Remember the equipment that you are driving is a valuable resource and as a professional equipment operator you need to protect it to the best of your ability. Also remember what you do with the equipment can have a great effect on aircraft and its passengers. There can literally be hundreds of lives that you can have a direct effect upon. You as the operator are responsible for the vehicle you are operating.

You can't abuse your truck just because it's big and powerful.

Your truck needs as much care as your car does. In fact, your truck works a lot harder than your car ever will and is likely to require a lot more care.

Most experienced drivers can tell you all kinds of stories about trucks that were destroyed years too soon simply because somebody didn't check something or forgot to top it up or was too lazy to tighten it up.

We have various trucks at Winnipeg James Armstrong Richardson International Airport. As an example, we have sand trucks, single axle dump trucks, tandem dump trucks, chemical trucks and plow trucks.
Get to know these trucks and learn how to operate them properly.

Some or all of the following features are commonly found on most trucks:

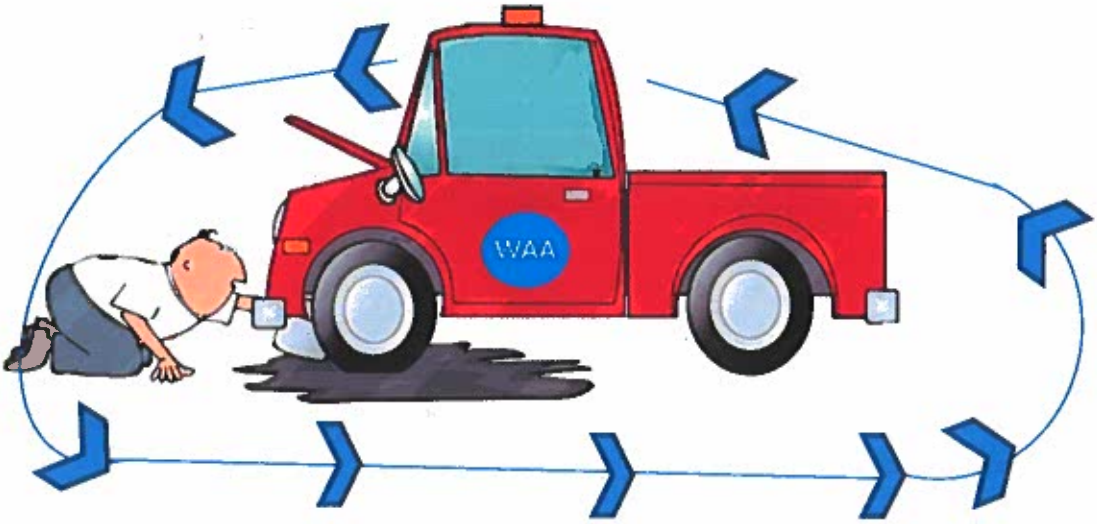
- ROTATING BEACON (must be on when you go airside)
- TWO-WAY RADIO (for airside use)
- PINTLE HOOK (trucks are often used for towing)
- BACK-UP ALARM (because you can't see behind you)
- SEAT BELTS (both seats)
- WEST COAST MIRRORS (better visibility)
- FIRE EXTINGUISHER
- LOW AIR PRESSURE ALARM

Most of the features are safety related.

THE CIRCLE CHECK

Before you climb into the cab of your truck, you want to make sure that your truck is ready to go.

- make sure your vehicle is safe
- Make sure you'll get through your shift without a breakdown.



PRIOR TO OPERATING ANY VEHICLE AT THE CSB YOU MUST DO THE FOLLOWING.

1. Check for any fluid leaks under Vehicle
2. Preform a walk around checking for damage to the vehicle (Report any damage found)
3. Pull the oil dip stick ***WIPE IT CLEAN*** insert it back into the vehicle and check the oil level.
4. Add washer fluid if needed
5. After any vehicle use ***ALWAYS ADD FUEL TO TOP UP THE TANK***
6. ***Make a One-Call ticket if needed at 204-987-9798***

It's impossible to give a detailed checklist in a manual such as this one. The one given here should serve as a guide to the things that you have to look after.

For example, the battery will probably be in different areas on different makes of trucks, but you know that you still have to check it, wherever it is.

Under The Hood Checks

- Engine Oil Level
- Radiator Level
- Power Steering Fluid Level
- All Belts for Tension and Wear
- Windshield Washer Level

Body Checks

- Cracked Lights and Lenses
- Mirrors
- Wheel Lugs
- Tire Pressure
- Tire Wear and Damage

Check Components

- Battery Levels
- Battery Tie Downs
- Battery Connection
- Hydraulic Oil Level
- Check for Obstructions around Vehicle
- Cock Closed on Air Tanks

Other Checks

- Evidence of Oil Leaks
- Evidence of Anti-freeze Leaks
  Locate Source if Possible
- Hydraulic Pump and Drive shaft

Report all damaged and defective items to your supervisor. Do not operate a defective truck. A decision will be made by the supervisor if the truck will be taken out of service at that time.

Since it is not good to put a cold engine to work, you have time to run secondary checks while waiting for the engine to warm up.

Cab Equipment
- Fully Charged Fire Extinguisher
- Wiper Motor
- Wiper blades
- Windshield Washer
- Horn City/Highway

Radio
- Check for Proper Frequency
- Check with Tower for Proper Operation

Adjust
- Seat
- Mirrors

Lights (Working and Clean)
- Beacon
- Headlights
- Taillights
- Flashers
- Plow Lights
- Back-up Lights

Check
- Brake Operation
- Back-up Alarm
- Air pressure Build Up
- Air Leaks with Engine Off
- Automatic Transmission Oil

After using any vehicle at the CSB you must top up the fuel tank.

Date: _____

Equipment Number: _____

		✓	X	N/A
Walk Around	Leaks (Fluid/Air)			
	General Condition			
Under Hood	Oil Level			
	Transmission Fluid			
	Brake/PTO Fluid			
	Power Steering Fluid			
	Coolant/ Radiator			
	Belts			
	Hoses			
	Air Cleaner			
Battery	Cable Condition			
	Mountings/Hold Down			
	Cover Secured			
Tires	Tread/Match			
	Tire Condition			
	Tire PSI			
	Wheel/Lugnuts			
Hydraulics	Reservoir Level			
	PTO Operation			
	Hose Condition			
	Cylinder Condition			
Frame/ Suspension	Loose Bolts			
	Cracks			
	Springs/ U Blots			
	Mud Flaps			
Broom	Shroud Shoveled			
	Body Shoveled			
	Broom Core			

		✓	X	N/A
Cab	First Aid Kit			
	Fire Extinguisher			
	Warning Triangles			
	Seat Belts			
	WS/Windows			
	Wipers			
	Horn/Air Horn			
	Mirrors			
	Inspection Sticker			
	Stairs			
	Clean			
Brakes	Emergency Brake			
Bed	Ladder			
	Cover/Cap			
	Loose Cargo			
	Dump Bed Safety Bar			
	Bed Lock Lamp			
	Lift Cylinder & Pin			
	Tailgate Latch			
Lamps	Head/ Dimmer			
	Parking			
	Turn Signal			
	Four Way			
	Clearance Lamps			
	Tail Lamps			
	Reverse Lamps			
	License Plate Lamp			
Air Brakes	Air Pressure			
	Buzzer/Lamp			
	Tank Drain			
	Glad Hands/Hoses			

Introduction

This manual provides information needed to operate and understand the vehicle and its components. More detailed information is contained in the *Owner's Warranty Information for North America* booklet, and in the vehicle's workshop and maintenance manuals.

Custom-built Sterling vehicles are equipped with various chassis and cab components. Not all of the information contained in this manual applies to every vehicle. For details about components in your vehicle, refer to the chassis specification pages included in all new vehicles and to the vehicle specification decal located inside the vehicle.

For your reference, keep this manual in the vehicle at all times.

IMPORTANT: Descriptions and specifications in this manual were in effect at the time of printing. Sterling Truck Corporation reserves the right to discontinue models and to change specifications or design at any time without notice and without incurring obligation. Descriptions and specifications contained in this publication provide no warranty, expressed or implied, and are subject to revisions and editions without notice.

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.

Event Data Recorder

This vehicle is equipped with one or more devices that record specific vehicle data. 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.).

Customer Assistance Center

Having trouble finding service? Call the Customer Assistance Center at 1-800-785-4357 or 1-800-STL-HELP. Call night or day, weekdays or weekends, for dealer referral, vehicle information, breakdown coordination, or Fleetpack assistance. Our people are knowledgeable, professional, and committed to following through to help you keep your truck moving.

Reporting Safety Defects

If you believe that your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Sterling Truck Corporation.

If the NHTSA receives similar complaints, it may open an investigation and 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 Sterling Truck Corporation.

To contact NHTSA, you may call the Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153); go to www.safercar.gov; or write to: Administrator, NHTSA, 1200 New Jersey Avenue, SE, Washington, DC 20590. You can also obtain other information about motor vehicle safety from www.safercar.gov.

Canadian customers who wish to report a safety-related defect to Transport Canada, Defect Investigations and Recalls, may telephone the toll-free hotline 1-800-333-0510, or contact Transport Canada by mail at: Transport Canada, ASFAD, Place de Ville Tower C, 330 Sparks Street, Ottawa, Ontario, Canada K1A 0N5.

For additional road safety information, please visit the Road Safety website at: www.tc.gc.ca/roadsafety/menu.htm.

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Foreword

Contents

1

Vehicle Identification

Vehicle Specification Decal

The vehicle specification decal lists the vehicle model, identification number, and major component models. It also recaps the major assemblies and installations shown on the chassis specification sheet. The specification decal is inside the rear cover of the *Owner's Warranty Information for North America* booklet. An illustration of the decal is shown in Fig. 1.1.

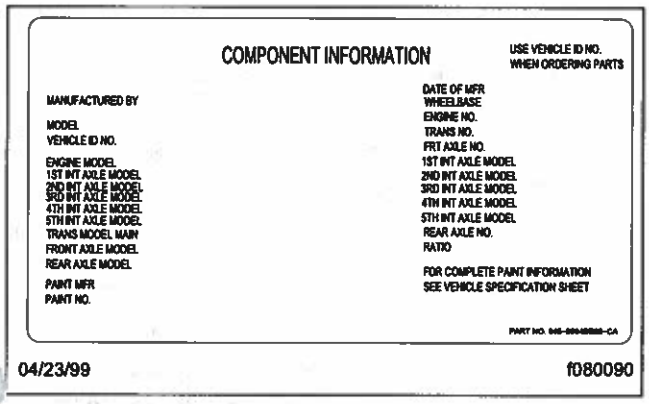


Fig. 1.1, Vehicle Specification Decal, Canadian-Built Vehicle Shown

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

Federal Motor Vehicle Safety Standard (FMVSS) Labels

NOTE: Due to the variety of FMVSS certification requirements, not all of the labels shown will apply to your vehicle.

Tractors with or without fifth wheels purchased in the U.S. are certified by means of a certification label (Fig. 1.2) and the tire and rim labels (Fig. 1.3). These labels are attached to the left side rear door jamb, as shown in Fig. 1.4.

If purchased for service in the U.S., trucks built without a cargo body have a certification label (Fig. 1.5) attached to the left side rear door jamb. See Fig. 1.4. In addition, after completion of the vehicle, a certification label similar to that shown in Fig. 1.2 must be attached by the final-stage manufacturer. This label will be located on the left side rear door jamb and certifies that the vehicle conforms to all applicable

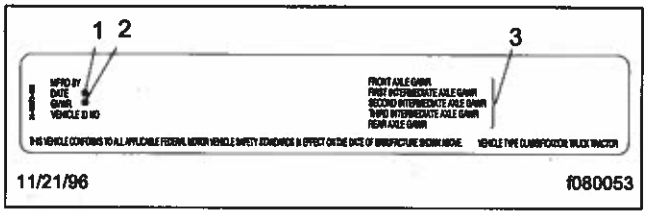
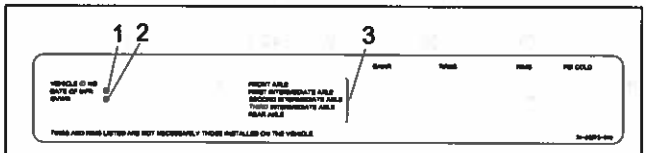
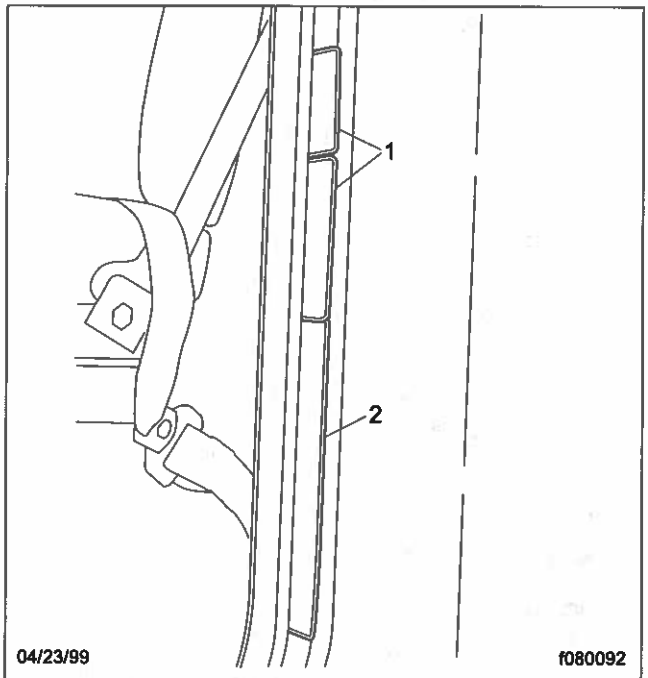


Fig. 1.2, Certification Label, U.S.



1. Date of manufacture by month and year.
2. Gross vehicle weight rating; developed by taking the sum of all the vehicle's gross axle ratings.
3. Gross axle weight ratings; developed by considering each component in an axle system, including suspension, axle, wheels, and tires. The lowest component capacity is the value for the system.

Fig. 1.3, Tire and Rim Label



1. Tire and Rim Labels
2. Certification Label

Fig. 1.4, Labels Location

FMVSS regulations in effect on the date of completion.

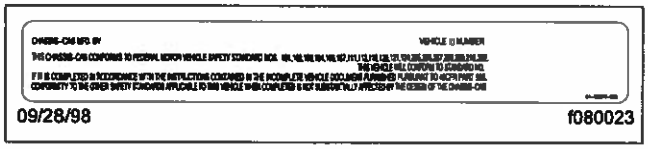


Fig. 1.5, Incomplete Vehicle Certification Label, U.S.

Canadian Motor Vehicle Safety Standard (CMVSS) Labels

In Canada, tractors with fifth wheels are certified by means of a "Statement of Compliance" label and the Canadian National Safety Mark (Fig. 1.6), which are attached to the left side rear door jamb. Tire and rim labels (Fig. 1.3) are also attached to the left side rear door jamb.

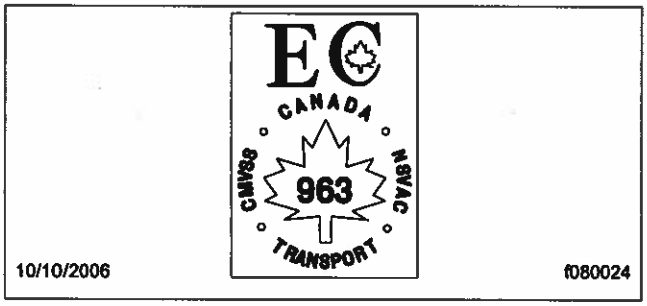


Fig. 1.6, Canadian National Safety Mark

If purchased for service in Canada, trucks built without a cargo body and tractors built without a fifth wheel are certified by a "Statement of Compliance" label, similar to Fig. 1.2. This label must be attached by the final-stage manufacturer after completion of the vehicle. The label is located on the left side rear door jamb, and certifies that the vehicle conforms to all applicable CMVSS regulations in effect on the date of completion.

Tire and Rim Labels

Tire and rim labels certify 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.

See Fig. 1.3 for U.S. and Canadian tire and rim labels.

EPA Emission Control

Vehicle Noise Emission Control Label

A vehicle noise emission control label (Fig. 1.7) is attached to the left side rear door jamb.

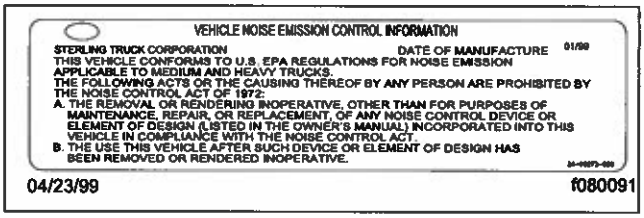


Fig. 1.7, Vehicle Noise Emission Control Label

IMPORTANT: Certain Sterling incomplete vehicles may be produced with incomplete noise control hardware. Such vehicles will not have a vehicle noise emission control information label. 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.

EPA07 Exhaust Emissions

To meet January 2007 emissions regulations, vehicles with engines manufactured after January 1, 2007, are equipped with an emission aftertreatment device. There is a warning label on the driver's sun-visor, explaining important new warning indicators in the driver's message display, that pertain to the after-treatment system. See Fig. 1.8.

It is a violation of federal law to alter exhaust plumbing or after-treatment in any way that would bring the engine 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 that it conforms to EPA regulations.

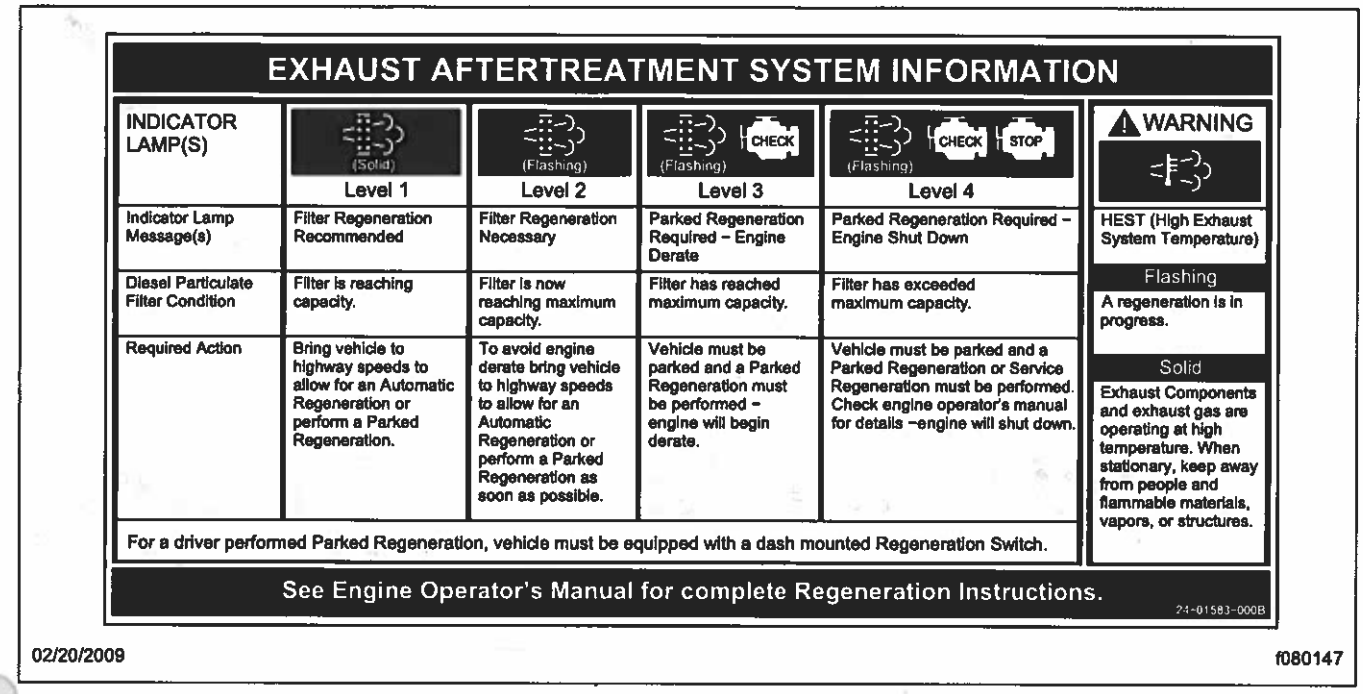


Fig. 1.8, Sunvisor Warning Label

2

Instruments and Controls Identification

Instruments and Controls Identification

Instrument and Control Panel

Figure 2.1 represents a typical instrument and control panel equipped with all of the standard and many of the optional instruments and controls.

Ignition Switch and Key

The ignition switch has four positions: OFF, START, ON, and accessory (ACC). See Fig. 2.2. The ignition key can be inserted and removed only in the OFF position. The ignition key also locks and unlocks the cab doors from the outside.

With the ignition switch in the OFF position, whether the ignition key is inserted or not, the low-beam headlights, hazard warning lights, marker lights, clearance lights, dome lights, parking lights, and the brake lights will operate.

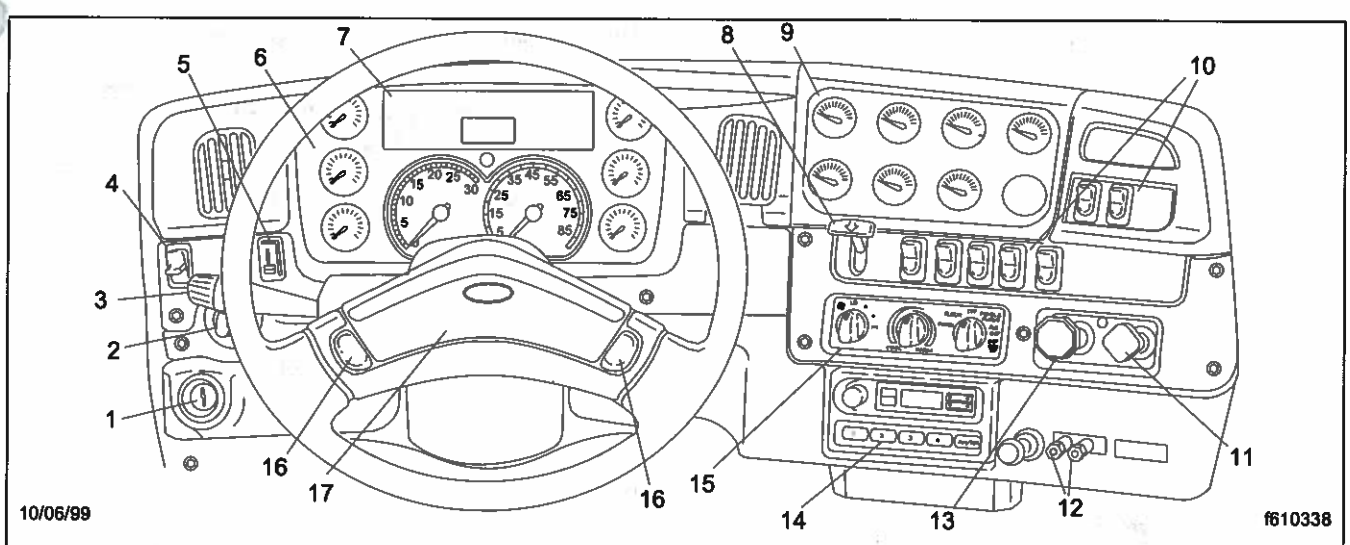
To start the engine, turn the ignition key 90 degrees clockwise to the START position. After the engine has started, release the key and it will return to the on position.

In the ON position, the key is turned 45 degrees clockwise. With the ignition switch in the ON position, all the electrical systems are operable. The warning lights and buzzer indicating low air pressure and low oil pressure will operate until the engine is started and the minimum pressures are built up.

In the ACC position, the key is turned 45 degrees counterclockwise. With the ignition switch in the accessory position, the radio, windshield wipers, heated mirrors, power mirrors, and power windows are operable.

Power Window Switch, Optional

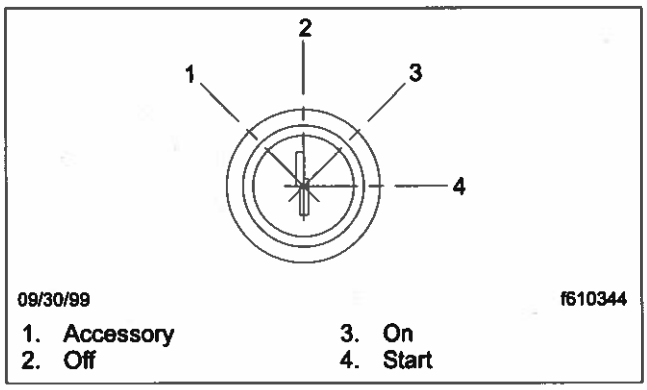
The power window switch is located on the driver's door and controls the passenger window if there is a manual window regulator for the driver's door. If there are two power window switches on the driver's door, one switch controls the driver's window and one switch controls the passenger's window. See Fig. 2.3. The passenger's door also has a power



NOTE: Instruments and controls and their locations may vary from those shown.

1. Ignition Switch
2. Headlight and Parking Light Switch
3. Turn Signal/Windshield Wiper Lever
4. Marker Blink Switch
5. Control Panel Dimmer and Dome Light Switch
6. Instrument Cluster
7. Dash Message Center
8. Trailer Brake Valve Control
9. Instrument Panel Gauges
10. Instrument Panel Switches
11. Parking Brake Valve Control
12. Hot Posts
13. Trailer Air-Supply Valve Control
14. Electronic Sound System
15. Climate Control Panel
16. Cruise Control Switch
17. Horn

Fig. 2.1, Instrument and Control Panel Layout

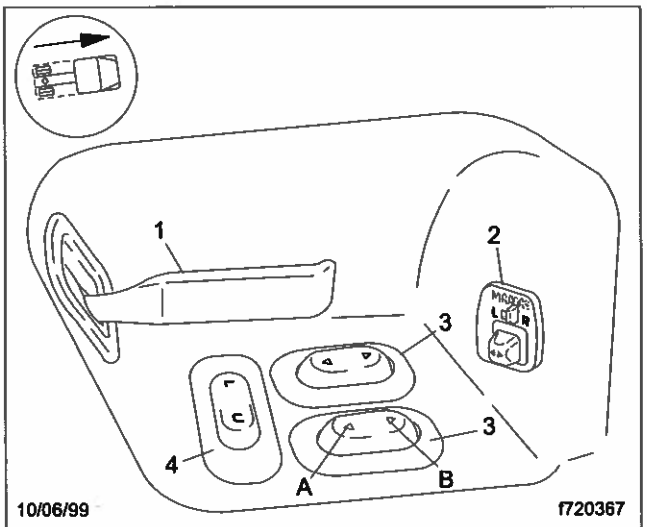


1. Accessory
2. Off
3. On
4. Start

Fig. 2.2, Ignition Switch Positions

window switch if both doors are controlled electrically.

Push the dimpled end of the power window switch to lower the window; push the raised end of the switch to raise the window.



A. Push here to lower window.
B. Push here to raise window.
1. Door Handle
2. Power Mirror Switch
3. Power Window Switch
4. Power Lock Switch

Fig. 2.3, Power Lock, Window, and Mirror Switches

Power Lock Switch, Optional

The power lock switch (Fig. 2.3) is located below the door handle on the driver's side and the passenger's side of the cab. Press the **L** to lock the doors. Press the **U** to unlock the doors.

