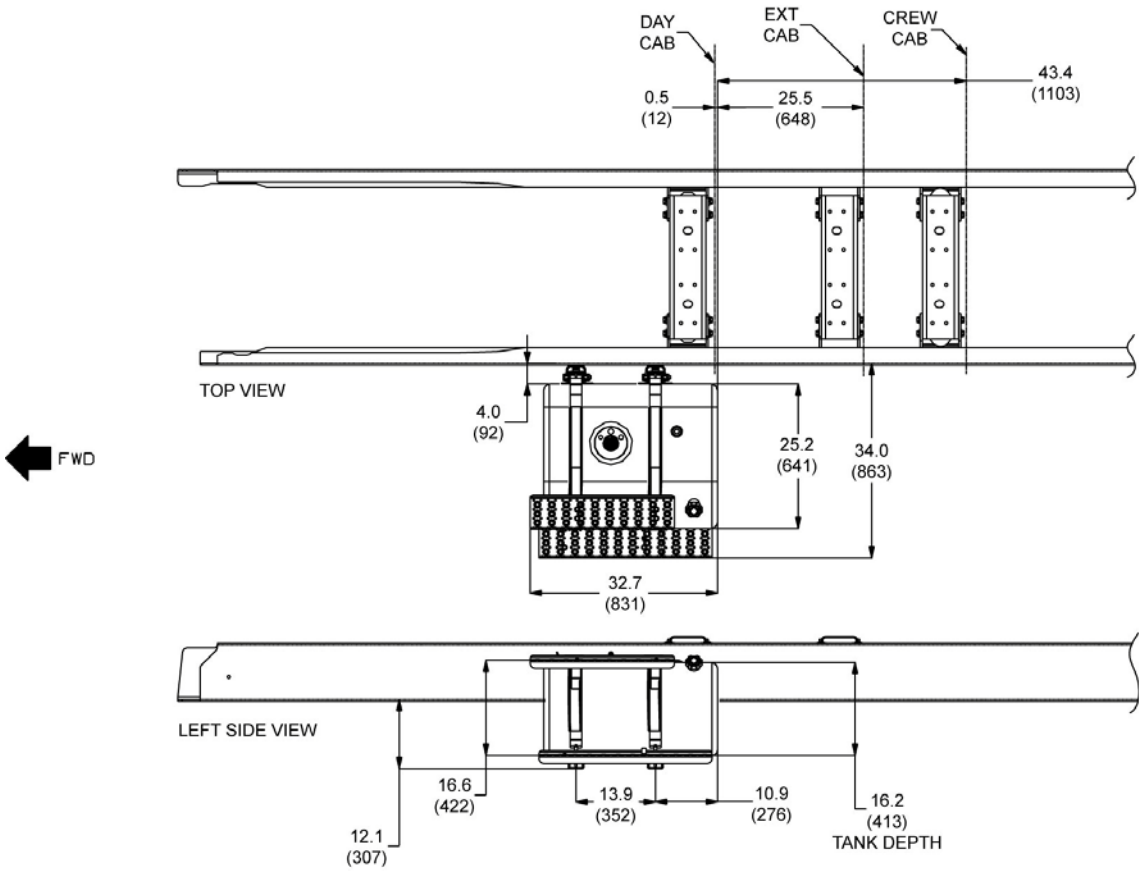



durastar_15sre_15swy

## *FUEL TANK AND STEP LOCATION (SCR)*

### *Models 4300 & 4400 SBA 4x2, 4400 SBA LP 4x2, 4400 SBA 6x4*

***Single 40 Gallon, 16" "D" Style, Mounted Left Side Under Cab (Code15SWU)***

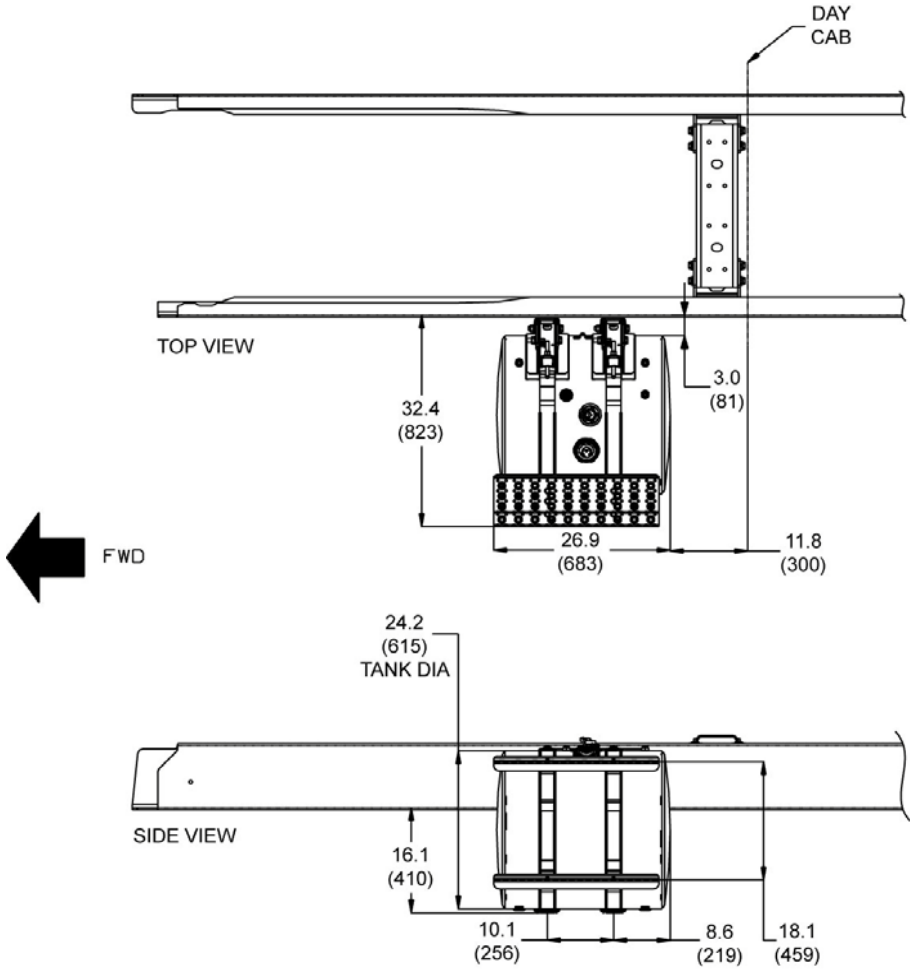



durastar_15swu

# *FUEL TANK AND STEP LOCATION (SCR)*

## *Models 4300 & 4400 SBA 4x2, 4400 SBA LP 4x2, 4400 SBA 6x4*

### ***Single 50 Gallon, 24", Mounted Left Side Under Cab (15SXJ, 15SXK)***

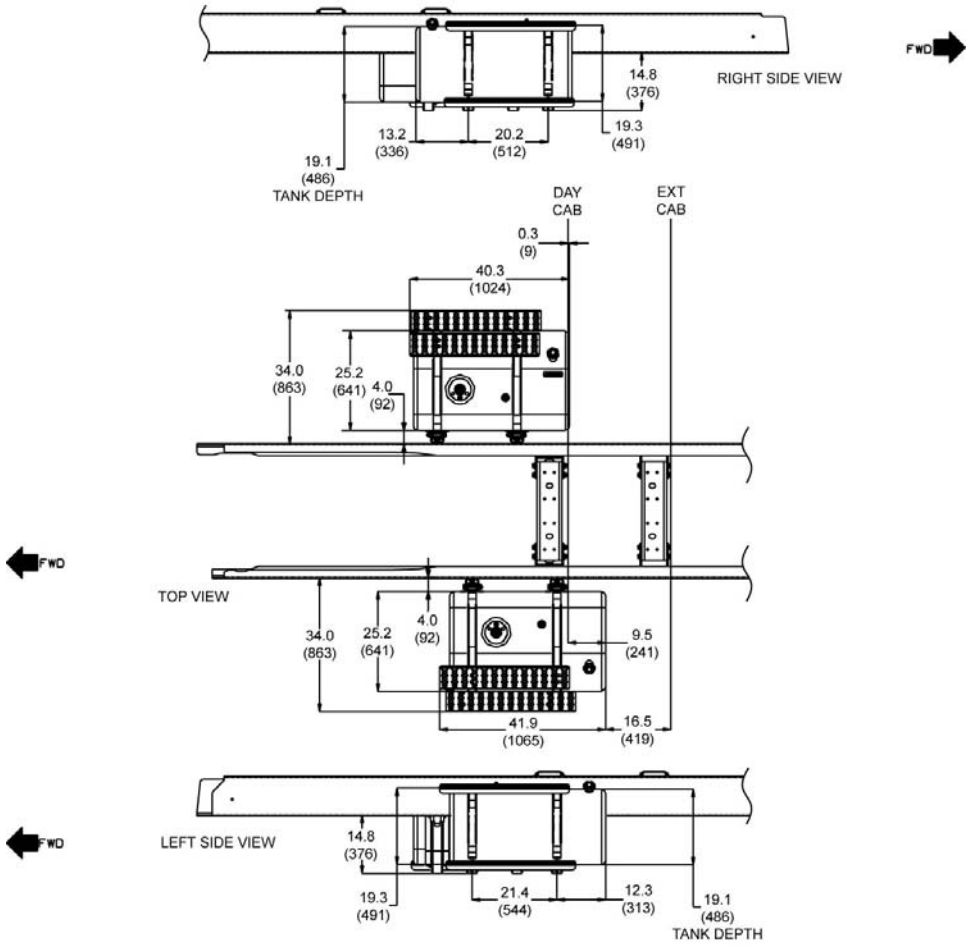



durastar_15sxj_15sxk

## *FUEL TANK AND STEP LOCATION (SCR)*

### *All Models*

***Dual 70 Gallon (140 Gallon Total Capacity), 19", Mounted Under Cab Left and Right Side (15DMV, 15DYS)***

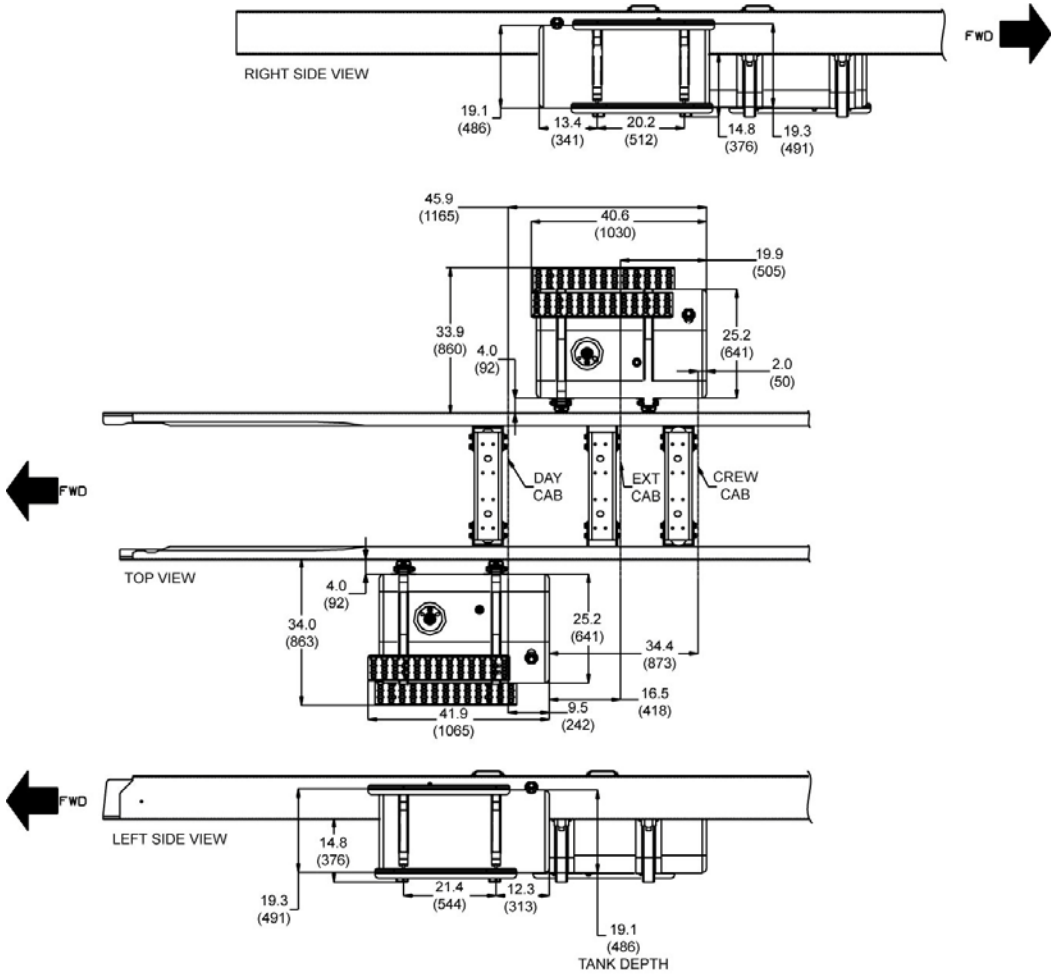



