4700, 5700, 4900, 6900 Driver's Manual

Models: 4700 Models
4900 Models
5700 Models
6900 Models

STI-505-1, ()

Published by
Daimler Trucks North America LLC
4747 N. Channel Ave.
Portland, OR 97217
Printed in U.S.A.

Table of Contents

1. Foreword 5
2. Vehicle Identification 9
3. Vehicle Access 23
4. Instruments 35
5. Driver Controls 63
6. Driver Assistance Features 95
7. Climate Controls 113
8. Seats and Restraints 125
9. Cab and Sleeper Features 141
10. Electrical System 149
11. Engine Starting, Operation, and Shutdown 159
12. Optional Engine Systems 165
13. Emissions and Fuel Efficiency 169
14. Brake Systems 181
15. Steering System 195
16. Automated Transmissions 199
17. Manual Transmissions and Clutch 215
18. Drive Axles 223
19. Fifth Wheels 231
20. Trailer Couplings 251
21. Headlight Aiming 255
22. Vehicle Appearance and Care 261
23. Pre- and Post-Trip Checklists 267
24. Pre- and Post-Trip Inspections and Maintenance 273
25. In An Emergency 295
26. Telematics Data 313

1.01 Customer Assistance Center....6
1.02 Environmental Concerns and Recommendations....6
1.03 Data Logging....6
1.04 Emissions and Fuel Efficiency Compliance....6
1.05 Reporting Safety Defects....6

1. Foreword

1.01 Customer Assistance Center

Having trouble finding service? Call the Customer Assistance Center at 1-866-850-7827 or 1-866-850-STAR. For dealer referrals and breakdown support, call night or day, weekdays or weekends. For specification requests and all other concerns and inquiries, the Customer Assistance Center is available 5:00 A.M. to 4:00 P.M. PST Monday through Friday. Our people are knowledgeable, professional, and committed to following through to help you keep your truck moving.

1.02 Environmental Concerns and Recommendations

Whenever you see instructions in this manual to discard materials, you should first attempt to reclaim and recycle them. To preserve our environment, follow appropriate environmental rules and regulations when disposing of materials.

1.03 Data Logging

This vehicle is equipped with a control module that performs data logging capabilities.

This vehicle is equipped with one or more devices that record specific vehicle data and may perform some of the same functionality as a regulated Event Data Recorder but the device(s) are not subject to, nor designed pursuant to, 49 C.F.R. Part 563.

The type and amount of data recorded varies depending on how the vehicle is equipped (such as the brand of engine, if an air bag is installed, or if the vehicle features a collision avoidance system, etc.). GPS location data, fault codes, and other technical data may be recorded.

This data may help provide a better understanding of the circumstances of a crash.

Personal data such as name, gender, and age are not recorded. However, other parties such as law enforcement, could combine the data logger's contents with the type of personally identifying data routinely acquired during a crash investigation.

1.04 Emissions and Fuel Efficiency Compliance

This vehicle must be regularly inspected and maintained as indicated in the *Western Star Maintenance Manual* , and in the *Pre- and Post-Trip Inspections and Maintenance* chapter in this manual, in order to continue satisfactory performance and ensure coverage of the vehicle under the manufacturer's warranty.

Many maintenance procedures ensure that the vehicle and engine continue to comply with applicable emissions standards. Maintenance procedures, using components engineered to comply with greenhouse gas emissions and fuel efficiency regulations, may be performed by an authorized Daimler Truck North America dealer, an independent outlet, or the vehicle owner or operator.

The vehicle owner is responsible for determining the suitability of replacement components to maintain compliance with federal and local jurisdictional regulations. Components including, but not limited to, tires, cab/sleeper side extenders, chassis fairings, bumper, hood, vehicle speed limiters, and idle reduction timers are specifically designed and manufactured to exacting standards for regulatory fuel efficiency and greenhouse gas emissions compliance. It is important that these components are always replaced with components that meet or exceed the performance of the originally installed components.

1.05 Reporting Safety Defects

Vehicles domiciled in the USA that are thought to have a defect that could cause a crash, injury, or death, should immediately be reported to the National Highway Traffic Safety Administration (NHTSA) and Daimler Truck North America LLC.

If the NHTSA receives similar complaints, it may open an investigation; if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or Daimler Truck North America LLC.

To contact NHTSA, call the Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153).

To e-mail NHTSA, go to www.safertruck.gov/ .

You can contact NHTSA by mail at: Administrator, NHTSA Headquarters, 1200 New Jersey Avenue SE, West Building, Washington, DC 20590.

For more information about motor vehicle safety, go to **www.safertruck.gov/**.

To contact Western Star about a concern about a specific vehicle call the Customer Assistance Center at 1-866-850-STAR or complete a Product Concern Form .

Vehicles domiciled in Canada that are thought to have a defect that could cause a crash, injury, or death, should immediately be reported to Transport Canada and Daimler Truck North America LLC.

If Transport Canada receives similar complaints, it may open an investigation; if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, Transport Canada cannot become involved in individual problems between you, your dealer, or Daimler Truck North America LLC.

To contact Western Star about a concerns about a specific vehicle call the Customer Assistance Center at 1-866-850-STAR or complete a Product Concern Form .

To contact Transport Canada, call the Defect Investigations and Recalls Division toll-free in Canada at 1-800-333-0510 or 819-994-3328 in the Gatinuau-Ottawa area or internationally.

You can also contact Transport Canada by mail at: Transport Canada, 330 Sparks Street, Ottawa, Ontario, K1A 0N5 Canada.

The following websites contain more information on Canadian recalls:

English: **www.tc.gc.ca/recalls**.

French: **www.tc.gc.ca/rappels**.

For additional road safety information, please visit the Road Transportation website:

English: **www.tc.gc.ca/en/services/road**

French: **www.tc.gc.ca/fr/services/routier**

© 2022–2023 Daimler Truck North America LLC. All rights reserved. Daimler Truck North America LLC is a Daimler company.

No part of this publication, in whole or part, may be translated, reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of Daimler Truck AG. For additional information, please contact Daimler Truck AG, Service Systems and Documentation, P. O. Box 3849, Portland OR 97208–3849 U.S.A. or refer to https://northamerica.daimlertruck.com/ and www.WesternStar-Trucks.com/ .

2.01 Component Information Label 10
2.02 Customer Assistance Label 10
2.03 Federal Motor Vehicle Safety Standard Label 11
2.04 Canada Certification Label 13
2.05 Component GWR Label 14
2.06 Emissions Labels 15

2. Vehicle Identification

2.01 Component Information Label

NOTE: Labels shown in this chapter are examples only. Actual specifications may vary from vehicle to vehicle.

The component information label lists the vehicle model, identification number, and major component models and serial numbers. See Fig. 1,Component Information Label. The component information label is attached inside the glove box. In vehicles without a glove box, the label is attached to the underside of the driver's sun visor.



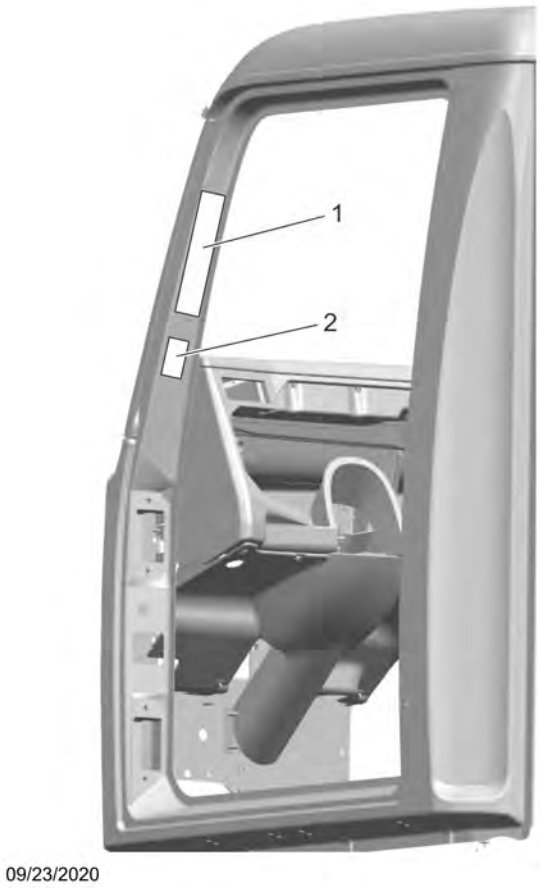
Fig 1, Component Information Label

2.02 Customer Assistance Label

The customer assistance center telephone number is printed on the customer assistance label. The label also includes a QR code encoded with the VIN; dealer applications can scan this code to bring up information about the vehicle. See Fig. 2,Customer Assistance Label. The customer assistance label is located on the driver-side door A-pillar. See Fig. 3,Western Star A-Pillar Labels.



Fig 2, Customer Assistance Label



1. Component GWR Label
2. Customer Assistance Label

Fig 3, Western Star A-Pillar Labels

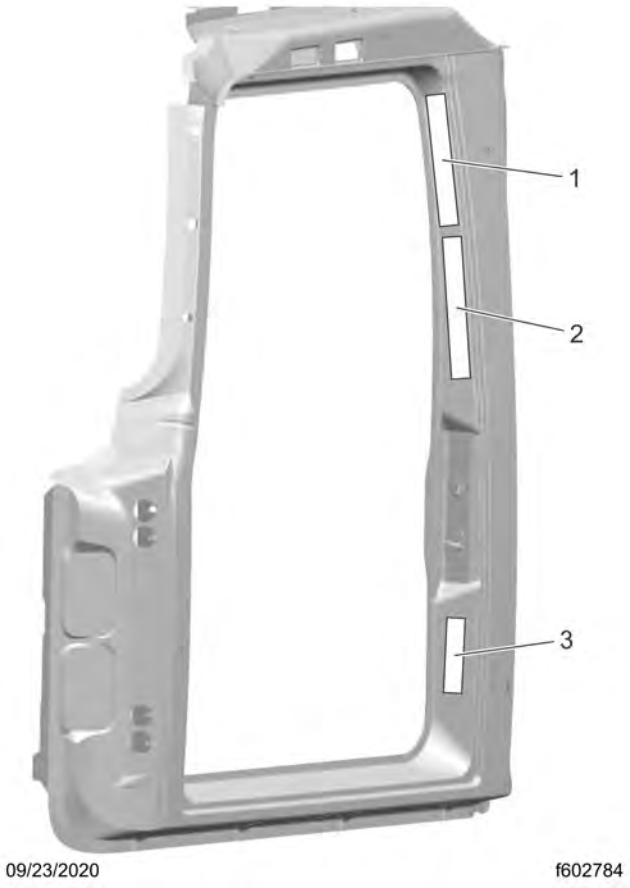
2.03 Federal Motor Vehicle Safety Standard Label

Tractors with or without fifth wheels purchased in the U.S. are marked as certified by means of an FMVSS label. An example label is shown in Fig.4,FMVSS Certification Label.

The FMVSS certification label is attached to the driver-side door B-pillar, as shown in Fig.5,Western Star B-Pillar Labels.



Fig 4, FMVSS Certification Label



1. Canada Certification Label
2. FMVSS Certification Label
3. Noise Emission Label

Fig 5, Western Star B-Pillar Labels

The tire and rim portion of the FMVSS certification label certifies suitable tire and rim combinations that can be installed on the vehicle for the given gross axle weight rating. Tires and rims installed on the vehicle at the time of manufacture may have a higher load capacity than that certified by the tire and rim label. If the tires and rims currently on the vehicle have a lower load capacity than that shown on the tire and rim label, then the tires and rims determine the load limitations on each of the axles.

Trucks built without a cargo body that are intended for service in the U.S. have an incomplete FMVSS certification label. See Fig.6,FMVSS Incomplete Certification Label for an example of such a label.

The incomplete FMVSS certification label will be attached to the incomplete vehicle document included with the vehicle.

After completion of the vehicle, a complete certification label must be attached by the final-stage manufacturer to certify that the vehicle conforms to all applicable FMVSS regulations in effect on the date of completion.



Fig 6, FMVSS Incomplete Certification Label

2.04 Canada Certification Label

NOTE: Vehicles with a Canada certification label will not have a Component GWR label.

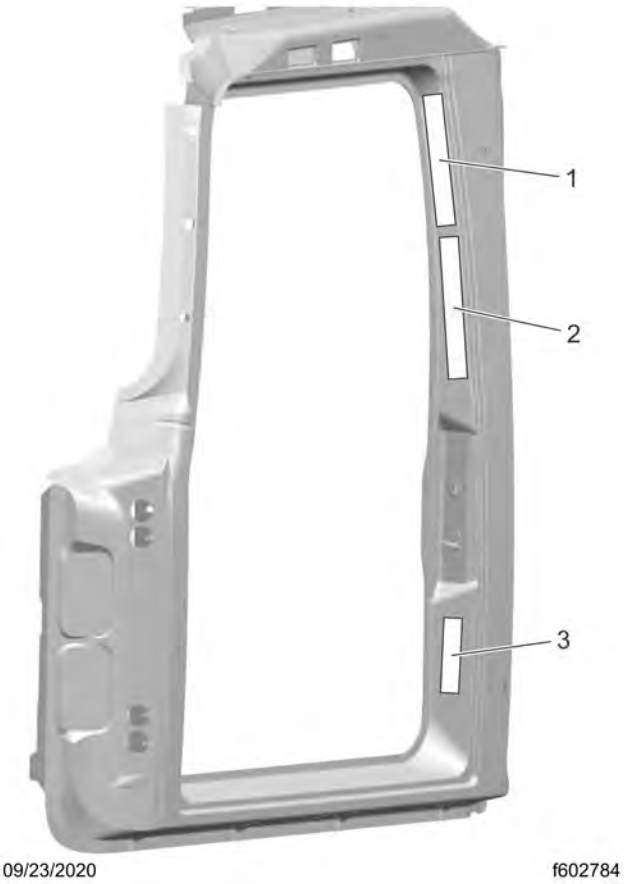
In Canada, tractors with fifth wheels are marked as certified by means of a Canada certification label (see Fig. 7,Canada Certification Label) attached to the passenger-side B-pillar (see Fig.8,Western Star B-Pillar Labels).



Fig 7, Canada Certification Label

Trucks built without a cargo body and tractors built without a fifth wheel that are intended for service in Canada have an incomplete vehicle certification label (see Fig.9,FMVSS Incomplete Certification Label) attached to the driver-side B-pillar. After completion of the vehicle, a complete certification label must be attached by the final-stage manufacturer to certify that the vehicle conforms to all applicable Canadian motor vehicle safety regulations in effect on the date of completion.

NOTE: Older vehicles may be marked with a Canada National Safety Mark label.



1. Canada Certification Label
2. FMVSS Certification Label
3. Noise Emission Label

Fig 8, Western Star B-Pillar Labels



Fig 9, FMVSS Incomplete Certification Label

2.05 Component GWR Label

NOTE: Vehicles with the Canada certification label will not have a component GWR label.

The component GWR label is located on the A-pillar of the passenger-side door frame (see Fig. 11,Western Star A-Pillar Labels). The label provides maximum GWR ratings for each component.

See Fig.10,Component GWR Label for a typical component GWR label.

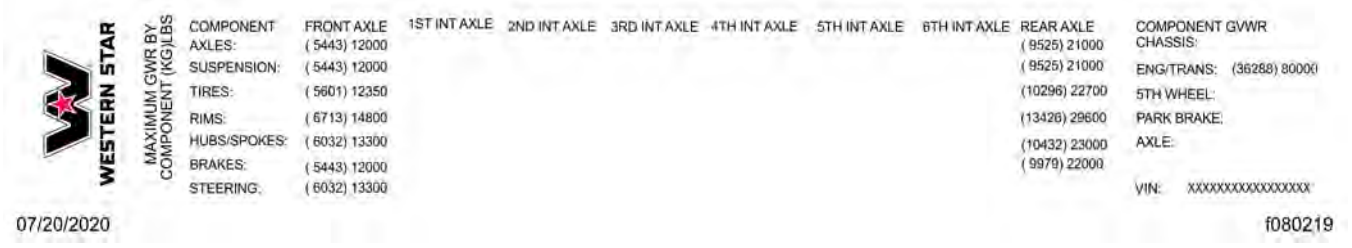


Fig 10, Component GWR Label

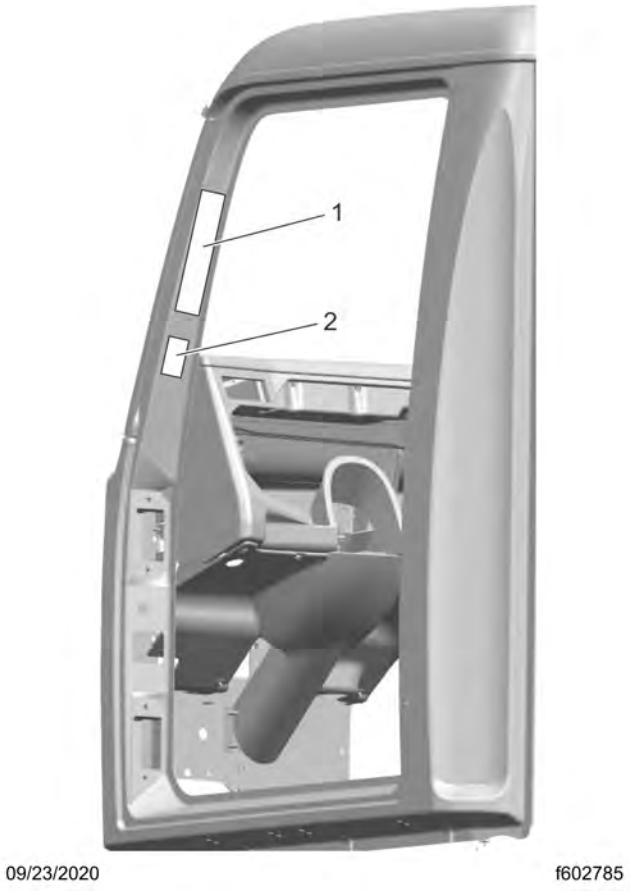


Fig 11, Western Star A-Pillar Labels

2.06 Emissions Labels

Aftertreatment System Indicators Label

Model year 2007 and later diesel engines in vehicles domiciled in the U.S. or Canada are required to meet all EPA exhaust gas emission regulations effective as per the applicable emission model year, and are equipped with an emission aftertreatment system (ATS).

Vehicles domiciled outside of the U.S. and Canada may not have aftertreatment equipment, depending upon local statutory emissions guidelines. See Table.1,EPA Regulations and see Table.2,Emission Regulations by Model Year at the end of this chapter for additional information on what EPA and GHG regulations apply to different model years. See Fig.

17,ATS Indicators for information on the driver's visor warning label for important warning indicators in the instrument cluster that pertain to the ATS.

It is a violation of U.S. federal law to alter exhaust plumbing, ATS, or other components in any way that would bring the engine/vehicle out of compliance with certification requirements [Ref: 42 U.S.C. S7522(a) (3)]. It is the owner's responsibility to maintain the vehicle so it conforms to EPA regulations.

Vehicle Emission Control Information Label

Model year 2013 and later vehicles meet requirements as specified by GHG14, GHG17 and GHG21 regulations, respectively. These vehicles are equipped with components that increase fuel efficiency and reduce greenhouse gas (GHG) emissions. Components may include, but are not limited to, low-rolling resistance tires; aerodynamic devices such as hood, cab side extenders, and fuel tank fairings; vehicle speed limiters; and idle shutdown timers.

A Vehicle Emission Control Information label (see Fig.12, Vehicle Emission Control Information Label) is located on the driver-side door (see Fig.13,Driver's Side Door Label). It is the owner's responsibility to maintain the vehicle so it conforms to EPA and NHTSA regulations.

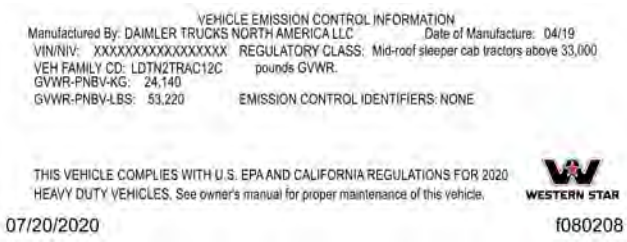


Fig 12, Vehicle Emission Control Information Label

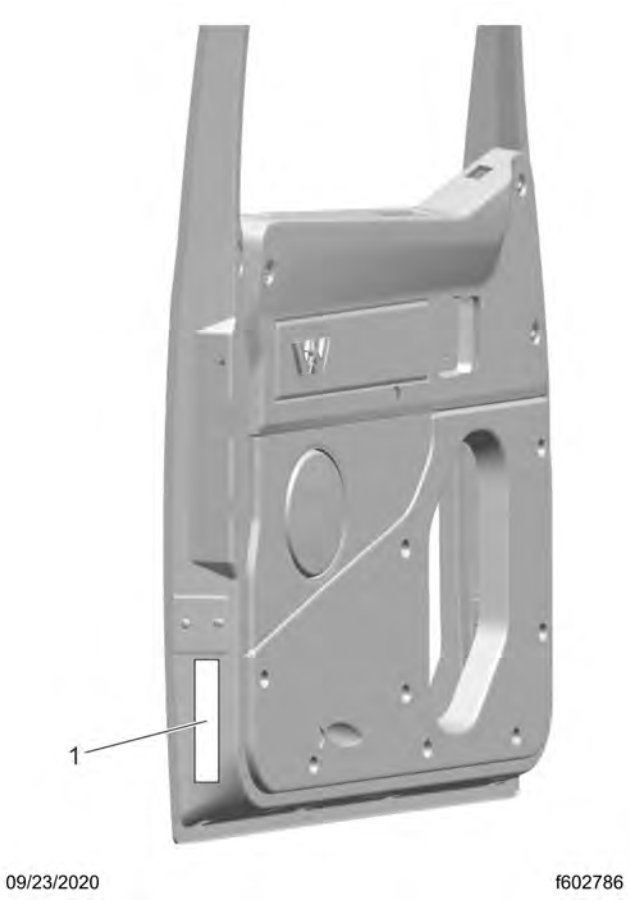


Fig 13, Driver's Side Door Label

Certified Clean Idle Label

The California Air Resources Board (CARB) requires model year 2008 and newer heavy-duty diesel engines to meet CARB's Heavy-Duty Diesel Engine Idling Requirement in order to limit idling emissions of particulate matter and NOx.

Certified vehicles are equipped with a label placed near the external bottom edge of the driver-side door. See Fig. 14,CARB Clean Idle Label for an example of the label.



Fig 14, CARB Clean Idle Label

EPA Noise Emission Control Label

A vehicle noise emission control label (See Fig.15,Vehicle Noise Emission Control Label (Complete Vehicle)) is located on the driver-side B-pillar as shown in Fig.18,Western Star B-Pillar Labels. It is the owner's responsibility to maintain the vehicle so it conforms to EPA noise regulations.

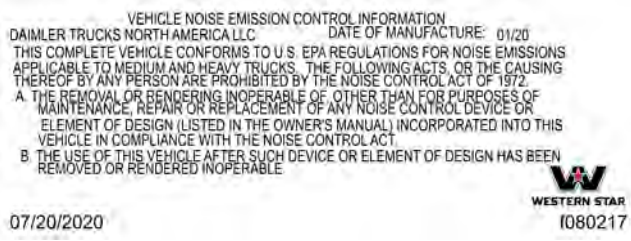


Fig 15, Vehicle Noise Emission Control Label (Complete Vehicle)

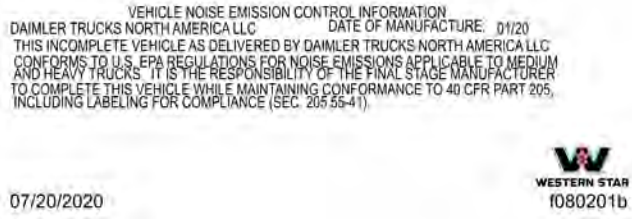


Fig 16, Vehicle Noise Emission Control Label (Incomplete Vehicle)

IMPORTANT: Certain Western Star incomplete vehicles may be produced with incomplete noise control hardware. Such vehicles will have an incomplete vehicle noise emission control information label. See Fig. 16, Vehicle Noise Emission Control Label (Incomplete Vehicle). For such vehicles, it is the final-stage manufacturer's responsibility to complete the vehicle in conformity to U.S. EPA regulations (40 CFR Part 205) and label it for compliance.

Table 1, EPA Regulations

EPA Regulations	
Regulation	**Emissions Components**
EPA07 (Reduction of nitrogen oxides (NOx) emissions to 1.1 g/bhp-hr, and particulate matter emissions to 0.01 g/bhp-hr)	Aftertreatment device (ATD) containing a diesel particulate filter that traps soot and ash.*
EPA10 (Reduction of NOx emissions to 0.2 g/bhp-hr)	EPA07-type ATD, with additional selective catalyst reduction (SCR) technology that utilizes diesel exhaust fluid (DEF) to convert NOx to nitrogen and water vapor.
GHG14 (Reduction of greenhouse gas emissions)	Fuel efficiency components including, but not limited to, engines, tires, aerodynamic components, vehicle speed limiters, and idle reduction timers specifically designed to meet regulatory fuel efficiency and greenhouse gas emissions standards.

GHG17	Fuel efficiency components including, but not limited to, engines, tires, aerodynamic components, vehicle speed limiters, and idle reduction timers specifically designed to meet regulatory fuel efficiency and greenhouse gas emissions standards.
GHG21	GHG14/17 components plus additional components including, but not limited to, transmissions, axles, predictive technologies, idle reduction technologies for vocational vehicles, tire pressure monitoring systems.

Table 1, EPA Regulations

* Cummins and Detroit ATD's are also equipped with a diesel oxidation catalyst to break down pollutants.

Table 2, Emission Regulations by Model Year

Emission Regulations by Model Year		
Model Year	**Engine Regulation**	**GHG Regulation**
2007–2009	EPA07	N/A
2010–2012	EPA10	N/A
2013–2015	EPA10, GHG14	GHG14
2016	EPA10, GHG17	GHG14
2017–2020	EPA10, GHG17	GHG17
2021–and later	EPA10, GHG21	GHG21

Table 2, Emission Regulations by Model Year

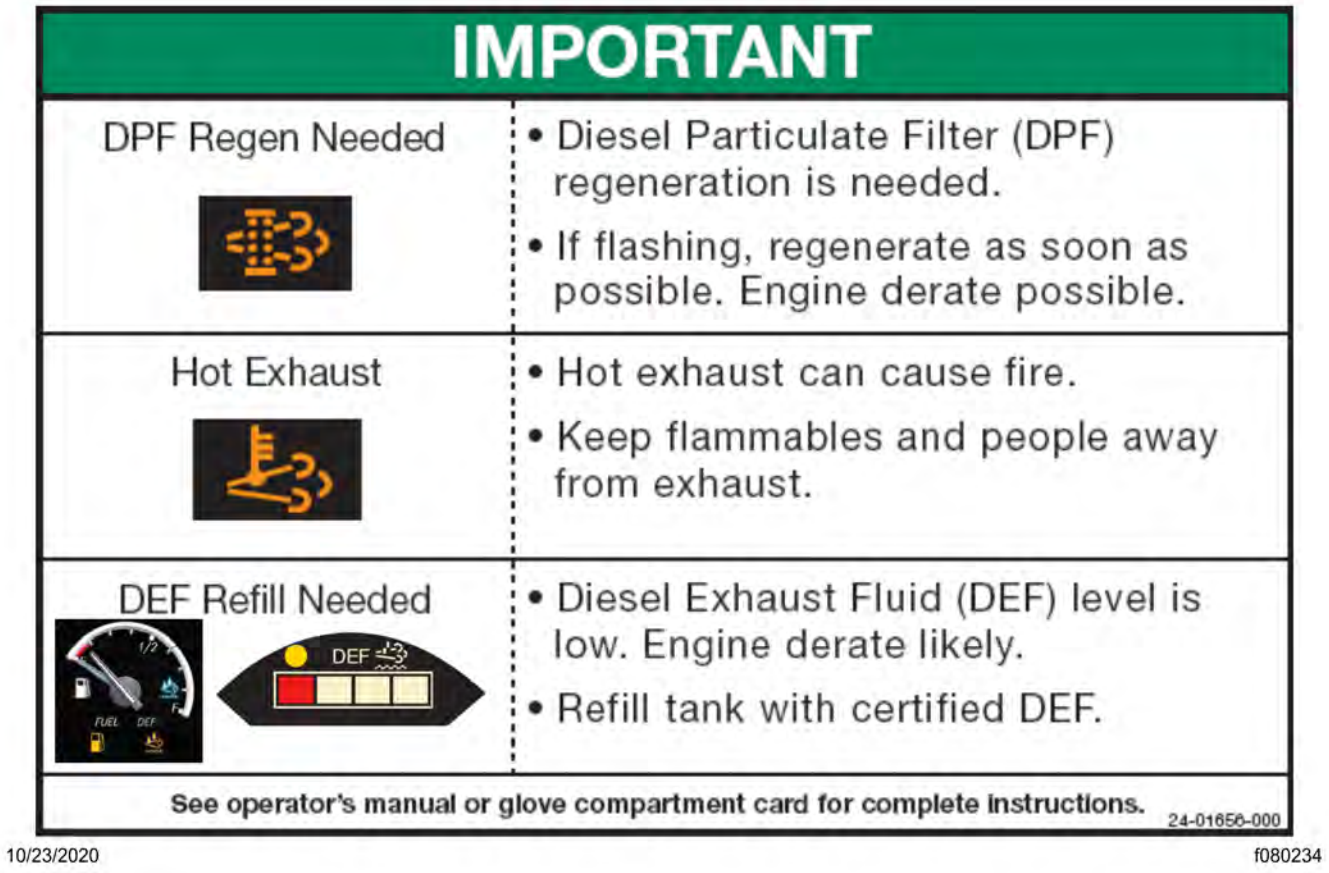
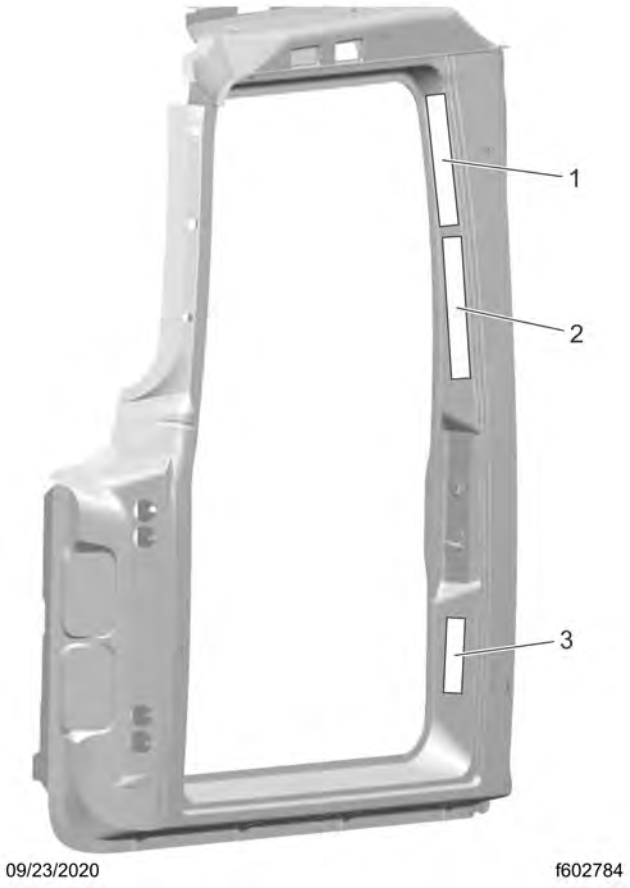


Fig 17, ATS Indicators



1. Canada Certification Label
2. FMVSS Certification Label
3. Noise Emission Label

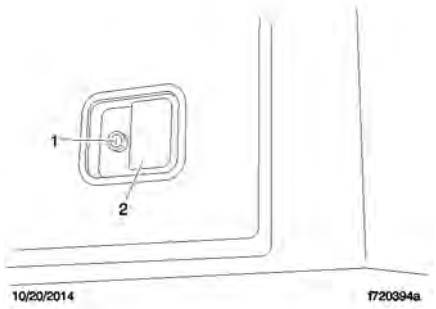
Fig 18, Western Star B-Pillar Labels

3.01 Door Locks and Handles....24
3.02 Remote Keyless Entry....24
3.03 Key Fob Programming....25
3.04 Replacement of the Key Fob Battery....26
3.05 Grab Handles and Access Steps....29
3.05.01 General Information....29
3.05.02 Entering the Driver's Side....29
3.05.03 Exiting the Driver's Side....30
3.05.04 Entering the Passenger's Side....31
3.05.05 Exiting the Passenger's Side....32
3.06 Back-of-Cab Access....33
3.06.01 General Information....33
3.06.02 Accessing Back-of-Cab Area....33
3.06.03 Exiting Back-of-Cab Area....33
3.07 Hood Opening and Closing....34
3.07.01 General Information....34
3.07.02 Opening the Hood....34
3.07.03 Closing the Hood....34

3. Vehicle Access

3.01 Door Locks and Handles

To unlock either door from outside the cab, insert the key in the lock and turn it one-quarter turn towards the front of the vehicle. See Fig.19,Exterior Door Handle. Turn the key back to the original position to remove it. Pull out on the paddle latch to open the door.



1. Lock
2. Paddle Latch

Fig 19, Exterior Door Handle

To lock either door from outside the cab, insert the key in the lock and turn it one-quarter turn towards the rear of the vehicle. Turn the key back to the original position to remove it. If the door is closed, it will now be locked. If the door is open, close the door firmly.

To lock either door from inside the cab, push the lock button down. Pull the lock button up to unlock the door from the inside.

To open either door from inside the cab, pull the lock button up, then pull the interior door latch out and push the door outwards.

3.02 Remote Keyless Entry

Remote keyless entry is optional on Western Star vehicles. The remote entry key fob can be used to unlock the doors from outside the cab.

To unlock both doors, press the unlock button. To lock both doors, press the lock button. See Fig.20,Key Fob.



1. Unlock Button
2. Lock Button

Fig 20, Key Fob

3.03 Key Fob Programming

A maximum of four fobs can be programmed to work on one vehicle. Whenever a new fob will be used, all existing fobs must be reprogrammed at the same time. Any existing fobs that were previously programmed will no longer work on the vehicle unless they are all reprogrammed at the same time.

DANGER:

Do not ingest the key fob battery. The button cell battery in this key fob is a chemical burn hazard.

CAUTION:

Failure to observe the following safety instructions can result in an explosion, fire, damage to the key fob, electric shock and other injuries, as well as property damage:

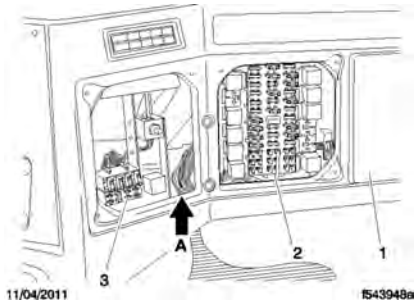
Always keep the key fob and button cell batteries away from children.

Always safely dispose of used batteries.

If the button cell battery in this key fob is swallowed, it can cause severe internal burns within two hours and can lead to death. If you think a battery might have been swallowed or otherwise placed inside any part of the body, seek immediate medical attention.

If the battery compartment does not close securely, stop using the key fob.

1. Remove the passenger-side electrical access panel, located next to the glove box. See Fig. 21, **Passenger-Side Electrical Access Panel (removed)**.



A. The two-wire connector is located next to the auxiliary power distribution module.
1. Glove Box
2. Main Power Distribution Module
3. Auxiliary Power Distribution Module

Fig 21, Passenger-Side Electrical Access Panel (removed)

2. Locate the 2-wire connector in the area between the auxiliary and main power distribution modules (PDMs) with circuit 443* and ground.

   NOTE: If the 2-wire connector cannot be located, the connector may be hanging below the PDM. In this case, remove the heater cover panel, which is located below the fuse panel.

3. Use a short length of wire or a paperclip to short the two terminals together three times within five seconds.
4. Wait three seconds.
5. Press and hold the first fob's lock button for two seconds. The LED in the fob will flash while the button is held.
6. Press the lock button on the second fob for one second. The LED in the fob will flash while the button is held.
7. Repeat step 6 for any additional fobs.

   NOTE: The system will exit program mode after one minute of no activity.

3.04 Replacement of the Key Fob Battery

You will need a flat surface, a CR2032 replacement button battery, and to replace the key fob battery, you will need a 5/32 inch (4mm) flat screwdriver or similar tool.

1. Remove the key fob from the key ring.
2. Hold the key fob with the opening for the key ring upwards, and carefully insert the flat end of the screwdriver on one side of key fob as shown in Fig.22,Opening the Key Fob. Twist the end of the screwdriver to pry the two halves apart.



Fig 22, Opening the Key Fob

3. Move the end of the screwdriver to the other side of the top of the key fob and pry that side apart.
4. Using your fingers, separate the two pieces of the key fob.
5. To remove the battery, lay the flat side of the key fob with the battery on a flat surface, and insert the end of the screwdriver underneath the top of the battery to gently lift it out. See Fig.23,Removing the Battery.

   Dispose of the used battery safely according to local regulations.



Fig 23, Removing the Battery

6. Insert the new battery with the + side down and the blank side up as shown in Fig.24,Inserting the Battery.

   Insert the bottom edge of the battery toward the bottom of the key fob, and press to open the metal cradle to create a space for the battery to slip into place.



Fig 24, Inserting the Battery

7. Align the hooked tag on the bottom edge of the circuit board side of the key fob with the matching recess on the other side of the key fob as shown in Fig.25,Align the Key Fob Hook. Press the two sides of the key fob together working from the bottom toward the top.

   The two halves may need some adjustment to snap into place.

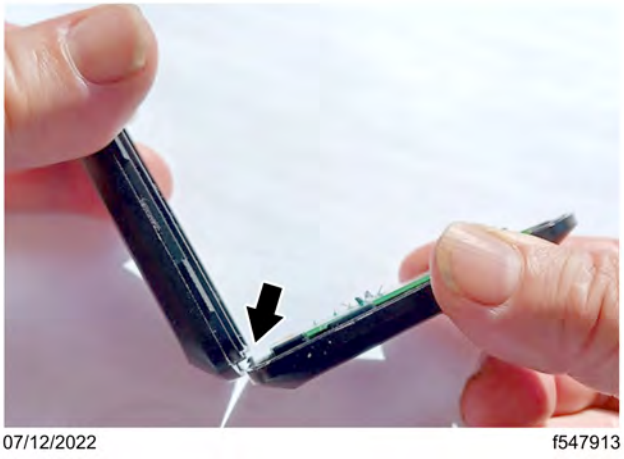


Fig 25, Align the Key Fob Hook

IMPORTANT: If the key fob will not close completely and securely, open it and try again. If it is not possible to securely close the key fob, stop using it. An unsecured button battery is hazardous. Safely dispose of the defective battery and key fob according to local regulations and order a new key fob at an authorised Western Star dealership.

8. Verify the key fob is completely closed as shown in Fig.26, **Securely Closed Key Fob**.



Fig 26, Securely Closed Key Fob

9. Attach the key fob to the key ring.

3.05 Grab Handles and Access Steps

3.05.01 General Information

The grab handles, access steps, and steering wheel are all part of the cab access system. Use these "helping hands" when getting into or out of the cab. They will increase your security and comfort.

CAUTION:

Slipping or falling from the vehicle can result in personal injury or propert damage.

Wet or dirty shoes greatly increase the chance of slipping or falling. If your shoes are wet or dirty, be especially careful when entering or exiting the vehicle.

Always maintain three-point contact with the vehicle when entering or exiting the cab. Three-point contact means both feet and one hand, or both hands and one foot.

When steps are mounted on battery box covers, make sure that the cover is latched and secure before using the steps.

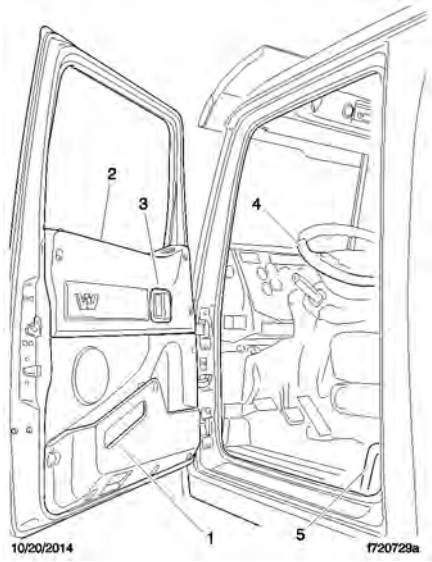
Do not step on the fuel tank, battery box, frame, etc. unless adequate slip resistant surfaces and handholds are provided.

Do not jump from the vehicle.

For ease of entry and exit, there are multiple grab handles: a handle on the A-pillar (optional on the driver's side), handles on the inside of the door, and handles on the B-pillar. In addition, the steering wheel may be used to provide a secure hand-hold. There are at least two access steps to provide secure footholds.

3.05.02 Entering the Driver's Side

1. Open the driver-side door and place anything that you are carrying in the cab.
2. Grasp the B-pillar grab handle with your right hand. See Fig.27,Driver-Side Cab Access.



1. Lower Door Pocket
2. Upper Door Pocket
3. Door Latch
4. Steering Wheel
5. B-Pillar Grab Handle

Fig 27, Driver-Side Cab Access

3. Grasp the lower door pocket with your left hand.
4. Place your right foot on the bottom step, and pull yourself up.
5. Place your left foot on the top step.
6. Grasp the steering wheel or A-pillar grab handle, if equipped, with your left hand.
7. Step into the cab with your right foot first, and grasp the steering wheel with your right hand.

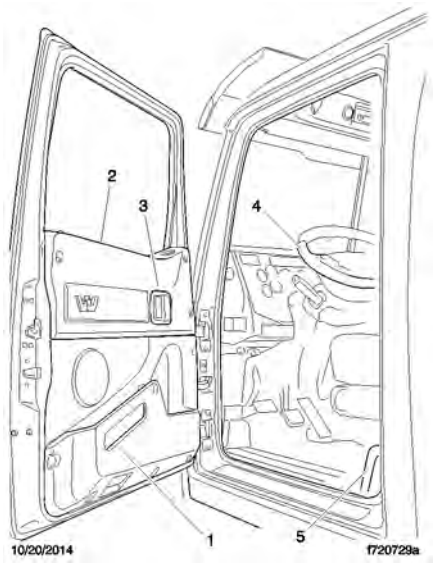
3.05.03 Exiting the Driver's Side

IMPORTANT: Do not attempt to exit the cab while carrying any items in your hands. Place them in an accessible location on the seat or cab floor and make sure they will not get in your way as you exit, then retrieve them after you have exited the cab.

CAUTION:

Always face in when exiting the cab. Do not attempt to exit with your back to the cab, as you would going down a flight of stairs. It is easier to slip or lose your balance. If you slip when exiting in this way, there is a greater likelihood of personal injury.

1. Grasp the steering wheel with both hands, place your left foot on the top step, and stand on the threshold, facing into the cab.
2. Grasp the B-pillar grab handle with your right hand. See Fig.28,Driver-Side Cab Access, item 5.
3. Move your right foot to the bottom step.
4. Move your left hand to the lower door pocket.
5. Step to the ground with your left foot first.

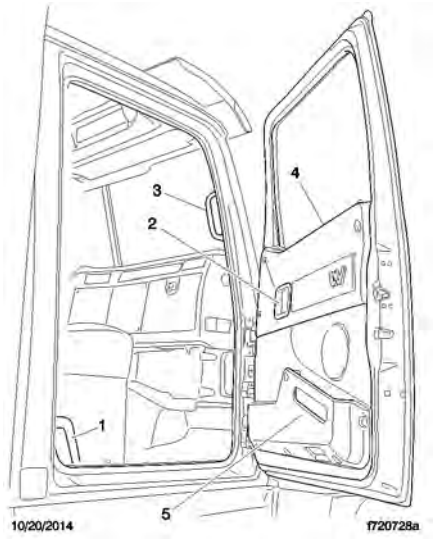


1. Lower Door Pocket
2. Upper Door Pocket
3. Door Latch
4. Steering Wheel
5. B-Pillar Grab Handle

Fig 28, Driver-Side Cab Access

3.05.04 Entering the Passenger's Side

1. Open the passenger-side door and place anything that you are carrying in the cab.
2. Grasp the B-pillar grab handle with your left hand. See Fig.29,Passenger-Side Cab Access.



1. B-Pillar Grab Handle
2. Door Latch
3. A-Pillar Grab Handle
4. Upper Door Pocket
5. Lower Door Pocket

Fig 29, Passenger-Side Cab Access

3. Grasp the lower door pocket with your right hand.
4. Place your left foot on the bottom step.

5. Place your right foot on the top step and move your right hand to the A-pillar grab handle.
6. Place your left foot on the top step, then move your left hand to the A-pillar grab handle.
7. Step into the cab with your left foot first.

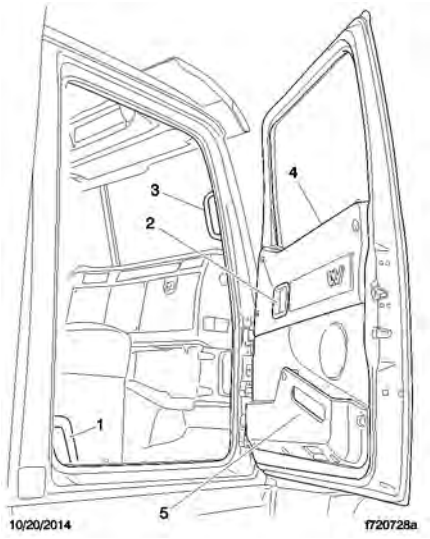
3.05.05 Exiting the Passenger's Side

IMPORTANT: Do not attempt to exit the cab while carrying any items in your hands. Place them in an accessible location on the seat or cab floor and make sure they will not get in your way as you exit, then retrieve them after you have exited the cab.

CAUTION:

Always face in when exiting the cab. Do not attempt to exit with your back to the cab, as you would going down a flight of stairs. It is easier to slip or lose your balance. If you slip when exiting in this way, there is a greater likelihood of personal injury.

1. Grasp the A-pillar grab handle with both hands, then place your right foot on the top step while facing inward. See Fig. 30,Passenger-Side Cab Access.
2. Place your left foot on the top step.
3. Move your left hand to the B-pillar grab handle.
4. Move your right foot to the bottom step.
5. Move your right hand to the lower door pocket.
6. Step to the ground with your left foot first.



1. B-Pillar Grab Handle
2. Door Latch
3. A-Pillar Grab Handle
4. Upper Door Pocket
5. Lower Door Pocket

Fig 30, Passenger-Side Cab Access

3.06 Back-of-Cab Access

3.06.01 General Information

When trailer air and electrical connections cannot be reached conveniently from the ground, Federal Motor Carrier Safety Regulations require that tractors have adequate back-of-cab access. Grab handles are typically located on the backwall of the cab or sleeper, or on the inside of the cab extender, if equipped. A grab handle may also be provided on the exhaust stack. Steps may be mounted on the fuel tank(s), battery or tool box(es), or on metal brackets secured to the frame rail. A deck plate is mounted across the top of the frame rails. All other areas are not meant to support back-of-cab access



CAUTION:

Follow these rules for back-of-cab access. Failing to follow these rules could lead to a fall, and possible personal injury.

Never step on any exterior part unless it has a slip-resistant surface meant for safe stepping. If the surface is movable, such as a battery box cover with a slip-resistant surface, be certain it is firmly secured.

Be careful not to trip on items such as chains or air lines in the back-of-cab area.

Always follow safety procedures for back-of-cab access, maintaining three-point contact—both hands and one foot, or both feet and one hand—whenever moving around, and always face in toward the deck plate when climbing up or down.

Wet or dirty shoes, steps, or grab rails greatly increase the chance of slipping or falling. If your shoes or the contact areas are wet or dirty, clean and dry them as much as possible before accessing the back of cab area, and be especially careful when climbing or standing on the vehicle.

Never jump onto, or off of, a vehicle; doing so creates a very high likelihood of a fall and personal injury.

IMPORTANT: Climb onto, and down from, behind the cab while facing in toward the vehicle, as you would on a ladder. Do not climb up or down facing out away from the vehicle.

3.06.02 Accessing Back-of-Cab Area



WARNING:

External surfaces of the exhaust system remain hot after the engine has been shut down. When accessing the back of the cab or sleeper, do not touch any part of the exhaust system other than the exhaust-mounted grab handle, if equipped, or severe burns could occur.

1. Facing the deck plate, grasp the grab handle with both hands. Reach up as far as is comfortable.
2. Place one foot on the bottom step and pull yourself up.
3. Place your other foot on the top step.
4. Move your lower hand to a higher position on the grab handle.
5. Step onto the deck plate.

3.06.03 Exiting Back-of-Cab Area

1. Face the center of the vehicle and grasp the sidewall grab handle with both hands.
2. Place one foot at a time on the top step.
3. Move your upper hand to a lower position on the grab handle.
4. Move one foot to the bottom step.

5. Step to the ground with your upper foot first.

3.07 Hood Opening and Closing

3.07.01 General Information

The hood can be raised to a full-open position. Tilt-assist struts help you to raise the hood, and to lower it to the operating position. In the operating position, the hood is secured to the cab-mounted cowl by a hold-down latch on each side.

3.07.02 Opening the Hood



NOTICE:
For hoods with tilt-assist springs, do not let the hood free-fall to the full-open position. To do so could cause damage to the hood or hood springs.

1. Release both hood hold-down latches by pulling the handles outward.
2. Slowly tilt the hood with both hands on the grab handle.
3. As the hood starts to open, walk backwards as you pull. The hood will stop in the full-open position.

3.07.03 Closing the Hood

1. Grasp and lift the grab handle to tilt the hood toward the closed position.
2. As the hood goes over center, slowly lower the hood with both hands on the grab handle.

   IMPORTANT: Make sure that both latches are fully engaged before operating the vehicle.

3. Make sure the hood is flush with the cowl, then secure the hood by engaging both hood hold-down latches.

4.01 Instrumentation Control Units 36
4.02 Warning and Indicator Lights 42
4.03 Instruments 47
4.04 Driver Message Center 56
4.05 Overhead Instrument Panel 62

4. Instruments

4.01 Instrumentation Control Units

The instrumentation control unit (ICU) provides the driver with engine and vehicle information. It is comprised of standard and optional gauges, an audible warning, a driver message center, and a lightbar containing warning and indicator lamps (also known as telltales). Warning and indicator lamps illuminate in red (danger), amber (caution), green (status advisory), or blue (high-beam headlights active).

Western Star 5700 vehicles are equipped with an ICU4Me. See Fig.31, **ICU4Me Instrument Cluster** for a typical ICU layout.

The following headings in this chapter provide additional information and operating instructions for ICU components:

- "Warning and Indicator Lights"
- "Instruments"
- "Driver Message Center"



1. Voltmeter
2. Turbocharger Boost Pressure Gauge
3. Trailer Air Supply Gauge
4. Engine Oil Temperature Gauge
5. Transmission Oil Temperature Gauge
6. Tachometer and Coolant Temperature Gauge
7. Fuel/DEF Level Gauge
8. Speedometer and Engine Oil Pressure Gauge
9. Suspension Air Pressure Gauge
10. Forward Drive-Axle Temperature Gauge
11. Rear Drive-Axle Temperature Gauge
12. Trailer Suspension Air Pressure Gauge
13. Secondary Air Pressure Gauge
14. Primary Air Pressure Gauge
15. Driver Message Center

Fig 31, ICU4Me Instrument Cluster

Ignition Sequence

When the ignition is turned on, the ICU runs a self-check. See Fig.32,ICU Ignition Sequence. Observing the ignition sequence is a good way to ensure the ICU is functioning properly.

IMPORTANT: Do not crank the engine until the ICU self-check is complete.

NOTE: Primary and secondary air pressure gauges are the only air gauges that complete a sweep of their dials during the ignition sequence.

When the ignition is turned on, the following actions should occur:

- electronic gauges complete a full sweep of their dials
- warning and indicator lamps illuminate, then are extinguished
- audible alert sounds for approximately four seconds or until sufficient air pressure builds up in the primary and secondary air systems
- DEF level indicator illuminates all segments green, then turns them off one at a time before turning the leftmost segment amber and then red
- Western Star logo displays on the ICU4Me driver message center for two seconds.
- software revision level of the ICU is displayed on the driver message center, followed by any active faults

IMPORTANT: If any red or amber warning and indicator lamps do not illuminate during the ICU self-check or do not go out after the self-check completes, take the action outlined, see Table.3,Common Warning and Indicator Lamps, then take the vehicle to an authorized Western Star service facility as soon as possible.

NOTE: If active faults are present, take the vehicle to an authorized Western Star service facility as soon as possible.

If the ICU receives active fault codes, it displays them one after the other until the parking brake is released or the ignition is turned off. Once the parking brake is completely released, the ICU displays the home screen. If there are no active faults, the ICU displays the home screen after the self-check completes.

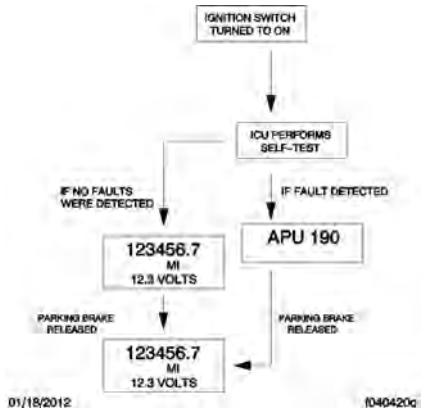


Fig 32, ICU Ignition Sequence

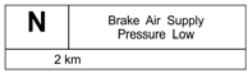
Audible Alerts

An audible alert sounds during the ignition sequence and whenever one of the following conditions exists:

- Engine oil pressure falls below the minimum preset value.
- Coolant temperature rises above the maximum preset value.
- Air pressure falls below approximately 70 psi (483 kPa).
- Parking brake is set with the vehicle moving faster than two miles per hour.
- System voltage falls below 11.9 volts.
- Door is open or the headlights are on, with the parking brake off.
- Driver seat belt is not fastened with the parking brake off (optional).

- Outside temperature falls below 35°F (1.7°C) (optional).

Table 3, Common Warning and Indicator Lamps

Common Warning and Indicator Lamps			
Lamp Description			**Color**
	STOP Engine*	Indicates a serious fault that requires engine shutdown immediately. The engine protection system will reduce the maximum engine torque and speed, and, if the condition does not improve, will shut down the engine within 30 to 60 seconds. Safely bring the vehicle to a stop on the side of the road and shut down the engine as soon as the red light is seen. **If the engine shuts down while the vehicle is in a hazardous location, turn the key to the OFF position for a few seconds, then restart the engine and move the vehicle to a safer location.**	Red
	High Coolant Temperature	Indicates the coolant temperature is above the maximum allowable temperature.	Red
	Low Air Pressure (EPA10 and Newer)	Indicates air pressure in the primary or secondary reservoir has dropped below approximately 70 psi (483 kPa).	Red
	Low Air Pressure (ICU4Me only, mid-GHG14)	Indicates air pressure in the primary or secondary reservoir has dropped below approximately 70 psi (483 kPa).	—
	Low Engine Oil Pressure	Indicates the engine oil pressure is below the minimum allowable pressure.	Red
	Transmission Overheat	Indicates high transmission temperature.	Red
	Transmission Fluid Level	Indicates low transmission fluid level. Safely bring the vehicle to a stop as soon as possible.	Red
	Parking Brake (EPA10 and Newer)	Indicates the parking brake is engaged.	Red
	Low Battery Voltage	Indicates that battery voltage is 11.9 volts or less.	Red
	Unfastened Seat Belt	Activates with an audible alert when the system detects that	Red

		the parking brake is off and the driver seat belt is not fastened on some vehicles. On other vehicles, this lamp illuminates for 15 seconds when the ignition is first turned on.	
	Check ECAS	Indicates Electronically Controlled Air Suspension (ECAS) active fault.	Red
	CHECK Engine*	Indicates an engine condition (low oil pressure, low coolant level, high coolant temperature, high DPF soot level, or uncontrolled DPF regeneration) that requires correction. Correct the condition as soon as possible. If the condition worsens, the STOP engine lamp will illuminate.	Amber
	High Exhaust System Temperature (HEST)*	Slow (10-second) flashing indicates a regeneration (regen) is in progress. IMPORTANT: When the HEST lamp is illuminated, do not park the vehicle near flammable material. Solid illumination indicates high exhaust temperatures at the outlet of the tail pipe when speed is below 5 mph (8 km/h).	Amber
	Diesel Particulate Filter (DPF) Status	Solid illumination indicates a regen is required. Change to a more challenging duty cycle (such as highway driving) to raise exhaust temperatures for at least twenty minutes, or perform a parked regen. Blinking indicates that a parked regen is required immediately. An engine derate and shutdown will occur.	Amber
	Malfunction Indicator Lamp (MIL)	Indicates an emissions-related fault. See the engine operation manual for details.	Amber
	Vehicle ABS	Momentary illumination indicates the vehicle ABS is engaged. Solid illumination indicates a problem with the vehicle ABS. Repair the ABS immediately to ensure full braking capability.	Amber
	Trailer ABS	Momentary illumination indicates the trailer ABS is engaged.	Amber

		Solid illumination indicates a problem with the trailer ABS. Repair the ABS immediately to ensure full braking capability.	
	No Charge	Indicates the alternator is not properly powering the electrical system.	Amber
	Water in Fuel	Indicates the fuel may contain water. Drain any water collected in the fuel/water separators.	Amber
	Fuel Filter Restriction	Indicates the fuel filter is clogged and requires service.	Amber
	Check Transmission	Indicates an undesirable transmission condition.	Amber
	Start Blocked (GHG14 only)	Indicates that the system is preventing the starter from cranking. This can occur when the ignition switch is turned to START before the gauge sweep has completed. NOTE: Illumination of the Start Blocked lamp does not indicate a problem with the starter. Turn the ignition switch back to ON, wait for the lamp to go out, then turn the ignition switch to START again.	Amber
	Wheel Spin (pre-EPA16)	Flashing indicates the ATC system is active, or the ATC button has been pressed to allow wheel slip. Solid illumination indicates ATC is shut off or unavailable due to a system fault. In the event of a system fault, repair the ATC system immediately to ensure full braking capability.	Amber
	Stability Event (EPA16 and newer)	Flashing indicates a stability event has been detected, and the ESC system is active. Solid illumination indicates a problem with the stability system. Repair the ESC system immediately to ensure full stability capability.	Amber
	ATC Deactivated (EPA16 and newer)	Flashing indicates the ATC SPIN button has been pressed to allow wheel slip. Solid illumination indicates ATC is shut off or unavailable due to a system fault. In the event of a system fault, repair the ATC	Amber

		system immediately to ensure full braking capability.	
	Roll Stability (pre-EPA16)	Momentary illumination indicates that a stability event has occurred. On vehicles that are also equipped with ATC, flashing indicates the ATC button has been pressed to allow wheel slip. Solid illumination indicates ATC is shut off or unavailable due to a system fault. In the event of a system fault, repair the ATC system immediately to ensure full braking capability.	Amber
	Hill Start Aid (HSA) Override	Indicates the HSA switch has been pressed to override the hill start assist feature.	Amber
	Outside Normal Ride Height	Indicates the current rear suspension height is not at the normal ride height. This light will turn off once the vehicle returns to normal ride height.	Amber
	Engine Brake	Indicates the engine brake is enabled.	Green
	Left-Turn Signal	Flashing indicates the outside left-turn signal lights are activated.	Green
	Right-Turn Signal	Flashing indicates the outside right-turn signal lights are activated.	Green
	Cruise Control	Indicates the cruise control is enabled. NOTE: The ICU4Me does not have a green cruise control telltale.	Green
	High-Beam Headlights	Indicates the high-beam headlights are on.	Blue

Table 3, Common Warning and Indicator Lamps

* See Fig.33,ATS Warning Lamps for an explanation of the aftertreatment system (ATS) warning indicators, and actions required to avoid further engine protection steps.

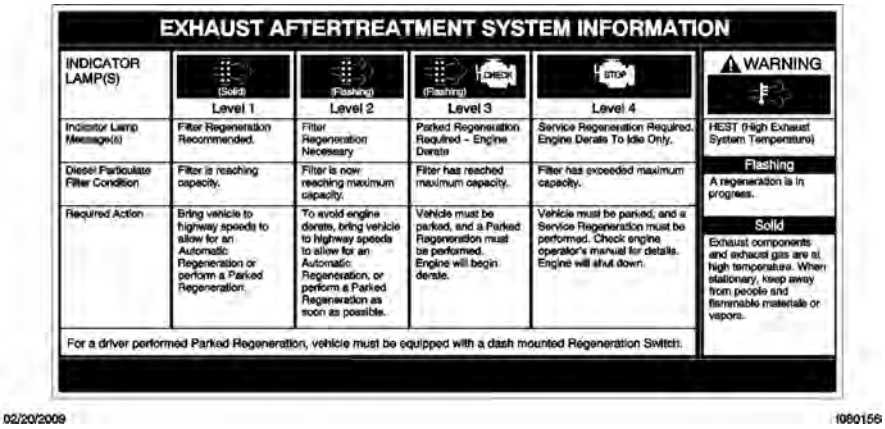


Fig 33, ATS Warning Lamps

4.02 Warning and Indicator Lights

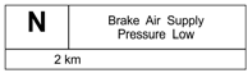
The ICU has three or four rows of warning and indicator lights with icon symbols, depending on the ICU configuration. The positions of the lights may vary, but the telltales are standard for all applications. See Table.4,Common Warning and Indicator Lamps for a listing of standard and commonly used warning and indicator lamps.

Warning and indicator lamps illuminate in red (danger), amber (caution), green (status advisory), or blue (high-beam headlights active).

IMPORTANT: Depending upon local jurisdictional emissions guidelines, vehicles and/or engines that are domiciled outside of the U.S. and Canada may not be compliant with EPA10 or GHG21 regulations. Noncompliant vehicles may not be equipped with all of the warning and indicator lamps shown in Table.4,Common Warning and Indicator Lamps.

Table 4, Common Warning and Indicator Lamps

Common Warning and Indicator Lamps			
Lamp Description			**Color**
	STOP Engine*	Indicates a serious fault that requires engine shutdown immediately. The engine protection system will reduce the maximum engine torque and speed, and, if the condition does not improve, will shut down the engine within 30 to 60 seconds. Safely bring the vehicle to a stop on the side of the road and shut down the engine as soon as the red light is seen. **If the engine shuts down while the vehicle is in a hazardous location, turn the key to the OFF position for a few seconds, then restart the engine and move the vehicle to a safer location.**	Red
	High Coolant Temperature	Indicates the coolant temperature is above the maximum allowable temperature.	Red

	Low Air Pressure (EPA10 and Newer)	Indicates air pressure in the primary or secondary reservoir has dropped below approximately 70 psi (483 kPa).	Red
	Low Air Pressure (ICU4Me only, mid-GHG14)	Indicates air pressure in the primary or secondary reservoir has dropped below approximately 70 psi (483 kPa).	—
	Low Engine Oil Pressure	Indicates the engine oil pressure is below the minimum allowable pressure.	Red
	Transmission Overheat	Indicates high transmission temperature.	Red
	Transmission Fluid Level	Indicates low transmission fluid level. Safely bring the vehicle to a stop as soon as possible.	Red
	Parking Brake (EPA10 and Newer)	Indicates the parking brake is engaged.	Red
	Low Battery Voltage	Indicates that battery voltage is 11.9 volts or less.	Red
	Unfastened Seat Belt	Activates with an audible alert when the system detects that the parking brake is off and the driver seat belt is not fastened on some vehicles. On other vehicles, this lamp illuminates for 15 seconds when the ignition is first turned on.	Red
	Check ECAS	Indicates Electronically Controlled Air Suspension (ECAS) active fault.	Red
	CHECK Engine*	Indicates an engine condition (low oil pressure, low coolant level, high coolant temperature, high DPF soot level, or uncontrolled DPF regeneration) that requires correction. Correct the condition as soon as possible. If the condition worsens, the STOP engine lamp will illuminate.	Amber
	High Exhaust System Temperature (HEST)*	Slow (10-second) flashing indicates a regeneration (regen) is in progress. IMPORTANT: When the HEST lamp is illuminated, do not park the vehicle near flammable material. Solid illumination indicates high exhaust temperatures at the outlet of the tail pipe when speed is below 5 mph (8 km/h).	Amber

	Diesel Particulate Filter (DPF) Status	Solid illumination indicates a regen is required. Change to a more challenging duty cycle (such as highway driving) to raise exhaust temperatures for at least twenty minutes, or perform a parked regen. Blinking indicates that a parked regen is required immediately. An engine derate and shutdown will occur.	Amber
	Malfunction Indicator Lamp (MIL)	Indicates an emissions-related fault. See the engine operation manual for details.	Amber
	Vehicle ABS	Momentary illumination indicates the vehicle ABS is engaged. Solid illumination indicates a problem with the vehicle ABS. Repair the ABS immediately to ensure full braking capability.	Amber
	Trailer ABS	Momentary illumination indicates the trailer ABS is engaged. Solid illumination indicates a problem with the trailer ABS. Repair the ABS immediately to ensure full braking capability.	Amber
	No Charge	Indicates the alternator is not properly powering the electrical system.	Amber
	Water in Fuel	Indicates the fuel may contain water. Drain any water collected in the fuel/water separators.	Amber
	Fuel Filter Restriction	Indicates the fuel filter is clogged and requires service.	Amber
	Check Transmission	Indicates an undesirable transmission condition.	Amber
	Start Blocked (GHG14 only)	Indicates that the system is preventing the starter from cranking. This can occur when the ignition switch is turned to START before the gauge sweep has completed. NOTE: Illumination of the Start Blocked lamp does not indicate a problem with the starter. Turn the ignition switch back to ON, wait for the lamp to go out, then turn the ignition switch to START again.	Amber

	Wheel Spin (pre-EPA16)	Flashing indicates the ATC system is active, or the ATC button has been pressed to allow wheel slip. Solid illumination indicates ATC is shut off or unavailable due to a system fault. In the event of a system fault, repair the ATC system immediately to ensure full braking capability.	Amber
	Stability Event (EPA16 and newer)	Flashing indicates a stability event has been detected, and the ESC system is active. Solid illumination indicates a problem with the stability system. Repair the ESC system immediately to ensure full stability capability.	Amber
	ATC Deactivated (EPA16 and newer)	Flashing indicates the ATC SPIN button has been pressed to allow wheel slip. Solid illumination indicates ATC is shut off or unavailable due to a system fault. In the event of a system fault, repair the ATC system immediately to ensure full braking capability.	Amber
	Roll Stability (pre-EPA16)	Momentary illumination indicates that a stability event has occurred. On vehicles that are also equipped with ATC, flashing indicates the ATC button has been pressed to allow wheel slip. Solid illumination indicates ATC is shut off or unavailable due to a system fault. In the event of a system fault, repair the ATC system immediately to ensure full braking capability.	Amber
	Hill Start Aid (HSA) Override	Indicates the HSA switch has been pressed to override the hill start assist feature.	Amber
	Outside Normal Ride Height	Indicates the current rear suspension height is not at the normal ride height. This light will turn off once the vehicle returns to normal ride height.	Amber
	Engine Brake	Indicates the engine brake is enabled.	Green
	Left-Turn Signal	Flashing indicates the outside left-turn signal lights are activated.	Green

	Right-Turn Signal	Flashing indicates the outside right-turn signal lights are activated.	Green
	Cruise Control	Indicates the cruise control is enabled. NOTE: The ICU4Me does not have a green cruise control telltale.	Green
	High-Beam Headlights	Indicates the high-beam headlights are on.	Blue

Table 4, Common Warning and Indicator Lamps

* See Fig.34,ATS Warning Lamps for an explanation of the aftertreatment system (ATS) warning indicators, and actions required to avoid further engine protection steps.