Mirror Controls

Power Mirror Switch, Optional

The position of the door-mounted mirrors is controlled by the power mirror switch (Fig. 2.4) located near the door handle on the driver's side of the cab. Move the lever toward the **L** to control the left mirror, and toward the **R** to control the right mirror. Move the button to the left or right to control the position of the mirror.

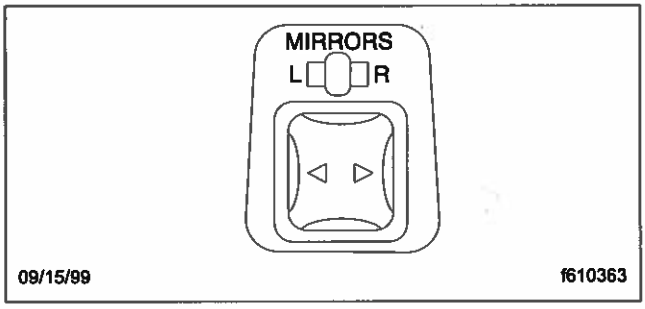


Fig. 2.4, Power Mirror Switch

Heated Mirror Switch, Optional

One or both door-mounted mirrors can be heated to keep them defrosted. Press the upper end of the heated mirror switch (Fig. 2.5) to heat the mirrors. When the heated mirror switch is pressed, the MIR HEAT indicator on the dash message center comes on.

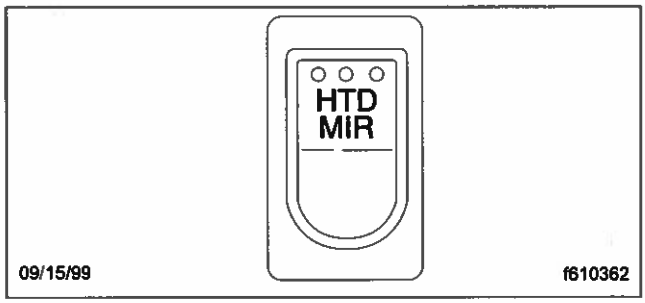


Fig. 2.5, Heated Mirror Switch

Lighted Mirrors, Optional

The lights on the door-mounted mirrors act as marker lights. Push the paddle on the marker blink (MARK BLNK) switch (Fig. 2.7) down to turn on the mirror lights.

Headlight and Parking Light Switch

The headlight and parking light switch (Fig. 2.6) is located above the ignition switch. Turn the switch 45 degrees clockwise to turn on the parking lights. Turn the switch 90 degrees clockwise to turn on the headlights.

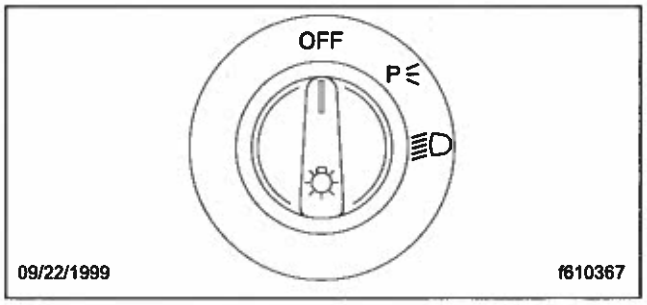


Fig. 2.6, Headlight and Parking Light Switch

Daytime Running Lights, Optional

⚠ WARNING

When the daytime running lights are on, only the headlights are illuminated at a reduced intensity. The marker lights, taillights, and trailer lights are not illuminated. Turn the headlights ON at dusk. Using the daytime running lights at night could cause an accident resulting in personal injury or property damage.

The daytime running lights are turned on when the engine is started, the parking brake is released, and the headlight switch is in the OFF position. The daytime running lights illuminate the headlights at a reduced intensity during daytime driving. These lights are not to be used in place of the headlights during reduced visibility or nighttime driving conditions.

For vehicles built to operate in Canada, daytime running lights are required.

Marker Blink Switch

The marker blink (MARK BLNK) switch (Fig. 2.7) is a paddle switch located above and to the left of the headlight and parking light switch. Push the paddle down to turn on the marker lights. Push the paddle up to blink the marker lights. When the paddle is in the center position, the marker lights are off.

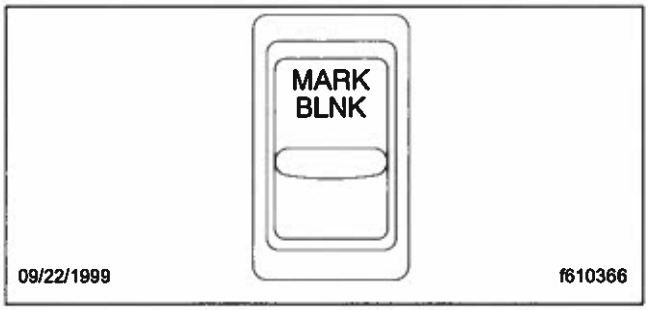


Fig. 2.7, Marker Blink Switch

Instrument and Control Panel Dimmer Switch

The instrument and control panel dimmer switch (Fig. 2.8) is located above and to the right of the headlight and parking light switch. The instrument and control panel lights can be brightened by moving the lever up, or dimmed by moving the lever down. The dome light can be turned on by moving the switch all the way up.

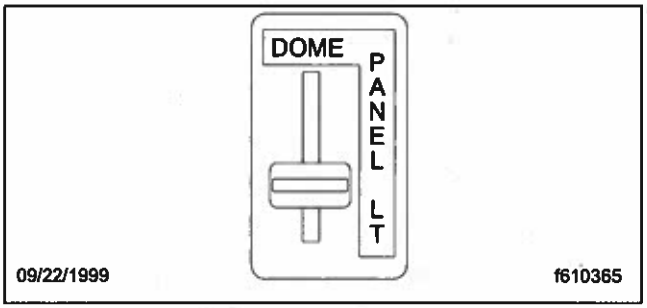


Fig. 2.8, Instrument and Control Panel Dimmer Switch

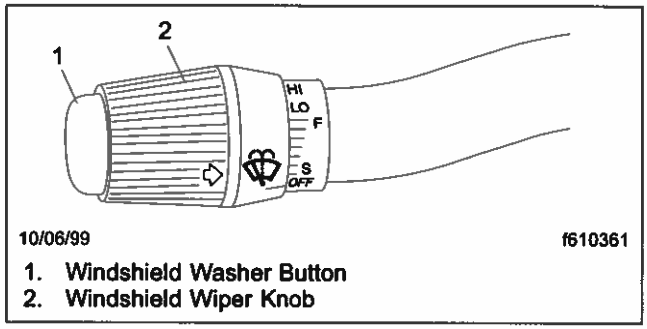
Turn Signal Lever, United Technologies

Turn Signals

The turn signal lever (Fig. 2.9) is located on the left side of the steering column. Push the lever up to turn on the right-turn signal. Pull the lever down to turn on the left-turn signal. The turn signal lever will return to the neutral position after the turn has been completed.

High-Beam Headlights

Push the turn signal lever away from you to change the headlights from low beam to high beam.



1. Windshield Washer Button
2. Windshield Wiper Knob

Fig. 2.9, Turn Signal Lever, United Technologies

Flash to Pass

Pull the turn signal lever toward you and release the lever to momentarily flash the high-beam headlights when the headlights are off.

Windshield Wipers

CAUTION

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

To turn on the windshield wipers, turn the knob on the end of the turn signal lever. There are seven intermittent wiper speeds from slow to fast, a low speed, and a high speed. See Fig. 2.9.

Windshield Washer

To turn on the windshield washer, push in the button at the end of the turn signal lever. Windshield washer fluid will continue to spray as long as the button is pushed in. See Fig. 2.9.

Hazard Warning Lights

Push the hazard warning lights switch (Fig. 2.10) on top of the steering column to turn on the hazard warning lights. Push the switch again to turn off the hazard warning lights.

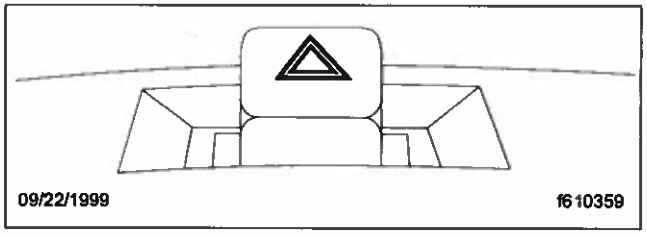
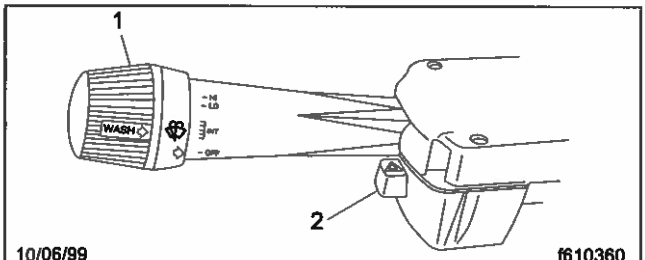


Fig. 2.10, Hazard Warning Lights Switch

Turn Signal Lever, Signal-Stat

Turn Signals

The turn signal lever (Fig. 2.11) is located on the left side of the steering column. Push the lever up to turn on the right-turn signal. Pull the lever down to turn on the left-turn signal. Return the turn signal lever to the neutral position after the turn has been completed.



1. Windshield Wiper/Washer Knob
2. Hazard Warning Lights Switch

Fig. 2.11, Turn Signal Lever, Signal-Stat

High-Beam Headlights

Pull the turn signal lever toward you to change the headlights from low beam to high beam.

Flash to Pass

Pull the turn signal lever toward you and release the lever to momentarily flash the high-beam headlights when the headlights are off.

Windshield Wipers

CAUTION

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

To turn the windshield wipers on, turn the knob on the end of the turn signal lever. There are five intermittent wiper speeds, a low speed, and a high speed. See Fig. 2.11.

Windshield Washer

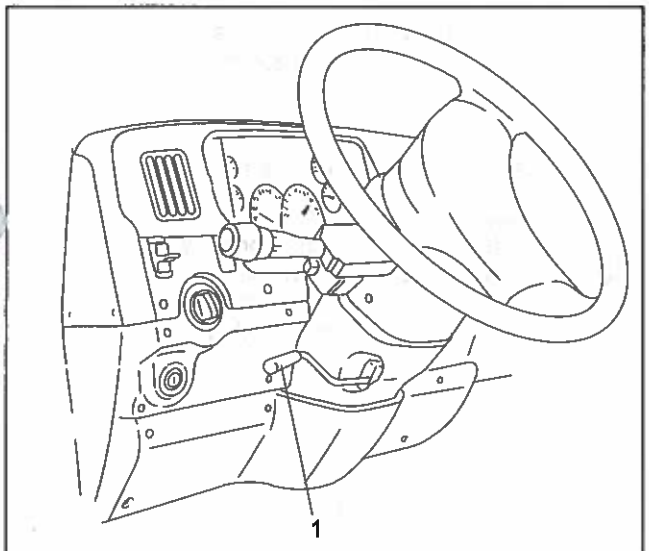
To turn the windshield washer on, push in the button at the end of the turn signal lever. Windshield washer fluid will continue to spray as long as the knob is pushed in. See Fig. 2.11.

Tilt, or Tilt and Telescoping Steering Wheel, Optional

⚠ WARNING

Make sure that the steering column is locked before driving the vehicle. Never tilt or telescope the steering wheel while driving the vehicle. Doing so could cause loss of vehicle control, personal injury, and property damage.

To tilt the steering wheel, push down on the lever (Fig. 2.12) below the steering wheel, and tilt the column to the desired position. Release the lever to lock the steering wheel in place.



1. Tilt and Telescoping Lever

Fig. 2.12, Tilt, or Tilt and Telescoping Steering Wheel

To telescope the steering wheel, pull the lever up and pull the steering wheel closer to you or push the steering wheel farther away. Release the lever to lock the steering wheel in place.

Horn

Your vehicle is equipped with an electric horn and may have an optional air horn.

To use the electric horn, press the center of the steering wheel. To use the air horn, pull the cable located on the ceiling above the driver's seat.

Trailer-Brake Hand-Control-Valve Lever

The trailer-brake hand-control-valve lever (Fig. 2.13) is used to apply the trailer brakes without applying the truck or tractor brakes, and is mounted on the instrument and control panel. Pull the lever down to apply the brakes. When the lever is released, the lever will return to the upper position.

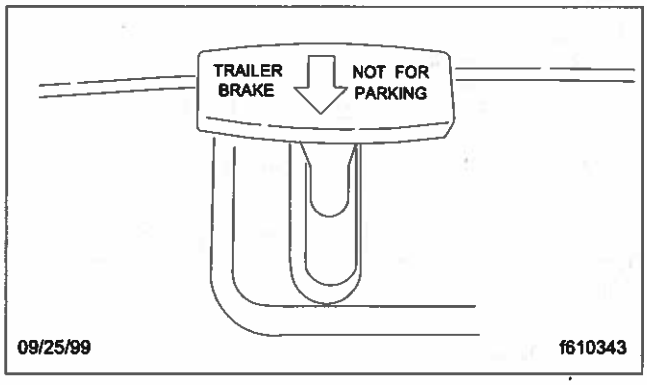


Fig. 2.13, Trailer-Brake Hand-Control-Valve Lever

Heater and Air-Conditioner Controls

Refer to Chapter 4 for detailed operating instructions of the heater and air conditioner.

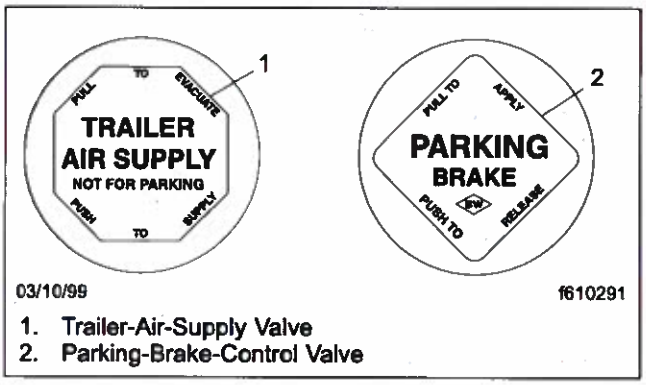
Parking-Brake-Control Valve

The yellow diamond-shaped knob (Fig. 2.14) operates the parking-brake-control valve. Pulling the knob out applies both the tractor and the trailer spring brakes. Pushing the knob in releases the tractor spring brakes. Before the spring brakes can be released, the air pressure in either air brake system must be at least 65 psi (448 kPa).

Refer to Chapter 6 under the heading "Air Brake System" for instructions regarding the use of the parking-brake-control valve.

Trailer-Air-Supply Valve

The red octagonal-shaped knob (Fig. 2.14) operates the trailer-air-supply valve. After the vehicle is connected to a trailer, and the air hoses are connected, and the pressure in the air system is at least 65 psi (448 kPa), the trailer-air-supply valve can be pushed in (and should stay in) to charge the trailer-air-supply system and release the trailer spring brakes. Before disconnecting a trailer, or when operating a vehicle



1. Trailer-Air-Supply Valve
2. Parking-Brake-Control Valve

Fig. 2.14, Brake Valve Knobs

without a trailer, the trailer-air-supply valve must be pulled out.

Refer to **Chapter 6** under the heading "Air Brake System" for instructions regarding the use of the trailer-air-supply valve.

Hot Posts

Hot posts (**Fig. 2.1**) are provided as a source of power within the cab to operate 12-volt electrical accessories. A power and ground jack are included in the hot post.

Mode/Reset Switch, Optional

The mode/reset switch (**Fig. 2.15**) is located on the right side of the instrument cluster. The mode/reset switch is used to scroll through the displays on the message display screen, and to reset the trip distance and trip hours values to zero. When the mode/reset switch is pressed for one second or less, the switch acts as a mode switch. When the switch is pressed for more than one second, the switch acts as a reset switch.

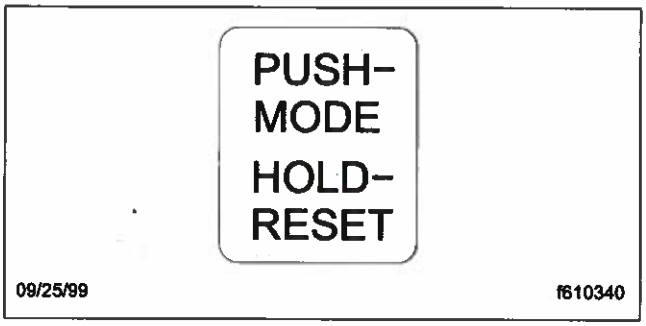


Fig. 2.15, Mode/Reset Switch

To reset the value of the selected display to zero, press the mode/reset switch for one second or longer. To toggle between MI (miles) or KM (kilometers), press the mode/reset switch while in the SELECT screen.

When the odometer reading is displayed and the parking brake is released:

- Press the mode/reset switch once and the trip distance will display.
- Press the mode/reset switch a second time and the trip hours (engine hours) will display.
- Press the mode/reset switch a third time and the SELECT screen and the current units, MI or KM, will display.
- Press the mode/reset switch a fourth time to return to the odometer reading.

Axle Controls

Wheel Lock Switch, Optional

The wheel lock switch locks together the wheels on the same axle. Push the wheel lock switch (**Fig. 2.16**) up to engage the wheel lock. Move the switch to the center position to disengage the wheel lock. Refer to **Chapter 9** for complete operating instructions.

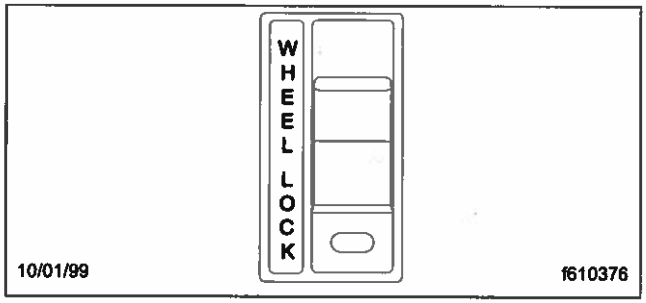


Fig. 2.16, Wheel Lock Switch

Axle Lock Switch, Optional

The axle lock switch is installed on vehicles with tandem rear drive axles. It locks the rear drive axles together. Push the axle lock switch (**Fig. 2.17**) up to engage the axle lock. Move the switch to the center position to disengage the axle lock.

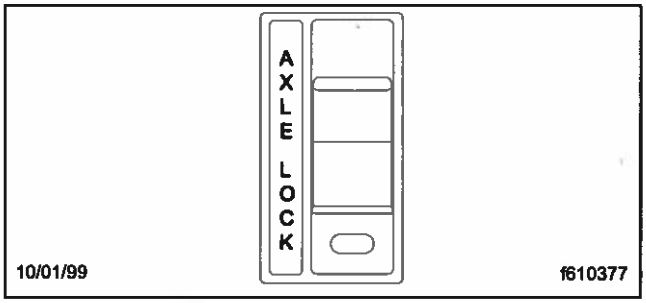


Fig. 2.17, Axle Lock Switch

All-Wheel-Drive Switches, Optional

All-wheel-drive (AWD) allows the driver to direct driveline power to all four axles, front and rear. Two switches are used to control AWD: an AWD operation switch used to activate all-wheel-drive, and an AWD range switch used to select the high or low range.

The AWD operation switch is a two-position rocker switch with a light-emitting diode (LED) that illuminates when AWD is engaged. The legend LOCKED is underneath the LED on the upper half of the switch. On the lower half is the legend AWD. See Fig. 2.18. When the panel lights are on, the AWD legend is backlit in green.

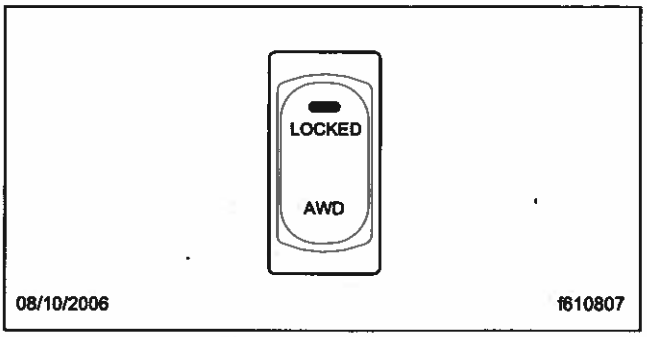


Fig. 2.18, AWD Operation Switch

To engage AWD, press the upper half of the rocker switch. The LED illuminates to indicate that AWD is engaged. To turn off AWD, press the lower half of the switch. The LED goes out to indicate the AWD is no longer engaged.

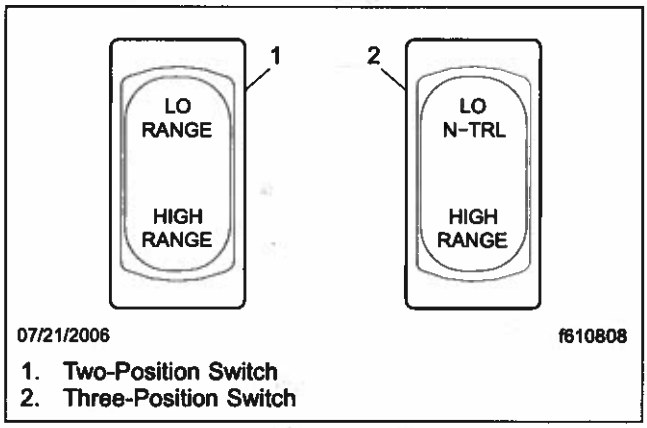
When AWD is engaged, the LOCKED legend is backlit in red. In addition, a red indicator with the legend FR AXLE ENGAGE displays on the dash message center.

⚠ CAUTION

To prevent damage to the transfer case and the driveline, stop the vehicle and apply the parking brake before using the range switch.

The AWD range switch is used under similar conditions to those of the axle shift switch on a two-speed rear axle. Use the high range when driving at normal speeds under off-road conditions, or on non-paved surfaces. Use the low range when extra traction is needed at low speeds; for example, under conditions of mud, snow, or ice. This switch should be used only when AWD has been engaged.

In most cases, the AWD range switch is a two-position rocker switch with the legends LO RANGE at the upper end and HIGH RANGE at the lower end. On vehicles with a power takeoff unit (PTO), the three-position switch has a neutral (N-TRL) position in the middle. See Fig. 2.19.



1. Two-Position Switch
2. Three-Position Switch

Fig. 2.19, AWD Range Switches

On vehicles without a PTO, high range is considered standard operation. To activate the low range, press the upper half of the switch. When the low range is activated, the LO RANGE legend is backlit in red. In addition, a red indicator with the legend T-CASE LO RANGE displays on the dash message center. To switch back to HIGH RANGE, press the lower half of the switch.

IMPORTANT: Always use the N-TRL switch position when operating the PTO.

On vehicles with a PTO, neutral is considered standard operation (switch in the middle position). An

amber indicator with the legend T-CASE NEUTRL displays on the dash message center.

To activate the high range, press the lower half of the switch. No indicator displays on the dash message center with the high range activated. Press the upper half to return to N-TRL.

To activate the low range, press the upper half of the switch. A red indicator with the legend T-CASE LO RANGE displays on the dash message center. On the switch, the LO N-TRL legend is backlit in red. Press the lower half to return to N-TRL, and then press the lower half again to select HIGH RANGE.

Traction in Mud or Snow Switch, Optional

If the vehicle is equipped with Automatic Traction Control, the traction in mud or snow (TRAC MUD/ SNOW) switch (**Fig. 2.20**) is used to provide increased traction on soft surfaces such as snow, mud, or gravel by slightly increasing the permissible wheel spin.

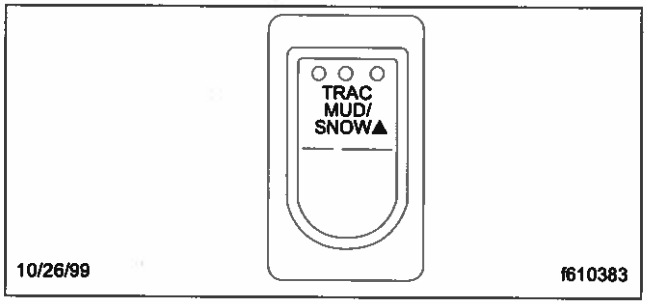


Fig. 2.20, Traction in Mud or Snow Switch

Engine Brake Controls

Exhaust Brake Switch, Optional

The exhaust brake restricts the flow of exhaust gasses, which slows the engine. Push the exhaust brake switch (**Fig. 2.21**) up to engage the exhaust brake. Move the switch to the center position to disengage the exhaust brake. Refer to **Chapter 7** under the heading "Exhaust Braking System, Optional" for additional information.

Engine Brake Switch, Optional

The three-position engine brake switch is available only on Mercedes-Benz MBE900 engines. Press the upper half of the engine brake switch to apply both

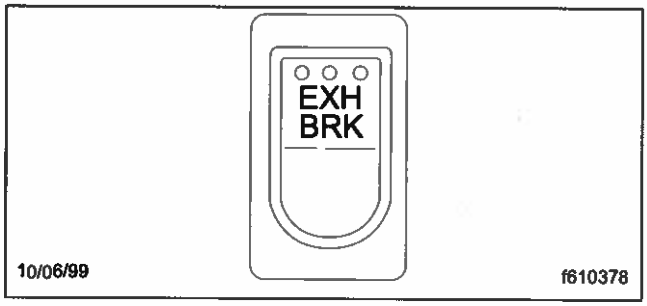


Fig. 2.21, Exhaust Brake Switch

the engine brake and exhaust brake. When the switch is in the center position, only the exhaust brake is applied. When the lower half of the switch is pressed, the switch is off.

Aftertreatment System (ATS) Request/Inhibit Regen Switch

A parked regen of the ATS can be initiated with the request/inhibit regen switch. See **Fig. 2.22.** It may also be used to inhibit the vehicle from performing an automatic regen.

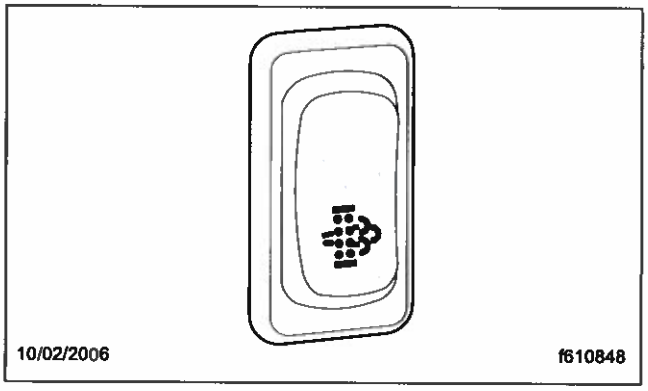


Fig. 2.22, Request/Inhibit Regen Switch

The style and function of switch will vary with the engine make and model. See the engine operation manual for operation details.