durastar_15dmv_15dys

# FUEL TANK AND STEP LOCATION (SCR)

## All Models

### Dual 70 Gallon (140 Gallon Total Capacity), 19", Mounted Under Cab Left and Right Side (15DTA, 15DZW)

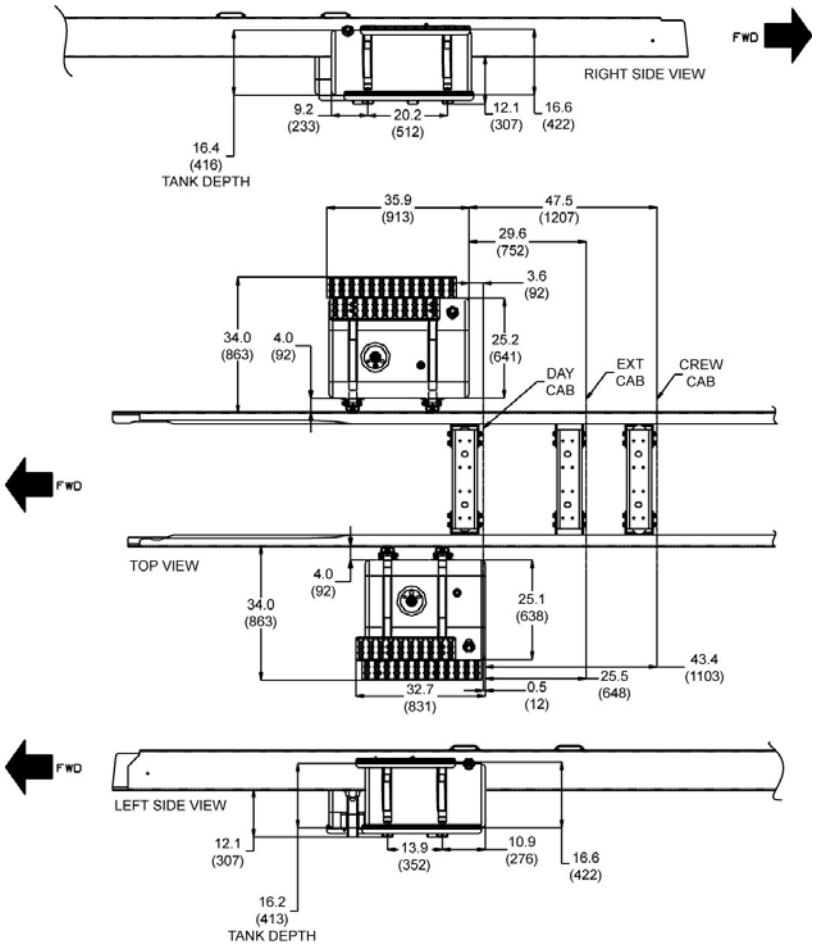



durastar_15dzw_15dta

## *FUEL TANK AND STEP LOCATION (SCR)*

### *Models 4300 & 4400 SBA 4x2, 4400 SBA 6x4*

***Dual 90 Gallon Total Capacity (40 Gallon Left, 50 Gallon Right), 16", Mounted Under Cab Left and Right Side (15DYT, 15DYU)***

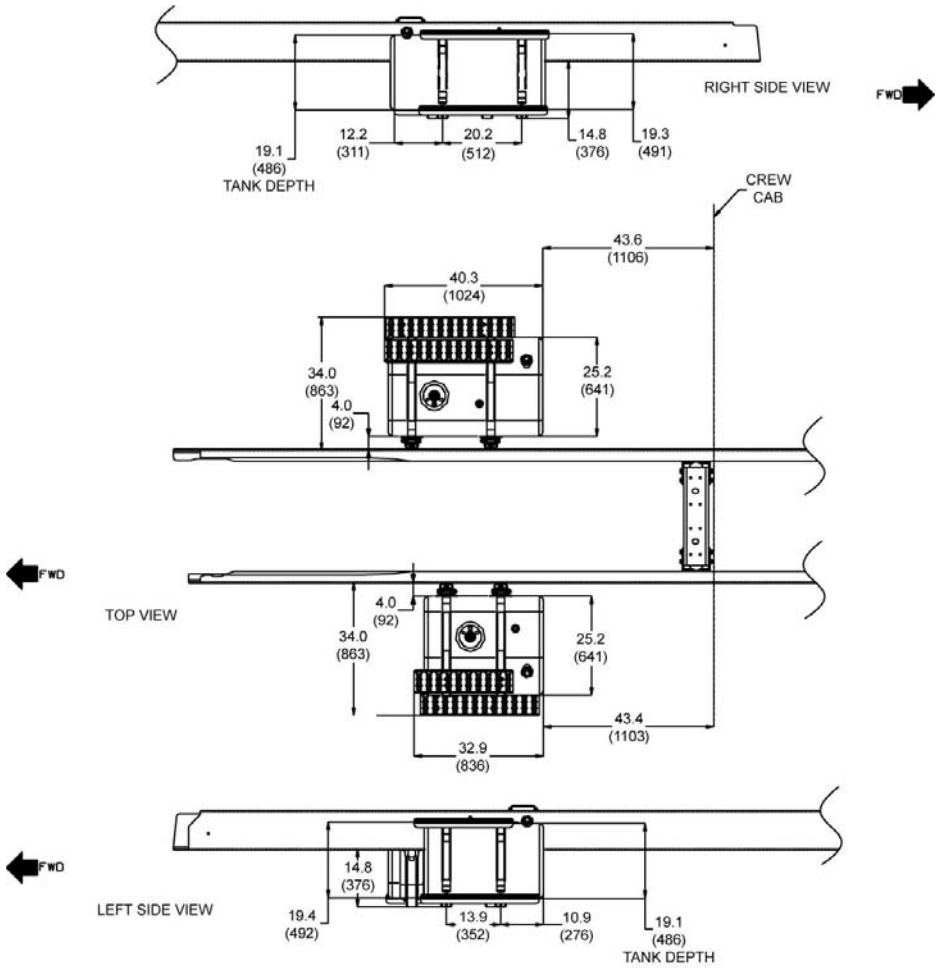



durastar_15dyt_15dyu

# *FUEL TANK AND STEP LOCATION (SCR)*

## *All Models*

### ***Dual 120 Gallon Total Capacity (50 Gallon Left, 70 Gallon Right), 19", Mounted Under Cab Left and Right Side (15DYZ, 15DZA)***