Engine Protection System

WARNING:

When the red STOP engine lamp illuminates, most engines are programmed to shut down automatically within 30 seconds. The driver must immediately move the vehicle to a safe location at the side of the road to prevent causing a hazardous situation that could cause bodily injury, property damage, or severe damage to the engine.

See Fig.34,ATS Warning Lamps for an explanation of the aftertreatment system (ATS) warning indicators, and actions required to avoid further engine protection steps.

The STOP engine lamp illuminates when the engine protection system is activated in one of two ways. On some engines, the engine protection system will derate the engine, allowing it to run at lower rpm and slower vehicle speed. Drive the vehicle to a safe location or to a service facility.

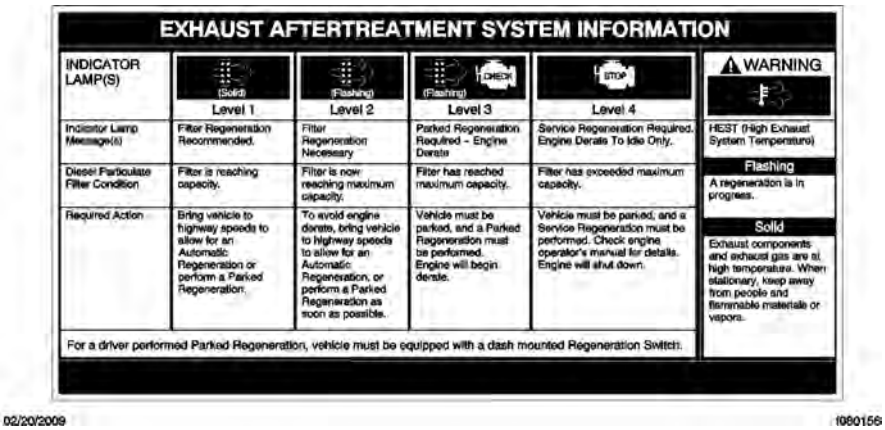


Fig 34, ATS Warning Lamps

IMPORTANT: Safely bring the vehicle to a stop on the side of the road and shut down the engine as soon as the red light is seen. If the engine shuts down while the vehicle is in a hazardous location, turn the key to the OFF position for a few seconds, then restart the engine and move the vehicle to a safer location.

On other engines, the engine protection system will shut down the engine. It will first derate the engine, then shut it down completely 30 to 60 seconds after the indicator illuminates (depending on the critical fault type) if the condition does not improve. Bring the vehicle to a stop on the side of the road before the engine shuts down.

Some vehicles may have a shutdown-override switch, which may be used to momentarily override the shutdown sequence. See 11.01.01 Engine Starting Procedure for detailed information regarding the shutdown process.

IMPORTANT: Do not attempt to restart the engine while the vehicle is moving. Bring the vehicle to a safe stop, then restart the engine.

To restart the engine, turn the ignition to OFF, leave it there a few seconds, then turn the ignition to START. The engine will run for a short period and shut down again if the condition does not improve.

4.03 Instruments

The instruments are listed here in alphabetical order, to make the information easier to find.

NOTE: Some of the listed instruments are optional, and not found in every vehicle.

Air Intake Restriction Gauge

The air intake restriction gauge indicates the vacuum on the engine side of the air cleaner. On standard installations, it is mounted on the air intake duct in the engine compartment, and has a go/no-go restriction indicator without graduations. See Fig.35,Manual-Reset Air Restriction Indicator, Go/No-Go. As an option, a graduated indicator (see Fig. 36,Air Intake Restriction Indicator, Graduated) on the air intake duct or, for easier viewing, a dash-mounted restriction gauge may be installed.



Fig 35, Manual-Reset Air Restriction Indicator, Go/No-Go

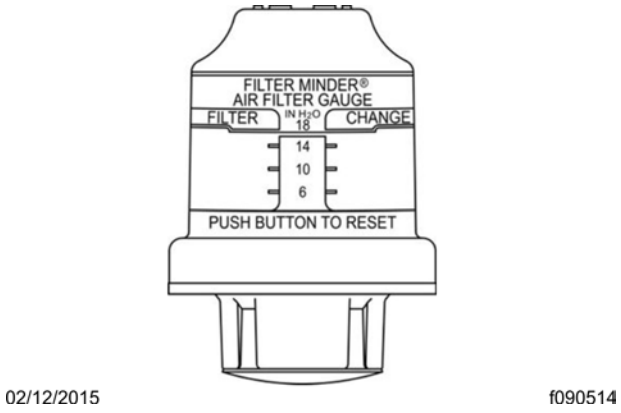


Fig 36, Air Intake Restriction Indicator, Graduated

Air intake restriction vacuum is measured in inches of water (inH_2O). For vehicles equipped with a graduated indicator or a restriction gauge on the dash, check the gauge with the engine off. If the yellow signal stays locked in the red zone once the engine is shut down, or is at or above the values shown in Table 4.2, the air cleaner element needs to be replaced.

NOTE: Rain or snow can wet the filter and cause a temporary high reading.

Table 5, Air Intake Maximum Restriction Values

Air Intake Maximum Restriction Values (inH2O)	
Engine Make	**GHG14, GHG17, and GHG21 Engines**
Detroit	18
Cummins	25

Table 5, Air Intake Maximum Restriction Values

Application Air Pressure Gauge

An application air pressure gauge (see Fig.37,Application Air Pressure Gauge) registers the air pressure being used to apply the brakes, and should be used for reference only. The gauge will not register air pressure until the foot brake pedal is depressed or the trailer hand brake is applied.



Fig 37, Application Air Pressure Gauge

Coolant Temperature Gauge

NOTICE:

A sudden increase in coolant temperature may indicate engine or cooling system failure. Bring the vehicle to a safe stop and investigate the cause to prevent further damage. Do not operate the engine until the cause has been determined and corrected.

During normal engine operation, the coolant temperature gauge (see Fig.38,Tachometer and Coolant Temperature Gauge) should read 175 to 195°F (79 to 91°C). If the temperature remains below 160°F (71°C), inspect the cooling system to determine the cause.



Fig 38, Tachometer and Coolant Temperature Gauge

For Detroit engines, if coolant temperature rises above 215°F (101°C), the CHECK engine lamp will illuminate. If the condition does not improve, the STOP engine lamp will also illuminate and an audible warning will sound. The engine will then derate or shut down, depending on the type of engine protection system installed.

Drive Axle Oil Temperature Gauges

NOTICE:

A sudden increase in oil temperature that is not caused by a load increase may indicate mechanical failure. Bring the vehicle to a safe stop and investigate the cause to prevent further damage. Do not operate the vehicle until the cause has been determined and corrected.

During normal operation, drive axle oil temperature gauges (see Fig. 39,Drive Axle Oil Temperature Gauge (rear drive axle gauge shown)) should read as follows:

- 160 to 220°F (71 to 104°C) for Detroit Classic Model 2, 4, and 6 axles.
- 160 to 329°F (71 to 165°C) for Detroit New Final Drive (NFD) axles.
- 160 to 275°F (71 to 135°C) for Meritor™ drive axles.
- 180 to 200°F (82 to 93°C) for Dana Spicer® drive axles.



Fig 39, Drive Axle Oil Temperature Gauge (rear drive axle gauge shown)

Under heavy loads, such as when climbing steep grades, temperatures that exceed the normal oil temperature range for a short period are not unusual. If the temperature returns to normal when the load decreases, there is no problem.

Engine Oil Pressure Gauge

NOTICE:

A sudden decrease or absence of oil pressure may indicate mechanical failure. Bring the vehicle to a safe stop and investigate the cause to prevent further damage. Do not operate the engine until the cause has been determined and corrected.

The engine oil pressure gauge, as shown in Fig.40,Speedometer and Engine Oil Pressure Gauge, displays the current engine oil pressure. If engine oil pressure falls below the minimum levels shown in Table.6,Minimum Engine Oil Pressure, the CHECK engine lamp will illuminate. If the condition does not improve, the STOP engine lamp will also illuminate and an audible warning will sound. The engine will then derate or shut down, depending on the type of engine protection system installed.

NOTE: Oil pressures in See Table.6,Minimum Engine Oil Pressure are given with the engine at operating temperature. With the engine cold, oil pressure may be higher. Individual engines may vary from the listed pressures; observe and record pressures when the engine is new to create a guide for checking engine condition.



Fig 40, Speedometer and Engine Oil Pressure Gauge

Table 6, Minimum Engine Oil Pressure

Minimum Oil Pressure		
Engine Model	**At Idle Speed: psi (kPa)**	**At Rated RPM: psi (kPa)**
Detroit	14 (97)	55 (350)

Table 6, Minimum Engine Oil Pressure

Engine Oil Temperature Gauge

NOTICE:
A sudden increase in oil temperature that is not caused by a load increase may indicate mechanical failure. Bring the vehicle to a safe stop and investigate the cause to prevent further damage. Do not operate the engine until the cause has been determined and corrected.

During normal operation, the optional engine oil temperature gauge (see Fig.41,Engine Oil Temperature Gauge) should read in the following temperature range:

- 200 to 260°F (93 to 126°C) for Detroit engines

Under heavy loads, such as when climbing steep grades, temperatures that exceed the normal oil temperature range for a short period are not unusual. If the temperature returns to normal when the load decreases, there is no problem.



Fig 41, Engine Oil Temperature Gauge

Fuel/Diesel Exhaust Fluid (DEF) Gauge

For engines that are EPA10-compliant or newer, the fuel and DEF levels are measured in a dual purpose fuel/DEF level gauge. See Fig.42,Fuel/DEF Gauge, EPA10 and Newer.



1. Diesel Fuel Level Indicator
2. DEF Level Indicator
3. Low DEF Warning Lamp (amber below 10% DEF)
4. Low Fuel Warning Lamp (amber at 1/8 tank of fuel)

Fig 42, Fuel/DEF Gauge, EPA10 and Newer

The diesel fuel level is indicated at the top of the gauge, with a low-fuel warning lamp that illuminates amber when the diesel fuel level registers 1/8th of capacity.

The DEF level is indicated in a four-segment lightbar on the lower portion of the gauge. There is a low DEF level warning lamp that illuminates amber when the DEF level reaches 10% of capacity. See 13.01 Greenhouse Gas Emissions and Fuel Consumption Standards for details of the DEF gauge functions.

Primary and Secondary Air Pressure Gauges

WARNING:

If air pressure falls below minimum pressure, the braking ability of the vehicle will be limited. Slow the vehicle down and bring it to a gradual stop. Do not attempt to move the vehicle until air pressure has risen above the minimum level. Moving a vehicle without adequate braking power could cause an accident resulting in property damage, personal injury, or death.

Air pressure gauges (see Fig.43,Air Pressure Gauge (primary shown)) register the pressure in the primary and secondary air systems. Normal pressure, with the engine running, is 100 to 120 psi (689 to 827 kPa) in both systems.



Fig 43, Air Pressure Gauge (primary shown)

A low-air-pressure warning light and audible alert, connected to both the primary and secondary systems, activate when air pressure in either system drops below approximately 70 psi (483 kPa).

When the engine is started, the warning light and audible warning remain on until air pressure in both systems exceeds minimum pressure.

Speedometer

Two speedometer options are available. The U.S. version of the speedometer (see Fig. 40,Speedometer and Engine Oil Pressure Gauge) registers speed in both miles per hour (mph) and kilometers per hour (km/h), with mph in larger numbers. The metric version of the speedometer face reverses this arrangement, with km/h in larger numbers.

Suspension Air Pressure Gauge

A suspension air pressure gauge (see Fig.44,Suspension Air Pressure Gauge) registers the air pressure applied to the vehicle air suspension.



Fig 44, Suspension Air Pressure Gauge

Tachometer

The tachometer (see Fig.38,Tachometer and Coolant Temperature Gauge) indicates engine speed in revolutions per minute (rpm) and serves as a guide for shifting the transmission and keeping the engine in the appropriate rpm range. For low idle and rated rpm, see the engine identification plate.

Transmission Fluid Temperature Gauge

The transmission fluid temperature gauge, shown in Fig.45,Transmission Fluid Temperature Gauge, measures the transmission lubricant operating temperature. Temperatures vary by application, but the transmission fluid temperature gauge reading should not exceed 250°F (121°C).



Fig 45, Transmission Fluid Temperature Gauge

NOTICE:

A sudden increase in transmission fluid temperature that is not caused by a load increase may indicate mechanical failure. Bring the vehicle to a safe stop and investigate the cause to prevent further damage. Do not operate the vehicle until the cause has been determined and corrected.

Under heavy loads, such as when climbing steep grades, temperatures that exceed the normal oil temperature range for a short period are not unusual. If the temperature returns to normal when the load decreases, there is no problem.

Turbocharger Boost Pressure Gauge

A turbocharger boost pressure gauge (see Fig.46,Turbocharger Boost Pressure Gauge) indicates the pressure in the intake manifold, in excess of atmospheric pressure, being created by the turbocharger.



Fig 46, Turbocharger Boost Pressure Gauge

Voltmeter

The voltmeter indicates the vehicle charging system voltage when the engine is running and the battery voltage when the engine is off. By monitoring the voltmeter, the driver can stay aware of potential battery charging problems and have them fixed before the batteries discharge enough to create starting difficulties. A digital voltage display is integrated with driver message center. An optional voltmeter gauge (see Fig.47,Voltmeter) may be installed.



Fig 47, Voltmeter

The voltmeter will normally show approximately 13.7 to 14.1 volts when the engine is running. The voltage of a fully charged battery is 12.7 to 12.8 volts when the engine is off. Battery voltage under 12.0 volts is considered a low battery, and a completely discharged battery will produce only about 11.0 volts.

If the voltmeter shows an undercharged or overcharged condition for an extended period, have the charging system and batteries checked at an authorized Western Star service facility.

On a vehicle equipped with a battery isolator system, the voltmeter measures the average voltage of all the batteries when the engine is running. When the engine is off, the voltmeter shows only the isolated battery voltage and does not indicate the voltage of the engine-starting batteries.

4.04 Driver Message Center

ICU4Me

Functions

ICU4Me settings and the driver message center are controlled using the switches mounted in the left-hand switch pod of the steering wheel. See Fig.48,Steering Wheel-Mounted Switches, Left-Hand Switch Pod.



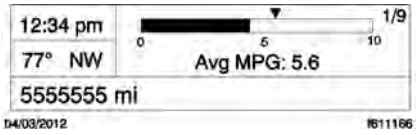
NOTE: To reset values in the ICU4Me driver message center, press and hold the RIGHT navigation switch.

1. Volume Up Switch
2. Volume Down Switch
3. Headlight Interrupt Switch
4. UP Navigation Switch
5. RIGHT Navigation Switch
6. DOWN Navigation Switch
7. LEFT Navigation Switch

Fig 48, Steering Wheel-Mounted Switches, Left-Hand Switch Pod

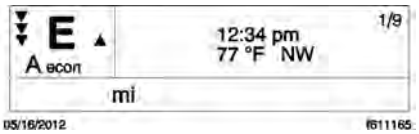
The driver message center is divided into four sections. The odometer and cruise control status field are displayed along the bottom of the message center. When cruise control is active, the cruise control status field displays relevant cruise control icons and the set speed. If the vehicle is equipped with a manual transmission, time and temperature are displayed in the top left corner of the driver message center. The message field displays the driving screens and alert messages. See Fig.49,Driver Message Center Without Gear Display, ICU4Me.

If the vehicle is equipped with an automated transmission, the gear display is located in the top left corner of the driver message center. Time and temperature are displayed in the message field, unless an alert message is active or a driving screen has been selected. The odometer and cruise control status field are displayed along the bottom of the message center. See Fig.50,Driver Message Center with Gear Display, ICU4Me. For information about transmission display options, see 16.01.01 Detroit™ Multifunction Control.



1. Temperature and Compass
2. Message Field
3. Cruise Control Status Field
4. Odometer

Fig 49, Driver Message Center Without Gear Display, ICU4Me



1. Gear Display
2. Temperature and Compass
3. Cruise Control Status Field
4. Odometer

Fig 50, Driver Message Center with Gear Display, ICU4Me

Alert Messages

Alert messages are displayed in the message field to notify the driver when certain conditions occur. They include warnings, cautions, and other messages that require the driver's attention. Not all alert messages are critical to the operation of the vehicle. More important messages take priority over less important messages.

NOTE: All alert messages follow the format shown in Fig.51,Parking Brake Alert Message.

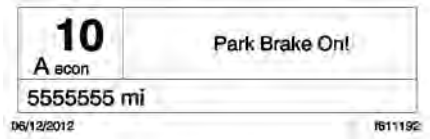


Fig 51, Parking Brake Alert Message

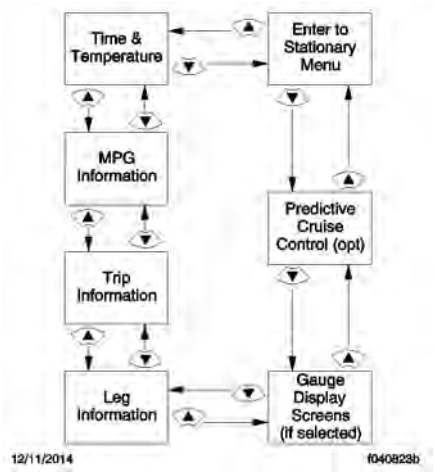
Press the OK button on the left-hand steering wheel pod to acknowledge alert messages and revert to the previously displayed driving screen. The following alert messages will repeat intermittently until the condition is eliminated:

- turn signal on
- low voltage
- no datalink
- low transmission air pressure (Detroit transmissions only)

Driving Screens

With the parking brake off, only the driving screens are available. Use the UP and DOWN navigation switches on the steering wheel to scroll through the driving screens; see Fig.52,Driving Screen Navigation, ICU4Me. To reset any values, press and hold the RIGHT navigation switch.

- Temperature
- MPG information
- Trip information
- Leg information
- Gauge display (if selected)
- Predictive Cruise Control (optional)
- Enter parked menus



Use the UP and DOWN navigation switches on the steering wheel to navigate through the driving screens.

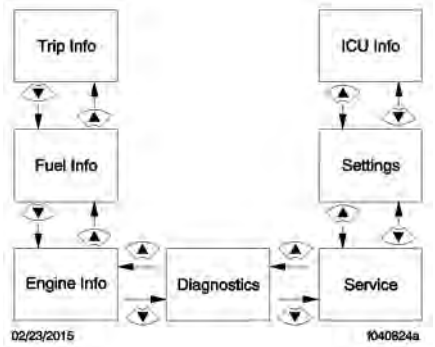
Fig 52, Driving Screen Navigation, ICU4Me

Use the UP and DOWN navigation switches on the steering wheel to navigate through the driving screens.

Parked Screens/Menus

Park the vehicle and set the parking brake to access the parked menus and submenus. See Fig. 53,Parked Menus, ICU4Me. To reset values in any of the menus, press and hold the RIGHT navigation switch.

- Trip information
- Fuel information
- Engine information
- Diagnostics
- Service information
- Settings
- ICU Information



Use the UP and DOWN navigation switches on the steering wheel to navigate through the parked menus.

Fig 53, Parked Menus, ICU4Me

Use the UP and DOWN navigation switches on the steering wheel to navigate through the parked menus.

A small numerical fraction is displayed in the upper right-hand corner of each screen to indicate the number of available screens or options to scroll through. See Fig.54,Parked Menu Navigation, ICU4Me. Press the OK button on the left-hand steering wheel pod to select a menu choice. Press the LEFT navigation switch to back out of a selected menu or submenu. Use the UP navigation switch to scroll up, and the DOWN navigation switch to scroll down.

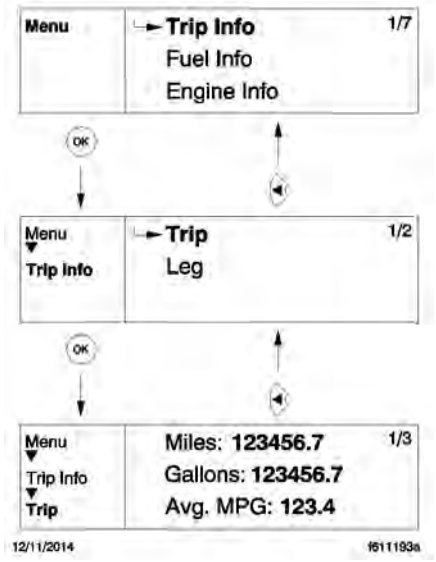


Fig 54, Parked Menu Navigation, ICU4Me

When navigating the parked menus, the left side of the driver message center displays a "breadcrumb menu" to show the order of menus and submenus that have been selected during the current navigation.

Trip Information

The ICU can record data for one trip segment and one leg segment. When trip information is reset, all the leg information is reset as well.

Fuel Information

Using this menu, the driver can view the total fuel used since the last reset, the total idle gallons used since the last reset, and the average MPG since the last reset.

Engine Information

Using this menu, the driver can view engine miles, engine hours, gallons used, PTO hours, and PTO gallons. Engine oil level is optional for Detroit engines. The information contained in the Engine Information screens cannot be reset.

Diagnostics

Active faults are displayed in the diagnostics menu. See Fig.55,Diagnostics Menu Navigation, ICU4Me. If there are any active faults, the total number of faults is displayed in parenthesis next to the affected controller. To view specific active faults, press the OK button on the left-hand steering wheel pod. Press the OK button to toggle between the text description and the failure code for each selected fault.

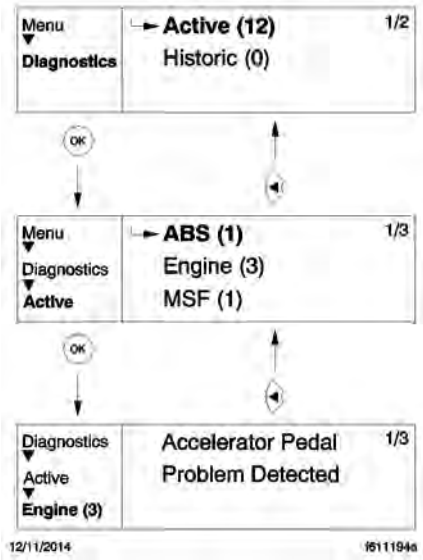


Fig 55, Diagnostics Menu Navigation, ICU4Me

Service Information

Using this menu, the driver can enable, disable, and set service intervals for engine miles or engine hours. After enabling service intervals, select interval unit (miles or hours), and the interval duration.

Settings

The settings menu contains the controls for the following settings:

- Display (includes brightness, display light, and night mode settings)
- Gauge select
- Language
- Temperature warning enable/disable
- Units

The Gauge Select submenu allows the driver to select certain gauge values for display in the message field while driving. See Fig.56,Selecting Gauges to Display, ICU4Me. Use the UP and DOWN navigation switches on the steering wheel to scroll through the list of available gauges, then press the OK button to select a desired gauge. The OK button can also be used to uncheck boxes if necessary.

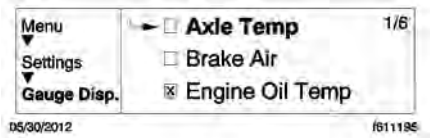


Fig 56, Selecting Gauges to Display, ICU4Me

ICU Information

The ICU Information screen displays the part numbers for the instrument cluster and software.

4.05 Overhead Instrument Panel

The overhead instrument panel typically holds a citizen's band (C/B) radio, an AM/FM radio, a digital clock, and storage areas with netting. The underside of the overhead console also holds the sun visors and the dome/reading light assembly. For more information on the dome/reading light assembly, see 9.01.01 Power Mirrors.

5.01 Control Panels 65
5.02 Ignition Switch 65
5.03 Lighting Controls 67
5.03.01 Exterior Lighting Controls 67
5.03.02 Interior Lighting Controls 70
5.04 Horn Controls 72
5.04.01 Air Horn 72
5.04.02 Electric Horn 72
5.05 Powertrain Controls 72
5.05.01 Aftertreatment System Regen Switches 72
5.05.02 Axle Switches 73
5.05.03 Engine Brake Switches 74
5.05.04 Engine Fan Switch 74
5.05.05 Shutdown Override Switch 75
5.05.06 Hill Start Aid Override Switch 75
5.05.07 Power Takeoff Controls 76
5.05.08 Transmission Controls 76
5.06 Cruise Control 78
5.06.01 General Information 78
5.06.02 Cruise Control 79
5.06.03 Cruise Control ("CC") Limiter 80
5.06.04 Descent Control and Deceleration Modes, Detroit™ Automated Transmissions 80
5.07 Dash-Mounted Brake Controls 81
5.07.01 Parking Brake Control Valve 81
5.07.02 Trailer Air Supply Valve 82
5.07.03 Trailer Brake Lever 83
5.07.04 Antilock Braking System 83
5.08 Windshield Wiper and Washer Controls 84
5.09 Suspension/Trailer Connection Controls 85
5.09.01 Air Suspension Height Control Switch 85
5.09.02 ECAS Dash Switches 86

5.09.03 ECAS Remote Control Unit....88
5.09.04 Fifth Wheel Slide Control Switch....89
5.09.05 Trailer Auxiliary Switch....89
5.10 Adjustable Steering Column Controls....89
5.11 Radio/Bluetooth Controls....90
5.12 Climate Controls....91
5.13 Seat Controls....92

5. Driver Controls

5.01 Control Panels

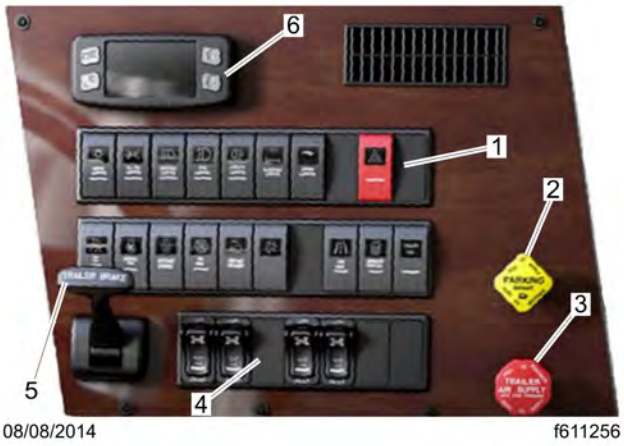
NOTE: Western Star vehicles are offered with various chassis and body components. Because of the various options, the information contained in this chapter may not apply to every vehicle.

The right-hand dash control panel contains a face vent, the majority of the driver switch controls, automated and automatic transmission controls, and the OnGuard display module, if equipped.

The ignition switch control panel (below the right-hand dash panel) contains the ignition switch, cigarette lighter, and climate controls.

The instrument cluster is located behind the steering wheel.

See Fig.57,Dash Control Panel shows a typical dash control panel layout.



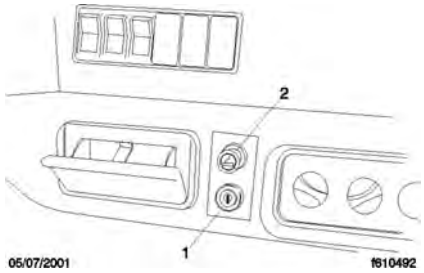
NOTE: Control locations may vary from those shown depending on vehicle options.

1. Lighting Switches
2. Parking Brake
3. Trailer Air Supply
4. Axle and Fifth Wheel Switches
5. Trailer Brake Lever
6. OnGuard

Fig 57, Dash Control Panel

5.02 Ignition Switch

The ignition switch has four positions: OFF, ACCESSORY, ON, and START. See Fig. 58,Ignition Switch and Cigarette Lighter.



1. Ignition Switch
2. Cigarette Lighter

Fig 58, Ignition Switch and Cigarette Lighter

In the OFF position, the key slot is vertical. The key can be inserted and removed only in the OFF position.

The following functions are operable when the ignition switch is in the OFF position (regardless of whether the key is inserted):

- high-beam headlights
- taillights
- brake lights
- road lights
- dome lights
- clearance lights
- turn signals
- hazard warning lights
- utility and baggage lights
- spotlights
- electric horn
- clock
- refrigerator
- television

Turn the key counterclockwise to the ACCESSORY position. In addition to all the functions that are operable with the ignition switch in the OFF position, the following functions are operable when the switch is in the ACCESSORY position:

- radio/stereo system
- heater and A/C fan
- mirror defog
- windshield wipers
- beacons
- power windows
- windshield washer
- outside air temperature display

Turn the key clockwise past the OFF position to the ON position. With the switch in the ON position, the warning and indicator lamps illuminate. Wait for three seconds before starting the engine.

Turn the key clockwise past the ON position to the START position and start the engine. Do not operate the starter longer than thirty seconds, and wait at least two minutes between starting attempts to allow the starter to cool. Release the key the moment the engine starts.

Switching on the ignition and releasing the parking brake automatically activates the daytime running lights, if equipped. The daytime running lights will operate until the parking brake is applied or the headlights are turned on.

5.03 Lighting Controls

5.03.01 Exterior Lighting Controls

IMPORTANT: Unless otherwise noted below, press the upper half of the switch to activate the desired light(s). Press the lower half of the switch to turn the light(s) off.

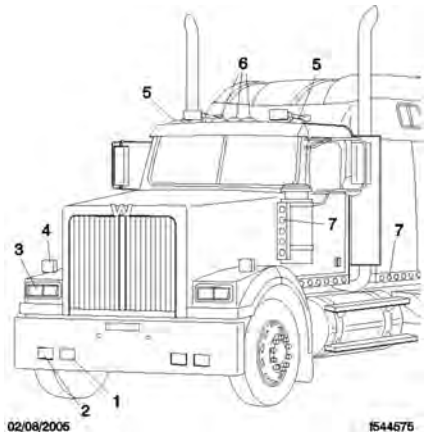
Exterior light controls are listed here in alphabetical order. See Fig.59,Exterior Lights (5700 models) or see Fig. 60,Exterior Lights (4700 models) for exterior light locations. At the rear of the vehicle there are taillights, brake lights with turn signals, backup lights, and optional utility lights.

See Fig.61,Exterior and Interior Light Switches for exterior and interior light switches.



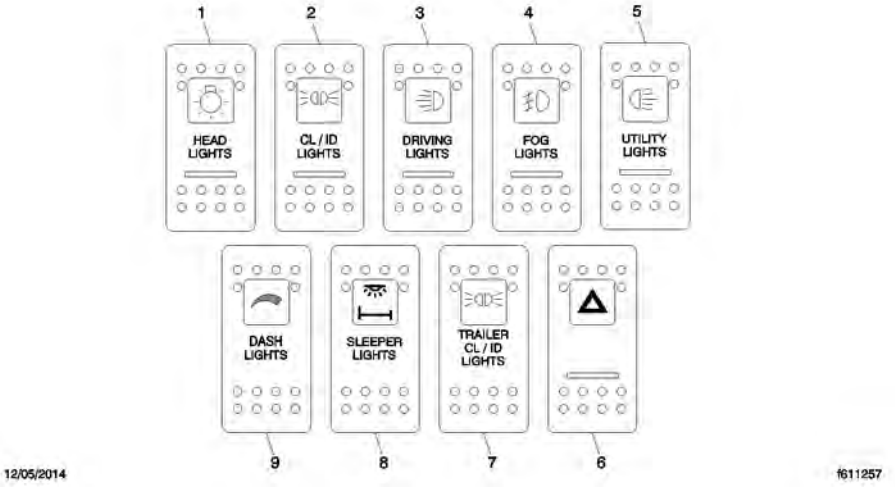
1. Clearance Light
2. Identification Lights
3. Mirror Marker Light
4. Clearance Light
5. Side Marker Light
6. Front Turn Signal
7. Headlight, Low Beam
8. Combination Fog/Driving Light
9. Headlight, High Beam
10. LED Accent Light

Fig 59, Exterior Lights (5700 models)



1. Fog Light
2. Road Light
3. Headlights
4. Turn Signal/Side-Marker Lights
5. Clearance Light
6. Identification Lights
7. Clearance Light

Fig 60, Exterior Lights (4700 models)



1. Headlights Switch
2. Tractor Clearance Lights Switch
3. Driving Lights Switch
4. Fog Lights Switch
5. Utility Lights Switch
6. Hazard Flasher Switch
7. Trailer Clearance Lights Switch
8. Sleeper Lights Switch
9. Dash Lights Switch

Fig 61, Exterior and Interior Light Switches

Backup Lights

Backup lights are activated automatically when the vehicle is in reverse, and are designed to be used while backing up at night.

Clearance Lights

Press the upper half of the clearance lights switch to activate all clearance lamps including back-of-sleeper and mirrors.

Driving Lights

Driving lights are designed to extend the range of the high-beam headlights, and can only be activated when the headlight high-beams are on. When headlights are dimmed, the driving lights automatically turn off.

Fog Lights

Fog lights are designed to reduce glare in foggy conditions. The headlights must be on and set on low beam for the fog lights to activate.

Hazard Warning Lights

Press the upper half of the hazard light switch to activate all of the turn signal lights. Both of the telltales on the instrument cluster will flash. To cancel the hazard lights, press the lower half of the switch.

Headlights

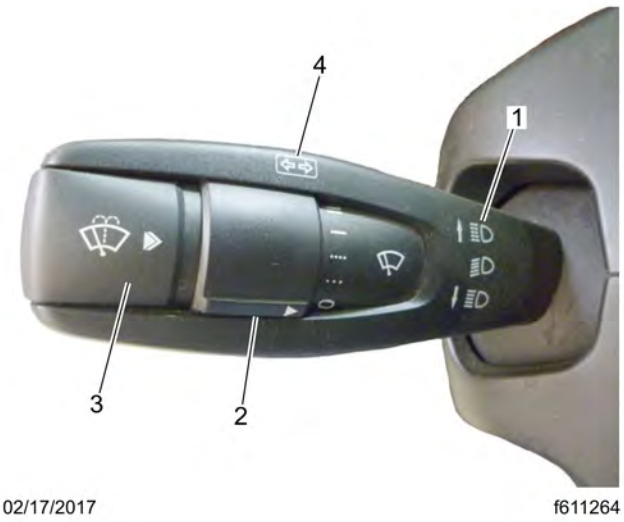
The headlight switch is operated by pushing the upper half of the switch once for the parking lights, illuminating the taillights and side marker lamps on both the tractor and trailer. Pressing the upper half of the switch a second time activates the headlights. An audible warning will sound if the lights are left on when the ignition is turned off and the driver-side door is open.

High-Beam Headlights

With the low-beam headlights on, push the turn-signal lever away from you to turn on the high-beam headlights. See 62,Steering Column-Mounted Turn Signal Lever. To turn off the high-beam headlights, pull the lever to the middle position.

With the low-beam headlights on, pull the lever towards you to flash the high-beam headlights momentarily.

When the high-beam headlights are on, a blue telltale illuminates on the instrument cluster.



1. Headlight Control Symbols
2. Windshield Wiper Switch
3. Windshield Washer Switch
4. Turn Signal Symbol

Fig 62, Steering Column-Mounted Turn Signal Lever

Headlight Interrupt

The headlight interrupt switch is located on the left-hand switch pod of the steering wheel. See Fig. 63,Left-Hand Steering Wheel Switches. When the headlight interrupt switch is activated, the daytime running lights blink. The headlight interrupt switch only operates when the headlights are on.



1. Volume Up Switch
2. Volume Down Switch
3. Headlight Interrupt Switch
4. ICU4Me Navigation Switches

Fig 63, Left-Hand Steering Wheel Switches

Turn Signals

The turn-signal lever is mounted on the left-hand side of the steering column. Pulling the turn-signal lever up activates the right-turn signal; pushing it down activates the left-turn signal. The lever is typically a non-canceling combination turn-signal, windshield wiper/washer switch, and headlight control unit. See Fig.62,Steering Column-Mounted Turn Signal Lever.

When a turn signal is activated, a green telltale light flashes on the instrument panel.

On a self-canceling turn signal lever, the lever automatically returns to the neutral position when the steering wheel returns to the straight-ahead position after a turn.

Trailer Clearance Lights

The trailer clearance lights switch activates the trailer clearance lamps independent of the tractor lamps.

Utility Lights

Utility lights can be swivel-mounted on the upper half of the cab, or flush-mounted on the back of the cab or sleeper. Press the upper half of the switch to activate it. Press the lower half of the switch to turn it off.

5.03.02 Interior Lighting Controls

The cab is equipped with door-activated dome lamps on the ceiling and under the overhead console, and courtesy lights on the bottom edge of each door and under the dash. Depending on vehicle configuration, there may also be LH and RH reading/map lamps.

When the instrument panel lights are on, most switch icons are backlit with a colored light to allow the driver to find switches more easily in the dark. When a switch is activated, an LED on the switch is illuminated.

For sleeper and baggage compartment lights, see 9.01.01 Power Mirrors.

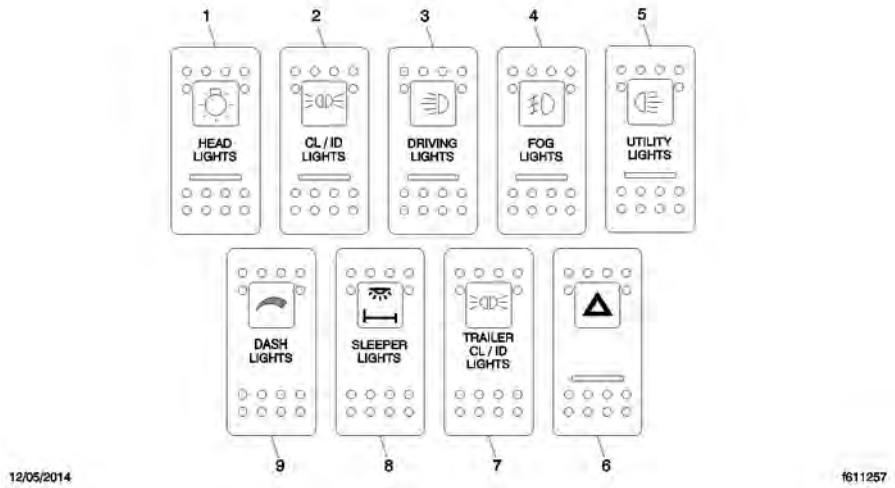
Dash Lights

The dash lights are controlled by the dash lights switch (see Fig.64,Exterior and Interior Light Switches, item 9). With the headlight switch in position 1 (marker lights on) or position 2 (headlights on), tapping the upper half of the dash lights switch increases the instrument cluster and switch backlighting incrementally. Note that tapping the switch past the maximum setting also activates the dome lamps and courtesy lights. Tapping the lower half of the switch dims the dash lights.

Cab Dome Lamps and Courtesy Lights

The dome lamps on the cab ceiling and overhead console, and the courtesy lights on the cab doors and under the dash are activated when a cab door is opened. Closing the doors will cause the lights to be turned off after 30 seconds. If a cab door is left open, a timer turns the lights off after 15 minutes.

Both the ceiling and overhead console dome lamps can be activated using the dash lights switch (see Fig. 64,Exterior and Interior Light Switches, item 9) when the headlight switch is in position 1 (marker lights on) or position 2 (headlights on). Tap the top half of the dash lights switch until the dome lamps are activated. Tap the bottom half of the switch to turn the dome lamps off.



1. Headlights Switch
2. Tractor Clearance Lights Switch
3. Driving Lights Switch
4. Fog Lights Switch
5. Utility Lights Switch
6. Hazard Flasher Switch
7. Trailer Clearance Lights Switch
8. Sleeper Lights Switch
9. Dash Lights Switch

Fig 64, Exterior and Interior Light Switches

Overhead Console Dome/Reading Lamps

The overhead console dome/reading lamps (see Fig.65,Overhead Console Lamps) are powered by both the ECC module and the battery. When powered by the ECC module, they are controlled together with the cab dome lamps (see "Cab Dome Lamps and Courtesy Lights" above). They can also be operated individually (when not powered by the ECC module) by pushing on the lens.

Red Map Lamps

The red map lamps (see Fig.65,Overhead Console Lamps) on the overhead console are operated by pushing on the lens.



1. Red Map Lamp
2. Clear Dome/Reading Lamp

Fig 65, Overhead Console Lamps

5.04 Horn Controls

5.04.01 Air Horn

The air horn is controlled by a wire lanyard hanging from the center of the overhead console. Pull down on the lanyard to sound the air horn.

5.04.02 Electric Horn

The electric horn control is located in the center of the steering wheel. To sound the horn, press down on the top of the steering wheel center pad. The horn will sound for the duration that the button pressed, up to 60 seconds.

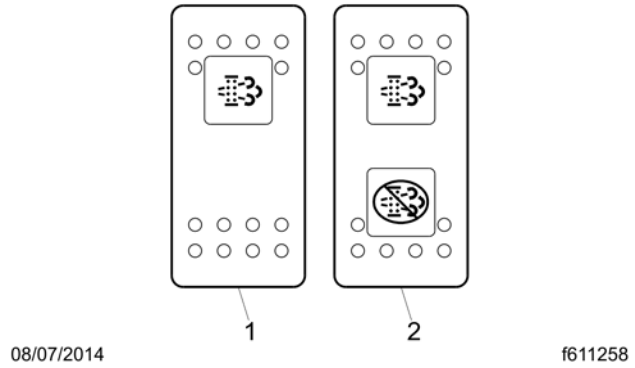
5.05 Powertrain Controls

5.05.01 Aftertreatment System Regen Switches

NOTE: See 13.01 Greenhouse Gas Emissions and Fuel Consumption Standards for detailed information about the operation of the regeneration (regen) switches and the aftertreatment system (ATS).

The regen request switch is used to initiate a parked regen. See Fig.66,Aftertreatment System Regen Switches.

Some vehicles are equipped with an optional regen request/inhibit switch. To request a parked regen, press the upper half of the switch. To stop a regen in progress or prevent the start of a regen, press the lower half of the switch. Regen will not occur until the switch is no longer active.

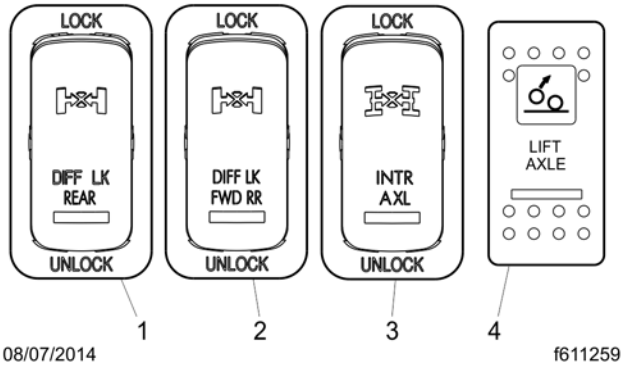


1. Regen Request Switch
2. Regen Request/Inhibit Switch

Fig 66, Aftertreatment System Regen Switches

5.05.02 Axle Switches

Axle switch controls are listed here in alphabetical order. See Fig.67,Axle Switches.



1. Rear Drive Axle Differential Lock Switch
2. Forward Drive Axle Differential Lock Switch
3. Interaxle Lock Switch
4. Lift Axle Switch

Fig 67, Axle Switches

NOTE: See 18.01.01 General Information for detailed information about drive axle functions.

Differential Lock Switch

The differential lock switch provides maximum traction for slippery conditions by forcing the wheels on each drive axle governed by the switch to rotate together. Engagement can be at any speed, provided the wheels are not slipping or spinning.

Interaxle Lock Switch

The interaxle lock switch allows the driver to lock the drive axles together, causing the drive axle shafts to rotate together. Use this feature only under adverse road conditions where greater traction is needed.

Leave the control in the UNLOCK position for normal highway operation. When a spinning or slipping action occurs at any of the drive wheels, press the upper half of the switch to LOCK the differential and prevent the wheels from spinning.

NOTICE:

Do not shift into LOCK while the rear wheels are spinning. Come to a halt before engaging to prevent damage to the interaxle and main differentials.

Do not permit rear wheels to spin freely for more than ten seconds when traction is lost. Shift into LOCK to prevent damage to the interaxle and main differentials.

Lift Axle Switch

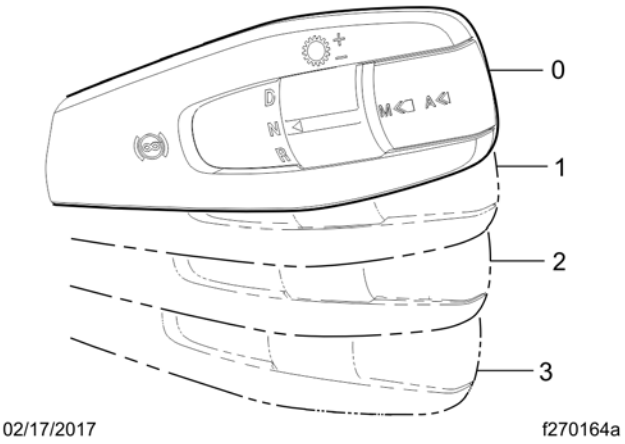
The lift axle switch controls the lift axle operation. Pushing the upper half of the switch will lower the lift axle.

5.05.03 Engine Brake Switches

NOTE: See 14.01.01 Brake System General Information for detailed information about engine brake operation.

Whenever vehicle braking is required on good road conditions, the engine brake may be used in conjunction with the service brakes. There is no time limit for operation of the engine brake. However, an engine brake does not provide the precise control of, and is not a substitute for, service brakes.

The engine brake control is located on the right-hand steering-column-mounted lever. At the top position, the engine brake is off, and at the three lower positions, the brake is on and the intensity (low, medium, high) increases with each step down. See Fig.68,Engine Brake Positions.



1. Off
2. Low
3. Medium
4. High

Fig 68, Engine Brake Positions

5.05.04 Engine Fan Switch

Press the upper half of the engine fan switch to override the automatic fan control and cause the engine fan to run continuously. See Fig.69,Engine Switches, item 1. This switch is intended for temporary use, or if the automatic fan control fails. Press the lower half of the switch to return to automatic fan control.

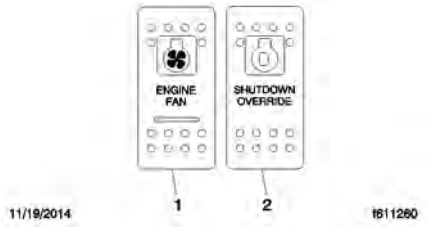


Fig 69, Engine Switches

5.05.05 Shutdown Override Switch

Some vehicles may have a shutdown override switch, which can be used to momentarily override the shutdown sequence. This switch resets the shutdown timer, restoring power to the level before the derate. The switch must be pressed again after five seconds to obtain a subsequent override. See Fig.70,Engine Switches, item 2.

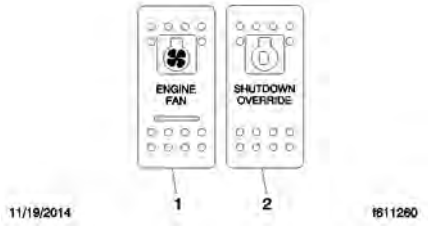


Fig 70, Engine Switches

NOTICE:

When the derate process begins, immediately get the vehicle serviced in order to prevent severe damage to the engine.

5.05.06 Hill Start Aid Override Switch

Some vehicles are equipped with a Hill Start Aid (HSA) feature to prevent the vehicle from rolling while on steep grades and to allow for a controlled launch. HSA is "on" by default. It can be turned off by pressing and releasing the HSA override switch on the dash (see Fig.71,Hill Start Aid Override Switch).



Fig 71, Hill Start Aid Override Switch

5.05.07 Power Takeoff Controls

Engine power takeoffs (PTO) are devices used to tap into engine power to run auxiliary devices, such as hydraulic pumps that power additional equipment. The following instructions are general guidelines for operating a PTO.

1. Set the parking brake and put the transmission in neutral.
2. Press the PTO switch. See Fig.72,PTO Switch. When the light is steadily illuminated, the PTO is engaged and ready to operate. In stationary mode, the vehicle must remain in neutral with the parking brake set.

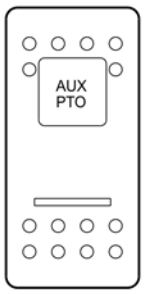


Fig 72, PTO Switch

3. To activate the mobile mode, shift from neutral to reverse, 1st, or 2nd gear. The clutch will open and the PTO will disengage for a moment.
4. Touch the accelerator pedal to close the clutch and engage the PTO in mobile mode. The PTO may be operated with the transmission in reverse, neutral, 1st, or 2nd gear only.

   NOTE: Do not attempt to change gears while the vehicle is moving. The transmission will ignore the request.

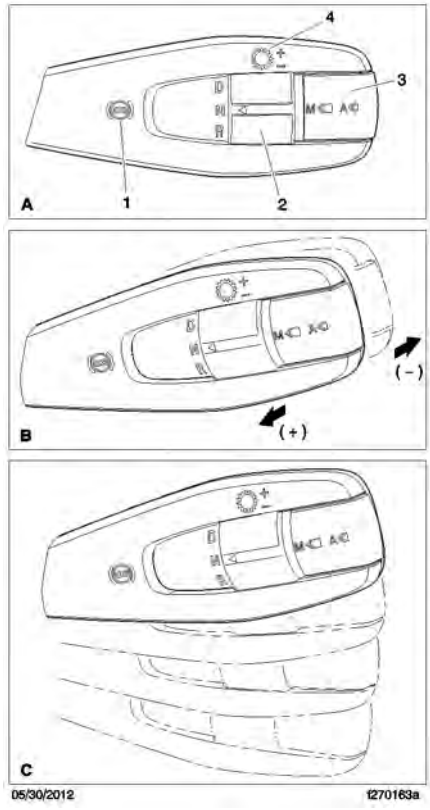
5. To end the mobile mode, bring the vehicle to a stop. The clutch will open and shut down power to the PTO.
6. To resume stationary mode, shift to neutral. The PTO will engage.
7. To end stationary mode, press the PTO switch. When the light in the switch goes out, power to the PTO is shut off.

5.05.08 Transmission Controls

Detroit™ Automated Transmissions

NOTE: See 16.01.01 Detroit™ Multifunction Control for complete Detroit automated transmission operating instructions.

Vehicles with Detroit transmissions use the multifunction control shown in Fig.73,Detroit Multifunction Control. This control moves in two directions and has two switches. It is used to request manual shifts, change shift mode, set engine brake levels, and control specialty engine brake functions during cruise control operation.



A. Front View
B. Shift Requests
C. Four positions for engine brake settings
1. Engine Brake Symbol
2. D/N/R Switch
3. Mode Switch
4. Gear Shift Symbol

Fig 73, Detroit Multifunction Control

Manual Transmissions

NOTE: See 17.01 Eaton® Fuller® Transmission Operation Tips for complete manual transmission operating instructions.

if equipped, the transmission range control and splitter valves are attached to the gear shift knob.

To operate a range-shift transmission, move the shift knob through all the low-range gear positions and then pull the range-preselection lever up to move into the high-range ratios. Use the same shift knob positions in both the low and high ranges.

Dependent on the transmission model, some ratios can be split using the splitter-control button (located on the side of the shift knob).

5.06 Cruise Control

5.06.01 General Information

WARNING:

Do not use the cruise control system when driving conditions do not permit maintaining a constant speed, such as in heavy traffic or on roads that are winding, icy, snow-covered, slippery, or roads with a loose driving surface. Failure to follow this precaution could cause a collision or loss of vehicle control, possibly resulting in personal injury or property damage.

NOTICE:

When the cruise control is engaged, do not attempt to shift gears without using the clutch pedal. Failure to follow this precaution will result in a temporarily uncontrolled increase in engine speed. Transmission damage and gear stripping could result.

NOTE: If the vehicle is equipped with a Detroit multifunction control, setting the cruise control with the engine brake on will activate Descent Control Mode. Moving the lever to the top position will resume the set cruise speed. Moving the lever down to engage the engine brake after the cruise control has been set will activate Deceleration Mode. See "Descent Control and Deceleration Modes, Detroit™ Automated Transmissions" in this chapter.

The cruise control is operated by four buttons mounted in the right-hand switch pod of the steering wheel. See Fig. 74,Right-Hand Steering Wheel Switches.

- Cruise On/Off Button—Press to turn cruise control on or off. When cruise control is on, the ICU message center displays relevant cruise control icons and the set speed. The speed memory will be retained until the cruise control is disabled with the ON/OFF button, or the ignition is turned off.
- Cruise Accelerate/SET Button—Press to set the cruise speed while the vehicle is traveling at the desired speed. Press and hold to increase the set cruise speed.
- CNCL Button —Press to pause the cruise control, while retaining the speed setting in memory. The cruise control can also be disengaged, while retaining the speed memory, by depressing the brake or clutch pedals.
- Cruise Decelerate/RES Button—Press to resume the set speed. Press and hold to decrease the set cruise speed.



1. Cruise Accelerate/SET
2. Marker Interrupt
3. Cruise Decelerate/Resume
4. Bluetooth—End Call
5. Mute
6. Bluetooth—Start Call
7. Cruise On/Off

Fig 74, Right-Hand Steering Wheel Switches

5.06.02 Cruise Control

1. To cruise at a particular speed:
   - 1.a Press the on/off button to turn cruise control on.
   - 1.b Depress the accelerator pedal until the speedometer reaches the desired speed.

     NOTE: Cruise control is cancelled if the brake or clutch pedal is depressed, or vehicle speed drops below the minimum cruise control speed.

   - 1.c Press the cruise accelerate/SET button to set the desired speed.

     NOTE: he speed memory is lost whenever the ignition switch is turned to OFF, or cruise control is turned off.

2. To disengage the cruise control, do one of the following:
   - Press the CNCL button in the center of the right-hand control pod.
   - Depress the brake pedal.
   - Depress the clutch pedal (on a manual transmission only).
3. To resume a preselected cruise speed:
   - 3.a Ensure cruise control is on.
   - 3.b Press the cruise decelerate/RES button. Cruise will return to the last set speed.

     NOTE: If vehicle speed drops below the minimum cruise control speed, cruise control will disengage. To resume to the preselected cruise speed, increase vehicle speed to above minimum cruise control speed and press the cruise decelerate/RES button.

4. To increase cruise speed, press the cruise accelerate/SET button until the vehicle accelerates to the desired speed.
5. To decrease cruise speed, press the cruise decelerate/RES button until the vehicle decelerates to the desired speed.

5.06.03 Cruise Control ("CC") Limiter

On vehicles equipped with a CC limiter switch (see Fig.75,CC Limiter Switch), the cruise control limiter allows the vehicle to exceed the set cruise control speed before engine braking is applied. The CC limiter switch provides more flexibility to the existing cruise control limit function, allowing the driver to tune the cruise function to better suit driving preferences and conditions. To select a limit, use the three-position CC Limiter switch on the dash. See Table.7,CC Limiter Switch Settings for switch settings.

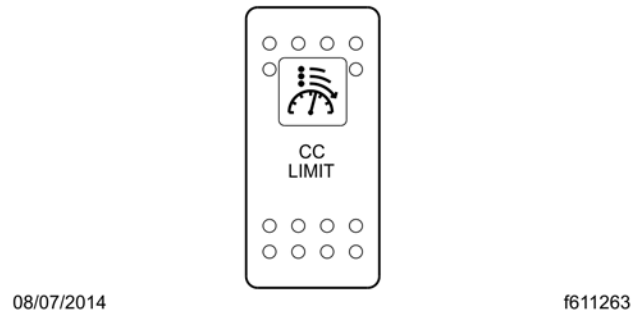


Fig 75, CC Limiter Switch

Table 7, CC Limiter Switch Settings

CC Limiter Switch Settings	
Position	**Approximate Overrun Setting**
Top in	3 mph (5 km/h)
Middle	6 mph (9 km/h)
Bottom in	Unlimited

Table 7, CC Limiter Switch Settings

5.06.04 Descent Control and Deceleration Modes, Detroit™ Automated Transmissions

On vehicles equipped with a Detroit multifunction control (see Fig. 76,Descent Control Mode Positions, Detroit Multifunction Control), the functions of the lever positions for engine brake control change when cruise control is set. Two distinct modes can be activated:

- Descent Control Mode—engine braking keeps the speed below cruise set speed; throttle is not automatically applied
- Deceleration Mode—engine braking activates to reduce vehicle speed (with no lower limit) at a constant rate.

Descent Control Mode

Descent Control Mode keeps the vehicle speed below the set cruise speed on a downhill.

To activate Descent Control Mode, set the cruise control speed with the engine brake on (see Fig. 76,Descent Control Mode Positions, Detroit Multifunction Control, positions 1, 2, or 3). In this mode, all three levels of engine braking will be employed to to keep the speed below the set cruise speed. This mode will not keep the speed above the lower limit of the set speed, so it is possible to eventually coast to a stop, unless the lever is moved to "engine brake off" (position 0), or throttle is applied. After throttle application, the Descent Control Mode is resumed.

Moving the lever to "engine brake off" (position 0) cancels Descent Control Mode and resumes cruise speed. To reactivate Descent Control Mode, reset the cruise control speed with the lever in position 1, 2, or 3.

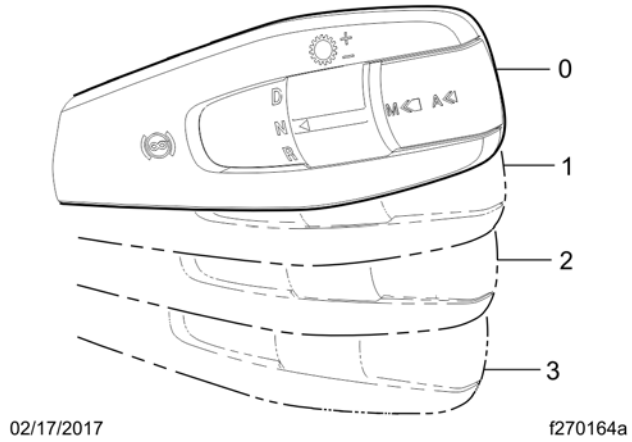


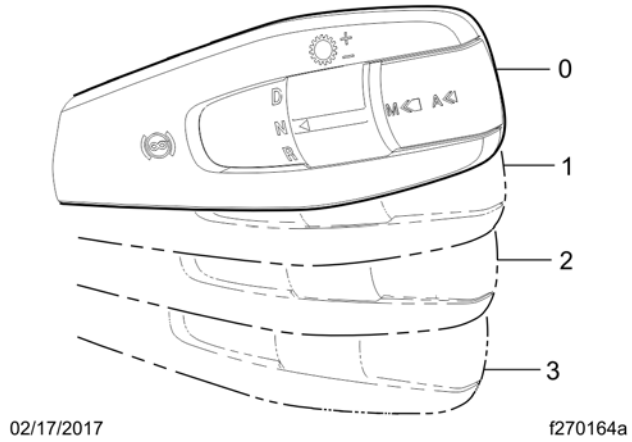
Fig 76, Descent Control Mode Positions, Detroit Multifunction Control

Deceleration Mode

Deceleration Mode reduces the vehicle speed at a constant rate.

With the cruise control speed set, activate Deceleration Mode by moving the lever to engine brake on (see Fig. 77,Deceleration Mode Positions, Detroit Multifunction Control, position 1, 2, or 3). This mode engages one of the engine brake levels, depending on the lever position. The vehicle will decelerate at a constant rate until the vehicle comes to a stop, unless throttle applied to override the deceleration, or the lever is moved to "engine brake off" (position 0).

Moving the lever to position 0 resumes the previously set cruise control speed.



1. Resume cruise control set speed.
2. Low
3. Medium
4. High

Fig 77, Deceleration Mode Positions, Detroit Multifunction Control

5.07 Dash-Mounted Brake Controls

5.07.01 Parking Brake Control Valve

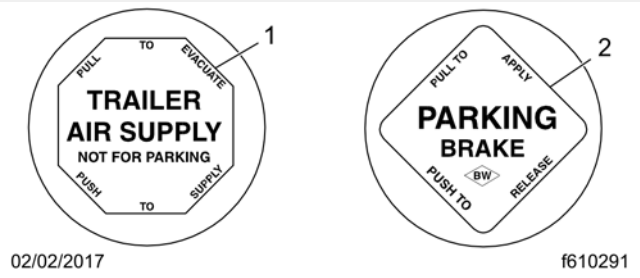
NOTE: See 14.01.01 Brake System General Information for detailed information about brake systems.

NOTICE:

Do not step on the service brake pedal while the parking brakes are applied. To do so can cause damage to the brake mechanisms.

The yellow diamond-shaped knob operates the parking brake valve. See Fig., page . Pull the knob out to apply both the tractor and the trailer spring parking brakes. Push the knob in to release the tractor and trailer spring parking brakes. Before the spring parking brakes can be released, the air pressure in either air brake system must be at least 65 psi (447 kPa).

If the trailer is not equipped with spring parking brakes, pull the parking brake valve out to apply the tractor parking brakes and the trailer service brakes.

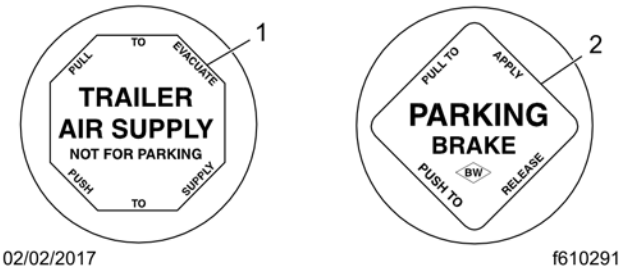


1. Trailer Air Supply Valve (red knob)
2. Parking Brake Control Valve (yellow knob)

Fig 78, Brake Valve Control Knobs

5.07.02 Trailer Air Supply Valve

The red octagonal-shaped knob operates the trailer air supply valve, which charges the trailer air supply system and releases the trailer spring parking brakes. See Fig.79,Brake Valve Control Knobs.



1. Trailer Air Supply Valve (red knob)
2. Parking Brake Control Valve (yellow knob)

Fig 79, Brake Valve Control Knobs

After the vehicle and its air hoses are connected to a trailer and the pressure in the air system is at least 65 psi (447 kPa), push the trailer air supply valve knob in (and leave it in) to charge the trailer air supply system and release the trailer spring parking brakes. Pull the trailer air supply valve out before disconnecting a trailer or when operating a vehicle without a trailer.

5.07.03 Trailer Brake Lever

The trailer brake lever is used to apply the trailer service brakes without applying the truck or tractor service brakes. It is usually mounted on the right-hand control panel. See Fig.80,Trailer Brake Lever. The valve can be partially or fully applied, but in any partially on position it will be overridden by a full application of the service brake pedal. Move the lever down to apply the trailer brakes; move the lever up to release the trailer brakes. The lever will automatically return to the up position when it is released.

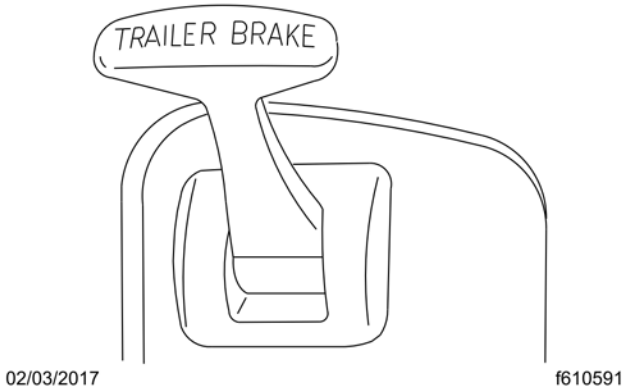


Fig 80, Trailer Brake Lever

5.07.04 Antilock Braking System

The Meritor™ WABCO® Antilock Braking System (ABS) passively monitors vehicle wheel speed at all times, and controls wheel speed during emergency stops or wheel lock situations.

During emergency or reduced-traction stops, fully depress the brake pedal until the vehicle comes to a safe stop. *Do not pump the brake pedal* . With the brake pedal fully depressed, the ABS will control all wheels to provide steering control and a reduced braking distance.

The ABS is designed to communicate with a trailer ABS, if they are compatible. Compatibility will result in the illumination of the trailer ABS lamp during vehicle start-up and fault detection. The trailer ABS lamp will not illuminate unless a compatible trailer is connected to the tractor.

Vehicles with ABS may have Automatic Traction Control (ATC). On these vehicles, the ATC system automatically limits wheel spin during reduced-traction situations. In normal braking applications, the standard air brake system is in effect.

ATC includes a deep snow and mud option to increase available traction on extra-soft surfaces like snow, mud, or gravel. The snow/mud feature will remain active until turned off with the rocker switch, or for the duration of the ignition cycle. A switch labeled ATC will be located on the dash. See Fig.81,ATC Switch. Press the switch to temporarily allow more drive wheel spin. The activation of the deep snow and mud option is indicated by a flashing WHEEL SPIN lamp. Press the switch again to cycle the system back to normal operation.



Fig 81, ATC Switch

NOTICE:

The deep snow and mud option is intended to be used under specific slippery conditions that require momentary increased wheel spin. Using this option for an extended period of time may damage the brake system.