ABS Diagnostic Switch, Optional

The ABS diagnostic switch (**Fig. 2.23**) is a momentary switch that turns on the blink code diagnostic capabilities. For information on troubleshooting with blink code diagnostics, see **Group 42** in the *Acterra® Workshop Manual.*

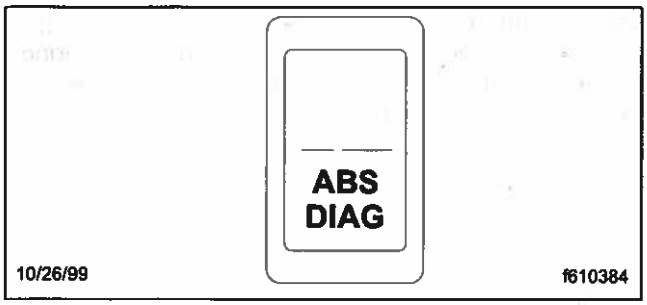


Fig. 2.23, ABS Diagnostic Switch

Cruise Control

To turn on the cruise control, press the ON switch located on the steering wheel. See Fig. 2.24.

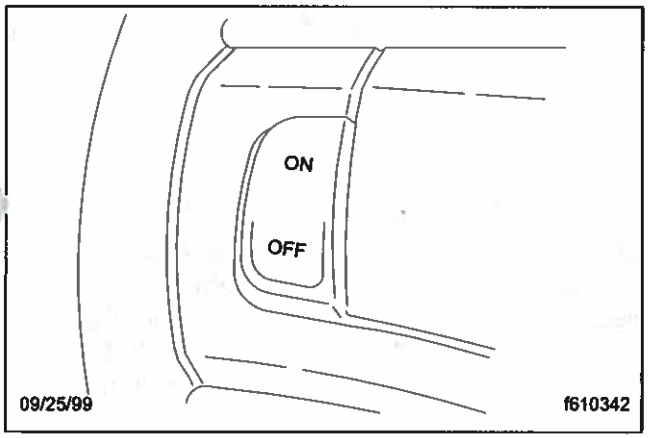


Fig. 2.24, Cruise Control On/Off Switch

To Set a Speed—press the set/coast (SET/CST) switch located on the steering wheel, after you have reached the desired speed. See Fig. 2.25. The vehicle will travel at the set speed until the brake pedal or clutch pedal is depressed, or until the cruise control OFF switch is pressed.

The speed control may not operate until a minimum vehicle speed is reached. For more information, refer to your diesel engine operation and maintenance manual.

When driving up a steep hill, the speed control may not be able to maintain the preset speed in the transmission gear position selected. To maintain a preset speed in this situation, downshift the transmission to a lower gear.

To Set a Higher Set Speed—choose one of three ways to set a higher set speed.

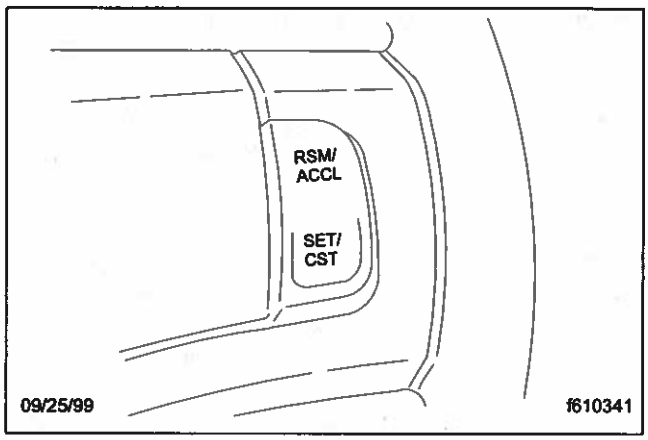


Fig. 2.25, Speed Control Switch

- Press and hold the resume/accelerate (RSM/ACCL) switch (Fig. 2.25) located on the steering wheel until the higher set speed is reached. Then release the switch.
- Press and release the resume/accelerate switch. Each press of the switch will increase the set speed by 1 mph (1.6 km/h).
- Press and release the resume/accelerate switch and depress the accelerator pedal until the desired speed is reached. Then press the set/coast (SET/CST) switch.

You can accelerate with the throttle pedal at any time during cruise control usage. Releasing the throttle pedal will return the vehicle to the previously programmed set speed.

To Set a Lower Set Speed—choose one of three ways to set a lower set speed.

- Press and hold the set/coast (SET/CST) switch located on the steering wheel until the lower set speed is reached. Then release the switch.
- Press and release the set/coast switch. Each press of the switch will decrease the set speed by 1 mph (1.6 km/h).
- Press and release the set/coast switch and depress the brake pedal until the desired speed is reached. Then press the set/coast switch.

To Disengage the Speed Control—depress the brake pedal or the clutch pedal. Disengaging the

speed control will not erase the previously programmed set speed. Pressing the OFF switch will erase the previously programmed set speed.

To Return to a Set Speed—press the resume/accelerate (RSM/ACCL) switch for about three seconds.

IMPORTANT: The use of radio transmitting equipment that is not FCC approved may cause the speed control to malfunction. Therefore, use only properly installed FCC approved radio transmitting equipment in your vehicle.

To Turn Off Cruise Control—press the OFF switch (Fig. 2.24) located on the steering wheel. Once the cruise control is turned off, the previously programmed set speed will be deleted.

Stationary Throttle Control Operation

On all engines except CAT 3126, the cruise control may also be used as a throttle control for PTO applications under the following conditions:

- the parking brake is set
- the clutch and accelerator pedals are released

To operate the cruise control:

- Press the ON switch located on the steering wheel;
- Press and hold the set/coast (SET/CST) switch located on the steering wheel until the desired rpm has been reached;
- Adjust the rpm by alternately pressing the set/coast and resume/accelerate (RSM/ACCL) switches.

The cruise control now functions as a throttle control.

To turn off the throttle control:

- Press the OFF switch located on the steering wheel, or depress the throttle pedal or the clutch pedal.

On CAT 3126 engines, the PTO will only operate if the vehicle is in neutral. This feature can be overridden by a special service tool. See your dealer or service representative for more information.

Battery-Isolation Switch

The battery-isolation switch (see Fig. 2.26) is located on the cab floor at the left of the driver's seat, or inside the battery box. The battery-isolation switch reduces the power to the cab and engine power wiring. Use it whenever the vehicle is to be put out of service for extended periods.

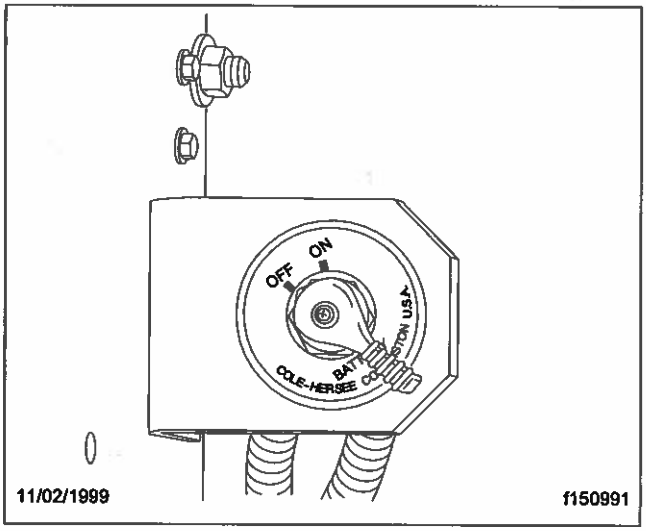


Fig. 2.26, Battery-Isolation Switch

IMPORTANT: The battery-isolation switch does not completely disconnect the batteries from the electrical system. For service operations that require that the batteries be disconnected, always shut down the engine and remove the negative battery cables.

NOTE: Whenever battery power is disconnected, clocks and electronically tuned radios must be reset.

Transmission Controls

If so equipped, the transmission range control valve and splitter valve are attached to the gearshift knob. Transmission shift pattern labels are located inside the cab.

Refer to **Chapter 8** for complete manual transmission operating instructions.

Refer to **Chapter 8** for information on the automatic transmission controls.

Warning and Indicator Lights

Dash lightbars have warning and indicator lights that may be lettering or icons. Up until December 31,

Instruments and Controls Identification

2006, the warning and indicator lights were a mixture of ISO icons and lettering. Since January 2007, ISO icons are used for all standard warning and indicator lights on the dash lightbar. See **Table 2.1** for descriptions of the icons.

Warning and Indicator Light Icons		
	Check Engine (amber)	Indicates an undesirable engine condition is detected or recorded. The vehicle can still be driven. If the condition gets worse, the stop engine or engine protection light will illuminate.
	Stop Engine or Engine Protect (red)	Indicates a serious fault that requires the engine shut down immediately. The engine ECU will reduce the maximum engine torque and speed, and, if the condition does not improve, will shut down the engine within 30 seconds of the light illuminating. The driver must 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, the engine can be restarted after turning the key to the OFF position for a few seconds.
	High Exhaust System Temperature (HEST) Lamp (amber)	Slow (10-second) flash indicates a regeneration is in progress, and the driver is not controlling the engine idle speed. Steadily illuminated indicates a regeneration is in progress, with high exhaust temperatures at the outlet of the tail pipe, if the speed is below 5 mph (8 km/h). It does not signify the need for service; it only alerts the vehicle operator of high exhaust temperatures. See the engine operation manual for details.
	Diesel Particulate Filter (DPF) Lamp (amber)	Steadily illuminated indicates a regeneration is required. Change to a more challenging duty cycle, such as highway driving, to raise exhaust temperatures for at least 20 minutes, or perform a parked regeneration. See the engine operation manual for details. Blinking indicates that a parked regeneration is required immediately. An engine derate and shutdown will occur. See the engine operation manual for details on how to perform a stationary regeneration.
	Malfunction Indicator Lamp (MIL) (amber)	Indicates an engine emissions-related fault, including, but not limited to the aftertreatment system. See the engine operation manual for details.
	Tractor ABS Lamp (amber)	Indicates a problem with the ABS is detected. Repair the tractor ABS immediately to ensure full antilock braking capability.
	Trailer ABS Lamp (amber)	Indicates a fault is detected with the trailer ABS.
	Left-Turn Signal (green)	Flashes on and off whenever the outside turn signal lights are flashing.

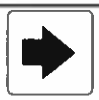
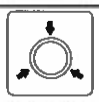
Warning and Indicator Light Icons		
	Right-Turn Signal (green)	Flashes on and off whenever the outside turn signal lights are flashing.
	High-Beam Indicator (blue)	Indicates the headlights are on high beam.
	Low Air Pressure Warning Lamp (red)	Activates with a buzzer when air pressure in the primary or secondary air reservoir falls below 64 to 76 psi (440 to 525 kPa).
	High Coolant Temperature Warning Lamp (red)	Activates with a buzzer when the coolant temperature goes above a maximum level specified by the engine manufacturer (see the engine manual).
	Low Engine Oil Pressure Warning Lamp (red)	Activates with a buzzer when engine oil pressure goes below a minimum level specified by the engine manufacturer (see the engine manual).
	Parking/Emergency Brake Lamp (BRAKE!) (Red)	Indicates the parking brake is engaged, or hydraulic brake fluid pressure is low. A buzzer activates when the vehicle is moving over 2 mph (3 km/h) with the parking brake set.
	Fasten Seat Belt Lamp (red)	Illuminates for 15 seconds when the ignition key is turned to the ON position.
	Intake Heater Lamp (amber)	Indicates the intake air heater is active.
	Water in Fuel Lamp (amber)	Indicates that the fuel could contain water.
	Low Battery Voltage Lamp (red)	Indicates battery voltage is 11.9 volts or less.

Table 2.1, Warning and Indicator Light Icons

Engine Protection Warning Lights

IMPORTANT: Drivers of electronically controlled engines should know the extent of the warning/warning-shutdown system for their vehicle before operating it. This information can be obtained from their Sterling dealer.

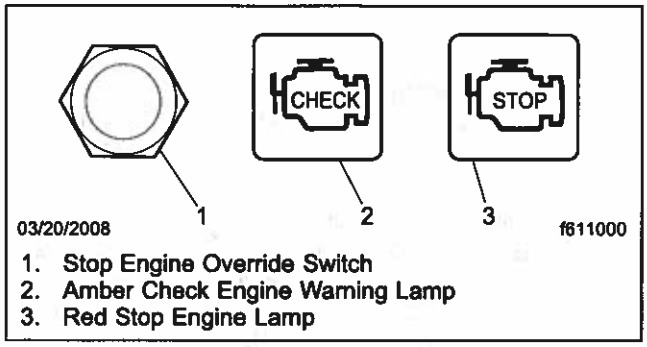
Amber Check Engine Warning Light

When the amber Check Engine warning lamp comes on for any reason, the vehicle can still be operated, and the driver can proceed to the required destination. This condition should be reported to an authorized service center as soon as possible. See the engine manufacturer's engine operation and maintenance manual for details of the engine protection system in the vehicle. See **Fig. 2.27**.

Red Stop Engine Light

When the red Stop Engine lamp comes on, the computer has detected a major malfunction in the engine that requires immediate attention.

IMPORTANT: It is the operator's responsibility to shut down the engine to avoid serious damage.



1. Stop Engine Override Switch
2. Amber Check Engine Warning Lamp
3. Red Stop Engine Lamp

Fig. 2.27, Engine Protection Warning Lights

See the engine manufacturer's engine operation and maintenance manual for details of the engine protection system in the vehicle.

If the engine shuts down while the vehicle is in a hazardous location, the engine can be restarted after turning the key to the OFF position for a few seconds, to allow the driver to move the vehicle to a safe location.

Stop Engine Override Switch

⚠ CAUTION

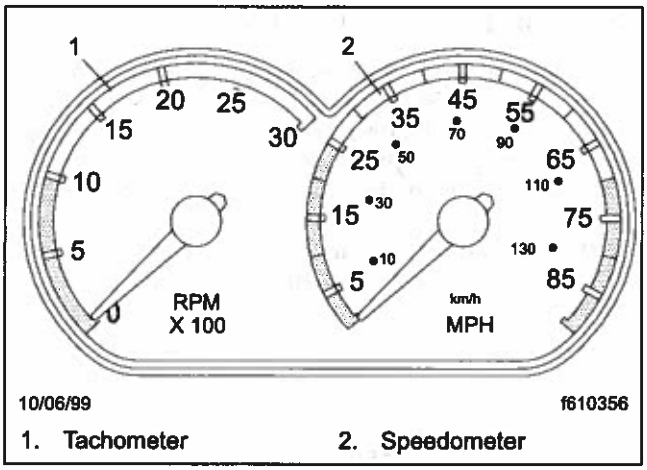
Using the override button so the engine operates for an extended period may result in engine damage. The operator has the responsibility to take action to avoid engine damage.

The vehicle may be equipped with a Stop Engine Override (SEO) switch, that can be used to override the shutdown sequence. This override resets the shutdown timer, restoring power to the level when the red stop engine lamp was illuminated. The switch must be recycled after five seconds to obtain a subsequent override.

Instruments

Tachometer, Optional

The tachometer (Fig. 2.28) indicates the engine speed in hundreds of revolutions per minute (rpm) and serves as a guide for shifting the transmission and keeping the engine in the appropriate rpm range.



1. Tachometer
2. Speedometer

Fig. 2.28, Tachometer/Speedometer

Speedometer

The speedometer (Fig. 2.28) registers speed in both miles per hour (mph) and kilometers per hour (km/h).

Engine Oil Pressure Gauge

⚠ CAUTION

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.

Refer to the engine operation manual for the specific safe-operating range for your vehicle. See Fig. 2.29.

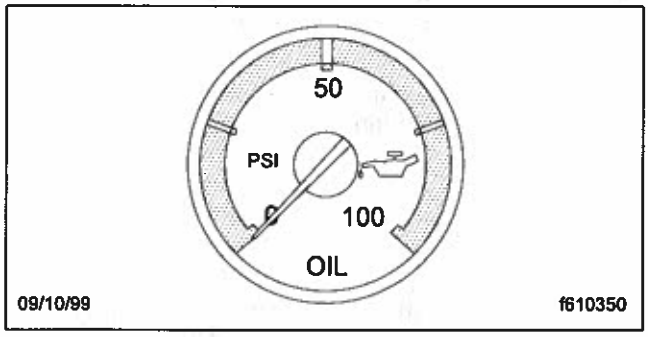


Fig. 2.29, Engine Oil Pressure Gauge

Coolant Temperature Gauge

During normal operation, the coolant temperature gauge should read 180 to 210°F (82 to 99°C). Refer to the engine operation manual for the specific safe-operating range for your vehicle. See **Fig. 2.30**. If the temperature remains below normal or exceeds the maximum, inspect the cooling system to determine the cause. Refer to **Group 20** in the *Acterra® Workshop Manual* for troubleshooting and repair procedures.

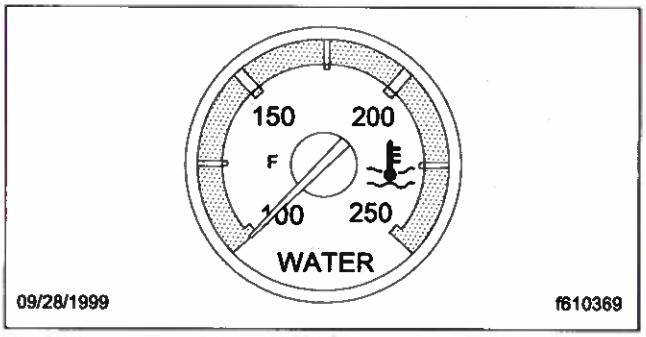


Fig. 2.30, Coolant Temperature Gauge

Voltage Reading

⚠ CAUTION

Gel cell batteries can be damaged if the battery voltage is allowed to drop below 12.0 volts or if the charging voltage is more than 14.1 volts. Start the engine to recharge the gel cell before the battery becomes fully discharged. If an external charger is needed, disconnect the gel cell battery and use only an external battery charger that has been approved for gel cell batteries.

The voltage reading indicates the vehicle charging system voltage when the engine is running, and the battery voltage when the engine is stopped. By monitoring the voltage reading, you can be aware of potential charging system problems and have them fixed before the batteries discharge enough to create starting difficulties.

The voltage reading 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 stopped. A completely discharged battery will produce only about 12.0 volts. The voltage reading will indicate lower voltage as the vehicle is being started or when electrical devices in the vehicle are being used.

If the voltage reading shows an undercharged or overcharged condition for an extended period, have the charging system and batteries checked at a repair facility.

On a vehicle equipped with a battery isolator system, the voltage reading shows the average voltage of all the batteries when the engine is running. When the engine is stopped, the voltage reading shows only the gel cell battery voltage and does not indicate the voltage of the engine-starting batteries.

Primary and Secondary Air Pressure Gauges

Air pressure gauges (**Fig. 2.31** and **Fig. 2.32**) 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. A low air pressure warning light comes on and a buzzer sounds when air pressure in either the primary or secondary system drops below a minimum pressure of 60 psi (414 kPa). When the engine is started, the warning light and buzzer remain on until air pressure in both systems exceeds minimum pressure.

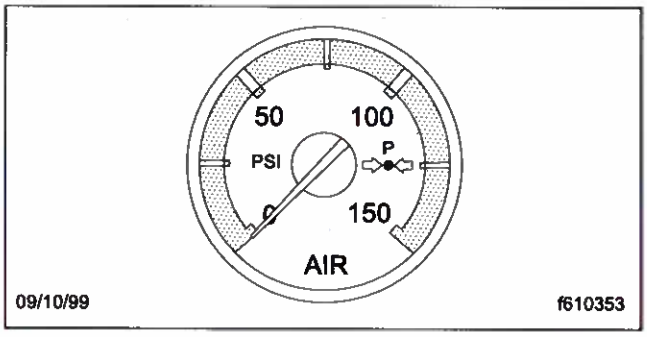


Fig. 2.31, Primary Air Pressure Gauge

Fuel Gauge

The fuel gauge (**Fig. 2.33**) indicates the level of fuel in the fuel tank(s).

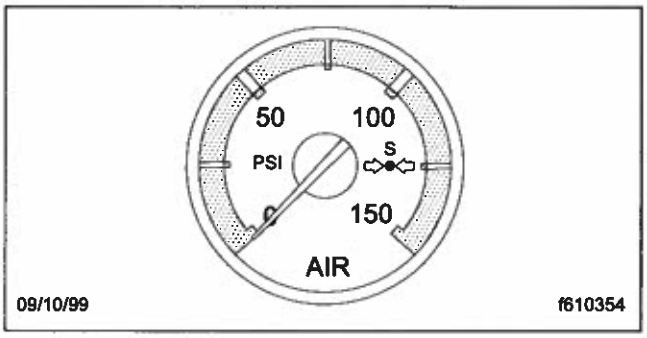


Fig. 2.32, Secondary Air Pressure Gauge

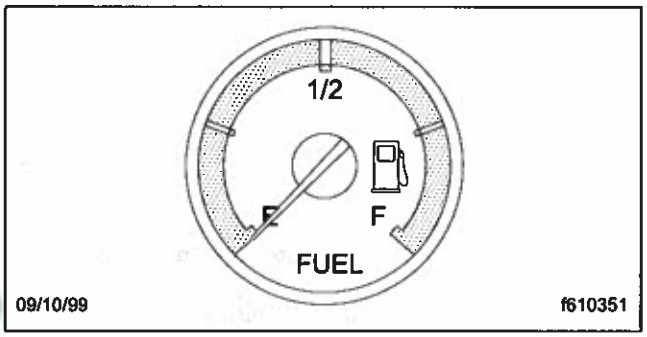


Fig. 2.33, Fuel Gauge

Transmission Oil Temperature Gauge, Optional

⚠ CAUTION

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 transmission oil temperature gauge (Fig. 2.34) reading should not exceed 250°F (121°C).

Forward and Rear Axle Oil Temperature Gauges, Optional

⚠ CAUTION

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.

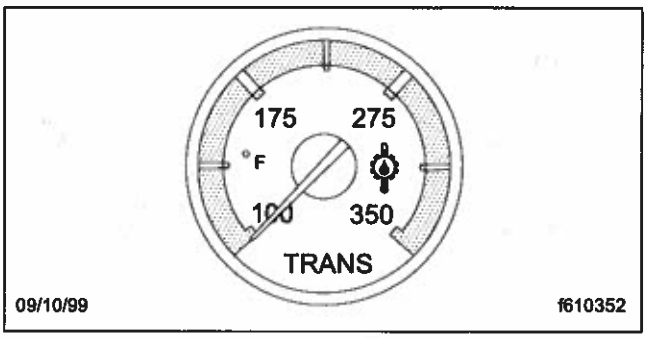


Fig. 2.34, Transmission Oil Temperature Gauge

During normal operation, forward and rear axle oil temperature gauges (Fig. 2.35 and Fig. 2.36) should read between 150 and 230°F (65 and 110°C).

Under heavy loads, such as when climbing steep grades, temperatures up to a maximum of 250°F (121°C) are not unusual.

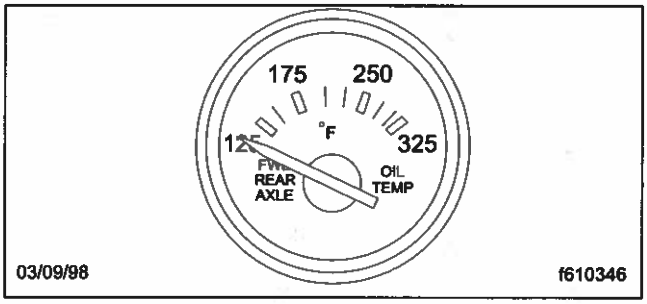


Fig. 2.35, Forward Rear Axle Oil Temperature Gauge

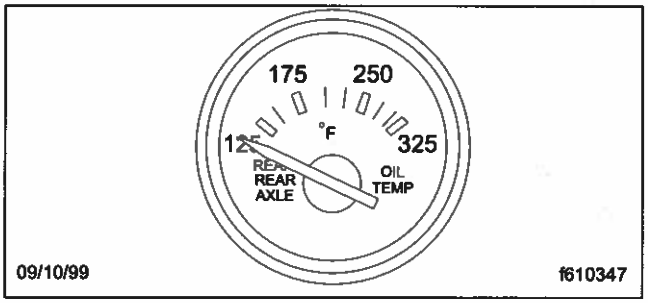


Fig. 2.36, Rearmost Axle Oil Temperature Gauge

Application Air Pressure Gauge, Optional

An application air pressure gauge (Fig. 2.37) 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.

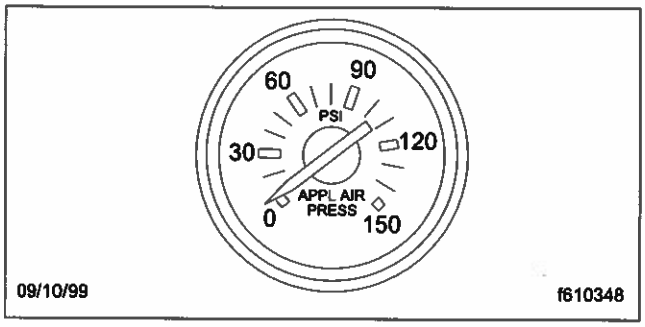


Fig. 2.37, Application Air Pressure Gauge

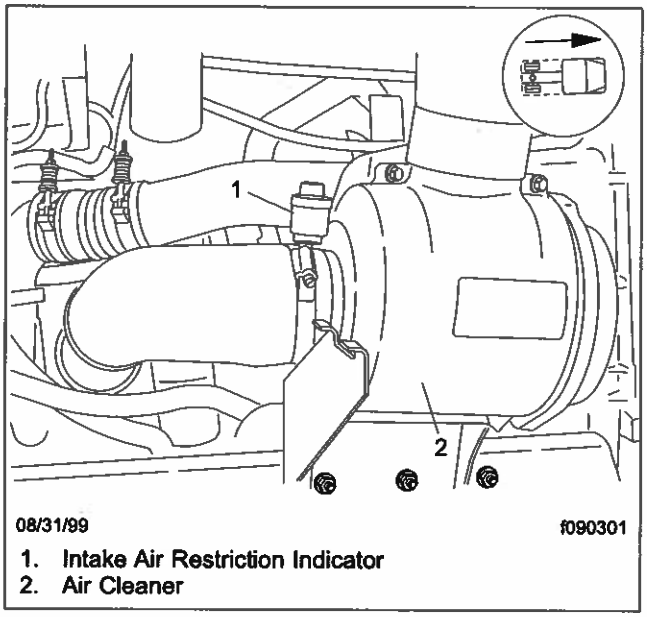
Intake Air Restriction Indicator

The intake air restriction indicator (Fig. 2.38) measures the vacuum on the engine side of the air cleaner at the air cleaner outlet. Vacuum is measured in inH_2O (inches of water). If the intake air restriction indicator stays locked at or above the service values shown in Table 2.2, the air cleaner needs to be serviced. After the air cleaner is serviced, push the reset button on the intake air restriction indicator to reset the indicator.

NOTE: Rain or snow can wet the filter, which can temporarily cause a higher than normal reading.

Intake Air Restriction Indicator Values		
Engine Type	**Initial inH_2O**	**Service inH_2O**
Caterpillar	15	25
Cummins	10	25
Mercedes-Benz	10	22
Detroit Diesel	12	20

Table 2.2, Intake Air Restriction Indicator Values



1. Intake Air Restriction Indicator
2. Air Cleaner

Fig. 2.38, Intake Air Restriction Indicator

Intake Air Restriction Indicator, Dash-Mounted, Optional

The intake air restriction indicator (Fig. 2.39) measures the vacuum on the engine side of the air cleaner at the air cleaner outlet. Vacuum is measured in inH_2O (inches of water). If the intake air restriction indicator stays locked at or above the service values shown in Table 2.2, the air cleaner needs to be serviced. After the air cleaner is serviced, push the reset tab on the intake air restriction indicator to reset the indicator.