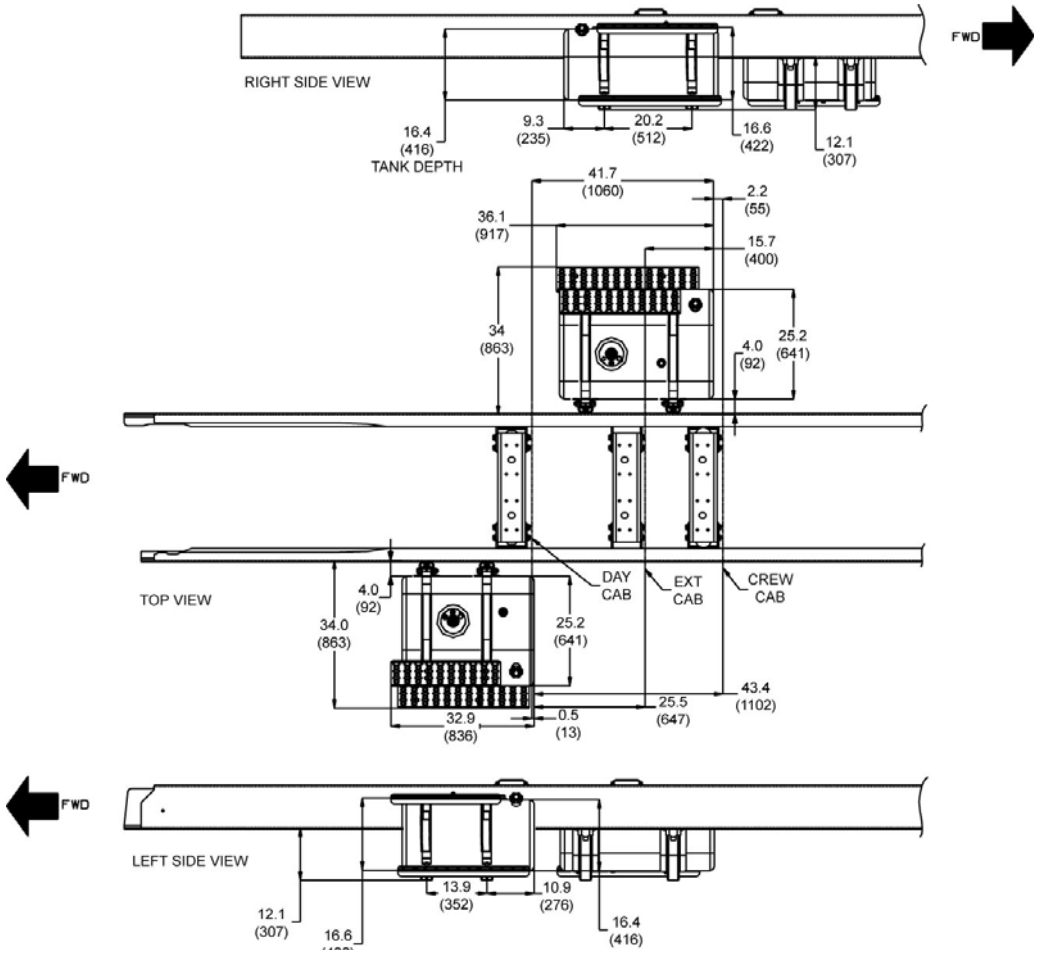



durastar_15dyz_15dza

## *FUEL TANK AND STEP LOCATION (SCR)*

### *All Models*

***Dual 90 Gallon Total Capacity (40 Gallon Left, 50 Gallon Right), 16", Mounted Under Cab Left Side and BOC Right Side (15DZT, 15DZX)***