5.08 Windshield Wiper and Washer Controls

NOTICE:

Do not attempt to manually move the windshield wiper arms. Wiper motor damage will occur if the arms are forcibly moved.

The windshield wipers and washer controls are on the multi-function turn signal lever on the left-hand side of the steering column. See Fig.82,Windshield Wiper/Washer Controls.



1. Headlight Control Symbols
2. Windshield Wiper Switch
3. Windshield Washer Switch
4. Turn Signal Symbol

Fig 82, Windshield Wiper/Washer Controls

The wipers are operated by a rotary switch on the turn signal lever. There are five settings, marked on the dial by symbols for off, two intermittent settings, and two continuous speeds.

Turn the wipers on by rotating the rotary switch up. Rotate the switch further to increase the speed of the wipers through the two intermittent settings, then to low and high speeds. Rotate the switch down to slow the wipers down. Rotate the switch as far down as it will go to turn the wipers off.

For wiper intermittent operation, there are two settings. The first intermittent setting has a default interval of 6 seconds, but the interval is programmable from 1 to 25 seconds. To program the interval, rotate the switch from the first intermittent position to the OFF position, wait for the desired interval between wipes to lapse (between 1 and 25 seconds), and then move the switch back to the first intermittent position. If the switch is kept in the OFF position for more than 50 seconds, the interval changes back to the default of 6 seconds. The second intermittent setting has an interval of 1 second, and is not programmable.

The windshield washer button is located at the end of the turn signal lever. Momentarily press the windshield washer button to initiate a single wipe without activating the washer pump. The wipers will swipe one full cycle and return to the inactive position.

To operate the windshield washers, press and hold the button in. After a short delay, the washer will pump windshield washer fluid onto the windshield for as long as the washer button is pressed. The windshield wipers will turn on at low speed while the washer button is pressed. After the button is released, the wipers will continue to operate for one to several wipe cycles, depending on how long the wash button was pressed initially.

5.09 Suspension/Trailer Connection Controls

5.09.01 Air Suspension Height Control Switch

NOTICE:

Do not operate the vehicle over uneven ground such as ramps, speed bumps, curbs, etc. with the air springs deflated. Doing this may lead to air bag separation from the piston, preventing the suspension air springs from re-inflating.

The air suspension height control switch is used to adjust the vehicle height to aid in coupling or uncoupling from a trailer. See Fig.83,Air Suspension Height Control Switch. Setting the switch to DOWN deflates the air springs to lower the rear of the vehicle. In the UP position, the air springs inflate to raise the rear of the vehicle to normal ride height.



Fig 83, Air Suspension Height Control Switch

NOTICE:

Never exhaust air from the suspension while driving. When the air is exhausted, the suspension will not absorb road shocks, and components may be damaged.

A red LED in the switch is illuminated when the suspension is deflated.

5.09.02 ECAS Dash Switches

Vehicles with Electronically Controlled Air Suspension (ECAS) may be equipped with either dash switches (see Fig. 84,ECAS Dash Switches) or a remote control unit, not both.

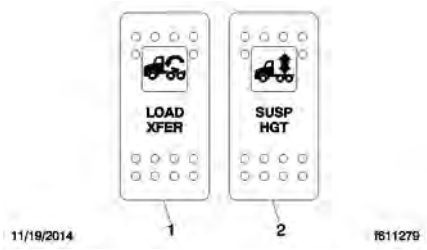


Fig 84, ECAS Dash Switches

LOAD XFER (Load Transfer)

This switch controls the ECAS Manual Load Transfer function by adjusting suspension air pressure. Use this function to minimize wheel slippage in road conditions where traction may be a concern.

The ECAS Load Transfer feature applies the maximum available vehicle load on the drive axle, up to the maximum allowable limit, determined by the gross axle weight rating (GAWR). In bobtail or with a loaded trailer less than the GAWR, the tag axle supports a negligible load while the drive axle supports nearly the full weight. Above the GAWR, the drive axle is loaded with approximately the maximum allowable load and the tag supports the remainder.

Load transfer mode can be deactivated by holding up on the dash switch for 4 seconds. Load transfer mode will automatically deactivate when the vehicle reaches 45 mph (72 kmh).

When Load Transfer mode is active, "Load Transfer" will display in the message field of the driver message center. See Fig. 85,Load Transfer Notification.

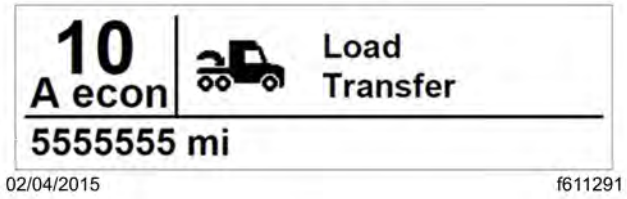


Fig 85, Load Transfer Notification

SUSP HGT (Suspension Height)

If the suspension is at normal height:

- each up press increases the suspension height an increment, unless the suspension is at maximum height
- a down press lowers the suspension to its lowest set-point (usually axle stops)

If the suspension is *below* normal height:

- an up press increases the suspension height to normal ride height
- a down press does nothing; the suspension is already at its lowest point

If the suspension is *above* normal height:

- each up press increases the suspension height an increment, unless the suspension is at maximum height
- a down press lowers the suspension to normal ride height

Messages about the ride height status will display in the message field of the driver message center. See Fig. 86,Example of Ride Height Message.

If the suspension is outside normal ride height (amber lamp on), the ECAS system will automatically return the suspension to normal ride height when vehicle speed reaches or exceeds a set speed (usually set to 5 mph).



Fig 86, Example of Ride Height Message

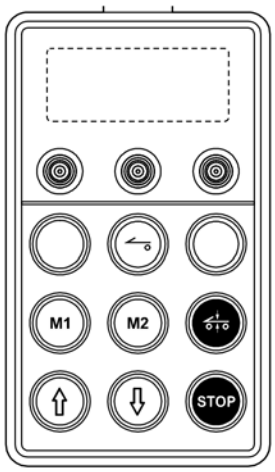
ECAS Standby Mode, Dash Switch

Once the key is turned off, the ECAS will enter Standby mode, remaining powered and adjusting to level and load changes for 1 hour. To cancel Standby mode on vehicles with ECAS dash switches, turn the key from OFF to ON to OFF in less than 1.5 seconds. Confirm the deactivation of standby mode by pressing the SUSP HGT switch, which should not adjust the suspension.

5.09.03 ECAS Remote Control Unit

Some vehicles equipped with Electronically Controlled Air Suspension (ECAS) have a remote control unit to lower and raise the rear suspension. See Table. for keys and functions.

ECAS Remote Control Keys and Functions



02/03/2017 f611211

Key	Function
	Remote Control On/Off. The middle light will remain lit while the remote is active.
M1 M2	Memory keys. Pressing the Stop key and a memory key simultaneously will store the current height. Once stored, pressing the key will adjust the vehicle to the stored height.
	Normal height key. This key will return the vehicle to normal ride height.
	Lift and lower keys. These keys will raise or lower the rear suspension height.
STOP	The Stop key. Pressing the Stop key will interrupt and stop all adjustments being made by the remote control. When the key is off, holding the Stop key for 2 seconds will cancel the 1 hour Standby mode.

If the suspension is outside normal ride height (amber lamp on), the ECAS system will automatically return the suspension to normal ride height when vehicle speed reaches or exceeds a set speed (usually set to 5 mph).

Messages about the ride height status will display in the message field of the driver message center.

ECAS Standby Mode, Remote Control

Once the key is turned off, the ECAS will enter Standby mode, remaining powered and adjusting to level and load changes for 1 hour. To cancel Standby mode on vehicles with a remote control, turn on the remote control then hold the STOP key on the remote for 2 seconds. Confirm the deactivation of standby mode by attempting to turn the remote on and adjust the suspension, which should not be possible.

5.09.04 Fifth Wheel Slide Control Switch

NOTE: Do not activate the fifth wheel slide control valve while the vehicle is in motion. To do so could cause damage to the fifth wheel member, the kingpin, the cab or trailer, and ultimately to the drivetrain.

The fifth wheel air slide switch permits repositioning of the sliding fifth wheel from inside the cab. See Fig. 87,Fifth Wheel Slide Control Switch. Moving the air slide control valve switch to the lock position deactivates the control valve and locks the fifth wheel to the baseplate. Moving the switch to the unlock position activates the control valve and unlocks the fifth wheel slide mechanism, allowing changes to the total length of the tractor-trailer and changes to axle loads to comply with varying jurisdictional laws. For detailed operating instructions for fifth wheel slide, coupling, and uncoupling procedures, see 19.01 Fifth Wheels, General Information.

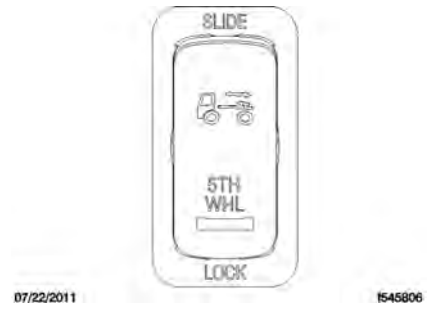


Fig 87, Fifth Wheel Slide Control Switch

5.09.05 Trailer Auxiliary Switch

Trailers that are equipped with pneumatic brakes and used in North America or South America are generally equipped with power for the trailer lights. The connection is passed from the vehicle to the trailer via the primary receptacle, controlled by a dash switch.

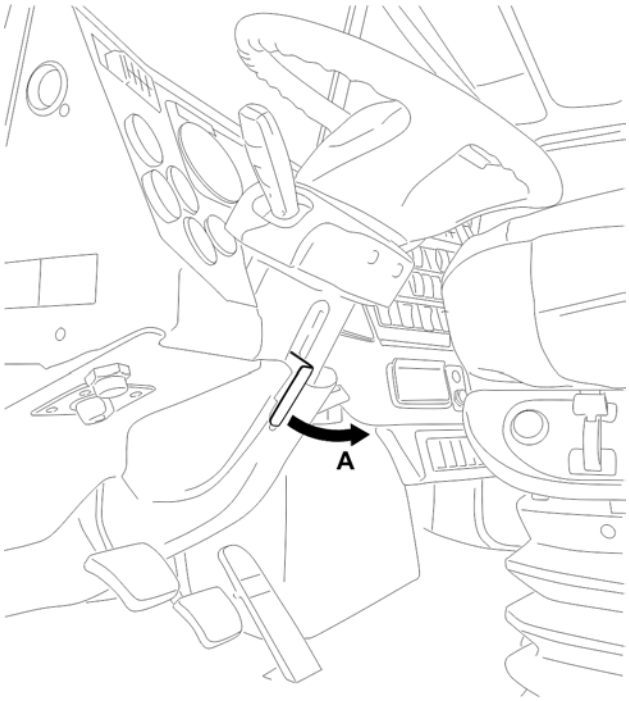
Press the top of the switch to activate the trailer auxiliary function. Press the bottom of the switch to turn trailer auxiliary function off. See Fig.88,Trailer Auxiliary Switch.



Fig 88, Trailer Auxiliary Switch

5.10 Adjustable Steering Column Controls

To unlock the steering column to adjust it, pull the steering column locking lever out and away from the column. See Fig. 89,Steering Column Locking Lever. With the column unlocked, the steering wheel can be adjusted up-and-down and tilted fore-and-aft. Once the wheel is in the desired position, lock the position by pushing the lever in toward the column until it goes no further and is parallel to the column itself.



A. To unlock the steering column for adjustment, pull the lever out and away from the column.

Fig 89, Steering Column Locking Lever

WARNING:
Make sure that the steering column is locked before driving the vehicle. Never attempt to adjust the column while driving the vehicle. Doing so could cause loss of vehicle control, personal injury, and property damage.

5.11 Radio/Bluetooth Controls

Bluetooth controls are located on the steering wheel. Volume up and down buttons are on the left-hand switch pod. Start call, end call, and mute buttons are on the right-hand switch pod. See Fig. 90,Radio/Bluetooth Controls on the Steering Wheel. For additional radio operating instructions, see the radio manufacturer's manual.



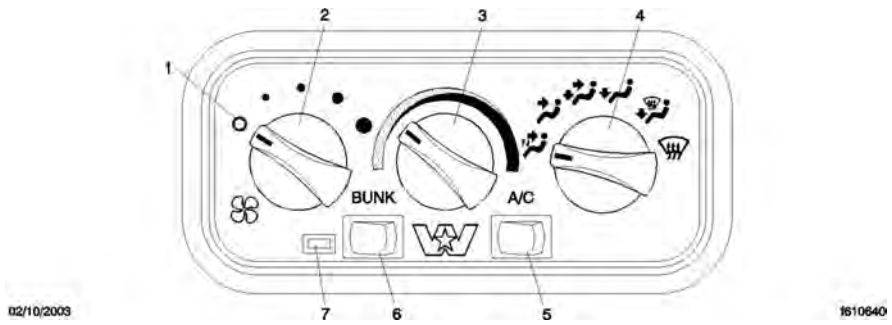
1. Bluetooth—Start Call
2. Mute
3. Bluetooth—End Call
4. Volume Down
5. Volume Up

Fig 90, Radio/Bluetooth Controls on the Steering Wheel

5.12 Climate Controls

NOTE: See 7.01 Climate Control Options for detailed climate control panel operating instructions.

The climate control panel allows you to control the heating, ventilating, defrosting, and air conditioning functions. See Fig. 91,Cab Climate Control Panel, No ATC. Western Star vehicles have several heater and air conditioner options.



1. Fan Off Position
2. Fan Switch
3. Temperature Control Switch
4. Mode Control Switch
5. Air Conditioner Switch
6. Bunk Switch
7. Indicator

Fig 91, Cab Climate Control Panel, No ATC

Options for the cab include:

- heater only
- heater and air conditioner
- heater and air conditioner with automatic temperature control (ATC)

Options for a sleeper unit include:

- no heater or air conditioner
- heater only
- heater and air conditioner
- heater and air conditioner with ATC

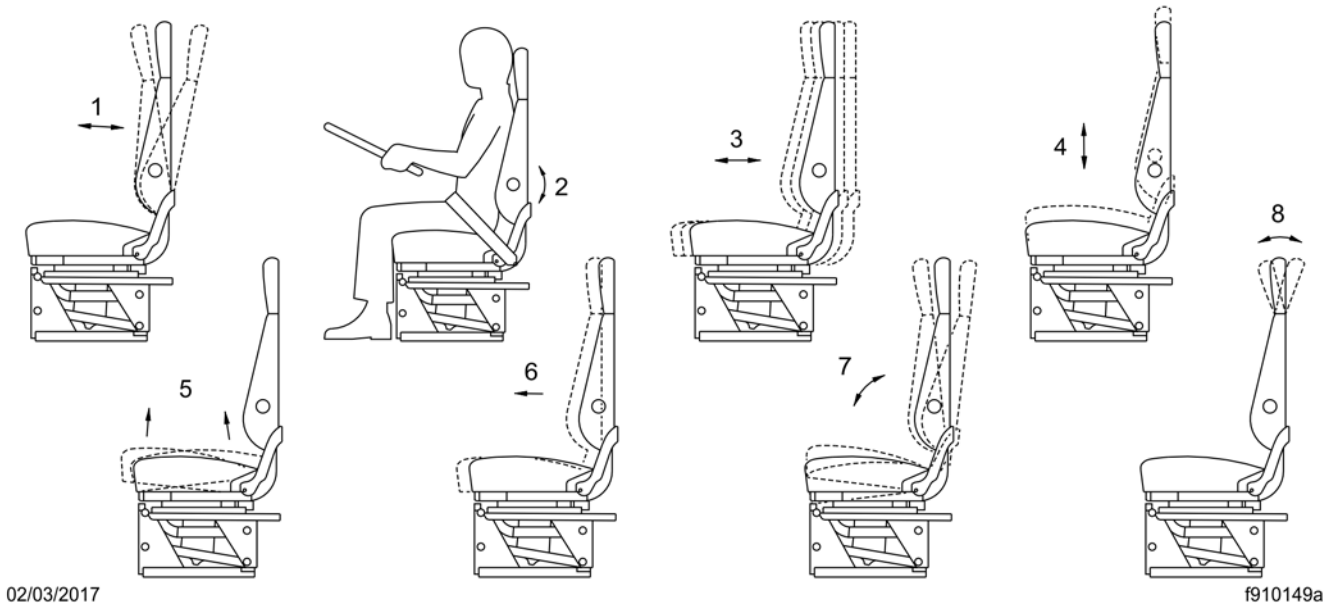
The ATC feature automatically controls the heating and cooling system to maintain the cab and sleeper air temperature close to the temperature set by the user. The ATC adjusts the air temperature blown through the air outlets to maintain the selected temperature.

5.13 Seat Controls

NOTE: See 8.01 Seats, General Information for detailed information about seat controls and adjustments.

WARNING:
Keep hands, tools, and other objects away from the scissor points under the seats. Failure to do so could cause personal injury.

The following is a description of adjustments that can be made to various Western Star seats. Not all seats have all of the adjustments listed below. See Fig.92,General Seat Adjustments.



1. Backrest Tilt
2. Lumbar Support
3. Isolator Feature
4. Height Adjustment
5. Bottom Cushion Angle (fore-and-aft cushion height)
6. Fore-and-Aft Seat Slide (seat track adjustment)
7. Seat Tilt
8. Headrest Adjustment

Fig 92, General Seat Adjustments

1. Backrest Tilt: This adjustment enables the backrest to pivot forward or backward.

2. Lumbar Support: Lumbar support changes the shape of the seat back to give more or less support to the occupant's lumbar (lower back) area. This adjustment is either mechanical or air controlled, depending on make and model of the seat.
3. Isolator: This feature reduces the amount of road shock by isolating the occupant from the motion of the vehicle, and allowing the upper seat to move in a simple pendulum motion. A lockout feature is used whenever the isolator is not desired.
4. Height Adjustment: This adjustment moves the entire seat up or down. The adjustment is either manually- or air-controlled, depending on the make of the seat.
5. Bottom Cushion Angle, or Fore-and-Aft Bottom Cushion Height: This adjustment enables the occupant to raise or lower the front or back of the bottom cushion. This adjustment is easier to perform when all weight is removed from the seat.
6. Fore-and-Aft Seat Slide, or Seat Track Adjustment: This adjustment moves the entire seat forward or backward on its track.
7. Seat Tilt: This adjustment allows the seat assembly (back and bottom cushions) to tilt forward or backward.
8. Headrest Adjustment: This adjustment changes the angle of the upper part of the backrest to provide head and upper back support.

6.01 OnGuardACTIVE™ Collision Mitigation System 96
6.01.01 General Information 96
6.02 AutoVue® Lane Departure Warning System 101
6.02.01 Overview 101
6.02.02 System Startup 102
6.02.03 Intentional Lane Changes 103
6.02.04 Unintentional Lane Departure 104
6.02.05 Alert Warnings 104
6.02.06 SafetyDirect 104
6.02.07 Cleaning the Windshield in the Area of the Camera 104
6.02.08 Temporarily Disabling the System 104
6.02.09 System Offline Indicators 105
6.03 Roll Stability System 105
6.03.01 General Information 105
6.03.02 Roll Stability Advisor 106
6.03.03 Roll Stability Control 107
6.03.04 Hard-Braking Advisor 108
6.03.05 Trip/Leg Totals 108
6.04 Enhanced Stability Control 109
6.05 OnLane™ Lane Departure Warning 110
6.05.01 General Description 110
6.05.02 System Startup 110
6.05.03 Intentional Lane Changes 110
6.05.04 Unintentional Lane Departure 111
6.05.05 Driver Alertness Warning 111
6.05.06 Temporarily Disabling the System 111

6. Driver Assistance Features

6.01 OnGuardACTIVE™ Collision Mitigation System

6.01.01 General Information

WABCO OnGuardACTIVE CMS is a forward-looking radar-based safety system. The system includes forward collision warning, adaptive cruise control (ACC), and collision mitigation.

OnGuard equipped vehicles have antilock brakes (ABS) and automatic traction control (ATC), and either roll stability control (RSC) or electronic stability control (ESC). These systems work together to enhance control of the vehicle. Depending on the situation, any of these features may apply throttle control, engine brakes, and/or service brakes, as needed.

The front-looking antenna assembly transmits radar signals to, and receives them back from, objects ahead of the vehicle. To be detected, vehicles must be within the radar field of view and provide a surface area that can reflect the radar. The distance, speed, and angle of the vehicle ahead is calculated, and the driver is warned of potentially dangerous situations. The system also warns of stationary objects to alert the driver of potential obstructions ahead in their lane.

WARNING:

The WABCO OnGuardACTIVE Collision Mitigation System is intended solely as an aid for an alert and conscientious professional driver. It is not intended to be relied upon to operate a vehicle. Use the system in conjunction with rearview mirrors and other instruments to safely operate the vehicle. Operate a vehicle equipped with OnGuardACTIVE in the same safe manner as if the CMS were not present.

The OnGuardACTIVE Collision Safety System is not a substitute for safe, normal driving procedures, nor will it compensate for any driver impairment such as drugs, alcohol, or fatigue.

Failure to drive safely and use the system properly could result in personal injury and/or death and severe property damage.

System Limitations

The OnGuardACTIVE Collision Mitigation System may provide little or no warning of hazards such as pedestrians, animals, oncoming vehicles, or cross traffic.

The OnGuardACTIVE CMS only brakes for lead vehicles located directly in front of your vehicle, and does not operate when vehicle speed is less than 15 mph (25 km/h).

Due to these limitations, the system:

- will not react and alert the operator to objects crossing in front of the vehicle or oncoming traffic;
- should not be relied on to track lead vehicles when traveling through a severe curve in the road. Because of this, ACC is not recommended for use on winding roads;
- should not be relied upon to track narrow objects like motorcycles, mopeds, bicycles, or pedestrians;
- should not be relied on to alert drivers to vehicles in an adjacent lane.

OnGuard Display Unit

The OnGuardACTIVE CMS controls are located in the display unit. The display provides visual and audible warnings and messages, as well as verification of correct system operation and faults. Menu selections are made by pressing the up and down arrows, and the MODE button. See Fig.93,OnGuard Display Unit.



1. Mode
2. Day/Night Mode
3. Up
4. Down

Fig 93, OnGuard Display Unit

The display unit includes:

- an internal speaker
- a graphic display
- buttons to scroll and select options
- day/night display mode (second-generation only)

Collision Mitigation System (CMS)

The CWS generates audible, visual, and vibrational alerts when the following distance may result in a collision. The On-Guard display unit shows a graphic of the condition, enhanced by a screen color relevant to the intensity of the situation. See Table.8,OnGuard Display Screen Background Colors. If a potential rear-end collision is imminent, OnGuard's active braking automatically applies the engine and service brakes to slow the vehicle. The active braking application is intended only to provide early braking; the driver is still required to recognize and react to all driving situations.

IMPORTANT: CMS and active braking are not operational at vehicle speeds below 15 mph (25 km/h).

Table 8, OnGuard Display Screen Background Colors

OnGuard Display Screen Background Colors	
Screen Color	**Description**
Blue	General operation; no lead vehicles detected.
Green	Lead vehicle detected.
Yellow	Following distance alert, accompanied by an audible alert.
Red	Collision warning, stationary object warning. Accompanied with audible alert.
Amber	Data Error

Table 8, OnGuard Display Screen Background Colors

Standby

When no lead vehicle is detected, the display shows that the CMS is on and the radar is searching. See Fig. 94,CMS Standby (blue).

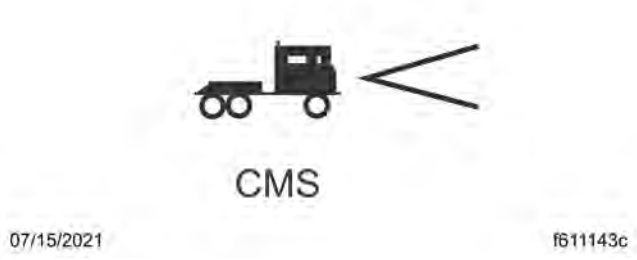


Fig 94, CMS Standby (blue)

A Vehicle is Detected

When a lead vehicle is detected in the lane ahead, the display shows that the CMS is on and the radar is tracking a lead vehicle at the speed shown. See Fig.95,CMS Lead Vehicle Detected (green).

If the following distance between the vehicle and the lead vehicle is too close, the CMS will emit an audible alert and the display background will turn yellow. The alert will end when the vehicle speed drops below the lead vehicle speed and the following distance is increased.

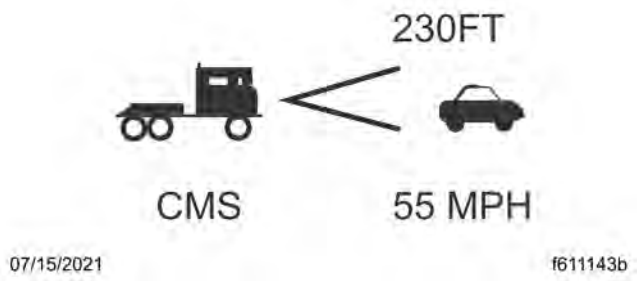


Fig 95, CMS Lead Vehicle Detected (green)

Collision Warning

When a lead vehicle is detected traveling slower than your vehicle, or the gap between them becomes too close, the CMS warns of an impending collision by emitting an urgent audible alert and displaying the collision warning symbol with a red background. See Fig.96,CMS Collision Warning (red).

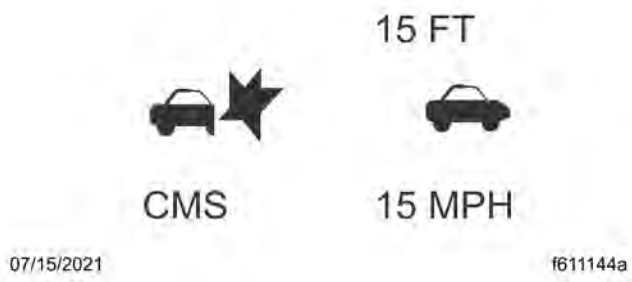


Fig 96, CMS Collision Warning (red)

Adaptive Cruise Control (ACC)

ACC works in conjunction with conventional cruise control to maintain a minimum following distance when a lead vehicle is being tracked. The minimum following distance is maintained by automatically decelerating the vehicle using throttle, engine, and service brakes without driver intervention. When the lead vehicle is no longer being tracked, the set cruise control speed resumes automatically.

Standby

When no lead vehicle is detected, OnGuard ACC operates similarly to conventional cruise control. The cruise control set speed is shown on the OnGuard display unit. See Fig.97,ACC Standby (blue).

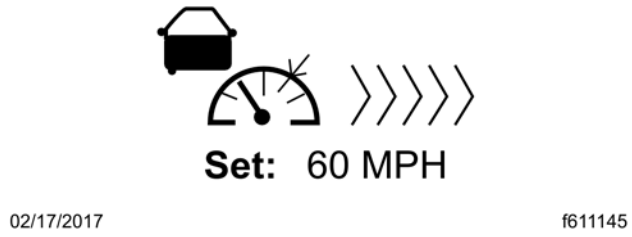


Fig 97, ACC Standby (blue)

Lead Vehicle Detected

When a lead vehicle is detected in the lane ahead, the display shows that ACC is on and the radar is tracking it. See Fig. 98,ACC Lead Vehicle Detected (green).

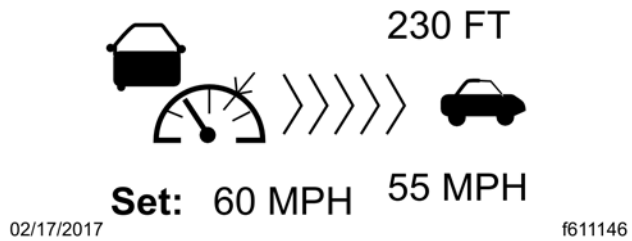


Fig 98, ACC Lead Vehicle Detected (green)

If the driver uses the accelerator pedal to override the cruise control and approach a vehicle too closely, the ACC will emit an audible alert and the display background will turn yellow. The alert will end when vehicle speed drops below the lead vehicle's speed and the following distance is increased.

NOTE: The following distance alert does not operate at speeds below 15 mph (25 km/h) or above 77 mph (124 km/h).

Collision Warning

If the lead vehicle is traveling slower than the driver's vehicle, the CMS warns of an impending collision by emitting an urgent audible alert and displaying the collision warning symbol with a red background. See Fig.99,ACC Collision Warning (red).

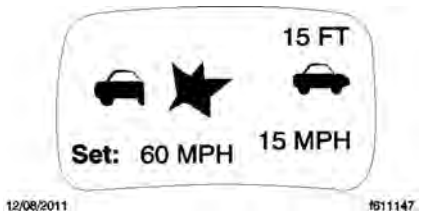


Fig 99, ACC Collision Warning (red)

The braking control will activate and slow the vehicle. The driver must also initiate braking.

Error Screens

IMPORTANT: The OnGuard collision mitigation system is not operational when an error screen is displayed. If a fault occurs or OnGuard fails to properly track a vehicle, take the vehicle in for service as soon as possible. Standard cruise control will not function with an active OnGuard system fault.

If a system fault is detected, the OnGuard display unit will immediately display an error screen as shown in Fig. 100,OnGuard Error Screen (amber). The first error code transmitted will be displayed first; additional faults (if any) can be viewed using the up or down buttons. The display does not show stored fault codes.

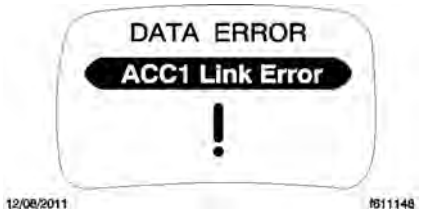


Fig 100, OnGuard Error Screen (amber)

Refer to the **OnGuard and OnGuardActive Collision Mitigation Systems Maintenance Manual** for a full list of error screens and messages. (www.meritorwabco.com).

Additional Features

Press the MODE button to access the OnGuard display unit additional features from the CMS or ACC main operating screen. Press the up and down arrows to scroll through each menu, then press the MODE button to select the value to be changed. In edit mode, press the up or down arrows to change a value setting, then press the MODE button to save the setting. Pressing MODE in each feature screen advances the display to the next feature.

The Display Control menu allows adjustment of the alarm volume, LCD brightness, LCD contrast, and U.S./metric unit conversion. See Fig.101,Display Control Menu.

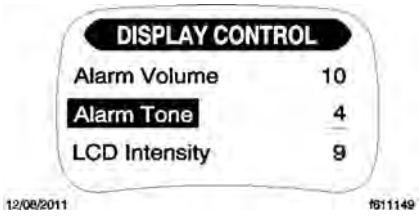


Fig 101, Display Control Menu

The component test menu provides verification of system component operation and acts as a valuable OnGuard system diagnostic tool. The header will display either COMPONENT TEST or ACC FUNCTION, depending on the software release version of the OnGuard system. The component test screen shown in Fig.102,Component Test Menu provides access to the following components (press the up or down arrows to scroll through the menu):

- brake pedal position

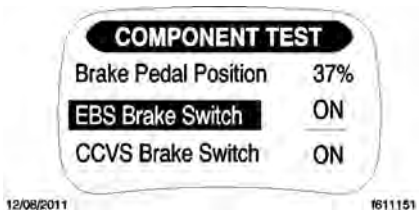


Fig 102, Component Test Menu

- EBS brake switch
- CCVS brake switch
- clutch switch
- park brake switch
- accelerator pedal position
- driveline engaged
- cruise control enable
- cruise control set speed switch
- cruise control coast switch
- cruise control resume switch
- cruise control accelerate switch
- cruise control pause switch

6.02 AutoVue® Lane Departure Warning System

6.02.01 Overview

NOTE: The Bendix AutoVue LDW system option became available in 2019.

AutoVue is a camera-based warning system that helps a driver avoid unintentional lane departure.

A camera mounted near the top center of the vehicle windshield tracks visible lane markings to monitor the vehicle's position within the lane. When the vehicle crosses lane markings without the turn signal being activated, AutoVue gives an audible warning.

WARNING:

The AutoVue Lane Departure Warning (LDW) system is intended only as an aid for a conscientious and alert driver. It may not warn of unintended lane departures under certain conditions. It does not warn of all possible hazards. Do not rely solely on the system to safely operate the vehicle.

The system cannot help prevent an accident if the driver is impaired or not driving safely.

Ultimate responsibility for the safe operation of the vehicle remains with the driver at all times.

6.02.02 System Startup

AutoVue activates when the ignition is turned on. Lane departure warnings are active only when the vehicle is traveling at or above 37 mph (60 kph).

At start-up the system performs a self-test. It then plays a brief clip of the "rumble strip" alert sound, first through the left speaker, then the right. The red 'enabled' lamp on the LANE ALERT switch (see Fig. 103,Western Star LANE ALERT Switch) and the 'lane searching' dash indicator (see Fig. 104,Lane Searching Dash Indicator then illuminate.



1. Red Enabled Lamp

Fig 103, Western Star LANE ALERT Switch

The red 'enabled' switch lamp will go OFF under the following conditions:

- the driver temporarily disables the system,
- an active diagnostic trouble code (DTC) is present.



06/02/2021 f611314b

Fig 104, Lane Searching Dash Indicator

The 'lane searching' dash indicator will remain ON under the following conditions:

- vehicle speed is below 37 mph (60 kph),
- an active diagnostic trouble code (DTC) is present.

WARNING:

If the system cannot discover right or left lane markings, the AutoVue Lane Departure Warning system may not deliver expected alerts or erroneous alerts may occur.

Missed and false alerts may occur in the following situations:

- Lane markings are difficult to distinguish due to standing water, snow, ice, mud, sand, dirt, or other debris on the road.
- Lane markings are hidden or obscured by heavy rain, fog, falling snow or sleet, or blowing smoke.
- Lane markings are missing or faded.
- Sun glare or other light sources blind the camera, obscuring lane markings or making other road markings (e.g. tar strips) look like lane markings.
- The camera's view through the windshield glass is blocked or obscured by dirt, chips, cracks, or some other distortion.
- the camera is mis-installed
- Headlights are not operating or are mis-aligned.

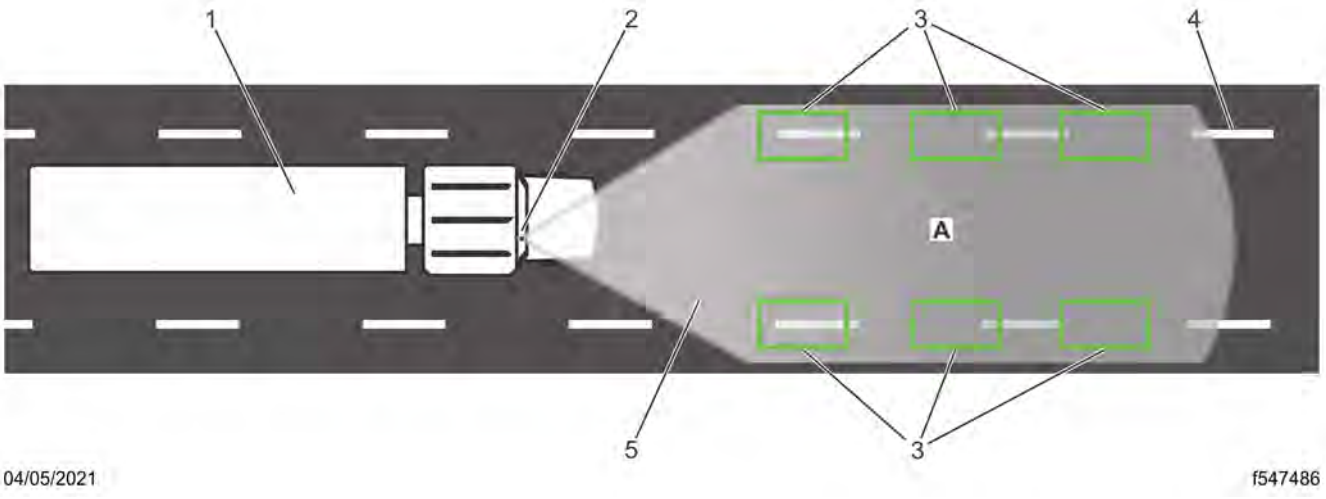
It is always the responsibility of the driver to remain vigilant and change driving practices to suit traffic and road conditions.

6.02.03 Intentional Lane Changes

NOTE: The Bendix AutoVue LDW system option became available in June 2021.

At or above 37 mph (60 kph), the AutoVue LDW system tracks both solid and dashed shoulder lines, center lines, and the lines between lanes. For a representation of the camera's field of view, see Fig.105,Camera Field of View.

The system identifies intentional lane changes by monitoring the turn signal. When a lane change is made with the turn signal on, no warnings are made.



1. Camera Field of View
2. Equipped Vehicle
3. Windshield Mounted Camera
4. Lane Measurement Zones
5. Painted Road Stripes
6. Lane Position Evaluation Zone

Fig 105, Camera Field of View

6.02.04 Unintentional Lane Departure

NOTE: The Bendix AutoVue LDW system option became available in June 2021.

When a lane change takes place without the turn signal being activated, the system alerts the driver to make a correction. The alert will come from the side of the vehicle crossing the lane markings.

6.02.05 Alert Warnings

NOTE: The Bendix AutoVue LDW system option became available in June 2021.

The AutoVue LDW system uses speakers that emit a distinctive "rumble strip" sound on the appropriate side of the cab to alert a driver of an unintentional lane departure. Audible alert volume levels are set at the factory and cannot be adjusted.

6.02.06 SafetyDirect

NOTE: The Bendix AutoVue LDW system option became available in June 2021.

When triggered by a truck safety event, the AutoVue LDW system records ten seconds of video and transmits it to the SafetyDirect portal. Fleet managers can use the video along with vehicle sensor information to enhance driver training and road safety.

6.02.07 Cleaning the Windshield in the Area of the Camera

NOTE: The Bendix AutoVue LDW system option became available in June 2021.

Make sure that the windshield is always kept clean and unobstructed in the area of the camera.

The driver should switch on the windshield wiper to clean the windshield and remove snow and ice to avoid incorrect lane detection.

If this area of the windshield is damaged, the AutoVue LDW system may not work as intended. If this happens, the windshield must be replaced.

6.02.08 Temporarily Disabling the System

The system can be temporarily disabled by pressing the LANE ALERT switch; when the system is disabled, the red 'enabled' lamp will go OFF. See Fig.106,Western Star LANE ALERT Switch. The system will re-enable itself after 15 minutes. Warnings can be enabled sooner by pressing the switch again.



1. Red Enabled Lamp

Fig 106, Western Star LANE ALERT Switch

6.02.09 System Offline Indicators

NOTE: The Bendix AutoVue LDW system option became available in June 2021.

If the AutoVue LDW system goes offline while vehicle speed is at or above 37 mph (60 kph), the lane searching dash indicator will appear and the amber light in the LDW OFF switch will go out. Conditions that may cause this include:

- undetectable lane markings;
- an obscured camera lens;
- a system diagnostic trouble code (DTC).

If the lane searching dash indicator stays ON for a long period of time with the vehicle speed at or above 37 mph (60 kph) and the amber enabled lamp on the LDW OFF switch remains ON despite depressing the switch, the system requires calibration services at an authorised dealer.

6.03 Roll Stability System

6.03.01 General Information

The roll stability system may include the roll stability advisor (RSA) only, or it may also include the roll stability control (RSC).

A decal (see Fig.107,Roll Stability Decal) on the auxiliary dash panel, and an amber-colored dash indicator light (see Fig. 108,Roll Stability Indicator Lamp), indicate that the vehicle is equipped with roll stability system components.



Fig 107, Roll Stability Decal



Fig 108, Roll Stability Indicator Lamp

6.03.02 Roll Stability Advisor

IMPORTANT: This is not an advance warning system. The roll stability advisor displays a message only after the driving maneuver is completed.

The roll stability system uses a lateral-acceleration sensor that monitors rollover risk. Shortly after a curve, lane change, or other driving maneuver that results in a rollover-risk detection, a dash warning light illuminates, an audible tone sounds, and a driver advisory message is displayed in the driver message center. The purpose is to advise the driver that the previous maneuver produced a rollover risk.

The roll stability advisor displays different text messages depending on the severity of the risk of each occurrence of risky driving. From the highest risk level to the lowest risk level, the system will sound an audible alert, and display a message, as shown in Fig.109,Roll Stability and Hard-Braking Warnings.

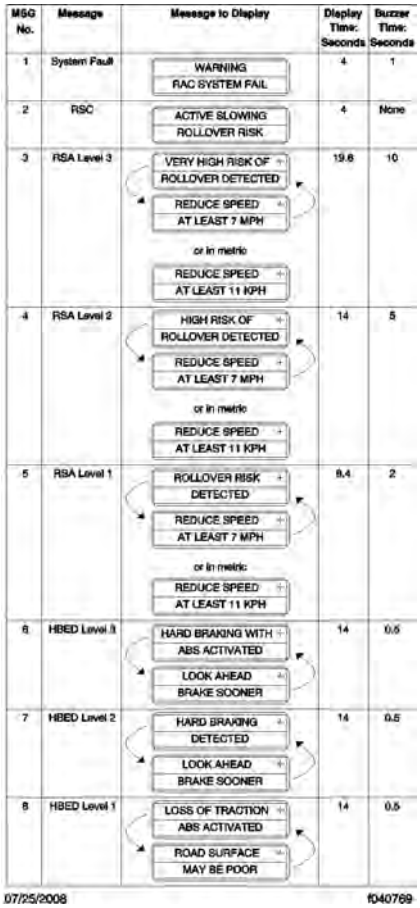


Fig 109, Roll Stability and Hard-Braking Warnings

NOTE: The system will calculate and recommend a speed reduction value. It may be different than the values shown here.

Bring the vehicle to an authorized service facility if a system failure message is displayed.

6.03.03 Roll Stability Control

WARNING:

The Roll Stability Control system is intended only as an aid for a conscientious and alert driver. Carefully read the information in this manual to understand this system and its limitations. The Roll Stability Control system is not a substitute for safe driving procedures. Failure to drive safely, and use the system properly, could result in personal injury and/or death and property damage.

The roll stability control system automatically reduces engine power, applies the engine brake, and/or applies the tractor and trailer brakes when the acceleration sensor detects that the vehicle is at risk of rolling over. The control can intervene even before an advisory message is displayed.

The dash indicator light illuminates whenever the roll stability control system intervenes.

6.03.04 Hard-Braking Advisor

The hard-braking advisor uses the information from the ABS wheel speed sensors to determine when braking is severe enough to produce lockup at one or more wheels on the tractor, and/or very rapid vehicle deceleration. Shortly after a hard-braking event occurs, an advisory message is displayed in the driver message center, indicating that the braking behavior was too aggressive for the current road surface conditions. This system is not a replacement for a driver's good judgment. Sometimes it is necessary to brake hard.

From the highest risk level to the lowest risk level, the system will sound an audible alert, and display a message, as shown in Fig.110,Roll Stability and Hard-Braking Warnings.

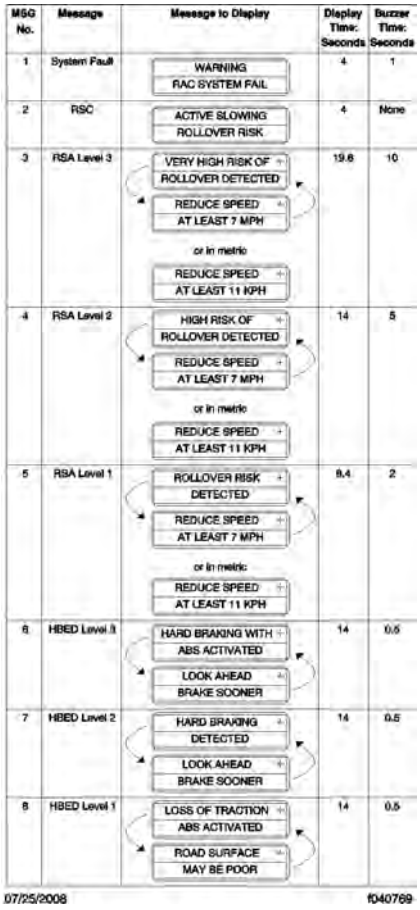


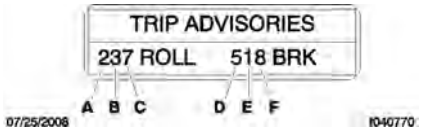
Fig 110, Roll Stability and Hard-Braking Warnings

6.03.05 Trip/Leg Totals

The driver message center records the number of messages received, and displays the number of messages as counts. Roll stability advisor (RSA) and hard-braking event data (HBED) counts can be viewed in the trip advisory screen, and the leg advisory screen.

Counts can be reset using the + key on the steering wheel. Clearing RSA and HBED leg counts will also reset the leg miles and leg hours. Clearing RSA and HBED trip counts will also reset trip miles, trip hours, leg miles, leg hours, and leg advisory counts. In addition, resetting leg miles will clear leg counts. Clearing trip miles will reset miles, hours, and counts in both the leg and trip screens.

The TRIP and LEG advisor screens count both the roll stability advisories (ROLL) and hard-braking events (BRK). For example, if during a TRIP, the driver message center recorded the events in see 9,RSA/HBED Count , the message center would display as shown in Fig.111,Trip Advisor Message Screen.



A. RSA lev. 3 Count (2)
B. RSA lev. 2 Count (3)
C. RSA lev. 1 Count (7)
D. HBED lev. 3 Count (5)
E. HBED lev. 2 Count (1)
F. HBED lev. 1 Count (8)

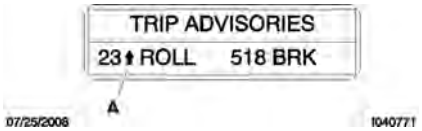
Fig 111, Trip Advisor Message Screen

Table 9, RSA/HBED Count

RSA/HBED Count	
Message Received	**Message Counts**
RSA Level 3	2
RSA Level 2	3
RSA Level 1	7
HBED Level 3	5
HBED Level 2	1
HBED Level 1	8

Table 9, RSA/HBED Count

If the count reaches more than 9 occurrences an up-arrow symbol will appear, to indicate to the driver that the count has exceeded 9 counts. See Fig.112,Trip Advisor Message Screen (more than 9 counts).



A. RSA Lev. 1 has more than 9 counts.

Fig 112, Trip Advisor Message Screen (more than 9 counts)

6.04 Enhanced Stability Control

WARNING:
Enhance Stability Control (ESC) is intended only as an aid for a conscientious and alert driver. Carefully read the information in this manual to understand this system and its limitations. ESC is not a substitute for safe driving procedures. Failure to drive safely, and use the system properly, could result in personal injury and/or death and property damage.

ESC offers the full capability of RSC (shown above) with the added capability of complete directional stability (yaw control) in oversteer and understeer conditions to reduce the likelihood of drift-out or jackknife. The system determines where the

driver is attempting to steer the vehicle and how much brake demand is required in order to more precisely control the vehicle in an emergency situation.

ESC works by constantly comparing the driver’s intention with the vehicle's actual behavior. The system does this by monitoring systems such as wheel speed, steering angle, yaw rate, lateral acceleration, throttle position, and brake application. A central microcomputer analyzes the collected data and triggers a response to keep the vehicle on course when an unstable condition is detected.

When the system detects that the vehicle is at risk of oversteering or understeering, it applies individual tractor wheel end brakes and trailer brakes, activates the engine retarder (if equipped), and/or cuts engine power, depending on the severity. As a result, the driver has full control over the vehicle until the system detects a potential risk and intervenes accordingly. ESC operates automatically; the driver does not monitor or activate the system.

6.05 OnLane™ Lane Departure Warning

6.05.01 General Description

NOTE: The Wabco OnLane Lane Guidance system was an option prior to 2020.



WARNING:

OnLane lane departure warning is intended only as an aid for a conscientious and alert driver. The system may not indicate lane departures under certain conditions. Read the information in this manual to understand the circumstances under which this system may not provide adequate lane departure warnings. Do not rely solely on the system to safely operate the vehicle. The system does not warn of all possible hazards. For example, the system cannot prevent an accident if the driver is impaired or not driving safely.

The lane departure warning system is not a substitute for safe driving procedures.

Failure to drive safely and use the system properly could result in personal injury and/or death and severe property damage.

OnLane is a camera-based warning system that helps the driver avoid unintentional lane drifting.

The system utilizes a camera mounted near the top center of the vehicle windshield, which calculates vehicle position within the lane. When the vehicle crosses lane markings without the turn signal being activated, OnLane sounds an audible warning.

The Driver Alertness Warning (DAW) system provides a warning when weaving or erratic driving is detected within the driving lane.

6.05.02 System Startup

OnLane is activated when the vehicle ignition is turned on. Lane departure warnings are active only when the vehicle is traveling at 42 mph (68 kph) or above.

6.05.03 Intentional Lane Changes

The system identifies intentional lane changes by monitoring the turn signal, the brake switch, and vehicle speed. When a lane change is intentional, the assistance warnings are disabled. The following conditions will disable/enable the warnings:

- If brake lights are ON, all warnings are disabled
- If the Left Turn Signal is ON, left departure warnings are disabled
- If the Right Turn Signal is ON, right departure warnings are disabled
- If the vehicle’s speed is under 42 mph (68 kph), all warnings are disabled
- If the hazard lights are ON, all warnings are enabled

6.05.04 Unintentional Lane Departure

The system constantly monitors and calculates the vehicle's position within the lane. In the event of an unintentional lane change, the system provides an audible warning (rumble strip noise). The audible warning will terminate once the vehicle is guided back into the lane.

6.05.05 Driver Alertness Warning

The system detects erratic driving based on weaving behavior within the driving lane. OnLane computes a "Driver Alertness Index" based on driving performance, and alerts the driver when it falls below a certain threshold. DAW warns the driver by providing an intermittent warning tone when it detects erratic driving or weaving within the driving lane. The alert terminates when driving performance improves, or when the key is cycled.

6.05.06 Temporarily Disabling the System

The system can be temporarily disabled by pressing the OnLane switch. This disables warnings for 15 minutes. Warnings can be enabled by pressing the OnLane switch again.

7.01 Climate Control Options 114
7.02 Cab Climate Control Panels 114
7.03 Sleeper Climate Control Panels 117
7.04 Parked HVAC 120
7.05 Accessory Heaters 122
7.05.01 Espar Heater 122
7.05.02 Webasto Heater 124

7. Climate Controls

7.01 Climate Control Options

The climate control panel allows you to control the heating, ventilating, defrosting, and air conditioning functions. Western Star vehicles have several heater and air conditioner options.

Options for the cab include:

- heater and air conditioner
- heater and air conditioner with automatic temperature control (ATC)

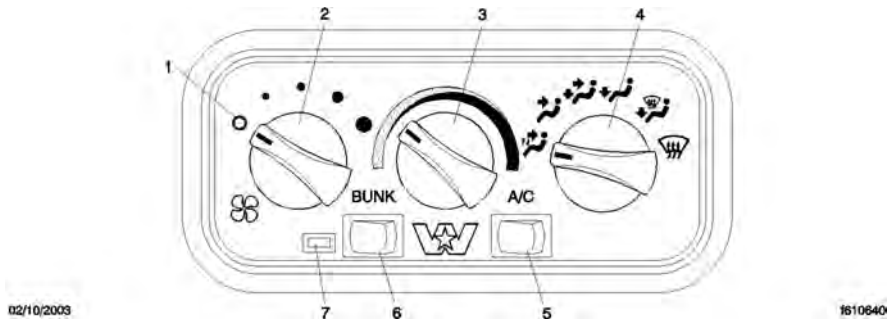
Options for a sleeper unit include:

- no heater or air conditioner
- heater only
- heater and air conditioner
- heater and air conditioner with ATC

The ATC feature automatically controls the heating and cooling system to maintain the cab and sleeper air temperature close to the temperature set by the user. The ATC adjusts the air temperature blown through the air outlets to maintain the selected temperature.

7.02 Cab Climate Control Panels

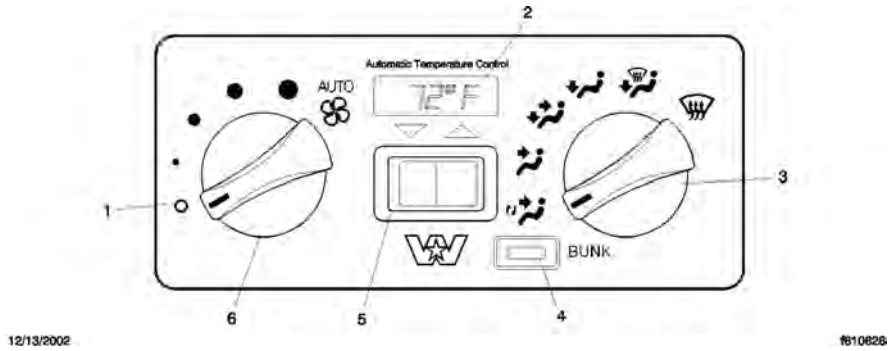
The standard cab climate control panel has a fan switch, a temperature control switch, and a mode control switch that allows the driver to control heating, cooling, defrosting, and ventilating. The control panel may also be equipped with an optional A/C switch and/or an optional BUNK switch. See Fig.113,Cab Climate Control Panel, No ATC.



1. Fan Off Position
2. Fan Switch
3. Bunk Switch
4. Indicator
5. Temperature Control Switch
6. Mode Control Switch
7. Air Conditioner Switch

Fig 113, Cab Climate Control Panel, No ATC

Vehicles equipped with ATC have an LED display. See Fig.114,Cab Climate Control Panel With ATC.



1. Fan Off Position
2. LED Display
3. Mode Control Switch
4. Bunk Switch (optional)
5. Temperature Up/Down Switch
6. Fan Switch

Fig 114, Cab Climate Control Panel With ATC

Controls

Fan Switch

The fan switch activates the fan, which forces fresh air or recirculated air through the air outlets. The fan switch has four fan speed settings and an off position. See Fig.113,Cab Climate Control Panel, No ATC.

To operate the fan switch, turn the fan switch clockwise to increase airflow; turn the fan switch counterclockwise to decrease airflow.

On vehicles equipped with ATC, the AUTO setting on the fan switch places the heater and air conditioner system in the automatic fan speed control mode. When the fan switch is set to AUTO, the fan speed will vary as necessary to maintain the temperature set by the user.

Temperature Control Switch

To select the desired temperature:

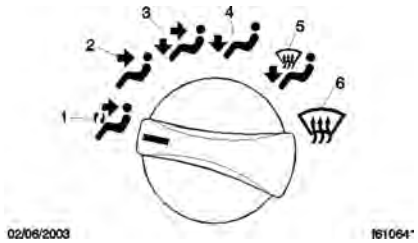
- *Vehicles Without ATC:* Turn the switch to the left (counterclockwise) for cool air, or to the right (clockwise) for hot air.
- *Vehicles With ATC:* Press and release the right side of the temperature up/down switch to increase the temperature to the desired setting. Press and release the left side of the temperature up/down switch to decrease the temperature to the desired setting. Press and hold the temperature up/down switch to change the desired temperature in large increments.

Mode Control Switch

The mode control switch allows the driver to control the flow of air through the face outlets, the floor outlets, the defrost (windshield) outlets, or a combination of these outlets to provide six air selection modes. See Fig. 115,Mode Control Switch Settings.

- *Face Mode (using recirculating air):* Directs all airflow through the face or instrument panel outlets, using recirculated air.
- *Face Mode (using fresh air):* Directs all airflow through the face or instrument panel outlets, using fresh air.
- *Bi-Level Mode:* Directs the airflow equally to the face outlets and the floor outlets.
- *Floor Mode:* Directs all airflow through the floor outlets.
- *Floor/Defrost Mode:* Directs the airflow equally to the floor outlets and the defrost outlets.
- *Defrost Mode:* Directs all airflow through the defrost outlets.

NOTE: The face mode using recirculating air is the only mode that recirculates the air in the cab. All other modes draw in fresh air from outside the vehicle.



1. Face Mode (recirculating air)
2. Face Mode (fresh air)
3. Bi-Level Mode
4. Floor Mode
5. Floor and Defrost Mode
6. Defrost Mode

Fig 115, Mode Control Switch Settings

Bunk Switch

The optional BUNK switch allows the driver to control the sleeper heater and air conditioner from the cab. Press the BUNK switch to turn the sleeper heater and air conditioner on. When the bunk switch is on, the indicator light is on. The sleeper heater and air conditioner can still be controlled from the sleeper when the BUNK switch is on.

Air Conditioner (A/C) Switch

The air conditioner cools and dehumidifies the air inside the cab. Press the optional A/C switch to turn the air conditioner on or off. When the air conditioner is on, the A/C switch illuminates.

IMPORTANT: Operate the air conditioner at least five minutes each month, even during cool weather. This helps prevent drying and cracking of the refrigerant compressor seals and reduces the chance of refrigerant leaks in the system.

LED Display, Vehicles With ATC Only

The LED display shows the temperature to which the heater or air conditioner has been set in degrees Fahrenheit or degrees Celsius.

Changing Temperature Units

The temperature units can be changed from Fahrenheit (°F) to Celsius (°C) or from Celsius to Fahrenheit by turning the ignition on, turning the fan switch off, and pressing and holding the left side of the temperature up/down switch for five seconds. The current temperature unit will then be shown on the LED display. Press the left side of the temperature up/down switch again to toggle between °F and °C. Changing the temperature units on the cab climate control panel will also effect the sleeper climate control panel.

Error Codes

Error codes can be displayed by turning the ignition on, turning the fan switch off, and pressing and holding the right side of the temperature up/down switch for five seconds. The current error status will be shown on the LED display. Press the right side of the temperature up/down switch again repeatedly to scroll the display through any existing error codes. If an error code is displayed, contact your Western Star dealer for service.

Modes

Recirculation Mode

WARNING:

Do not use the recirculation mode when the heater is on and the vehicle is in motion. Driving with the recirculation mode on while the heater is on may cause the windows to be obscured by moisture or ice, which could result in an accident possibly causing personal injury or property damage.

Do not use the recirculation mode for more than 20 minutes at a time because the air inside the cab may become stuffy and the windows may become obscured by moisture, which could result in an accident possibly causing personal injury or property damage.

When the mode control switch (see Fig.115,Mode Control Switch Settings.) is turned to the face mode using recirculating air, the air in the cab is recirculated through the heater and air conditioner system. This is the only mode that uses recirculated air. Fresh air, or outside air, is circulated through the heating and air conditioning system when any other mode is selected.

The recirculation mode can be used to prevent dusty or smoky air from entering the cab, or to decrease the time required to cool or heat the cab interior during extreme outside temperature conditions. When the outside air is clear or the desired cab temperature is reached, change the mode control switch to a fresh-air mode. The recirculation mode can be used when the air conditioner is on whether the vehicle is moving or not.

Defrost Mode

The defrost mode is used to deice, defrost, or defog the windows.

NOTE: When the defrost mode is on, the air conditioner is on. The air conditioner is used to dehumidify the air entering the cab and to remove the moisture from the windshield.

7.03 Sleeper Climate Control Panels

The standard sleeper climate control panel has a fan switch, a temperature control switch, and a power switch that allow you to control the heating and air conditioning functions in the sleeper. A vehicle with an air conditioner has an air conditioner switch on the control panel. See Fig.116,Sleeper Climate Control Panel, No ATC.

Vehicles with ATC have button controls instead of switch controls. See Fig.117,Sleeper Climate Control Panel With ATC.

Controls, Vehicles Without ATC

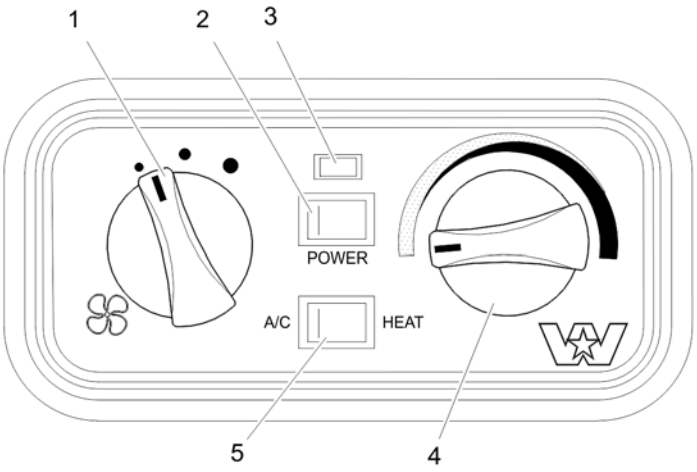
Power Switch and Indicator

The power switch is used to turn the sleeper heater and air conditioner on and off. When the heater or air conditioner is on, the indicator illuminates.

Fan Switch

The fan switch controls the fan speed and forces air through the air outlets. The fan switch has three speed settings and an off position. See Fig.116,Sleeper Climate Control Panel, No ATC.

To operate the fan switch, turn the switch clockwise to increase airflow; turn the fan switch counterclockwise to decrease airflow.



1. Fan Switch
2. Power Switch
3. Indicator
4. Temperature Control Switch
5. Air Conditioner Switch

Fig 116, Sleeper Climate Control Panel, No ATC

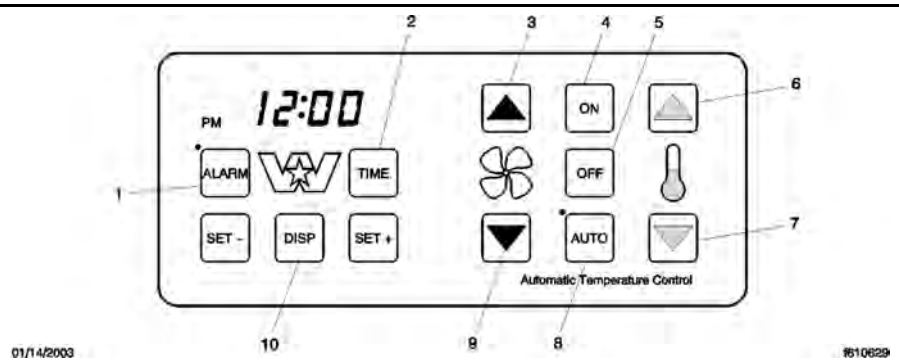


Fig 117, Sleeper Climate Control Panel With ATC

1. Alarm Button
2. Time Button
3. Fan Up Button
4. Heater and Air Conditioner On Button
5. Heater and Air Conditioner Off Button
6. Temperature Up Button
7. Temperature Down Button
8. Automatic Fan Button
9. Fan Down Button
10. Display Button

Temperature Control Switch

To select the desired temperature, turn the switch to the left (counterclockwise) for cool air, or to the right (clockwise) for hot air.

Air Conditioner (A/C) Switch

The air conditioner cools and dehumidifies the air inside the sleeper. Press the optional A/C switch to turn the air conditioner on or off.

Controls, Vehicles With ATC

The controls for the sleeper heater and air conditioner are located on the right side of the ATC sleeper control panel. See Fig.117,Sleeper Climate Control Panel With ATC.

Power Switch and Indicator

Turn the sleeper heater and air conditioner on by pressing the ON button. The current set temperature is displayed for five seconds, after which it returns to the time display. When the heater or air conditioner is on, the indicator illuminates. To turn the sleeper heater and air conditioner off, press the OFF button.

Fan Switch

To operate the fan switch, press the fan up or fan down button repeatedly to incrementally increase or decrease the fan speed. Press either button for at least two seconds to continuously increase or decrease the fan speed. The fan speed setting is displayed on the sleeper control panel in 10 percent increments. When the highest or lowest fan speed is selected, HI or LO is displayed. The display returns to the time display five seconds after a fan up/down button is pressed and released.

In the ATC mode, fan speed is determined by the system as required. The fan speed is based on the difference between the set point temperature and the actual sleeper cab temperature. The greater the difference, the greater the fan speed. The AUTO fan function is disabled when either the fan up or fan down button is pressed.

Temperature Control Switch

Temperature is displayed with a three-digit annotation and can be displayed either in degrees Celsius or degrees Fahrenheit. A capital "C" or "F" is displayed for the appropriate temperature scale.

To select the desired temperature, press the temperature up or temperature down button repeatedly to incrementally increase or decrease the set temperature. Press either button for at least two seconds to continuously increase or decrease the set temperature. The temperature setting is displayed on the sleeper control panel. The display returns to the time display five seconds after a temperature up/down button is pressed and released.

The temperature units can be changed from °F to °C or from °C to °F by pressing the temperature up and temperature down buttons simultaneously. Changing the temperature units on the ATC sleeper control panel will also change the temperature units on the ATC cab control panel.

Auto Button

Press the AUTO button to enable automatic control of the fan speed. The display will show the current set temperature for five seconds, then return to the time display. When in the automatic mode, the fan speed can vary to maintain the temperature set by the user. When automatic control is turned on, the indicator above the AUTO button illuminates.

Alarm Button

Momentarily press the ALARM button to turn the alarm on and to illuminate the alarm indicator above the ALARM button. Momentarily press the button again to deactivate the alarm.

When pressing the ALARM button, the display shows the alarm time setting for five seconds before returning to the current time display. If the ALARM button is pressed and held down continuously for more than one second, the alarm time setting can be viewed without changing the state of the alarm indicator. If either the SET+ or SET– buttons are pressed simultaneously with the ALARM button held down, the alarm time setting will increase or decrease. When the ALARM button is released after changing the alarm time, the alarm will be turned on and the indicator will be illuminated. When the ALARM is sounding, press the ALARM button to turn the alarm off and to reset the alarm for the next 24-hour cycle.

To set the snooze function, press any button on the control panel, except the ALARM button, when the alarm is sounding. The alarm will sound again after seven minutes. The alarm indicator flashes when the snooze function is set.

To cancel the snooze function, press the ALARM button. This will also reset the alarm for the next 24-hour cycle.

Time Button

The clock controls are located on the left side of the ATC sleeper control panel under the display. The display will show the clock time as the default mode.

Press the TIME button to display the current time. If the TIME button is held down and either the SET+ or SET– buttons are pressed simultaneously with the TIME button, the clock setting will increase or decrease.

Display Button

Press the DISP button to allow the display and illumination of the control panel to scroll through three illumination levels: bright, dim, and off. If you want the alarm, time, or temperature setting to be displayed when the display is in the off mode, press the ALARM, TIME, or temperature up/down buttons to display the corresponding display for five seconds. After five seconds, the display will turn off. If the alarm sounds while in the display off mode, the current time will be displayed simultaneously. The display will remain on for five minutes, then turn off.