NOTE: Rain or snow can wet the filter, which can temporarily cause a higher than normal reading.

Instrumentation Control Unit 4 (ICU4)

The ICU4 instrument cluster is an individual gauge cluster, with a lightbar with a driver message display screen, and integrated warning and indicator lights. See Fig. 2.40 for a typical layout of the gauges.

Standard gauges are:

- speedometer
- engine-coolant temperature gauge

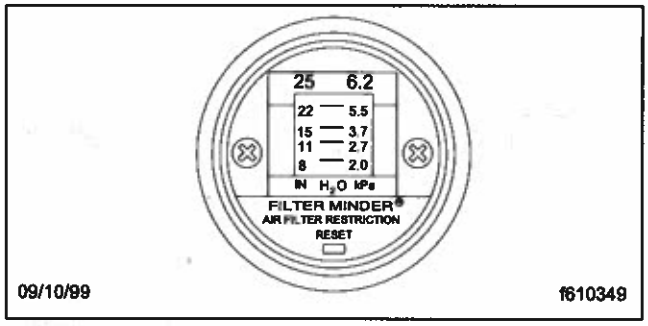
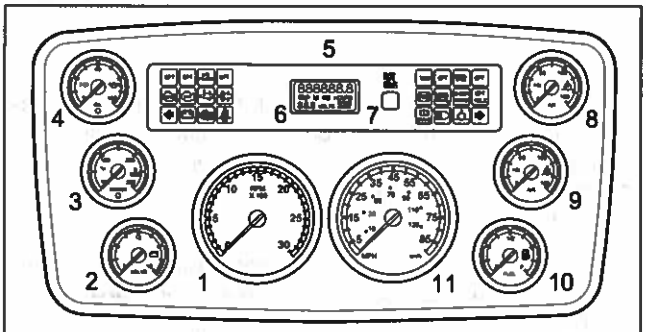


Fig. 2.39, Intake Air Restriction Indicator, Dash-Mounted

- engine-oil pressure gauge
- voltmeter
- fuel gauge
- air gauges

The following gauges have a warning light on the gauge:

- engine-coolant temperature (high)
- engine-oil pressure (low)
- fuel level (low)



1. Tachometer
2. Voltmeter
3. Engine-Coolant Temperature Gauge
4. Engine-Oil Pressure Gauge
5. Lightbar
6. Dash Message Center
7. Mode/Reset Switch
8. Primary-Air Pressure Gauge
9. Secondary-Air Pressure Gauge
10. Fuel Level Gauge
11. Speedometer

Fig. 2.40, ICU4 Instrument Cluster

Buzzer and Chime

A buzzer sounds for three seconds during the self-test at start-up, and when the following conditions exist:

- low air pressure
- low oil pressure
- high coolant temperature
- the parking brake is applied and the vehicle is moving at a speed of at least 2 mph (3 km/h)

A chime sounds when the parking brake is off and the door is open, or when the headlights are on and the door is open.

Ignition Sequence

When the ignition key is turned on, the ICU4 begins a self-test. During this process, all gauges controlled by the cluster sweep to full scale and return, the buzzer sounds for 3 seconds, the fasten seat belt warning light illuminates for 15 seconds, and the battery voltage, low air pressure, and parking brake warning lights illuminate then turn off. Then the software revision level of the ICU4 is displayed, followed by active faults, if any, then the odometer display.

Mode/Reset Switch

The mode/reset switch controls the display of the odometer, trip miles and hours, engine miles and hours, service cycle screens, fault code screens, and oil level screens (on some Mercedes-Benz engines; if equipped and enabled).

With the parking brake released, only the basic function screens, which include odometer, trip miles, and trip hours, can be accessed. Park the vehicle and set the parking brake to access additional screen functions.

Basic Function Screens

When the odometer is displayed, push the mode/reset switch once to display trip distance, and push it again to display trip hours. Both numbers are calculated from the last time the value was reset. Hold the switch when either number is displayed, to reset the value to zero. See **Fig. 2.41**.

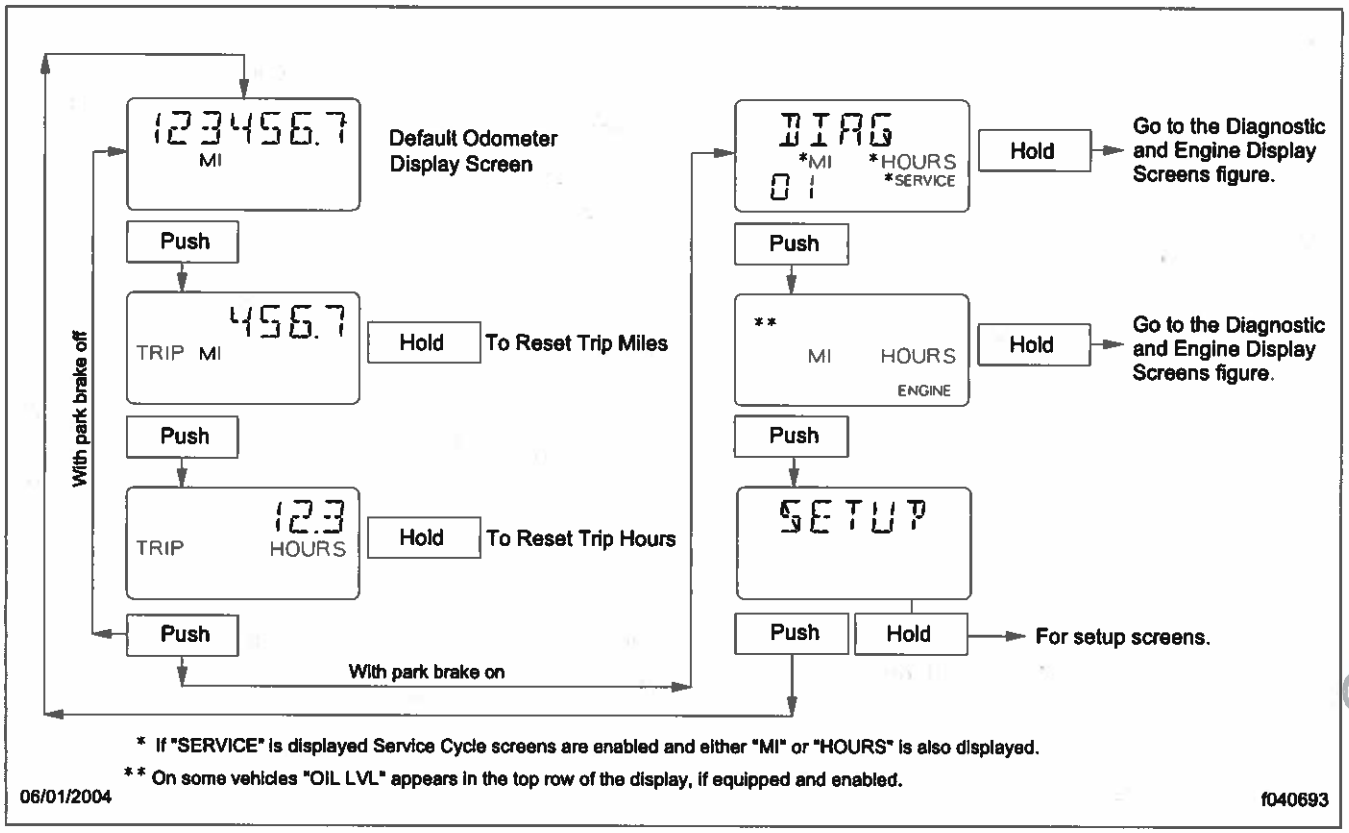


Fig. 2.41, ICU4 Basic Function Screens

Diagnostic Screens

During vehicle start-up, with the parking brake on, the ICU4 displays any active fault codes for three seconds each, until the parking brake is released. While the active fault codes are on display, push the mode/reset switch once to display the initial diagnostic screen (DIAG) and the total number of active faults. See **Fig. 2.42**.

If service cycle screens are enabled, and service distance or time has been exceeded, the text SERVICE will be displayed with the other fault messages. This informs the driver that the service interval has been exceeded, and vehicle service is required.

Specific fault code information can be displayed only while the vehicle is parked and the parking brake set. When the odometer screen is displayed, push the mode/reset switch until the DIAG screen is displayed, then hold the switch to enter the fault code screen sequence. Once the initial fault code is displayed, push the switch to cycle through additional diagnostic codes relating to the first fault. Hold the switch to display additional faults or return to the DIAG screen. If service cycle screens are enabled, service interval information is displayed before fault code information is displayed.

When the word SERVICE appears on the DIAG message display screen, service cycle screens are enabled. Hold the mode/reset switch at the DIAG screen to display miles or hours remaining until the next scheduled service. When MI appears on the DIAG screen, service miles are enabled; when HOURS appears on the screen, service hours are enabled. Either service miles or hours can be enabled, but not both. When service miles or hours has been exceeded, the number flashes to indicate service is overdue.

Engine Screens

Push the mode/reset switch once following the DIAG screen and the word ENGINE is displayed in the lower right corner of the digital display. Hold the

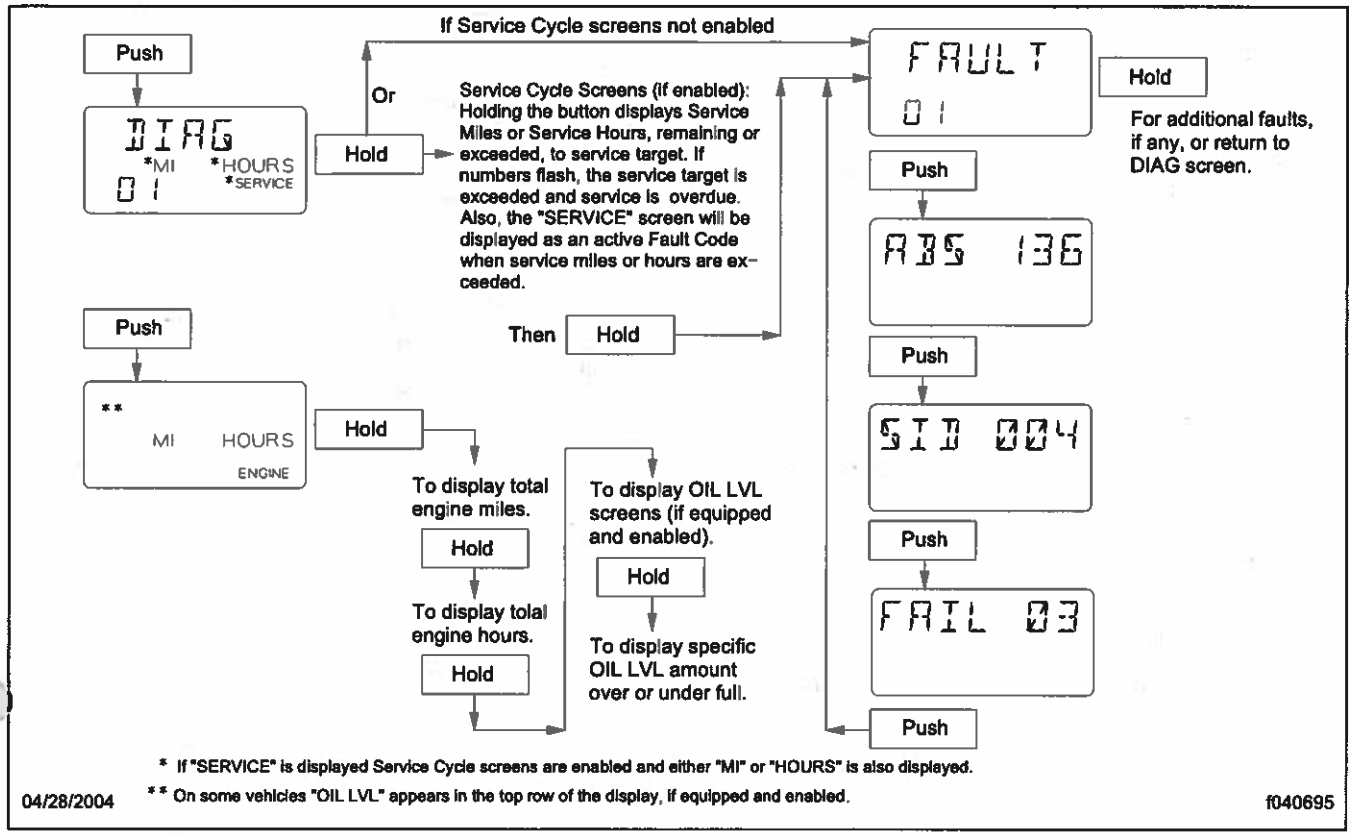


Fig. 2.42, ICU4 Diagnostic and Engine Screens

switch to display total engine miles. Push then hold it again to display total engine hours. If OIL LVL is displayed earlier with ENGINE (only on vehicles with Mercedes-Benz engines; if equipped and enabled) hold the switch again to access oil level screens.

Setup Screens

See **Fig. 2.43** for setup screens.

Press the mode reset switch while in the engine display screen, to sequence to the SETUP screen. Hold the mode switch while in the SETUP screen, to sequence to the SELECT screen. Hold the mode switch while in SELECT, to toggle between MI or KM as a display preference. Release the mode switch at the desired selection, then press again to reset.

Push the mode switch again to display the temperature warning screen. Hold the mode switch to toggle between ON and OFF. Release the button, then press it again to reset to the desired setting.

Push the mode switch again to sequence to the LCD brightness screen. Hold the mode switch to toggle between ON and OFF. Release the button at the desired setting, then push again to reset.

Push the mode switch again to sequence to the service SETUP screen.

To reset the service intervals, hold the mode switch while in the service SETUP screen, to display the RESET screen. Hold the mode switch while in the RESET screen, to display the interval select screen. Hold the mode switch while in the interval select screen, to toggle between MI (KM), or HOURS for selection of the service interval mode. Release the button at the desired setting, then push again to reset.

When MI (KM) is selected, push the mode switch to sequence to the service miles distance select screen. Holding the mode switch for approximately 1-1/2 seconds will display table values. Holding the mode/reset switch for 3 seconds will speed up scrolling

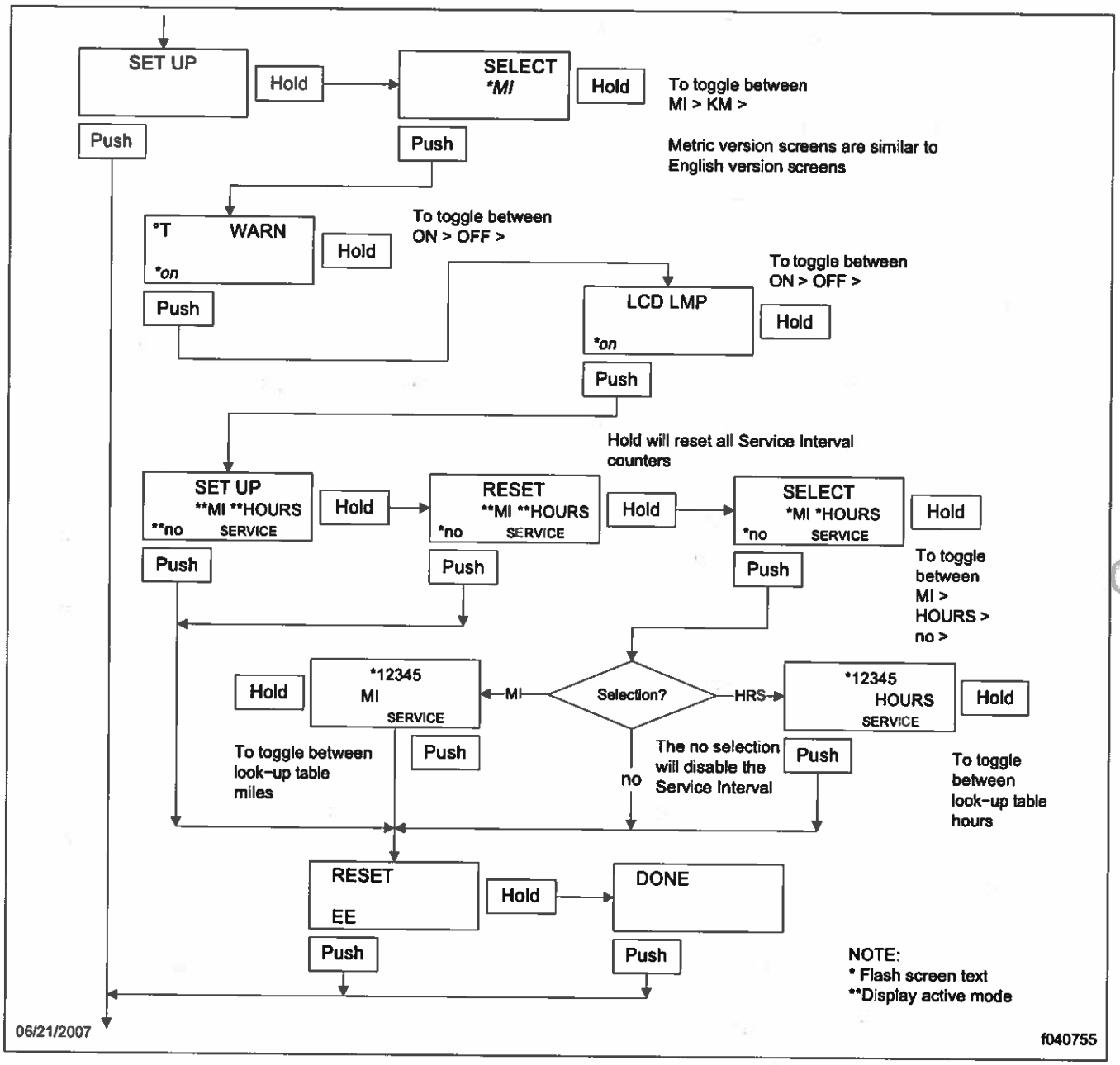


Fig. 2.43, ICU4 Setup Screens

through the tables. Release the mode switch when the desired interval flashes, then push the mode/reset switch to select it. When completed, the display will sequence to the odometer display.

When HOURS is selected, push the mode switch to sequence to the service hours time select screen.

Holding the mode switch for approximately 1-1/2 seconds will display table values. Holding the mode/reset switch for 3 seconds will speed up scrolling through the tables. Release the mode switch when the desired interval flashes, then push the mode/reset switch to select it. When completed, the display will sequence to the odometer display.

If NO is selected, the display will sequence to the odometer display.

The last screen in the SETUP menu, RESET EE is for resetting certain parameters to the original settings. Hold the mode switch to reset the ABS rollcall, sensor fault codes, and engine oil level screens. Push the mode switch to sequence the display to the odometer setting.

Instrumentation Control Unit 3 (ICU3 and ICU3 '07)

The instrumentation control unit (ICU) houses most warning and indicator lights, most gauges, and a message display screen. Warning messages and diagnostic fault codes will appear in the message display screen. The dash lightbars have warning and indicator lights that may be lettering or icons. Up until December 31, 2006, the warning and indicator lights are a mixture of ISO icons, and lettering. Since January 2007, ISO icons are used for all standard warning and indicator lights on the dash lightbar. See Table 2.1 for an explanation of the icons.

There can be up to eight gauges on the ICU3 instrument cluster, six electronic gauges and two mechanical gauges. See Fig. 2.44. Only air gauges operate mechanically. The ICU3 cannot drive gauges located on the control panel.

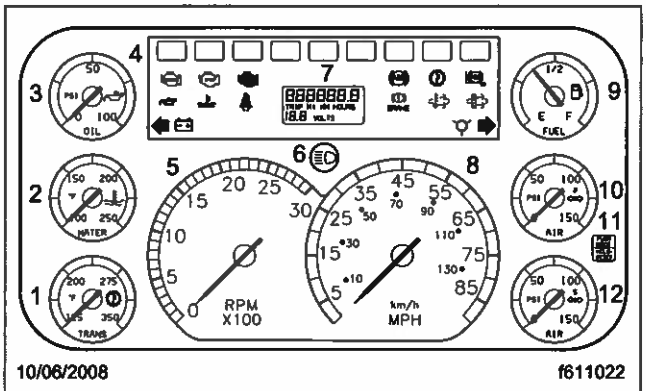
The dash message center is the heart of the ICU3. It has two parts, a set of up to 26 warning and indicator lights and a message display screen. The message display screen is a one-line by seven-character liquid crystal display (LCD) that normally shows the odometer reading. Below the odometer reading is a smaller one-line by three-character LCD that shows the voltmeter reading.

The message display screen will also display the trip distance, trip hours (engine hours), and service diagnostics if the vehicle has this option.

Use the instrument and control panel dimmer switch to increase or decrease the brightness of the message display screen.

There can be up to 26 warning and indicator lights installed in the ICU3. See Fig. 2.45 and Fig. 2.46.

There are four rows of lights in the dash message center. Lights installed in the top row are optional and their positions may vary. The lights in the bottom



1. Transmission Temperature Gauge
2. Engine Coolant Temperature Gauge
3. Engine Oil Pressure Gauge
4. Lightbar
5. Tachometer
6. High Beam Indicator Light
7. Dash Message Center
8. Speedometer
9. Fuel Level Gauge
10. Primary Air Pressure Gauge
11. Mode/Reset Switch
12. Secondary Air Pressure Gauge

Fig. 2.44, ICU3 ('07 shown)

three rows are installed in fixed positions on all vehicles. Most are standard, but a few are optional.

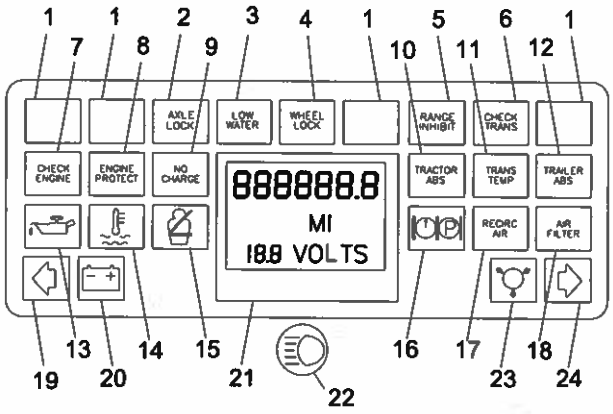
ICU3 Ignition Sequence

If the headlights are turned on, the message display screen displays the odometer reading. When the ignition is turned on, all the electronic gauges complete a full sweep of their dials, the warning and indicator lights light up, and the buzzer sounds for three seconds.

NOTE: The air gauges do not sweep.

The following lights come on during the ignition sequence:

- high coolant temperature warning
- low engine oil pressure warning
- low air pressure warning
- parking brake indicator
- engine protection warning
- check engine warning
- tractor ABS
- trailer ABS



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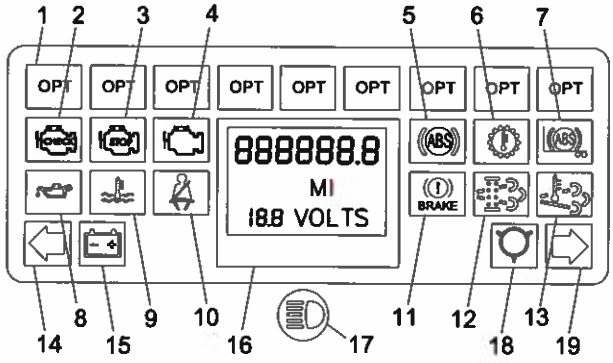
Typical installation shown. Location of icons installed in the top row may vary, and other icons may be specified.

1. Optional Warning and Indicator Lights
2. Axle Lock
3. Low Water (coolant)
4. Wheel Lock
5. Range Inhibit
6. Check Transmission
7. Check Engine
8. Engine Protection Warning
9. No Charge
10. Tractor ABS
11. Transmission Temperature
12. Trailer ABS
13. Low Oil Pressure
14. High Coolant Temperature
15. Fasten Seat Belt
16. Brake System Warning and Parking Brake Indicator
17. Recirculated Air
18. Air Filter Restriction
19. Left-Turn Signal
20. Low Battery Voltage
21. Message Display Screen
22. High-Beam
23. Low Air Pressure
24. Right-Turn Signal

Fig. 2.45, ICU3 Dash Message Center



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1. Optional Indicator
2. Check Engine
3. Stop Engine
4. Malfunction Indicator Light (MIL)
5. Tractor ABS
6. Transmission Temperature
7. Trailer ABS
8. Low Oil Pressure
9. High Coolant Temperature
10. Fasten Seat Belt
11. Parking Brake ON
12. Diesel Particulate Filter (DPF) Status Lamp
13. High Exhaust System Temperature (HEST)
14. Left-Turn Signal
15. Low Battery Voltage
16. Driver Display Screen
17. High Beams
18. Low Air Pressure
19. Right-Turn Signal

Fig. 2.46, ICU3 '07 Dash Message Center

NOTE: Although the engine and ABS warning lights come on during the ignition sequence, they are not controlled by the ICU3 or ICU3 '07 but by their own system ECU (electronic control unit).

Once the ignition switch has been turned on, the ICU3 or ICU3 '07 performs a self-test to look for active faults. During the first half of the self-test, all segments of the message display screen display **888888.8**. The voltmeter display also comes on with the value **18.8**. During the second half of the self-test, the software revision level is displayed.

If there are no active faults, the screen displays the odometer reading.

If the ICU3 or ICU3 '07 *has* received active fault codes from other devices, it displays them, one after the other, until the parking brake is released or the ignition switch is turned off.

A list of fault codes and definitions can be found in **Group 54** of the *Acterra® Workshop Manual*. Once the parking brake is released, the ICU3 or ICU3 '07 displays the odometer reading again.

Mode/Reset Switch

The mode/reset switch (Fig. 2.47) is located on the right side of the instrument cluster. The mode/reset switch is used to scroll through the displays on the message display screen, and to reset the trip distance and trip hours values to zero.

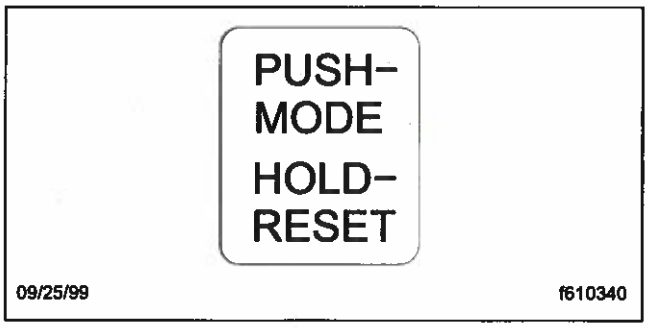


Fig. 2.47, Mode/Reset Switch

See Fig. 2.48 for the state diagram for the LCD display cycle.

NOTE: The systems diagnostics test is used by trained personnel to retrieve fault codes and other diagnostic information pertaining to the vehicle.