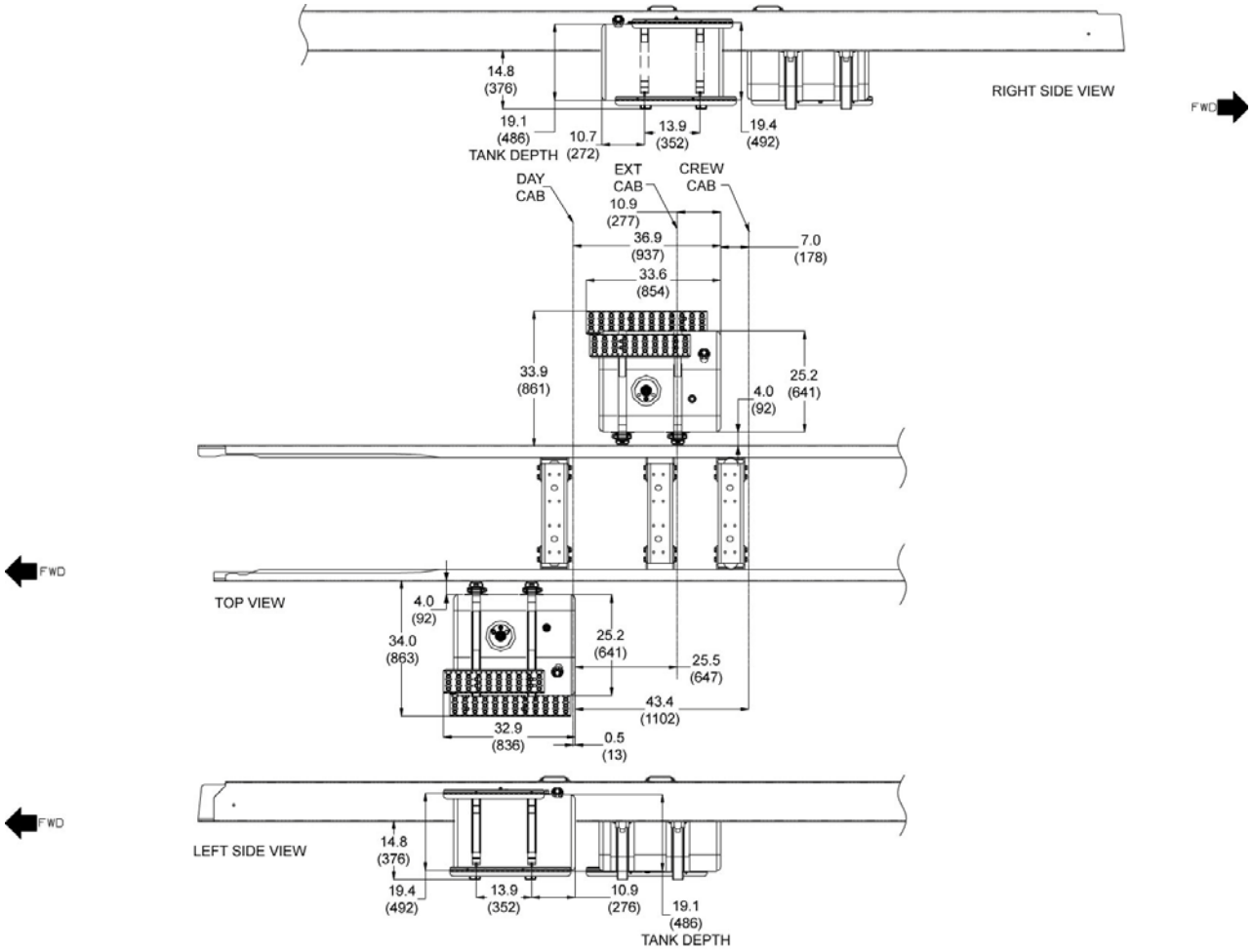



durastar_15dzt_15dzx

# FUEL TANK AND STEP LOCATION (SCR)

## All Models

### Dual 50 Gallon (100 Gallon Total Capacity), 19", Mounted Under Cab Left Side and BOC Right Side (15DZU, 15DZY)

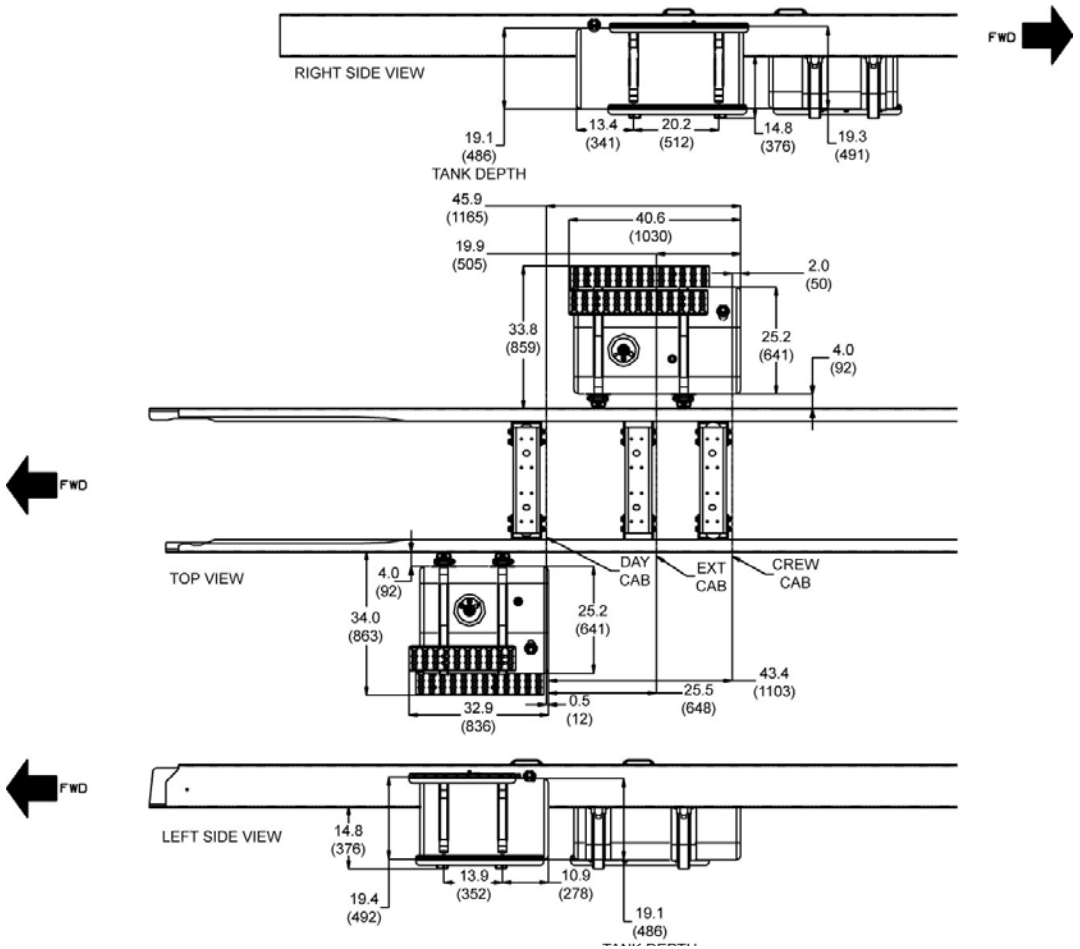



durastar_15dzu_15dzy

## *FUEL TANK AND STEP LOCATION (SCR)*

### *All Models*

***Dual 120 Gallon Total Capacity (50 Gallon Left, 70 Gallon Right), 19", Mounted Under Cab Left Side and BOC Right Side (15DZV, 15DZZ)***