When the vehicle ignition is not powered, the sleeper climate control panel is in a power-saving mode and the display and illumination of the control panel will be off. All clock functions, including the alarm, will continue to work internally.

Temperature Secondary Mode Feature

The temperature secondary mode allows the set temperature of the cab heater and air conditioner to be automatically tied to the sleeper heater and air conditioner. In this mode, the set temperature in the vehicle will be the same whether the set temperature is changed on the cab climate control panel or the sleeper climate control panel. To enable the temperature

secondary mode, press the SET+ and SET– buttons simultaneously. The display will read S–ON when the temperature secondary mode is enabled.

To disable the temperature secondary mode, press the SET+ and SET– buttons simultaneously. The display will read S–OFF indicating that the temperature secondary mode is disabled. When disabled, the temperatures for the cab and sleeper can be changed independently for separate temperature control. If you wish to maintain a temperature in the sleeper that is different than the temperature in the front of the cab, it is recommended that a curtain be used between the sleeper and the front of the cab.

Turning on the Sleeper Air Conditioner When the Cab Air Conditioner is Off

The sleeper ATC control panel can turn on the air conditioner even if the cab HVAC unit is turned off but the engine is running. By pressing the ON button, the ATC sleeper control panel will turn on the cab unit and the bunk indicator light on the cab control panel will be illuminated. If cooling is needed in the sleeper, the cab HVAC unit will switch on to a low blower fan setting and the A/C compressor clutch will engage. If cooling is no longer required in the sleeper or if heat is needed, the cab unit fan and the compressor clutch will be turned off after a five-minute delay.

Accessory Heaters

Optional accessary heaters are available from the factory in several configurations. Familiarize yourself with the equipment on your specific vehicle, and follow the manufacturer's operating and maintenance instructions.

WARNING:

Do not operate fuel-operated heaters in an area where flammable vapors, including gasoline or diesel fumes, are present, such as at filling stations and tank farms. Turn off a fuel-operated heater and allow it shut down completely before entering an area where flammable gases or liquids are present. Heaters continue to operate for up to three minutes after being turned off.

Failure to observe these precautions could cause an explosion or fire, resulting in serious property damage, and personal injury or death.

7.04 Parked HVAC

The Bergstrom NITE parked HVAC system consists of a compact electrical 3000-BTU air-conditioning system, and a diesel-fired heater unit. It is completely self-contained, and runs on 12-volt deep-cycle batteries located between the frame rails. The parked HVAC batteries are isolated from the vehicle-starting batteries, to prevent the starting batteries from being drawn down during HVAC operation.

The A/C system is designed to maintain cool air in the sleeper interior without having the engine running. However, the parked A/C unit will not cool down a hot sleeper that has been sitting in the sun without the vehicle A/C running. If the interior temperature is higher than desired, start the engine and run the vehicle A/C system until the desired sleeper temperature is achieved. This will help cool the sleeper to a temperature that the parked A/C system can maintain. For optimal operation, the curtain between the cab and the sleeper should be closed when using the Parked HVAC A/C system.

The A/C unit is located under the lower bunk in the sleeper compartment, and intakes air through a grille located on the front panel of the lower bunk. The outlet ducting runs from the left side of the unit to an outlet on the back wall of the sleeper.

The heater unit is located next to the A/C unit. It intakes air through a grille located on the right side of the front panel of the lower bunk. The outlet ducting runs from the back of the unit to a grille on the left side of the front panel of the lower bunk.

WARNING:

Do not operate fuel-operated heaters in an area where flammable vapors, including gasoline or diesel fumes, are present, such as at filling stations and tank farms. Turn off a fuel-operated heater and allow it shut down completely before entering an area where flammable gases or liquids are present. Heaters continue to operate for up to three minutes after being turned off.

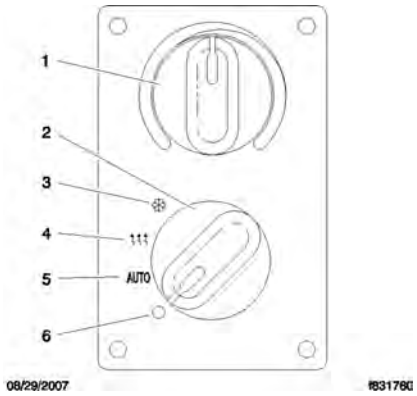
Failure to observe these precautions could cause an explosion or fire, resulting in serious property damage, and personal injury or death.

IMPORTANT: Blocked vents will hamper the operation of the unit. Keep the area around the air intake grilles clear of objects that may block air flow, or emit objectionable odors into the HVAC system.

Parked-HVAC Controls

The control panel for the parked HVAC is located on the left side of the rear wall, in the sleeper. It has a temperature-control dial, and a 4-position mode switch. Turn the temperature-control dial to the left for cooling, and to the right for heat. See Fig. 118,Parked-HVAC Control Panel. See Table.10,Parked-HVAC Mode Operation for a description of the mode functions.

After using the system, turn the mode switch to the OFF position, even if the unit is not running, or the batteries may not charge properly.



1. Temperature-Control Dial
2. Mode Switch
3. A/C Only
4. Heat Only
5. AUTO
6. OFF

Fig 118, Parked-HVAC Control Panel

Table 10, Parked-HVAC Mode Operation

Parked-HVAC Mode Operation	
Mode	**Function**
OFF	Turns the unit OFF.
AUTO	Allows the unit to automatically heat or cool the sleeper, depending on the temperature setting and the sleeper temperature. Adjusts the compressor, heater, and fans to keep temperature constant.

Heat Only	Allows only the heat portion of the system to run. Adjusts the heater only to keep the temperature constant.
A/C Only	Allows only the A/C portion of the system to run. Adjusts compressor and fans only to keep the temperature constant.

Table 10, Parked-HVAC Mode Operation

7.05 Accessory Heaters

7.05.01 Espar Heater

Optional accessary heaters are available from the factory in several configurations. Familiarize yourself with the equipment on your specific vehicle, and follow the manufacturer's operating and maintenance instructions.

WARNING:

Do not operate fuel-operated heaters in an area where flammable vapors, including gasoline or diesel fumes, are present, such as at filling stations and tank farms. Turn off a fuel-operated heater and allow it shut down completely before entering an area where flammable gases or liquids are present. Heaters continue to operate for up to three minutes after being turned off.

Failure to observe these precautions could cause an explosion or fire, resulting in serious property damage, and personal injury or death.

NOTE: Always ensure that air inlet and outlet grilles are not restricted. Restriction of any air inlet or outlet ports could result in damage to the auxiliary heater.

IMPORTANT: To maintain reliable performance, run the accessory heater for at least 15 minutes every month to prevent fuel from degrading.

Accessory heaters function when the ignition switch is in the off position and the cab load disconnect switch is on, if equipped.

IMPORTANT: Wait three minutes after shutting down an accessory heater before turning the cab load disconnect switch (CLDS) to OFF.

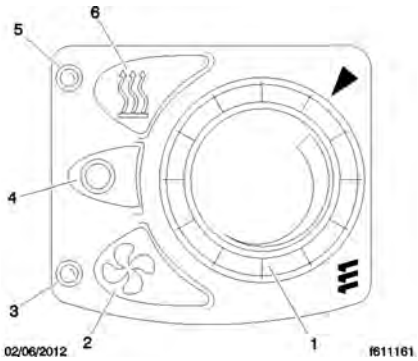
NOTE: The low voltage disconnect (LVD) control prevents a heater from draining the batteries below starting voltage.

Espar Heater

Refer to the Espar website,www.espar.com, for additional information.

Espar Mini-Controller

To turn the heat on, press the heat button. See Fig.119,Espar Mini-Controller. The red indicator will illuminate when heat mode is activated. Adjust the desired temperature with the control knob; rotate the temperature control knob clockwise for warmer air, or counterclockwise for cooler air. To turn the heat off, press the off button.



1. Temperature Control Knob
2. Fan Button
3. Fan Indicator (blue)
4. Off Button
5. Heat Indicator (red)
6. Heat Button

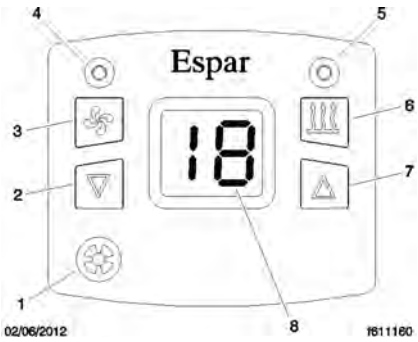
Fig 119, Espar Mini-Controller

To turn the fan on, press the fan button. The blue indicator will illuminate when ventilation mode is activated. To turn the fan off, press the off button.

Espar Digi-Controller

Vehicles built after December 8, 2011 with the Digi-Controller and D2 air heaters are equipped with an internal LVD in the Digi-Controller that prevents the heater from draining battery voltage below 12.0 volts.

To turn heat mode on, press the heat button and the heater will begin its start-up cycle. See Fig.120,Espar Digi-Controller. ON will display briefly followed by the ambient temperature, and the green indicator will illuminate. Ambient display temperature range is 41°F to 90°F.



1. Ambient Temperature Sensor
2. Down Arrow Button
3. Fan Button
4. Fan Indicator (blue)
5. Heat Indicator (green)
6. Heat On/Off Button
7. Up Arrow Button
8. Ambient Temperature Display

Fig 120, Espar Digi-Controller

To adjust the desired temperature, press the up or down arrow buttons. The desired temperature will display briefly, followed by the ambient temperature. The desired temperature will remain in the modulator memory when the heater is not in operation. Temperature adjustment range is from 41°F to 90°F.

To turn heat mode off, press the heat button again. The heater will initiate a 3-minute cooling cycle.

To turn the fan on, press and hold the fan button until the blue indicator illuminates and the display shows active rotating digits. To turn the fan off, press the fan button again.

NOTE: The Digi-Controller also has a programmable run timer that will automatically shut the heater off after the set time limit. The default time limit setting is 10 hours.

7.05.02 Webasto Heater

To turn the heater on, rotate the heater control knob clockwise until the indicator light illuminates. See Fig. 121,Webasto Heater Control Knob. The Webasto heater requires one to two minutes to warm up before warm air is delivered.



1. Off Position
2. Heater On Indicator Light

Fig 121, Webasto Heater Control Knob

To set the desired temperature, rotate the heater control knob clockwise for warmer air, or counterclockwise for cooler air.

To turn the heater off, rotate the heater control counterclockwise until it clicks and the indicator light is extinguished. The heater will initiate a two-minute cooling cycle.

Refer to the Webasto website, techwebasto.com , for additional information.

8.01 Seats, General Information 126
8.02 Western Star High-Back Seat 127
8.03 National High-Back Seat 128
8.04 Seat Belts and Tether Belts 133
8.04.01 General Information 133
8.04.02 Inspection of the Seat Belt 133
8.04.03 Seat Belt Operation 133
8.04.04 Seat Belt With Komfort Latch or Sliding Komfort Latch 135
8.05 Sleeper Compartment Restraints 139
8.05.01 Adjustment of the Bunk Restraint 139

8. Seats and Restraints

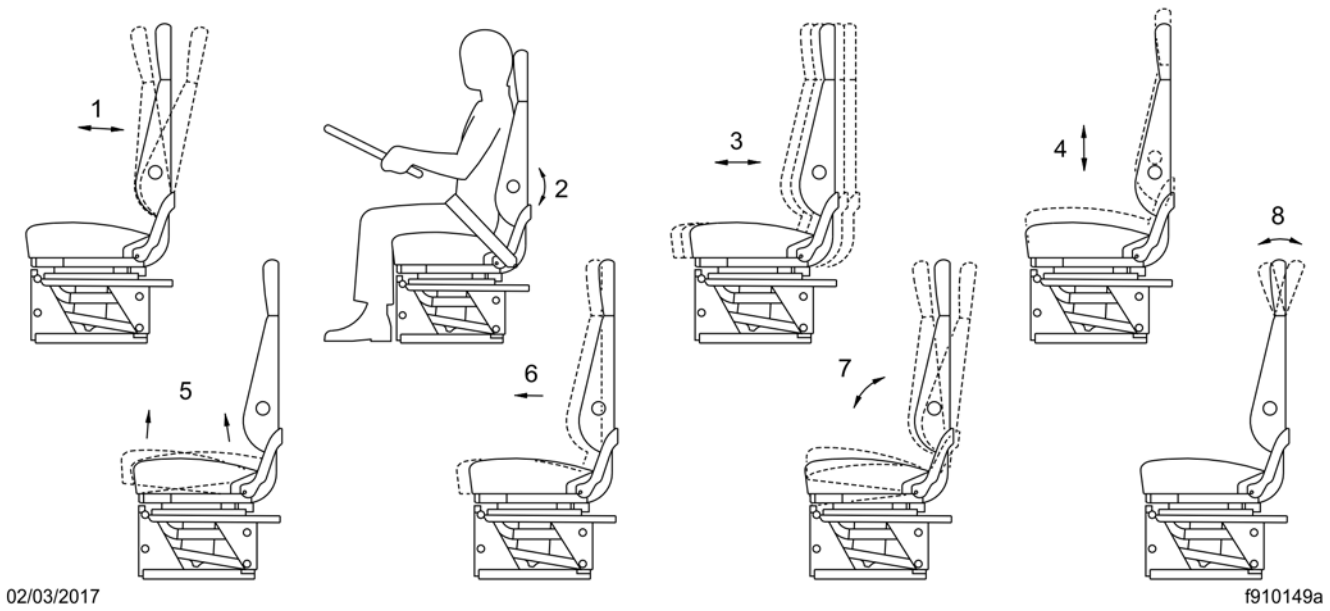
8.01 Seats, General Information

Unless otherwise noted, all seat adjustments should be made while seated and before the engine is started.

Due to the maximum adjustability of mid- and high-back air suspension seats, it is possible to combine the seat back recline adjustment and the seat slide adjustment so that the seat back contacts the backwall. It is the responsibility of the driver to adjust the seat to prevent damage to the seat and the cab interior.

WARNING:
Keep hands, tools, and other objects away from the scissor points under the seats. Failure to do so could cause personal injury.

The following is a description of adjustments that can be made to various Freightliner-installed seats. Not all seats have all of the adjustments listed below. See Fig. 122,General Seat Adjustments.



1. Backrest Tilt
2. Lumbar Support
3. Isolator Feature
4. Height Adjustment
5. Bottom Cushion Angle (fore-and-aft cushion height)
6. Fore-and-Aft Seat Slide (seat track adjustment)
7. Seat Tilt
8. Headrest Adjustment

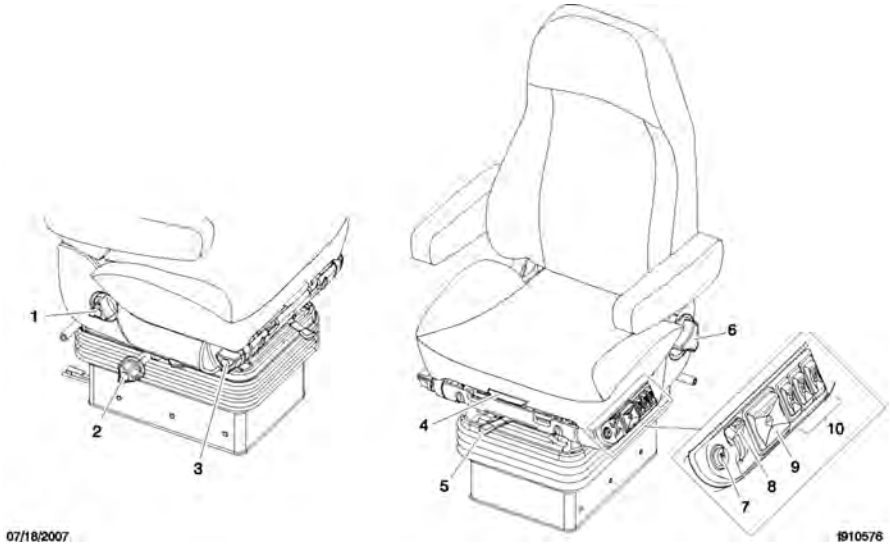
Fig 122, General Seat Adjustments

1. Backrest Tilt: This adjustment enables the backrest to pivot forward or backward.
2. Lumbar Support: Lumbar support changes the shape of the seat back to give more or less support to the occupant's lumbar (lower back) area. This adjustment is either mechanical or air controlled, depending on make and model of the seat.
3. Isolator: This feature reduces the amount of road shock by isolating the occupant from the motion of the vehicle, and allowing the upper seat to move in a simple pendulum motion. A lockout feature is used whenever the isolator is not desired.

4. Height Adjustment: This adjustment moves the entire seat up or down. The adjustment is either manual or air-controlled, depending on the make of the seat.
5. Bottom Cushion Angle, or Fore-and-Aft Bottom Cushion Height: This adjustment enables the occupant to raise or lower the front or back of the bottom cushion. This adjustment is easier to perform when all weight is removed from the seat.
6. Fore-and-Aft Seat Slide, or Seat Track Adjustment: This adjustment moves the entire seat forward or backward on its track.
7. Seat Tilt: This adjustment allows the seat assembly (back and bottom cushions) to tilt forward or backward.
8. Headrest Adjustment: This adjustment changes the angle of the upper part of the backrest to provide head and upper back support.

8.02 Western Star High-Back Seat

See Fig.123,Western Star High-Back Seat for seat adjustment controls. Not all models of the seat have all the adjustments listed below.



NOTE: Not all models of the seat have all the adjustment controls shown.

1. Rear Cushion Height Adjustment Knob
2. Fore/Aft Isolator
3. Front Cushion Height Adjustment Knob
4. Bottom Cushion Extension Handle
5. Fore/Aft Seat Slide Lever
6. Backrest Tilt Knob
7. Heater Button
8. Shock Absorber Lever
9. Height Adjustment Switch
10. Lumbar Support Switches

Fig 123, Western Star High-Back Seat

1. *Rear Cushion Height:* To adjust the height of the rear of the seat cushion, remove your weight from the seat and turn the rear cushion adjustment knob to one of three positions.
2. *Fore/Aft Isolator:* To engage the isolator, turn the isolator knob rearward to the unlocked position. Turn the isolator knob forward to the locked position when the isolator feature is not desired.
3. *Front Cushion Height:* To adjust the height of the front of the cushion, remove your weight from the seat, then turn the adjustment knob toward the front of the seat (clockwise) to increase cushion height. To lower the cushion height, turn the adjustment knob toward the rear of the seat (counterclockwise).

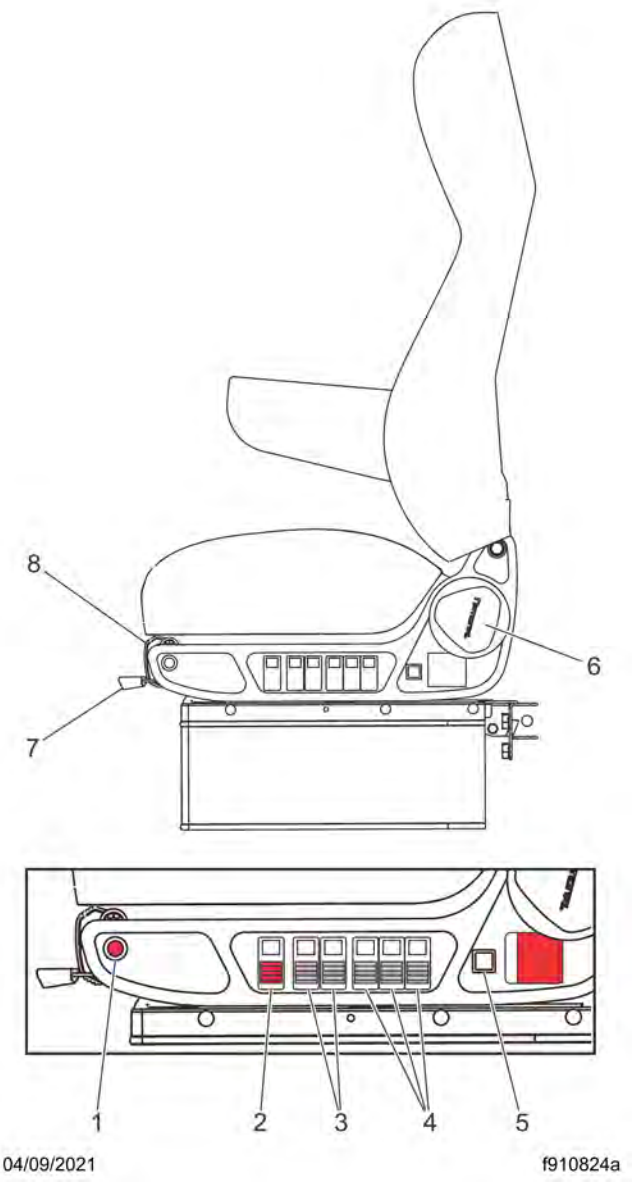
4. *Bottom Cushion Extension:* To adjust the fore-and-aft position of the seat cushion, remove your weight from the seat, then lift up and pull forward on the cushion adjustment handle. To return the cushion to the aft position, lift up and push rearward.
5. *Fore/Aft Seat Slide:* To adjust the fore-and-aft position of the entire seat, move the fore-and-aft seat adjustment lever to the left and slide the seat forward or backward to the desired position. Move the lever back to its original position to lock the seat in place.
6. *Backrest Tilt:* To tilt the backrest, lean forward slightly to remove pressure from the cushion, then turn the knob forward or rearward to achieve the desired position.
7. *Heater:* To turn on the heat option, press the button. To turn off the heat option, press the button again.
8. *Shock Absorber:* To adjust the amount of damping the shock absorber provides, move the lever up to increase damping; move the lever down to decrease damping.
9. *Height Adjustment:* To raise or lower the height of the seat, use the height adjustment switch on the side of the seat.
10. *Lumbar Support:* To adjust the lumbar support, use the lumbar support switches on the side of the seat.

8.03 National High-Back Seat

See Fig.124,Left Side Controls of the National Seat and see Fig.126,Right Side Controls of the National Seat for seat controls.

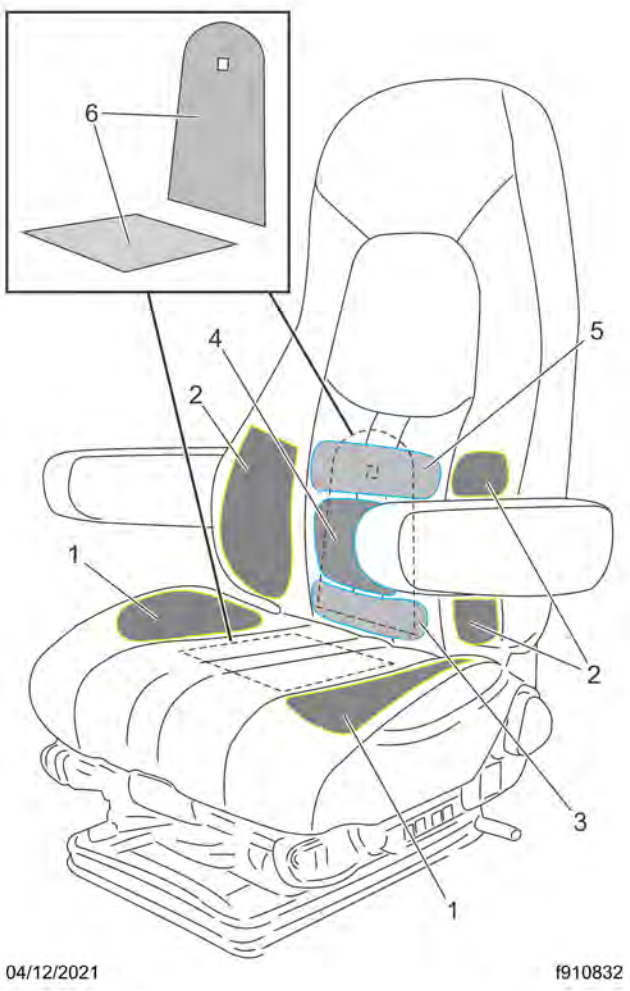
If equipped, the BackCycler feature cyclically inflates and deflates air bladders in the low-back area of the seat. When used regularly during long periods of sitting, the BackCycler potentially relieves back strain.

National Seat Controls (Left-Side)



1. Seat Heat On/Off Switch
2. Seat Height Adjustment Switch
3. Leg and Back Air Support Switches
4. Three-Zone Air Lumbar Support Switches
5. BackCycler Feature Switch
6. Sea-Back Recline Adjustment Knob
7. Fore-and-Aft Seat Slide Lever
8. Seat Cushion Extension Handle

Fig 124, Left Side Controls of the National Seat



1. Leg Cushions
2. Side Cushions
3. Low Lumbar Cushion
4. Mid-Lumbar Cushion
5. Upper Lumbar Cushion
6. Heated Seat Areas

Fig 125, Left View of Air Cushion Supports and Heated Seat Areas

Seat Heat

If equipped, the heater switch turns on heating pads in the seat and low-back areas. See Fig. 125,Left View of Air Cushion Supports and Heated Seat Areas.

A thermostat in the seat cushion monitors the temperature. When it detects the area has reached 114° F, both the low-back and seat heating pads will cycle off. When the thermostat detects the seat area has dropped to 81° F, both the low-back and seat heating pads will cycle on. Cycling is highly variable as heat is captured and the seat is insulated in various ways by different bodies.

Seat Height Adjustment

Pull up on the red valve switch to increase air pressure and raise the seat. Push down on the switch to lower the seat.

Leg and Back Air Support

Air cushions on either side of the seat and back can be inflated to provide support. See Fig. 125,Left View of Air Cushion Supports and Heated Seat Areas for cushion locations. Pull up on a valve switch to inflate an area; push down on a valve switch to deflate.

Three-Zone Air Lumbar Support

To adjust any of the three lumbar zones, pull up on a valve switch to inflate and push down to deflate. The further back the valve switch, the higher the lumbar zone it controls. See Fig.125,Left View of Air Cushion Supports and Heated Seat Areas for the locations of the three low-back air cushions.

BackCycler Feature

If equipped, the Backcycler will inflate and deflate the lumbar area sections of the seat in 40 second cycles. To operate, deflate all three lumbar support areas then press the BackCycler switch to the ON position. Let the BackCycler go through two or three cycles before turning it off and reinflating the lumbar support air cushions to the desired comfort level.

Seat-Back Recline Adjustment

Rotate the triangular knob at the back of the seat rearward to increase the seat-back recline and forward to bring it back to vertical. The seat back can recline up to 23°.

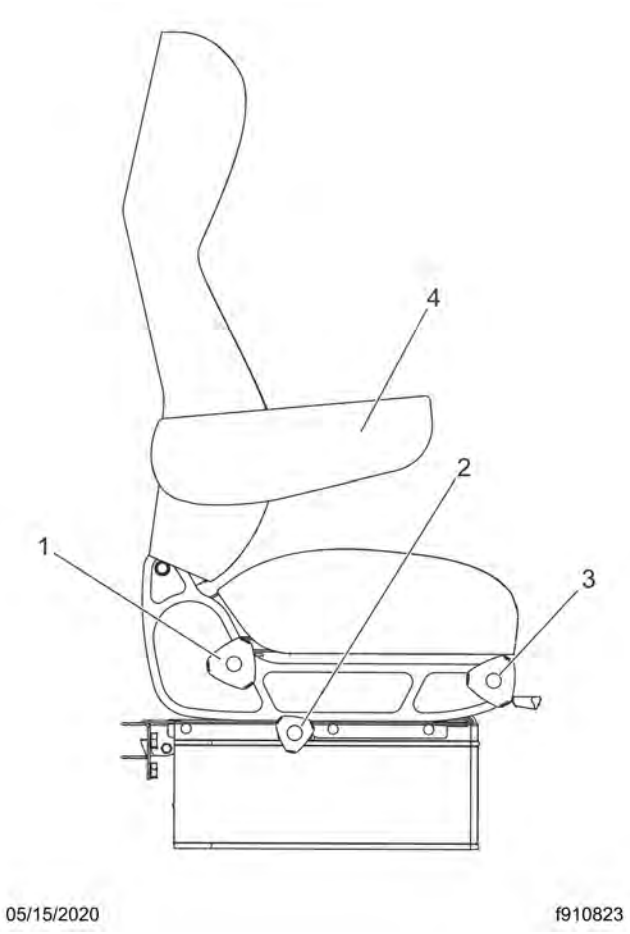
Fore-and-Aft Seat Slide

The lever beneath the front of the seat cushion controls the fore-and aft position of seat. While sitting in the seat, move the lever to the left, then move the seat forward or back. When the seat is in the desired position, release the track slide lever to lock it into position. The seat can move seven inches (17.8 cm).

Seat Cushion Extension

With your weight off the seat, lift the bottom cushion adjustment handle and pull it forward or push it back to move the seat into the desired location.

National Seat Controls (Right-Side)



1. Rear Cushion Tilt
2. Suspension Base Isolator
3. Front Cushion Tilt
4. Armrest Adjustment

Fig 126, Right Side Controls of the National Seat

Rear Cushion Tilt

With your weight off the seat, rotate the knob clockwise to raise the rear of the seat cushion to the desired height. There are three rear cushion height positions.

Suspension Base Isolator

Rotate the knob counterclockwise to enable the isolation feature. Rotate the knob clockwise to decrease the level of isolation. To turn the isolator off, turn the knob clockwise until completely tightened.

Front Cushion Tilt

With your weight off the seat, rotate the knob clockwise to raise the front of the seat cushion to the desired height. There are three front cushion height positions.

Armrest Adjustment

Rotate an arm to the full up position then rotate it fully down. Then slowly raise the arm as you listen for clicks. Each click represents one of seven armrest positions. Stop when the armrest is high enough to support your forearm in a horizontal position. Each armrest can be adjusted independently.

8.04 Seat Belts and Tether Belts

8.04.01 General Information

Seat belt assemblies are designed to secure persons in the vehicle to help reduce the chance of injury, or the amount of injury, resulting from accidents or sudden stops. For this reason, Daimler Truck North America LLC (DTNA) urges that the driver and *all* passengers, regardless of age or physical condition, use seat belts when riding in the vehicle.



WARNING:

Always use the vehicle's seat belt system when operating the vehicle. Failure to do so can result in severe personal injury or death.

Seat belt assemblies in DTNA vehicles meet Federal Motor Vehicle Safety Standard 209, "Type 1" and "Type 2" requirements.

When transporting a child, always use a child restraint system or the vehicle seat belts as appropriate. To determine whether a child restraint system is required, review and comply with applicable state and local laws. Any child restraint used must comply with Federal Motor Vehicle Safety Standard 213, "Child Restraint Systems." When providing a child restraint system, always carefully read and follow all instructions pertaining to installation and usage for the child. Make certain the child remains in the restraint system at all times when the vehicle is in motion.

In addition to seat belt assemblies, tether belts are installed on suspension-type seats. Tether belts help secure the seat to the floor and are intended to restrain the seat and seat belt in case of an accident or sudden stop.

IMPORTANT: Seat belts have a finite life which may be much shorter than the life of the vehicle. Regular inspections and replacement as needed are the only assurance of adequate seat belt security over the life of the vehicle.

8.04.02 Inspection of the Seat Belt



WARNING:

Inspect and maintain seat belts. When any part of a seat belt system needs replacement, the entire seat belt must be replaced, both retractor and buckle side. Any time a vehicle is involved in an accident, and the seat belt system was in use, the entire vehicle seat belt system must be replaced before operating the vehicle. Do not attempt to modify the seat belt system; doing so could change the effectiveness of the system. Failure to replace worn or damaged seat belts, or making any modifications to the system, may result in personal injury or death.

Inspect the seat belts and tether belts (if so equipped).

1. Check the web for fraying, cuts, extreme dirt and dust, or for severe fading from exposure to sunlight, especially near the buckle latch plate and in the D-loop guide area.
2. Check operation of the buckle, latch, Komfort Latch or Sliding Komfort Latch (if equipped), web retractor, and upper seat belt mount on the door pillar. Check all visible components for wear or damage.
3. Check the seat belt and tether belt connection points and tighten any that are loose.

8.04.03 Seat Belt Operation

Three-Point Seat Belt

NOTE: For vehicles equipped with the Komfort Latch or the Sliding Komfort Latch, see the seat belt operation under the heading **Seat Belt With Komfort Latch or Sliding Komfort Latch** .

WARNING:

Wear three-point seat belts only as described below. Three-point seat belts are designed to be worn by one person at a time. In case of an accident or sudden stop, personal injury or death could result from misuse.

Fasten the seat belts before driving. Fastening a three-point seat belt while driving creates a hazard.

1. Slowly pull the link end of the three-point seat belt out of the retractor and pull it across your lap (from outboard to inboard) far enough to engage the buckle. If the retractor locks too soon, allow the belt to retract slightly, then slowly pull it out again.
2. Fasten the seat belt by pushing the latch into the buckle. Listen for an audible click. See Fig. 127,Fastening the Three-Point Belt.

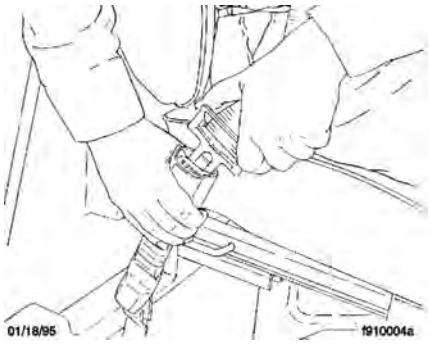
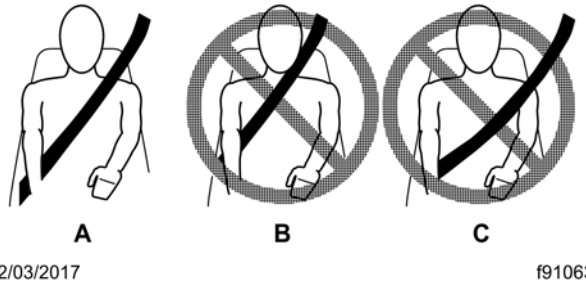


Fig 127, Fastening the Three-Point Belt

3. Tug on the seat belt to make sure it is securely fastened. If the buckle unlatches, repeat this step. If the problem continues, replace the seat belt.
4. Snug the seat belt to your waist.
5. Position the shoulder strap diagonally across your chest with the adjustable D-loop bracket (if equipped). The shoulder strap must be centered on your shoulder and chest, away from your face and neck. See Fig. 128,Proper Shoulder Strap Fit.



A. Correct—Belt is centered on your shoulder and chest, away from your face and neck.
B. Wrong—Belt must not rub against face or neck.
C. Wrong—Belt must not hang off shoulder.

Fig 128, Proper Shoulder Strap Fit

6. To unbuckle the seat belt, press the release button on the buckle. See Fig.129,Releasing the Three-Point Seat Belt.

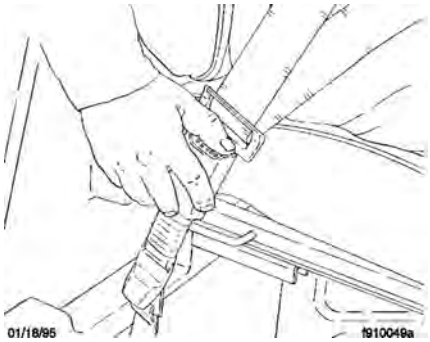


Fig 129, Releasing the Three-Point Seat Belt

NOTE: Make sure the seat belt is completely retracted when it is not in use.

8.04.04 Seat Belt With Komfort Latch or Sliding Komfort Latch

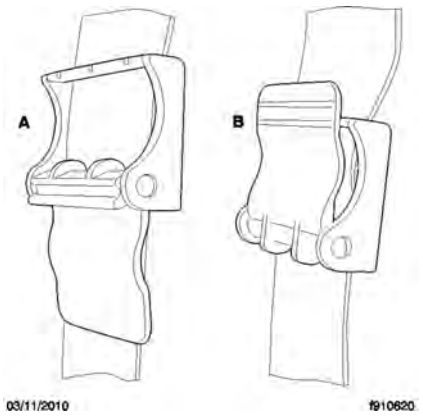
NOTE: For vehicles not equipped with the Komfort Latch or the Sliding Komfort Latch, see the seat belt operation under the heading **Three-Point Seat Belt** .

WARNING:

Wear three-point seat belts only as described below. Three-point seat belts are designed to be worn by one person at a time. In case of an accident or sudden stop, personal injury or death could result from misuse.

Fasten the seat belts before driving. Fastening a three-point seat belt while driving creates a hazard.

When engaged and used properly, the Komfort Latch (see Fig.130,Komfort Latch) and the Sliding Komfort Latch (see Fig. 131,Sliding Komfort Latch) introduce a small amount of slack into the seat belt, resulting in a more comfortable ride.



A. Disengaged B. Engaged

Fig 130, Komfort Latch



Fig 131, Sliding Komfort Latch

1. Slowly pull the link end of the three-point seat belt out of the retractor and pull it across your lap (from outboard to inboard) far enough to engage the buckle. If the retractor locks too soon, allow the belt to retract slightly, then slowly pull it out again.
2. Fasten the seat belt by pushing the latch into the buckle. Listen for an audible click. See Fig. 132,Fastening the Three-Point Belt.

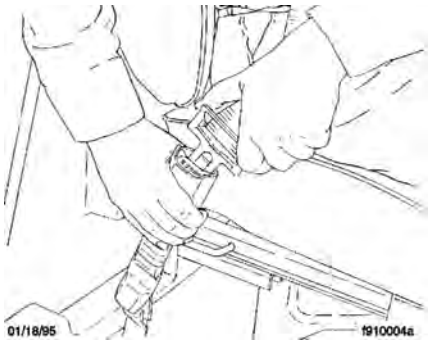


Fig 132, Fastening the Three-Point Belt

3. Tug on the seat belt to make sure it is securely fastened. If the buckle unlatches, repeat this step. If the problem continues, replace the seat belt.
4. Snug the seat belt to your waist.

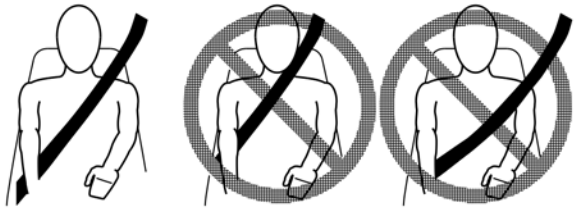
WARNING:

Before activating a Komfort Latch, make sure the amount of slack in the shoulder strap is set as described below. Excess slack in the shoulder strap reduces the effectiveness of the seat belt, and increases the risk of injury or death in an accident.

5. Position the shoulder strap diagonally across your chest with the adjustable D-loop bracket (if equipped). The shoulder strap must be centered on your shoulder and chest, away from your face and neck. See Fig. 133,Proper Shoulder Strap Fit. If desired, engage the Komfort Latch or Sliding Komfort Latch as follows.

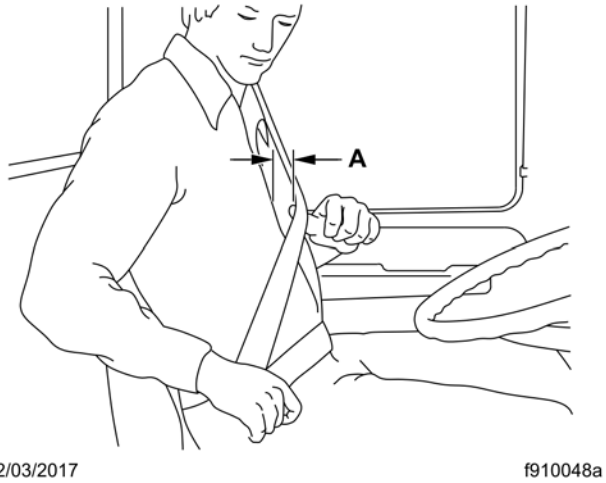
   If equipped with a Sliding Komfort Latch, make sure that the shoulder strap is snug against your chest. Without loosening the shoulder strap, push the Sliding Komfort Latch switch to the "ON" position. See Fig.131,Sliding Komfort Latch. To activate the latch lean forward until you hear a click. This will allow for approximately 1 inch (2.5 cm) of slack between your chest and the shoulder harness. Once engaged, the latch will allow you to lean forward about 5 inches (13 cm) without having to reset the latch. Leaning forward more than 5 inches (13 cm) will disengage the Sliding Komfort Latch, requiring it to be reset.

   If equipped with a Komfort Latch, pull on the shoulder strap to lessen the pressure of the strap on your shoulder and chest. Allow no more than 1 inch (2.5 cm) of slack between your chest and the shoulder harness. More slack can significantly reduce the seat belt effectiveness in an accident or a sudden stop. While holding the belt slack, press the Komfort Latch lever up, clamping the seat belt webbing (see Fig. 134,Adjusting Shoulder Harness Clearance, Komfort Latch and see Fig.135,Locking the Komfort Latch).



A. Correct—Belt is centered on your shoulder and chest, away from your face and neck.
B. Wrong—Belt must not rub against face or neck.
C. Wrong—Belt must not hang off shoulder.

Fig 133, Proper Shoulder Strap Fit



A. 1 Inch (2.5 cm) Maximum

Fig 134, Adjusting Shoulder Harness Clearance, Komfort Latch

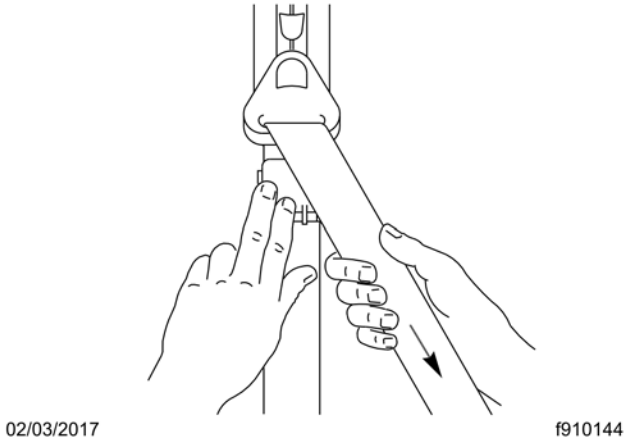


Fig 135, Locking the Komfort Latch

6. Unbuckle the seat belt and release the Komfort Latch or the Sliding Komfort Latch as follows.

   If equipped with a Sliding Komfort Latch, unbuckle the seat belt (see Fig.136,Releasing the Three-Point Seat Belt), then tug on the shoulder belt to release the Sliding Komfort Latch, *or* press the Sliding Komfort latch to the "OFF" position, then unbuckle the seat belt.

   If equipped with a Komfort Latch, unbuckle the seat belt (see Fig.136,Releasing the Three-Point Seat Belt), then release the Komfort Latch by giving the shoulder belt a quick tug. If you lean forward against the shoulder belt, the Komfort Latch will automatically release, and will need to be reset.

   NOTE: Neither the Komfort Latch nor the Sliding Komfort Latch need to be manually released in an emergency situation. Each will release by itself under rough road or other abnormal conditions. Make sure the seat belt is completely retracted when it is not in use.

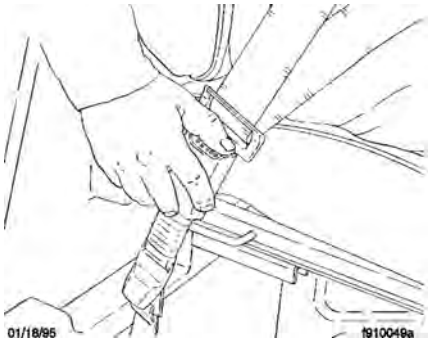


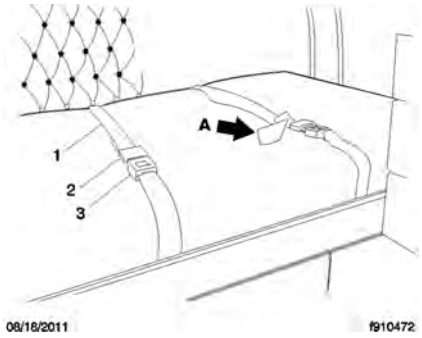
Fig 136, Releasing the Three-Point Seat Belt

8.05 Sleeper Compartment Restraints

8.05.01 Adjustment of the Bunk Restraint

On vehicles equipped with a sleeper compartment, bunk restraints should be used whenever the sleeper compartment is occupied and the vehicle is moving. Restraints are designed to lessen the chance of injury or the amount of injury resulting from accidents or sudden stops.

1. Make sure the belt is attached to the bunk support and sleeper wall.
2. To lengthen the belt, tip the link end downward and pull the link until it connects with the buckle.
3. After the belt is connected, shorten it by pulling on the loose end until the belt is snug, but comfortable. Be sure the belts are not twisted. See Fig.137,Bunk Restraint Adjustment.



A. Pull on the loose end to shorten the belt.
1. Belt
2. Connector
3. Release Buckle

Fig 137, Bunk Restraint Adjustment

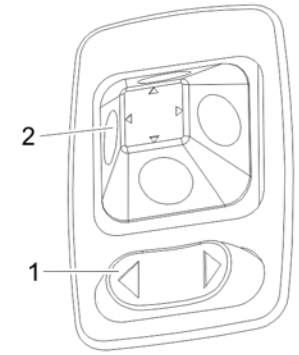
9.01 Windows and Mirrors 142
9.01.01 Power Mirrors 142
9.01.02 Down-View Mirror 142
9.01.03 Windows 143
9.02 Cab Amenities 144
9.02.01 Cigar Lighter/Accessory Plugs 144
9.02.02 Cup Holders 144
9.02.03 Glove Box 145
9.02.04 Electronic Device Mount 145
9.02.05 Cab Lighting 145
9.02.06 Storage Areas 145
9.03 Sleeper Amenities 146
9.03.01 Baggage Compartment Doors 146
9.03.02 Sleeper Lighting 146
9.03.03 Sleeper Door 147
9.03.04 Sliding Side Window 147
9.03.05 Vent 147

9. Cab and Sleeper Features

9.01 Windows and Mirrors

9.01.01 Power Mirrors

The outside mirrors are mounted on the cab. There is a primary rear view mirror and a convex mirror on both the driver and passenger sides. The mirrors are controlled by a switch pad located on the overhead console. See Fig. 138,Power Mirror Switch Pad.



1. Mirror Select Switch
2. Keypad

Fig 138, Power Mirror Switch Pad

One or both outside mirrors may be heated to clear fog, frost, or ice. To defog the mirrors, press the upper half of the mirror defog switch (MIRROR DEFOG). See Fig.139,Mirror Defog Switch. When the mirror defog switch is on, the status bar illuminates. To turn off heat to the mirror(s), press the lower half of the switch.

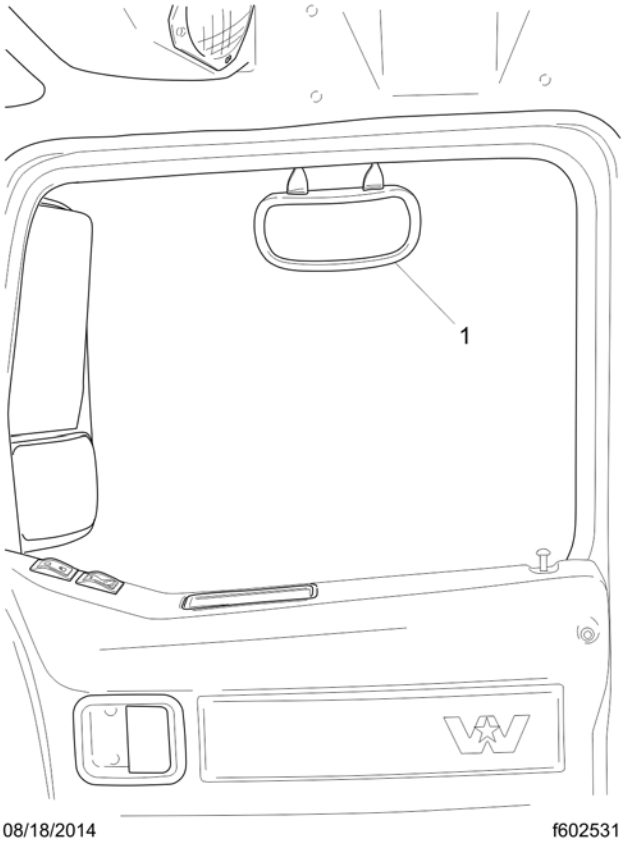


NOTE: To defog the mirror(s), press the upper half of the switch. To turn off heat to the mirror(s), press the lower half of the switch.

Fig 139, Mirror Defog Switch

9.01.02 Down-View Mirror

A down-view mirror is installed on the door frame to provide the driver a view of the area adjacent to the side of the cab. See Fig.140,Down-View Mirror.



1. Down-View Mirror (passenger side shown)

Fig 140, Down-View Mirror

9.01.03 Windows

Power windows are operated by switches (POWER WINDOW) located on the door. See Fig. 141,Door Lock and Power Window Switches.

To raise the window, press the upper half of the switch. To lower the window, press the lower half of the switch.



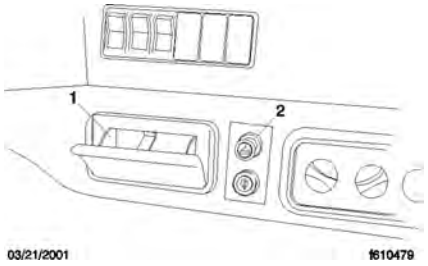
1. Door Lock Switch
2. Right-Hand Power Window Switch
3. Left-Hand Power Window Switch

Fig 141, Door Lock and Power Window Switches

9.02 Cab Amenities

9.02.01 Cigar Lighter/Accessory Plugs

The cigar lighter/accessory plug (see Fig.142,Ash Tray and Lighter) is located on the lower right-hand dash panel, above the ignition switch. The ash tray is located to the left of the cigar lighter. Optional 12V receptacles may be located on the dash.



1. Ash Tray
2. Cigar Lighter

Fig 142, Ash Tray and Lighter

To activate the cigar lighter, push in the element knob. It will pop out when heated. Grasp the element knob and pull it out of the socket.

To remove the ash tray, push down on the center bar, and swing outwards. To install the ash tray, insert in the opening then swing upwards until the bar snaps into place.

9.02.02 Cup Holders

A dual cup holder with a cell phone holder, standard in the sleeper cab and optional in the day cab, is located below the right-hand dash control panel.

9.02.03 Glove Box

The glove box (see Fig.143,Passenger-Side Dash Panels) is located on the right side of the dash face, and is equipped with a lock. To lock the latch, insert the key in the lock, and turn it 1/2-turn clockwise. Remove the key. To unlock the latch, insert the key in the lock, and turn it 1/2-turn counterclockwise.

The glove box door is hinged at the bottom. To open the unlocked door, push the button in with your thumb and pull gently on the tang-style latch. The door will swing downwards, then stop in the open position. To close the door, swing it upwards, and put gentle pressure on the latch. The door will be secured, but not locked.



1. Glove Box
2. Fuse/Relay Panel

Fig 143, Passenger-Side Dash Panels

9.02.04 Electronic Device Mount

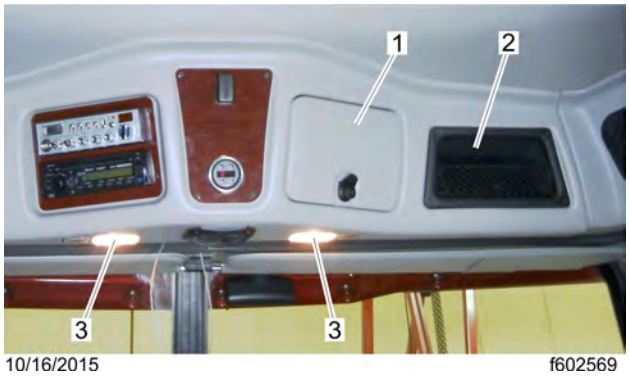
Some vehicles may be equipped with an optional electronic device mounting station and 12-volt outlet on the dash. The standard bolt pattern allows the mounting of a variety of devices including navigation systems, cell phone holders, portable music players, and other electronic devices. Mounting systems can be found at Cab Amenities.

9.02.05 Cab Lighting

See 5.01 Control Panels for detailed information regarding cab lighting controls.

9.02.06 Storage Areas

Some vehicles may have a storage bin and a glove box located on the right-hand side of the overhead console (see Fig. 144,Overhead Console Area). The storage bin has an elastic mesh cover to keep objects in place. Map pockets are molded into the lower portion of the driver and passenger doors.



1. Glove Box
2. Storage Bin
3. Dome/Reading Lamp

Fig 144, Overhead Console Area

9.03 Sleeper Amenities

9.03.01 Baggage Compartment Doors

NOTE: See 7.01 Climate Control Options for detailed information regarding sleeper climate controls and the digital clock.

To unlock, insert the baggage door key in the lock and turn counterclockwise 1/4-turn. Push the button, and the latch will spring open. To lock, press the latch in, turn the key clockwise 1/4-turn, then remove the key. If the baggage compartment door is unlocked, it can be opened simply by pushing the button.

9.03.02 Sleeper Lighting

The sleeper is equipped with two dome lamps, a floor courtesy light, and swivel reading lamps. The baggage compartment is equipped with LH and RH compartment lights. Depending on vehicle configuration, the sleeper may also be equipped with dome lamps under the rear shelf, a swivel task lamp mounted on the cabinet, and a pull-out desk lamp. See Fig. 145,Sleeper Lighting.



1. Dome Lamps
2. Task Lamp
3. Reading Lamp
4. Under-Shelf Dome Lamps

Fig 145, Sleeper Lighting

Dome Lamps and Sleeper Courtesy Light

The ceiling dome lamps and the floor courtesy light are operated by the sleeper lights switches on the sleeper control panel and the dash. The under-shelf dome lamps are operated by pushing on the lens.

Reading Lamps

The swivel reading lamps are operated with a rocker switch on the lamp.

Baggage Compartment Lights

The baggage compartment lights are activated by opening or closing the baggage compartment door, raising and lowering the bunk, or toggling the switch on the sleeper control panel (if equipped).

Task Lamp

The task lamp is operated by rotating the end of the lamp canister.

9.03.03 Sleeper Door

NOTE: The sleeper door is not intended for entry or exit. The door is intended only as a convenient means to stow or remove personal belongings in the sleeper area.

To open the sleeper door, reach behind the latch cover at the rear upper corner, locate the flat handle, and push down.

IMPORTANT: The sleeper doors have two-stage latching. When closing the doors, ensure that they are completely latched to prevent wind noise and water intrusion.

9.03.04 Sliding Side Window

The sliding side window is locked with an over-center toggle lever. When unlocked, the window may be adjusted to suit.

9.03.05 Vent

The air vent is operated using a simple, over-center latch. The vent will open in two directions. Push the knob firmly forward or back to open. The center position is closed.

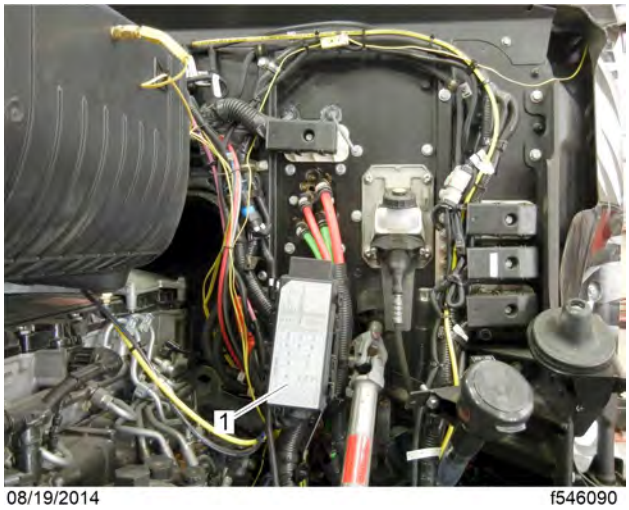
10.01 Vehicle Power Distribution..... 150
10.02 Battery Disconnect Switch..... 151
10.03 Battery Access..... 152
10.04 Low Voltage Disconnect..... 152
10.05 Inverter/Charger..... 154

10. Electrical System

10.01 Vehicle Power Distribution

There are three standard power distribution modules (PDMs) on vehicles that are compliant with EPA10 and newer regulations: the dash electrical panel, the powertrain PDM, and the powernet distribution box (PNDB). See Fig. 146,Powertrain PDM Location for the typical location of the powertrain PDM located in the engine compartment.

IMPORTANT: The cover on the powertrain PDM unit must be in place to protect against water splash and dust intrusion.



1. Powertrain PDM

Fig 146, Powertrain PDM Location

The powertrain PDM houses many of the fuses and relays for the engine, transmission, and aftertreatment system (ATS). There is a label on the cover of the powertrain PDM identifying the fuses and relays.

The PNDB houses up to three MIDI fuses and four ATO fuses. A label on the cover of the PNDB identifies the fuses.

Vehicles may also be equipped with a secondary PNDB. The secondary PNDB sources power to any of the following:

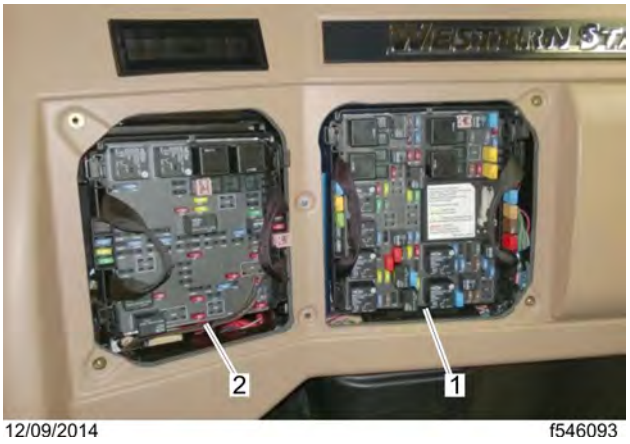
- fleet management communications
- trailer end-of-frame connection
- shore power inverter
- bodybuilder PDM (housing any fuses and relays necessary for customer-installed truck body equipment)

The main PDMs are located inboard of the passenger-side glove box. Access to the PDMs is achieved by removing the four screws that secure the panel cover. See Fig.147,Passenger-Side Dash Panels and see Fig.148,Main PDMs.



1. Glove Box
2. PDM Cover Panel

Fig 147, Passenger-Side Dash Panels



1. PDM 1
2. PDM 2

Fig 148, Main PDMs

10.02 Battery Disconnect Switch

Your Western Star vehicle may be equipped with a cab load disconnect switch (CLDS).

The optional CLDS (see Fig.149,Cab Load Disconnect Switch) is used to minimize draw on the battery, and should be set to OFF when the vehicle is parked for an extended period of time.

When the CLDS is set to OFF, it signals the PNDB to disconnect battery power to the circuits powered by the MIDI fuses.

The CLDS is mounted on the underdash cover, outboard of the steering column.



Fig 149, Cab Load Disconnect Switch

IMPORTANT: The ignition should be turned OFF before using the CLDS.

10.03 Battery Access

The batteries on a Western Star vehicle may be located in a variety of locations, including under the passenger seat, under the cab, behind the cab, or under the sleeper bunk, if equipped. Some vehicles may have two batteries in the step compartments on both sides of the vehicle.

10.04 Low Voltage Disconnect

The Low Voltage Disconnect (LVD) system protects the batteries from excessive discharge by disconnecting certain isolated circuits from battery power supply if necessary. See Table.11, **Isolated Circuits**. This allows the batteries to maintain acceptable charge to restart the vehicle. The LVD is integrated into PDM 1. See Fig.150,Main PDMs.



1. PDM 1
2. PDM 2

Fig 150, Main PDMs

Table 11, Isolated Circuits

Isolated Circuits	
Function	**Key Position**
PDM 1	
12V Power Receptacle 1, Dash	OFF/ACC/IGN*
12V Power Receptacle 2, Dash	OFF/ACC/IGN
12V Power Receptacle 1, Sleeper	OFF/ACC/IGN
CB Radio	OFF/ACC/IGN*
Dome Lamp, Cab, Dome/Reading	OFF/ACC/IGN
Dome Lamp, Sleeper	OFF/ACC/IGN
Dome Lamp, Floor Lamp, Sleeper	OFF/ACC/IGN
Fuel Water Separator Heater Element	IGN
Mirror Heat, Driver	IGN
Mirror Heat, Hood-Mounted	IGN
Spare Power Feed 1	IGN
Spare Power Feed 2	IGN
Utility Lamp	OFF/ACC/IGN
PDM 2	
12V Power Receptacle 2, Sleeper	OFF/ACC/IGN
12V Power Receptacle 3, Sleeper	OFF/ACC/IGN
Air Dryer	ACC
Amplifier Power	ACC
Sleeper/Cab Auxiliary Heater/Parked HVAC	OFF/ACC/IGN*
Auxillary Circulation Fan, Windshield	ACC
Auxilliary/Thermo Coolant Heater	OFF/ACC/IGN*
Heated Seat	ACC
Navigation System	ACC
Optional Switch 1	OFF/BAT/IGN†
Optional Switch 2	OFF/ACC/IGN†

Optional Switch 3	OFF/ACC/IGN†
Optional Switch 4	OFF/ACC/IGN†
Optional Switch 5	OFF/ACC/IGN†
Optional Switch 6	OFF/ACC/IGN†
Optional Switch 7	OFF/ACC/IGN†
Optional Switch 8	OFF/ACC/IGN†
Optional Switch 9	OFF/ACC/IGN†
Optional Switch 10	OFF/ACC/IGN†
Radio	ACC
Refrigerator	OFF/ACC/IGN*
Sleeper HVAC Controller, Wake-Up	ACC
Sleeper HVAC Fan Motor	ACC
Spare Power Feed 3	ACC
Spare Power Feed 4	OFF/ACC/IGN

Table 11, Isolated Circuits

* Option to move fuse to remove the function from the LVD bus.

† Option to move fuse to BAT to remove the function from the LVD bus.

If battery voltage drops to the trip point (12.3 or 12.1 volts, determined by the vehicle configuration), the LVD system implements a shut-down. At 70 seconds before the disconnect, an alarm beeps and the low battery indicator light on PDM 1 flashes green. The alarm beeps again at 9 and 3 seconds before the disconnect. If no action is taken, the LVD system will shut off power to the circuits, and a red low battery indicator remains lighted.

These circuits will remain off until the LVD system measures 13.0 volts applied to the system, which can be achieved by starting the engine. After the engine is started, the system will reset.

Vehicles are equipped with an LVD label on the drivers-side sun visor, indicating the presence of the system.

10.05 Inverter/Charger

The optional Freedom HF Inverter/Charger powers small appliances and other electric equipment. It is located in the driver-side luggage compartment. See Fig.151,Inverter/Charger. The unit has one three-pin GFIC OUT connector, one three-pin GFIC IN connector, and two AC power outlets.

There are two models available for the Western Star:

- **1000W** : 1000 watt, 20-amp
- **1500W** : 1500 watt, 40-amp



Fig 151, Inverter/Charger

DANGER:

Do not store gasoline, flammable material, or any component with a connection to the fuel system in the storage compartment with the inverter/charger. The unit contains equipment that may produce sparks. Storing flammable or electrical equipment in proximity to the unit could result in fire or explosion hazards, which could result in serious injury or death.

The display on the sleeper control panel provides information about the operation of the unit. See Fig. 152,Inverter/Charger Display Panel (1000W shown). See Table.12,Display Panel Functions for details on the display panel.

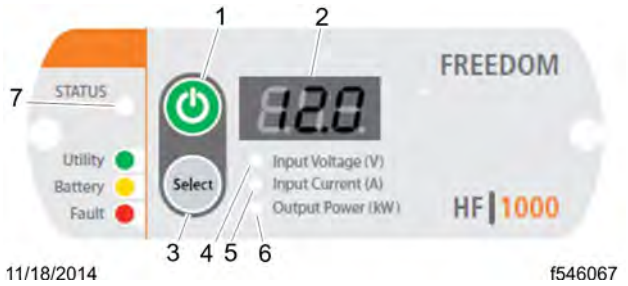


Fig 152, Inverter/Charger Display Panel (1000W shown)

Table 12, Display Panel Functions

Display Panel Functions		
Number	Name	Function

1	Power	Press the power button for one second to turn on the unit. Press and hold the button for five seconds to enter the feature settings mode, then press the button to toggle between the following modes: • Charging Current Setting • Inverter Mode Setting • Alarm Setting • Shutdown Setting • Factory Setting Refer to the owner's manual for more information.
2	LED Display	The LED display screen shows status information and fault codes.
3	Select	The Select button changes the display or settings. Press the Select button to cycle through the setting options. Press and hold the Select button for five seconds to save the setting. Refer to the owner's manual for more information. • In "Inverter Mode Setting" press the button to turn the inverter mode ON or OFF. • With the inverter mode ON, press the button to choose what appears on the LED display screen: Input Voltage, Input Current, or Output Power. Details are provided below. NOTE: The unit is in "Inverter Mode" when shore power is not present and the unit is using the battery to power the appliances connected to it. • In an alarm condition, press and hold the button for two seconds to disable or enable the audible alarm. • In "Charging Current Setting" mode, press the button to select the charger current.
4	Input Voltage LED	In inverter mode, when Input Voltage is selected, the corresponding LED will light up and the display will show the input voltage.
5	Input Current LED	In inverter mode, when Input Current is selected, the corresponding LED will light up and the display will show the input current.

6	Output Power LED	In inverter mode, when Output Power is selected, the corresponding LED will light up and the display will show the output power.
7	Status	The color of the Status light indicates the unit's mode of operation: • **Green** : Utility (Shore Power Mode) A solid green light indicates that the battery is fully charged. A flashing green light indicates that the unit is charging the battery. • **Yellow** : Battery (Inverter Mode) A solid yellow light indicates that the unit is using the battery to supply AC power. A flashing yellow light indicates that the unit is in inverter mode, but that AC shore power is detected and is transferring to shore power mode within 20 seconds. • **Red** : Fault Condition The fault status light indicates a fault condition with the unit. Refer to the owner's manual for fault code information and troubleshooting procedures.

Table 12, Display Panel Functions

For more information about troubleshooting, settings, and other features, refer to the owner's manual included with the inverter/charger.

11.01 Engine Starting 160
11.01.01 Engine Starting Procedure 160
11.01.02 Cold-Weather Starting 161
11.01.03 Starting After Extended Shutdown 161
11.02 Engine Operation 161
11.02.01 Safety and Environmental Considerations 161
11.02.02 Engine Break-In 162
11.02.03 Normal Operation 162
11.02.04 Cold-Weather Operation 162
11.03 Engine Shutdown 163
11.04 Engine Cooling 164

11. Engine Starting, Operation, and Shutdown

11.01 Engine Starting

11.01.01 Engine Starting Procedure

This engine chapter is to serve as a guide for best practices only. Each engine model may have operating characteristics that are unique to that particular engine, and will be documented in the engine manufacturer's literature. Always refer to specific instructions and recommendations from the engine manufacturer.