When the odometer reading is displayed and the parking brake is applied:

- Press the mode/reset switch once and the trip distance will display.
- Press the mode/reset switch a second time and the trip hours (engine hours) will display.
- Press the mode/reset switch a third time and the SELECT screen and the current units, MI or KM, will display.
- Press the mode/reset switch a fourth time to return to the odometer reading.

To reset trip miles and/or trip hours to zero, press the mode/reset switch for 1 second or longer. To toggle between MI (miles) or KM (kilometers), press the mode/reset switch while in the SELECT screen.

NGI Instrument Cluster, Optional

Instruments

The NGI instrument cluster became an option in January of 2002.

Each of its gauges is an individually replaceable unit. The instrument control unit (ICU) is located in the speedometer and receives information from the various sensors installed on the vehicle and feeds it to the electronic gauges. Only the air gauges operate mechanically.

Lightbar

The lightbar has 3 rows of 7 warning lights. See Fig. 2.49. The 7 telltales on the top row of the lightbar will vary depending on the vehicle configuration and customer preference. The 2 lower rows contain 14 standard telltales as shown in Table 2.3.

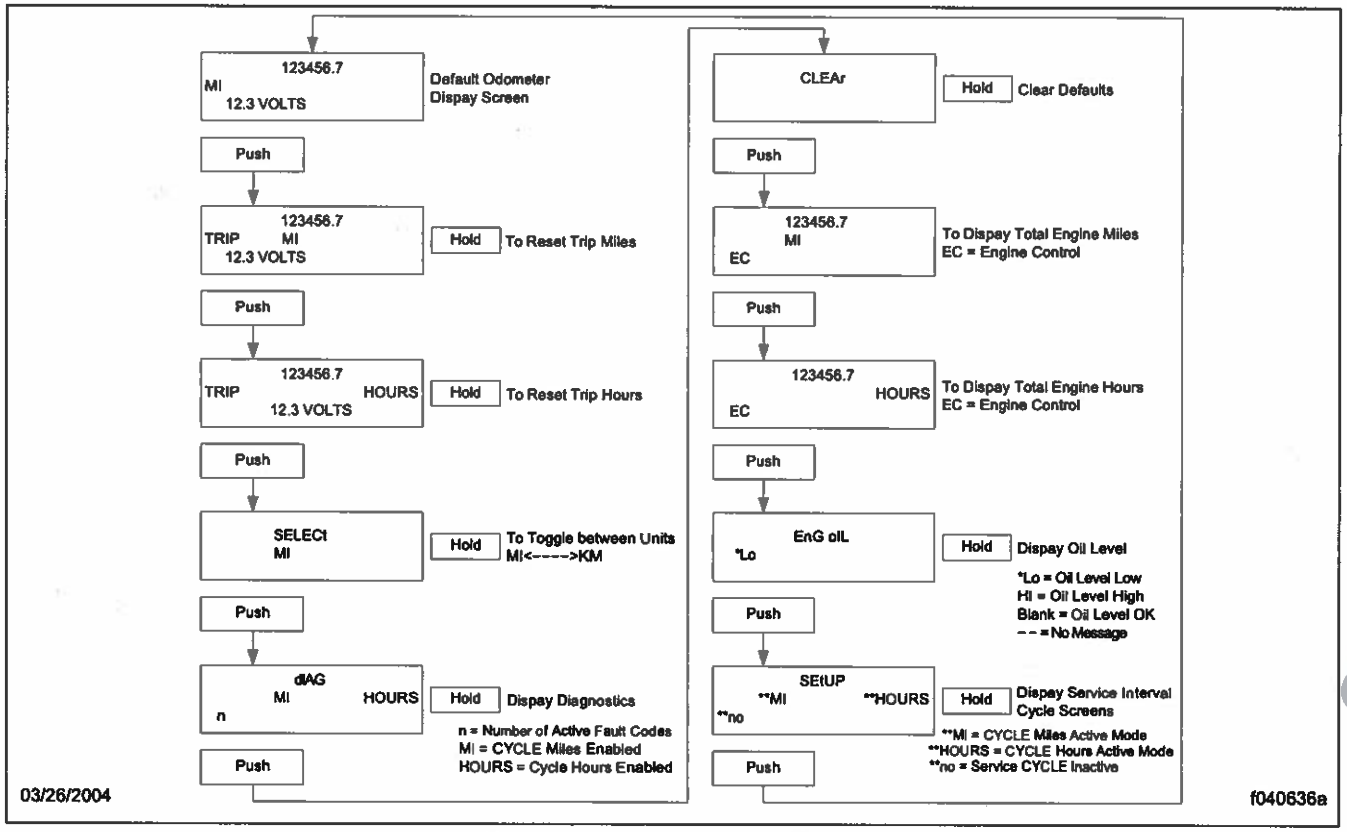


Fig. 2.48, ICU3 Mode Reset LCD Display Cycle

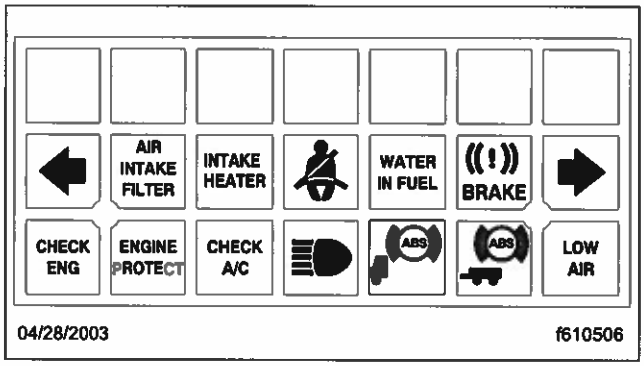


Fig. 2.49, NGI Lightbar

NGI Lightbar Standard Telltales	
Light	**LED Color**
Left Turn Signal	Green
Check Engine	Amber
Engine Protection	Red
Fasten Seat Belt Symbol	Red

NGI Lightbar Standard Telltales	
Light	**LED Color**
High Beam Headlamps	Blue
Tractor ABS (Antilock Brake System)	Amber
Parking/Emergency Brake	Red
Air Intake Filter Restriction	Amber
Right Turn Signal	Green
Trailer ABS	Amber
Water in Fuel	Amber
Intake Heater	Amber
Check A/C	Amber
Low Air	Red

Table 2.3, NGI Lightbar Standard Telltales

Message Center

The NGI message center is a one row, seven character liquid crystal display (LCD), located on the speedometer, that displays the following information:

- Odometer
- Trip Odometers (two)
- Engine Hour Meter
- System Diagnostic Menu
- NGI-specific warning messages

The odometer, hour meter, and trip odometers are primary screens. When a primary screen is displayed for 3 seconds or more it becomes the default screen. The default screen is displayed at ignition and will remain so until manually adjusted using the Mode and Set buttons.

Mode and Set Buttons

The Mode and Set buttons are located in the lower right corner of the instrument cluster. See **Fig. 2.50**. Pressing the Mode button cycles through the various functions. Pressing the Set button selects the desired function. See **Fig. 2.51**. In the Odometer mode, the Set button toggles to MI or KM. In the Trip 1 and 2 Odometer modes, the Set button resets the Trip meter to zero. In the Engine hours mode, total engine hours are displayed. This is not resetable. In the System mode, the Set button initiates the System Diagnostics test and will display any warning messages that are present in the system.

NOTE: The systems diagnostics test is used by trained personnel to retrieve fault codes and other diagnostic information pertaining to the vehicle.

To run the system diagnostics, the following conditions must be met:

- ignition on;
- parking brake set;
- road speed below 2 mph;
- engine rpm at or below 1000;
- no low air pressure warning in effect.

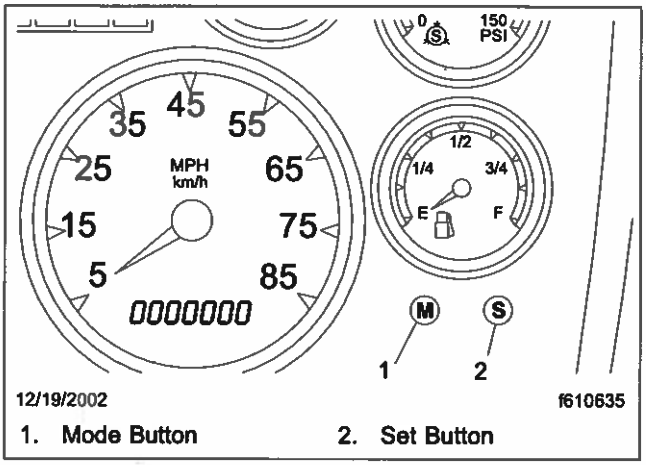


Fig. 2.50, Mode and Set Buttons

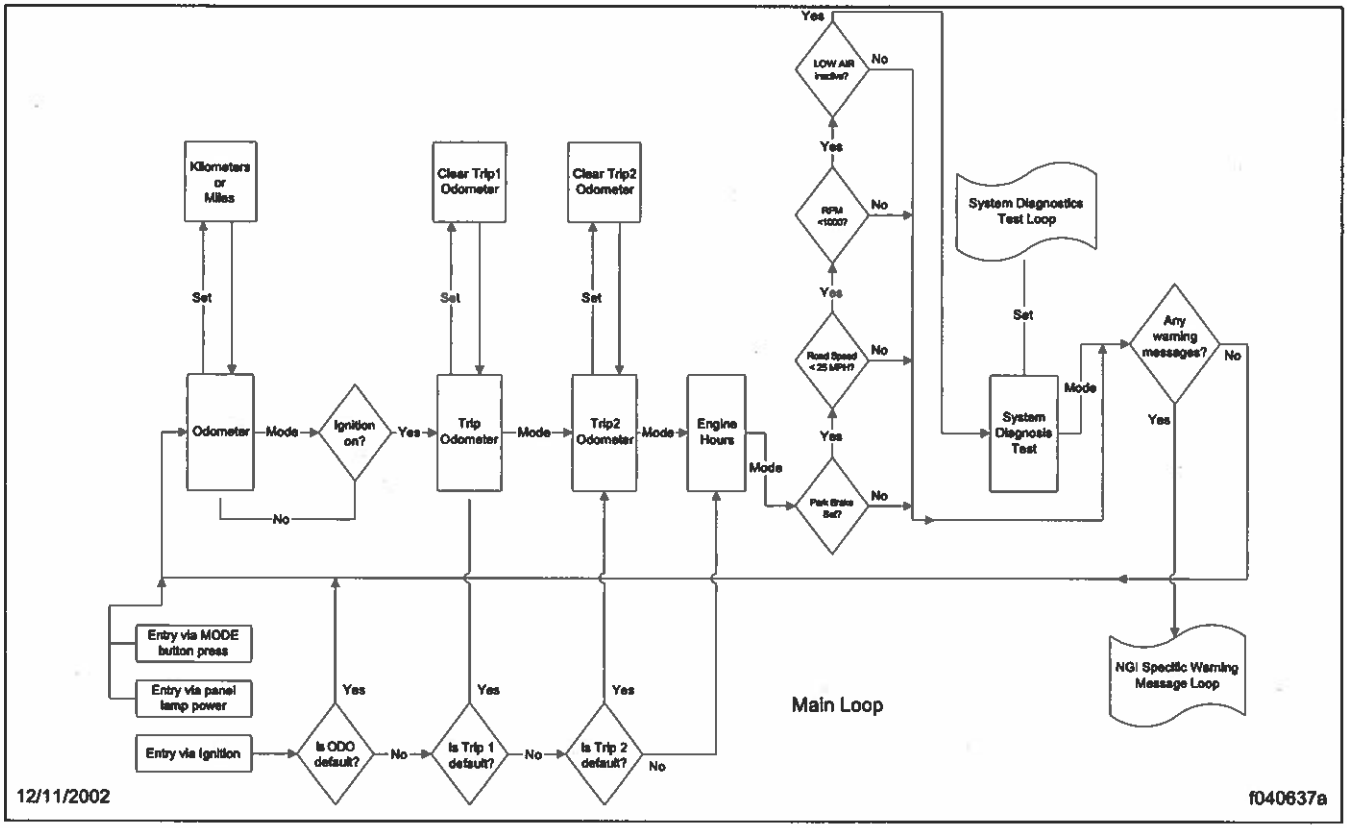


Fig. 2.51, State Diagram for LCD Display

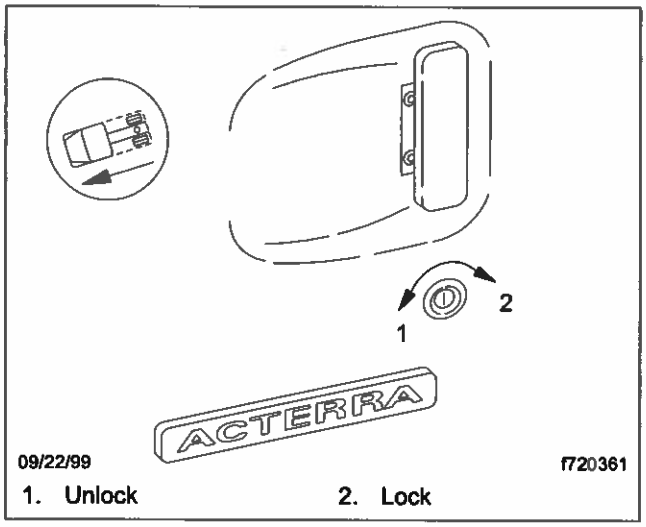
3

Vehicle Access and Features

Cab Door Locks and Handles

The key that operates the ignition switch also locks and unlocks the cab doors from the outside. The lock cannot be operated when the door is open.

To unlock the driver's door from outside the cab, insert the key in the lockset and turn the key counterclockwise (Fig. 3.1). Pull the handle out to open the door. To lock the driver's door, insert the key in the lockset and turn the key clockwise.



09/22/99 f720361

1. Unlock
2. Lock

Fig. 3.1, Driver's Door Lock and Handle

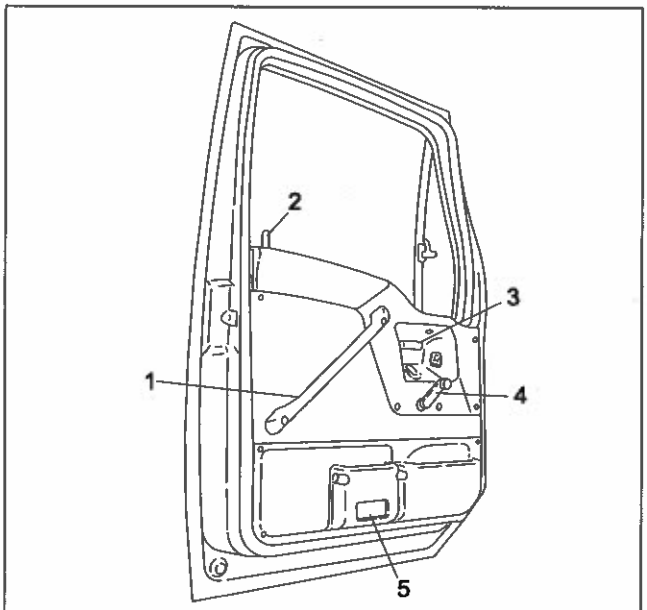
To unlock the passenger's door from outside the cab, insert the key in the lockset and turn the key clockwise. Pull the handle out to open the door. To lock the passenger's door, insert the key in the lockset and turn the key counterclockwise.

To lock the door from inside the cab, close the door, then push the lock button down or push the **L** on the power lock switch. See Fig. 3.2 and Fig. 3.3.

To open the door from the inside, pull the door handle toward you. This will unlatch the door whether or not it was locked. To unlock the door without unlatching it, pull up the lock button or press the **U** on the power lock switch.

Door Windows

If the vehicle has manual window regulators, lower the driver's door window by turning the window regulator handle clockwise. To lower the passenger's



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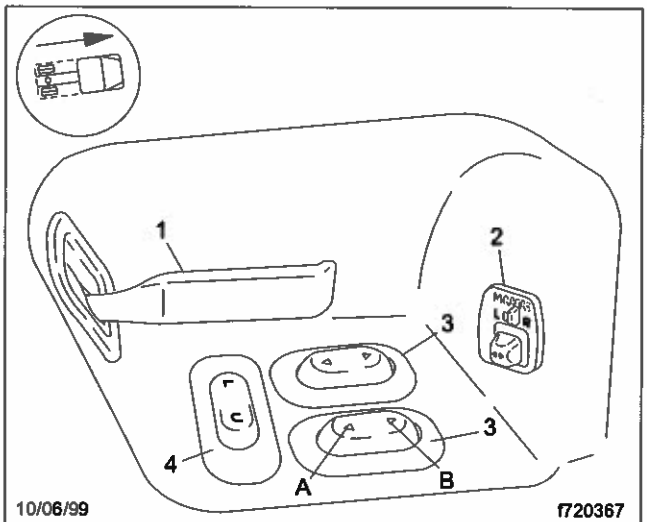
1. Door Grab Handle
2. Lock Button
3. Door Handle
4. Window Regulator Handle
5. Door Light

Fig. 3.2, Door Interior



10/06/99 f720367

A. Push here to lower the window.
B. Push here to raise the window.

1. Door Handle
2. Power Mirror Switch
3. Power Window Switch
4. Power Lock Switch

Fig. 3.3, Power Switches

door window, turn the window regulator handle counterclockwise.

If the vehicle is equipped with power window switches, they are located on the door (Fig. 3.3). Push the dimpled end of the power window switch to lower the window. Push the raised end of the power window switch to raise the window.

Cab Entry and Exit

⚠ WARNING

Wet or dirty shoe soles greatly increase the chance of slipping or falling. If your soles are wet or dirty, be especially careful when climbing onto, or down from, the back-of-cab area.

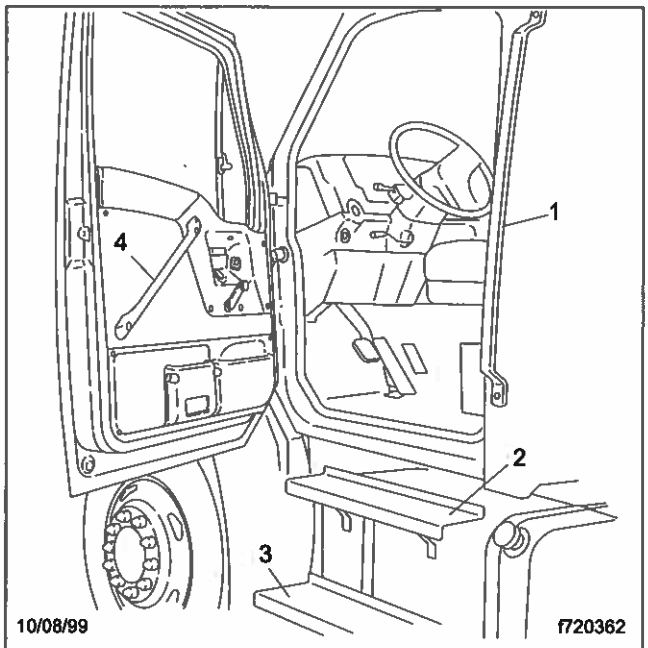
Always maintain three-point contact with the back-of-cab access supports while entering and exiting the back-of-cab area. Three-point contact means both feet and one hand, or both hands and one foot, on the grab handles, steps, and deck plates. Other areas are not meant to support back-of-cab access, and grabbing or stepping in the wrong place could lead to a fall, and personal injury.

Be careful not to get hands or feet tangled in hoses or other back-of-cab equipment. Carelessness could cause a person to trip and fall, with possible injury.

When entering or exiting the cab, use the grab handles and cab access steps as indicated in the following instructions. See Fig. 3.4 and Fig. 3.5.

Entering the Driver's Side When There are Two Cab Access Steps

1. Open the driver's door and place anything that you are carrying in the cab.
2. Grasp the door grab handle with your left hand and the cab grab handle with your right hand.
3. Place your right foot on the bottom step and pull yourself up.
4. Place your left foot on the top step.
5. Grasp the steering wheel with your left hand and step into the cab with your right foot first.



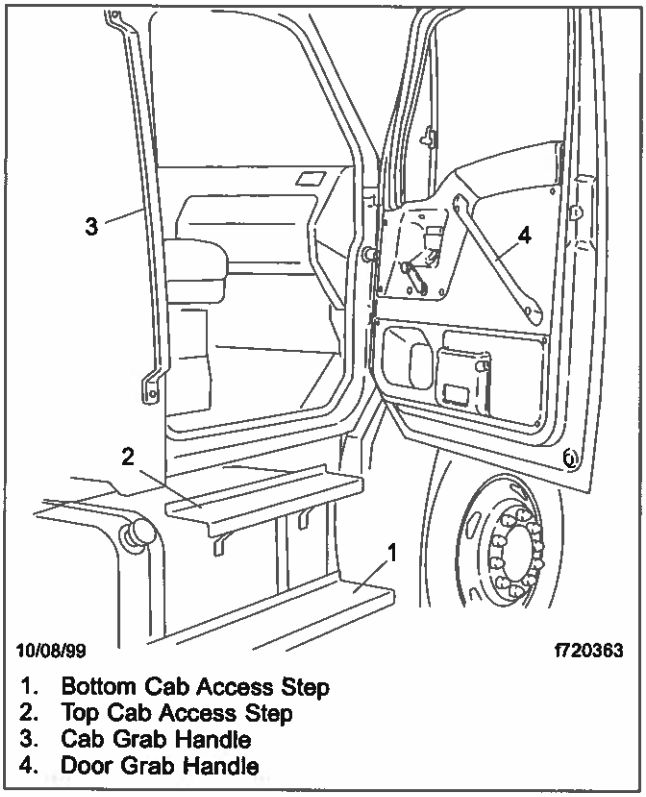
1. Cab Grab Handle
2. Top Cab Access Step
3. Bottom Cab Access Step
4. Door Grab Handle

Fig. 3.4, Driver's Side Cab Access Steps and Grab Handles

6. Grasp the steering wheel with your right hand and pull yourself into the seat.

Exiting the Driver's Side When There are Two Cab Access Steps

1. Do not attempt to exit the cab while carrying any items in your hands.
2. Grasp the steering wheel with both hands and place your left foot on the top step. Pivot your body so you're facing in to the cab.
3. Grasp the cab grab handle with your right hand.
4. Move your right foot to the bottom step.
5. Grasp the door grab handle with your left hand.
6. Step to the ground with your left foot first.



1. Bottom Cab Access Step
2. Top Cab Access Step
3. Cab Grab Handle
4. Door Grab Handle

Fig. 3.5, Passenger's Side Cab Access Steps and Grab Handles

Entering the Passenger's Side When There are Two Cab Access Steps

1. Open the passenger's door and place anything that you are carrying in the cab.
2. Grasp the cab grab handle with your left hand and the door grab handle with your right hand.
3. Place your left foot on the bottom step and pull yourself up.
4. Place your right foot on the top step.
5. Grasp the seat with your left hand and step into the cab with your left foot first.
6. Pull yourself into the seat.

Exiting the Passenger's Side When There are Two Cab Access Steps

1. Do not attempt to exit the cab while carrying any items in your hands.
2. Grasp the door grab handle with your right hand and place your right foot on the top step.
3. Grasp the grab handle with your left hand.
4. Move your left foot to the bottom step.
5. Step to the ground with your right foot first.

Entering the Driver's Side When There is One Cab Access Step

1. Open the driver's door and place anything that you are carrying in the cab.
2. Grasp the door grab handle with your left hand and the grab handle with your right hand.
3. Place your right foot on the cab access step.
4. Bring your left foot up to the cab floor and step up, bringing your right foot into place in the cab.
5. Grasp the steering wheel with your left hand and pull yourself into the seat.

Exiting the Driver's Side When There is One Cab Access Step

1. Do not attempt to exit the cab while carrying any items in your hands.
2. Grasp the door grab handle with your left hand.
3. Move your left foot to the cab access step and grasp the grab handle with your right hand.
4. Bring your right foot down to the ground, then bring your left foot down to the ground.

Entering the Passenger's Side When There is One Cab Access Step

1. Open the passenger's door and place anything that you are carrying in the cab.
2. Grasp the grab handle with your left hand and the door grab handle with your right hand.
3. Place your right foot on the cab access step.
4. Bring your left foot up to the cab floor and step up, bringing your right foot into place in the cab.
5. Grasp the seat with your left hand and pull yourself into the seat.

Exiting the Passenger's Side When There is One Cab Access Step

1. Do not attempt to exit the cab while carrying any items in your hands.
2. Grasp the door grab handle with your right hand.
3. Move your right foot to the cab access step, and grasp the grab handle with your left hand.
4. Bring your left foot down to the ground, then bring your right foot down to the ground.

Hood Tilting

A grab handle at the front of the hood provides a hand-hold for hood tilting. Stop cables prevent the hood from overtravel. In the operating position, the hood is secured to the lower cab half-fenders by a hold-down latch on each side of the hood.

To Tilt the Hood

1. Apply the parking brakes.
2. Release both hood hold-down latches by pulling the ends up. See **Fig. 3.6**.

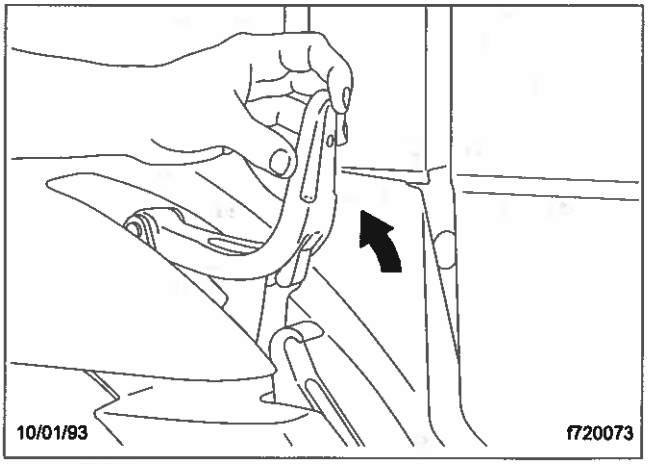


Fig. 3.6, Unlatch the Hood

3. Using the front bumper step and the hood handle, slowly tilt the hood until the stop cables support it. See **Fig. 3.7**.

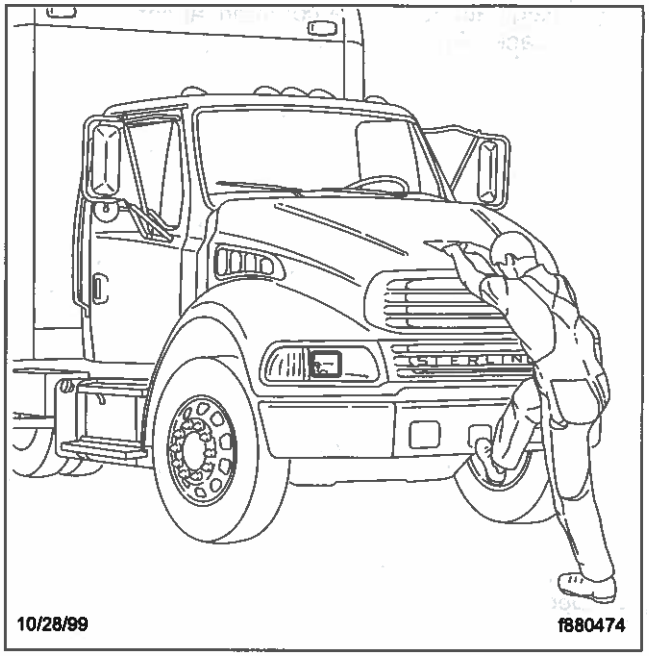


Fig. 3.7, Tilting the Hood

⚠ CAUTION

Do not let the hood free-fall to the full-open position. To do so could cause damage to the hood or hood straps.