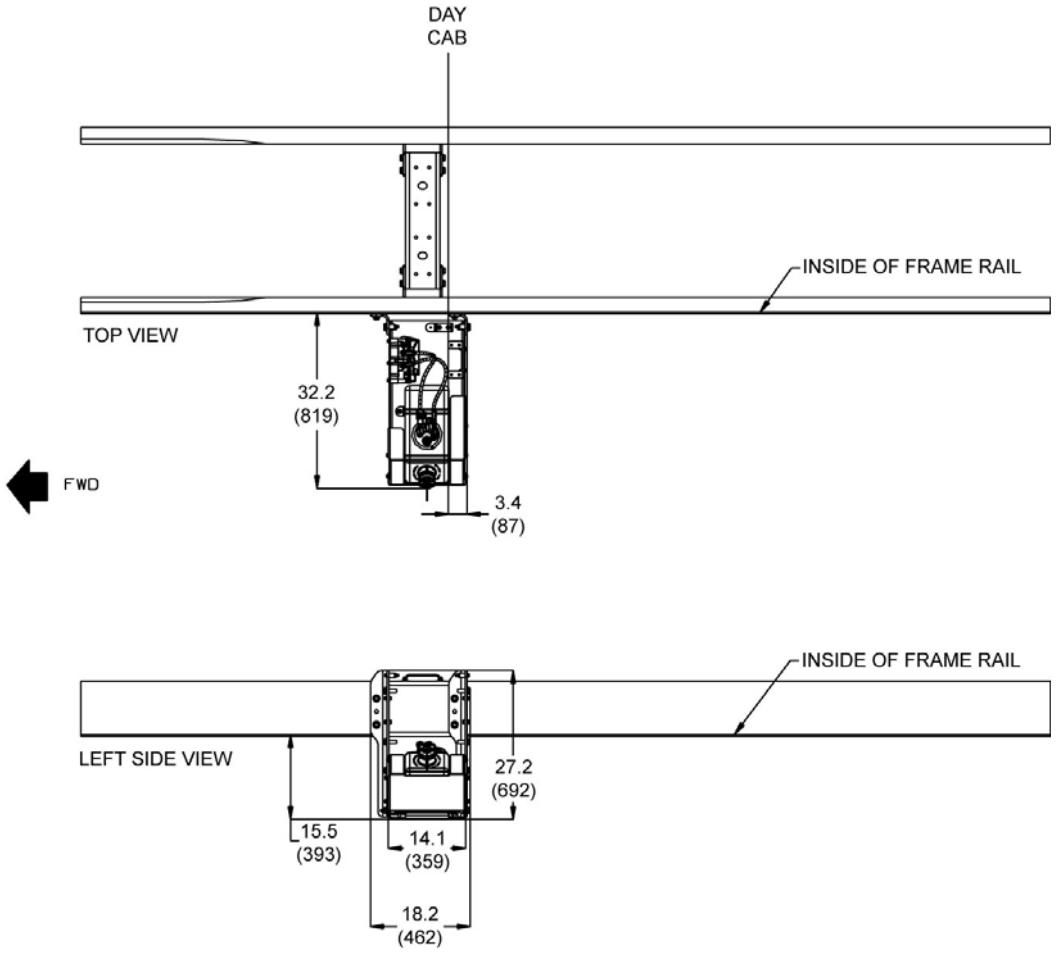



durastar_15dzv_15dzz

# DEF TANK LOCATION (SCR)

## Day Cab

### *Frame Mounted Ouside Left Rail, Under Cab; 5 Gallon Capacity (15WCN)*

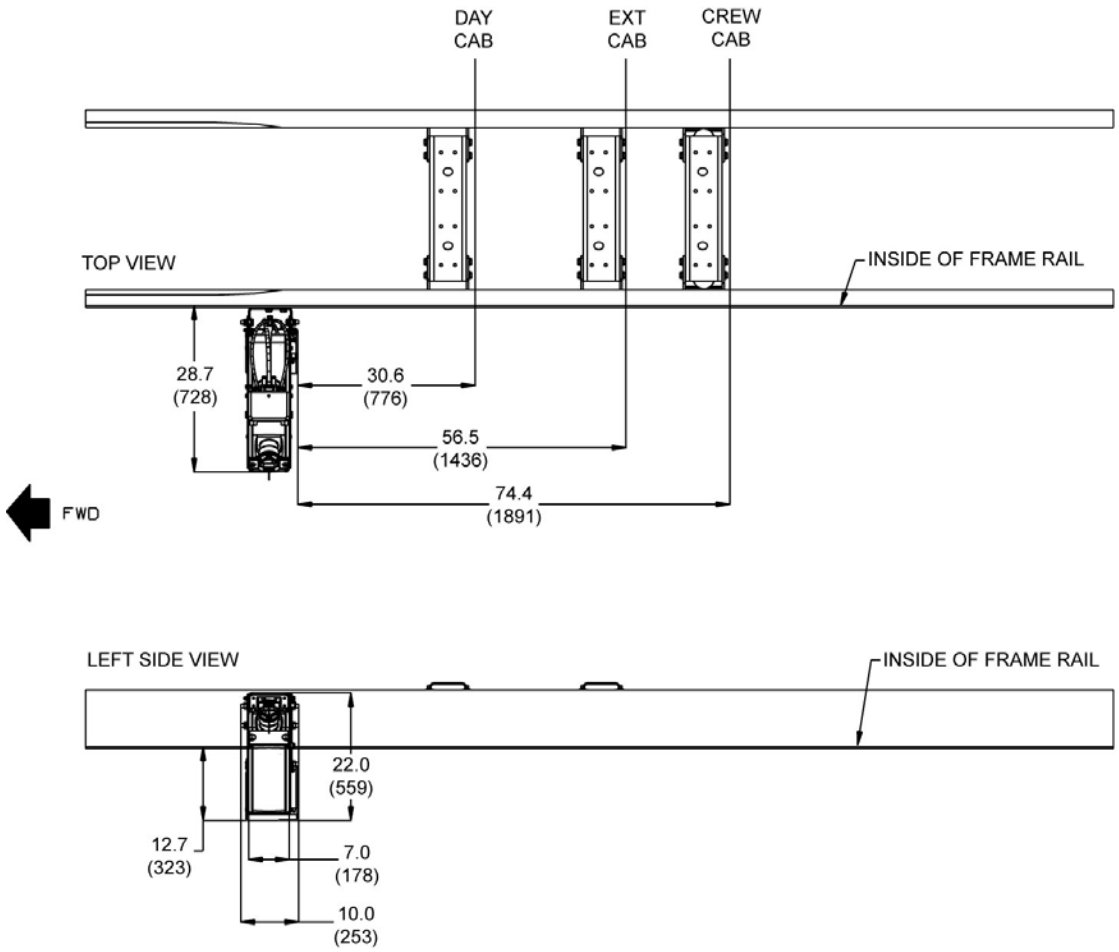



durastar_15wcn_day_top_side_view

## *DEF TANK LOCATION (SCR)*

### *Day, Extended and Crew Cab*

#### ***Frame Mounted Ouside Left Rail, Under Cab; 7 Gallon Capacity (15WDG)***

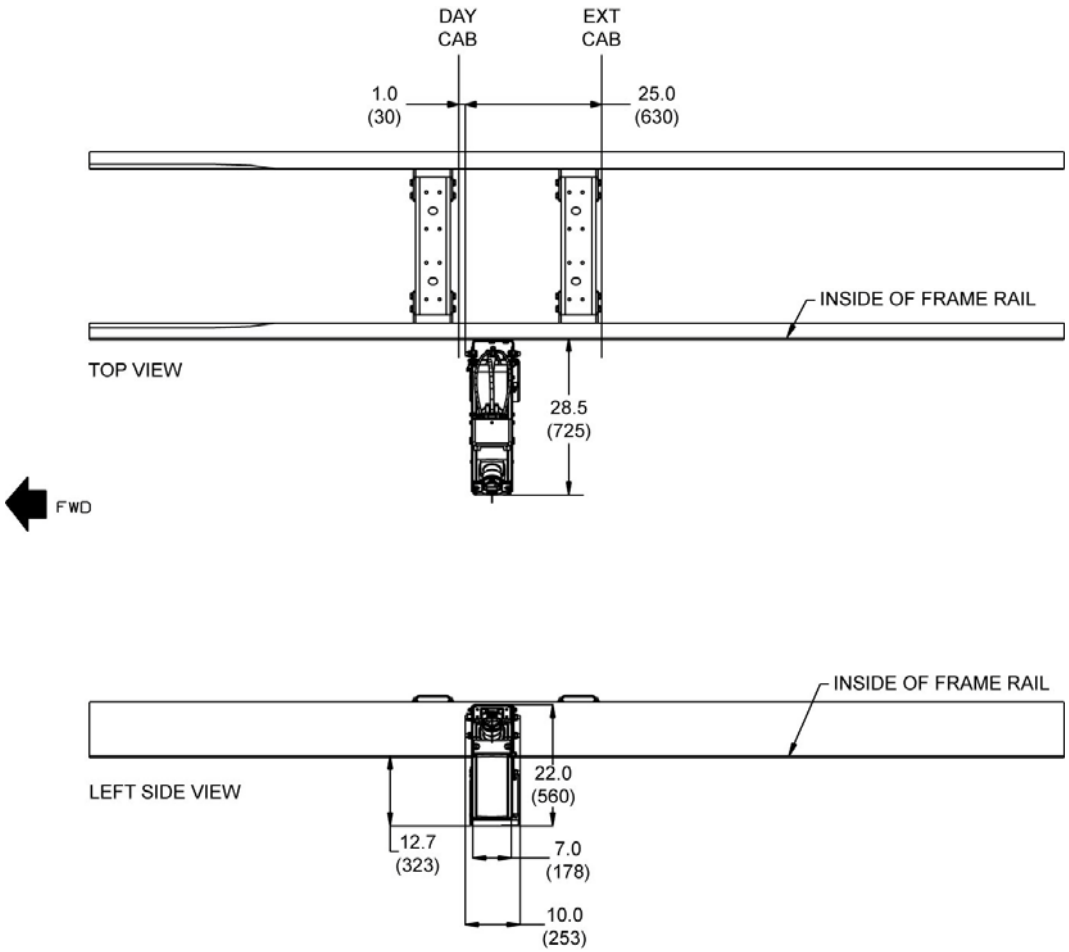



durastar_15wdg_day_extended__crew_top_side_view

# *DEF TANK LOCATION (SCR)*

## *Day and Extended Cab*

### ***Frame Mounted Ouside Left Rail, Back of Cab; 7 Gallon Capacity (15WDH)***




durastar_15wdh_day_extended_top_side_view

## *DEF System and Aftertreatment Information for SCR*

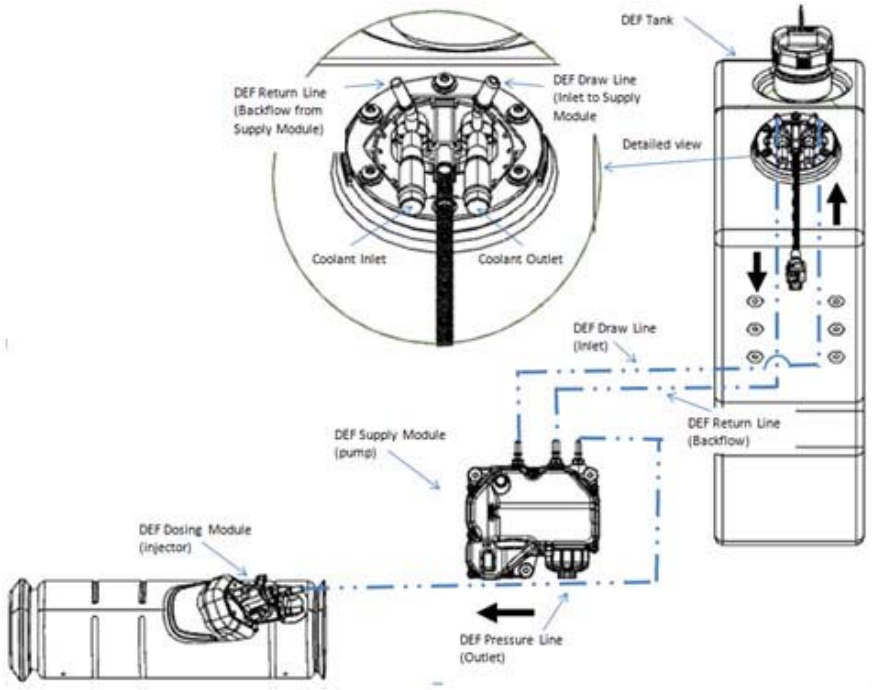
### *Models with SCR*

The following section is intended to give you information regarding the exhaust and aftertreatment systems on International chassis.

International trucks equipped with 2013 engines utilize Selective Catalyst Reduction (SCR). SCR is a chemical reaction in which Diesel Exhaust Fluid (DEF) is injected into the exhaust downstream of the oxidation catalyst where it converts nitrous oxide into ammonia and simpler nitrogen oxides. For more information on the specific details of how SCR works, please refer to this fact sheet from USEPA: http://www.epa.gov/ttn/catc/dir1/fscr.pdf.

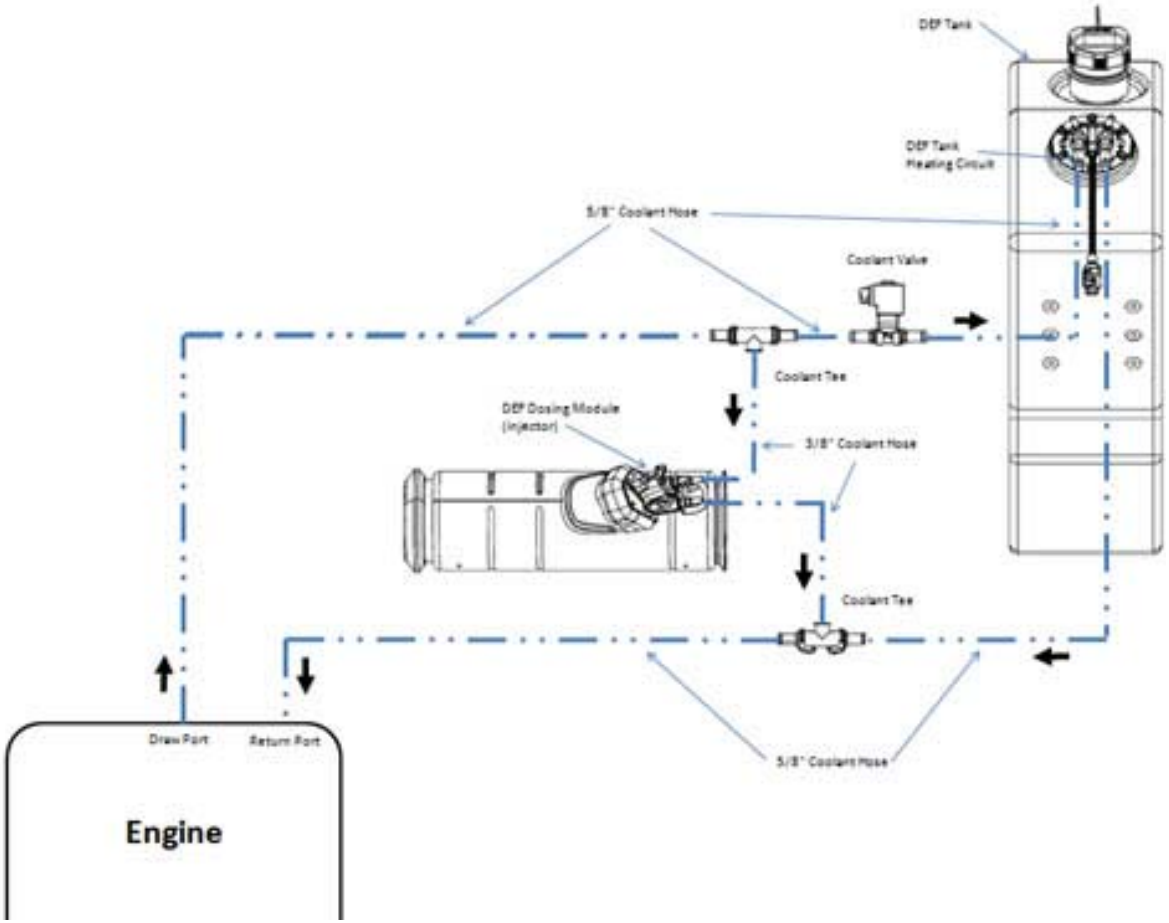
### DEF System Schematic

On most International chassis the DEF Supply Module (or Pump) is integrated into the DEF tank. Navistar, Inc. does not authorize or endorse relocation of the DEF Supply Module. The following schematic details how the DEF lines route to the after-treatment system.