NOTE: Before starting the engine, see 4.01 Instrumentation Control Units for detailed information on how to read the instruments and see 5.01 Control Panels for detailed information on how to operate the controls. Read the engine manufacturer's operating instructions before starting the engine.



WARNING:

Never pour fuel or other flammable liquid into the air inlet opening in the air intake in an attempt to start the vehicle. This could result in a flash fire causing serious personal injury or property damage.

1. Before engine start-up, complete the engine pretrip inspection and maintenance procedures, see 24.01 Safety Precautions.
2. Set the parking brake.
3. For manual transmissions, place the transmission in neutral and fully depress the clutch pedal. Do not depress the accelerator pedal.

   For automatic transmissions, put the transmission in neutral. Do depress the accelerator pedal.



NOTICE:

If the warning lights stay on, or do not come on momentarily after turning on the ignition, do not operate the engine. To do so may result in engine damage.

4. Turn the ignition switch to the ON position. The buzzer will sound for three seconds.

   During cold conditions, the START BLOCKED lamp may illuminate. Wait until the lamp goes out before turning the ignition key to START.

   NOTE: The length of time the START BLOCKED lamp remains illuminated depends on the ambient temperature. The lower the ambient temperature, the longer the lamp will be illuminated.

   NOTE: The engine electronics supply the correct amount of fuel for starting the engine. Accelerator pedal pressure is unnecessary and could interfere with engine starting.

5. Turn the ignition key to the START position. Do not depress the accelerator pedal. Release the key the moment the engine starts.
6. Apply load gradually during the warm-up period.

NOTICE:
Do not rev the engine if the oil pressure gauge indicates no oil pressure. Shut down the engine within approximately ten seconds to avoid engine damage.

7. Check the oil pressure gauge for any drop in lubricating oil pressure or mechanical malfunction in the lubricating oil system.

11.01.02 Cold-Weather Starting

See the engine manufacturer's operation manual for starting aids that are approved for specific engines.

11.01.03 Starting After Extended Shutdown

Before engine start-up, complete the engine pretrip inspection and maintenance procedures, see 24.01 Safety Precautions.

NOTE: Failure to eliminate water-diluted lubricating oil may lead to serious engine damage at startup.

An engine in storage for an extended period of time (over winter, for example) may accumulate water in the oil pan through normal condensation of moisture on the internal surfaces of the engine. Oil diluted by water cannot provide adequate bearing protection at start-up. For this reason, change the engine oil and filters after extended storage.

11.02 Engine Operation

11.02.01 Safety and Environmental Considerations

All engines on Western Star vehicles comply with the requirements of the Federal (U.S.) Clean Air Act. Once an engine is placed in service, the responsibility for meeting both state and local regulations is with the owner/operator.

IMPORTANT: Depending upon local jurisdictional emissions guidelines, vehicles that are domiciled outside of the U.S. and Canada may not have engines and/or emissions aftertreatment systems that are compliant with current emissions regulations.

NOTICE:
It is extremely important that the following guidelines be followed for engines that comply with EPA07 or newer regulations, or damage may occur to the aftertreatment device, and the warranty may be compromised.

- Use ultralow-sulfur diesel with 15 ppm sulfur content or less.
- Do not use fuel blended with used engine lube oil or kerosene.
- Use only approved engine lube oil. For lists of engine oils approved for Detroit Diesel engines, refer to the Engine Operator Manual, accessible on Lubricants, Fuels & Coolants on the DTNA Portal. For third party engines, please refer to the engine manual.

A Top Tier™ compliant fuel is recommended. Look for the symbol that denotes a Top Tier compliant fuel; see Fig. 153,Top Tier Fuel Symbol.



Fig 153, Top Tier Fuel Symbol

Adequate maintenance of the engine and the diesel particulate filter (DPF) are the responsibility of the owner/operator, and are essential to keep the emission levels low. Good operating practices, regular maintenance, and correct adjustments are factors that will help keep emissions within the regulations.

The driver should be familiar with the vehicle warning system in order to bring the vehicle to a safe stop if the engine malfunctions. If the driver doesn't understand how the warning system works, an engine shutdown could occur, causing a safety hazard. See 12.01 Engine Protection—Warning and Shutdown for more information.

11.02.02 Engine Break-In

Each engine must pass a full-load operating test on a dynamometer before shipment, thereby eliminating the need for a break-in. Before running the engine for the first time, follow the instructions in the engine manufacturer's operation manual specific to your engine.

11.02.03 Normal Operation

WARNING:

Do not operate the engine in an area where flammable vapors such as gasoline or diesel fumes are present. Shut off the engine when in an area where flammable liquids or gases are being handled. Failure to observe these precautions could result in serious injury or death.

Every engine has an operating range in which it performs most efficiently. The operating range extends from maximum torque rpm at the low end, to engine rated speed at the high end. Most engines deliver best fuel economy when operated in the low- and mid-speed segments of the efficiency range and produce maximum horsepower at rated speed, which is also the recommended maximum speed of the engine. For further engine-specific information, refer to the engine manufacturer's operation manual.

Prolonged idling of engines is not recommended, and is illegal in some states. Idling produces sulfuric acid, that is absorbed by the lubricating oil, and eats into bearings, rings, valve stems, and engine surfaces. If you must idle the engine for cab heat or cooling, use the high idle function of the cruise control switches. An idle speed of 900 rpm should be enough to provide cab heat in ambient temperatures that are above freezing.

If the engine is programmed with the idle shutdown timer, ninety seconds before the preset shutdown time, the CHECK engine light will begin to flash at a rapid rate. If the position of the clutch pedal or service brake changes during this final ninety seconds the idle shutdown timer will be disabled until reset.

11.02.04 Cold-Weather Operation

Satisfactory performance of a diesel engine operating in low ambient temperatures requires modification of the engine, surrounding equipment, operating practices, and maintenance procedures. The lower the temperature, the greater the amount of modification required. For service products approved for use in cold weather for your engine, see the engine manufacturer's engine operation manual.

If satisfactory engine temperature is not maintained, maintenance costs will increase due to greater engine wear. If the engine coolant gets too cold, raw fuel will wash the lubricating oil off the cylinder walls and dilute the crankcase oil, causing all moving parts of the engine to suffer from poor lubrication.

If the engine is in good mechanical condition and the precautions necessary for cold-weather operation are taken, ordinary cold weather will not cause difficulty in starting or loss of efficiency.

The following points are important to observe when operating in cold weather:

- Check for cracks in the batteries, for corrosion of the terminals, and for tightness of the cable clamps at the terminals.
- Charge the batteries to full capacity. Replace damaged batteries.
- If equipped, turn off the load disconnect switch after the engine is shut down, to prevent battery discharge.
- Have the alternator output checked at an authorized service provider.
- Check the condition and tension of the drive belts.
- Refer to the engine manufacturer's operation manual for recommended heaters, low-viscosity lubricating oils, winter-grade fuels, and approved coolants.

NOTICE:
For Detroit engines, use of a winterfront is not recommended, as it can cause false fault codes with the engine and aftertreatment system, and possible emission component failures.

If using a winterfront, leave at least 25% of the grille opening exposed in sectioned stripes that run perpendicular to the charge-air-cooler tube-flow direction. This assures even cooling across each tube, and reduces header-to-tube stress, and possible chance of component failure. For engine-specific guidelines, see below:

Cummins engine: A winterfront may be used to improve cab heating while idling, and only when the ambient temperature remains below 10°F (-12°C).

Detroit engine: Using a winterfront can cause excessive fan run time, increased fuel consumption, and failure of the DEF system heaters to operate correctly, resulting in fault codes, poor performance, and power reduction. A winterfront should only be used temporarily in the following situations:

- To improve cab heating while idling in an extremely cold ambient temperature;
- When the ambient temperature remains below -22°F (-30°C) and the engine is unable to maintain a running coolant temperature of 175°F (80°C) during normal over-the-road operation.

11.03 Engine Shutdown

1. With the vehicle stopped, set the parking brake and place the transmission in neutral.

NOTICE:
Idle the engine one to two minutes before shutting it down. After hard operation, shutting down the engine without idling may cause damage to the turbocharger.

2. Allow the engine to idle one to two minutes before shutting it down.



NOTICE:

Except in an emergency, do not shut down the engine when the coolant temperature is above 194°F (90°C). To do so could damage the engine.

3. Turn off the ignition switch and shut down the engine.

11.04 Engine Cooling

The cooling system used on all Western Star vehicles is a pressure type system. This raises the coolant boiling point, permitting higher operating temperatures. The coolant supplied in your vehicle will be a 50/50 mix of antifreeze and water, giving protection down to –35°F(–37°C). It is recommended that an antifreeze mixture be used at all times, as, in addition to providing frost protection, it is a more effective coolant, and has a higher boiling point than tap water.

Over-concentration of antifreeze or coolant conditioner can cause silicate to precipitate out of the coolant, forming silica gel on cooling system heat transfer surfaces (fuel coolers, oil coolers, radiators, and heater cores), resulting in reduced coolant flow and overheating.

Hard water (with high levels of calcium and magnesium ions) encourages formation of silica gel. Do not use softened water as the salt used to artificially soften it is corrosive. Most engine manufacturers prefer the use of distilled or de-ionized water to reduce the potential and severity of silicate dropouts.

Never exceed a 60/40 antifreeze-to-water ratio. If the level is low, add a 50/50 antifreeze solution to maintain solution concentrations. Note that checking the engine coolant level is part of the pretrip inspection. See 24.01 Safety Precautions for more information.

12.01 Engine Protection—Warning and Shutdown 166
12.02 Engine Idle Limiting 167
12.03 Power Takeoff (PTO) Governor 167

12. Optional Engine Systems

12.01 Engine Protection—Warning and Shutdown

The driver should be familiar with the vehicle warning system in order to bring the vehicle to a safe stop if necessary. If the driver doesn't understand how the warning system works, the driver may not be able to utilize the advantage of the advance warning system to pull over appropriately.

The engine will begin a warning and derate and/or shutdown process if the engine coolant temperature, coolant level, engine oil pressure, or exhaust aftertreatment system (ATS) reach preset levels. On some engines, the warning process will begin when the engine oil temperature, engine coolant temperature, or the intake air temperature reach preset levels. Detroit™ engines may also begin the warning and shutdown process if water is detected in the fuel.

See the engine manufacturer's operation manual for specific details for your vehicle. See 13.01 Greenhouse Gas Emissions and Fuel Consumption Standards for the warning and shutdown modes associated with the ATS.

Electronic engine protection can be specified as either SHUTDOWN or WARNING and DERATE.

WARNING:

When the STOP engine or CHECK engine lamp illuminates, most engines are programmed to shut down automatically within 30 seconds. The driver must immediately move the vehicle to a safe location at the side of the road to prevent causing a hazardous situation that could cause bodily injury, property damage, or severe damage to the engine.

In SHUTDOWN mode, the red STOP engine lamp will illuminate when the problem is serious enough to reduce power or speed. See Fig.154,Engine Warning Lamps. Engine power will ramp down, then the engine will shut down if the problem continues while in derate mode. The driver has 30 or 60 seconds (depending on the critical fault type) after the STOP engine lamp illuminates to move the vehicle safely off the road. If the vehicle cannot be moved to a safe location within that time, turn the ignition switch to OFF for at least five seconds, then restart the engine. Repeat this action until the vehicle is safely off the road.



1. Malfunction Indicator Lamp (MIL)
2. CHECK Engine Lamp
3. STOP Engine Lamp

Fig 154, Engine Warning Lamps

Do not operate the vehicle further until the problem causing the shutdown has been corrected.

Some vehicles may have a shutdown override switch, which can be used to momentarily override the shutdown sequence. This switch resets the shutdown timer, restoring power to the level before the derate. The switch must be pressed again after five seconds to obtain a subsequent override. See Fig.155,Shutdown Override Switch.

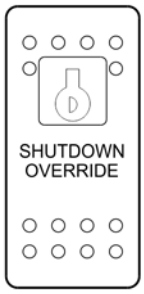


Fig 155, Shutdown Override Switch

NOTICE:
When the derate process begins, immediately get the vehicle serviced in order to prevent severe damage to the engine.

Detroit engines may begin a warning and derate process if water is detected in the fuel, or if engine coolant temperature is high. In WARNING and DERATE mode, the CHECK engine, STOP engine, or MIL lamp will illuminate to indicate an engine problem that requires service and the engine controls will begin a derate of engine output. Continuing to run the engine while it is in derate mode could cause severe damage to the engine.

12.02 Engine Idle Limiting

Idle Shutdown Timer

This feature is an optional 1- to 100-minute idle shutdown system. Its purpose is to conserve fuel by eliminating excessive idling, and allowing a turbocharger cool-down period. Idle shutdown timing and parameters are programmable. See the engine manufacturer's operation manual for specific details for your vehicle.

The idle shutdown system requires that the transmission be in neutral with the parking brake set.

12.03 Power Takeoff (PTO) Governor

WARNING:
To avoid injury, do not install a PTO that is not Detroit Diesel approved onto a Detroit™ Transmission. Use of a non-Detroit Diesel approved PTO with a Detroit Transmission could result in unintended operation which could lead to severe personal injury.

Engine power takeoffs (PTO) tap into engine power to run auxiliary devices, such as hydraulic pumps that power additional equipment. The following are general guidelines for operating a PTO.

1. Set the parking brake and put the transmission in neutral.
2. Press the dash PTO switch. Release the switch when the light begins to blink.

   When the light illuminates steadily, the PTO is engaged and ready to operate. In stationary mode, the vehicle must remain in neutral with the parking brake set.

3. To activate mobile mode, shift from neutral to reverse, 1st, or 2nd gear. The clutch will open and the PTO will disengage for a moment.
4. Touch the accelerator pedal to close the clutch and engage the PTO in mobile mode. The PTO may be operated with the transmission in neutral or reverse, and 1st and 2nd gears only.

   NOTE: Do not attempt to change gears while the vehicle is moving. The transmission will ignore the request.

5. To deactivate mobile mode, bring the vehicle to a stop. The clutch will open and shut down power to the PTO.
6. To resume stationary mode, shift to neutral. The PTO will engage.
7. To deactivate PTO, press the PTO switch again. When the light in the switch goes out, power to the PTO is shut off.

13.01 Greenhouse Gas Emissions and Fuel Consumption Standards....170
13.02 EPA-Regulated Emissions Aftertreatment Systems....171
13.02.01 General Information....171
13.02.02 EPA10 and Newer Engines....171
13.02.03 Regeneration....171
13.02.04 Regen Switches Procedure....172
13.02.05 ATS Warning Lamps....173
13.02.06 Maintenance....176
13.03 Diesel Exhaust Fluid and Tank, EPA10 and Newer Engines....176
13.03.01 Diesel Exhaust Fluid....176
13.03.02 DEF Tank....176
13.03.03 Fuel/DEF Gauge....176
13.03.04 DEF Warnings and Engine Limits....177

13. Emissions and Fuel Efficiency

13.01 Greenhouse Gas Emissions and Fuel Consumption Standards

Model year 2007 and later vehicles and/or engines domiciled in the U.S. or Canada are designed to meet Emission and Fuel Efficiency Standards of the U.S. (Federal) Environmental Protection Agency (EPA), the National Highway Traffic Safety Administration (NHTSA), Emission Regulations under the Canada Motor Vehicle Safety Act in Canada, and the California Air Resources Board (CARB) effective as per the applicable emission model year. To determine an engine's or vehicle's emission model year, refer to the respective EPA/CARB certification label.

Table 13, EPA Regulations

EPA Regulations	
Regulation	**Emissions Components**
EPA07 (Reduction of nitrogen oxides (NOx) emissions to 1.1 g/bhp-hr, and particulate matter emissions to 0.01 g/bhp-hr)	Aftertreatment device (ATD) containing a diesel particulate filter that traps soot and ash.[1]
EPA10 (Reduction of NOx emissions to 0.2 g/bhp-hr)	EPA07-type ATD, with additional selective catalyst reduction (SCR) technology that utilizes diesel exhaust fluid (DEF) to convert NOx to nitrogen and water vapor.
GHG14 (Reduction of greenhouse gas emissions)	Fuel efficiency components including, but not limited to, engines, tires, aerodynamic components, vehicle speed limiters, and idle reduction timers specifically designed to meet regulatory fuel efficiency and greenhouse gas emissions standards.
GHG17	Fuel efficiency components including, but not limited to, engines, tires, aerodynamic components, vehicle speed limiters, and idle reduction timers specifically designed to meet regulatory fuel efficiency and greenhouse gas emissions standards.
GHG21	GHG14/17 components plus additional components including, but not limited to, transmissions, axles, predictive technologies, idle reduction technologies for vocational vehicles, tire pressure monitoring systems.

1. Cummins and Detroit ATD's are also equipped with a diesel oxidation catalyst to break down pollutants.

Table 13, EPA Regulations

Table 14, Emission Regulations by Model Year

Emission Regulations by Model Year		
Model Year	**Engine Regulation**	**GHG Regulation**
2007–2009	EPA07	N/A
2010–2012	EPA10	N/A
2013–2015	EPA10, GHG14	GHG14
2016	EPA10, GHG17	GHG14

2017–2020	EPA10, GHG17	GHG17
2021–and later	EPA10, GHG21	GHG21

Table 14, Emission Regulations by Model Year

13.02 EPA-Regulated Emissions Aftertreatment Systems

13.02.01 General Information

IMPORTANT: Depending on local jurisdictional guidelines, vehicles that are domiciled outside of the U.S. and Canada may not have emissions aftertreatment systems (ATS) that are compliant with EPA regulations.



NOTICE:

Follow these guidelines for engines that comply with EPA07 or newer regulations, or damage may occur to the aftertreatment device (ATD) and the warranty may be compromised.

- Use ultralow-sulfur diesel with 15 ppm sulfur content or less.
- Do not use fuel blended with used engine lube oil or kerosene.
- Use only approved engine lube oil. For lists of engine oils approved for Detroit Diesel engines, refer to the Engine Operator Manual, accessible on Lubricants, Fuels & Coolants on the DTNA Portal. For third party engines, please refer to the engine manual.

IMPORTANT: Using non-specification fuels or oils can lead to shortened diesel particulate filter (DPF) cleaning or replacement intervals.

IMPORTANT: See the engine manufacturer's operation manual for complete details and operation of the ATS.

13.02.02 EPA10 and Newer Engines

The EPA mandates that all engines built after December 31, 2009 must reduce the level of emissions exhausted by the engine to the following levels:

- Nitrogen Oxides (NOx) – 0.2 g/bhp-hr
- Particulate Matter (PM) – .01 g/bhp-hr

To meet EPA guidelines, engines that are compliant with EPA10 and newer regulations use an ATS that has, in addition to a DOC/DPF device like that used in an EPA07 ATD, a Selective Catalytic Reduction (SCR) devide to reduce NOx downstream of the engine. After exhaust gases leave the DPF, a controlled quantity of diesel exhaust fluid (DEF) is injected into the exhaust stream. In the presence of heat, DEF is converted to ammonia gas, which reacts with NOx in the selective catalyst chamber to yield nitrogen and water vapor, which exit through the tailpipe.

13.02.03 Regeneration

The harder an engine works, the better it disposes of soot. If the exhaust temperature is high enough, a process called **passive regeneration** (regen) occurs as the vehicle is driven normally. However, if the engine isn't running hot enough, the electronic controls may initiate an **active regen** , whereby extra fuel is injected into the exhaust stream to superheat and reduce the soot trapped in the DPF to ash. Active regen happens only when the vehicle is moving above a certain speed, determined by the engine manufacturer. See your engine operation manual for complete details. Both active and passive regen happen automatically, without driver input.

WARNING:

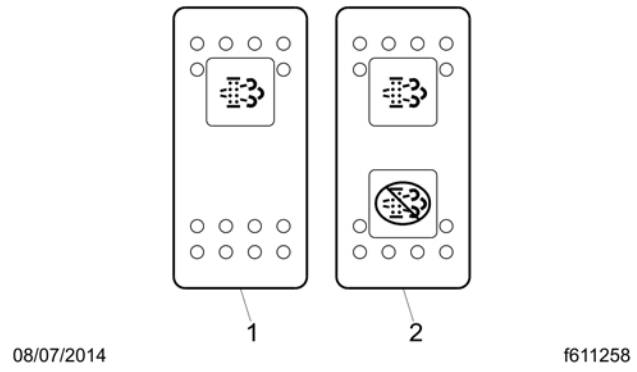
Active regeneration can occur automatically anytime the vehicle is moving. The exhaust gas temperature could reach 1500°F (800°C), which is hot enough to cause a fire, heat damage to objects or materials, or personal injury to persons near the exhaust outlet. The exhaust temperature can remain high even after the vehicle has stopped. When stopping the vehicle shortly after an automatic regen, ensure the exhaust outlets are directed away from structures, vegetation, flammable materials, and anything else that may be harmed by exposure to high heat.

See Regen Switches **, below, for instructions on preventing automatic regen if necessary.**

When operating conditions do not allow for ATD filter cleaning by active or passive regen, the vehicle may require a driver-activated **parked regen** . When this occurs, the DPF lamp illuminates, indicating that a regen is required. The driver must either bring the vehicle up to highway speed to increase the load (thus starting an active regen), or park the vehicle and initiate a parked regen. See *Regen Switches* , below, for instructions on initiating a parked regen.

Regen Switches

The regen request switch, located on the dash, is used to initiate a parked regen. See Fig. 156,Aftertreatment System Regen Switches, item 1. The function of the switch varies by the engine make and model in the vehicle. See the engine operation manual for switch operation details.



1. Regen Request Switch
2. Regen Request/Inhibit Switch

Fig 156, Aftertreatment System Regen Switches

Some vehicles may be equipped with a regen request/inhibit switch. See Fig.156,Aftertreatment System Regen Switches, item 2. To stop a regen in progress or prevent the start of a regen, press the lower half of the switch. Regen is then delayed until the switch is no longer active.

NOTE: The regen switch can initiate a parked regen only when the DPF lamp is illuminated.

WARNING:

During parked regen, exhaust temperatures are very high and could cause a fire, heat damage to objects or materials, or personal injury to persons near the exhaust outlet.

Before initiating a parked regen, make certain the exhaust outlets are directed away from structures, vegetation, flammable materials, and anything else that may be harmed by prolonged exposure to high heat.

13.02.04 Regen Switches Procedure

To initiate a parked regen, perform the following steps.

1. Park the vehicle away from all flammable materials, put the transmission in neutral, and set the parking brake.
2. Start and warm the engine until the coolant temperature is at least 150°F (66°C).
3. Press and hold the regen switch for five seconds. The engine will increase rpm and initiate the regen process. As the regen process is initiated, engine rpm increases and the HEST lamp illuminates to indicate extremely high exhaust temperatures.

   IMPORTANT: The driver is responsible forensuring,during the entire regen cycle, that anything that could be harmed by exposure to high heat does not come in contact with theexhaustgases flowing from the outlets.

4. The regen cycle will finish after 20 to 60 minutes, at which time engine idle speed drops to normal and the vehicle can be driven normally. The HEST lamp is extinguished when vehicle speed exceeds 5 mph (8 km/h) or the system has cooled to normal operating temperature.
5. To stop a parked regen at any time during the process:
   - depress the clutch pedal, brake pedal, or accelerator pedal;
   - press and hold the regen inhibit switch until idle returns to normal;
   - shut down the engine.

13.02.05 ATS Warning Lamps

There are three warning lamps that alert the driver of the need to perform a regen, of high exhaust temperature, and of a need to refill the diesel exhaust (DEF) fluid tank. A decal attached to the driver's sun visor explains these ATS warning lamps. See Fig.157,Warning Lamp Decal, Sun Visor.

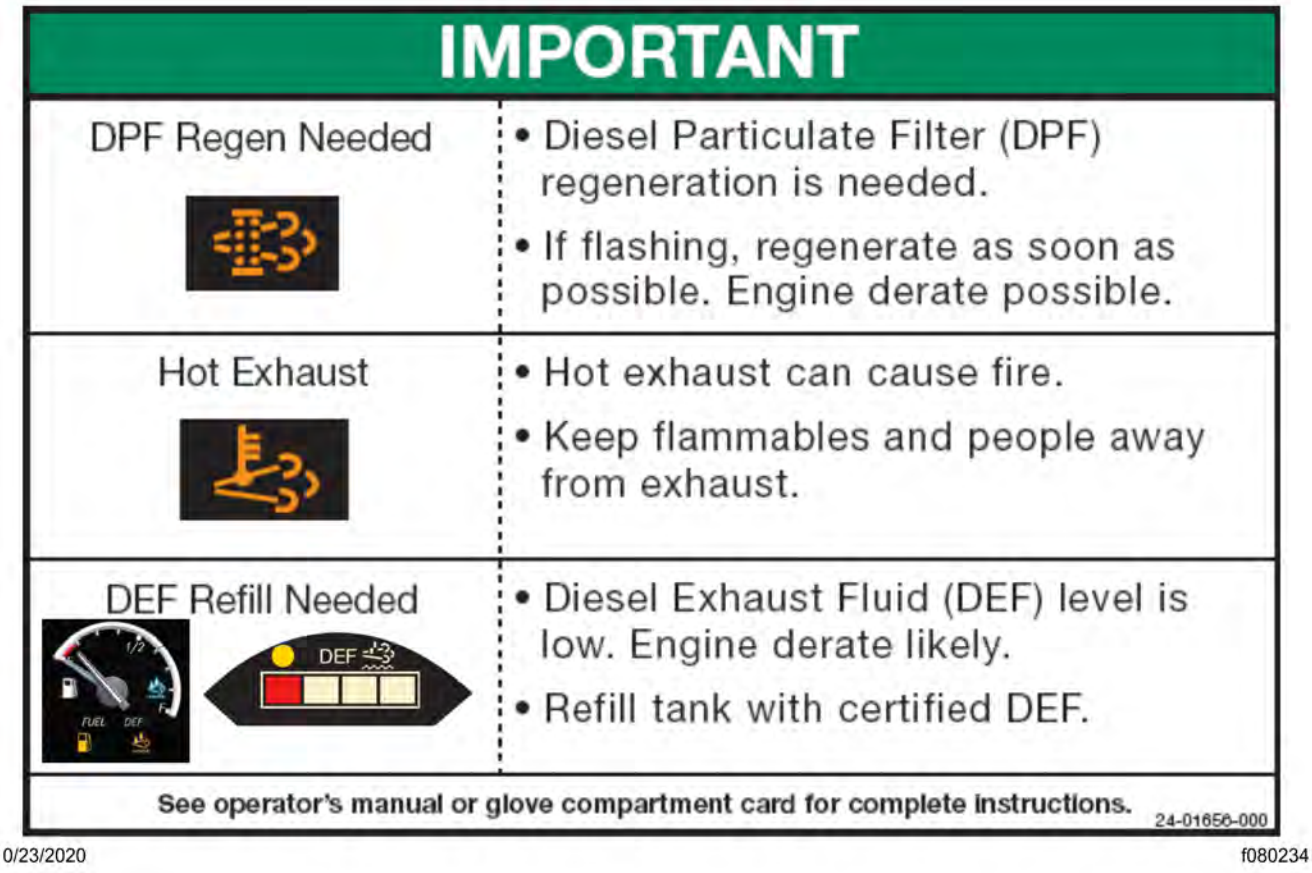


Fig 157, Warning Lamp Decal, Sun Visor

See Fig.158,ATS Warning Lamps for an explanation of the ATS warnings, and actions required to avoid engine protection sequences.

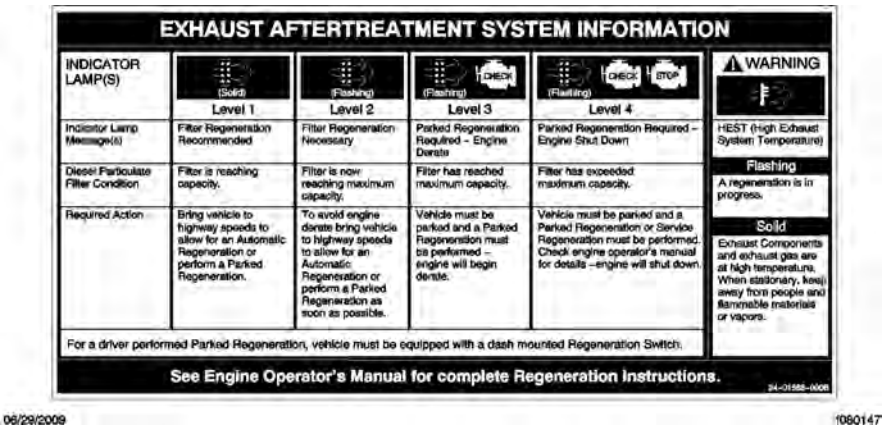


Fig 158, ATS Warning Lamps

Malfunction Indicator Lamp (MIL)

A steadily illuminated yellow malfunction indicator lamp (MIL) indicates an engine fault that affects the emissions. See Fig. 159,Malfunction Indicator Lamp (MIL).

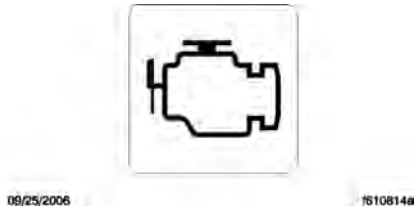


Fig 159, Malfunction Indicator Lamp (MIL)

DPF Lamp

When soot accumulates in the DPF and the DPF status lamp illuminates, see Fig. 160,Diesel Particulate Filter (DPF) Status Lamp, perform a parked regen or bring the vehicle up to highway speed to increase the load (thus starting an active regen).

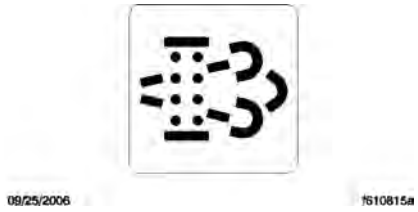


Fig 160, Diesel Particulate Filter (DPF) Status Lamp

If the DPF status lamp blinks while the CHECK engine lamp is illuminated, initiate a parked regen immediately in order to prevent an engine derate.

If the red STOP engine lamp illuminates with the blinking DPF lamp and the CHECK engine lamp, begin a parked regen in order to prevent an engine shutdown. Park the vehicle and perform a parked regen.

High Exhaust System Temperature (HEST) Lamp

Slow (10-second) flashing of the high exhaust system temperature (HEST) lamp indicates that a parked regen is in progress, and the engine's high idle speed is being controlled by the engine software, not the vehicle driver.

Steady illumination of the HEST lamp alerts the driver of high exhaust temperature during the regen process if the vehicle speed is below 5 mph (8 km/h), or during a parked regen. See Fig.161,High Exhaust System Temperature (HEST) Lamp.



Fig 161, High Exhaust System Temperature (HEST) Lamp

13.02.06 Maintenance

Authorized service facilities must perform any DPF service. For warranty purposes, maintain a record that includes:

- date of cleaning or replacement;
- vehicle mileage;
- particulate filter part number and serial number.

13.03 Diesel Exhaust Fluid and Tank, EPA10 and Newer Engines

13.03.01 Diesel Exhaust Fluid

Diesel exhaust fluid (DEF) is used in the ATS to lower NOx in the exhaust stream. DEF is colorless and close to odorless (it may have a slightly pungent odor similar to ammonia). It is nontoxic, nonflammable, and biodegradable. It is mildly corrosive to aluminum, but does not affect the strength or structure of the aluminum.

White crystals may be noticeable around components that come into contact with DEF. The crystals are easily removed with water.

DEF consumption varies depending on ambient conditions and vehicle application.

Freezing Conditions

DEF freezes to slush at around 12°F (-11°C). It is not damaged or destroyed if frozen, and is fully usable when thawed. The DEF in the tank is allowed to freeze while a vehicle is non-operational. At start-up, normal operation of the vehicle is not inhibited if the DEF is frozen; an immersion heater with engine coolant flowing through it warms the DEF once the engine is running, allowing the SCR system to operate.

13.03.02 DEF Tank

Engines that are compliant with EPA10 and newer regulations are equipped with a DEF tank located on the driver's side of the vehicle behind the battery box or forward of the fuel tank. See Fig.162,DEF Tank Location (Western Star 5700 shown). The DEF tank has a 19 mm filler neck inlet that prevents the hose from a diesel outlet from being inserted, and has a blue cap for easy identification.



1. DEF Fill Cap

Fig 162, DEF Tank Location (Western Star 5700 shown)

13.03.03 Fuel/DEF Gauge

The diesel fuel and DEF levels are measured in a dual-purpose gauge. See Fig.163,Fuel/DEF Gauge.

Fuel level is indicated at the top of the gauge. Below the fuel level, a low fuel warning lamp illuminates amber when the fuel level drops below 1/8th of the capacity.



A. Green bars—DEF level indicators
B. One bar illuminated amber—DEF very low, refill DEF
C. One bar flashing red—DEF empty, refill DEF

1. Low Fuel Warning Lamp
2. DEF Warning Lamp

Fig 163, Fuel/DEF Gauge

The lower portion of the gauge has a DEF warning lamp that illuminates amber when the DEF tank is near empty, and a lightbar that indicates the level of DEF in the tank. The DEF light bar illuminates as follows.

- Four bars illuminated green—Between 75% and 100% full
- Three bars illuminated green—Between 50% and 75% full
- Two bars illuminated green—Between 25% and 50% full
- One bar illuminated green—Between approximately 10% and 25% full
- One bar illuminated amber—DEF very low, refill DEF
- One bar flashing red—DEF empty, refill DEF

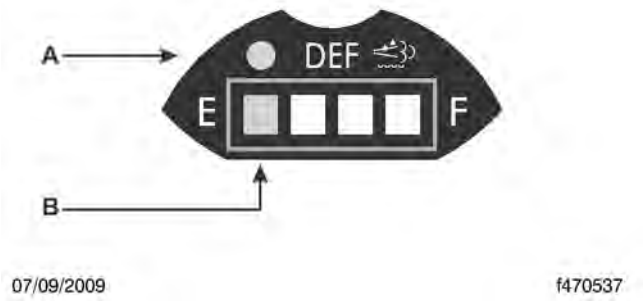
13.03.04 DEF Warnings and Engine Limits

IMPORTANT: Ignoring the DEF warning lights results in limited engine power, with the application of a 5 mph (8 km/h) speed limit.

DEF Level Low—Initial Warning

When the DEF level is low, the following lamps notify the driver. See Fig.164,DEF Level Low Initial Warning. Refill the DEF tank in order to cancel the warning sequence.

- One bar of the DEF level indicator illuminates amber—DEF very low, refill DEF.
- The DEF warning lamp illuminates solid amber.



A. DEF Warning Lamp (illuminated)
B. DEF Lightbar (one bar amber)

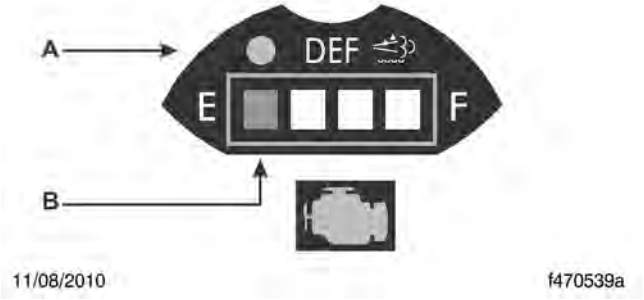
Fig 164, DEF Level Low Initial Warning

DEF Empty

When the DEF level reads empty, the following lamps notify the driver. See Fig.165,DEF Empty Warning.

- One bar of the DEF level indicator flashes red—DEF empty, refill DEF.
- The DEF warning lamp flashes amber.
- The MIL lamp illuminates.

Power is limited with progressively harsher engine power limits applied.



NOTE: MIL illuminates. CHECK engine lamp illuminates if Cummins ISB or ISC/L engine. Engine power is limited.

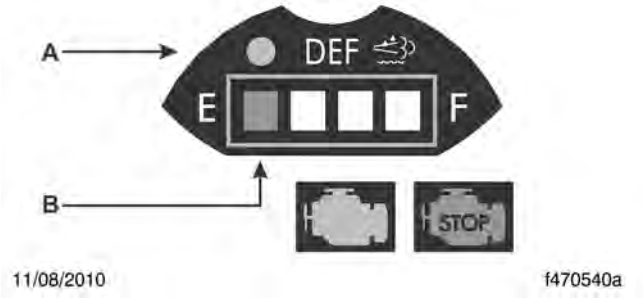
A. DEF Warning Lamp (flashing)
B. DEF Lightbar (one bar flashing red)

Fig 165, DEF Empty Warning

DEF Tank Empty and Ignored

If the empty warning is ignored and the DEF tank is not refilled, the red STOP engine lamp illuminates in addition to the MIL lamp and CHECK engine lamp (on vehicles with a Cummins ISB or ISC/L engine.) See Fig. 166,DEF Empty and Ignored Warning.

If the DEF is not refilled, a 5 mph (8 km/h) speed limit is applied after the next engine shutdown, while parked and idling, or if a fuel refill is detected.



NOTE: STOP engine light and MIL illuminate, engine power is limited, speed limit of 5 mph (8 km/h)

A. DEF Warning Lamp (flashing)
B. DEF Lightbar (one bar flashing red)

Fig 166, DEF Empty and Ignored Warning

DEF Contamination or SCR Tampering

NOTICE:

Once contaminated DEF or tampering has been detected, the vehicle must be taken to an authorized service facility to check the SCR system for damage and to deactivate the warning lights and engine limits.

If contaminated DEF or tampering with the ATS is detected, the DEF warning light flashes and the MIL lamp illuminates to warn the driver. The CHECK engine lamp also illuminates on vehicles with a Cummins ISB or ISC/L engine. See Fig. 166,DEF Empty and Ignored Warning.

- Detroit engines: Engine power is limited with progressively harsher limits applied. If the fault is not corrected, the STOP engine light illuminates and a 5 mph (8 km/h) speed limit is applied after the next engine shutdown, while parked and idling, or if a fuel refill is detected.
- Cummins engines: Engine power is limited with progressively harsher limits applied. If the fault is not corrected, the STOP engine light illuminates and a 5 mph (8 km/h) speed limit is applied after the next engine shutdown, or while parked and idling.

14.01 Air Brake System..... 182
14.01.01 Brake System General Information..... 182
14.01.02 Brake System Components..... 182
14.01.03 Brake System Operation..... 183
14.01.04 Automatic Slack Adjusters..... 186
14.02 Meritor WABCO® Antilock Braking System..... 186
14.02.01 General Information..... 186
14.02.02 Trailer ABS Compatibility..... 187
14.02.03 Automatic Traction Control..... 189
14.02.04 ECAS Automatic Load Transfer (ECAS only)..... 190
14.03 Engine Brake..... 191
14.03.01 General Information..... 191
14.03.02 Engine Brake Operation..... 193

14. Brake Systems

14.01 Air Brake System

14.01.01 Brake System General Information

A dual air brake system consists of two independent air systems that use a single set of brake controls. Each system has its own reservoirs, plumbing, and brake chambers. The primary system operates the service brakes on the rear axle; the secondary system operates the service brakes on the front axle. Service brake signals from both systems are sent to the trailer.

WARNING:

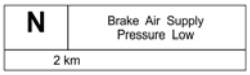
Do not operate the vehicle with the front brakes backed off or disconnected. Backing off or disconnecting the front brakes will not improve vehicle handling and may lead to loss of vehicle control, resulting in property damage or personal injury.

14.01.02 Brake System Components

A warning light or ICU text message (ICU4Me only) and buzzer come on if air pressure drops below approximately 70 psi (483 kPa) in either system. See Table.15,Brake System Warning and Indicator Lamps. If this happens, check the air pressure gauges to determine which system has low air pressure. Although the vehicle's speed can be reduced using the foot brake control pedal, either the front or rear service brakes will not be operating at full capacity, causing a longer stopping distance. Bring the vehicle to a safe stop and have the air system repaired before continuing.

IMPORTANT: In the event of a total loss of service brakes with full system air pressure, use the parking brake control valve (yellow knob) to bring the vehicle to a complete stop in the safest location possible.

Table 15, Brake System Warning and Indicator Lamps

Brake System Warning and Indicator Lamps			
Lamp Description			**Color**
	Low Air Pressure (EPA10 and Newer)	Indicates air pressure in the primary or secondary reservoir has dropped below approximately 70 psi (483 kPa).	Red
	Low Air Pressure (ICU4Me only, mid-GHG14)	Indicates air pressure in the primary or secondary reservoir has dropped below approximately 70 psi (483 kPa).	—
	Parking Brake	Indicates the parking brake is engaged.	Red
	Vehicle ABS	Momentary illumination indicates the vehicle ABS is engaged. Solid illumination indicates a problem with the vehicle ABS. Repair the ABS immediately to ensure full braking capability.	Amber

	Trailer ABS	Momentary illumination indicates the trailer ABS is engaged. Solid illumination indicates a problem with the trailer ABS. Repair the ABS immediately to ensure full braking capability.	Amber
	Wheel Spin	Flashing indicates the ATC system is active, or the ATC button has been pressed to allow wheel slip. Solid illumination indicates a problem with the ATC system. Repair the ATC system immediately to ensure full braking capability.	Amber
	Engine Brake	Indicates the engine brake is enabled.	Green

Table 15, Brake System Warning and Indicator Lamps

Before a vehicle with insufficient system air pressure can be moved, the spring parking brakes must be released by applying an external air source at the gladhands, or by manually caging the parking brake springs.



WARNING:

Do not release the spring parking brakes and then drive the vehicle. There would be no means of stopping the vehicle, which could result in serious personal injury or vehicle damage. Before releasing the spring parking brakes, make the connection to a towing vehicle or chock the tires.

After correcting the brake system problem, uncage the spring parking brakes before resuming normal vehicle operation.

Primary Air Brake System

Loss of air pressure in the primary air system causes the rear service brakes to become inoperative. The secondary air system will continue to operate the front brakes and the trailer brakes (if equipped).

Secondary Air System

Loss of air pressure in the secondary air system causes the front service brakes to become inoperative. The primary air system will continue to operate the rear service brakes and the trailer brakes (if equipped).

14.01.03 Brake System Operation

Before driving your vehicle, allow time for the air compressor to build up a minimum of 100 psi (689 kPa) pressure in both the primary and secondary systems. Monitor the air pressure system by observing the air pressure gauges and the low-air-pressure warning light and buzzer. The warning light and buzzer shut off when air pressure in both systems reaches approximately 70 psi (483 kPa).

IMPORTANT: Before driving the vehicle, secure all loose items in the cab so that they will not fly forward during a full brake application. Make sure all passengers are wearing seat belts.

During normal brake stops, depress the foot brake control pedal until braking action slows down the vehicle. Increase or decrease the pressure on the pedal so that the vehicle comes to a smooth, safe stop. Apply the spring parking brakes if the vehicle is to be parked.

IMPORTANT: An air brake proportioning system may be used in tractor air brake systems when the vehicle is not equipped with an antilock braking system (ABS). When operating in bobtail mode, the rear brake chambers (on which the axle load has been greatly reduced) receive reduced (proportional) air pressure, while the front axle brake chambers receive full (normal) air pressure. This results in a different brake pedal "feel," as the pedal seems to require more travel and/or effort to slow or stop the vehicle. However, the air brake proportioning system actually improves vehicle control when the tractor is in bobtail mode. When the tractor is towing a trailer, the rear brake chambers will receive full (normal) application air pressure.

When parking a vehicle attached to a trailer that does not have spring parking brakes, apply the tractor parking brakes. Chock the trailer tires before disconnecting the vehicle from the trailer.

When parking a vehicle attached to a trailer that does not have spring parking brakes, apply the tractor parking brakes. Chock the trailer tires before disconnecting the vehicle from the trailer.

WARNING:

If a trailer or combination vehicle is not equipped with spring parking brakes, do not park it by pulling out only the trailer air supply valve knob. This would apply only the trailer service brakes. If air were to bleed from the trailer brake system, the trailer brakes would release, possibly causing an unattended runaway vehicle.

NOTICE:

Never apply the service and spring parking brakes simultaneously. To do so transmits excessive input force to the brake components, which could damage or cause eventual failure of brake actuating components.

Brake Controls

The trailer brake lever (hand control valve) is used for applying the trailer brakes without applying the truck or tractor service brakes. It is usually mounted on the right-hand control panel. See Fig.167,Trailer Brake Lever. The valve can be partially or fully applied, but in any partially on position it will be overridden by a full application of the service brake pedal. Moving the lever down applies the trailer brakes, while moving it up releases the trailer brakes. The lever will automatically return to the up position when it is released.

WARNING:

Do not use the trailer service brakes for parking; they are not designed for this purpose. If air bleeds out of the trailer air tank during parking, the vehicle could roll, causing serious personal injury or property damage.

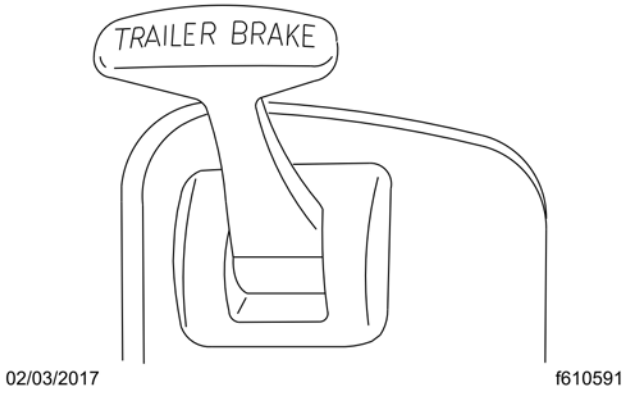


Fig 167, Trailer Brake Lever

The red octagonal-shaped knob in the control panel actuates the trailer air supply valve. See Fig.168,Brake Valve Knobs. After the vehicle's air hoses are connected to a trailer and the pressure in both air systems is at least 65 psi (448 kPa), the trailer air supply valve must be pushed in. It should stay in to charge the trailer air supply system and to release the trailer spring parking brakes.

Pull the trailer air supply valve out before disconnecting a trailer or when operating a vehicle without a trailer. If pressure in both air systems drops to 35 to 45 psi (241 to 310 kPa), the trailer air supply valve automatically pops out, exhausting the trailer air supply, and applying the trailer service or spring parking brakes.

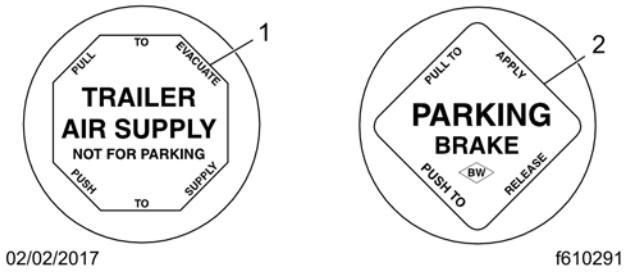


Fig 168, Brake Valve Knobs

The yellow diamond-shaped knob in the control panel actuates the parking brake valve. See Fig.168,Brake Valve Knobs. Pulling out the parking brake valve applies both the tractor and trailer spring parking brakes and automatically causes the trailer air supply valve to pop out.

NOTICE:

Do not use the spring parking brakes if the service brakes are hot, such as after descending a steep grade. To do so could damage the brakes. Allow hot brakes to cool before using the spring parking brakes.

Do not use the spring parking brakes during freezing temperatures if the service brakes are wet. To do so could cause them to freeze. If the brakes are wet, drive the vehicle in low gear and lightly apply the brakes to heat and dry them.

If the trailer is not equipped with spring parking brakes, pulling out the parking brake valve applies the tractor spring parking brakes and the trailer service brakes. When the tractor and trailer parking brakes (or trailer service brakes) are both applied, the trailer brakes are released by pushing in the trailer air supply valve, leaving the tractor parking brakes applied. Air

pressure in the primary or secondary reservoir must be at least 65 psi (448 kPa) before the tractor spring parking brakes, or the trailer service or spring parking brakes, can be released.

14.01.04 Automatic Slack Adjusters

Automatic slack adjusters should never be manually adjusted except during routine maintenance of the foundation brakes (e.g., replacing shoes), during slack adjuster installation, or in an emergency situation.

When the brake pushrod stroke exceeds the legal brake adjustment limit on a vehicle, there is likely a mechanical problem with the foundation brake components or the adjuster is improperly installed.

Visit a repair facility as soon as possible when brakes equipped with automatic slack adjusters are determined to be out of adjustment.



WARNING:

Manually adjusting an automatic slack adjuster to bring the pushrod stroke within legal limits is likely masking a mechanical problem. Adjustment is not a repair. Before adjusting an automatic slack adjuster, troubleshoot the foundation brake system and inspect it for worn or damaged components. Improperly maintaining the vehicle braking system may lead to brake failure, resulting in property damage, personal injury, or death.

14.02 Meritor WABCO® Antilock Braking System

14.02.01 General Information

The Meritor WABCO Antilock Braking System (ABS) is an electronic wheel speed monitoring and control system that works with the standard air brake system. ABS passively monitors vehicle wheel speed at all times, and controls wheel speed during emergency stops.

IMPORTANT: For proper ABS system operation, do not change tire sizes. The sizes of the tires installed during production are programmed into the electronic control unit. Installing different-sized tires could result in a reduced braking force, leading to longer stopping distances.

ABS includes signal-generating tone wheels and sensors located in the wheel hubs of each sensed wheel. The sensors transmit vehicle wheel speed information to an electronic control unit (located behind the center dash). The control unit's main circuit interprets the speed sensor signals and calculates wheel speed, wheel retardation, and a vehicle reference speed. If the calculations indicate wheel lockup, the main circuit signals the appropriate modulator valve to reduce braking pressure. During emergency braking, the modulator valve alternately reduces, increases, or maintains air pressure supply in the brake chamber to prevent front and rear wheel lockup.

The electronic control unit (ECU) also has a safety circuit that constantly monitors the wheel sensors, traction control valve (if equipped), modulator valves, and the electrical circuitry.

The Meritor WABCO ABS combines one front-axle control channel with one rear-axle control channel to form one control circuit. For example, the sensor and modulator valve on the left-front axle form a control circuit with the sensor and modulator valve on the right-rear axle. If, during vehicle operation, the safety circuit senses a failure in any part of the ABS, the vehicle ABS warning lamp (see Table.16,Brake System Warning and Indicator Lamps) illuminates and the control circuit where the failure occurred is switched to normal braking action. The remaining control circuit will retain the ABS effect. Even if the ABS is completely inoperative, normal braking ability is maintained. An exception would be if a modulator valve (or combination modulator valve) is damaged and inoperative. As these components are an integral part of the air brake system, normal braking may be impaired or inoperative.

Table 16, Brake System Warning and Indicator Lamps

Brake System Warning and Indicator Lamps	
Lamp Description	**Color**

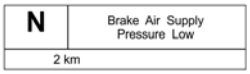
	Low Air Pressure (EPA10 and Newer)	Indicates air pressure in the primary or secondary reservoir has dropped below approximately 70 psi (483 kPa).	Red
	Low Air Pressure (ICU4Me only, mid-GHG14)	Indicates air pressure in the primary or secondary reservoir has dropped below approximately 70 psi (483 kPa).	—
	Parking Brake	Indicates the parking brake is engaged.	Red
	Vehicle ABS	Momentary illumination indicates the vehicle ABS is engaged. Solid illumination indicates a problem with the vehicle ABS. Repair the ABS immediately to ensure full braking capability.	Amber
	Trailer ABS	Momentary illumination indicates the trailer ABS is engaged. Solid illumination indicates a problem with the trailer ABS. Repair the ABS immediately to ensure full braking capability.	Amber
	Wheel Spin	Flashing indicates the ATC system is active, or the ATC button has been pressed to allow wheel slip. Solid illumination indicates a problem with the ATC system. Repair the ATC system immediately to ensure full braking capability.	Amber
	Engine Brake	Indicates the engine brake is enabled.	Green

Table 16, Brake System Warning and Indicator Lamps

During emergency or reduced-traction stops, fully depress the brake pedal until the vehicle comes to a safe stop. *Do not pump the brake pedal* . With the brake pedal fully depressed, the ABS will control all wheels to provide steering control and a reduced braking distance.

Although the ABS improves vehicle control during emergency braking situations, the driver still has the responsibility to change driving styles depending on existing traffic and road conditions. For example, the ABS cannot prevent an accident if the driver is speeding or following too closely.

14.02.02 Trailer ABS Compatibility

The Meritor WABCO ABS is designed to communicate with a trailer ABS, if they are compatible. Compatibility will result in the illumination of the TRAILER ABS lamp (see Table.17,Brake System Warning and Indicator Lamps) during vehicle start-up and fault detection.

Table 17, Brake System Warning and Indicator Lamps

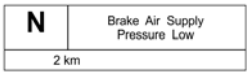
Brake System Warning and Indicator Lamps			
Lamp Description			**Color**
	Low Air Pressure (EPA10 and Newer)	Indicates air pressure in the primary or secondary reservoir has dropped below approximately 70 psi (483 kPa).	Red
	Low Air Pressure (ICU4Me only, mid-GHG14)	Indicates air pressure in the primary or secondary reservoir has dropped below approximately 70 psi (483 kPa).	—
	Parking Brake	Indicates the parking brake is engaged.	Red
	Vehicle ABS	Momentary illumination indicates the vehicle ABS is engaged. Solid illumination indicates a problem with the vehicle ABS. Repair the ABS immediately to ensure full braking capability.	Amber
	Trailer ABS	Momentary illumination indicates the trailer ABS is engaged. Solid illumination indicates a problem with the trailer ABS. Repair the ABS immediately to ensure full braking capability.	Amber
	Wheel Spin	Flashing indicates the ATC system is active, or the ATC button has been pressed to allow wheel slip. Solid illumination indicates a problem with the ATC system. Repair the ATC system immediately to ensure full braking capability.	Amber
	Engine Brake	Indicates the engine brake is enabled.	Green

Table 17, Brake System Warning and Indicator Lamps

The TRAILER ABS lamp will not illuminate unless a compatible trailer is connected to the tractor. The dash-mounted lamp will operate as follows when a compatible trailer is properly connected to the tractor:

- When the ignition key is turned to the ON position, the TRAILER ABS lamp will illuminate momentarily, then turn off.
- If the lamp illuminates momentarily during vehicle operation, then shuts off, a fault was detected and corrected.
- If the lamp illuminates and stays on during vehicle operation, there is a fault with the trailer ABS. Repair the trailer ABS system immediately to ensure full antilock braking capability.

IMPORTANT: If a compatible trailer is connected, and the lamp is not illuminating momentarily when the ignition key is turned to the ON position, it is possible that the lamp is burnt out.

14.02.03 Automatic Traction Control

Vehicles with electronic engines and ABS may have Automatic Traction Control (ATC). On these vehicles, the ATC system automatically limits wheel spin during reduced-traction situations. In normal braking applications, the standard air brake system is in effect.

An additional solenoid valve is installed. During reduced-traction situations, the ATC solenoid valve controls air pressure to the modulator valves and they in turn increase, hold, or reduce pressure to the appropriate brake chambers to provide better traction whenever wheel spin occurs.

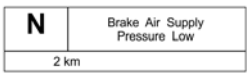
When the ATC system is in the NORMAL mode, it will apply gentle braking to the spinning wheel, to feed power to the wheel(s) with better traction. If both wheels are spinning, the system will signal the engine to reduce power.

ATC includes a deep snow and mud option to increase available traction on extra soft surfaces like snow, mud, or gravel. A rocker switch labeled ATC will be located on the dash. See Fig.169,ATC Switch. Pressing the switch will temporarily allow more drive wheel spin. The activation of the deep snow and mud option is indicated by a flashing WHEEL SPIN lamp. See Table.18,Brake System Warning and Indicator Lamps. Pressing the switch again will cycle the system back to normal operation.



Fig 169, ATC Switch

Table 18, Brake System Warning and Indicator Lamps

Brake System Warning and Indicator Lamps			
Lamp Description			**Color**
	Low Air Pressure (EPA10 and Newer)	Indicates air pressure in the primary or secondary reservoir has dropped below approximately 70 psi (483 kPa).	Red
	Low Air Pressure (ICU4Me only, mid-GHG14)	Indicates air pressure in the primary or secondary reservoir has dropped below approximately 70 psi (483 kPa).	—
	Parking Brake	Indicates the parking brake is engaged.	Red
	Vehicle ABS	Momentary illumination indicates the vehicle ABS is engaged. Solid illumination indicates a problem with the vehicle ABS.	Amber

		Repair the ABS immediately to ensure full braking capability.	
	Trailer ABS	Momentary illumination indicates the trailer ABS is engaged. Solid illumination indicates a problem with the trailer ABS. Repair the ABS immediately to ensure full braking capability.	Amber
	Wheel Spin	Flashing indicates the ATC system is active, or the ATC button has been pressed to allow wheel slip. Solid illumination indicates a problem with the ATC system. Repair the ATC system immediately to ensure full braking capability.	Amber
	Engine Brake	Indicates the engine brake is enabled.	Green

Table 18, Brake System Warning and Indicator Lamps



NOTICE:

The deep snow and mud option is intended to be used under specific slippery conditions that require momentary increased wheel spin. Using this option for an extended period of time may damage the vehicle brake system.

After the ignition switch is turned on, the vehicle ABS lamp and the WHEEL SPIN indicator lamp come on for about three seconds. After three seconds, the warning lights go out if all of the tractor's ABS components are working.

IMPORTANT: If any of the ABS warning lights do not work as described above, or come on while driving, repair the ABS immediately to ensure full antilock braking capability.

14.02.04 ECAS Automatic Load Transfer (ECAS only)

On vehicles equipped with Electronically Controlled Air Suspension (ECAS), ECAS works in conjunction with ABS. When wheel slippage is detected by the ABS, the ECAS system transfers weight from the tag axle to the drive axle by changing air pressures in the suspension air bellows, increasing drive wheel traction.

The ECAS Load Transfer feature is optimized to apply the maximum available vehicle load on the drive axle, up to the maximum allowable limit, determined by the gross axle weight rating (GAWR). In bobtail or with a loaded trailer less than the GAWR, the tag axle supports a negligible load while the drive axle supports nearly the full weight. Above the GAWR, the drive axle is loaded with approximately the maximum allowable load and the tag supports the remainder.

When Load Transfer mode is active, "Load Transfer" will display in the message field of the driver message center. See Fig. 170,Load Transfer Notification.



Fig 170, Load Transfer Notification

Load transfer mode will automatically deactivate when the vehicle reaches 45 mph (72 kmh).

14.03 Engine Brake

14.03.01 General Information

Each engine manufacturer uses a specific engine brake for their engine. Regardless of the manufacturer, the engine brake is operated with the principles outlined here. Refer to the engine manufacturer's operation manual for details of their particular engine brake product.

WARNING:

To avoid injury from loss of vehicle control, do not activate the engine brake system under the following conditions:

- on wet or slippery pavement, unless the vehicle is equipped with antilock braking system (ABS) and you have had prior experience driving under these conditions;
- when driving without a trailer or pulling an empty trailer;
- if the tractor drive wheels begin to lock, or there is fishtail motion after the engine brake is activated.

NOTE: When the engine brake is enabled, the engine brake lamp illuminates in the instrument panel. See Table.19,Brake System Warning and Indicator Lamps.

Whenever vehicle braking is required on good road conditions, the engine brake may be used in conjunction with the service brakes. There is no time limit for operation of the engine brake. However, an engine brake does not provide the precise control of, and is not a substitute for, service brakes.

WARNING:

Usage of the engine brake as the primary braking system can cause unpredictable stopping distances, that could result in personal injury or property damage. Service brakes are the primary vehicle braking system.

Since the engine brake is most effective at rated engine speed, gear selection is very important. Gearing down the vehicle within the limits of the rated engine speed makes the engine brake more effective. Recommended engine braking speed is above 1800 rpm and below the rated speed.

WARNING:

The engine brake must be disengaged when shifting gears using the clutch pedal. If the engine brake is engaged when the transmission is in neutral, the braking power of the engine brake can stall the engine, which could result in loss of vehicle control, possibly causing personal injury and property damage.

“Control speed” is the speed at which the engine brake performs 100 percent of the required downhill braking, resulting in a constant speed of descent. The control speed varies, depending on vehicle weight and the downhill grade.

For faster descent, select a higher gear than that used for control speed. Service brakes must then be used intermittently to prevent engine overspeed and to maintain desired vehicle speed.

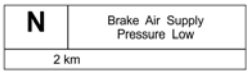
For slower descent, select a lower gear, being careful not to overspeed the engine. Occasional deactivation of the engine brake may be necessary to maintain the designated road speed under these conditions.

If the engine is equipped with both cruise control and an engine brake, the engine brake can operate automatically while cruise control is activated. The maximum amount of braking is selected with the engine brake control. When the vehicle returns to the set cruise speed, the engine brake will turn off.

The engine brake will only operate when the accelerator and clutch pedals are fully released.

Vehicles equipped with ABS have the ability to turn the engine brake off if wheel slip is detected. The engine brake will automatically turn back on once wheel slip is no longer detected.

Table 19, Brake System Warning and Indicator Lamps

Brake System Warning and Indicator Lamps			
Lamp Description			**Color**
	Low Air Pressure (EPA10 and Newer)	Indicates air pressure in the primary or secondary reservoir has dropped below approximately 70 psi (483 kPa).	Red
	Low Air Pressure (ICU4Me only, mid-GHG14)	Indicates air pressure in the primary or secondary reservoir has dropped below approximately 70 psi (483 kPa).	—
	Parking Brake	Indicates the parking brake is engaged.	Red
	Vehicle ABS	Momentary illumination indicates the vehicle ABS is engaged. Solid illumination indicates a problem with the vehicle ABS. Repair the ABS immediately to ensure full braking capability.	Amber
	Trailer ABS	Momentary illumination indicates the trailer ABS is engaged. Solid illumination indicates a problem with the trailer ABS. Repair the ABS immediately to ensure full braking capability.	Amber

	Wheel Spin	Flashing indicates the ATC system is active, or the ATC button has been pressed to allow wheel slip. Solid illumination indicates a problem with the ATC system. Repair the ATC system immediately to ensure full braking capability.	Amber
	Engine Brake	Indicates the engine brake is enabled.	Green

Table 19, Brake System Warning and Indicator Lamps

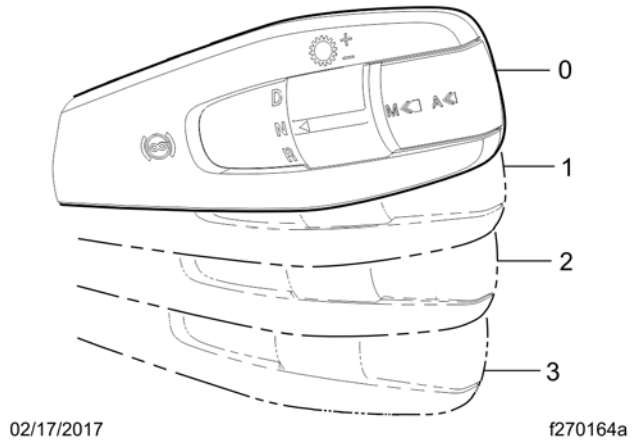
14.03.02 Engine Brake Operation

NOTICE:
Do not allow the engine to exceed its governed speed, or serious engine damage could result.

NOTE: Depending on the brake type, the engine brake may be disabled when engine temperature falls below a set level.

The engine brake control is located on the right-hand steering column lever. At the top position, the engine brake is off, and at the three lower positions, the engine brake is on and the intensity (low, medium, high) increases with each step down. See Fig.171,Engine Brake Positions, Detroit Multifunction Control.

NOTE: On vehicles equipped with a Detroit automated transmission, setting the engine brake with the cruise control set activates Deceleration Mode. Setting the cruise control while the engine brake is on activates Descent Control Mode. For information on these modes, see "Cruise Control", see 5.01 Control Panels.



1. Off
2. Low
3. Medium
4. High

Fig 171, Engine Brake Positions, Detroit Multifunction Control

15.01 Power Steering System 196
15.02 Adjustment of the Steering Wheel 196

15. Steering System

15.01 Power Steering System

The power steering system includes the power steering gear, hydraulic hoses, power steering pump, reservoir, steering wheel and column, and other components.

The power steering pump, driven by the engine, provides the power assist for the steering system. If the engine is not running, there is no power assist.

WARNING:

Driving the vehicle without the power-assist feature of the steering system requires much greater effort, especially in sharp turns or at low speeds, which could result in an accident and possible injury.

If the power-assist feature does not work due to hydraulic fluid loss, steering pump damage, or another cause, bring the vehicle to a safe stop. Do not drive the vehicle until the cause of the problem has been corrected.

NOTICE:

Never steam clean or high-pressure wash the steering gear. Internal damage to gear seals, and ultimately the steering gear, can result.

Drivers should carefully use the power available with a power steering system. If the front tires become lodged in a deep hole or rut, drive the vehicle out instead of using the steering system to lift the tires out of the hole.

NOTICE:

Avoid turning the tires when they are against a curb, as this places a heavy load on steering components and could damage them.

15.02 Adjustment of the Steering Wheel

When there is no load on the vehicle and the front tires are pointed straight ahead, the standard steering wheel spokes should be at the 3 o'clock and 9 o'clock positions or within 10 degrees of these positions. See Fig. 172,Steering Wheel Centered.