To Return the Hood

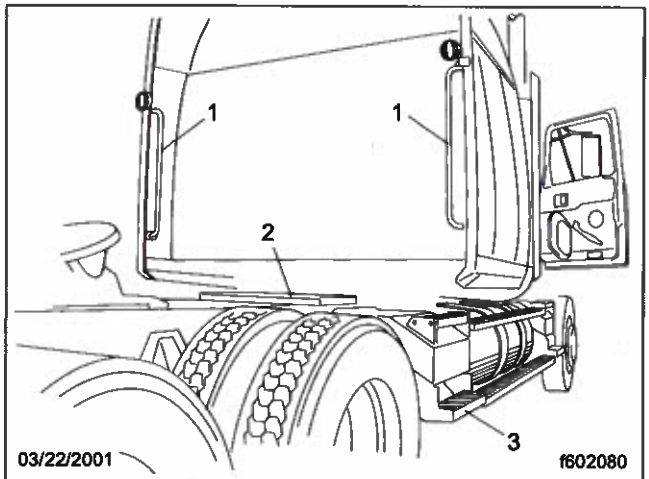
1. Grasp the hood handle and lift the hood to the 45-degree position.
2. As the hood goes over center, use the bumper step and the hood handle to control the rate of descent to the operating position.
3. Make sure the hood is flush with the cowl, then secure the hood by engaging both hood hold-down latches.

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

Back-of-Cab Grab Handles, Steps, and Deck Plate

When trailer air and electrical connections cannot be coupled from the ground, Federal Motor Carrier

Safety Regulations require commercial carriers to provide back-of-cab access (Fig. 3.8).



1. Grab Handle
2. Deck Plate
3. Step

Fig. 3.8, Back-of-Cab Access

A grab handle is mounted either on the exhaust shield, the cab, or the sleeper. Steps are mounted on the fuel tank, battery box, or frame; depending on the available space. When an optional deck plate is included, it is mounted across the top of the frame rails.

⚠ WARNING

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, be especially careful when entering or exiting the vehicle, or back-of-cab access.

Always maintain three-point contact with the vehicle, when accessing the back of 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.

Accessing Back-of-Cab Area

When climbing onto the deck plate, use the grab handle and access steps as follows:

1. 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.

Exiting the Back-of-Cab Area

When climbing down from the deck plate, use the grab handle and access steps as follows:

1. Grasp the grab handle with both hands.
2. Step one foot at a time to 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. Move your upper hand to a lower position on the grab handle.
6. Step to the ground with your upper foot first.

Fuse, Relay, and Circuit Breaker Identification

There are two power distribution modules (PDM) in the vehicle. The internal PDM is located below the right-side dash or the passenger-side dash. The external PDM is located under the hood on the front-wall. Refer to Fig. 3.9 and Table 3.1 for the internal PDM fuse, relay, and circuit breaker identification. Refer to Fig. 3.10 and Table 3.2 for the external PDM fuse, relay, and circuit breaker identification.

Internal PDM Fuse, Relay, and Circuit Breaker Identification

Pos. No.	Description	Part Number	Rating
1	—	D9ZB-14A094-CA and F6HT-14526-CA	10A

Internal PDM Fuse, Relay, and Circuit Breaker Identification			
Pos. No.	Description	Part Number	Rating
2	Power Door Lock	D9ZB-14A094-CA and F6HT-14526-CA	10A
3	Horn/Buzzer	D9ZB-14A094-CA and F6HT-14526-CA	10A
4	Windshield Washer/Wiper	F6HT-145264-NA and F6HT-14526-NA	11/CB
5	—	D9ZB-14A094-DA and F6HT-14526-DA	15A
6	Air Dryer Heater	D9ZB-14A094-CA and F6HT-14526-CA	10A
7	—	D9ZB-14A094-CA and F6HT-14526-CA	10A
8	Axle Shift	D9ZB-14A094-DA and F6HT-14526-DA	15A
9	—	D9ZB-14A094-CA and F6HT-14526-CA	10A
10	Backup Lamp	D9ZB-14A094-CA and F6HT-14526-CA	10A
11	Open	D9ZB-14A094-CA and F6HT-14526-CA	10A
12	—	D9ZB-14A094-CA and F6HT-14526-CA	10A
13	—	D9ZB-14A094-CA and F6HT-14526-CA	10A
14	—	D9ZB-14A094-CA and F6HT-14526-CA	10A
15	Radio System	D9ZB-14A094-EA and F6HT-14526-EA	20A
16	Radio System	D9ZB-14A094-CA and F6HT-14526-CA	10A
17	Mirror, Heated, Power	D9ZB-14A094-FA and F6HT-14526-FA	25A
18	Accessory Supply	D9ZB-14A094-DA and F6HT-14526-DA	15A
19	—	D9ZB-14A094-BA and F6HT-14526-BA	5A
20	—	D9ZB-14A094-DA and F6HT-14526-DA	15A
21	—	D9ZB-14A094-CA and F6HT-14526-CA	10A
22	Ignition Run	D9ZB-14A094-CA and F6HT-14526-CA	10A
23	—	D9ZB-14A094-DA and F6HT-14526-DA	15A
24	CB Radio Post	D9ZB-14A094-DA and F6HT-14526-DA	15A

Internal PDM Fuse, Relay, and Circuit Breaker Identification			
Pos. No.	Description	Part Number	Rating
25	Start, Ignition	D9ZB-14A094-FA and F6HT-14526-FA	25A
26	ABS Hydraulic Pump	D9ZB-14A094-CA and F6HT-14526-CA	10A
27	Open	—	—
28	Open	—	—
29	Open	—	—
30	Open	—	—
31	Interior Light	D9ZB-14A094-DA and F6HT-14526-DA	15A
32	Marker Clearance Lamp	D9ZB-14A094-DA and F6HT-14526-DA	15A
33	Cluster Diagram Connector	D9ZB-14A094-DA and F6HT-14526-DA	15A
34	Left Side Power Window	F6HT-14526-MA and F6HT-14526-MA	18A/CB
35	Right Side Power Window	F6HT-14526-MA and F6HT-14526-MA	18A/CB
36	Utility/Trailer Lamp	—	—
37	Head Lamp	D9ZB-14A094-DA and F6HT-14526-DA	15A
38	Open	D9ZB-14A094-CA and F6HT-14526-CA	—
39	Fog/Road Lamp	D9ZB-14A094-CA and F6HT-14526-CA	10A
40	Open	—	—
41	Open	—	—
42	Stop Lamp/Hazard Warning Lamp	D9ZB-14A094-GA and F6HT-14526-GA	30A
43	Engine	D9ZB-14A094-CA and F6HT-14526-CA	10A
44	—	D9ZB-14A094-CA and F6HT-14526-CA	—
45	ABS	D9ZB-14A094-BA and F6HT-14526-AA	5A
46	—	D9ZB-14A094-CA and F6HT-14526-CA	10A
47	ABS	D9ZB-14A094-BA and F6HT-14526-AA	5A
48	—	D9ZB-14A094-BA and F6HT-14526-BA	—
R1	Right Side Power Window Relay	23-11276-011	—
R2	Left Side Power Window Relay	23-11276-011	—
R3	2-Speed Axle Relay	23-11276-011	—

Internal PDM Fuse, Relay, and Circuit Breaker Identification			
Pos. No.	Description	Part Number	Rating
R4	Ignition Run Relay	23-11276-011	—
R5	Ignition Run/ Accessory Relay	23-11276-011	—
R6	Ignition Run Relay	23-11276-011	—
R7	Fog/Road Lamp	23-11276-011	—
R8	HVAC Blower	—	—
R9	Hazard Warning Lamps	—	—
R10	Open	—	—
R11	Windshield Wiper/ Washer	23-11276-011	—
R12	ABS Power	23-11276-011	—
R13	Transmission	680 545 00 05	—
R14	Brake Cut Out	680 545 00 05	—

Internal PDM Fuse, Relay, and Circuit Breaker Identification			
Pos. No.	Description	Part Number	Rating
R15	Open	—	—
R16	Open	—	—
R17	Hydraulic Brake Pump	680 545 00 05	—
R18	Engine Brake	680 545 00 05	—
R19	ABS Lamp	680 545 00 05	—
R20	2-Speed Axle, MBE	680 545 00 05	—
R21	Electronic Engine Service Brake	680 545 00 05	—
R22	Trans ABS	680 545 00 05	—

Table 3.1, Internal PDM Fuse, Relay, and Circuit Breaker Identification

External PDM Fuse, Relay, and Circuit Breaker Identification			
Pos.	Description	Part Number	Rating
R–A	Fuel Heater Relay (optional)	F0AB-14B192-AA	—
R–B	Tail/Brake Lamp Relay (body builder)	F0AB-14B192-AA	—
R–C	Marker Lamp Relay (body builder)	F0AB-14B192-AA	—
R–D	Transmission, Backup Light Relay	F0AB-14B192-AA	—
R–E	Trailer ABS ECU Constant Relay	F80B-14B192-AA	—
R–F	Transmission Neutral Relay	F0AB-14B192-AA	—
R–G	Not Used	—	—
R–H	Not Used	—	—
R–J	Not Used	—	—
R–K	Not Used	—	—
R–L	Not Used	—	—
R–M	Not Used	—	—
R–N	Trailer Left-Turn Relay	F0AB-14B192-AA	—
R–P	Trailer Right-Turn Relay	F0AB-14B192-AA	—
R–R	Trailer Park Lamp Relay	F0AB-14B192-AA	—
R–U	Trailer Marker Lamp Relay	F0AB-14B192-AA	—
R–V	Trailer Brake Lamp Relay	F80B-14B192-AA	—
R–W	Not Used	—	—
A	Power to R–A Fuel Heater (optional)	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
B	Feed F1, F2 (PDM electrical center)	E97B-14A094-AA and F6HT-14526-LA	30A Fuse 30A CB
C	Feed to R–B, R–C (body builder)	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
D	Feed F13, F14, F15 (PDM electrical center)	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
E	Power to R–2 (PDM electrical center) Left Door	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
F	Feed F36 (PDM electrical center)	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
G	Power to R–8 (PDM electrical center) HVAC Blower Motor	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
H	Power to R–6 (PDM electrical center) Ignition Run	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB

External PDM Fuse, Relay, and Circuit Breaker Identification			
Pos.	**Description**	**Part Number**	**Rating**
J	Ignition to R–5 (PDM electrical center)	E97B-14A094-DA	60A Fuse 60A CB
K	Feed F31, F32, F33 (PDM electrical center)	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
L	Feed F37 (PDM electrical center) Head Lamps	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
M	Feed F26 (PDM electrical center) ABS Power	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
N	Open	—	—
P	Open	—	—
R	Open	—	—
S	Feed F3, F4 (PDM electrical center) Windshield Wipers	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
T	Power to R–N, R–P Trailer Left and Right Turn Signals	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
U	Feed F23, F24 (PDM electrical center) CB Radio	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
V	Power to R–1 (PDM electrical center) Right Door	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
W	Power to R–R, R–U Trailer Park/Marker	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
X	Open	—	30A Fuse 30A CB
Y	Open	—	30A Fuse 30A CB
Z	Feed F42 (PDM Electrical Center) Brake Lamp/ Flash	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
AA	Feed PDM Electrical Center (A) Custom Access Panel	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
BB	Open	—	30A Fuse 30A CB
CC	Power to R–V Trailer Brake Lamp	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
DD	Open	—	—
EE	Power to R–E Trailer	E97B-14A094-BA and F6HT-14526-JA	40A Fuse 40A CB
FF	Open	—	—
GG	Open	—	—

Table 3.2, External PDM Fuse, Relay, and Circuit Breaker Identification

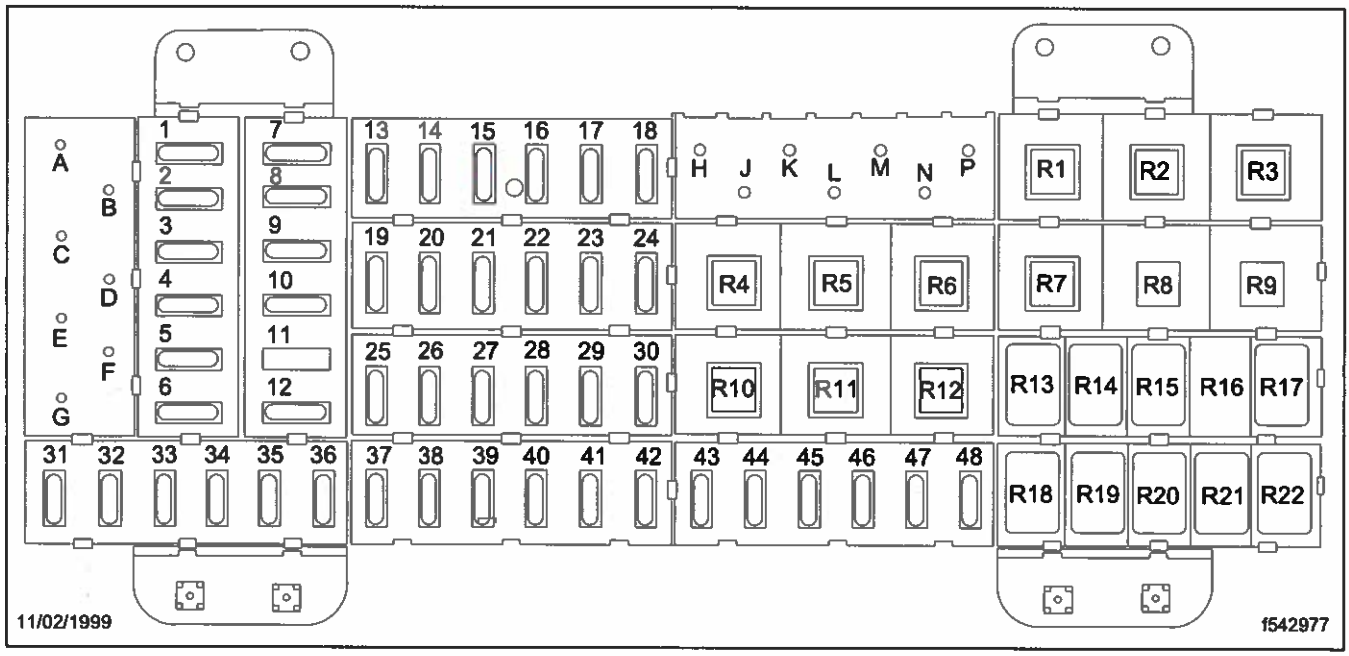


Fig. 3.9, Internal PDM Fuse, Relay, and Circuit Breaker Panel

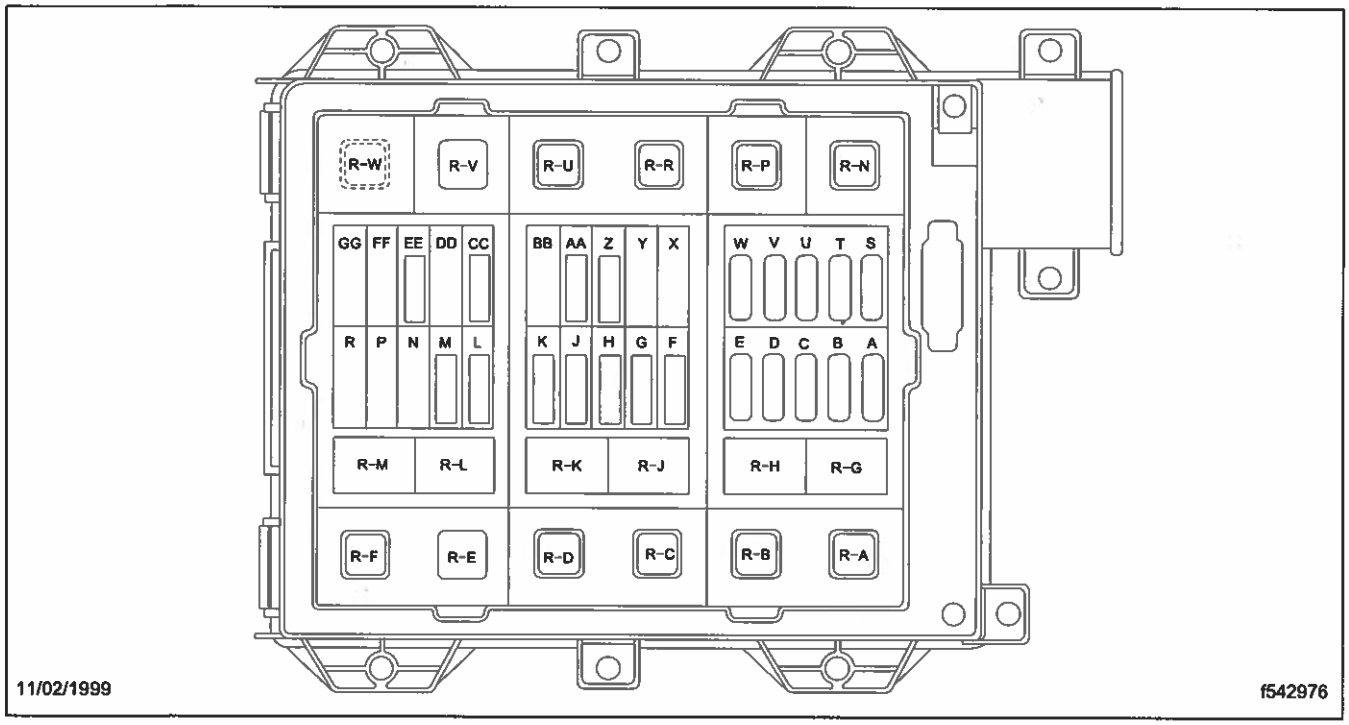


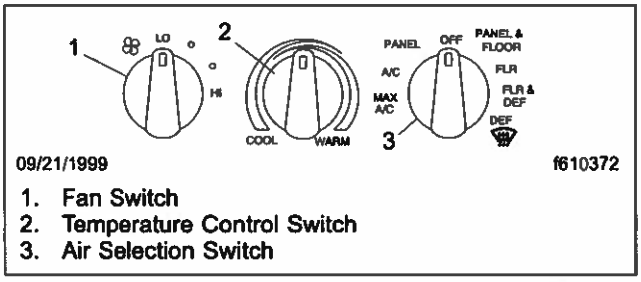
Fig. 3.10, External PDM Fuse, Relay, and Circuit Breaker Panel

4

Heater and Air Conditioner

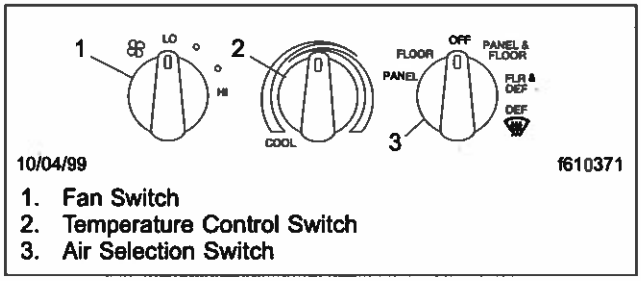
HVAC General Information

A dash-mounted climate control panel (Fig. 4.1 or Fig. 4.2) allows you to control all of the heating, air conditioning, defrosting, and ventilating functions.



1. Fan Switch
2. Temperature Control Switch
3. Air Selection Switch

Fig. 4.1, Climate Control Panel With Air Conditioning



1. Fan Switch
2. Temperature Control Switch
3. Air Selection Switch

Fig. 4.2, Climate Control Panel Without Air Conditioning

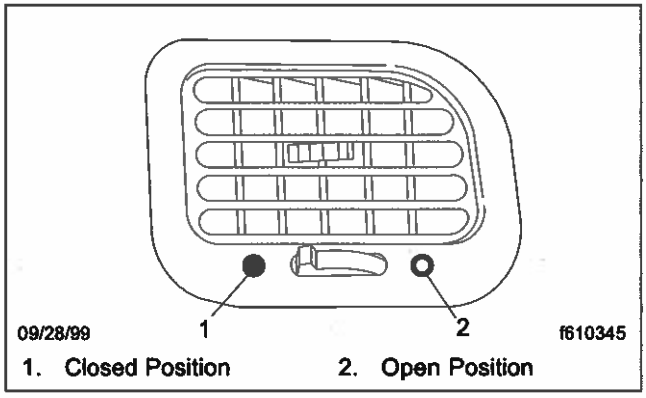
A four-speed fan forces fresh or recirculated air through the air outlets at the windshield, door windows, dash panel, and cab floor.

A temperature control switch is used to select the desired temperature. Turn the switch counterclockwise for cool air, or clockwise for warm air.

An air selection switch controls the direction of warm or cool air either through the dash panel louvers, the dash panel louvers and floor outlets, the floor outlets, the floor and defrost (windshield) outlets, or the defrost outlets.

The dash panel louvers can be adjusted left and right, and up and down. Close the louver by moving the control toward the solid circle; open the louver by moving the control toward the open circle (Fig. 4.3).

Fresh air is forced through the air outlets when the air selection switch is in the A/C (air conditioning), PANEL, PANEL & FLOOR, FLR (floor), FLR & DEF (defrost), and DEF positions. Recirculated air is forced through the air outlets when the air selection



1. Closed Position
2. Open Position

Fig. 4.3, Dash Panel Louver

switch is in the MAX A/C (maximum air conditioning) position. Dusty or smoky outside air is prevented from being drawn inside the cab when the air selection switch is in the OFF position.

IMPORTANT: To prevent the buildup of fumes or odors (for example from smoking) and to prevent oxygen depletion inside the cab, do *not* operate the air conditioning system in the MAX A/C mode for more than 20 minutes.

NOTE: An engine heater supply gate valve is optional on the Acterra. Shutting off the heater supply gate valve limits the ability to control the air conditioning temperature in the cab. With the valve shut off, warm coolant is no longer available from the engine and the controls on the climate control panel can't be used to change the air temperature.

Defogging and Defrosting Using Fresh Air

1. Turn the temperature control switch all the way clockwise for warm air, and turn the fan switch to LO before starting the engine.
2. Remove any ice or snow from the outside of the windshield, door windows, and fresh air inlet grille.
3. With the engine at operating temperature, turn the fan switch to the highest speed. Leave it in this position for 30 seconds. This will clear the system of moist air.

4. Move the air selection switch to the defrost (DEF) position. In this position warm, dry air is directed to the windshield.

NOTE: If your vehicle is equipped with air conditioning, the air conditioner automatically comes on in the defrost mode. Operating in this mode dries the air.

Heating

1. With the engine at operating temperature, move the temperature control switch all the way clockwise for heat.
2. Turn on the fan switch to the desired speed.
3. Move the air selection switch to the desired setting.

IMPORTANT: If the windows start to fog, move the air selection switch to defrost (DEF) and make sure the fan is on.

NOTE: In mild weather the fan switch can be kept in the LO position since forward motion of the vehicle will provide airflow through the heater.

4. When a comfortable temperature has been reached, adjust the fan switch setting and temperature control switch as needed to maintain the temperature.

Air Conditioning, Optional

IMPORTANT: Operate the air conditioner at least five minutes each month, even during cool weather. This helps prevent drying and cracking of tubing seals, reducing refrigerant leaks in the system. Operate the air conditioner only after the engine compartment is warm, and the interior of the cab is 70°F (21°C) or higher. During cold weather, the heater can be operated at the same time to prevent discomfort.

1. If the cab is hot inside, temporarily open the windows to let the hot air out.
2. Move the air selection switch to a non-air conditioning panel position and turn the fan switch to LO before starting the engine.
3. Start the engine.
4. Move the air selection switch to either one of the air conditioning settings. With the switch at the A/C setting, fresh air is drawn into the cab. With the switch at MAX A/C, the air inside the cab is recirculated. A recirculated air (RECIRC AIR) indicator on the dash message center illuminates when the air inside the cab is recirculated.

IMPORTANT: To prevent the buildup of fumes or odors (for example from smoking) and to prevent oxygen depletion inside the cab, do *not* operate the air conditioning system in the MAX A/C mode for more than 20 minutes.

5. Move the temperature control switch counterclockwise for cool air. In this position, no heat is given off by the heater.
6. Turn the fan switch to the highest speed.
7. As soon as cool air is flowing from the dash panel louvers, close the windows. Adjust the fan switch setting as desired.
8. If the air from the outlets is too cold, move the temperature control switch clockwise for warmer air flow.

IMPORTANT: If the outside air is dusty or smoky, set the air selection switch to MAX A/C and keep the windows and vent closed to prevent drawing in dust or smoke. The air selection switch can also be set to OFF to prevent drawing in dust or smoke.

Fresh Air

1. Move the air selection switch to the desired position.
2. Move the temperature control switch counterclockwise for no heating, or move it clockwise for heat.
3. Set the fan switch at the desired speed.

5

Seats and Seat Belts

Seats

General Information

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

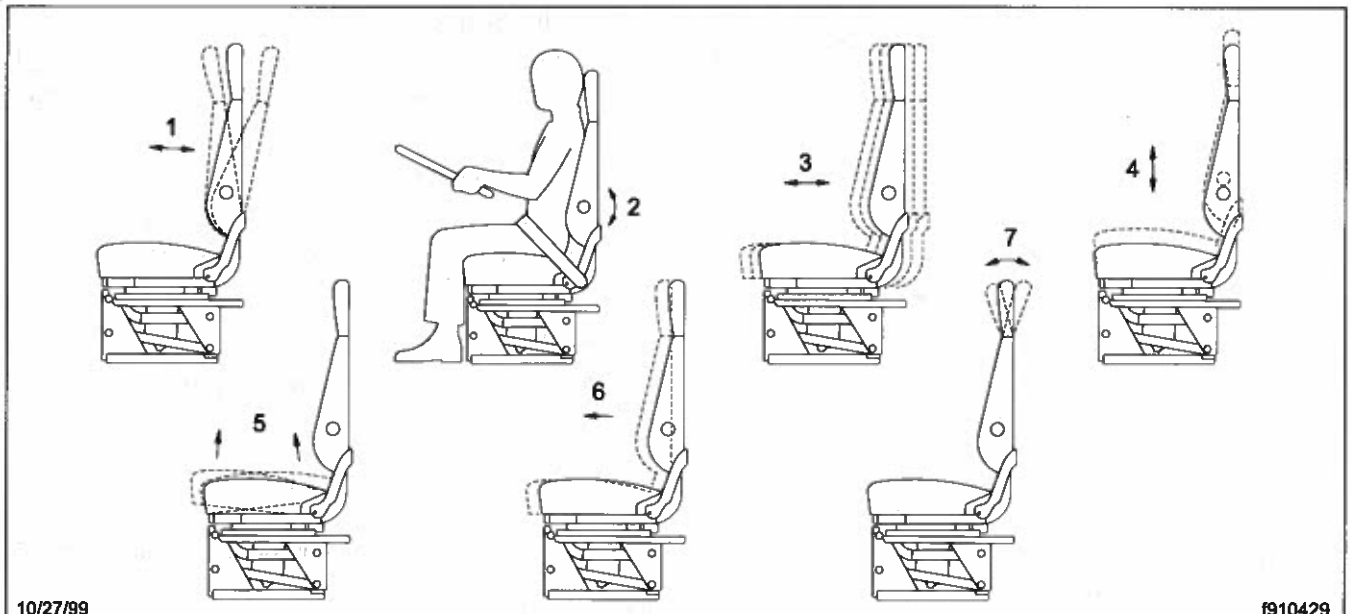
⚠ WARNING

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

Seat Adjustment

The following is a description of adjustments that can be made to various Sterling-installed seats. Not all seats have all of the adjustments listed below. See **Fig. 5.1** for illustrations of the seat adjustments.