15_0200

DEF will freeze at approximately 11°F. In order to thaw DEF all tanks are heated with engine coolant. The following schematic shows the routing of the lines. The coolant lines that run to and from the SCR system must not be tampered with, or used for a source of heat and/or cooling for other components on the chassis. It is critical that the system is not compromised in any manner.




15_0201

## General Guidelines for DEF System

The installation of the DEF tank is critical to the operation of the SCR system. Navistar, Inc. does not recommend relocating the DEF tank but understands there are applications and body installations that may require it. The guidelines below must be strictly followed by any entity relocating the DEF tank. Failure to follow the guidelines completely and accurately may result in loss of engine power or engine shutdown.

Since Navistar, Inc. cannot ascertain each possible DEF tank mounting configuration, the body builder and/or person modifying the attachment of the DEF tank assembly have sole responsibility for correctly mounting the DEF tank assembly, assuring mounting integrity and preventing structural damage to the DEF tank assembly for a given configuration. Additionally, body builder and/or persons modifying the vehicle must ensure that the final vehicle configuration conforms to all pertinent federal, state, and local requirements, including but not limited to safety and emissions requirements.

Navistar, Inc. has multiple DEF tank sizes to meet various applications. The DEF tank volume is sized according to regulatory stipulations that ensure an adequate supply of urea is available on-board each chassis to which an SCR system is fitted. DEF the tank volume must not be altered or reconfigured after the truck has been delivered from the factory.

Total DEF capacity must meet or exceed a given percentage of the usable fuel capacity of the truck based on engine size (see table 1 below) The calculation to determine DEF capacity is:

Minimum DEF Tank Volume = Useable Fuel Capacity (gal) x % in table 1

Example: For medium duty truck with 200 useable gallons of fuel that is not centrally fueled, the equation is

DEF required = 200 x 0.06 = 12 gallons or more of DEF

| Truck Class | Percent Calculator |
|---|---|
| Medium (Long Haul) | 6.0% |
| Heavy (Long Haul) | 7.4% |
| Medium (Centrally Fueled Daily) | 3.0% |
| Heavy (Centrally Fueled Daily) | 3.7% |

Navistar, Inc. approved DEF hoses are required when retro fitting for system to function properly. The use of unapproved hoses for DEF lines will void warranty and may cause loss of engine power or engine shutdown. The DEF pump (or Supply Module) cannot be relocated from the DEF tanks.

## Installation Requirements and Dimensions for DEF System

When relocating any DEF system components, the locations must meet the guidelines below. Failure to comply may cause non-conformance to EPA standards and may result in engine power loss or shutdown. Body Builders must not modify (including altering, substituting, and relocating) the DPF/SCR catalysts and the pre DPF/SCR exhaust piping. The downstream SCR catalyst exhaust may be modified, however using smaller diameter piping or piping with numerous bends is not recommend as the backpressure specification of the system may be exceeded causing engine power loss or shutdown conditions.

DEF line routing relative heights: In order to ensure proper functionality of the DEF system, the height differences in the guidelines below must be followed during the line routing and component placement.

With all relocating procedures, general clearances and routing guidelines must be followed.

When relocating the components the maximum pressure DEF line length, from the Supply Module to the Dosing Module, is 3 meters (118”).

Maintain a minimum of 4” clearance to shielded exhaust components and 6” to unshielded exhaust components when routing DEF lines to prevent possible melting.

If the DEF tank is relocated, the coolant line will need to be modified. If the tank is moved fore or aft along the chassis (i.e. closer or further to the engine) it will be necessary to remove or add length to the coolant lines and maintain the original routing path. If additional length of coolant line is required the installation must be located in a straight section of the existing coolant routing lines. The clipping locations for the coolant line must not be changed. This process will minimize the change in coolant flow by minimizing changes in restrictions. Changes in restriction are added with excessive line length and additional bends. Work with your local Navistar, Inc. dealer if you are unsure about coolant line modifications.

Modifications of the DEF Injection coolant lines are not allowed. Movement of the DEF coolant tee’s and coolant valve are not allowed.

## Measurement Reference Points

For all relocation procedures, the measurement point referenced in the guideline are taken from the following specific points.

**Supply Module:** The supply module is commonly called the pump. The measurement point on the supply module is the top of the DEF fluid pressure line.



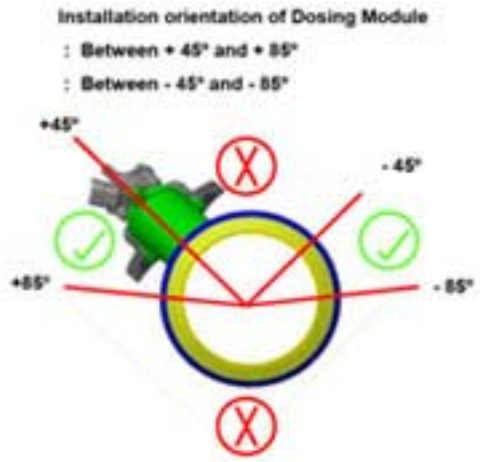
Measurement Location of DEF Supply Module (Pump) 15_0202

**Dosing Module:** The dosing module is commonly called an injector. The dosing module is located on the SCR dosing pipe (mixing pipe) which is between the DPF and SCR catalyst. The measurement point on the dosing module is the fluid pressure line connector.



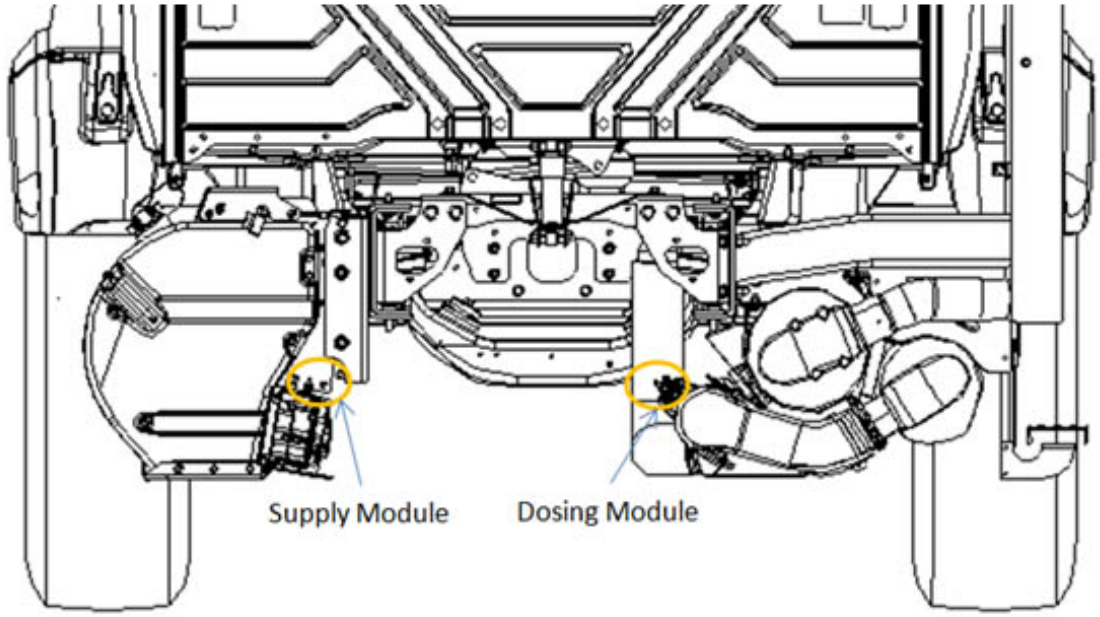
Measurement Location of DEF Dosing Module (Injector) 15_0203

The following relocation guidelines are dependent on exhaust configuration and DEF tank type and location. The Dosing Module should never need to be relocated, however if it is removed for any reason, it is critical that the module be reinstalled at the correct orientation. Figure 6 below illustrates the correct installation orientations. The angle references the vertical plane.