1. 9 o'Clock
2. 3 o'Clock

Fig 172, Steering Wheel Centered

16.01 Detroit™ Automated Transmissions 200
16.01.01 Detroit™ Multifunction Control 200
16.01.02 Power Up and Shift into Gear 202
16.01.03 Gear Display Window 202
16.01.04 Driving Modes 202
16.01.05 Selected Gear 202
16.01.06 Suggested Shift 203
16.01.07 eCoast 203
16.01.08 Creep Mode 204
16.01.09 Clutch Abuse Protection 204
16.01.10 Engine Overspeed Alerts 205
16.01.11 Low Transmission Air Warning 205
16.02 Eaton® Fuller® Automated Transmissions 206
16.02.01 General Information, Automated Transmissions 206
16.02.02 Automated Transmission Operation 207
16.02.03 Powering Up 209
16.02.04 Powering Down 211
16.02.05 Upshifting 211
16.02.06 Transmission Diagnostics 212
16.02.07 System Problem 212
16.02.08 Transmission Reset Procedure 212
16.02.09 Locked In Gear 212
16.03 Allison Automatic Transmissions 213
16.03.01 General Information, Allison Transmissions 213
16.03.02 Allison Transmission Operation 214

16. Automated Transmissions

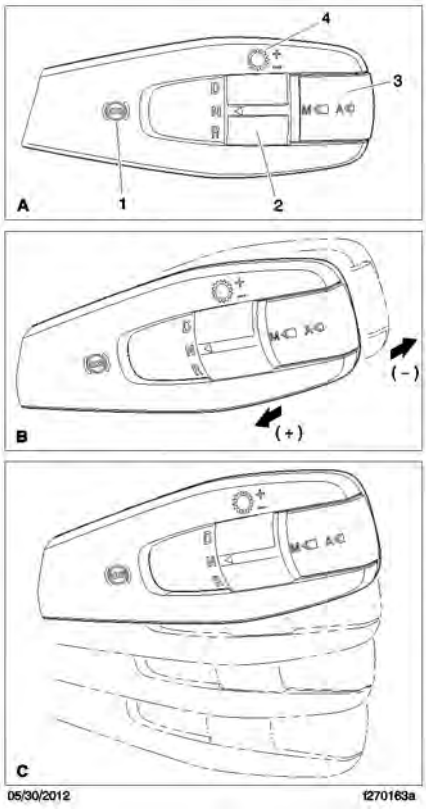
16.01 Detroit™ Automated Transmissions

16.01.01 Detroit™ Multifunction Control

Detroit transmissions have twelve forward gears and up to four reverse gears that can be shifted automatically or manually. Shifting and clutch actuation are computer controlled, and there is no clutch pedal needed to operate the vehicle. Automatic shifts are selected for fuel economy or engine power. Manual shifts can be requested with the shift control and the transmission ECU grants them when conditions permit. In all cases, shifts depend on the following factors: engine speed, accelerator pedal position, service brake usage, engine brake operation, vehicle load status, and road conditions.

To avoid potential engine stall risk or unexpected shifting, use the interaxle differential lock when the vehicle is operated in slippery conditions. See for information about the interaxle differential lock.

Vehicles with Detroit transmissions use the control see Fig.173,Detroit Multifunction Control. This control can be used to request manual shifts, change driving mode, and set engine brake levels. See Table.20,Functionality, Detroit Multifunction Control for an overview of control functionality.



NOTE: See Table for a description of control functionality.

A. Front View
B. Shift Requests
C. Four positions for engine brake settings
1. Engine Brake Symbol
2. D/N/R Switch
3. Mode Switch
4. Gear Shift Symbol

Fig 173, Detroit Multifunction Control

D/N/R Switch

Use the "D/N/R Switch" to request drive (D), neutral (N), or reverse (R).

Mode Switch

The driving mode can be changed using the Mode switch on the shift control (see Fig.173,Detroit Multifunction Control). To activate the manual drive mode, press and hold the switch briefly. Press the switch quickly to activate the automatic drive mode or change between Automatic Economy and Automatic Performance modes.

Upshifting and Downshifting

Gear shifts can be requested manually; push the lever away to request a downshift, or pull the lever toward you to request an upshift. See Table.20,Functionality, Detroit Multifunction Control for more information about upshift and downshift requests.

Table 20, Functionality, Detroit Multifunction Control

Functionality, Detroit Multifunction Control		
Function/Switch	**Action/Position**	**Request**
D/N/R	D	Forward gears
	N	Neutral
	R	Reverse gears
Mode	Depress switch and release it quickly	Activate the automatic drive mode, or switch between Automatic Economy and Automatic Performance.
	Depress switch and hold it briefly	Activate the manual drive mode.
Upshifting and Downshifting	Pull the lever toward you momentarily	Upshift, single gear
	Pull the lever toward you in quick repetitions	Upshift, multiple gears
	Push the lever away momentarily	Downshift, single gear
	Push the lever away in quick repetitions	Downshift, multiple gears
Engine Brake*	Lever at position 0 (top)	Engine brake off
	Lever at position 1	Low intensity
	Lever at position 2	Medium intensity
	Lever at position 3 (bottom)	High intensity

Table 20, Functionality, Detroit Multifunction Control

* For functions with cruise control active, see .

Engine Brake

The engine brake is controlled by the lever position (see Fig.173,Detroit Multifunction Control, Ref. C). At the top position, the engine brake is off, and at the three lower positions, the engine brake is on and the intensity (low, medium, high) increases with each step down. For more information about using the engine brake, see .

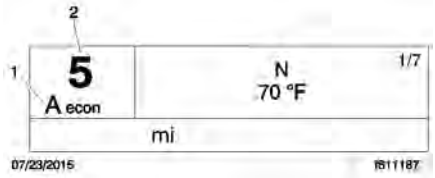
Using the engine brake with cruise control can be used to activate Descent Control Mode or Deceleration Mode. For more information, see "Cruise Control" in .

16.01.02 Power Up and Shift into Gear

1. With the parking brake set and Neutral (N) selected on the shift control, turn the ignition switch to the ON position.
2. Start the engine.
3. Apply the service brake.
4. Select the desired starting gear.
5. Release the parking brake.
6. Release the service brake and apply the accelerator.

16.01.03 Gear Display Window

The gear display window shows the current transmission gear and driving mode. See Fig.174,Gear Display Window.



1. Driving Mode
2. Current Gear

Fig 174, Gear Display Window

16.01.04 Driving Modes

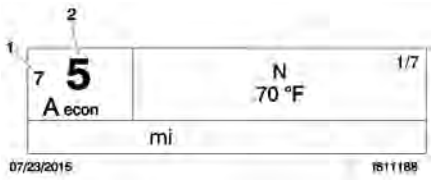
There are three driving modes: Manual, Automatic Economy, and Automatic Performance.

In Automatic Economy mode, gear shifts are designed for saving fuel. In Automatic Performance mode, gear shifts are designed for higher performance and are made at higher engine speeds. In manual mode, gear shifts are requested manually. See for more information about upshifting and downshifting using the control.

NOTE: In Automatic Performance mode, the transmission will automatically change to Automatic Economy mode if it hasn't received a request for more power in several minutes, unless current road conditions require higher engine performance.

16.01.05 Selected Gear

If the selected gear is different than the current gear for longer than a half second, the current gear display will flash and the selected gear value will be shown. Once the current gear and selected gear match, the selected gear display disappears and the current gear display stops flashing. See Fig.175,Selected Gear Display.

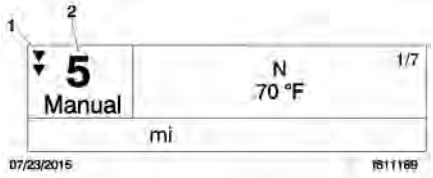


1. Selected Gear
2. Current Gear

Fig 175, Selected Gear Display

16.01.06 Suggested Shift

In Manual mode only, a suggested shift is displayed to indicate the most economical gear available. The suggested shift is the number of up or down arrows from the current gear with a maximum of three up or down arrows. See Fig. 176,Suggested Shift.



1. Suggested Shift Arrows
2. Current Gear

Fig 176, Suggested Shift

16.01.07 eCoast

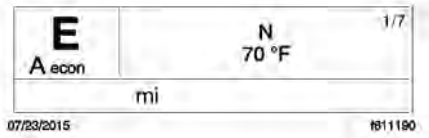
The eCoast feature can improve driving economy. When conditions permit, the transmission control automatically shifts the transmission to neutral to coast at speeds between approximately 22 - 55 mph (35 - 88.5 km/h), and above depending on specific programming. An "E" shows in the gear display window when eCoast is in effect. See Fig.177,eCoast Display.

The eCoast function is not active when any of the following occur:

- the accelerator pedal is pressed.
- vehicle acceleration rate is exceeded.
- the service brake pedal is pressed.
- the engine brake is in use.
- cruise control brakes or accelerates.
- vehicle speed exceeds the cruise control set speed by more than approximately 4 mph (6 km/h).
- the speed limiter is active and the maximum speed set is exceeded.
- diesel particulate filter (DPF) regeneration occurs.

The eCoast function cannot be deactivated when the Automatic Economy mode is active.

NOTE: To disable eCoast, see an authorized Freightliner service facility.



NOTE: Upshift and downshift arrows are not shown when "E" is shown in the gear display window.

Fig 177, eCoast Display

16.01.08 Creep Mode

Creep mode allows the vehicle to be maneuvered at very slow speeds. To activate Creep mode for the first time within the current driving cycle, press the accelerator pedal to launch the vehicle, thereby fully engaging the clutch. Following this and for the duration of the current driving cycle, Creep mode is active.

Once the vehicle is stopped via the service brakes, the vehicle will begin to creep again, without the accelerator pedal actuation, as soon as the service brakes are released.

To begin using Creep mode (once active) from a parked position, shift from neutral to either drive or reverse, release the service brakes, and briefly depress the accelerator pedal. The vehicle's urge to move can then be felt.

If creep is active and no acceleration is achieved within five seconds, then Creep mode will abort. A display message notifies the operator when Creep mode is about to be aborted.

IMPORTANT: When slowing down from higher speeds in drive or reverse, remember that Creep mode will be in effect at lower speeds. Use the service brakes to stop the vehicle.

16.01.09 Clutch Abuse Protection

A vehicle equipped with a Detroit transmission does not have a clutch pedal, but still has a clutch that is operated automatically and can be damaged by abusive driver actions. To protect the clutch, the vehicle has a clutch abuse protection system that alerts the driver and restricts functionality when needed. Extended periods in Creep Mode, slipping the clutch (using the accelerator pedal to hold the vehicle on a hill, for example), and high clutch temperatures can activate the clutch abuse protection system. A display message notifies the operator when the protections are needed.

NOTICE:

To hold the vehicle stationary on an uphill slope, use the service brakes, not the accelerator pedal. Using the accelerator pedal can overheat and damage the clutch. To start moving, use the accelerator pedal and release the brakes as the vehicle begins to move.

There are three clutch abuse protection levels. At each, the driver is alerted and functionality is modified; see Table.21, Clutch Abuse Alerts and Protections.

- To avoid clutch overheating, follow these tips:
- To hold the vehicle stationary on an uphill slope, use the service brakes, not the accelerator pedal.
- To start moving on an uphill slope, use the accelerator pedal and release the brakes as the vehicle begins to move.
- When hooking up to a trailer, ensure the trailer is high enough to back under, and use first gear reverse.
- Avoid starting in higher gears, and start in first gear when a trailer is attached.
- Ensure trailer brakes have had time to completely release prior to starting.
- Do not use Creep mode for an extended period. Stop or adjust the vehicle speed when warned to deactivate Creep mode.

Table 21, Clutch Abuse Alerts and Protections

Clutch Abuse Alerts and Protections				
Alert Level	Alert	Protections		
		Highest Start Gear	Creep Mode	Clutch Function
1	Heavy clutch load message	1	No restriction	Normal function
2	Heavy clutch load message	1	Disabled	Normal function
3	Clutch overload message and buzzer	1	Disabled	If the accelerator pedal is depressed, the clutch closes at fixed rate. If the accelerator pedal is released, the clutch opens at fixed rate.

Table 21, Clutch Abuse Alerts and Protections

16.01.10 Engine Overspeed Alerts

To help protect the engine, the system has display messages to notify the operator when the engine has exceeded certain thresholds and needs to be slowed down before significant engine damage occurs. There are two warnings, one at about 2400 rpm and another at 2500 rpm, indicated with messages and a fault code.

16.01.11 Low Transmission Air Warning

Pneumatic controls are used to shift the transmission. If there is inadequate air pressure, a warning is displayed and the quality of gear shifts may be degraded. Wait for air pressure to build before operating the vehicle.

IMPORTANT: If the low transmission air warning indicator appears while the vehicle is in operation, safely pull the vehicle off the road, and correct the problem.

Table 22, Clutch Abuse Alerts and Protections

Clutch Abuse Alerts and Protections				
Alert Level	Alert	Protections		
		Highest Start Gear	Creep Mode	Clutch Function
1	Heavy clutch load message	1	No restriction	Normal function
2	Heavy clutch load message	1	Disabled	Normal function
3	Clutch overload message and buzzer	1	Disabled	If the accelerator pedal is depressed, the clutch closes at fixed rate. If the accelerator pedal is released, the clutch opens at fixed rate.

Table 22, Clutch Abuse Alerts and Protections

16.02 Eaton® Fuller® Automated Transmissions

16.02.01 General Information, Automated Transmissions

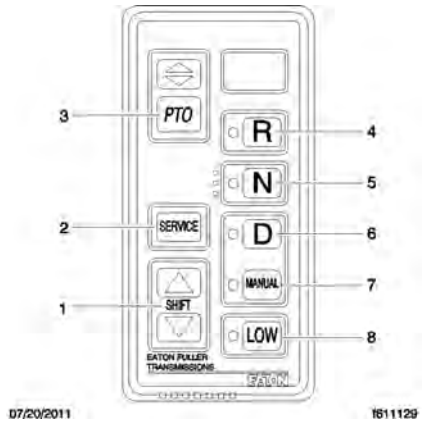
Refer to the Eaton website (www.roadranger.com) for additional information.

The Eaton Fuller UltraShift is a heavy-duty fully automated transmission. The UltraShift uses a dry clutch system, so no clutch pedal is required to shift gears.

The Eaton Fuller AutoShift transmission requires the driver to use the clutch to start and stop the vehicle. However, the driver does not need to use the clutch to shift gears.

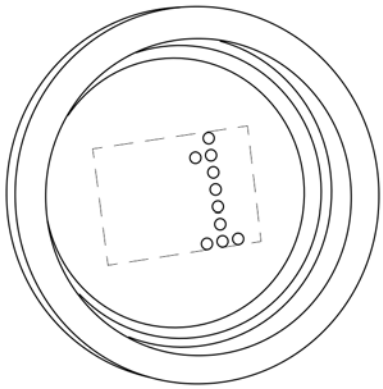
The Eaton Fuller automated transmissions use a shift selection module located on the dash control panel. See Fig. 178,Shift Selection Module, UltraShift and AutoShift Transmissions. Shifts can be made automatically, or manually using the shift selection module.

The current gear is displayed on the indicator shown in Fig.179,Gear Indicator. At the start of a shift, the current gear continues to display until the transmission has been pulled into neutral. As the transmission is synchronizing for the new (target) gear, the gear indicator flashes the number of the target gear. When the shift is complete, the gear indicator displays the new gear, without flashing.



1. Upshift/Downshift Buttons
2. Service Needed Indicator
3. PTO Activation Button
4. Reverse Mode Button
5. Neutral Button
6. Drive Mode Button
7. Manual Mode Selector
8. Low Mode Button

Fig 178, Shift Selection Module, UltraShift and AutoShift Transmissions



03/29/2017 f610680

NOTE: The gear indicator displays the current gear. In this example, it displays first gear.

Fig 179, Gear Indicator

16.02.02 Automated Transmission Operation

Modes

The shift selection module controls the driving mode, which includes drive, manual, reverse, or low.

IMPORTANT: In all modes but low, it is possible to shift manually by pressing the upshift or downshift selectors as needed. When the engine speed is within 75 rpm of the load-based shift point for an automatic shift, the transmission will advance the shift.

Drive Mode

Press the drive mode button (D) on the shift selection module to put the transmission in drive mode.

In drive mode, upshifts and downshifts are made by the transmission without driver intervention. The transmission will shift automatically when the driver presses the drive mode button (D) and depresses the accelerator pedal.

If driving conditions require, it is still possible to request a manual shift. The transmission will make the shift if the engine speed is within 75 rpm of the load-based shift point for that gear.

If the vehicle is stopped while in drive mode, the upshift/downshift buttons can be used to change the starting gear. This selection becomes the default starting gear until it is changed by the driver again, or the vehicle is shut down.

The transmission controller adapts to the working conditions of each vehicle and its driver. After power-up or a load change, it needs to learn the new conditions. While learning, it may hold a gear too long before upshifting. If this occurs, start the upshift manually. It may take three or four shifts before the transmission succeeds in learning the new load-based shift points, but after that it will handle the shifting automatically.

Automatic skip shifts may occur in drive mode if conditions are appropriate.

Manual Mode

In manual mode, upshifts and downshifts are made by the driver. This allows the driver to respond to a wide range of driving conditions, such as blind corners, tight curves, and steep hills.

To change to manual mode, press the manual mode button (MANUAL) on the shift selection module. If manual mode is selected while the vehicle is moving, the current gear will be maintained until the driver requests a shift using the proper upshift/downshift arrow button. If the manual mode is selected while the vehicle is not moving, the starting gear will be maintained until the driver requests a shift. In downhill situations in particular, the driver must be alert to vehicle speed by downshifting and/or using the service brakes as needed. A shift request will be refused if the selected gear would cause engine overspeed or excessive lugging.

To upshift, press the upshift arrow button on the shift selection module; to downshift, press the downshift arrow button. See Fig.181,Shift Selection Module, UltraShift and AutoShift Transmissions. A shift request will be refused if the selected gear would cause engine overspeed or excessive lugging.

Reverse Mode

To put the transmission in reverse, press the reverse mode button on the shift selection module.

The UltraShift transmission has two reverse gears: reverse low and reverse high. The AutoShift transmission may have multiple reverse gears. To shift manually between the reverse gears, press the upshift or downshift arrow button until the desired reverse gear is displayed.

Reverse low is the default reverse gear. When reverse low is selected, the letter R displays on the gear indicator. See Fig. 180,Gear Indicator: Reverse Low Gear. When reverse high is selected, the letter H is displayed.

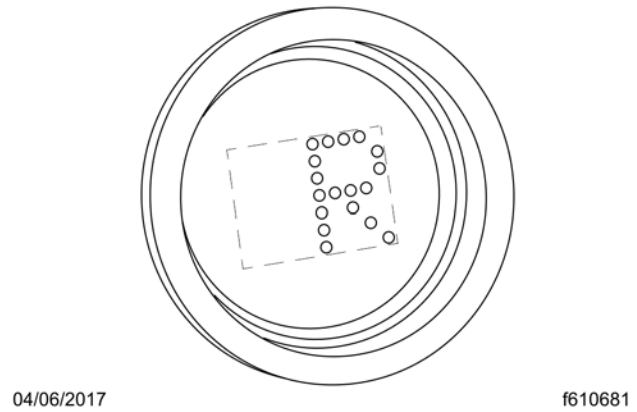


Fig 180, Gear Indicator: Reverse Low Gear

IMPORTANT: Under normal conditions, do not select reverse with the vehicle moving forward.

The vehicle must be moving at less than two miles per hour (3 km/h) before selecting reverse. If reverse is selected when the vehicle is moving faster, an audible alert will sound and continue sounding at three-second intervals until the vehicle slows to the proper speed or the driver selects the drive mode.

Low Mode

Low mode should be used to maximize engine braking and minimize the use of the brake pedal. It is most useful when descending steep hills or when coming to a stop. Engine speed will be increased by 200 rpm and shift points will be offset by 200 rpm.

To select low mode, press the low mode button (LOW) on the shift selection module. When in low, the current gear is maintained. Requests to upshift are not enabled.

IMPORTANT: If the engine is approaching overspeed, the transmission controller will override the current gear setting and upshift to prevent engine damage.

If low mode is selected from neutral while the vehicle is stopped, the vehicle will start up in first gear and stay there until the engine approaches overspeed.

Neutral

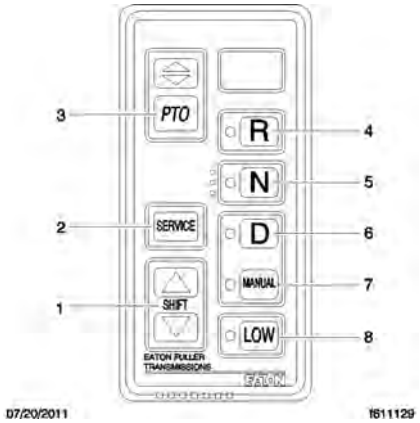
IMPORTANT: Always start the engine with the transmission in neutral (N) and the parking brake set.

WARNING:
Do not coast in neutral. Coasting in neutral can cause an accident, possibly resulting in severe personal injury or death.

Neutral is always available during operation, whatever the vehicle speed. When in neutral, requests to upshift or downshift are ignored. If the driver selects drive mode while the vehicle is moving in neutral, the transmission will shift into the appropriate gear given the engine speed.

When shifting from neutral, always depress the brake pedal. If the brake pedal is not depressed, the transmission will not shift and an audible alert will sound. To reset the transmission, select neutral again and attempt the shift again, this time with the brake pedal depressed.

Before shutting down the engine, return the transmission to neutral.



1. Upshift/Downshift Buttons
2. Service Needed Indicator
3. PTO Activation Button
4. Reverse Mode Button
5. Neutral Button
6. Drive Mode Button
7. Manual Mode Selector
8. Low Mode Button

Fig 181, Shift Selection Module, UltraShift and AutoShift Transmissions

16.02.03 Powering Up

1. With the parking brake set, turn the ignition switch on and allow the shift selection module to power up. The gear indicator will show the dot display, arranged in a square pattern. All dots in the pattern should light up, without gaps or spaces. See Fig.182,Gear Indicator: Power Up Dot Display.

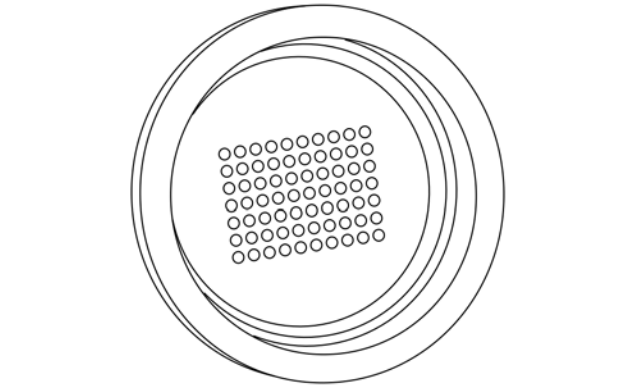


Fig 182, Gear Indicator: Power Up Dot Display

2. Wait for the gear indicator to show a solid N. See Fig.183,Gear Indicator: Neutral. When the N is solid (not flashing), the transmission controller is powered up.

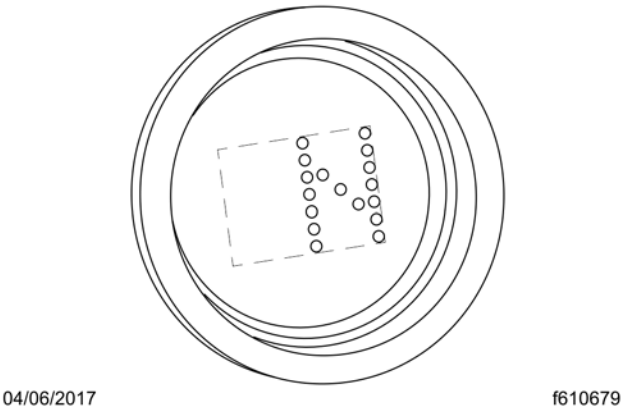


Fig 183, Gear Indicator: Neutral

3. On vehicles with an AutoShift transmission, depress the clutch pedal all the way to the floor.
4. Apply the service brake and start the engine.
5. On vehicles with an AutoShift transmission, release the clutch to allow the speed sensor on the input shaft to get a reading, then depress the clutch pedal again.

   NOTE: When in drive mode, the transmission defaults to second gear when starting off. If desired, the driver can select to start off in first gear. No other start gear is available.

6. Select the desired mode (drive, manual, low, or reverse), then select the desired starting gear.



WARNING:
When starting or stopping on hills and grades, use extra care to prevent the vehicle from rolling back. A rollback accident could cause death, serious personal injury, or property damage.

7. On a level grade, release the parking and service brakes.
8. Move the vehicle forward by doing one of the following:
   - Vehicles with an UltraShift transmission: depress the accelerator pedal.
   - *Vehicles with an AutoShift transmission:* release the clutch and depress the accelerator pedal.

16.02.04 Powering Down

1. On vehicles equipped with an Autoshift transmission, depress the clutch pedal to the floor.
2. Bring the vehicle to a halt
3. Apply the service brakes.
4. Select neutral (N) on the shift selection module. When the N on the gear indicator is solid (not flashing), the transmission controller is ready to power down.
5. Set the parking brake and shut down the engine.

16.02.05 Upshifting

To request an upshift, push the upshift arrow button on the shift selection module. If the gear is available, the transmission will upshift and the new gear will display on the gear indicator. If the gear requested is unavailable, a tone will sound.

Upshifts are not available in low mode, except to prevent engine overspeed.

NOTE: The AutoShift transmission is able to perform triple upshifts when the next three higher gears are available and conditions are appropriate.

Skip shifts can be performed only in manual mode. To skip shift, press the upshift button twice or three times. The number of the gear engaged will appear on the gear indicator.

Downshifting

To request a downshift, push the downshift arrow button on the shift selection module. If the gear is available, the transmission will downshift and the new gear will display on the gear indicator. If the gear requested is unavailable, a tone will sound.

Before starting down a hill, downshift to a speed that you can control without hard pressure on the service brakes. Before entering a curve, downshift if necessary. This lets you use some power through the curve to help the vehicle be more stable in the turn. It also allows you to regain speed faster as you come out of the curve.

NOTE: The AutoShift transmission is able to perform triple downshifts when the next three lower gears are available and conditions are appropriate.

Skip shifts can be performed only in manual mode. To skip shift, press the downshift button twice or three times. The number of the gear engaged will appear on the gear indicator.

For best engine braking, select low mode while moving. In low, downshifts are performed at higher rpm than in drive.

IMPORTANT: If the engine is approaching overspeed, the transmission controller will override the current gear setting and upshift to prevent engine damage.

16.02.06 Transmission Diagnostics

Clutch Protection Fault, UltraShift Transmissions

Even though a vehicle with an UltraShift transmission does not have a clutch pedal, it does have a mechanical clutch. As you slowly increase and decrease engine rpm from a stop, the mechanical clutch is engaging and disengaging, just like slipping the clutch with a manual transmission. Excessive clutch slippage creates heat and reduces the life of the clutch. Conditions that can cause clutch damage include:

- Using the accelerator pedal to hold the vehicle on a hill
- Starting the vehicle from a stop in a gear that's too high
- Overloading the vehicle
- Using high idle with the vehicle in gear

The transmission controller is programmed to prevent clutch damage. When the clutch overheats, the following alerts take place:

- The TRANS TEMP light comes on
- The gear indicator displays "C," then "A"
- A warning tone sounds at one-second intervals

The alerts continue until the clutch cools, the accelerator pedal is released, or the clutch is fully engaged.

16.02.07 System Problem

In the event of a problem, complete the following steps.

1. Note the driving conditions at the time the problem occurred.
2. Record the status of the transmission at the time of the problem (current mode, current gear, engine speed, etc.).
3. Complete the transmission reset procedure.

16.02.08 Transmission Reset Procedure

In some cases, proper transmission operation can be restored by resetting the transmission controller.

1. When it is safe to do so, stop the vehicle.
2. Select neutral by pressing the neutral button (N) on the shift selection module.
3. Set the parking brake.
4. Shut down the engine.
5. Wait at least two minutes.
6. Restart the engine.
7. If the problem continues or the transmission doesn't achieve neutral after power-up, contact an authorized Western Star or Eaton service facility.

16.02.09 Locked In Gear

If the vehicle is shut down while in gear, the transmission may become locked in gear. The transmission will attempt to get to neutral during the next power-up if neutral is selected on the shift selection module. If neutral can't be achieved, a dash (–) will appear on the gear indicator when the vehicle is restarted.

Complete the following steps.

1. Set the parking brake.
2. Turn off the ignition and wait at least two minutes.
3. Depress the brake pedal and release the parking brake.
4. On vehicles with an AutoShift transmission, depress the clutch partway to the floor.

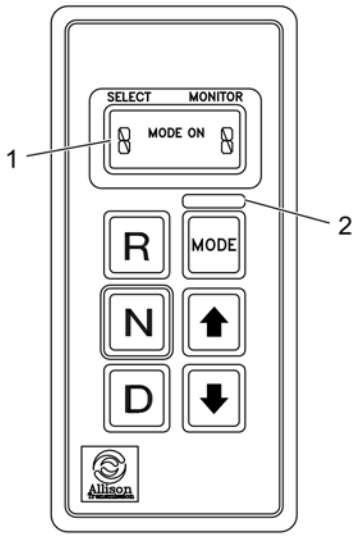
5. Select neutral by pressing the neutral button (N) on the shift selection module, then turn on the ignition key. Do not attempt to start the engine yet.
6. Release the pressure on the brake pedal slightly.
7. Once the transmission is in neutral, a solid N will appear on the gear indicator and the vehicle will start. Apply the service brakes and start the engine.
8. If the gear indicator continues to display a dash, contact an authorized Western Star or Eaton service facility.

16.03 Allison Automatic Transmissions

16.03.01 General Information, Allison Transmissions

Refer to the Allison website for additional information,www.allisontransmission.com.

HD-series automatic transmissions have six forward speeds and one reverse speed. These transmissions have electronic shift controls that can be programmed to allow the use of different numbers of geared speeds. For instance, the transmission can be programmed to operate as a 4-speed, 5-speed, or 6-speed unit in the "primary" shift mode. If needed, a "secondary" shift mode can be programmed to provide another shift configuration to optimize vehicle use under different operating conditions. To activate a secondary shift mode, or other special functions programmed into the electronic control unit (ECU), depress the Mode button. See Fig.184,Allison Push Button Shift Selector. "Mode On" is displayed in the indicator panel just above the push buttons. A label just above the Mode button identifies the special function.



1. Indicator Panel
2. Mode ID

Fig 184, Allison Push Button Shift Selector

NOTE: Each time a push button is depressed on the shift selector, a short beep will be heard. This indicates that the ECU has received input to change operation.

The HD-series transmission is designed to warn the driver of transmission malfunctions. The driver should know the extent of the warning system in order to safely operate the vehicle.

16.03.02 Allison Transmission Operation

WARNING:
Never shift from neutral (N) to drive (D) or reverse (R) at engine speeds above idle. The vehicle will lurch forward or backward, which could cause property damage and personal injury.

NOTICE:
The engine should never be operated for more than thirty seconds at full throttle with the transmission in gear and the output stalled. Prolonged operation of this type will overheat the transmission fluid and will result in severe damage to the transmission.

NOTICE:
Do not allow the vehicle to coast in neutral. This can result in severe transmission damage. Also, no engine braking is available.

The following tips highlight important operation principles.

- Start the engine, then check the digital display on the shift selector. Under "Select" at the top of the unit, the display should always show the "primary" shift mode. Under "Monitor," the current gear should be displayed.
- Use reverse (R) to back the vehicle. Completely stop the vehicle before shifting from a forward gear to reverse, or from reverse to forward. There is only one reverse gear.
- Select drive (D) for all normal driving conditions. The vehicle will start out in 1st gear, and as speed increases, the transmission will upshift through each gear automatically. As the vehicle slows down, the transmission will downshift to the correct gear automatically.
- The pressure of your foot on the accelerator pedal influences the automatic shifting. When the pedal is fully depressed, the transmission will automatically upshift near the governed speed of the engine. A partially-depressed position of the pedal will cause the upshifts to occur at a lower engine speed.
- Occasionally the road, load, or traffic conditions make it desirable to restrict the automatic shifting to a lower range. The lower the gear range, the greater the engine braking power.
- Use the up or down arrow buttons on the shift selector to reach the desired gear. The "Select" indicator will display your choice, and the "Monitor" indicator will show the selected gear once it is reached. In the lower gear ranges, the transmission will not upshift above the highest gear selected unless the engine governed speed is exceeded.
- Use neutral and apply the parking brake when the vehicle is parked with the engine running.

17.01 Eaton® Fuller® Transmission Operation Tips 216
17.02 Eaton Fuller 13-Speed and 18-Speed Splitter and Range-Shift Transmissions 216
17.02.01 General Information, Eaton Fuller Splitter and Range-Shift 216
17.02.02 Operation, Eaton Fuller Splitter and Range-Shift Transmissions 217
17.02.03 Upshifting 217
17.02.04 Downshifting 219
17.03 Eaton Fuller 10-Speed Range-Shift Transmissions 220
17.03.01 General Information, Eaton Fuller Range-Shift 220
17.03.02 Operation, Eaton Fuller Range-Shift 220
17.03.03 Downshifting 221

17. Manual Transmissions and Clutch

17.01 Eaton® Fuller® Transmission Operation Tips

NOTE: Refer to the Eaton website (**www.roadranger.com**) for additional information.

Follow these important operation principles:

- For all conditions, use the highest gear that is still low enough to start the vehicle moving with the engine at or near idle speed, and without slipping the clutch excessively.
- When operating on-highway with no load or under ideal conditions, use 1st gear to start the vehicle moving forward.
- When operating off-road or under adverse conditions, use LOW gear to start the vehicle moving forward.
- Use the clutch brake to stop gear rotation when shifting into LOW or reverse while the vehicle is stationary. The clutch brake is actuated by depressing the clutch pedal all the way to the floor.
- Partially disengage the clutch to break engine torque during normal gear shifts.
- Double-clutch between all upshifts and downshifts that require movement of the shift knob. Splitting of gears does not require movement of the shift knob.
- Never push the range-preselection lever down into low range while operating in high range, except when downshifting from 5th gear to 4th gear.
- Do not shift from high range to low range at high vehicle speeds.
- Never make a range shift or a splitter shift while the vehicle is in reverse.
- Never move the range-preselection lever with the transmission in neutral while the vehicle is moving.
- Skip ratios while shifting *only* when operating conditions permit, depending on the load, grade, and road speed.
- Never coast with the transmission in neutral.

17.02 Eaton Fuller 13-Speed and 18-Speed Splitter and Range-Shift Transmissions

17.02.01 General Information, Eaton Fuller Splitter and Range-Shift

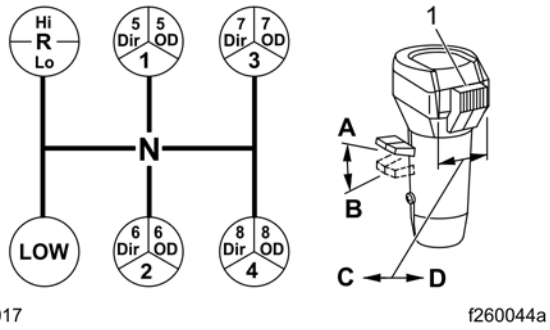
Refer to the Eaton website for additional information: www.roadranger.com.

Combination splitter and range-shift transmissions allow the choice of two splitter ratios in each lever position as well as the additional ratio provided in each lever position after shifting to the other range.

IMPORTANT: Not all lever positions are used in each range and the shift patterns vary between transmissions. Be sure to read the shift pattern decal on the dash for the operating instructions for the specific transmission installed in your vehicle.

13-Speed RTLO Models

Eaton Fuller 13-speed transmissions have thirteen forward speeds and two reverse speeds. Each transmission consists of a 5-speed front section, and a 3-speed auxiliary section. The auxiliary section contains low- and high-range ratios, plus an overdrive splitter gear. See Fig.185,Eaton Fuller 13-Speed Transmission Shift Pattern for the shift pattern.



A. High Range
B. Low Range
C. Overdrive (forward)
D. Direct Drive (rearward)
1. Splitter Control Button

Fig 185, Eaton Fuller 13-Speed Transmission Shift Pattern

All of the 13 speeds are controlled with one shift lever. A range preselection lever and a splitter control button are built into the shift knob. The range preselection lever controls range selection and the splitter control button (located on the side of the shift knob) controls gear splits.

Low gear in the front section is used only as a starting ratio. The remaining four forward positions are used once in the low range and once in the high range. However, each of the four high range gear positions can be split with the underdrive ratio (RT models), or overdrive ratio (RTO models) of the splitter gear. Ratios cannot be split while the transmission is in low range.

18-Speed RTLO Splitter and Range-Shift Models

Eaton Fuller 18-speed transmissions have 18 forward speeds and four reverse speeds. These transmissions consisting of a 5-speed front section and a 3-speed auxiliary section. The auxiliary section contains low and high range ratios, plus an overdrive splitter gear.

One ratio in the front section (low) is used as a starting ratio; it is never used when the transmission is in high range. Low gear can be split to provide both a direct and an overdrive ratio.

The other four ratios in the front section are used once in low range and once again in high range; however, each of the five ratios (low–1–2–3–4) in low range and each of the four ratios (5–6–7–8) in high range can be split with the overdrive splitter gear.

All of the 18 speeds are controlled with one shift lever. A range preselection lever and a splitter control button are built into the shift knob. The range preselection lever controls range selection and the splitter control button (located on the side of the shift knob) controls gear splits.

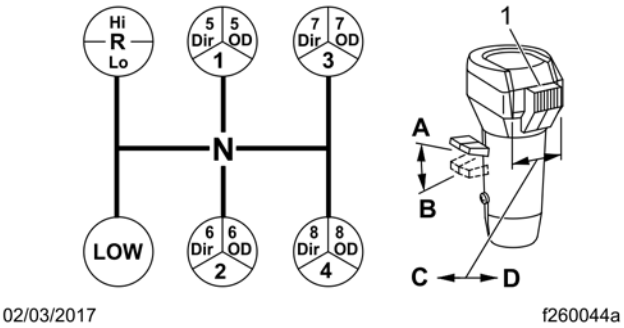
17.02.02 Operation, Eaton Fuller Splitter and Range-Shift Transmissions

Dependent on the transmission model, some ratios can be split using the splitter-control button (located on the side of the gear shift lever).

IMPORTANT: The shifter knob has an interlock feature that prevents the splitter control button from being moved forward when the range preselection lever is down (in low range); when in high range and the splitter control button is in the forward position, the range preselection lever cannot be moved down.

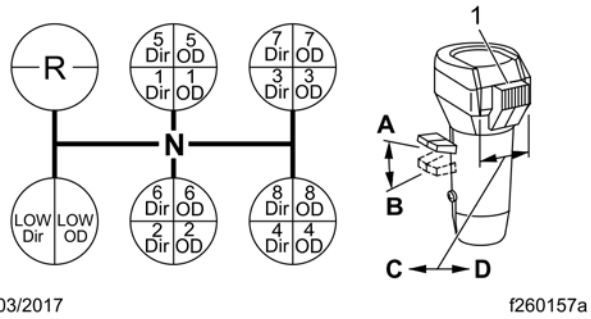
17.02.03 Upshifting

1. Position the gear shift lever in neutral. Start the engine, and bring the air system pressure up to 100 to 120 psi (689 to 827 kPa).
2. Position the range preselection lever down, into low range. See Fig. 187,Eaton Fuller 18-Speed Transmission Shift Pattern.



A. High Range
B. Low Range
C. Overdrive (forward)
D. Direct Drive (rearward)
1. Splitter Control Button

Fig 186, Eaton Fuller 13-Speed Transmission Shift Pattern



A. High Range
B. Low Range
C. Overdrive (forward)
D. Direct Drive (rearward)
1. Splitter Control Button

Fig 187, Eaton Fuller 18-Speed Transmission Shift Pattern

3. Make sure the splitter control button is in the direct (rearward) position. See Fig. 187,Eaton Fuller 18-Speed Transmission Shift Pattern.
4. For 13-speed transmissions:

   Press the clutch to the floor, shift into low or 1st gear; then engage the clutch, with the engine at or near idle speed, to start the vehicle moving. Accelerate to 80 percent of engine governed speed.

   For 18-speed transmissions:

   Press the clutch to the floor, shift into low; then engage the clutch, with the engine at or near idle speed, to start the vehicle moving.

   To shift from low direct to low overdrive, move the splitter control button into the overdrive (forward) position, then immediately release the accelerator. Press and release the clutch pedal. After releasing the clutch, accelerate again.
5. For 13-speed transmissions:

   Shift upward from low to 1st gear, 2nd, etc. until 4th gear, double-clutching between shifts, and accelerating to 80 percent of engine governed speed. See Fig.186,Eaton Fuller 13-Speed Transmission Shift Pattern.

   For 18-speed transmissions:

Shift upward from low overdrive to 1st direct by first moving the splitter control button into the direct (rearward) position (see Fig.187,Eaton Fuller 18-Speed Transmission Shift Pattern). Move the shift lever, double-clutching, to the 1st gear position.

Continue upshifting through the shift pattern. Double-clutch during lever shifts (1st to 2nd to 3rd to 4th); single-clutch during split shifts (1st direct to 1st overdrive, etc.).

6. When in 4th gear (13-speed transmissions) or 4th overdrive (18-speed transmissions) and ready to shift up to 5th gear, use the range shift lever as follows:

   For 13-speed transmissions:

   While in 4th gear, pull the range shift preselection lever up, into high range. The transmission will automatically shift from low to high range as the shift lever passes through neutral. Then, disengage the clutch; double-clutch through neutral; move the shift lever to 5th gear; engage the clutch, and accelerate the engine.

   For 18-speed transmissions:

   While in 4th overdrive, pull the range shift preselection lever up, into high range. The transmission will automatically shift from low to high range as the shift lever passes through neutral.

   Move the shift lever, double-clutching, to the 5th gear position. Just before making final clutch engagement, move the splitter control button to the direct (rearward) position; then engage the clutch and accelerate. Do not move the control button while the shift lever is in neutral.

7. Shift up through the high range gears as follows:

   For 13-speed transmissions:

   To shift from 5th direct to 5th overdrive, move the splitter control button (see Fig. 186,Eaton Fuller 13-Speed Transmission Shift Pattern) into the overdrive (forward) position, then immediately release the accelerator. Press and release the clutch pedal. After releasing the clutch, accelerate again.

   Continue upshifting through the shift pattern. Double-clutch during lever shifts (6th to 7th to 8th); single-clutch during split shifts (6th direct to 6th overdrive, etc.).

   For 18-speed transmissions:

   To shift from 5th direct to 5th overdrive, move the splitter control button (see Fig. 187,Eaton Fuller 18-Speed Transmission Shift Pattern) into the overdrive (forward) position, then immediately release the accelerator. Press and release the clutch pedal. After releasing the clutch, accelerate again.

   Continue upshifting through the shift pattern. Double-clutch during lever shifts (6th to 7th to 8th); single-clutch during split shifts (6th direct to 6th overdrive, etc.).

17.02.04 Downshifting

1. Downshift from 8th overdrive to 8th direct without moving the shift lever. Flip the splitter control button to the direct (rearward) position, then immediately release the accelerator, and disengage the clutch. Engage the clutch, and accelerate the engine only after the transmission has shifted.
2. Start the downshift from 8th direct to 7th overdrive by flipping the splitter control button to the overdrive (forward) position; then, immediately double-clutch through neutral, moving the shift lever from 8th to 7th gear.
3. Shift downward through each of the high range gears, alternating the procedures in steps 1 and 2, above, until reaching 5th direct.
4. While in 5th direct and ready for the downshift to 4th (13-speed transmissions) or 4th overdrive (18-speed transmissions), push the range preselection lever down. Then, double-clutch through neutral and move the shift lever to the 4th gear position. On 18-speed transmissions, move the splitter control button to the overdrive (forward) position *before* engaging the clutch. Do not move the control button while the shift lever is in neutral.
5. Continue downshifting from 4th to 1st as follows:

   For 13-speed transmissions:

   Downshift through the low range gears as conditions require.

For 18-speed transmissions:

Continue downshifting from 4th overdrive to 4th direct, then 4th direct to 3rd overdrive, 3rd overdrive to 3rd direct, etc. Single-clutch when split shifting (direct to overdrive, overdrive to direct). Double-clutch when making lever shifts (4th to 3rd, 3rd to 2nd, etc.).

IMPORTANT: Never use the clutch brake when downshifting, or as a brake to slow the vehicle.

17.03 Eaton Fuller 10-Speed Range-Shift Transmissions

17.03.01 General Information, Eaton Fuller Range-Shift

Refer to the Eaton website for additional information,[Missing cross reference text].

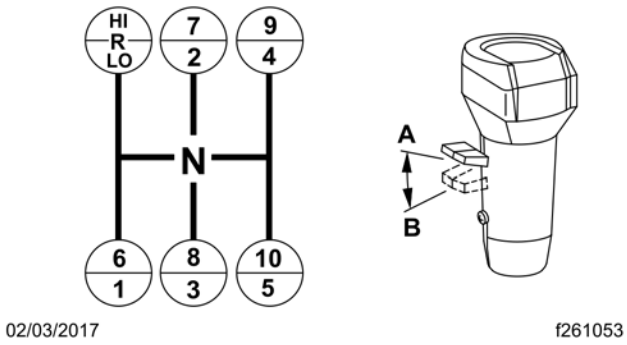
To operate a range-shift transmission, move the shift lever through all the low gear positions and then activate a range switch to provide an additional set of ratios in the high range. Using the same shift lever positions as in low range, move the shift lever through each position as before. On some models, the initial low gear is often used only in low range.

IMPORTANT: Not all lever positions are used in each range and the shift patterns vary between transmissions. Be sure to read the shift pattern decal on the dash for the operating instructions for the specific transmission installed in your vehicle.

10-Speed FR/FRO and RT/RTO/RTX Models

10-Speed FR/FRO and RT/RTO/RTX Models

Eaton Fuller 10-speed transmissions have 10 selective, evenly spaced forward ratios. Each transmission has a 5-speed front section and a 2-speed rear range section. The 10 forward speeds are obtained by twice using a 5-speed shift pattern: the first time in low range, the second time in high range. See Fig.188,Eaton Fuller 10-Speed Transmission Shift Patterns for the shift patterns.



A. High Range B. Low Range

Fig 188, Eaton Fuller 10-Speed Transmission Shift Patterns

NOTE: The 4th/9th and the 5th/10th shift positions in the RT (direct ratio) and RTX (overdrive ratio) transmissions are directly opposite in the RTO (overdrive ratio) transmissions

17.03.02 Operation, Eaton Fuller Range-Shift

Upshifting

1. Position the gear shift lever in neutral. Start the engine, and bring the air system pressure up to 100 to 120 psi (689 to 827 kPa).
2. Position the range preselection lever down, into low range.
3. Press the clutch pedal to the floor; shift into low or 1st gear (see Table.23,Eaton Fuller Shift Progressions), then engage the clutch, with the engine at or near idle speed, to start the vehicle moving. Accelerate to 80 percent of engine governed speed.

Table 23, Eaton Fuller Shift Progressions

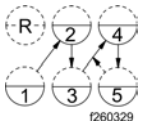
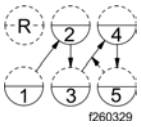
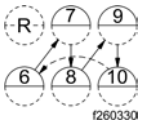
Eaton Fuller Shift Progressions			
TRANS. MODEL	**LOW RANGE**		**HIGH RANGE**
	Off-Highway	**On-Highway**	
10-Speed Direct or Overdrive (RT or RTX)			

Table 23, Eaton Fuller Shift Progressions

4. Shift progressively upward from low or 1st gear, to the top gear in low range (see Table.23,Eaton Fuller Shift Progressions), double-clutching between shifts, and accelerating to 80 percent of engine governed speed.
5. While in the top gear of the low range shift pattern, and ready for the next upshift, flip the range preselection lever up into high range. Double-clutch through neutral, and shift into the bottom gear in high range (see Table.23,Eaton Fuller Shift Progressions). As the shift lever passes through neutral, the transmission will automatically shift from low range to high range.
6. With the transmission in high range, shift progressively upward through each of the high range gears (see Table.23, Eaton Fuller Shift Progressions), double-clutching between shifts.

17.03.03 Downshifting

1. With the transmission in high range, shift progressively downward to the bottom gear in high range, double-clutching between shifts.
2. When in the bottom gear of the high range shift pattern, and ready for the next downshift, push the range preselection lever down into low range. Double-clutch through neutral, and shift into the top gear of the low range shift pattern. As the shift lever passes through neutral, the transmission will automatically shift from high range to low range.
3. With the transmission in low range, downshift through the low range gears as conditions require.

IMPORTANT: Never use the clutch brake when downshifting, or as a brake to slow the vehicle.

18.01 Differential Lock, Drive Axles 224
18.01.01 General Information 224
18.01.02 Differential Lock Switch 224
18.01.03 Differential Lock Operation 224
18.01.04 Single Drive Axles with Traction Equalizer 225
18.02 Interaxle Lock, Tandem and Tridem Axles 226
18.02.01 General Information 226
18.02.02 Interaxle Lock Switch 226
18.02.03 Interaxle Lock Operation 226
18.03 Transfer Cases 227
18.03.01 Meritor MTC Series 227
18.03.02 Shifting Between HIGH RANGE and LO RANGE 228
18.03.03 Engaging PTO 228

18. Drive Axles

18.01 Differential Lock, Drive Axles

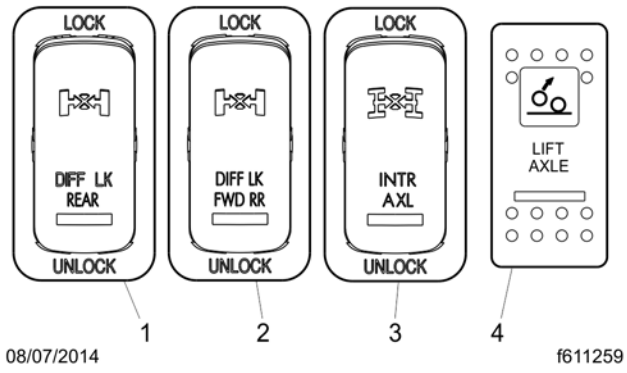
18.01.01 General Information

The driver-controlled differential lock feature (side-to-side wheel lock, traction control, or traction equalizer) is available on vehicles with single- or tandem-drive axles.

The differential lock provides maximum traction for slippery conditions by forcing the wheels on each drive axle governed by the switch to rotate together. When the differential lock is engaged, the clutch collar completely locks the differential case, gearing, and axle shafts together, maximizing the traction of both wheels.

18.01.02 Differential Lock Switch

Each differential lock is controlled by a switch on the dash. See Fig.189,Axle Switches.



1. Rear Drive Axle Differential Lock Switch
2. Forward Drive Axle Differential Lock Switch
3. Interaxle Lock Switch
4. Lift Axle Switch

Fig 189, Axle Switches

18.01.03 Differential Lock Operation

WARNING:
Locking the wheels when the vehicle is traveling down steep grades or when the wheels are slipping could damage the differential and/or lead to loss of vehicle control, causing personal injury and property damage.

NOTICE:
Engage the differential lock only when the vehicle is stopped or moving slowly at low speed, less than 5 mph (8 km/h). Engaging the differential lock at high speeds can cause internal axle damage.

NOTE: On some vehicles, the differential lock system is connected through the low speed range of the transmission. If this system is used, the transmission must be in the low speed range for the wheels to fully lock. In addition, shifting out of low speed range will also disengage the differential lock.

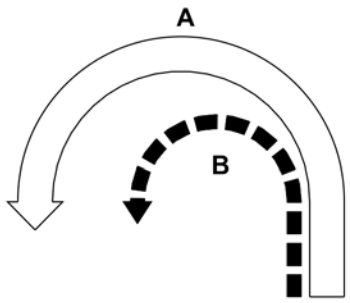
NOTE: If the differential lock is engaged when the engine is shut down, the differential lock will disengage.

1. With the engine running, press the upper half of the differential lock switch to engage the differential lock.
2. If the vehicle is moving, briefly let up on the accelerator to relieve torque on the gearing, allowing the differential to fully lock.

WARNING:

Be especially careful when driving under slippery conditions with the differential locked. Though forward traction is improved, the vehicle can still slip sideways, causing possible loss of vehicle control, personal injury, and property damage.

3. Drive cautiously and do not exceed 25 mph (40 km/h). When the differential is fully locked, the turning radius will increase because the vehicle understeers. See Fig.190,Turning Radii.



A. Turning Radius When the Differential Lock is Engaged (understeer condition)
B. Turning Radius When the Differential Lock is Disengaged

Fig 190, Turning Radii

4. Press the upper half of the differential lock switch again to disengage the differential lock after leaving poor road conditions.
5. If the vehicle is moving, briefly let up on the accelerator to allow the wheels to fully unlock, then resume driving at normal speed.

18.01.04 Single Drive Axles with Traction Equalizer

Some single drive axles are equipped with a traction equalizer that is a load-sensing, self-actuating feature. A traction equalizer provides normal differential action where traction is good. When one wheel begins to spin faster than the other, clutch plates in the differential housing automatically engage, delivering power to both wheels. There is no operator control with this feature.

NOTICE:

Tire sizes on both rear wheels should be the same on axles equipped with a traction equalizer. If not, excessive wear may occur in the traction equalizer.

18.02 Interaxle Lock, Tandem and Tridem Axles

18.02.01 General Information

NOTICE:

When the interaxle differential (IAD) lock is engaged on a tandem axle that has tires with varying diameters, the wheels of one axle try to rotate at a different speed than the other axle. In this event, torque builds up between the drive axles, which prevents the IAD lock from disengaging and leads to a severe increase in axle operating temperature that can cause premature oil failure and result in gear, bearing, or seal damage. Using the interaxle differential lock on a tandem axle with different size tires can cause catastrophic damage to the axle and axle components.

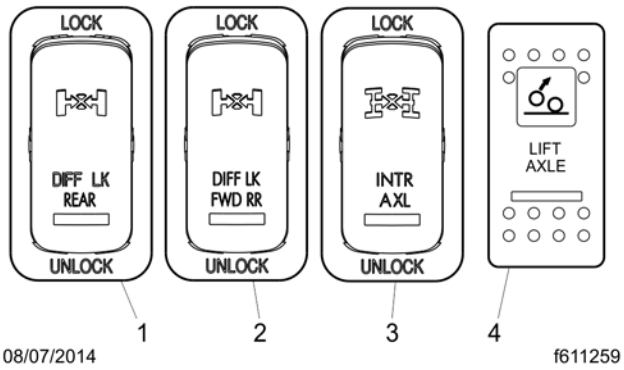
The interaxle lock (axle lock, interaxle differential lockout) feature causes the drive axle shafts to rotate together, and is recommended for use under adverse road conditions where greater traction is needed.

When engaged, the interaxle lock essentially makes the driveshaft a solid connection between the drive axles. Power entering the forward axle is transmitted straight through to the rearmost axle(s). Driveline torque is now delivered equally and the drive axles, and wheels, turn together at the same speed. The interaxle lock increases drivetrain and tire wear and should be used only when improved traction is required.

See the axle manufacturer's website for more information.

18.02.02 Interaxle Lock Switch

The interaxle lock switch (see Fig.191,Axle Switches, item 3) allows the driver to lock the drive axles together.



1. Rear Drive Axle Differential Lock Switch
2. Forward Drive Axle Differential Lock Switch
3. Interaxle Lock Switch
4. Lift Axle Switch

Fig 191, Axle Switches

18.02.03 Interaxle Lock Operation

NOTICE:

The interaxle lock should not be engaged on a vehicle with obviously spinning wheels. Engagement at high speed or power can damage the axle(s).

NOTE: If the interaxle lock is engaged when the engine is turned off, the interaxle lock will disengage.

1. With the engine running, press the upper half of the interaxle lock switch to engage the interaxle lock. Do not wait until traction is lost and the tires are spinning before engaging the interaxle lock.
2. If the vehicle is moving, briefly let up on the accelerator until the interaxle lock engages. The red interaxle indicator light illuminates on the dash message center when interaxle lock is engaged.
3. Proceed over poor road conditions with caution.



NOTICE:

Do not operate the vehicle continuously with the interaxle locked during extended good road conditions. To do so could result in damage to the axle gearing and excessive driveline and tire wear.

4. Press the lower half of the interaxle lock switch to disengage the interaxle lock after leaving poor road conditions.
5. If the vehicle is moving, briefly let up on the accelerator to allow the interaxle lock to disengage, then resume driving at normal speed. Once the interaxle lock disengages, the indicator light will go off.

18.03 Transfer Cases

18.03.01 Meritor MTC Series

Some vehicles are equipped with a Meritor MTC Series transfer case for part-time 4x4, 6x6, or 8x8 operation. Meritor MTC Series transfer cases have two gear sets: HIGH RANGE and LO RANGE.



WARNING:

Do not engage a Meritor MTC Series transfer case when driving on normal highway conditions. Severe personal injury and/or damage to components can result when the transfer case is misused.

IMPORTANT: Steer axle engagement is limited to 20% or less of annual vehicle mileage.

Follow the operating guidelines in Table.24,Operating Guidelines, Meritor MTC Transfer Cases when driving a vehicle equipped with a Meritor MTC transfer case.

Engaging and Disengaging the Steer Axle

Dash-mounted switches control the transfer case functions; see for more information.

IMPORTANT: The wheels must not slip during engagement of the steer axle driveline.

To engage the steer axle driveline, drive the vehicle at a constant speed below 10 mph (16 km/h) and press the AWD switch. An audible engagement may be heard.

To disengage the steer axle, drive the vehicle at a constant speed below 10 mph (16 km/h) and press the AWD switch. An audible disengagement may be heard. If the steer axle driveline does not disengage, the steer axle driveline coupling may be in a bind. Turn the steering wheel back and forth while driving, or briefly drive the vehicle in reverse.

Table 24, Operating Guidelines, Meritor MTC Transfer Cases

	Disengaged Steer Axle		Engaged Steer Axle	
Range	**Traction Conditions**	**Applicable Vehicle Speeds**	**Traction Conditions**	**Applicable Vehicle Speeds**
HIGH RANGE	Most normal driving conditions (such as dry or wet pavement or mixed road surfaces) when moderate to high vehicle speeds are appropriate.	0 mph (0 km/h) to maximum vehicle speed	When more traction is needed at moderate to low vehicle speeds on dirt or gravel surface with shallow to moderate grades (8% maximum), icy or snow-covered roads, or hard-packed sand.	20 mph (32 km/h) or less
LO RANGE	Not applicable. Do not use LO RANGE unless the steer axle is engaged.		When maximum power and maximum traction is needed on steeper grades (15% maximum), deeply rutted tracks, deep mud or snow, extremely rocky surfaces, or soft, loamy sand.	15 mph (24 km/h) or less
IMPORTANT: Engaging the steer axle will increase the turning radius of the vehicle.				

Table 24, Operating Guidelines, Meritor MTC Transfer Cases

18.03.02 Shifting Between HIGH RANGE and LO RANGE

Marmon-Herrington MVG-1600 transfer cases use an air cylinder to shift between HIGH RANGE and LO RANGE. A dash-mounted switch operates the shift mechanism (see for more information).

Shift between HIGH RANGE and LO RANGE, as follows:

1. Stop the vehicle.
2. Shift the transmission to NEUTRAL.
3. Apply the parking brake.
4. Move the dash-mounted switch to the HIGH or LO RANGE position to pressurize the shift mechanism in the transfer case. An audible engagement may be heard (which is normal).
5. Shift the transmission to FIRST gear and apply light torque to test the engagement.

   If the shifter does not engage when shifting from HIGH RANGE to LO RANGE, shift the transmission into REVERSE, then NEUTRAL, and apply light torque to engage LO RANGE.

18.03.03 Engaging PTO

Some vehicles are equipped with a PTO mounted to a Meritor MTC transfer case. For these vehicles, engage the PTO only when the transfer case is in neutral, the transmission is in neutral/park, and the parking brake is applied. To begin using the PTO, select the drive gear based on the PTO system operator's manual.

Table 25, Operating Guidelines, Meritor MTC Transfer Cases

	Disengaged Steer Axle		Engaged Steer Axle	
Range	**Traction Conditions**	**Applicable Vehicle Speeds**	**Traction Conditions**	**Applicable Vehicle Speeds**

HIGH RANGE	Most normal driving conditions (such as dry or wet pavement or mixed road surfaces) when moderate to high vehicle speeds are appropriate.	0 mph (0 km/h) to maximum vehicle speed	When more traction is needed at moderate to low vehicle speeds on dirt or gravel surface with shallow to moderate grades (8% maximum), icy or snow-covered roads, or hard-packed sand.	20 mph (32 km/h) or less
LO RANGE	Not applicable. Do not use LO RANGE unless the steer axle is engaged.		When maximum power and maximum traction is needed on steeper grades (15% maximum), deeply rutted tracks, deep mud or snow, extremely rocky surfaces, or soft, loamy sand.	15 mph (24 km/h) or less
IMPORTANT: Engaging the steer axle will increase the turning radius of the vehicle.				

Table 25, Operating Guidelines, Meritor MTC Transfer Cases

19.01 Fifth Wheels, General Information....232
19.02 Fifth Wheel Coupling....233
19.02.01 Coupling, Fontaine and Holland Fifth Wheels....233
19.02.02 Coupling, Jost Fifth Wheel....237
19.03 Fifth Wheel Uncoupling....240
19.03.01 Manual Uncoupling....240
19.03.02 Air-Actuated Uncoupling....243
19.03.03 Preparing the Trailer for Uncoupling....243
19.03.04 Air-Activated Kingpin Unlock, Fontaine and Holland Fifth Wheels....244
19.03.05 Air-Activated Kingpin Unlock, Jost Fifth Wheels....244
19.04 Fifth Wheel Slide....245
19.04.01 General Information....245
19.04.02 Manual Slide Operation....245
19.04.03 Air Slide Operation....247

19. Fifth Wheels

19.01 Fifth Wheels, General Information

NOTE: Do not use any fifth wheel that fails to operate properly. Doing so may cause loss of vehicle control, possibly resulting in severe personal injury or death.

Air Suspension Height Control Switch

NOTICE:

Do not operate the vehicle over uneven ground such as ramps, speed bumps, curbs, etc. with the air springs deflated. Doing this may lead to air bag separation from the piston, preventing the suspension air springs from re-inflating.

The air suspension height control switch may be used to adjust the vehicle height to aid in coupling or uncoupling from a trailer. See Fig.192,Air Suspension Height Control Switch. Setting the switch to DOWN deflates the air springs to lower the rear of the vehicle. In the UP position, the air springs inflate to raise the rear of the vehicle to normal ride height.



Fig 192, Air Suspension Height Control Switch

NOTICE:

Never exhaust air from the suspension while driving. When the air is exhausted, the suspension will not absorb road shocks, and components may be damaged.

A red LED in the switch is illuminated when the suspension is deflated.

Fifth Wheel Lubrication

WARNING:

A standard fifth wheel plate must be kept lubricated to prevent binding between the tractor and trailer. A binding fifth wheel could cause erratic steering and loss of vehicle control, possibly resulting in personal injury or death.

The standard fifth wheel plate must be kept well lubricated with chassis grease to prevent friction and binding between the vehicle fifth wheel plate and the trailer.

For a low-lube fifth wheel plate, inspect the condition of the low-lube pads. There should be no damaged or missing pieces. Slight puckering at the outside edges is normal.

For lubrication instructions, see **Group 31** of the *Western Star Maintenance Manual* .

19.02 Fifth Wheel Coupling

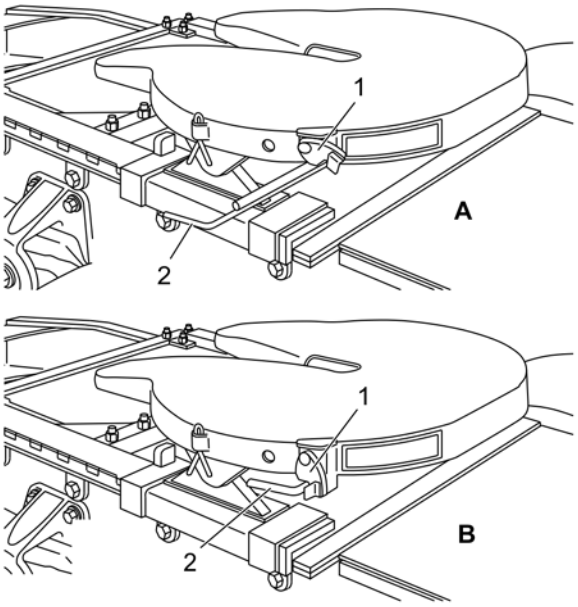
19.02.01 Coupling, Fontaine and Holland Fifth Wheels

Fifth wheel coupling is activated with the lock control handle located on either the right side or left side of the fifth wheel. Coupling has successfully occurred when the kingpin has been forced into the jaws and the lock control handle has moved to the locked position.

NOTICE:
Some fifth wheels may be mounted on sliding rails. Before attempting to couple a trailer to a sliding fifth wheel, the slide feature must be locked to prevent the top plate from sliding rapidly forward or rearward, causing damage to the fifth wheel or kingpin.

NOTE: For a tractor equipped with a Jost fifth wheel, see the heading **Coupling, Jost Fifth Wheel** below.

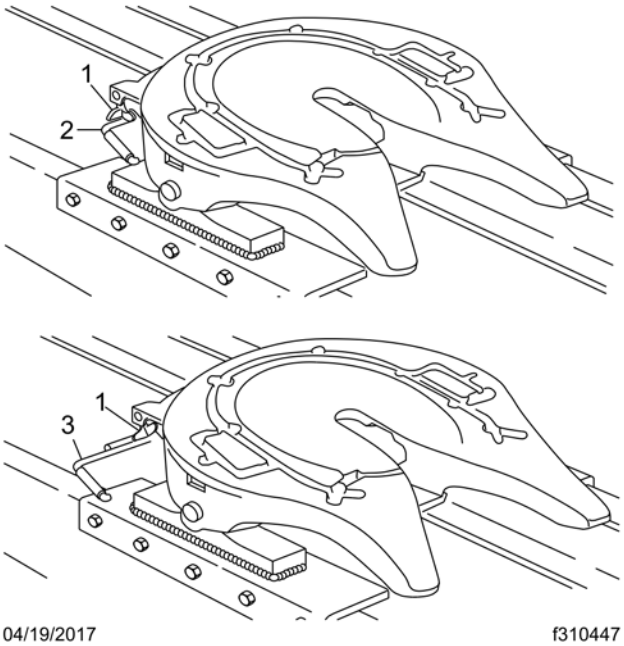
1. Chock the front and rear trailer tires.
2. Ensure the fifth wheel jaw is fully open and the operating rod is in the unlocked position. See Fig. 193, Fontaine Locking Mechanism or see Fig.194,Holland Simplex SE Locking Mechanism.



NOTE: Make sure the safety latch is down when the control handle is locked.