1. Back Cushion Tilt: This adjustment tilts the back cushion forward or backward.
2. Lumbar Support: Lumbar support changes the shape of the back of the seat to give more or less support to the occupant's lumbar (lower back) area. This adjustment is either mechanical or air controlled depending on the type of seat.
3. Isolator: This feature (also referred to as back-slap isolator or Chugger-Snubber®) 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 when the isolator is not desired.
4. Height Adjustment: The entire seat moves up or down when adjusting the height. The adjustment is either manually controlled or air controlled depending on the type of seat.
5. Bottom Cushion Angle or Fore and Aft Bottom Cushion Height: This feature lets the occupant 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.



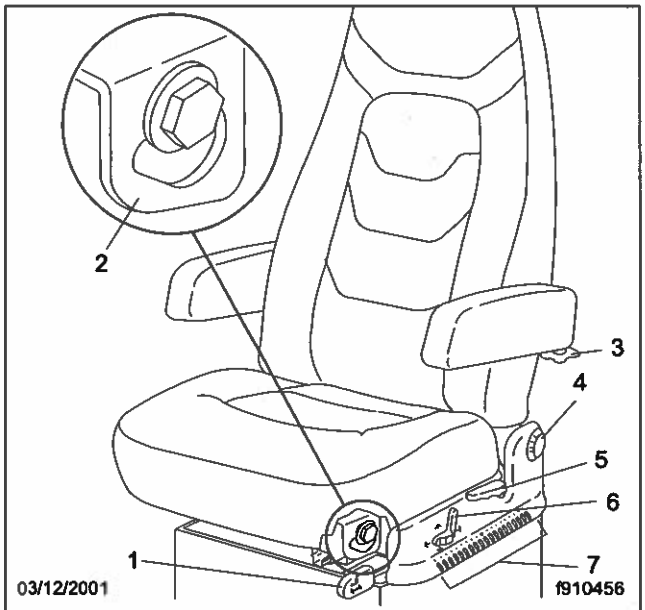
1. Back Cushion Tilt
2. Lumbar Support
3. Isolator Feature
4. Height Adjustment
5. Bottom Cushion Angle (fore and aft cushion height)
6. Fore and Aft Seat Adjustment (seat track adjustment)
7. Head Rest Adjustment

Fig. 5.1, Seat Adjustments

6. Fore and Aft Seat or Seat Track Adjustment: The entire seat moves forward or backward when this adjustment is made.
7. Head Rest Adjustment: When this adjustment is made, the angle of the head rest changes to provide support to the head.
8. Weight Adjustment: On seats with weight adjustment, the feature is fully automatic. When you sit on the seat, a leveling valve places you in the center of the ride zone. Additional adjustments are possible by using the height adjustment feature.

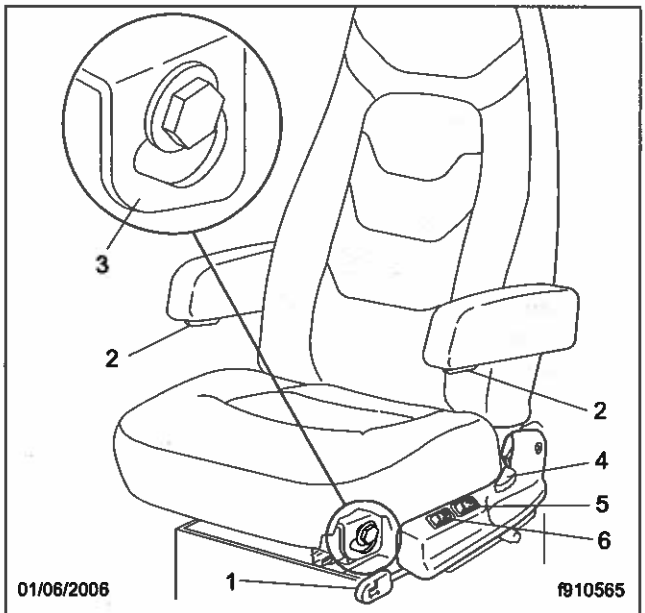
EzyRider® Seat

For seat adjustment controls on vehicles built before November 28, 2005, see **Fig. 5.2**. For seat adjustment controls on vehicles built on or after November 28, 2005, see **Fig. 5.3**.



1. Isolator and Fore/Aft Seat Adjustment Lever
2. Bottom Cushion Angle Guide
3. Armrest Adjustment Knob
4. Back Cushion Tilt Position Indicator
5. Back Cushion Tilt Lever
6. Height Adjustment and Lumbar Support Lever
7. Fore/Aft Seat Position Indicator

Fig. 5.2, EzyRider Seat Adjustment Controls (Vehicles Built Before November 28, 2005)



1. Isolator and Fore/Aft Seat Adjustment Lever
2. Armrest Adjustment Knob
3. Bottom Cushion Angle Guide
4. Back Cushion Tilt Lever
5. Lumbar Support Switch
6. Height Adjustment Switch

Fig. 5.3, EzyRider Seat Adjustment Controls (Vehicles Built on or After November 28, 2005)

Back Cushion Tilt

To tilt the back cushion, raise the back cushion tilt lever and lean forward or backward. Release the lever to lock the cushion in place.

Lumbar Support

To adjust the amount of support for your lower back, use the lumbar support switch or lever on the side of the seat.

Isolator

To engage the isolator, push in on the isolator lever. To lock out the isolator, pull the isolator lever out to the first stop.

Fore and Aft Seat Adjustment

Pull the fore and aft seat adjustment lever out to the second stop and slide the seat forward or backward to the desired position.

Height Adjustment

To raise or lower the seat, use the height adjustment switch or lever on the side of the seat.

Bottom Cushion Angle

To adjust the bottom cushion angle, pull the bottom cushion up and forward or down and back. The bottom cushion angle is controlled by the guides on each side of the seat.

Seat Position Indicators

Seats installed in vehicles built before November 28, 2005 are equipped with seat position indicators. A back cushion tilt position indicator and a fore/aft seat position indicator allow the driver to see where the seat is adjusted within the adjustment ranges.

Armrest Angle (optional armrests)

To adjust the vertical angle of the armrest, turn the adjustment knob on the underside of the armrest.

National Nonsuspended Seat

See Fig. 5.4 for seat adjustment controls.

Back Cushion Tilt

To tilt the back cushion, turn the back cushion tilt knob and lean forward or backward.

Fore and Aft Seat Adjustment

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.

Fore and Aft Bottom Cushion Adjustment

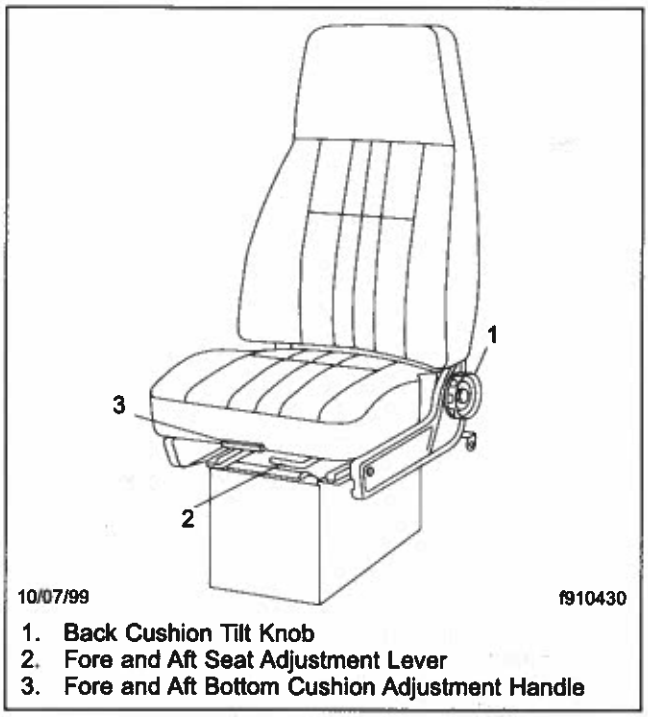
To adjust the fore and aft position of the bottom cushion only, pull the fore and aft bottom cushion adjustment handle out and slide the bottom cushion forward or backward to the desired position.

National 2000 Series Seat

See Fig. 5.5 for seat adjustment controls.

Back Cushion Tilt

To tilt the back cushion, turn the back cushion tilt knob until the desired position is reached.



1. Back Cushion Tilt Knob
2. Fore and Aft Seat Adjustment Lever
3. Fore and Aft Bottom Cushion Adjustment Handle

Fig. 5.4, National Nonsuspended Seat Adjustment Controls

Height Adjustment

To raise or lower the height of the seat, use the height adjustment switch on the side of the seat.

Fore and Aft Seat Adjustment

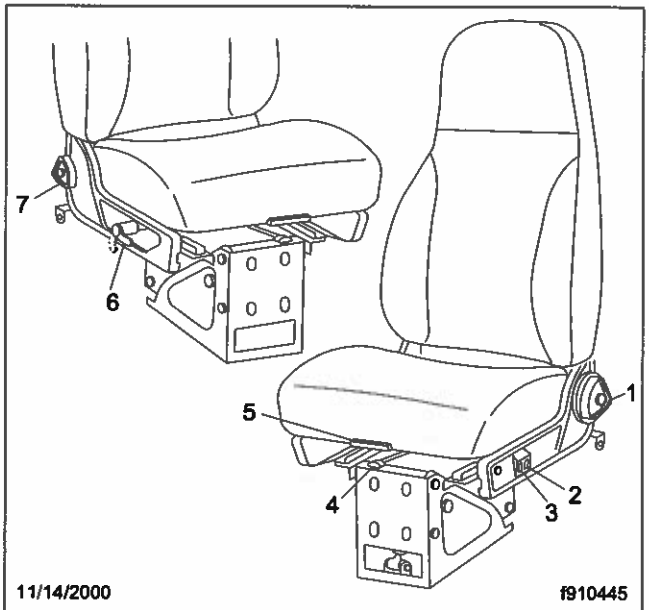
To adjust the fore and aft position of the entire seat, move the fore and aft seat adjustment lever to the left and slide the seat forward or backward to the desired position. Move the lever back to its original position to lock the seat in place.

Rear Cushion Adjustment

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.

Isolator

Also called a Chugger Snubber®, the isolator reduces the amount of road shock by isolating the occupant from the motion of the vehicle and allowing the seat to move in a simple pendulum motion. To use the



1. Back Cushion Tilt Knob
2. Lumbar Support Switch
3. Height Adjustment Switch
4. Fore and Aft Seat Adjustment Lever
5. Bottom Cushion Front Height Adjustment Handle
6. Isolator Handle
7. Rear Cushion Adjustment Knob

Fig. 5.5, National 2000 Series Seat Adjustment Controls

isolator feature, turn the isolator handle to the horizontal position. Turn the isolator handle down when the isolator feature is not desired.

Lumbar Support

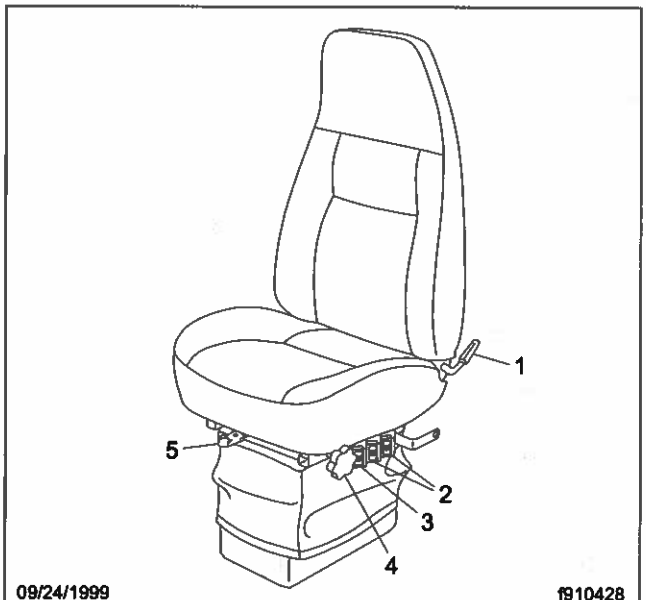
To adjust the lumbar support, use the lumbar support switch on the side of the seat to give more or less support to your lower back.

Bottom Cushion Front Height

To adjust the height of the front of the bottom cushion, lift the bottom cushion front height adjustment handle, and pull forward or push back to the desired setting.

Bostrom Talladega™ 915 Seat

See Fig. 5.6 for seat adjustment controls.



1. Back Cushion Tilt Lever
2. Upper and Lower Lumbar Support Switches
3. Height Adjustment Switch
4. Bottom Cushion Tilt Adjustment Knob
5. Fore and Aft Seat Adjustment Lever

Fig. 5.6, Bostrom Talladega 915 Seat Adjustment Controls

Back Cushion Tilt

To tilt the back cushion, lean forward slightly to remove pressure from the cushion and hold the back cushion tilt lever down. Lean backward slowly to the desired position and release the lever to lock the cushion in place.

Height Adjustment

To raise the seat, push up on the height adjustment switch. To lower the seat, push down on the height adjustment switch.

Fore and Aft Seat Adjustment

Move the fore and aft seat adjustment lever to the side to adjust the seat to the desired fore-aft position. Move the lever back to its original position to lock the fore-aft position.

Bottom Cushion Tilt Adjustment

Turn the bottom cushion tilt adjustment knob to increase or decrease the bottom cushion tilt.

Lumbar Support

For seats with air lumbar support, use the upper and lower lumbar support switches to adjust the top lumbar and bottom lumbar supports.

Two-Passenger Bench Seat

The two-passenger bench seat is stationary. The bottom seat cushion lifts up to access an additional storage area under the seat.

Seat Belts and Tether Belts

General Information

Seat belt assemblies are designed to secure persons in the vehicle to help lessen the chance of injury or the amount of injury resulting from accidents or sudden stops. For this reason, Sterling Truck Corporation urges the driver and *all* passengers, regardless of age or physical condition, to use seat belts when riding in the vehicle.

Seat belt assemblies in the vehicle meet Federal Motor Vehicle Safety Standard 209, "Type 1" and "Type 2" requirements. They are recommended for all persons weighing over 50 pounds (23 kg).

A child restraint system should also be provided for each child weighing 50 pounds (23 kg) or less. It should meet the requirements of Federal Motor Vehicle Safety Standard 213, "Child Restraint Systems." When providing such a restraint system, 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.

See **Chapter 11** for the seat belt inspection procedure.

Seat Belt Operation

Three-Point Seat Belt With Komfort® Latch

While your vehicle is in motion, the combination lap and shoulder belt adjusts to your movement. However, if you brake hard, corner hard or if your vehicle receives an impact of 5 mph (8 km/h) or more, the lap and shoulder belt locks and prevents you from moving.

⚠ 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.

⚠ WARNING

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

1. Pull the lap-shoulder portion of the belt from the retractor so that the shoulder portion of the belt crosses your shoulder and chest. Insert the belt tongue into the proper buckle until you hear a snap and feel it latch.
2. Tighten the lap portion of the belt, pull up on the shoulder piece until it fits you snugly. The belt should rest as low on your hips as possible.
3. If desired, engage the Komfort latch as follows:

   Pull on the shoulder strap to lessen the pressure of the strap on your shoulder and chest. Allow no more than one inch (2.5 cm) of slack between your chest and the shoulder harness. See **Fig. 5.7**. More slack can significantly reduce the seat belt's effectiveness in an accident or a sudden stop. While holding the belt slack, press the Komfort latch lever up, clamping the belt's webbing. See **Fig. 5.8**.
4. To unbuckle the three-point seat belt, push the button on the buckle as shown in **Fig. 5.9**. If the Komfort latch was used, release it 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.

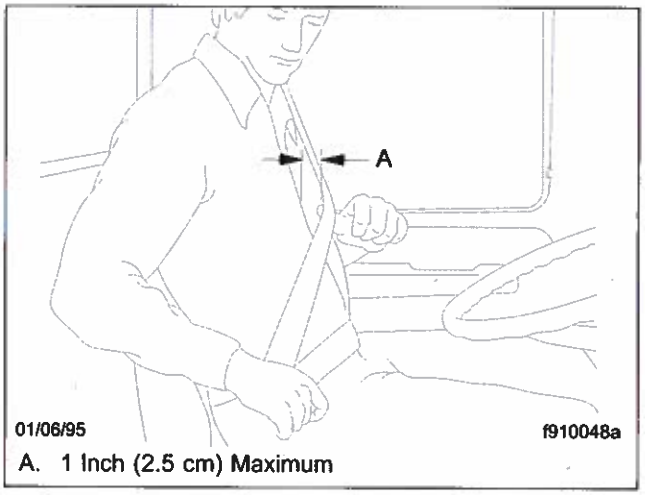


Fig. 5.7, Adjusting Shoulder Harness Clearance

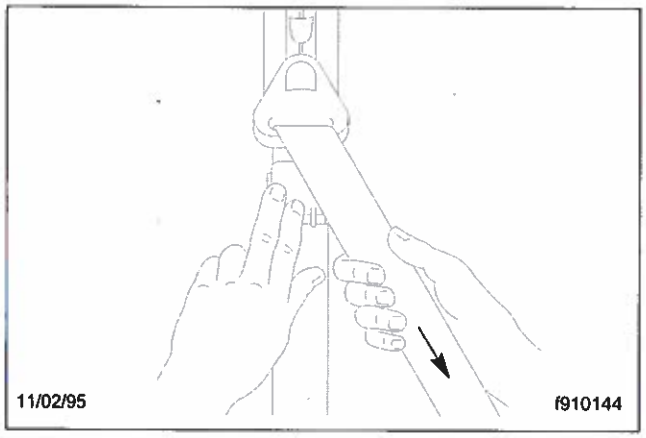


Fig. 5.8, Locking the Komfort Latch

NOTE: The Komfort Latch does not have to be released in an emergency situation. The Komfort Latch will release by itself under rough road or other abnormal conditions. Make sure the three-point seat belt is completely retracted when it is not in use.

Lap Belt Without a Retractor

The center lap belt on a two-passenger seat does not have a retractor and therefore should be shortened and fastened when being used. To lengthen the belt, tip the belt tongue at a right angle to the belt and pull the belt over your lap until the tongue reaches the buckle.

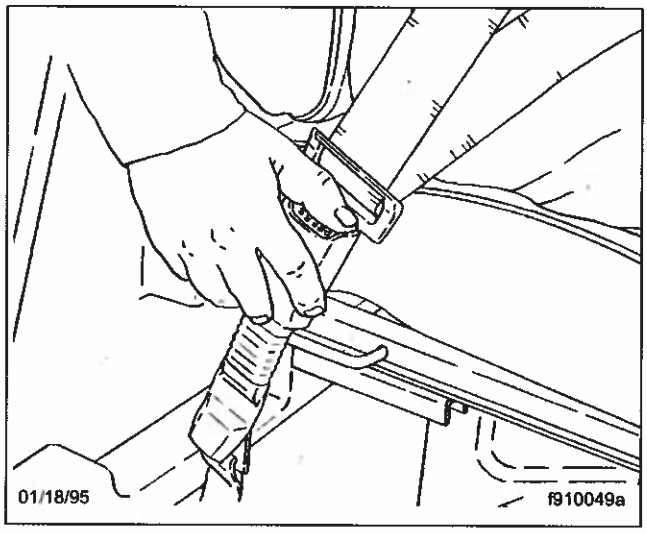


Fig. 5.9, Releasing the Three-Point Seat Belt

1. Pull the belt across your hips and insert the tongue into the correct buckle on your seat until you hear a snap and feel it lock.
2. Make sure the buckle is securely fastened.
3. Adjust the belt so that it fits snugly around your hips. If you need to lengthen the belt, unfasten it and repeat the previous steps. If you need to shorten the belt, pull on the loose end of the belt.

6

Steering and Brake Systems

Steering System

General Information

When there is no load on the vehicle and the front tires are pointed straight ahead, the steering wheel spokes should be at the 4 o'clock and 8 o'clock positions, or within 10 degrees of these positions. See Fig. 6.1. For steering wheel adjustment procedures, see **Group 46** of the *Acterra® Workshop Manual*.

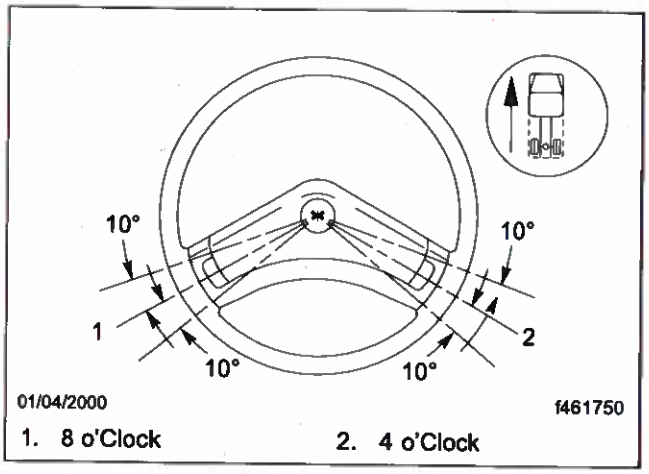


Fig. 6.1, Steering Wheel Centered

Power Steering System

The power steering system consists of a steering gear (which includes a manual steering mechanism, a hydraulic control valve, and a hydraulic power cylinder), hydraulic hoses, power steering pump, power steering reservoir, and other components. Some models are also equipped with a separate hydraulic power cylinder on the right side of the front axle. 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.

If the power-assist feature does not work due to hydraulic fluid loss, steering pump damage, or some other cause, bring the vehicle to a safe stop. Do not drive the vehicle until the cause of the problem is corrected.

⚠ 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.

Drivers should use the power available with a power steering system carefully. If the front tires become lodged in a deep chuckhole or rut, drive the vehicle out instead of using the steering system to lift the tires from the hole. Also, avoid turning the tires when they are against a curb as this places a heavy load on steering components and could damage them.

Air Brake System

General Information

A dual air brake system operates two independent air brake systems through one set of brake controls. Each system has its own reservoir, plumbing, and brake chambers. The primary air system operates the service brakes on the rear axles; the secondary air system operates the service brakes on the front axle. Either or both the primary and secondary sytems can operate the trailer brakes.

⚠ 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.

If the primary air system loses pressure, the rear service brakes will not work but the secondary air system will continue to operate the front axle and trailer brakes.

If the secondary air system loses air pressure, the front brakes will not work but the primary air system will continue to operate the rear service brakes and trailer brakes.

IMPORTANT: When air pressure is lost in one of the air systems, the air compressor will operate but will not replenish the air supply in the system that is not leaking. There will only be enough air in the non-leaking system to get the vehicle stopped. Therefore, it is important to bring the vehicle to a safe stop as soon as possible. Do not attempt to drive the vehicle again until the problem is corrected.

Trucks are equipped with spring brake modulation. If an air pressure loss occurs in the primary air system, the rear spring brakes will be modulated (applied and released) according to how hard the brake pedal is being pushed. There will only be enough air in the secondary system for two to four brake applications, then the park brake valve will pop out and lock the brakes.

Before driving your vehicle, allow time for the air compressor to build up a minimum pressure of 95 psi (655 kPa) in both air systems. Monitor the air pressure system by observing the primary and secondary 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 64 to 76 psi (441 to 524 kPa).

The low air pressure warning light and buzzer come on if air pressure drops below 64 to 76 psi (441 to 524 kPa) in either system. If this happens, check the air system pressure gauges to determine which system has low pressure. Although the service brakes will still slow the vehicle, one set of the service brakes will not be operating and the vehicle will require a longer distance to stop. Bring the vehicle to a safe stop and have the air system repaired before continuing.

If if a tractor-trailer loses pressure in both the primary and secondary air systems, the trailer service brakes or spring parking brakes will automatically activate when the air pressure drops below 35 to 45 psi (241 to 310 kPa). The tractor spring parking brakes will automatically activate when the air pressure drops below 20 to 30 psi (138 to 207 kPa). On trucks, spring parking brakes will come on when the air pressure drops below 20 to 30 psi (138 to 207 kPa). The activation is gradual but irreversible. Do not wait for automatic activation of the brakes. When the low air pressure warning light and buzzer first come on, immediately bring the vehicle to a safe stop. Correct the cause of the air loss before attempting to drive the vehicle again.

⚠ WARNING

Do not drive the vehicle with the parking brakes caged. If the vehicle is driven with the parking brakes caged, there would be no means of stopping the vehicle if a complete loss of air pressure occurred. This could result in serious personal injury or vehicle damage.

IMPORTANT: Connect to a towing vehicle or chock the tires before caging the spring parking brakes.

NOTE: Before a vehicle with insufficient system air pressure can be moved, the spring parking brakes must be released by connecting an external air source at the gladhands, or by manually caging (manually releasing) the parking brake springs.

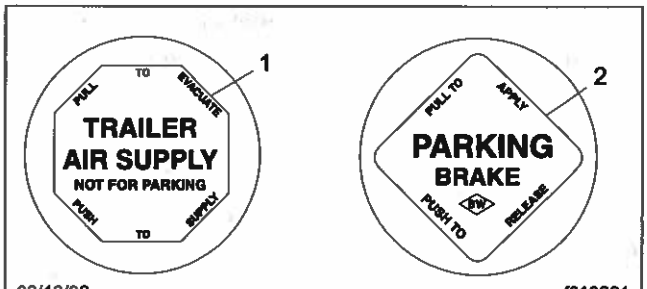
Operation

Before driving the vehicle, make sure all occupants are wearing seat belts. Secure all loose items in the cab so that they will not fly forward during a full brake application.

In a normal stop, push in the clutch pedal (if the vehicle has one) as the vehicle approaches a halt and shift the transmission to neutral. Set the spring parking brakes after coming to a stop, if the vehicle is to be parked.

IMPORTANT: In the event of a total loss of service brakes with full system air pressure, use the parking brake control valve (the yellow knob) to bring the vehicle to a complete stop in the safest location possible.

The yellow diamond-shaped knob (**Fig. 6.2**) on the control panel activates the parking brake valve. Pulling out the knob puts on both the tractor and the trailer spring parking brakes and causes the trailer air supply valve knob to pop out.



1. Trailer Air Supply Valve Knob
2. Parking Brake Control Valve Knob

Fig. 6.2, Parking Brake Control Valve and Trailer Air Supply Valve Knobs

Pulling the red octagonal knob (Fig. 6.2) on the control panel opens the trailer air supply valve, exhausting the pressurized air from the system and setting the parking spring brakes. When the air hoses from the vehicle are connected to the trailer and the pressure in both air systems reaches at least 65 psi (448 kPa), the red knob must be pushed in. It should remain pushed in to keep the supply valve open, releasing the trailer spring parking brakes and charging the trailer air supply system .