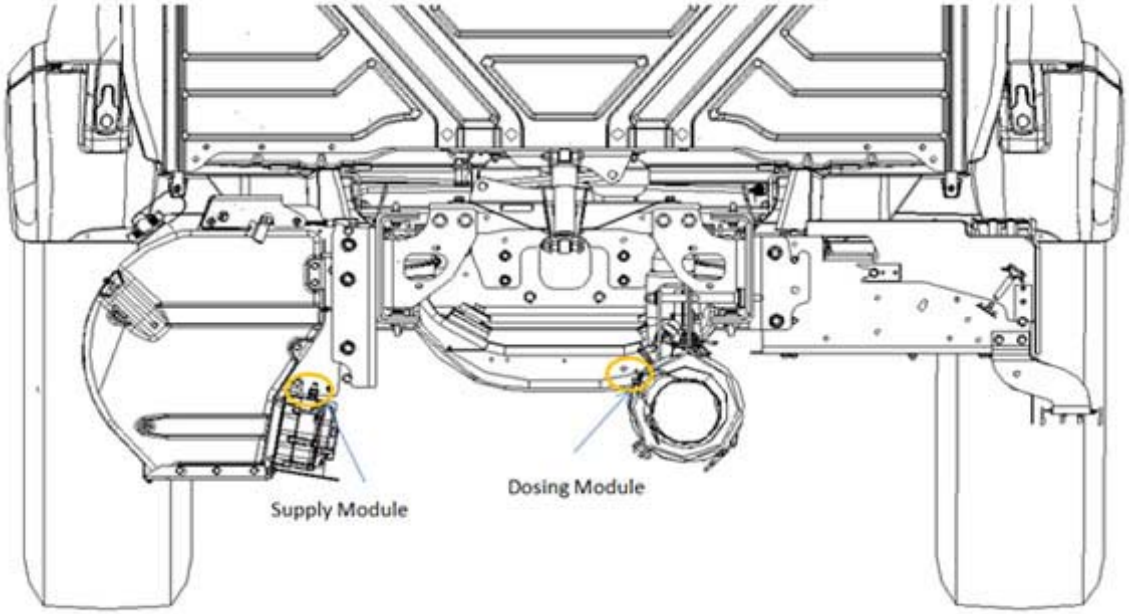

Orientation of Dosing Module 15_0204

**Right Hand under Cab DPF and SCR (switchback) DEF Tanks**




Medium Duty 15_0205

**Horizontal DPF and SCR (inline) DEF Tanks**




Medium Duty Inline 15_0208

The height differential between the supply module and dosing module cannot exceed one meter. The supply module is integrated into the DEF tank assembly, separation of the module from the tank is not allowed. When relocating the components the maximum pressure DEF hose length, from Supply module to Dosing Module is 3 meters (118”). DEF Pressure hose must include a “trap” in the routing if Dosing Module is below the highest point of the Supply Module

**Routing to the Dosing Module (Injector) to Create Trap**

It is important for the function of the dosing module to ensure that the dosing module is not routed downhill (below) of DEF lines or components. If this is unavoidable (for example on RH under exhaust systems) or Horizontal (Series) Exhaust a routing trap must be installed. A minimum of 12” of line length must be routed below the dosing module in order to catch any leftover DEF when system is purged.

INTERNATIONAL
A NAVISTAR COMPANY

# CAB

## *AIR CONDITIONING SYSTEM MODIFICATIONS*

### *All Models*

The HVAC system provided with International® DuraStar®, WorkStar®, TranStar® and TerraStar® Series should not be modified. NO additional components should be added to the factory installed HVAC system as it is delivered from the manufacturer. If additional air conditioning capacity is needed, a completely independent system should be added to handle the additional load requirements of the Body Builder. There are additional costs for a second system; it would however, provide for optimal performance from both HVAC systems.

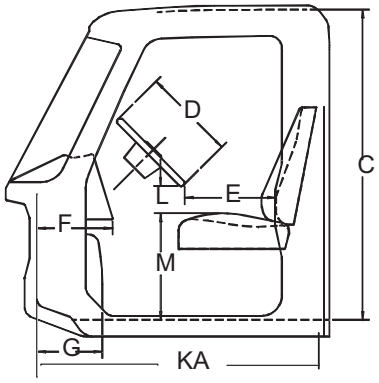
**THE FACTORY INSTALLED SYSTEM CANNOT BE MODIFIED IN ANY MANNER. MODIFICATION OF THE HVAC SYSTEM WILL VOID THE INTERNATIONAL WARRANTY ON THAT SYSTEM.**

There are several reasons why HVAC system modifications are not permitted.

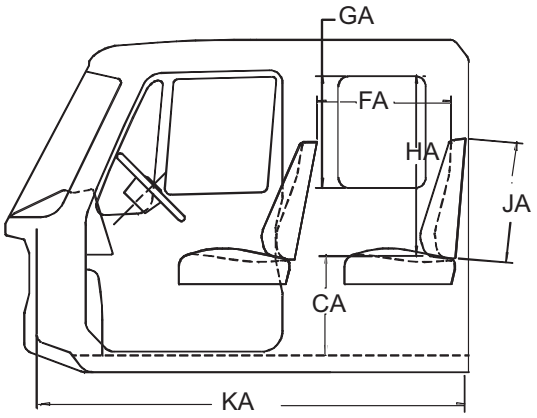
- The factory installed HVAC system is *optimized* for the evaporator, condenser and compressor combination on the vehicle. To introduce an additional evaporator (or other components) into the system will create an imbalance and unsatisfactory performance.
- The Refrigerant Control and Diagnostics (RCD) software that resides in the vehicle's body computer is designed to monitor the factory installed AC system only. Adding any additional equipment or components to the original air conditioning system will introduce conditions that the RCD software will interpret as out-of-specification conditions and cause faults to be logged.
- The factory compressor clutch is cycled by the RCD software residing in the ESC of the vehicle. Modification of this control system to add an auxiliary system could result in damage to other vehicle components.
- Since the HVAC system has been optimized for the factory components, there is no extra condenser capacity available for an auxiliary evaporator.