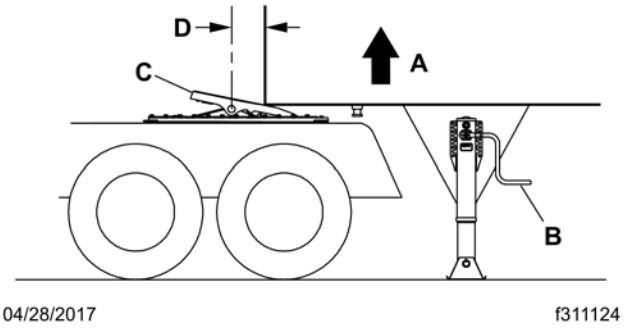
A. Unlocked
B. Locked
1. Safety Latch
2. Lock Control Handle

Fig 193, Fontaine Locking Mechanism



1. Safety Latch
2. Operating Rod (locked)
3. Operating Rod (unlocked)

Fig 194, Holland Simplex SE Locking Mechanism



A. Fifth wheel must lift trailer
B. Adjust trailer height
C. Ramps tilted down
D. 4 to 8 inches (10 to 20 cm)

Fig 195, Trailer Connection Point, Standard Fifth Wheel Plate

3. Make sure the fifth wheel top plate is tilted so the ramps are as low as possible.
4. Position the tractor so that the center of the fifth wheel is in line with the trailer kingpin. The kingpin should be in a position to enter the throat of the locking mechanism.

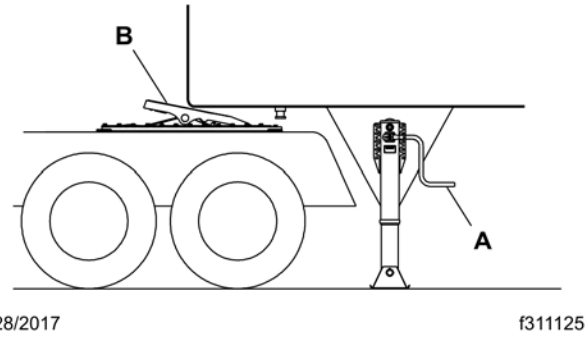
NOTICE:

Attempting to couple at the wrong height may cause improper coupling, which could result in damage to the fifth wheel or kingpin.

5. Adjust the trailer height if required.

   For a standard fifth wheel plate, the trailer should contact the fifth wheel approximately 4 to 8 inches (10 to 20 cm) behind the fifth wheel pivot. See Fig.195, **Trailer Connection Point, Standard Fifth Wheel Plate**.

   For a low-lube fifth wheel plate, the fifth wheel must slide freely under the trailer, and the trailer should contact the fifth wheel at the pivot. See Fig.196,Trailer Connection Point, Low-Lube Fifth Wheel.



A. Adjust trailer height
B. Ramps tilted down

Fig 196, Trailer Connection Point, Low-Lube Fifth Wheel

6. With the fifth wheel lock opening aligned with the trailer kingpin, back the tractor slowly toward the trailer. After sliding under the trailer, STOP to prevent from hitting the kingpin too hard, then resume backing slowly until the fifth wheel locks.

   On a standard fifth wheel, the fifth wheel must lift the trailer.

   On a low-lube fifth wheel, do not lift the trailer as this may damage the fifth wheel plate.

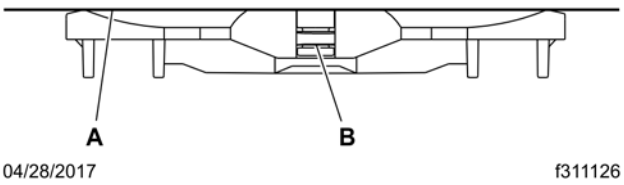
7. Set the tractor parking brake.

WARNING:

A visual inspection is required by law. Some improper couplings can pass a pull test. Sound is not reliable. Get out of the cab and look. Incorrect coupling could cause the trailer to disconnect, possibly resulting in serious personal injury or death.

8. Perform a coupling inspection, checking that there is no gap between the bottom of the trailer and the fifth wheel, and that the kingpin is securely locked. See Fig.197,Coupling Inspection.

   When lockup has occurred, the fifth wheel control handle moves to the locked position. Make sure that the safety latch is down over the lock control handle to hold the control handle in the locked position. (The safety latch will only rotate down if the operating rod is fully retracted in the locked position.) See Fig.193, Fontaine Locking Mechanism for Fontaine fifth wheels. See Fig.194,Holland Simplex SE Locking Mechanism for Holland fifth wheels.



A. No gap between trailer and fifth wheel
B. Kingpin inside lock

Fig 197, Coupling Inspection

9. Release the tractor parking brakes. Test for kingpin lockup slowly inching the tractor forward, pulling on the trailer against the chocks.
10. After lockup is completed, connect the tractor-to-trailer air system lines and the electrical cable to the trailer. Take care to prevent dirt or foreign material from entering the air system lines.

NOTICE:

Always make sure the connection hanger keeps the trailer air hoses and electrical cables positioned so that they do not rub on anything. Rubbing may wear through hoses or cables, resulting in air leaks, or exposed or broken wires, potentially affecting trailer brake or electrical systems.

11. Charge the air brake system with air, checking that the air connections do not leak.

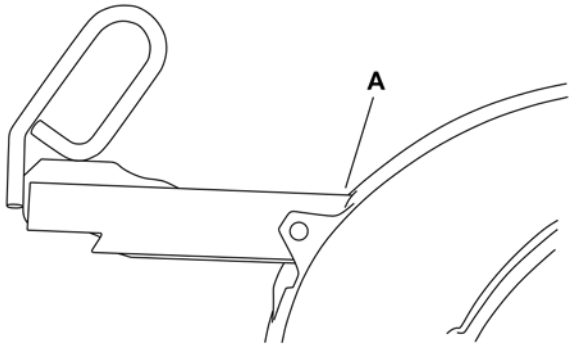
WARNING:
Incorrect fifth wheel lock adjustment could cause the trailer to disconnect, possibly resulting in serious personal injury or death.

12. With the trailer wheels chocked and the brakes set, check for clearance between the kingpin and the fifth wheel jaws by moving the tractor forward and backward against the locked kingpin. If slack is present, uncouple the trailer and have the fifth wheel inspected and adjusted by a certified technician.

19.02.02 Coupling, Jost Fifth Wheel

NOTE: For a tractor equipped with a Fontaine or Holland fifth wheel, see the heading **Coupling, Fontaine and Holland Fifth Wheels** above.

1. Tilt the ramp down.
2. Open the kingpin locks. See Fig.198,Jost Release Handle Unlocked.



A. Lock held open by catch mechanism

Fig 198, Jost Release Handle Unlocked

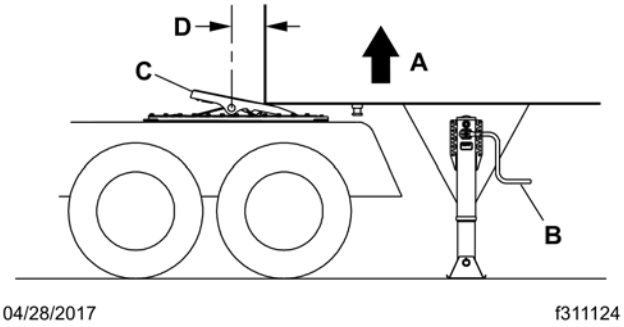
3. Back the vehicle close to the trailer, centering the kingpin on the fifth wheel.
4. Chock the trailer wheels.
5. Connect the air lines and electrical cable.
6. Ensure that the red trailer air supply valve (trailer brake) is pulled out, and that the trailer parking brakes are set. See Fig.201,Brake Valve Knobs.

NOTICE:
Attempting to couple at the wrong height may cause improper coupling, which could result in damage to the fifth wheel or kingpin.

7. Adjust the trailer height (if required).

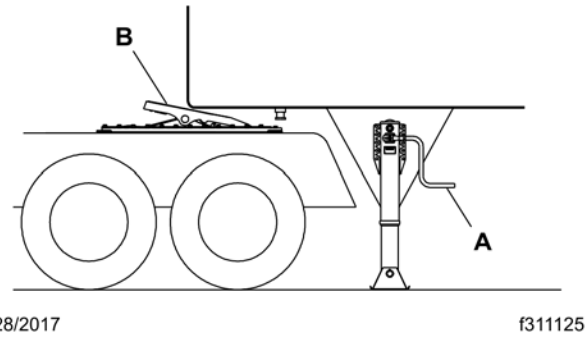
   For a standard fifth wheel plate, the trailer should contact the fifth wheel approximately 4 to 8 inches (10 to 20 cm) behind the pivot. See Fig.199,Trailer Connection Point, Standard Fifth Wheel Plate.

   For a low-lube fifth wheel plate, the fifth wheel must slide freely under the trailer, and the trailer should contact the fifth wheel at the pivot. See Fig.200,Trailer Connection Point, Low-Lube Fifth Wheel.



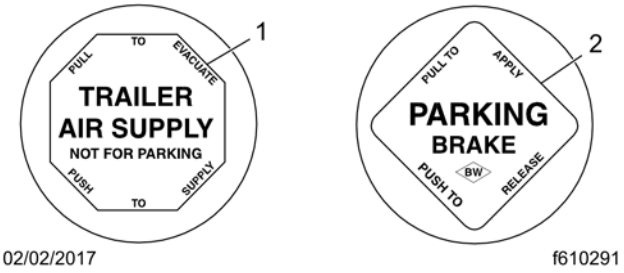
A. Fifth wheel must lift trailer
B. Adjust trailer height
C. Ramps tilted down
D. 4 to 8 inches

Fig 199, Trailer Connection Point, Standard Fifth Wheel Plate



A. Adjust trailer height
B. Ramps tilted down

Fig 200, Trailer Connection Point, Low-Lube Fifth Wheel



1. Trailer Air Supply Valve Knob
2. Parking Brake Valve Knob

Fig 201, Brake Valve Knobs

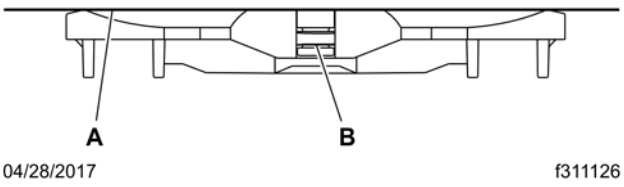
8. Back the tractor under the trailer.

   On a standard fifth wheel, the fifth wheel must lift the trailer.

   On a low-lube fifth wheel, do not lift the trailer as this may damage the fifth wheel plate.
9. After sliding under the trailer, STOP to prevent from hitting the kingpin too hard, then resume backing slowly until the fifth wheel locks.
10. Set the tractor parking brake.

WARNING:
A visual inspection is required by law. Some improper couplings can pass a pull test. Sound is not reliable. Get out of the cab and look. Incorrect coupling could cause the trailer to disconnect, possibly resulting in serious personal injury or death.

11. Ensure that the release handle is in the locked position adjacent to the casting. See Fig.202,Coupling Inspection.



A. No gap between trailer and fifth wheel
B. Kingpin inside lock

Fig 202, Coupling Inspection

12. Ensure that the release handle is in the locked position adjacent to the casting. See Fig. 203,Jost Release Handle Locked.

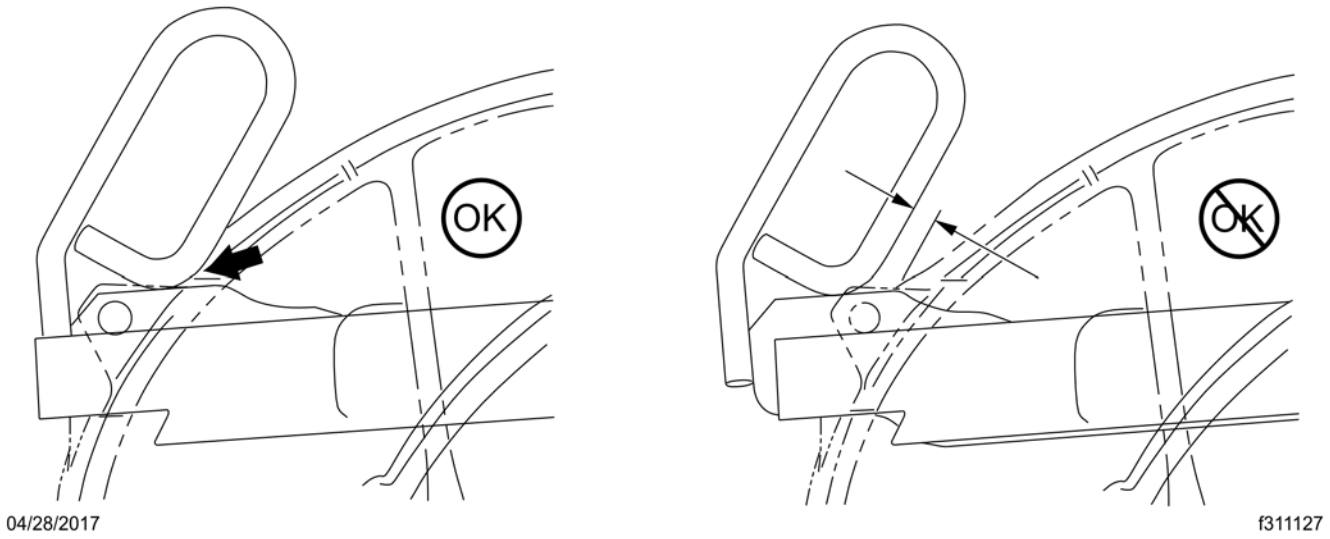


Fig 203, Jost Release Handle Locked

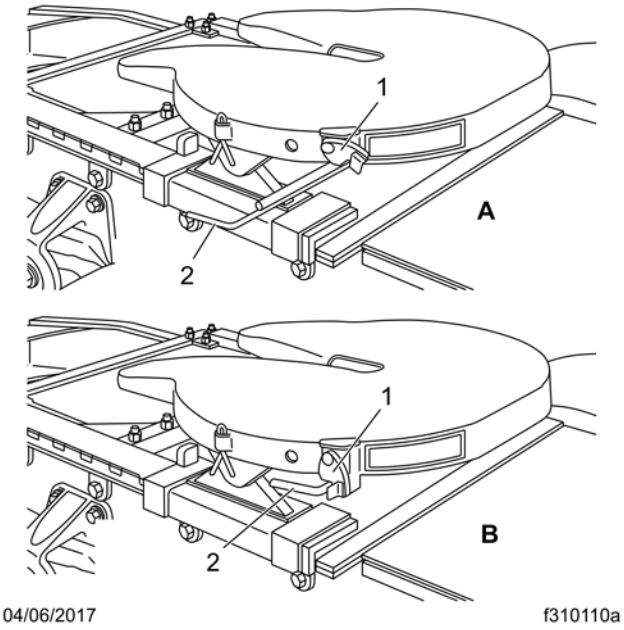
13. Release the tractor parking brakes and test for kingpin lockup by slowly moving the tractor forward, pulling on the trailer against the chocks.

19.03 Fifth Wheel Uncoupling

19.03.01 Manual Uncoupling

1. Set the tractor and trailer parking brakes.
2. Chock the trailer rear wheels.
3. Lower the trailer landing gear until the weight is removed from the fifth wheel.
4. Disconnect the tractor-to-trailer air system lines and electrical cable. Plug the air lines to prevent dirt or foreign material from entering the lines.
5. Verify that both the parking brake and trailer air supply knobs are out (see Fig.207,Brake Valve Knobs), the tractor and trailer parking brakes are set, and that the trailer is prepared for uncoupling.
6. Release the kingpin locking mechanism following the instructions for each manufacturer below.

   6.a **Fontaine:** Lift the safety latch and pull the lock control handle to the unlocked position. See Fig. 204, Fontaine Locking Mechanism.



NOTE: Make sure the safety latch is down when the control handle is locked.

A. Unlocked
B. Locked
1. Safety Latch
2. Lock Control Handle

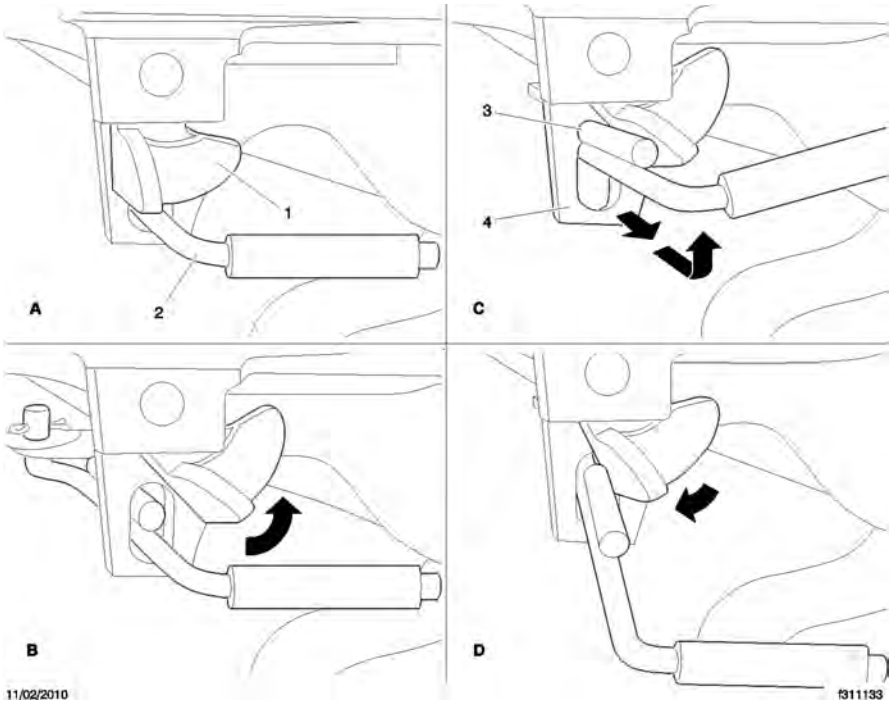
Fig 204, Fontaine Locking Mechanism

6.b **Holland:** In the locked position the safety indicator swings freely over the operating rod. See Fig. 205,Holland Kingpin Locking Mechanism, View A.

To unlock the mechanism, manually rotate the safety indicator toward the rear of the fifth wheel. See Fig. 205,Holland Kingpin Locking Mechanism, View B.

Pull the operating rod out. When the upper operating rod shoulder is outside the slot, raise the handle and place the shoulder of the upper rod against the plate casting, above the slot. See Fig. 205,Holland Kingpin Locking Mechanism, View C.

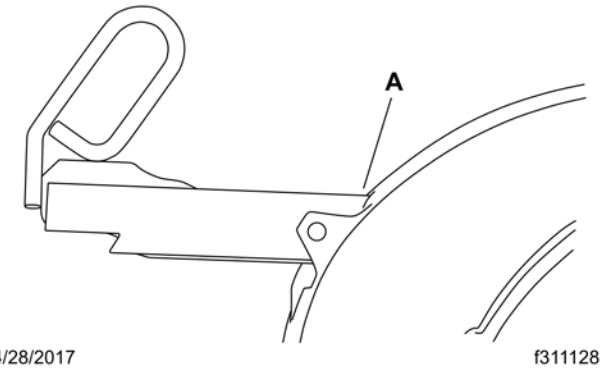
The fifth wheel is now in the lockset position and is ready for uncoupling. As the tractor pulls away from the trailer the kingpin forces the jaw to rotate, contacting the lock. Continued rotation of the jaw forces the lock to move outward, and drops the upper rod back into the slot. See Fig.205,Holland Kingpin Locking Mechanism View D. The wheel is now ready for coupling.



A. Locked Position
B. Unlatched Position (safety indicator rotated towards the rear of the fifth wheel)
C. Lockset Position (upper rod resting against casting above slot)
D. Open Position (ready for recoupling)
1. Safety Indicator
2. Operating Rod
3. Upper Rod
4. Plate Casting

Fig 205, Holland Kingpin Locking Mechanism

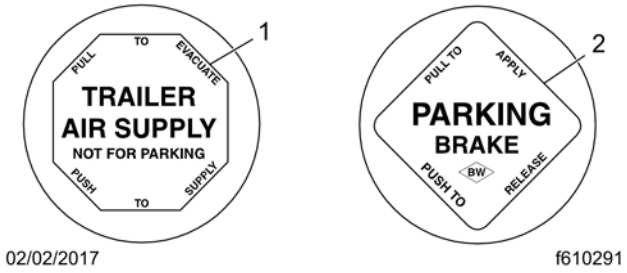
6.c **Jost:** Pull the retractable handle out, then secure it in the open position with the catch. See Fig. 206,Jost Release Handle Unlocked.



A. Lock held open by catch mechanism

Fig 206, Jost Release Handle Unlocked

7. Release the tractor parking brake then drive out slowly, allowing the trailer to slide down the fifth wheel and pick-up ramps.



1. Trailer Air Supply Valve Knob
2. Parking Brake Valve Knob

Fig 207, Brake Valve Knobs

19.03.02 Air-Actuated Uncoupling

An air-actuated kingpin release valve is optional with all fifth wheels. See Fig.208,Air-Actuated Kingpin Release Valve.

NOTE: In the event of an air system failure, air-actuated kingpins can be manually released following the instructions for manual unlocking.

WARNING:

Once the kingpin release valve has been pulled the kingpin lock is released. The vehicle MUST NOT be driven with the trailer until the trailer has been uncoupled and coupled again. Failure to do so may result in separation of the trailer from the tractor, possibly causing serious personal injury or death.



Fig 208, Air-Actuated Kingpin Release Valve

19.03.03 Preparing the Trailer for Uncoupling

Before using the air valve to unlock a fifth wheel kingpin, prepare the trailer as follows.

1. Set the tractor and trailer parking brakes.
2. Chock the rear trailer tires.
3. Lower the trailer landing gear until the weight is removed from the fifth wheel.
4. Disconnect the tractor-to-trailer air lines and electrical cable. Plug the air lines to prevent dirt or foreign material from entering the lines.

19.03.04 Air-Activated Kingpin Unlock, Fontaine and Holland Fifth Wheels

1. Verify that both the parking brake and trailer-air supply knobs are out (see Fig.210,Brake Valve Knobs), the tractor and trailer parking brakes are set, and that the trailer is prepared for uncoupling.

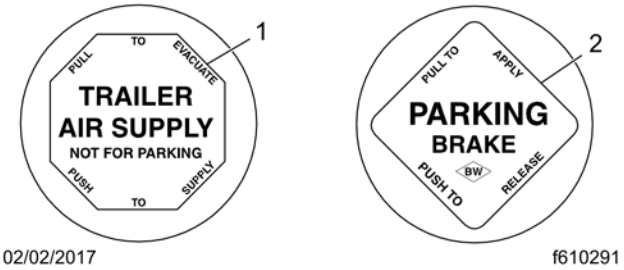
   NOTE: If the tractor parking brake is not set, the air-actuated kingpin-release valve will not activate.

2. Pull and hold the kingpin release valve (see Fig.209,Air-Actuated Kingpin Release Valve) until the kingpin lock mechanism opens and locks in place.



Fig 209, Air-Actuated Kingpin Release Valve

3. Let go of the kingpin release valve.
4. Release the tractor parking brake.
5. Drive out from under the trailer.



1. Trailer Air Supply Valve Knob
2. Parking Brake Valve Knob

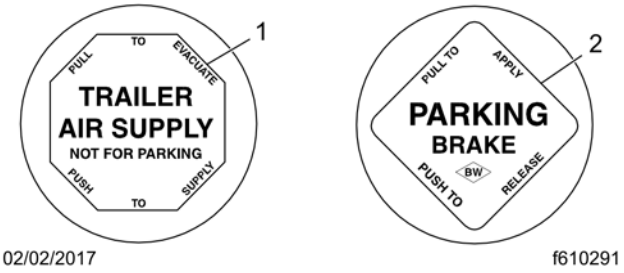
Fig 210, Brake Valve Knobs

19.03.05 Air-Activated Kingpin Unlock, Jost Fifth Wheels

1. Verify that both the parking brake and trailer air supply knobs are out (see Fig.211,Brake Valve Knobs), the tractor and trailer parking brakes are set, and that the trailer is prepared for uncoupling.

   NOTE: If the trailer parking brake is not set, the air-actuated valve will not activate.

2. Release the tractor parking brake.
3. Pull and hold the kingpin release valve, then drive forward slowly.
4. After the trailer has slid down the fifth wheel and pick-up ramps, let go of the kingpin release valve.



1. Trailer Air Supply Valve Knob
2. Parking Brake Valve Knob

Fig 211, Brake Valve Knobs

19.04 Fifth Wheel Slide

19.04.01 General Information

NOTE: Adjust the fifth wheel slide correctly, and do not overload any tractor axle by incorrectly loading the trailer. Incorrect slide adjustment or improper axle loading could cause erratic steering and loss of vehicle control, possibly resulting in serious personal injury or death.

On sliding fifth wheel assemblies, the fifth wheel plate is attached to rails that allow forward and rearward movement of the fifth wheel in order to optimally distribute the load across the axles. Slots are evenly spaced along the slide rails, and retractable wedges are positioned through the slots to hold the fifth wheel in the desiposition.

The amount of load distribution on the front steering axle and rear drive axle(s) will have a direct effect on the steering control of the tractor. Determine the front and rear axle weights by weighing the tractor on scales designed for this purpose.

The maximum axle weight ratings are shown on the Federal Motor Vehicle Safety Standard (FMVSS) label or Canadian Motor Vehicle Safety Standard (CMVSS) label attached to the driver-side door frame. The desired load on the axle is no less than 80 percent of the maximum axle weight rating, but in no instances should the axle load exceed the maximum axle weight rating given on the FMVSS or CMVSS label.

19.04.02 Manual Slide Operation

Use the following procedure to manually slide the fifth wheel. See Fig,212,Manual Release Sliding Fifth Wheel, Fontaine.

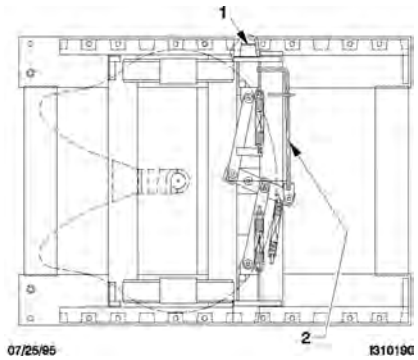


Fig 212, Manual Release Sliding Fifth Wheel, Fontaine

1. Stop the tractor and trailer in a straight line on level ground. Pull the trailer air supply knob to set the trailer parking brakes.
2. Set the tractor parking brake, then release the sliding mechanism using the appropriate method for the fifth wheel manufacturer.

2.a **Fontaine:** Lift the slide release pull handle to disengage it from the guide plate. Then, pull out the handle until it is in the unlocked position and can be positioned against the guide plate to hold it out. The handle will stay in the unlocked position until it is manually disengaged from the guide plate. See Fig. 213,Sliding Fifth Wheel Manual Release, Fontaine .

2.b **Holland:** Pull the operating rod out. Make sure both side plungers have released. See Fig. 214,Sliding Fifth Wheel Manual Release, Holland Simplex.

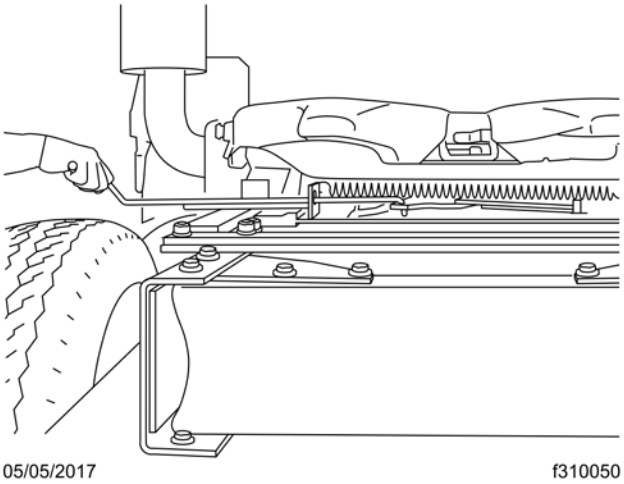
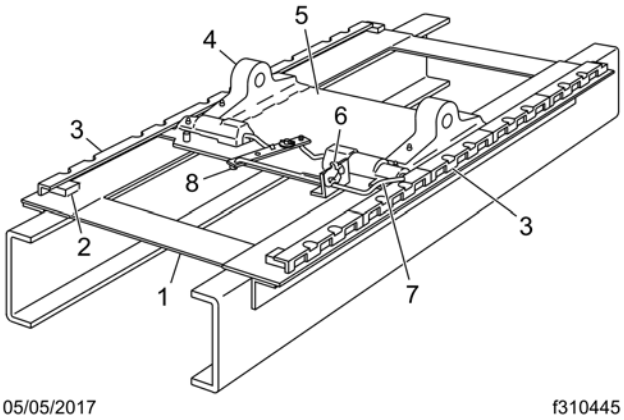


Fig 213, Sliding Fifth Wheel Manual Release, Fontaine



1. Baseplate
2. Bolted Stop
3. Baseplate Rail
4. Fifth Wheel Mount
5. Slider Saddle Plate
6. Safety Latch
7. Operating Rod
8. Operating Lever

Fig 214, Sliding Fifth Wheel Manual Release, Holland Simplex

3. Lower the trailer landing gear just enough to remove the weight from the tractor.
4. Chock the front and rear trailer tires to prevent the trailer from moving.

NOTICE:
When moving the fifth wheel to the desiposition, be sure the trailer landing gear will not at any time come in contact with the tractor frame or other components. Make sure that the front of the trailer will not come in contact with the rear of the cab or with other components if they extend beyond the rear of the cab.

5. Release the tractor parking brake, then slowly move the tractor forward or backward until the fifth wheel is in the desilocation.

WARNING:
Check that the locking wedges have seated in the slots. Failure to achieve complete lockup may allow disengagement of the tractor from the trailer, possibly resulting in serious personal injury or death.

6. Set the tractor parking brake, then lock the sliding member in position using one of the following methods:
   - 6.a **Fontaine:** Disengage the slide release pull handle from the guide plate. The slide release pull handle is spring-loaded in the locked position and will seek the locked position when disengaged from the guide plate. After the slide release pull handle returns to the fully locked position, visually and physically check the locking wedges to make sure they are fully inserted into the slots in the slide rails. Make sure the handle is locked in position against the guide plate.
   - 6.b **Holland:** Raise the operating rod so that it is free to move inward. Make sure that the lock pins have seated in the base plate rail holes and the operating rod moves into the locked position.

NOTE: The fifth wheel may need to be moved slightly to enable the locking wedges to enter the fully locked position.

19.04.03 Air Slide Operation

The slide feature may be operated with a dash-mounted switch that operates an air cylinder that locks and unlocks the slide.

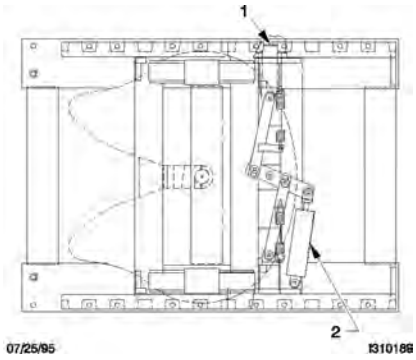
1. Press the top half of the air-slide switch to enable the air-slide feature. See Fig.215,Air Slide Switch.

   Ensure the locking plungers have released. See Fig.216,Air-Operated Sliding Fifth Wheel, Fontaine.

   For Jost fifth wheels, the mechanism activates as shown in Fig.217,Jost Sliding Fifth Wheel.
2. Lower the trailer landing gear just enough to remove the weight from the tractor.
3. Pull the trailer air supply knob to set the trailer parking brakes.
4. Slowly move the tractor forward or backward until the fifth wheel is in the desilocation.

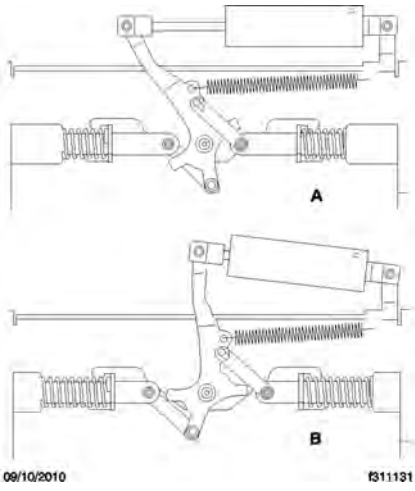


Fig 215, Air Slide Switch



1. Locking Wedge
2. Air Cylinder

Fig 216, Air-Operated Sliding Fifth Wheel, Fontaine



A. Unlocked
B. Locked

Fig 217, Jost Sliding Fifth Wheel



NOTICE:

Ensure the trailer landing gear does not come in contact with the tractor frame or other components, and that the front of the trailer will not come in contact with the rear of the cab or other components if they extend beyond the rear of the cab.

5. Set the tractor parking brake.



WARNING:

Check that the locking wedges have seated in the slots. Failure to achieve complete lockup may allow disengagement of the tractor from the trailer, possibly resulting in serious personal injury or death.

6. Press the lower half of the air-slide switch to disable the air-slide feature. Visually inspect the locking wedges or plungers to make sure that they are fully inserted in the slide rail slots. Verify that the plungers have engaged by tugging the tractor forward while the trailer brakes are locked and the tires are chocked.

NOTE: The fifth wheel may need to be moved slightly to enable the locking wedges to fully lock.

20.01 Holland Trailer Coupling....252
20.01.01 General Information....252
20.01.02 Trailer Hookup....252
20.01.03 Trailer Release....253

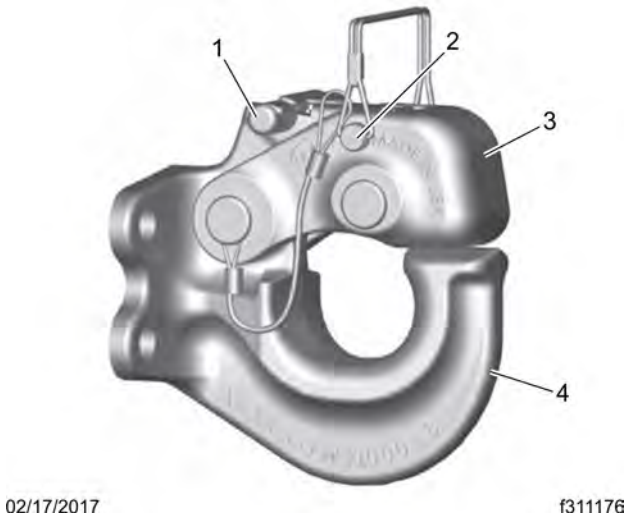
20. Trailer Couplings

20.01 Holland Trailer Coupling

20.01.01 General Information

IMPORTANT: Refer to the Holland web site (www.hollandhitch.com) for additional information.

The Holland trailer coupling is designed for use with trailers having a maximum gross weight of 10,000 lb. (4540 kg) for Holland PH-10RP41 and PH-10RP51, or 30,000 lb. (13,610 kg) for Holland PH-30RP41 and PH-30RP51. It is a rigid-type pintle hook, used only on tractor applications, and is fastened to the rear closing crossmember of the vehicle. It is a non-air-adjusted coupling. See Fig.218,Holland Trailer Coupling (typical).



1. Lock
2. Cotter Pin
3. Latch
4. Pintle Hook

Fig 218, Holland Trailer Coupling (typical)

20.01.02 Trailer Hookup

1. Chock the front and rear tires of the trailer.
2. Remove the lock pin (if equipped), then lift the lock handle and raise the latch.
3. Back up the vehicle until the drawbar eye is over the pintle hook.
4. Lower the trailer, until the drawbar eye rests on the pintle hook.
5. Push the latch closed, then insert the lock pin (if equipped).



NOTICE:

Always make sure the connection hanger keeps the trailer air hoses and electrical cables positioned so that they do not rub on anything. Rubbing may wear through hoses or cables, resulting in air leaks, or exposed or broken wires, potentially affecting trailer brake or electrical systems.

6. Connect the trailer electrical and air lines.

20.01.03 Trailer Release

1. Apply the tractor and trailer parking brakes.



WARNING:

Do not use the trailer air supply for parking trailers not equipped with spring parking brakes. This applies the trailer service brakes only. As air bleeds from the trailer brake system, brake application is lost. This could allow the unattended vehicle to roll away, possibly resulting in serious personal injury or death.

2. Chock the front and rear tires of the trailer.
3. Disconnect the trailer air and electrical lines. Plug the air lines to keep them free of dirt.
4. Take the weight of the trailer drawbar off the pintle hook.
5. Open the latch by removing the lock pin (if equipped), then lift up the lock and raise the latch.
6. Slowly drive the vehicle away from the trailer.

21.01 Preliminary Checks 256
21.02 Checking Headlight Aim 256
21.03 Adjusting the Headlight Aim 258

21. Headlight Aiming

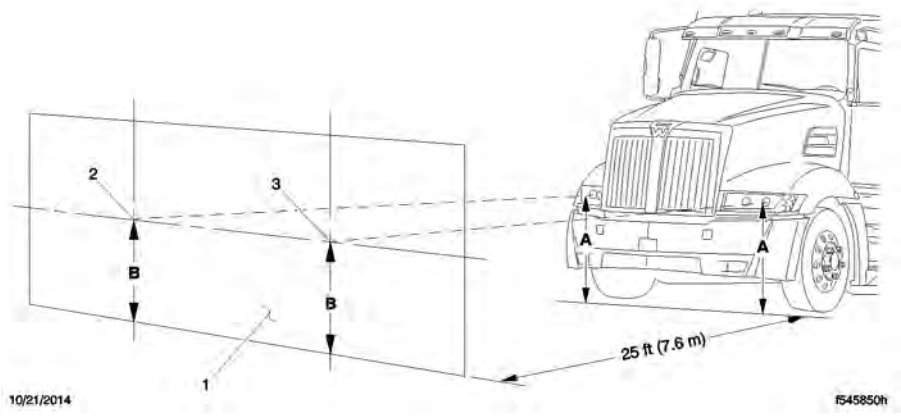
21.01 Preliminary Checks

Before checking or adjusting the headlight aim, complete the following inspection:

- Check that the hood is closed and latched.
- Remove any large amounts of mud or ice from the underside of the fenders.
- Check the springs for sagging or broken leaves.
- Check the suspension for proper functioning of the leveling mechanism. On cabs with air suspensions, make sure that the height is properly adjusted.
- Check for damage to the hood and hinge assembly. Repair as necessary.
- With the vehicle unloaded, check that the tires are inflated to the recommended air pressure.
- Clean the headlight lenses. Use a soft cloth with mild, non-caustic soap or detergent, and water.

21.02 Checking Headlight Aim

1. Park the vehicle on a level surface, 25 ft (7.6 m) away from, and perpendicular to, a vertical screen or wall. Shut down the engine and set the parking brake. Chock the tires.
2. On each headlight, find the low-beam bulb center, marked by a small transparent ring on the inside of the headlight lens.
3. Measure the distance from the ground to the center of each headlight bulb (see Fig. 219,Headlight Aiming Screen/Wall, Item A). Note those distances.

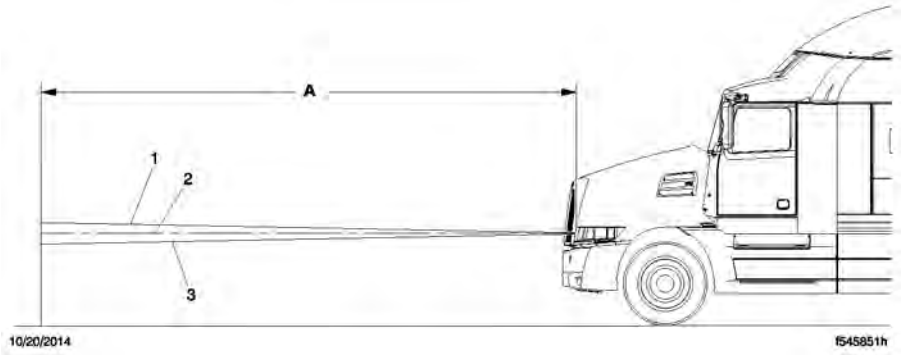


A. Measure the distance from the ground to the center of each headlight bulb.
B. Mark where the center of each headlight projection should appear.

1. Screen or Wall
2. Center of Right-Hand Headlight Projection
3. Center of Left-Hand Headlight Projection

Fig 219, Headlight Aiming Screen/Wall

4. On the screen or wall, mark the locations of each low-beam headlight bulb center using the distances found in step 3. See Fig.219,Headlight Aiming Screen/Wall, Items 2 and 3.
5. Turn on the low-beam headlights.
6. Check the vertical adjustment of the low beams. The center of each beam projection should fall on or near the marks made during step 4. See Fig.220,Vertical Low-Beam Headlight Variation Limits.



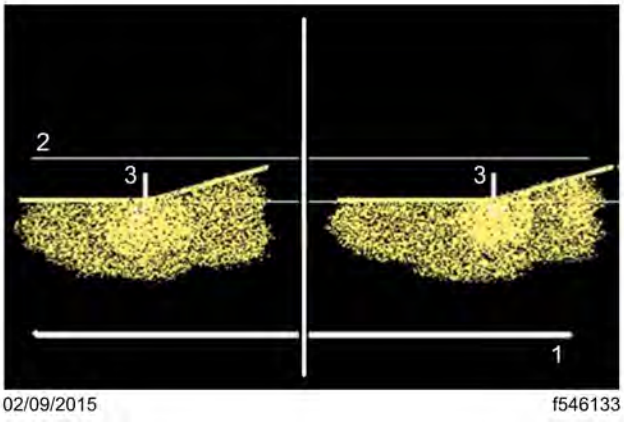
A. Measurement
1. Low-Beam Angle Upper Limit
2. Ideal Low-Beam Projection
3. Low-Beam Angle Lower Limit

Fig 220, Vertical Low-Beam Headlight Variation Limits

7. See Table.26,Vertical Low-Beam Headlight Variation Limits to determine the maximum vertical distance allowable between the marks on the wall and the center of each beam projection.

   If the distance between either projection center and the mark made on the wall or screen is greater than the maximum distance given in Table.26,Vertical Low-Beam Headlight Variation Limits, adjust the vertical positioning of that headlight.

IMPORTANT: The zone of high-intensity light from a low-beam lamp should not project above the low-beam angle upper limit. See Fig.221,Beam Projection of Correctly Aimed Headlights (5700 model) for an example of correctly aimed headlights.



1. Ground
2. Low-Beam Angle Upper Limit
3. Low-Beam Vertical Center Line

Fig 221, Beam Projection of Correctly Aimed Headlights (5700 model)

Table 26, Vertical Low-Beam Headlight Variation Limits

Vertical Low-Beam Headlight Variation Limits			
Distance Between Ground and Headlight: in (mm)	**Desired Variation (See Fig. 220,Vertical Low-Beam Headlight Variation Limits, Item 2) : in (mm)**	**Upper Limit (See Fig. 220,Vertical Low-Beam Headlight Variation Limits, Item 1): in (mm) up**	**Lower Limit (See Fig. 220,Vertical Low-Beam Headlight Variation Limits, Item 3): in (mm) down**
22–36 (560–900)	0	3.9 (100)	3.9 (100)
36–48 (900–1200)	2 (50) down	2 (50)	6 (150)
48–54 (1200–1400)	4 (101.6) down	1.6 (40)	6.5 (165)

Table 26, Vertical Low-Beam Headlight Variation Limits

21.03 Adjusting the Headlight Aim

NOTICE:
Do not use power tools to adjust headlight aim. Doing so will strip or break the adjusting screw.

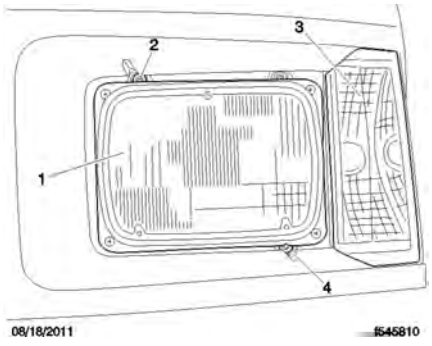
For 5700 models, headlight adjustment is made on the bottom of the headlight assembly, accessible through the wheel well when the hood is closed.

Using a Phillips #2 screwdriver inserted through the slot in the hood-mounted splash shield (see Fig. 222,Headlight Adjustment Slot (5700 model, shown with the hood open)), turn the adjusting screw clockwise to raise the beam and counterclockwise to lower it, until the beam pattern meets the acceptable standard.



Fig 222, Headlight Adjustment Slot (5700 model, shown with the hood open)

For adjustment screw locations on a 4700 model, see Fig. 223,Single Headlight Assembly (4700 model). Turn the adjustment screw in either direction until the beam pattern meets the acceptable standard.



NOTE: Adjustment screw locations may vary.

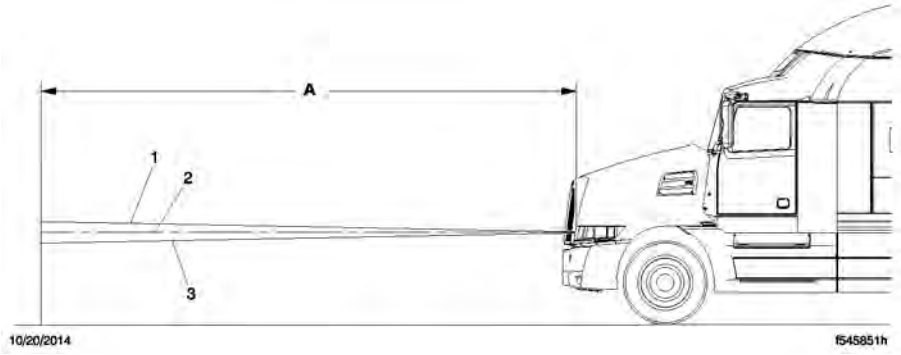
1. Headlight Lens
2. Horizontal Adjusting Screw
3. Turn Signal
4. Vertical Adjusting Screw

Fig 223, Single Headlight Assembly (4700 model)

Table 27, Vertical Low-Beam Headlight Variation Limits

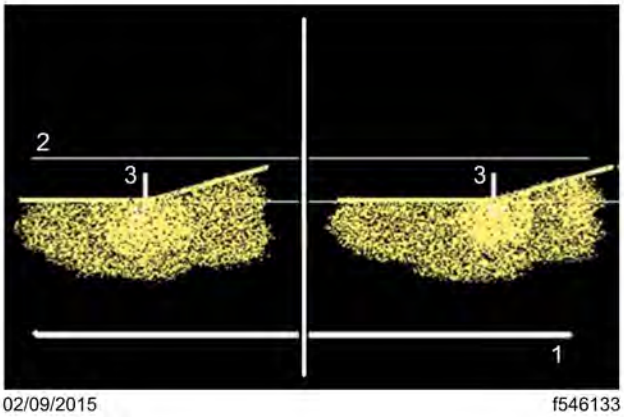
Distance Between Ground and Headlight: in (mm)	Desired Variation (See Fig. 224,Vertical Low-Beam Headlight Variation Limits, Item 2) : in (mm)	Upper Limit (See Fig. 224,Vertical Low-Beam Headlight Variation Limits, Item 1): in (mm) up	Lower Limit (See Fig. 224,Vertical Low-Beam Headlight Variation Limits, Item 3): in (mm) down
22–36 (560–900)	0	3.9 (100)	3.9 (100)
36–48 (900–1200)	2 (50) down	2 (50)	6 (150)
48–54 (1200–1400)	4 (101.6) down	1.6 (40)	6.5 (165)

Table 27, Vertical Low-Beam Headlight Variation Limits



A. Measurement
1. Low-Beam Angle Upper Limit
2. Ideal Low-Beam Projection
3. Low-Beam Angle Lower Limit

Fig 224, Vertical Low-Beam Headlight Variation Limits



1. Ground
2. Low-Beam Angle Upper Limit
3. Low-Beam Vertical Center Line

Fig 225, Beam Projection of Correctly Aimed Headlights (5700 model)

22.01 Cab Washing and Polishing....262
22.02 Care of Fiberglass Parts....262
22.03 Care of Fiberglass Parts....262
22.04 Care of Chrome Parts....262
22.05 Care of Exterior Lights....263
22.06 Dashboard and Instrument Panel Care....263
22.07 Vinyl Upholstery Cleaning....263
22.07.01 General Information....263
22.07.02 Ordinary Dirt....263
22.07.03 Chewing Gum....263
22.07.04 Tars, Asphalts, and Creosote....264
22.07.05 Paint, Shoe Heel Marks....264
22.07.06 Sulfide Stains....264
22.07.07 Nail Polish and Nail Polish Remover....264
22.07.08 Shoe Polish....264
22.07.09 Ball Point Ink....264
22.07.10 Miscellaneous....264
22.08 Velour Upholstery Cleaning....264
22.08.01 General Information....264
22.08.02 Grease and Oil-Based Stains....264
22.08.03 Sugar and Water-Based Stains....264
22.08.04 Chewing Gum or Wax....265
22.08.05 Mildew....265

22. Vehicle Appearance and Care

22.01 Cab Washing and Polishing

IMPORTANT: Carefully read all instructions before using or applying any cleaner or product on the vehicle or components. Failure to follow manufacturers' recommendations can result in damage to the finish.

To protect the finish of your new vehicle, follow these guidelines carefully.

- During the first 30 days, rinse your vehicle frequently with water. If the vehicle is dirty, use a mild liquid soap. Do not use detergent.
- During the first 30 days, do not use anything abrasive on your vehicle. Brushes, chemicals, and cleaners may scratch the finish.
- During the first 120 days, do not wax your vehicle.

To extend the life of your vehicle's finish, follow these guidelines.

- Avoid washing your vehicle in the hot sun.
- Always use water. After the cab is completely washed, dry it with a towel or chamois.
- Do not dust painted surfaces with a dry cloth, as this will scratch the paint.
- Do not remove ice or snow from a painted surface with a scraper of any sort.
- To prevent damage to the finish, wax it regularly. Before waxing, if the finish has become dull, remove oxidized paint using a cleaner specifically designed for this purpose. Remove all road tar and tree sap before waxing. Freightliner recommends using a high quality brand of cleaner or cleaner-polish and polishing wax.
- Do not let diesel fuel or antifreeze stand on a painted surface. If either should occur, rinse the surface off with water.
- To prevent rust, have any nicks or other damage on the finish touched up as soon as possible.
- Park your vehicle in a sheltered area whenever possible.

To prevent delamination and deterioration of labels and stickers on the cab, follow these guidlines carefully:

- Do not pressure wash the label or sticker or surfaces near it.
- Do not use strong alkaline soaps on or near the label or sticker.

22.02 Care of Fiberglass Parts

Wash unpainted fiberglass air fairings and shields monthly with a mild detergent, such as dishwashing liquid. Avoid strong alkaline cleansers.

Apply a wax specifically designed for fiberglass.

22.03 Care of Fiberglass Parts

Wash unpainted fiberglass air fairings and shields monthly with a mild detergent, such as dishwashing liquid. Avoid strong alkaline cleansers.

Apply a wax specifically designed for fiberglass.

22.04 Care of Chrome Parts

To prevent rust, keep chrome parts clean and protected at all times. This is especially important during winter driving and in coastal areas where there is exposure to salt air.

When cleaning chrome parts, use clean water and a soft cloth or sponge. A mild detergent may also be used.

Sponge gently, then rinse. If necessary, use a nonabrasive chrome cleaner to remove stubborn rust or other material. Do not use steel wool.

To help protect the chrome after cleaning, apply a coat of polishing wax to the surface. Never use wax on parts that are exposed to high heat, such as exhaust pipes.

22.05 Care of Exterior Lights

Clean the headlight lenses by hand only. Use a flannel cloth with mild, non-caustic soap or detergent, and water.



NOTICE:

Do not use a power buffer, paper towels, chemical solvents, or abrasive cleaners on the headlight lens, all of which can remove the UV coating from the surface, and result in yellowing of the lens.

22.06 Dashboard and Instrument Panel Care



NOTICE:

When cleaning the dashboard, instrument panel, or gauge lens covers, do not use Armor-All Protectant®, STP Son-of-a-Gun®, window cleaner, or other equivalent treatments. These cleaners contain vinyl plasticizers which can cause stress crazing in the interior plastic panels and can result in cracking of the panels. Some cleaners can also have an adverse effect on the clear plastic of instrument panels and gauge lens covers, resulting in a foggy or cloudy appearance. This type of damage is not covered by vehicle warranty.

To clean the dashboard, instrument panel, and gauge lens covers, use a cloth dampened with warm soapy water. Make certain to wring the cloth out well before cleaning, as excess water will damage the electrical components.

22.07 Vinyl Upholstery Cleaning

22.07.01 General Information

To prevent soiling, frequent vacuuming or light brushing to remove dust and dirt is recommended. Harsh cleaning agents can cause permanent damage to vinyl upholstery.

To preserve the upholstery and prevent damage, carefully review the following sections for recommended cleaning procedures. Waxing or refinishing improves soil resistance and cleanability for all vinyls. Use any hard wax, such as that used on automobiles.

22.07.02 Ordinary Dirt

Wash the upholstery with warm water and mild soap, such as saddle or oil soap. Apply soapy water to a large area and allow to soak for a few minutes, then rub briskly with a cloth to remove the dirt. Repeat several times, as necessary.

If dirt is deeply imbedded, use a soft bristle brush after applying the soap.

If dirt is extremely difficult to remove, use a wall-washing preparation such as those normally found around the home. Powdered cleaners, such as those used for sinks and tiles, are abrasive and must be used with caution as they can scratch the vinyl or give it a permanent dull appearance.

22.07.03 Chewing Gum

Harden the gum with an ice cube wrapped in a plastic bag, then scrape it off with a dull knife. Remove any remaining traces of gum with an all-purpose light oil (peanut butter will also work). Wipe off the gum and oil substance.

22.07.04 Tars, Asphalts, and Creosote

Each of these items stains vinyl after prolonged contact. Wipe any of these items off immediately and carefully clean the area using a cloth dampened with naphtha.

22.07.05 Paint, Shoe Heel Marks

Remove paint immediately. Do not use paint remover or liquid-type brush cleaner on vinyl. An unprinted cloth, dampened with naphtha or turpentine may be used. Use care to prevent contact with parts of the upholstery that are not vinyl.

22.07.06 Sulfide Stains

Sulfide compounds, such as those found in eggs and some canned goods, can stain after prolonged contact with vinyl. Remove these stains by placing a clean, unprinted piece of cloth over the spotted area and pouring a liberal amount of 6 percent hydrogen peroxide onto the cloth. Allow the saturated cloth to remain on the spot for 30 to 60 minutes. For stubborn spots, allow the hydrogen-peroxide saturated cloth to remain on the area overnight. Use caution to prevent the solution from seeping into the seams, where it can weaken the cotton thread.

22.07.07 Nail Polish and Nail Polish Remover

Prolonged contact with these substances causes permanent damage to vinyl. Careful blotting immediately after contact minimizes damage. Do not spread the liquid during removal.

22.07.08 Shoe Polish

Most shoe polishes contain dyes which penetrate vinyl and stain it permanently. Wipe shoe polish off as quickly as possible using naphtha or lighter fluid. If staining occurs, try the procedure used for sulfide stains.

22.07.09 Ball Point Ink

Rub ball point ink immediately with a damp cloth, using water or rubbing alcohol. If this does not work, try the procedure used for sulfide stains.

22.07.10 Miscellaneous

If stains do not respond to any of the treatments described above, it is sometimes helpful to expose the vinyl to direct sunlight for up to 30 hours. Mustard, ball point ink, certain shoe polishes, and dyes often bleach out in direct sunlight, leaving the vinyl undamaged.

22.08 Velour Upholstery Cleaning

22.08.01 General Information

To prevent soiling, frequent vacuuming or light brushing to remove dust and dirt is recommended. Spot clean with a mild solvent or an upholstery shampoo, or the foam from a mild detergent. When using a solvent or a dry-cleaning product, follow the instructions carefully, and clean only in a well-ventilated area. Avoid any product that contains carbon tetrachloride or other toxic materials. With either method, pretest a small area before proceeding. Use a professional upholstery cleaning service when extensive cleaning is needed.

22.08.02 Grease and Oil-Based Stains

Dampen a small absorbent cloth with dry-cleaning solvent or spot remover. Apply the cloth carefully to the spot from the outer edge to the center. Pat and blot the spot with a clean, dry cloth. Repeat several times, as necessary, turning the cloths so that the stain does not redeposit on the fabric.

22.08.03 Sugar and Water-Based Stains

Apply water-based detergent or cleaner, working in circular motions. Pat and blot as dry as possible. Repeat, if necessary, before drying thoroughly.

22.08.04 Chewing Gum or Wax

Harden the gum or wax with an ice cube wrapped in a plastic bag, then scrape it off with a dull knife. Absorb excess wax by placing a thick white blotter over the wax and heating with a warm (not hot) iron. Remove the remainder by using the procedure for grease and oil-based stains.

22.08.05 Mildew

Brush the dry fabric with a soft brush. Sponge with detergent, and blot. If the fabric is colorfast, dilute a teaspoon of bleach in one quart (one liter) of cool water. Apply with a swab, directly on the mildew stain. Dab repeatedly with clear, cool water, and blot dry.

23.01 Periodic Inspections and Maintenance 268
23.02 Checklists 268
23.02.01 Daily Pretrip Inspection Checklists 268
23.02.02 Weekly Post-trip Inspection Checklist 270
23.02.03 Monthly Post-trip Inspection Checklists 270
23.03 Fluids Added 271

23. Pre- and Post-Trip Checklists

23.01 Periodic Inspections and Maintenance

Regulations in Canada and the U.S. clearly indicate that it is the driver's responsibility to perform an inspection, and ensure the complete road-worthiness of a vehicle, before placing it into service. Commercial vehicles may be subject to inspection by authorized inspectors, and an unsafe vehicle can be taken "out of service" until the driver or owner repairs it.

Use the following checklists to ensure that vehicle components are in good working condition before each trip. Careful inspections eliminate stops later to fix overlooked or forgotten items.

The checklists in this chapter can be copied and kept as a record that the procedures have been completed. For details on how to inspect each item on the checklists, see the corresponding procedure (step number) in 24.01 Safety Precautions.

23.02 Checklists

23.02.01 Daily Pretrip Inspection Checklists

NOTE: Checklists in this chapter correspond with the procedures and steps, see 24.01 Safety Precautions, *Pre- and Post-Trip Inspections and Maintenance* . Your vehicle may not be equipped with all components listed below.

See the following tables for a list of procedures that should be performed daily, before the first trip. Place a check mark in the complete (**Comp.**) column to indicate a procedure has been performed.

Inspector	Date

Suspension and Slack Adjusters		Comp.
1	Suspension components	
2	Slack adjusters	

Wheels and Tires		Comp.
1	Wheel covers	
2	Tire condition	
3	Tire inflation	
4	Rims and wheel components	
5	Wheel bearing oil seals and lubrication levels	
6	Mud Flaps	

Saddle Tank Areas		Comp.
1	Drain air reservoirs (without automatic drain valves)	

2	Fuel tank(s) secure	
3	Frame rails and crossmembers	
4	Visible exhaust components	

Engine Compartment		**Comp.**
1	Leakage under engine	
2	Air intake system	
3	Engine oil level	
4	Power steering reservoir level	
5	Engine coolant level	
6	Visible engine wiring	
7	Frame rails	

Cab		**Comp.**
1	Reset dash-mounted air intake restriction indicator	
2	Air-pressure warning systems	
3	Air governor cut-in and cut-out pressures	
4	Air pressure build-up time	
5	Air system leakage	
6	Air pressure reserve	
7	Mirrors, windows, windshield	
8	Horn, windshield wipers, windshield washers	
9	Heater and defroster	
10	Interior lights	
11	Exterior lights	
12	Seat belts and tether belts	
13	Fuel level	
14	Mirror adjustment	

15	Service brakes	
16	Backup alarm	

23.02.02 Weekly Post-trip Inspection Checklist

See the following table for procedures that should be performed weekly, post-trip. Place a check mark in the complete (**Comp.**) column to indicate a procedure has been performed.

Inspector	Date

Engine Compartment		Comp.
1	Windshield washer reservoir level	
2	Air intake restriction indicator	
3	Water evacuation components	
4	Automatic transmission fluid level	
5	Water in fuel/water separator	
6	Steering components	
7	Serpentine drive belts	

23.02.03 Monthly Post-trip Inspection Checklists

See the following tables for procedures that should be performed monthly, post-trip. Place a check mark in the complete (**Comp.**) column to indicate a procedure has been performed.

Inspector	Date

Brake Components		Comp.
1	Brake system components	
2	Brake chambers	
3	Air brake lines	
4	Flex air hoses	
5	Brake linings and brake drums	
6	Brake lining thickness	

Saddle Tank Areas		Comp.
1	Drain air reservoirs (with automatic drain valves)	
2	Batteries (location may vary)	
3	Aerodynamic components	

Engine Compartment		Comp.
1	Hood and bumper	
2	Hydraulic clutch reservoir	
3	Radiator and heater hoses	
4	Steering wheel play	

23.03 Fluids Added

Use the following table to note any fluids that were added during the inspection and maintenance procedures.

Fluids Added During Inspection	
Fluid	**Amount Added**
Wheel Bearing Lubricant	
Engine Oil	
Power Steering Fluid	
Engine Coolant	
Windshield Washer Fluid	
Automatic Transmission Fluid	
Hydraulic Clutch Fluid (DOT 4 brake fluid)	

24.01 Safety Precautions 274
24.02 Daily Pretrip Inspection and Maintenance 274
24.02.01 General Information 274
24.02.02 Inspection and Adjuster of the Suspension and Slack 274
24.02.03 Inspection of the Wheel and Tire 277
24.02.04 Inspection of the Saddle Tank Areas 279
24.02.05 Inspection of the Engine Compartment 280
24.02.06 Inspection of the Cab 282
24.03 Weekly Post-Trip Inspection and Maintenance 286
24.03.01 Inspection of the Engine Compartment 286
24.04 Monthly Post-Trip Inspection and Maintenance 291
24.04.01 Inspection of the Brake Component 291
24.04.02 Inspection of the Saddle Tank Areas 292
24.04.03 Inspection and Adjustments of the Engine Compartment 293

24. Pre- and Post-Trip Inspections and Maintenance

24.01 Safety Precautions

DANGER:

When working on the vehicle, shut down the engine, set the parking brake,and chock the tires. before working under the vehicle, always place jack stands under the frame rails to ensure the vehicle can not drop. Failure to follow these steps could result in serious personal injury or death.

24.02 Daily Pretrip Inspection and Maintenance

24.02.01 General Information

Complete the following inspection and maintenance procedures to ensure that vehicle components are in good working condition before each trip. A driver who is familiar with the vehicle and drives it regularly can perform the daily inspections, then add the weekly and monthly post-trip inspections as scheduled.

If the driver does not operate the vehicle on a consistent basis, all daily, weekly, and monthly inspection and maintenance procedures should be performed before the trip.

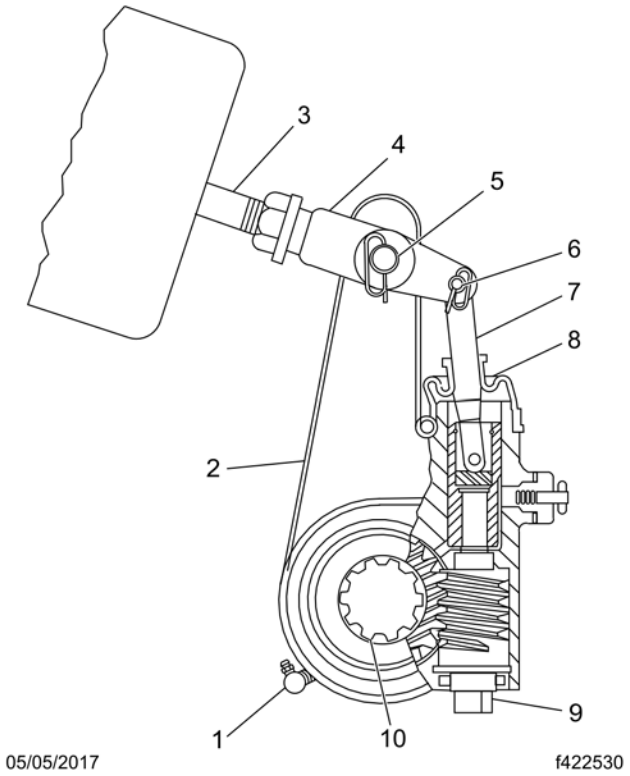
IMPORTANT: The pre- and post-trip checklists, inspections, and maintenance procedures detailed in this chapter are **not all-inclusive** . Refer to other component and body manufacturers' instructions for specific inspection and maintenance instructions, as well as local, state, and federal guidelines.

NOTE: If any system or component does not pass this inspection, it must be corrected before operating the vehicle. Whenever equipment requires adjustment, replacement, and/or repair, see the *Western Star Workshop Manual* for procedures and specifications.

24.02.02 Inspection and Adjuster of the Suspension and Slack

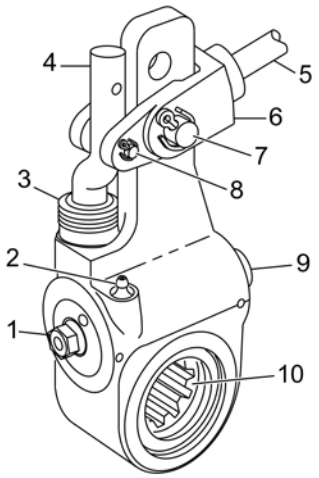
Walk around the vehicle and visually inspect suspension and slack adjuster components.

1. Inspect the following suspension components for signs of structural damage, cracks, or wear.
   - springs
   - spring hangers
   - shocks
   - suspension arms
   - suspension brackets
   - axle seats
   - bushings
2. Inspect slack adjusters for signs of damage. See Fig.226,Meritor Automatic Slack Adjuster. See Fig. 227,Gunite Automatic Slack Adjuster or see Fig.228,Haldex Automatic Slack Adjuster.