## CAB DIMENSIONS

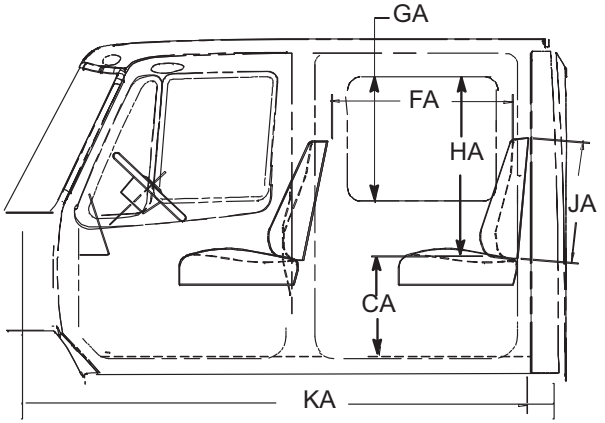
### All Models



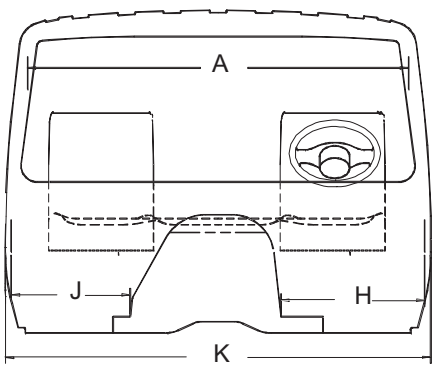

STANDARD CAB



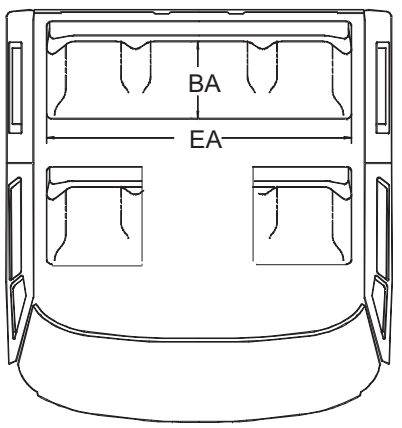

EXTENDED CAB




CREW CAB




FRONT VIEW




TOP VIEW

16_0009

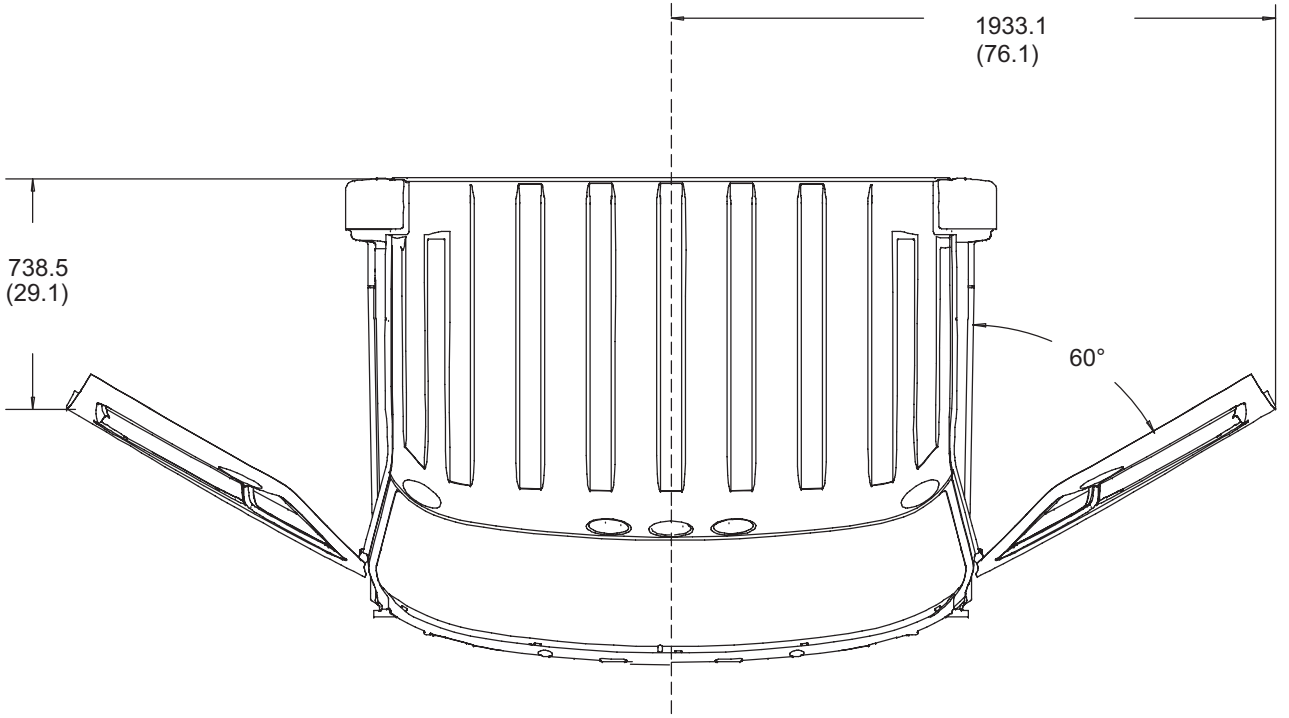
## *All Models*

| Key | Description | Dimension – Inches | | |
|---|---|---|---|---|
| | | Regular Cab | Extended Cab | Crew Cab |
| A | Shoulder Room | 70.6 | | |
| C | Inside Height | 56.8 | | |
| D | Steering Wheel Diameter | 18.0 | | |
| E | Steering Wheel to Seat Back (Maximum) | 18.2 | | |
| F | Bottom of Instrument Panel to Dash | 13.9 | | |
| G | Engine Cover Width | MaxxForce® DT, MaxxForce® 9, Navistar® N9 and Cummins ISB = 11.7 | | |
| H | Lateral Foot Room - Driver | 20.2 | | |
| J | Lateral Foot Room - Passenger | 18.8 | | |
| K | Outside Cab Width | 82.2 | | |
| L | Steering Wheel to Top of Seat Cushion | 5.8 | | |
| M | Top of Front Seat Cushion to Floor | 19.6 | | |
| – | Driver Seat Track Travel | Fixed Seat: 7.9" fore/aft<br>Air Suspension Seat: 7.4" mm fore/aft | | |
| BA | Rear Seat Cushion Depth | – | 18.0 | |
| CA | Top of Rear Seat Cushion to Floor | – | 19.0 | |
| EA | Rear Seat Width | – | 65.0 | |
| FA | Rear Seat Spacing | – | 23.2 | 40.2 |
| GA | Rear Side Window Height | – | 21.8 | 21.0 |
| HA | Rear Seat Cushion to Top of Window | – | 33.4 | 32.6 |
| JA | Rear Seat Back Height | – | 22.4 | |
| KA | Inside Length | 52.4 | 79.0 | 96 |

## DOOR SWING CLEARANCE

### All Models

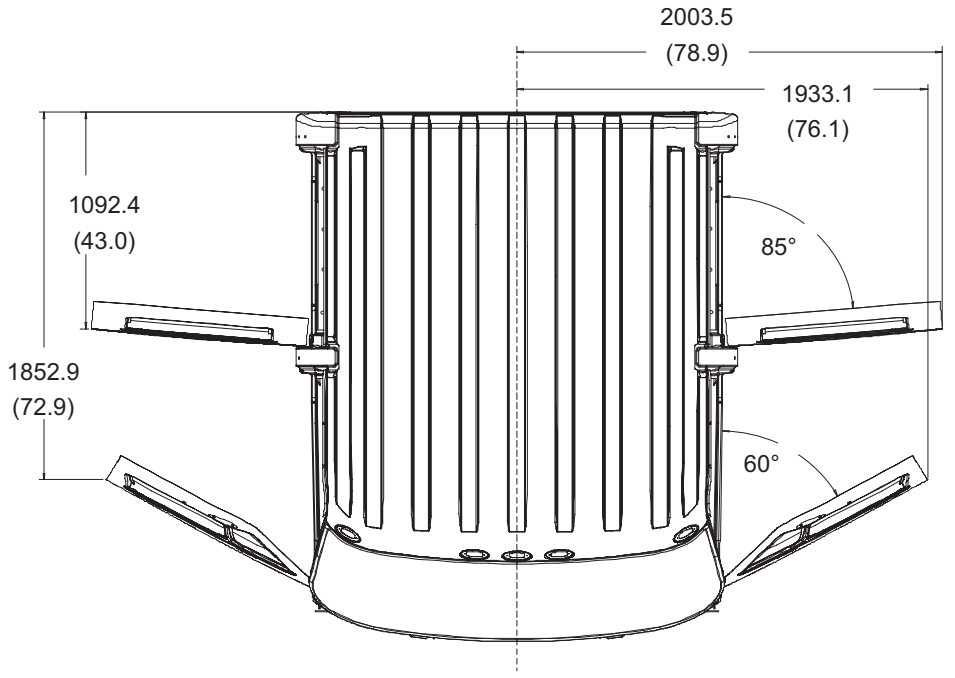
#### Standard Cab



## *DOOR SWING CLEARANCE (CONTINUED)*

### *All Models*

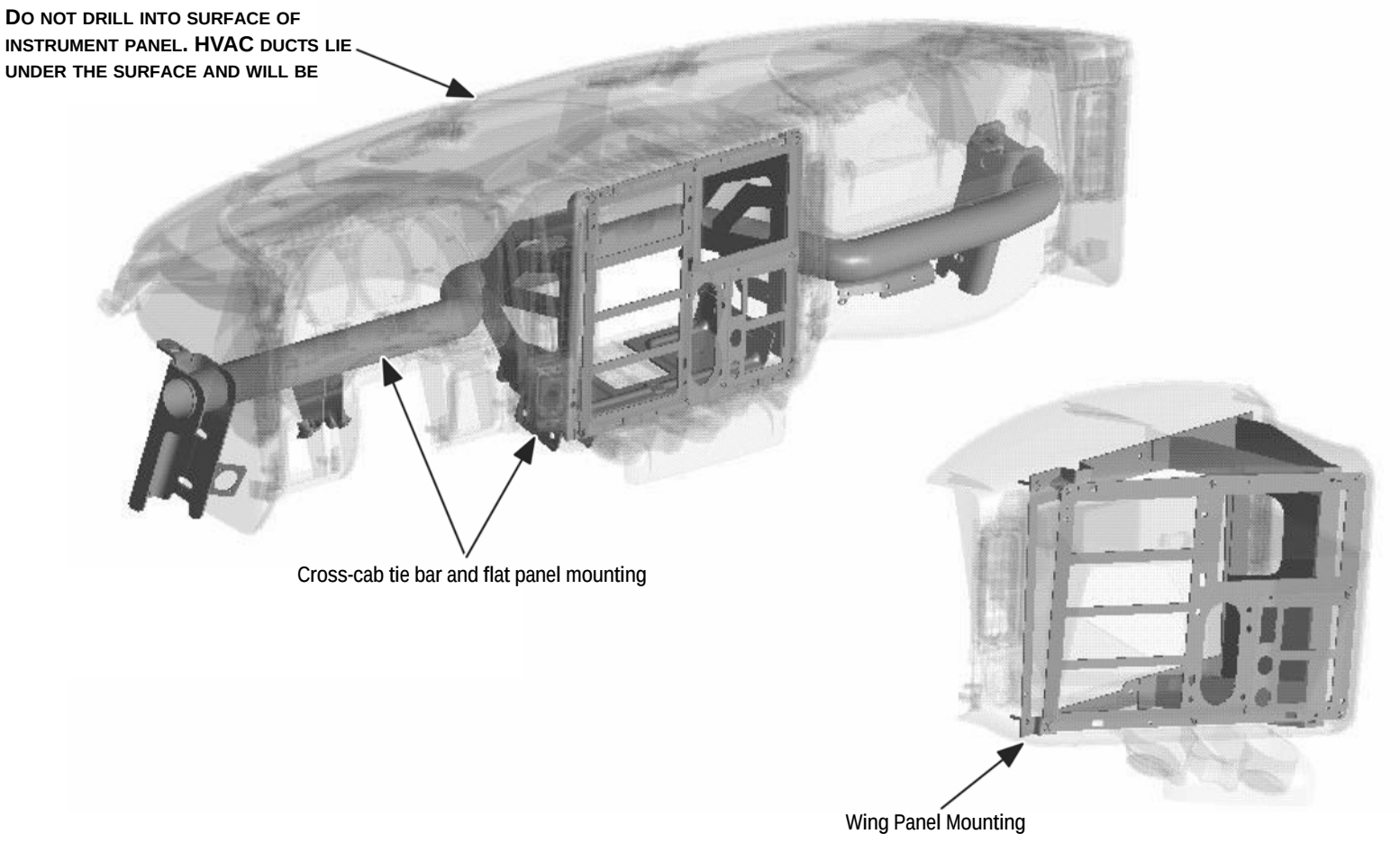
#### ***Crew Cab***




16_0112

## INSTRUMENT PANEL

### All Models




16_0011

It is not recommended to add any accessory to the instrument panel. If an accessory must be added, it must be attached to the tie bar and framework.



**Navistar, Inc.**
**2701 Navistar Drive**
**Lisle, IL 60532**