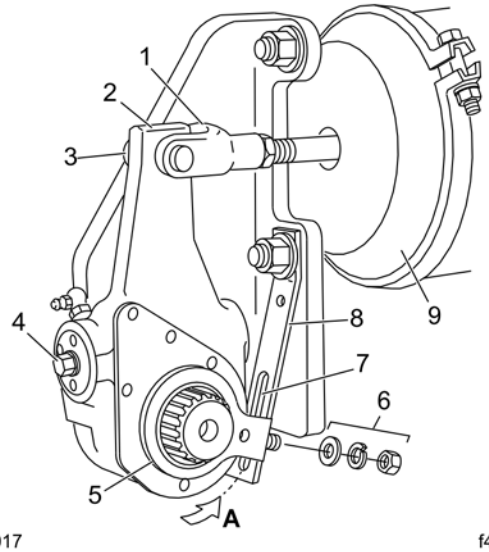
1. Grease Fitting (if equipped)
2. Slack Adjuster Housing
3. Brake Chamber Pushrod
4. Clevis
5. Clevis Pin (large)
6. Clevis Pin (small)
7. Actuator Rod
8. Boot
9. Manual Adjusting Nut
10. Camshaft Splines

Fig 226, Meritor Automatic Slack Adjuster



1. 7/16-inch Adjusting Nut
2. Grease Fitting
3. Boot
4. Link
5. Brake Chamber Piston Rod
6. Clevis
7. 1/2-inch Clevis Pin
8. 1/4-inch Clevis Pin
9. Grease Relief Opening
10. Slack Adjuster Spline

Fig 227, Gunite Automatic Slack Adjuster



A. Rotate the control arm toward the brake chamber until you can feel it contacting the internal stop.
1. Clevis
2. Slack Adjuster
3. Clevis Pin
4. Manual Adjusting Nut
5. Control Arm
6. Control-Arm Washers and Nut
7. Anchor Strap Slot
8. Anchor Strap
9. Brake Chamber

Fig 228, Haldex Automatic Slack Adjuster

- Inspect slack adjuster boots, if equipped, for cuts or tears.
- Inspect anchor straps, if equipped, for damage.

- Look for worn clevis pins on brake chamber pushrods.
- Look for missing or damaged cotter pins on the clevis pins.
- Ensure chamber piston rods are in line with the slack adjusters.

24.02.03 Inspection of the Wheel and Tire

Walk around the vehicle and visually inspect each wheel and tire assembly.

IMPORTANT: Wheel covers decrease drag force as a vehicle moves, thereby improving fuel efficiency. If replacement of a wheel cover is necessary, the replacement cover must meet or exceed the drag reduction performance of the originally installed cover in order to maintain compliance with greenhouse gas and fuel efficiency regulations.

1. If the vehicle was originally equipped with wheel covers, ensure all wheel covers are present. Inspect wheel covers for damage or wear. Remove wheel covers from rear drive wheels, if equipped, prior to inspecting the tires and wheel components.

   NOTE: During wheel cover installation, ensure the V-notch in the liner inner retaining ring is centered on the valve stem. The inner and outer retaining rings should be uniformly aligned to each other and to the wheel rim. The outer retaining ring of the liner is equipped with two canvas flaps. When installing the face cover, make sure the cover retaining ring is inserted between the two canvas flaps on the liner outer retaining ring so that the Velcro strips line up between the face cover and the liner. Make certain the detachable view cover is centered on the face cover, and the Velcro strips are pressed firmly in place.

2. Inspect each tire for the following:
   - valve stem caps on every tire, screwed on finger-tight
   - bulges, cracks, cuts, and penetrations
   - oil contamination (petroleum derivatives will soften the rubber and destroy the tire)
   - tread depth—if tread is less than4/32inch (3 mm) on any front tire, or less than 2/32 inch (1.5 mm) on any rear tire, replace the tire
   - debris lodged between dual tire sets

   IMPORTANT: Low-rolling resistance (LRR) tires minimize wasted energy as a tire rolls, thereby decreasing rolling effort and improving fuel efficiency. If tire replacement is necessary, replacement tires must meet or have less rolling resistance than the originally installed tires in order to maintain compliance with greenhouse gas and fuel efficiency regulations.Contact your tire manufacturer/supplier to determine the rolling resistance of the originally installed tires. Visitwww.epa.gov/smartwayfor additional information and resources.

3. Check tire inflation.

   For inflation pressures and maximum loads, see the tire manufacturer's guidelines. Inflate the tires to the applicable pressures if needed.

   If a tire has been run flat or under-inflated, check the wheel and tire for damage before adding air.

   Keep compressed air reservoirs and lines dry during tire inflation. Use well-maintained inline moisture traps and service them regularly.

WARNING:
Do not operate the vehicle with underinflated or overinflated tires. Incorrect inflation can stress the tires and make the tires and rims more susceptible to damage, possibly leading to rim or tire failure and loss of vehicle control, resulting in serious personal injury or death.

IMPORTANT: The load and cold inflation pressure must not exceed the rim or wheel manufacturer's recommendations, even though the tire may be approved for a higher load inflation. Consult the rim or wheel manufacturer for the correct tire inflation pressure for the vehicle load.

NOTICE:
A weekly pressure loss of 4 psi (28 kPa) or more in a tire may indicate damage. The tire should be inspected and, if necessary, repaired or replaced by a qualified tire service facility.

4. Examine each rim and wheel component.
   4.a Remove all dirt and debris from the assembly. Rust streaks or metal build-up around stud holes, or out-of-round or worn stud holes, may be caused by loose wheel nuts.

WARNING:
Have any worn or damaged wheel components replaced by a qualified person using the wheel manufacturer's instructions and the wheel industry's standard safety precautions and equipment. Otherwise a vehicle or workshop accident could occur, possibly resulting in serious personal injury or death.

   4.b Inspect for broken, cracked, badly worn, bent, rusty, or sprung rings and rims.

NOTICE:
Use the recommended torque values and follow the proper tightening sequence. Insufficient wheel nut torque can cause wheel shimmy, resulting in wheel damage, stud breakage, and extreme tire tread wear. Excessive wheel nut torque can break studs, damage threads, and crack discs in the stud hole area.

   4.c Make sure all wheel nuts are tightened. If tightening is necessary, use the tightening pattern in Fig. 229,Tightening Pattern, 10-Hole Wheels to initially tighten the flange nuts to 50 to 100 lbf·ft (68 to 136 N·m). Then tighten the flange nuts to 450 to 500 lbf·ft (610 to 678 N·m).

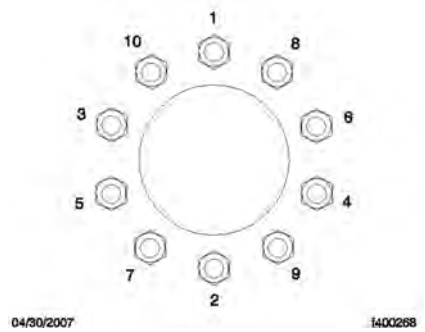


Fig 229, Tightening Pattern, 10-Hole Wheels

5. Inspect the outboard side of all wheel hubs and the hub oil seal area on the inboard side of each wheel for signs of oil leakage. If any oil is found on wheel and tire or brake components, remove the vehicle from service until the leak has been fixed.

   If needed, fill the hubs to the level indicated on the hub cap. See **Group 35** of the *Western Star Maintenance Manual* for recommended lubricants.

6. Check that mud flaps are undamaged and hang 10 inches (25.4 cm) or less from the ground.

24.02.04 Inspection of the Saddle Tank Areas

WARNING:
When draining the air reservoir, do not look into the air jets or direct them toward anyone. Dirt or sludge particles may be in the airstream and could cause injury.

NOTICE:
If the water drained from the air reservoirs is cloudy or oily, it may indicate a problem with the compressor. If oil is allowed to contaminate the air dryer, it will not remove the water from the air brake system, which could adversely affect braking.

1. Drain the brake system air reservoirs (reservoirs without automatic drain valves only).

WARNING:
Never operate the engine with the fuel tank shutoff valves partially closed. This could damage the fuel pump, causing sudden loss of engine power, possibly resulting in serious personal injury due to reduced vehicle control.

2. Ensure fuel tanks are secured to their mounting brackets and that the mounting brackets are secured to the frame.
3. Inspect visible frame rails for missing bolts, shiny areas, or rust streaks. Check all visible crossmembers for damage or signs of looseness.

4. Inspect visible components of the exhaust system to ensure connections are tight.

   Inspect upstream of the aftertreatment device (ATD) for cracking or signs of leaks, such as soot trails. Inspect downstream of the ATD for signs of exhaust leaks, such as blistering or warping of nearby components.

24.02.05 Inspection of the Engine Compartment

1. Check the ground underneath the engine for fuel, oil, or coolant leaks.
2. Inspect the air intake system for leaks or damage.

NOTICE:
Failure to maintain a sealed air intake system could allow the entry of dirt and contaminants into the engine. This could adversely affect engine performance and result in engine damage.

   2.a Push the reset button on the air intake restriction indicator located on the air cleaner, if equipped.

   2.b Check the engine air intake duct from the air cleaner to the engine intake. Make sure the duct components are secure and airtight.

3. Check the engine oil level.

NOTICE:
Operating the engine with the oil level below the minimum fill (or "add") mark or above the maximum fill (or "full") mark could result in engine damage.

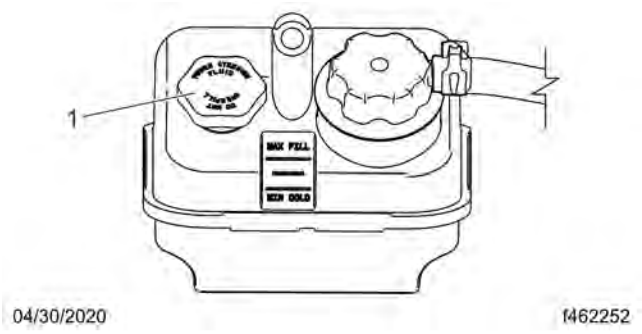
   3.a Check the oil level with the vehicle parked on a level surface. See the engine manufacturer's guidelines for engine shutdown time requirements prior to checking the oil level.

   IMPORTANT: Use only approved engine lube oil. For lists of engine oils approved for Detroit Diesel engines, refer to the Engine Operator Manual, accessible on Lubricants, Fuels & Coolants on the DTNA Portal. For third party engines, please refer to the engine manual.

   3.b If the oil level is at or below the minimum fill (or "add") mark on the dipstick, add enough oil to maintain the level between the minimum and maximum fill marks. See the engine operation manual for recommended lubricants.

4. Check the power steering reservoir fluid level.

   The power steering fluid level should be between the MIN COLD mark and the middle mark just above it. See Fig. 230,Power Steering Fluid Reservoir. If needed, fill the reservoir with automatic transmission fluid that meets Dexron III or TES-389 specifications.



NOTE: Typical reservoir shown; configurations may vary.

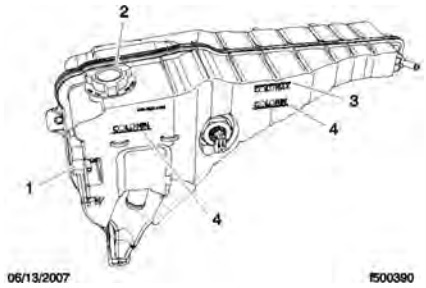
1. Filler Cap

Fig 230, Power Steering Fluid Reservoir

IMPORTANT: The surge tank must be cool to check the coolant level.

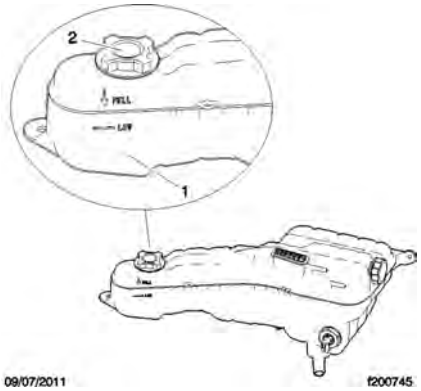
NOTICE:
Low coolant could result in engine overheating, which could cause engine damage.

5. Check the engine coolant level in the radiator surge tank. See Fig.231,Coolant Surge Tank (5700 models) or see fig. 232,Coolant Surge Tank (4700 models).



1. Pressure Relief Cap
2. Filler Cap
3. COLD MAX Fill Line
4. COLD MIN Fill Line
5. Coolant Level Sensor

Fig 231, Coolant Surge Tank (5700 models)



1. Filler Cap
2. Sight Glass
3. Low Coolant Sensor

Fig 232, Coolant Surge Tank (4700 models)

NOTICE:
Coolant must be filled to the COLD MAX line of the surge tank. Low coolant could result in engine overheating, which could cause engine damage.

5.a If the coolant is low, fill the surge tank to the MAX line with a 50/50 mixture of water and the type of antifreeze currently installed in your vehicle.

5.b If the surge tank was empty, start the engine after refilling and check the level again when the engine is at operating temperature.

6. Inspect visible engine wiring for damage or looseness. Check for loose wiring, chafed insulation, and damaged or loose hold-down clamps.
7. Inspect visible frame rails for missing bolts, shiny areas, or rust streaks.

24.02.06 Inspection of the Cab

1. Push the reset button on the dash-mounted air intake restriction indicator, if equipped.
2. With the ignition switch in the OFF position, check the air-pressure warning system.

   2.a If not previously drained, drain the air reservoirs using moderate brake applications until pressure in both reservoirs is less than 70 psi (483 kPa).

   2.b Turn the ignition to the ON position. The ICU will complete a full gauge sweep and bulb check, and the warning buzzer will sound. Ensure the BRAKE AIR lamp remains illuminated and the warning buzzer continues to sound after the gauge sweep is complete.
3. Check air governor cut-in and cut-out pressures.

   3.a Start the engine and ensure the BRAKE AIR lamp goes out and the buzzer silences when pressure reaches approximately 70 psi (483 kPa) in both air reservoirs.

   The air governor should cut out at approximately 120 psi (827 kPa). For vehicles with an optional dryer reservoir module (DRM), the cut-out pressure is approximately 130 psi (896 kPa).

   3.b With the engine idling, apply the brake pedal several times. The air governor should cut in when pressure in the primary air reservoir (top air gauge) reaches approximately 100 psi (689 kPa).

4. Check air pressure build-up time.
   - 4.a With the air system fully charged, make one full brake application and note the air pressure reading on the primary air gauge.
   - 4.b Further reduce air pressure using moderate brake applications, then run the engine at governed rpm.
   - 4.c Note the time that the pressure reaches the previously noted reading on the primary air gauge, then note the time that the air pressure reaches cut-out pressure.
   - 4.d If it takes longer than 30 seconds to reach cut-out pressure after the primary air gauge passes the previously noted pressure (noted after one full brake application), eliminate any leaks or replace the air compressor before operating the vehicle.
5. Check air leakage in the system.
   - 5.a With the parking brake applied, the transmission out of gear, and the air system fully charged, release the service brakes and shut down the engine.
   - 5.b Wait one minute and note the air pressure drop in psi (kPa) per minute from the primary air reservoir.

     If the pressure drop exceeds the limits shown in Table.28,Maximum Allowable Air Leakage, eliminate any leaks before operating the vehicle.
6. Check the air pressure reserve.

   With the engine still off, make one full brake application and observe the pressure drop on the primary air gauge. If pressure drops more than 25 psi (172 kPa), eliminate any leaks before operating the vehicle.

Table 28, Maximum Allowable Air Leakage

Maximum Allowable Air Leakage		
Description	**Pressure Drop: psi (kPa) Per Minute**	
	Released	Applied
Truck or Tractor Only	2 (14)	3 (21)
Truck or Tractor w/Single Trailer	3 (21)	4 (28)

Table 28, Maximum Allowable Air Leakage



WARNING:
When cleaning windshields and windows, always stand on the ground or on a secure ladder or platform. Use a long-handled window cleaner. Do not use the cab steps, tires, fenders, fuel tanks, engine, or under-hood components to access the windshield or windows. Doing so could cause a fall and result in an injury.

7. Inspect the mirrors, window glass, and windshield for cracks or other damage.
8. Ensure that the horn, windshield wipers, and windshield washers are operating properly. These devices must be in good working order for safe vehicle operation.
9. Ensure the heater and defroster are operating properly.
10. Check the operation of all interior lights.

10.a Turn on the headlights and leave them on. Ensure all equipped gauge bulbs illuminate in the dash message center.

10.b Ensure all equipped driver control switches illuminate.

10.c Ensure both turn signal indicator bulbs illuminate in the dash message center when the turn signal switch is activated.

11. Check the operation of all exterior lights. See Fig.233,Exterior Lights (5700 models) or see Fig. 234,Exterior Lights (4700 models).

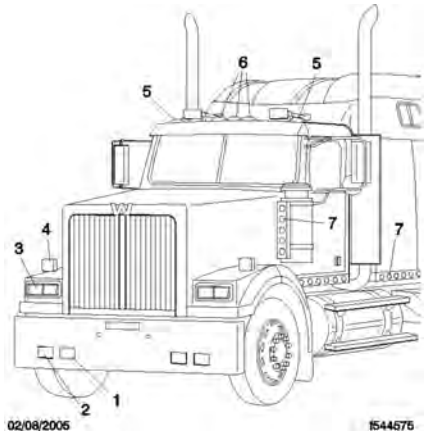
11.a Activate the high-beam headlights and hazard warning lights.

11.b Exit the cab and check that all exterior lights and reflectors are clean and intact.



1. Clearance Light
2. Identification Lights
3. Mirror Marker Light
4. Clearance Light
5. Side Marker Light
6. Front Turn Signal
7. Headlight, Low Beam
8. Combination Fog/Driving Light
9. Headlight, High Beam
10. LED Accent Light

Fig 233, Exterior Lights (5700 models)



1. Fog Light
2. Road Light
3. Headlights
4. Turn Signal/Side-Marker Lights
5. Clearance Light
6. Identification Lights
7. Clearance Light

Fig 234, Exterior Lights (4700 models)

11.c Check that the brake lights, taillights, headlights, turn signals, marker lights, identification lights, and clearance lights are working properly.

12. Inspect the seat belts and tether belts.

WARNING:

Inspect and maintain seat belts. When any part of a seat belt system needs replacement, the entire seat belt must be replaced, both retractor and buckle side. Any time a vehicle is involved in an accident, and the seat belt system was in use, the entire vehicle seat belt system must be replaced before operating the vehicle. Do not attempt to modify the seat belt system; doing so could change the effectiveness of the system. Failure to replace worn or damaged seat belts, or making any modifications to the system, may result in personal injury or death.

12.a Check the web for fraying, cuts, extreme dirt and dust, or for severe fading from exposure to sunlight, especially near the buckle latch plate and in the D-loop guide area.

12.b Check operation of the buckle, latch, Komfort Latch or Sliding Komfort Latch (if equipped), web retractor, and upper seat belt mount on the door pillar. Check all visible components for wear or damage.

12.c Check the seat belt and tether belt connection points and tighten any that are loose.

13. Check the fuel level in the fuel tank(s). To keep condensation to a minimum, fuel tanks should be filled at the end of each day.

14. Adjust the rearview and down view mirrors as necessary.

15. Test the service brakes.

15.a With the engine running and air system fully charged, set the parking brake.

15.b Put the vehicle in the lowest gear and gently attempt to move it forward. The vehicle should not move.

If the vehicle moves, the parking brakes are not operating correctly and must be repaired before the vehicle is operated.

16. Test the backup alarm.
    16.a Release the parking brake and put the transmission in reverse.
    16.b Move the vehicle slightly backward to ensure that the backup alarm is operating correctly.

24.03 Weekly Post-Trip Inspection and Maintenance

24.03.01 Inspection of the Engine Compartment

WARNING:
Washer fluids may be flammable and poisonous. Do not expose washer fluid to an open flame or any burning material, such as a cigarette. Always comply with the washer fluid manufacturer's recommended safety precautions.

1. Check the windshield washer reservoir fluid level. The reservoir is usually located near the left-hand hood support. See Fig.235,Windshield Washer Reservoir (Western Star 5700 shown).



1. Washer Fluid Filler Cap

Fig 235, Windshield Washer Reservoir (Western Star 5700 shown)

2. After resetting the air intake restriction indicator during the daily pretrip inspection, check the indicator again with the engine off.
    2.a For an indicator with graduations, check to see if air restriction exceeds 18 inH_2O.

    For a go/no-go indicator without graduations, check to see if the colored bar shows through the clear window.

Table 29, Air Intake Maximum Restriction Values

Air Intake Maximum Restriction Values (in H2O)	
Engine Make	**GHG14, GHG17, and GHG21 Engines**
Cummins	25
Detroit	18

Table 29, Air Intake Maximum Restriction Values

2.b If air restriction exceeds the maximum allowable value, operate the vehicle for one more day, making sure not to run the engine over rated rpm. Refer to the engine operation manual for more information on rated rpm for your engine.

2.c If air restriction exceeds the maximum value again, replace the air cleaner. For instructions, refer to **Group 09** of the *Western Star Workshop Manual* .

3. Inspect water evacuation components.

3.a Inspect the vacuator valve(s). Make sure the lips of each valve are undamaged and pliable, free of debris, and remain closed during inspection.

3.b Inspect the rain tray installed at the base of the windshield. Ensure that the seal on the forward edge of the rain tray is in good condition.

4. If the vehicle is equipped with an Allison automatic transmission, check the automatic transmission fluid level.

5. Check for water in the fuel/water separator, if equipped.

IMPORTANT: When draining fluid from a fuel/water separator, drain the fluid into an appropriate container and dispose of it properly. Many jurisdictions now issue fines for draining fuel/water separators onto the ground.

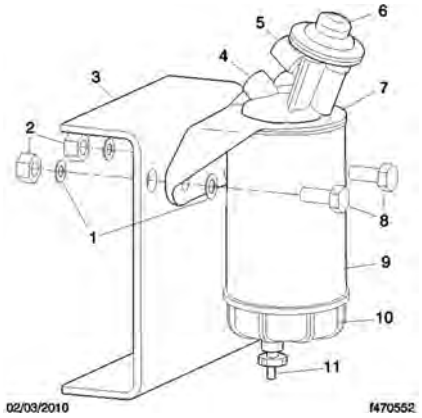
5.a Place a suitable container under the fuel/water separator.

NOTE: A hose may be used to direct water into the container. On older DAVCO models, the drain valve has a 1/2-inch (12.7-mm) pipe with threads. Use a hose with a 1/2-inch pipe thread to fit correctly and open the drain valve by turning it one-quarter revolution. On new DAVCO models, the drain valve has a 3/4-inch (19-mm) slip-on hose connection; pipe threads are no longer used. Open the drain valve by turning it one to one-and-a-half revolutions.

5.b If the engine is equipped with a built-in water separator, loosen the drain valve, and allow the water to run out. Close the drain valve, taking care not to overtighten it.

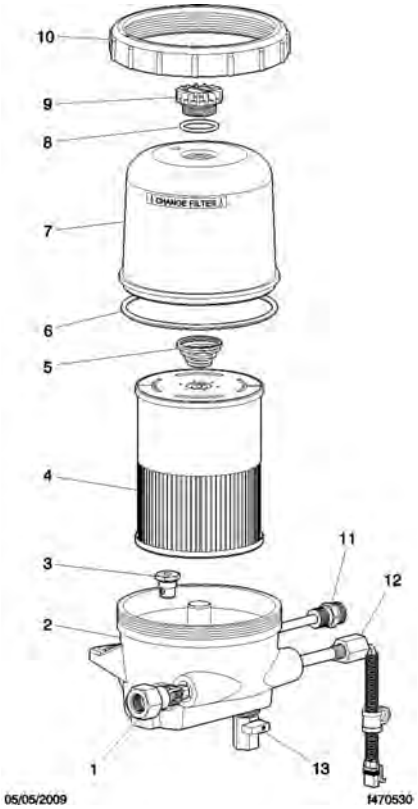
5.c *Alliance/Racor Models* : Turn the drain plug counterclockwise to open it. See Fig. 236,Alliance Fuel/Water Separator Assembly and Installation.

DAVCO Models : Remove the vent cap and open the drain. See Fig.237,DAVCO Fuel Pro 482 and see Fig. 238,DAVCO Fuel Pro 487.



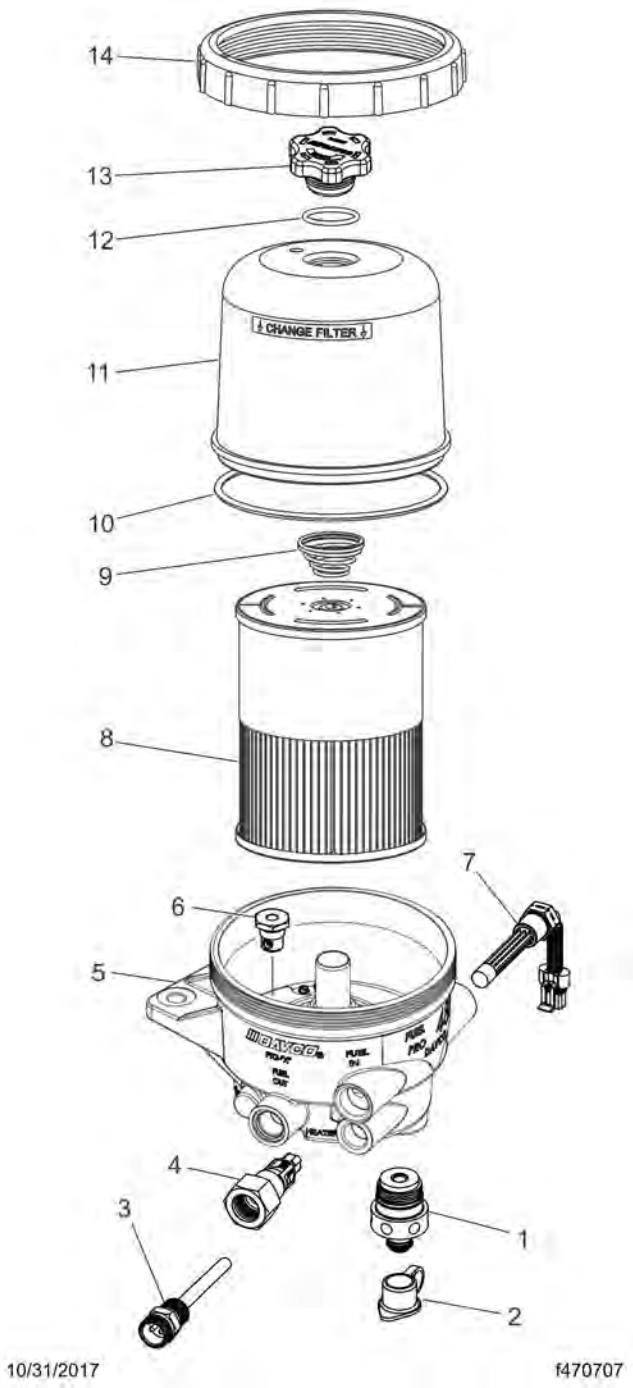
1. Washers (qty 2)
2. Nuts (qty 2)
3. Frame Rail
4. Fuel Outlet Port
5. Fuel Inlet Port
6. Priming Pump
7. Mounting Head
8. Mounting Bolts (qty 2)
9. Filter Element
10. Sight Bowl
11. Drain Plug

Fig 236, Alliance Fuel/Water Separator Assembly and Installation



1. Inlet Port/Check Valve
2. Lower Housing
3. Bypass Valve
4. Filter Element
5. Spring
6. Cover O-Ring
7. Clear Cover
8. Vent Cap O-Ring
9. Vent Cap
10. Collar
11. 120VAC Pre-Heater
12. 12VDC Pre-Heater
13. Drain Valve

Fig 237, DAVCO Fuel Pro 482



1. Drain Valve
2. Drain Valve Cap
3. 120VAC Pre-Heater
4. Inlet Port/Check Valve
5. Lower Housing
6. Bypass Valve
7. 12VDC Pre-Heater
8. Filter Element
9. Spring
10. Cover O-Ring
11. Clear Cover
12. Vent Cap O-Ring
13. Vent Cap
14. Collar

Fig 238, DAVCO Fuel Pro 487

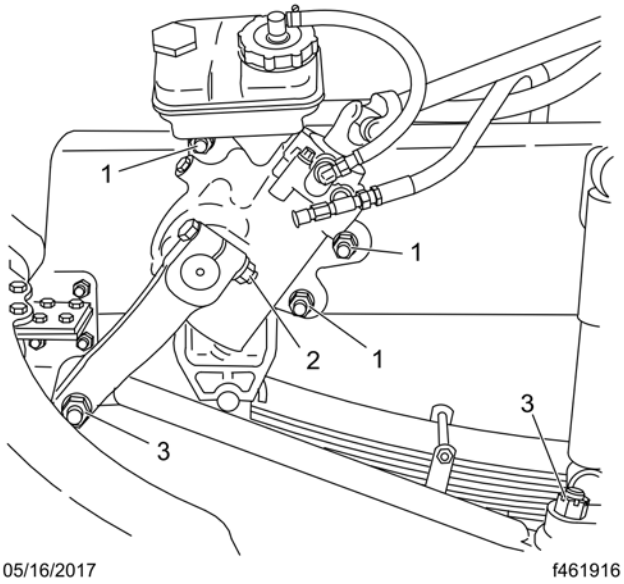
5.d Stop draining fluid when fuel begins to drain out.

Alliance/Racor Models : turn the drain plug clockwise to close it.

DAVCO Models : close the drain valve. Install and hand-tighten the vent cap.

6. Inspect the steering components.

6.a Inspect tie rods, steering arms, and the drag link for signs of looseness (i.e., shiny spots or rust tracks). See Fig.239,Integral Steering Gear Fasteners.



1. Steering Gear Mounting Bolt
2. Pitman Arm Pinch Bolt Nut
3. Drag Link Nut

Fig 239, Integral Steering Gear Fasteners

6.b Check the steering gear mounting bolts and pitman arm pinch bolt and nut for signs of looseness.

6.c Check the drag link nuts for missing cotter pins.

6.d Inspect the steering intermediate shaft and end yokes for excessive looseness or other damage.

NOTICE:
Do not drive with a drive belt that is visibly worn or damaged. If it fails, the lack of coolant flow could rapidly cause damage to engine components.

7. Inspect the serpentine drive belts for signs of glazing, frayed edges, breaks, cracks, or oil contamination.

24.04 Monthly Post-Trip Inspection and Maintenance

24.04.01 Inspection of the Brake Component

Walk around the vehicle and visually the brake system components for visible damage.

1. Inspect all visible brake system components for missing fasteners or signs of looseness, such as rust tracks.

NOTICE:
If the external breather tube or breather cap is missing or incorrectly installed, road dirt and debris can adversely affect the operation of the brake chamber. Once inside of the chamber, dirt and debris can cause the internal parts of the chamber to deteriorate faster.

2. Inspect the exterior surfaces of brake chambers for damage. Make sure that breather holes are open and free of debris.

   NOTE: Do not route air brake lines on top of anything likely to be stepped on.

3. Inspect air brake lines for dents, swelling, kinks, twisting, abrasion, and damage, especially near moving parts.
4. Inspect flex air lines for deterioration or signs of abrasion.
5. Inspect for cracked, worn, or oil-contaminated brake linings and brake drums (or rotors).
6. Check the thickness of the brake linings. Replace brake linings on all brake assemblies on the axle if any brake linings are worn to less than approximately 1/4 inch (6.4 mm) at the thinnest point.

24.04.02 Inspection of the Saddle Tank Areas

WARNING:
When draining the air reservoir, do not look into the air jets or direct them toward anyone. Dirt or sludge particles may be in the airstream and could cause injury.

NOTICE:
If the water drained from the air reservoirs is cloudy or oily, it may indicate a problem with the compressor. If oil is allowed to contaminate the air dryer, it will not remove the water from the air brake system, which could adversely affect braking.

1. Drain the brake system air reservoirs (reservoirs with automatic drain valves only).

NOTE: Battery locations vary between vehicles.

2. Inspect the batteries.



WARNING:
Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. To prevent possible personal injury, always wash your hands after handling battery parts and related accessories.

2.a Remove the battery box cover and inspect all visible battery cables for loose wiring or damage.

2.b Check that the battery hold-down is secure.

IMPORTANT: Aerodynamic components decrease drag force as a vehicle moves, thereby improving fuel efficiency. If replacement of an aerodynamic component is necessary, replacement components must meet or exceed the drag reduction performance of the originally installed component in order to maintain compliance with greenhouse gas and fuel efficiency regulations.

3. Inspect the following aerodynamic components, if equipped, for structural damage, cracks, or wear.
   - Chassis fairings
   - Roof fairing/deflector
   - Side skirts
   - Cab extenders
   - Battery access cover

24.04.03 Inspection and Adjustments of the Engine Compartment

IMPORTANT: If replacement of the hood or bumper is necessary, the replacement component must meet or exceed the drag reduction performance of the originally installed item in order to maintain compliance with greenhouse gas and fuel efficiency regulations.

1. Inspect the bumper and hood for structural damage, cracks, or wear.
2. Check the hydraulic clutch reservoir, if equipped. If necessary, add DOT 4 brake fluid.
3. Inspect the radiator and heater hoses, including the clamps and support brackets.

3.a Inspect the radiator and charge air cooler for damage and accumulated debris. Straighten bent or damaged fins to permit airflow across all areas of the cores.

NOTE: When traveling through areas of high insect concentration, it may be necessary to clean the exterior of the radiator or the charge air cooler core as often as every 200 miles (320 km).

3.b Make sure the radiator inlet and outlet hoses are pliable and are not cracking or ballooning.

3.c Make sure the heater hoses are pliable and are not cracking or ballooning.

3.d Tighten hose clamps as necessary.

IMPORTANT: Do not overtighten hose clamps, as hose life can be adversely affected.

3.e Ensure hose support brackets are securely fastened. Make sure hoses are not located near sources of wear, abrasion, or high heat.

IMPORTANT: When replacing hoses, install service-type knitted or braided yarn-reinforced neoprene hose. Extended-service-life silicone hoses may also be used. See the Alliance Parts Catalog atwww.alliancebrandparts.comor contact your Freightliner Dealer.

4. Check the steering wheel for excessive play.
   4.a Start the engine. With the front tires straight ahead, turn the steering wheel until motion is observed at the front wheels.
   4.b Align a reference mark on the steering wheel to a rule, then slowly turn the steering wheel in the opposite direction until motion is again detected at the wheels.
   4.c Measure the lash (free play) at the rim of the steering wheel. Excessive lash exists if steering wheel movement exceeds 2-1/2 inches (64 mm) with a 20-inch (508-mm) steering wheel, or 2-1/4 inches (57 mm) with an 18-inch (450-mm) steering wheel.
   4.d If there is excessive lash, check the steering system for wear or incorrect adjustment before operating the vehicle.

25.01 Hazard Warning Lights 296
25.02 Fire Extinguisher 296
25.03 Fire in the Cab 296
25.04 Emergency Kit 296
25.05 Replacement of the Emergency Filter, DAVCO 297
25.06 Emergency Starting With Jumper Cables 299
25.07 Raising and Lowering a Vehicle 302
25.07.01 Raising a Vehicle with Air Suspension 302
25.07.02 Lowering a Vehicle with Air Suspension 303
25.07.03 Raising a Vehicle without Air Suspension 303
25.07.04 Lowering a Vehicle without Air Suspension 304
25.08 Front Towing Hookup With Removable Tow Hooks 304
25.08.01 General Information 304
25.08.02 Use of Tow Hooks 305

25. In An Emergency

25.01 Hazard Warning Lights

The hazard warning light switch (see Fig.240,Hazard Warning Light Switch) is located on the right-hand dash panel. To operate the hazard lights, press the upper half of the switch. To cancel the hazard warning lights, press the lower half of the switch.

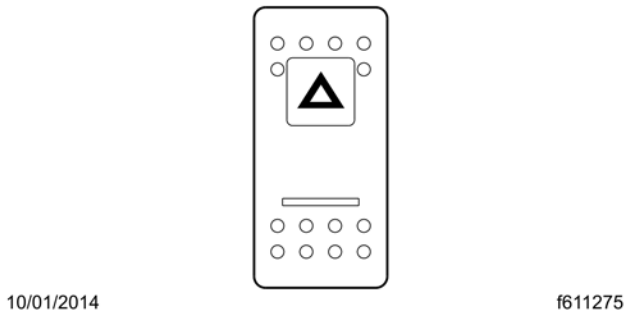


Fig 240, Hazard Warning Light Switch

25.02 Fire Extinguisher

An optional factory-installed fire extinguisher may be located in the cab by the driver's door, between the seats, or in the sleeper baggage compartment, if equipped.

25.03 Fire in the Cab

The incidence of fire in heavy and medium-duty trucks is rare, according to data from the National Highway Traffic Safety Administration. Federal Motor Vehicle Safety Standard #302 limits the flammability of specified materials used inside the cab but, despite this, most materials can burn.

WARNING:

Do not allow flames, sparks, or any other heat sources (such as cigarettes or light bulbs) to contact materials in the cab. Any materials in the cab in contact with such heat sources could cause serious personal injury as well as damage to the vehicle.

In Case of a Cab Fire

As quickly as possible, bring the vehicle to a safe stop, apply the parking brake, turn off the ignition, and get out of the vehicle.

25.04 Emergency Kit

An optional emergency reflector kit containing three triangular reflectors may be supplied in the cab.

WARNING:
Use extreme care when placing flares in emergency situations that involve exposure to flammable substances such as fuel. An explosion or fire could occur causing serious personal injury.

If there is an emergency while driving, cautiously pull off the road. Turn on the hazard warning lights. Place the reflectors and flares along the side of the road to alert other drivers that an emergency situation exists.

25.05 Replacement of the Emergency Filter, DAVCO

If the filter cover on the DAVCO fuel/water separator is broken, it will not be possible to operate the vehicle. A standard spin-on filter will correct this problem.

Refer to the DAVCO web site for additional information,www.davcotec.com.

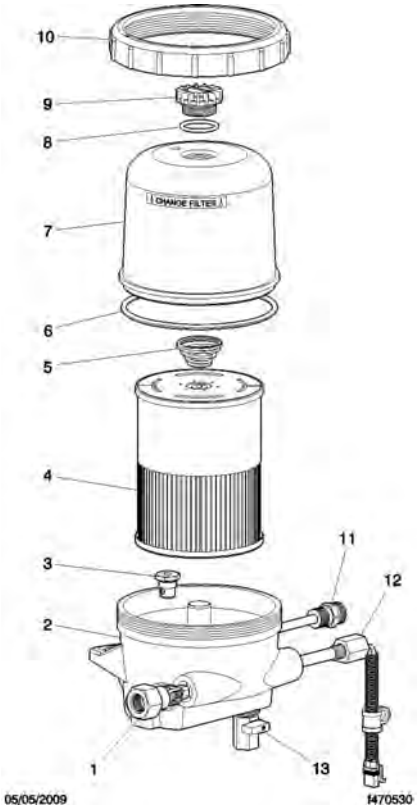
WARNING:
Fluid circulated through the fuel/water separator to heat the fuel may be diesel fuel returned from the engine, or engine coolant. Drain the fuel/water separator only when the engine and fluids have cooled. Draining it when the engine is hot could cause severe personal injury due to scalding.

If returning fuel is released into the atmosphere, its vapors can ignite in the presence of any ignition source. Do not expose the fuel to, or work with the fuel system near, open flame or intense heat. To do so could cause fire, possibly resulting in serious personal injury or property damage.

1. Shut down the engine, apply the parking brake, and chock the tires.
2. Put a clean receptacle under the fuel/water separator and attach a piece of hose to the drain valve, to direct fuel into the receptacle.

   NOTE: The drain valve on the Fuel Pro 382 has a 1/2-inch (12.7-mm) opening; use a hose with a 1/2-inch pipe thread to fit correctly. Open the drain valve by turning it one-quarter revolution.

3. Remove the vent cap (see Fig.241,DAVCO Fuel Pro 482, Item 4) and open the drain valve (see Fig. 241,DAVCO Fuel Pro 482, Item 1) to drain the fuel to just below the collar level, then close the drain valve.



1. Inlet Port/Check Valve
2. Lower Housing
3. Bypass Valve
4. Filter Element
5. Spring
6. Cover O-Ring
7. Clear Cover
8. Vent Cap O-Ring
9. Vent Cap
10. Collar
11. 120VAC Pre-Heater
12. 12VDC Pre-Heater
13. Drain Valve

Fig 241, DAVCO Fuel Pro 482

4. Using a DAVCO collar wrench (see Fig.242,DAVCO Collar Wrench), remove the clear cover and collar.

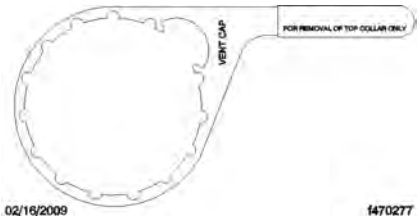


Fig 242, DAVCO Collar Wrench

NOTE: Broken vent cap and collar warranty claims will not be accepted if any tool other than a DAVCO collar wrench, p/n 380134 or 382002, is used for removal. During installation, the vent cap is to be **hand-tightened only** , not tightened with a wrench.

5. Remove the filter and dispose of it in an environmentally acceptable manner.
6. Clean all threads and sealing surfaces very thoroughly. Even a small amount of dirt will prevent the fuel/water separator from sealing, and an air leak will result.
7. Ensure that the drain valve is closed.
8. Remove the filter grommet from the filter stud, if equipped.
9. Fill the housing to the top of the filter element with clean diesel fuel.
10. Install a standard fuel filter element on the filter stud. If a standard filter element is not available, install a spin-on fuel filter element (part number FF105 or equivalent).
11. Install the cover O-ring, clear cover, and the collar. Simultaneously apply downward pressure to the top of the clear cover until it is seated on the body of the lower housing and hand tighten the collar until it no longer spins freely. Using the collar wrench, tighten the cover 18 lbf·ft (24 N·m). This is equivalent to rotating the collar clockwise two or three additional ribs, depending on the specific filter model.
12. Install and hand-tighten the vent cap O-ring and vent cap.
13. Start the engine. When the lubricating oil reaches its normal operating pressure, increase engine speed to high idle for one to two minutes to purge air from the system.

25.06 Emergency Starting With Jumper Cables

When using jumper cables, follow the instructions below.



WARNING:

Batteries release explosive gas. Do not smoke when working around batteries. Put out all flames and remove all sources of sparks or intense heat in the vicinity of the battery. Do not allow the vehicles to touch each other. Do not lean over the batteries when making connections, and keep all other persons away from the batteries. Failure to follow these precautions could lead to severe personal injury as a result of an explosion or acid burns.



NOTICE:

Make sure both electrical systems are the same voltage. Electronic devices on both vehicles can be damaged when connected to a vehicle with a different operating voltage.

1. Apply the parking brakes and turn off all lights and other electrical devices. Ensure that the vehicles are not touching and both ignition switches are turned to the OFF position.

   IMPORTANT: Do not attempt to jump start a damaged battery.

2. Remove the battery box cover.

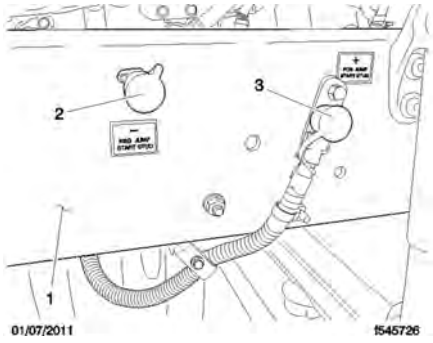
IMPORTANT: On vehicles equipped with optional jump start posts, connect to these posts instead of the battery terminals. Jump start posts may be installed in various locations on the vehicle. See Fig.243,, page 300.

NOTICE:

Always connect the batteries and jumper cables correctly (positive-to-positive and negative-to-negative). Connecting a charging device backwards (positive-to-negative) can severely damage the vehicle electrical content and cause non-warrantable failures.

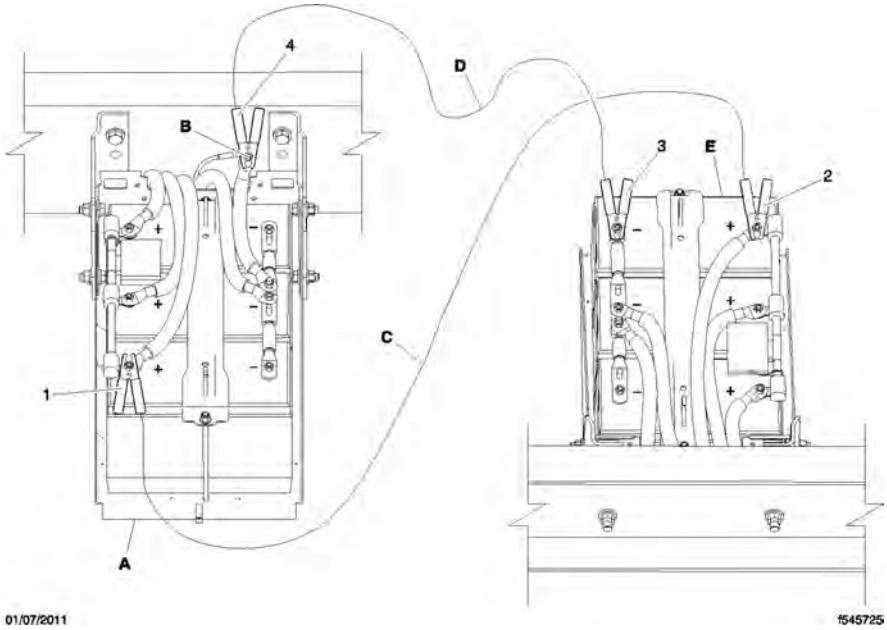
NOTE: The batteries on a Western Star vehicle may be located in a variety of locations, including under the passenger seat, under the cab, behind the cab, or under the sleeper bunk, if equipped. Some vehicles may have two batteries in the step compartments on both sides of the vehicle.

3. Connect the positive (+) jumper cable to the positive terminal or jump start post on the discharged battery. See Fig. 244, **Jumper Connections**.



1. Frame Rail
2. Negative Jump Start Post
3. Positive Jump Start Post

Fig 243, Possible Jump Start Post Location (passenger-side engine compartment)



Disconnect jumper cables in the REVERSE order that they were connected.

A. Discharged Battery
B. Negative Ground Stud
C. Positive Jumper Cable
D. Negative Jumper Cable

1. 1st Connection
2. 2nd Connection
3. 3rd Connection
4. 4th Connection

Fig 244, Jumper Connections

Disconnect jumper cables in the REVERSE order that they were connected.

4. Connect the other end of the positive jumper cable to the positive terminal or jump start post on the booster battery providing the charge.

WARNING:

Do the next step exactly as instructed and do not allow the clamps of one cable to touch the clamps of the other cable. Otherwise, a spark could occur near a battery, possibly resulting in severe personal injury from explosion or acid burns.

5. Connect the negative (-) jumper cable to the negative terminal or jump start post on the booster battery.
6. Connect the other end of the negative jumper cable to the negative ground stud on the vehicle requiring the jump start.
7. Start the engine of the vehicle providing the jump start and let the engine run a few minutes to charge the batteries of the other vehicle.
8. Attempt to start the engine of the vehicle receiving the jump. Do not operate the starter longer than 30 seconds, and wait at least two minutes between starting attempts to allow the starter to cool.
9. When the engine starts, let it idle a few minutes.



WARNING:

Do the next step exactly as instructed and do not allow the clamps of one cable to touch the clamps of the other cable. Otherwise, a spark could occur near a battery, possibly resulting in severe personal injury from explosion or acid burns.

10. Disconnect the negative jumper cable from the negative cable stud on the jump started vehicle.
11. Disconnect the negative jumper cable from the booster battery.
12. Disconnect the positive cable from the booster battery.
13. Disconnect the other end of the positive jumper cable from the jump started vehicle.
14. Install the battery box cover; be sure it is positioned properly before fastening the latch.

25.07 Raising and Lowering a Vehicle

25.07.01 Raising a Vehicle with Air Suspension

1. Park the vehicle on a level surface, set the parking brakes, and shut down the engine. Chock the tires.



WARNING:

Remove the air from the suspension. Failure to remove the air from the suspension may cause the vehicle to move or shift on the jack stands as air pressure drains from the system; this could cause the vehicle to fall, resulting in damage to the vehicle, serious injury, or death.

2. Exhaust all air from the air suspension.



WARNING:

Do not use bottle jacks to raise the vehicle. Always use floor jacks. Bottle jacks can slip, allowing the vehicle to fall, which could result in damage to the vehicle, serious injury, or death.

IMPORTANT: Only lift unloaded vehicles and vehicles disconnected from trailers. Unload vehicles with bodies (drilling rigs, mixers) as much as possible.

3. Place a floor jack under the axle housing, the clamp group, or the frame rail.

NOTICE:
Do not place jack stands under any of the suspension components; doing so could cause suspension component damage. Jack stands can be placed at any point below the axle, including the differential area.

4. Raise the vehicle. Add additional jack stands, as needed, under the axles to support the vehicle.

25.07.02 Lowering a Vehicle with Air Suspension

WARNING:
Do not use bottle jacks to raise the vehicle. Always use floor jacks. Bottle jacks can slip, allowing the vehicle to fall, which could result in damage to the vehicle, serious injury, or death.

NOTICE:
Do not place jack stands under any of the suspension components; doing so could cause suspension component damage. Jack stands can be placed at any point below the axle, including the differential area.

1. Using the floor jack, raise the vehicle to remove any jack stands used to support the vehicle.
2. Slowly lower the vehicle to the ground.
3. Inflate the air suspension, and check for proper operation. See General Information, Front Suspension in the 4700 / 5700 / 4900 / 6900 Workshop Manual for instructions.

25.07.03 Raising a Vehicle without Air Suspension

1. Park the vehicle on a level surface, set the parking brakes, and shut down the engine. Chock the tires.

WARNING:
Do not use bottle jacks to raise the vehicle. Always use floor jacks. Bottle jacks can slip, allowing the vehicle to fall, which could result in damage to the vehicle, serious injury, or death.

IMPORTANT: Only lift unloaded vehicles and vehicles disconnected from trailers. Unload vehicles with bodies (drilling rigs, mixers) as much as possible.

2. Place a floor jack under the axle housing, the clamp group, or the frame rail.



NOTICE:

Do not place jack stands under any of the suspension components; doing so could cause suspension component damage. Jack stands can be placed at any point below the axle, including the differential area.

3. Raise the vehicle. Add additional jack stands, as needed, to support the vehicle.

25.07.04 Lowering a Vehicle without Air Suspension



WARNING:

Do not use bottle jacks to raise the vehicle. Always use floor jacks. Bottle jacks can slip, allowing the vehicle to fall, which could result in damage to the vehicle, serious injury, or death.



NOTICE:

Do not place jack stands under any of the suspension components; doing so could cause suspension component damage. Jack stands can be placed at any point below the axle, including the differential area.

1. Using the floor jack, raise the vehicle to remove any jack stands used to support the vehicle.
2. Slowly lower the vehicle to the ground.

25.08 Front Towing Hookup With Removable Tow Hooks

25.08.01 General Information



NOTICE:

Towing the truck from the front and removing all of the drivelines is the approved method for towing DTNA products. Towing any other way is not preferred.



DANGER:

When working on the vehicle, shut down the engine, set the parking brake, and chock the tires. Before working under the vehicle, always place jack stands under the frame rails to ensure the vehicle can not drop. Failure to follow these steps could result in serious personal injury or death.

WARNING:

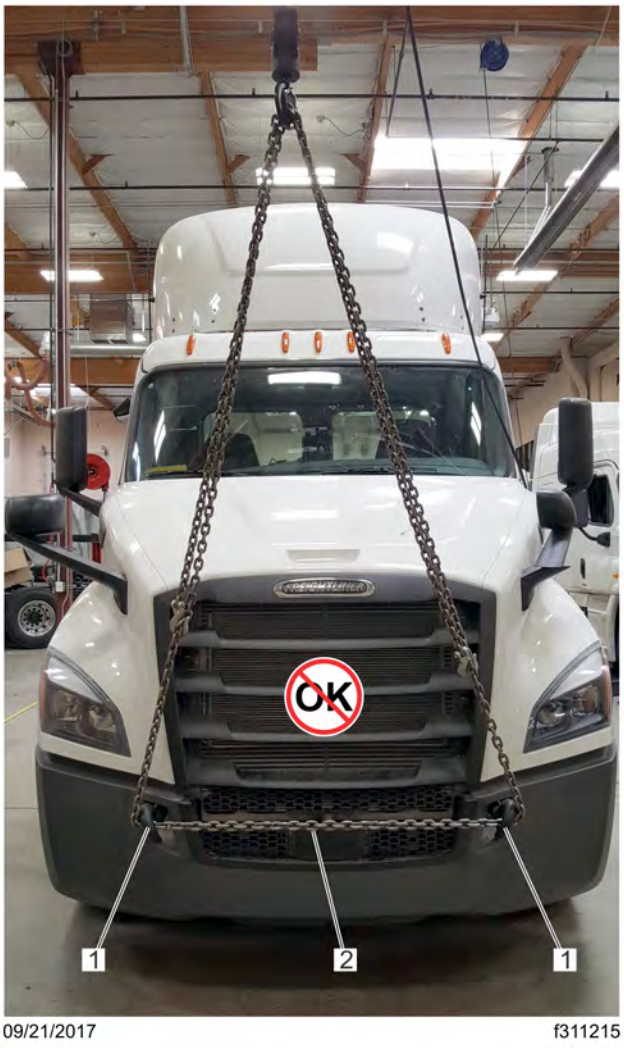
Do not tow an unbraked vehicle if the combined weight of both vehicles is more than the sum of the gross axle weight ratings (GAWR) of the towing vehicle. Otherwise brake capacity will be inadequate, which could result in personal injury or death.

25.08.02 Use of Tow Hooks

Tow hooks are not designed for on-road towing of the vehicle, but to recover and move the vehicle to a position where it can be hooked up properly for front towing.

NOTICE:

When using tow hooks to move the vehicle, do not pass a sling (for example, a rope or chain) from one hook to another. Known as reeving, this practice is ***not*** permissible in most industrial applications of towing and hoisting. Reeving can overload the hooks and result in damage to the vehicle. See Fig.245,, page 306.



IMPORTANT: Do not reeve when towing.

1. Tow Hook
2. Chain

Fig 245, Reeving

1. Disconnect the battery ground cables.

NOTICE:
Failure to protect the frame rails from the chains could cause damage, leading to eventual frame failure.

2. On dual drive axles, if the vehicle is to be lifted and towed, chain the forward rear-axle assembly to the vehicle frame. Use protection to keep the chains from damaging the frame.
3. Open the hood. Remove the tow hooks, located behind the driver's-side bumper. See Fig.246,Tow Hooks. Close and latch the hood.

NOTICE:
New or ungreased tow hooks may be hard to install. Tow hooks that are not properly installed may be damaged or break.

4. Install the tow hooks onto the tow hook receivers through the tow hook holes in the bumper, rotating the hooks so the hook opening faces down. See Fig.247,Tow Hooks Installed, Facing Down. Pull the tow hooks to ensure they are securely engaged in the tow hook receivers.



Fig 246, Tow Hooks

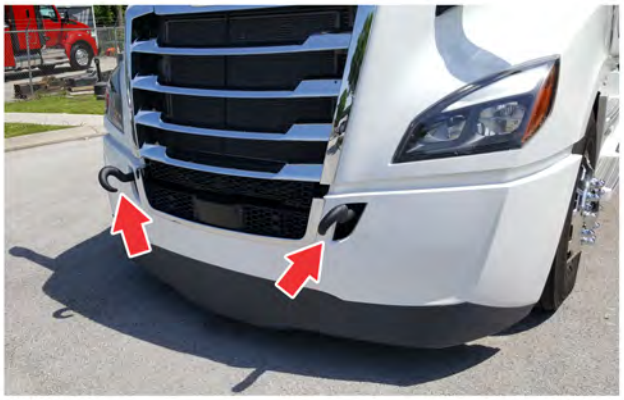


Fig 247, Tow Hooks Installed, Facing Down

5. Lower the stinger assembly so that it is level and approximately 1 inch (0.3 cm) off the ground. Back the tow truck so that the crossbar with lift adaptors is within 6 inches (15 cm) of the Aero bumper. See Fig. 248,Positioning the Stinger Assembly.



Fig 248, Positioning the Stinger Assembly

NOTICE:

When using tow hooks to move the vehicle, do not pass a sling (for example, a rope or chain) from one hook to another. Known as reeving, this practice is ***not*** **permissible in most industrial applications of towing and hoisting. Reeving can overload the hooks and result in damage to the vehicle.**

6. Pull the tow cables out of the tow truck and connect the tow cable lifting hooks onto the tow hooks, then extend the recovery boom within 4 to 6 inches (10 to 15 cm) of being vertical of the tow hooks. See Fig. 249,Tow Cables Connected to the Tow Hooks.
7. Lift the front of the truck until there is enough clearance for the stinger and crossbar to pass under the bumper. See Fig.250,Moving the Stinger and Crossbar Under the Bumper.

   If enough clearance cannot be gained with a single lift, jack stands or other means capable of supporting the weight on the front axle must be used while the cables are shortened to allow a second lift.



Fig 249, Tow Cables Connected to the Tow Hooks



Fig 250, Moving the Stinger and Crossbar Under the Bumper

WARNING:
Failure to chock the tires or connect the tow truck's air brake system before releasing the spring parking brakes could allow the disabled vehicle to suddenly roll. This could cause property damage or personal injury.

8. Chock the rear tires.

NOTICE:
Reference the applicable axle manufacturer's information to avoid damaging the axle when towing the truck.

9. Use mid-rise or high-rise forks, or lift adaptors (part number 0200020) on the crossbar to provide clearance for the aerodynamic bumper. See Fig.251,Lift Adaptors Installed on the Crossbar and Fig. 252,Backing the Tow Truck with Lift Adaptors on the Crossbar.



Fig 251, Lift Adaptors Installed on the Crossbar



Fig 252, Backing the Tow Truck with Lift Adaptors on the Crossbar

10. Extend the stinger and place the lift adaptors under the axle. Make certain the lift adaptors are under the front suspension springs between the U-bolts. See Fig.253,Positioning the Stinger with Lift Adaptors Under the Axle and Fig. 254,Stinger with Lift Adaptors Under the Axle (tow truck shown).

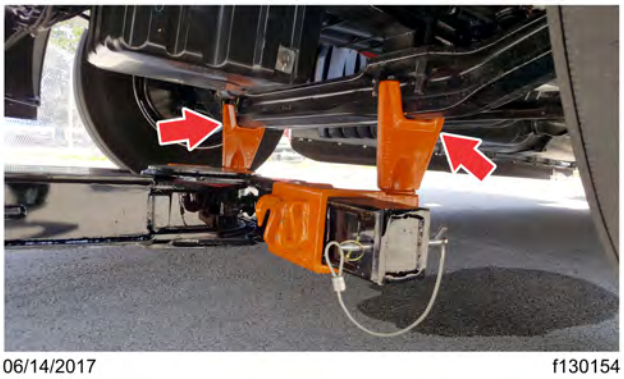


Fig 253, Positioning the Stinger with Lift Adaptors Under the Axle



Fig 254, Stinger with Lift Adaptors Under the Axle (tow truck shown)

11. Secure the axle to the crossbar with a chain or ratchet strap.

NOTICE:
Failure to remove the driveline(s) or the drive axle shafts when towing the vehicle with the rear wheels on the ground could result in damage to the transmission and other parts.

12. Use a paint pen to mark the drivelines in as built condition, and then remove the driveline, the interaxle driveline (if equipped), for each axle that may touch the ground during the towing process. Store the drivelines and U-joints in a secure location so they will not come off during transport.
13. Remove the tow cables from the tow hooks and retract the recovery boom. See Fig. 255,Retracting the Recovery Boom.



Fig 255, Retracting the Recovery Boom

14. Remove the tow hooks from the bumper.

IMPORTANT: On trucks equipped with a front air suspension, either air pressure must be supplied to the secondary air system or the front suspension must be blocked to operating height with wooden spacers and the axle chained to the frame to prevent damage to the truck.

15. Connect the air and electrical supply lines from the tow truck to the truck being towed.
16. Connect the clearance lights, taillights, and signal lights. Connect any special towing lights required by local regulations.
17. Release the park brake and remove the chocks from the rear tires.
18. Use the stinger to pull the truck close to the back of the tow truck for final towing position. See Fig. 256,Final Towing Position.



Fig 256, Final Towing Position

19. Connect the safety chains. See Fig.257,Safety Chains Connected on the Towed Vehicle.



Fig 257, Safety Chains Connected on the Towed Vehicle

26.01 Terms of Use....314
26.01.01 General Information....314
26.01.02 Telematics Information We Collect and Why We Collect It....314
26.01.03 What We Do with Telematics Information and Who We Share It With....314
26.01.04 Collection Method....315
26.01.05 Safeguards....315
26.01.06 Your Consent....315
26.01.07 Your Rights....315
26.01.08 Privacy Statement Changes....315

26. Telematics Data

26.01 Terms of Use

26.01.01 General Information

Your vehicle ("Vehicle") may be equipped with one or more devices that gather information described below regarding the Vehicle and the environment in which it may be operating ("Telematics Information"). The devices may periodically send Telematics Information to Daimler Truck North America LLC ("DTNA"). Additionally, DTNA and its dealers may manually retrieve Telematics Information from the devices for the purposes described below.

26.01.02 Telematics Information We Collect and Why We Collect It

The Telematics Information we collect may include, but is not limited to, information regarding the performance, operation, location, speed, trips, travel history, stop and idle times, fuel consumption, fault codes and diagnostic information, steering and braking performance, air bag deployment and seatbelt use, decelerations, and other information relating to the performance, operation, health and safety of your Vehicle. DTNA gathers this information in order to improve the performance, operation, health and safety of your Vehicle and other DTNA vehicles and products, in the following ways, among others:

- **To enable your subscription services.** DTNA and other third party service providers have developed a variety of applications and services that are now available to you to optimize the performance, use, reliability and safe operation of your Vehicle. These services are enabled by the Telematics Information we receive from your Vehicle and will likely be made more effective in the future by the use of that Telematics Information and similar information we receive from other DTNA vehicles.
- **To make your Vehicle safer and to improve its performance.** Depending on the type of device installed on your Vehicle, DTNA may periodically update your Vehicle's on-board software to improve the performance and safe use of the Vehicle. We may need to obtain certain Telematics Information to ensure the effectiveness of these updates.
- **To monitor and manage the health and efficiency of your Vehicle.** Telematics Information from your Vehicle may be used by DTNA and its affiliates, dealers and service providers to diagnose and resolve problems with your Vehicle more effectively and to help you maintain it.
- **To improve your customer service experience.** Telematics Information may be used by DTNA and its affiliates, dealers and service providers to provide you a more efficient and effective customer service experience in conjunction with Vehicle service, maintenance, field service campaigns and recalls.
- **For product development and product improvement.** Telematics Information may be analyzed and used to identify and resolve performance and safety issues and to develop improvements to our products that will benefit you and our future customers.
- **To develop more meaningful product marketing.** Telematics Information may be used to provide more customized and meaningful information to our customers regarding products and services that best satisfy their operational requirements and improve the performance of their businesses.
- **To help match our customers with the right products.** Telematics Information may be used to develop future products and services that best satisfy the operational requirements of our customers.

26.01.03 What We Do with Telematics Information and Who We Share It With

DTNA may use Telematics Information for any purpose allowed by law, including but not limited to using the information for any of the purposes described in this chapter. DTNA may share Telematics Information with its service providers, affiliates, subsidiaries, dealers and distributors, but only for lawful business purposes. This may include third parties who process information on behalf of DTNA, third parties who you authorize directly to receive information from us, and law enforcement agencies pursuant to applicable law.

DTNA may also combine Telematics Information it obtains from your Vehicle with data from others, anonymize and de-identify that aggregated data ("Aggregated Data"), and use and disclose that Aggregated Data and derivatives of it indefinitely and for any purpose whatsoever, including sharing it with third parties for any purpose without restriction. You will not have any rights in any Aggregated Data or any derivatives or proceeds of it. DTNA will be the exclusive owner of all rights, title and interests in and to all Aggregated Data. DTNA shall not have any obligation to provide any Aggregated Data to you or to compensate you for any use or disclosure of any Aggregated Data.

26.01.04 Collection Method

The Telematics Information may be transmitted automatically or manually from the devices on your Vehicle to DTNA or Detroit Diesel Corporation (DDC) through diagnostic tools, including but not limited to DDC DiagnosticLink.

26.01.05 Safeguards

DTNA will use reasonable data security systems and procedures in an effort to protect Telematics Information from unauthorized use, access, disclosure, distribution, loss or alteration. We do this through physical, electronic and procedural safeguards that are designed to protect the confidentiality, integrity and availability of Telematics Information. However, no security system is perfect. DTNA cannot guarantee that Telematics Information will not be hacked, deleted, intercepted or altered. DTNA will also require other parties to whom Telematics Information is disclosed to take reasonable steps to protect the Telematics Information from unauthorized use, access, disclosure, distribution, loss or alteration.

26.01.06 Your Consent

By continuing to provide to us, or allowing us to receive or retrieve, Telematics Information through the devices on your Vehicle, you consent to its collection and use as described in this chapter. Although some information may be transferred to and processed in countries without laws providing the same level of data protection as your country, our use and disclosure of your information is subject to these terms of use regardless of where your information is transferred. **If you have subscribed to a subscription service such as Virtual Technician or Detroit Analytics, the Telematics Terms and Conditions for that service will apply to DTNA's collection, storage, use and sharing of the data covered by those Terms and Conditions.**

26.01.07 Your Rights

You may ask DTNA to discontinue receiving and retrieving Telematics Information from the devices on your Vehicle. If you do so, you will be unable to receive telematics subscription services relating to your Vehicle and unable to remotely receive important Vehicle software updates, among other things. If you are interested in that option, please contact DTNA at: **DetroitConnect@Daimler.com** .

26.01.08 Privacy Statement Changes

DTNA reserves the right to amend these terms of use from time to time. Changes will be reflected in the online version of this document found at:https://dtnacontent-dtna.prd.freightliner.com/content/public/dtna-servicelit/TechLit-Homepage.html?make=freightliner. **By continuing to provide to us, or allowing us to receive or retrieve, Telematics Information through the devices on your Vehicle, you consent to and accept those changes.**

NOTE: These terms of use do not apply to aftermarket telematics devices that may be provided by others or configured to send information to someone other than DTNA or its affiliates, dealers or service providers.

CONTACT INFORMATION

For questions, please create a Service Technical Request using the DTTS Application on the DTNA Portal.

Published by
Daimler Trucks North America LLC
4747 N. Channel Ave.
Portland, OR 97217
Printed in U.S.A.