The red knob should be out to block the trailer air supply before disconnecting a trailer. If pressure in both air systems drops to 35 to 45 psi (241 to 310 kPa) the red knob automatically pops out, exhausting the trailer air supply and applying the trailer service or spring parking brakes. Braking increases as pressure falls, until as pressure approaches zero, the brakes are fully set.

⚠ CAUTION

Do not use the spring parking brakes if the service brakes are hot, such as after descending a steep grade. Also, do not use the spring parking brakes during freezing temperatures if the service brakes are wet. To do so could damage the brakes if hot, or cause them to freeze during cold weather.

If the brakes are wet, drive the vehicle in low gear and lightly apply the brakes to heat and dry them. Allow hot brakes to cool before using the spring parking brakes. Always chock the tires.

If the brakes are wet, drive the vehicle in low gear and lightly apply the brakes to heat and dry them.

Allow hot brakes to cool before using the spring parking brakes.

If the trailer is not equipped with spring parking brakes, pulling out the yellow knob 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 can be released by pushing in the red knob, leaving the tractor parking brakes applied. Air pressure in the primary or secondary reservoir must be at least 64 psi (441 kPa) before the tractor spring parking brakes, or the trailer service or spring parking brakes, can be released.

On trailers without spring parking brakes, chock the trailer tires before disconnecting the tractor when parking just the trailer. When parking a tractor with a trailer, if the trailer is not equipped with spring parking brakes, set the tractor spring parking brakes.

⚠ 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.

Meritor™ WABCO® Antilock Braking System (ABS), Air Brake Systems

The Meritor WABCO Antilock Braking System (ABS) is an electronic wheel speed monitoring and control system that works with the air brake system. ABS passively monitors vehicle wheel speed at all times, but *controls* wheel speed during an emergency or reduced-traction stop. In normal braking applications, the standard air brake system works as they always have and ABS has no active role.

IMPORTANT: For proper ABS system operation, use tires of the factory installed size. The sizes of the tires installed during production are programmed into the electronic control unit. Installing different size tires could result in reduced braking ability leading to longer stopping distances.

ABS reads from signal-generating tone wheels and sensors located in the wheel hubs of each sensed axle. The sensors transmit vehicle wheel speed information to an electronic control unit (ECU). The main circuit of the ECU interprets the speed sensor signals and constantly compares wheel speeds, wheel braking rates, and vehicle speed. If it senses a wheel is beginning to lock, the ECU signals the appropriate solenoid control valve to reduce braking in that wheel, preventing a skid. During emergency braking, the solenoid control valve prevents wheel lockup by controling air pressure in the brake chambers.

The ECU also has a safety circuit which constantly monitors the wheel sensors, solenoid control valves and the electrical circuitry. In a vehicle equipped only with a tractor ABS system, when the ignition switch is turned on the TRACTOR ABS warning light comes on. The warning light goes out only if all of the tractor ABS components are working properly.

⚠ CAUTION

An accumulation of road salt, dirt, or debris on the ABS tone wheels and sensors can cause the ABS warning light to come on. If the ABS light does come on, the tone rings and sensors should be inspected for corrosion and serviced if necessary. The service should include cleaning of the tone rings and sensors. If any tone ring on a vehicle shows severe corrosion, all tone rings on that vehicle should be replaced.

During winter months in areas where corrosive materials are used on the highways, periodically clean the underside of the vehicle, including the tone rings and sensors, to ensure proper ABS function and to protect the components from corrosion. Clean more frequently when unusually corrosive chemicals are being used.

The dash-mounted TRAILER ABS light will operate as follows when a compatible trailer is properly connected to a tractor:

- When the ignition key is turned to the on position, the trailer ABS lamp will illuminate briefly, then turn off.
- If the lamp comes on momentarily during vehicle operation then shuts off, a fault was detected and corrected.
- If the lamp comes on and stays on during vehicle operation, there is a problem with the trailer ABS. Repair the trailer ABS system immediately to ensure full antilock braking capability.

The Trailer ABS lamp will not light up unless a compatible trailer is connected to the tractor.

IMPORTANT: If a compatible trailer is connected and the lamp does not flash on briefly when the ignition key is turned on, it is possible that the lamp is burnt out.

Automatic Traction Control is an option available on ABS-equipped vehicles with air brake systems. It helps improve traction when vehicles are on slippery surfaces by keeping drive wheels from spinning. ATC works automatically in two ways.

- If a drive wheel starts to spin, ATC decreases air pressure to brake the wheel. This transfers engine torque to the wheels with better traction.
- If all of the drive wheels spin, ATC reduces engine torque to provide improved traction.

If the vehicle is equipped with Automatic Traction Control (ATC), any wheel spin during acceleration turns on the WHEEL SPIN indicator light. The light goes out when the wheel stops spinning. When the light comes on, partially release the throttle pedal until the light goes out. If slippery road conditions continue, turn the axle lock switch on. See **Chapter 9** for axle lock instructions.

⚠ CAUTION

Do not turn the differential lock switch on while the WHEEL SPIN indicator light is on. To do so could damage the rear axle.

ATC turns itself on and off. Drivers do not have to select this feature. If drive wheels spin during acceleration, the WHEEL SPIN indicator comes on, indicating ATC is active. It goes out when the drive wheels stop spinning.

The ATC option includes a mud or deep snow (TRAC MUD/SNOW) switch. This switch is used to improve traction on soft surfaces such as snow, mud, or gravel by slightly increasing the permissible wheel spin. When the mud or deep snow switch is pressed, the WHEEL SPIN indicator comes on.

The ABS diagnostic (ABS DIAG) switch is a momentary switch that turns on the blink code diagnostic capabilities. It may also be used to disable the traction control for dynamometer testing as described in the next paragraph. For information on troubleshooting with blink code diagnostics, see **Group 42** of the *Acterra® Workshop Manual*.

⚠ WARNING

Failure to disable the ATC before dynamometer testing could result in serious personal injury and damage to the vehicle.

Vehicles with ATC must have the ATC disabled to test the vehicle on a dynamometer. To disable the ATC, press and hold the ABS diagnostic switch for at least three seconds. Once the system configuration code begins, ATC has been disabled. The WHEEL SPIN indicator comes on and stays on while disabled.

The Meritor WABCO ABS system combines one front-axle control channel with either one rear axle

(the four-sensor system), or two rear axles (the six-sensor system) to form one control circuit. For example, the sensor and solenoid control valve at the left-front axle form a control circuit with the sensor(s) and solenoid valve(s) on the right rear axle(s). During vehicle operation, if the safety circuit senses a failure in any part of the ABS system (a sensor, solenoid control valve, wiring connection, short circuit, etc.), the TRACTOR ABS warning light comes on and the control circuit where the failure occurred is switched to normal braking action. ABS will continue to work on the remaining control circuit. Even if the ABS system is not working to some degree, normal braking ability is maintained. A possible exception would be if a solenoid control valve or combination solenoid control valve is damaged or not working. Since these valves are an integral part of the air brake system, normal braking may be reduced or may not work at all and if they are malfunctioning the vehicle must be parked as quickly and safely as possible.

IMPORTANT: If any of the ABS warning lights do not work as described above or come on while driving, repair the ABS system immediately to ensure full antilock braking capability.

During emergency or reduced-traction stops, push the brake pedal steadily until the vehicle comes to a safe stop. Do *not* pump the brake pedal. If the driver pushes the brake pedal hard enough to lock the wheels, the ABS system will control braking to provide steering control and the shortest possible stopping distance.

Although the ABS system improves vehicle control during emergency braking situations, the driver still has the responsibility to drive appropriately for the existing traffic and road conditions. For example, the ABS system cannot prevent an accident if the driver is speeding or following too closely, or going too fast in slippery road surfaces.

Automatic Slack Adjusters

Automatic slack adjusters are required on all vehicles equipped with air brakes manufactured after October 20, 1994. 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.

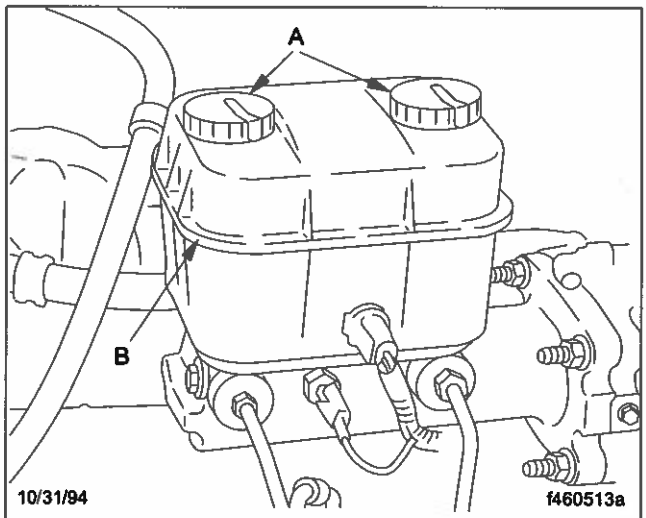
⚠ WARNING

Manually adjusting an automatic slack adjuster to bring the pushrod stroke within legal limits is likely masking a mechanical problem. Adjustment is not repairing. In fact, continual adjustment of automatic slack adjusters may result in premature wear of the adjuster itself. Further, the improper adjustment of some automatic slack adjusters may cause internal damage to the adjuster, thereby preventing it from properly functioning.

Hydraulic Brake System

General Information

The hydraulic brake system includes a Hydro-Max® power booster, master cylinder, hydraulic brake reservoir (Fig. 6.3), hydraulic lines, a brake rotor on each wheel hub, and a brake caliper and pad assembly at each rotor.



A. Open caps and check fluid level.
B. Fill to this level.

Fig. 6.3, Hydraulic Brake Reservoir

IMPORTANT: Fill the master cylinder reservoir to the bottom of the narrow ring of the filler neck. Use only heavy-duty DOT 3 brake fluid in the hydraulic brake system.

The master cylinder supplies hydraulic pressure to the brakes. It is attached to the front of the Hydro-Max power booster. The power booster receives pressurized automatic transmission fluid (ATF) from the power steering system. (The power steering system contains ATF, not the product specifically called power steering fluid.) An electrically powered "reserve" pump cuts in, if fluid pressure falls between the power steering pump and the power booster. The brake system warning light comes on if there is a problem within the system.

If the light comes on, bring the vehicle to a safe stop and correct the problem immediately. Do not attempt to drive until the problem is found and corrected.

For hydraulic brake system troubleshooting and adjustment procedures, see **Group 42** of the *Acterra® Workshop Manual.*

Operation

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 occupants are wearing seat belts. Check that the brake system warning light is off after releasing the parking brake. If the warning light does not go off, find and correct the problem before continuing to operate the vehicle.

During normal brake stops, pushing the brake pedal slows the vehicle. As the vehicle slows almost to a stop, push in the clutch pedal if there is one, and shift the transmission to neutral. After coming to a stop, apply the parking brake if the vehicle is to be parked.

Meritor™ WABCO® Antilock Braking System (ABS), Hydraulic Brake Systems

The Meritor WABCO Antilock Braking System (ABS) is an electronic wheel speed monitoring and control system which works with the hydraulic brake system. ABS watches each braking wheel's speed at all times, then *controls* wheel speed during an emergency or reduced-traction stop. In normal braking the standard hydraulic brake system is in effect, the ABS does nothing.

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 (SUV). Installing different sized tires could result in inaccurate wheel speed signals to the ECU, reduced braking force and longer stopping distances. This could lead to an accident, property damage and personal injury.

ABS uses signal-generating tone wheels and sensors located in the wheel hubs of each sensed axle to measure their speeds. The sensors transmit the wheel speed information to the ECU which compares wheel speeds and a vehicle reference speed. If the calculations indicate a wheel is about to lock, the ECU signals the brake pressure modulator to increase or decrease braking pressure.

The ECU also has a safety circuit which constantly monitors the wheel sensors, brake pressure modulator, and the electrical circuitry. The TRACTOR ABS warning light comes on after the ignition is switched on. The warning light goes out only if all the tractor ABS components are working properly.

The ABS warning light comes on and stays lit when the ignition is switched on. It should go off when the vehicle exceeds four miles per hour. If it does not go off over four miles per hour, there may be an active fault in the hydraulic ABS. If the ABS warning light comes on and stays on, then goes off after the vehicle goes over four miles per hour, there may be a stored fault in the hydraulic ABS. Have the ABS system checked if either situation occurs.

If during vehicle operation the safety circuit senses a failure in any part of the ABS system (a sensor, brake pressure modulator, wiring connection, short circuit, etc.) the TRACTOR ABS warning light comes on and the control circuit where the failure occurred is switched to normal braking action. Even if the ABS system is partially or completely inoperative, normal braking ability is maintained. An exception would be if the brake pressure modulator, or hydraulic fluid line is damaged. As these components are an integral part of the hydraulic brake system, normal braking may be impaired or inoperative.

⚠ CAUTION

An accumulation of road salt, dirt, or debris on the ABS tone wheels and sensors can cause the ABS warning light to come on. If the ABS light does come on, the tone rings and sensors should be inspected for corrosion and serviced if necessary. The service should include cleaning of the tone rings and sensors. If any tone ring on a vehicle shows severe corrosion, all tone rings on that vehicle should be replaced.

During winter months in areas where corrosive materials are used on the highways, periodically clean the underside of the vehicle, including the tone rings and sensors, to ensure proper ABS function and to protect the components from corrosion. Clean more frequently when unusually corrosive chemicals are being used.

Before ignition, the dash mounted TRAILER ABS lamp will operate as follows when a compatible trailer is properly connected to a tractor:

- When the ignition key is turned to the on position, the trailer ABS lamp will illuminate momentarily, then turn off.
- If the lamp comes on momentarily during vehicle operation, then shuts off, a fault was detected and corrected.
- If the lamp comes on 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.

The Trailer ABS lamp will not illuminate unless a compatible trailer is connected to the tractor.

IMPORTANT: If any of the ABS warning lights do not work as described above or come on while driving, repair the ABS system immediately to ensure full antilock braking capability.

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

Although the ABS system improves vehicle control during emergency braking situations, the driver still has the responsibility to change driving styles depending on the existing traffic and road conditions. For example, the ABS system cannot prevent an accident if the driver is speeding or following too closely on slippery road surfaces.

The ABS diagnostic (ABS DIAG) switch is a momentary switch that turns on the blink code diagnostic capabilities. It may also be used to disable the traction control for dynamometer testing. For information on troubleshooting with blink code diagnostics, see **Group 42** of the *Acterra® Workshop Manual.*

⚠ WARNING

Failure to disable the ATC before dynamometer testing could result in serious personal injury and damage to the vehicle.

Vehicles with ATC must have the ATC disabled to test the vehicle on a dynamometer. To disable the ATC, press and hold the ABS diagnostic switch for at least three seconds. Once the system configuration code begins, ATC has been disabled. The WHEEL SPIN indicator comes on and stays on while disabled.

7

Engines and Clutches

EPA07 Aftertreatment System (ATS)

On-road diesel engines built after December 31, 2006, are required to meet EPA07 guidelines for reduced exhaust emissions of particulate matter and nitrogen oxides (NOx). NOx is limited to just over 1 gram per brake horsepower hour (g/bhp-hr), and particulate matter cannot exceed 0.01 g/bhp-hr.

EPA07-compliant engines require ultralow-sulfur diesel (ULSD) fuel, and they should never be run on fuel with sulfur content higher than 15 ppm. In addition, they require low-ash engine oil. The following guidelines must be followed, or the warranty may be compromised.

- Use ultralow-sulfur diesel (ULSD) with 15 ppm sulfur content or less, based on ASTM D2622 test procedure.
- Do not use fuel blended with used engine lube oil.
- Engine lube oil must have a sulfated ash level less than 1.0 wt %, meeting the API CJ-4 index specifications.

IMPORTANT: Using non-specification fuels or oils can lead to shortened diesel particulate filter (DPF) cleaning or exchange intervals. For example, using CI-4+ oil with 1.3% sulfated ash (30% more ash content) may result in the need for DPF cleaning or exchange 20 to 30% sooner than would normally be required.

The "exhaust system" in EPA07-compliant vehicles is called the aftertreatment system (ATS). The ATS varies according to engine manufacturer and vehicle configuration, but instead of a muffler, an aftertreatment system has a device that outwardly resembles a muffler, called the aftertreatment device (ATD).

IMPORTANT: See your engine operation manual for complete details and operation of the aftertreatment system.

Inside the ATD on Mercedes-Benz, Detroit Diesel, and Cummins engines, the exhaust first passes over the diesel oxidation catalyst (DOC), then it passes through the diesel particulate filter (DPF), which traps soot particles. If exhaust temperature is high enough, the trapped soot is reduced to ash, in a process called passive regeneration (regen). **Passive regeneration** occurs as the vehicle is driven normally under load; the driver is not even aware that it is happening. The harder an EPA07 engine works, the better it disposes of soot, as the exhaust heat alone is enough to burn the soot to ash. Over the course of a workday, however, passive regeneration cannot always keep the ATD filter clean, so the filter must undergo **active regeneration**. In active regeneration, extra fuel is injected into the exhaust stream to superheat the soot trapped in the DPF and turn it to ash. Active regeneration happens only when the vehicle is moving above a certain speed, determined by the engine manufacturer. Consult manufacturers' documentation for details.

Both active and passive regeneration happen automatically, without driver input.

NOTE: Caterpillar engines do not use a DOC; CAT engines burn diesel fuel at the regeneration head to superheat the exhaust and burn the trapped soot to ash. Engine software monitors and controls this process.

If conditions do not provide for at-speed active regeneration, the vehicle will need a driver-activated **parked regeneration**. The vehicle must be standing still, and the driver must initiate parked regen. Completing a parked regen takes 20 minutes to an hour, depending on ambient conditions.

⚠ DANGER

During parked regeneration, 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 a parked regeneration, make certain the exhaust outlets are directed away from structures, trees, vegetation, flammable materials, and anything else that may be damaged or injured by prolonged exposure to high heat.

There are three warning lamps in the driver message center that alert the driver of the need to perform a parked regen, clean the filter, or of an engine fault that affects the emissions.

A slow (10-second) flash of the high exhaust system temperature (HEST) lamp, indicates a regeneration is in progress, and the driver is not controlling the engine idle speed.

A solid illuminated high exhaust system temperature (HEST) lamp, alerts the operator of high exhaust temperature during the regeneration process, when the speed is below 5 mph (8 km/h). The HEST lamp does not signify the need for any kind of vehicle or engine service; it only alerts the vehicle operator of high exhaust temperatures. Make sure the engine exhaust pipe outlet is not directed at any person, or at any surface or material that will melt, burn, or explode. See Fig. 7.1.

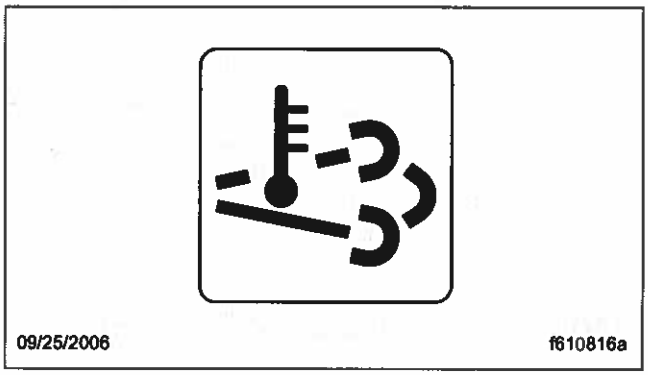


Fig. 7.1, High Exhaust System Temperature (HEST) Lamp

A solid yellow diesel particulate filter (DPF) lamp indicates that a parked regen is required soon, and should be scheduled for the earliest convenient time. See Fig. 7.2. A blinking yellow DPF lamp indicates that a parked regen is required immediately, or an engine derate may occur.

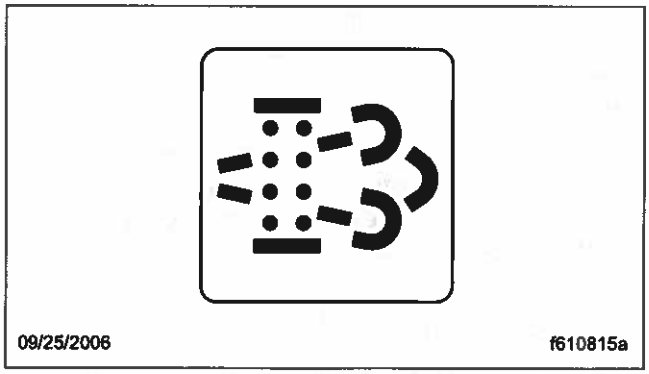


Fig. 7.2, Diesel Particulate Filter (DPF) Status Lamp

A solid yellow malfunction indicator lamp (MIL) indicates an engine fault that affects the emissions. See Fig. 7.3.

Diesel particulate filter servicing must be performed by an authorized technician, and a record must be maintained for warranty purposes. The record must include:

- date of cleaning or replacement;
- vehicle mileage;
- particulate filter part number and serial number.

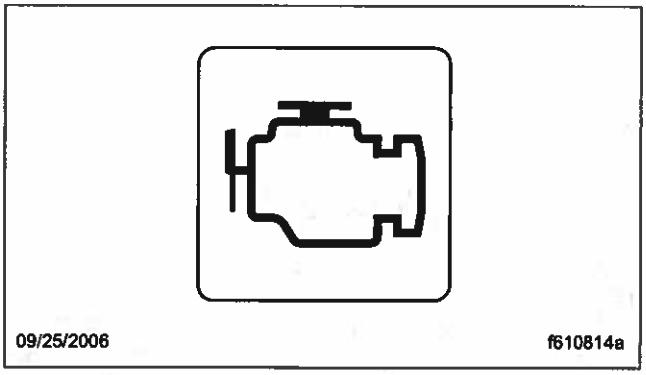


Fig. 7.3, Malfunction Indicator Lamp (MIL)

The request/inhibit regen switch (Fig. 7.4), located on the dash, may have three selectable positions:

- request regeneration;
- default (can include appropriate normal state condition—either in an automatic regeneration or inhibit state);
- inhibit regeneration.

NOTE: The regen switch can start an active regen only when at least one of two conditions exists: either the DPF light is lit, or the engine software calls for it. If neither of those conditions exist, the regen switch cannot cause a regeneration to happen.

The function of the switch will vary by the engine make and model in the vehicle. See the engine operation manual for switch operation details.

Engine Starting

NOTE: Before starting the engine, read Chapter 2 for detailed information on how to read the instruments and operate the controls.

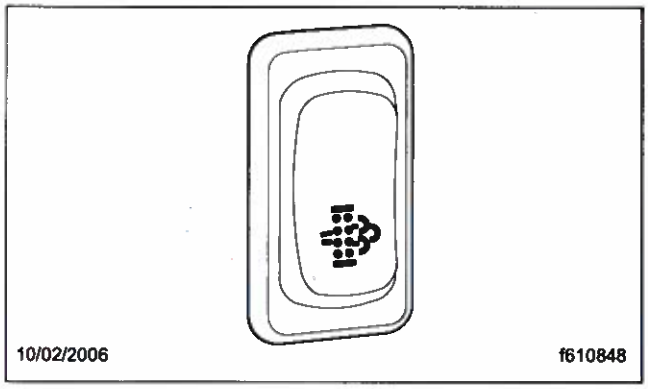


Fig. 7.4, Request/Inhibit Regen Switch

⚠ CAUTION

When starting a vehicle equipped with a manual transmission and clutch lockout switch, the clutch pedal must be fully depressed during the entire start sequence. Failure to do so can cause the pinion to release and re-engage, which could cause ring gear and starter pinion damage.

If a vehicle does not start on the first attempt, make sure that the engine has completely stopped rotating before reapplying the starter switch. Failure to do so can cause the pinion to release and re-engage, which could cause ring gear and starter pinion damage.

Moving a vehicle with the starter and/or using the starter to bump the engine for maintenance procedures is strictly prohibited. Use of these methods to bump the engine over or move the vehicle can cause the pinion to release and re-engage, which could cause ring gear and starter pinion damage.

IMPORTANT: Ring gear and starter pinion damage caused by improper starting procedures is not warrantable.

Whenever you start an engine, watch for any signs of engine problems. If the engine vibrates, misfires, or makes unusual noises, turn the engine off as soon as possible and determine the cause of the problem. Frequently, engine damage may be avoided by a quick response to early indications of problems.

Pre-Start

NOTE: These pre-start steps apply to all engines.

1. Perform the engine pretrip inspection and daily maintenance checks in Chapter 11.
2. Set the parking brake.
3. For manual transmissions, place the transmission in neutral and disengage the clutch.

   For automatic transmissions, make sure the transmission shift control is in neutral or park.

NOTE: On vehicles equipped with a neutral start switch, the transmission must be in neutral before the engine can be started. For air start systems, check the air supply before starting the engine. There must be 100 psi (689 kPa) of air pressure available.

Starting Precautions, All Engines

⚠ WARNING

Do not use any starting aid, such as ether, in engines with an intake air preheater. This could cause an explosion, resulting in serious personal injury or death.

⚠ CAUTION

Do not crank the engine for more than 30 seconds at a time. Wait two minutes after each try to allow the starter to cool. Failure to do so could cause starter damage.

NOTE: Some starters are equipped with optional overcrank protection. If overcranking occurs, a thermostat breaks the electrical circuit to the starter motor until the motor has cooled.

⚠ CAUTION

Protect the turbocharger during the start-up by not opening the throttle or accelerating the engine above 1000 rpm until normal engine idle oil pressure registers on the gauge.

Mercedes-Benz

NOTE: Before doing these steps, do the steps in "Pre-Start."

⚠ CAUTION

Never attempt to start any Mercedes-Benz electronic engine using ether or any other starting fluid. Serious engine damage could result.

1. Turn the ignition switch to the on position (Fig. 7.5). All the electronic gauges on the instrument and control panel complete a full sweep of their dials, the warning and indicator lights light up, and the buzzer sounds for three seconds.

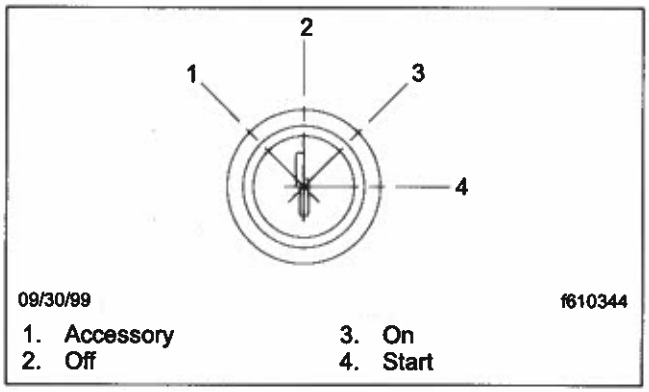


Fig. 7.5, Ignition Switch Positions

IMPORTANT: On vehicles equipped with an intake air preheater, wait until the INTAKE HEATER indicator goes out before attempting to start the engine.

2. Turn the ignition switch to the start position. Without touching the throttle pedal, start the engine.
3. Idle the engine for one to three minutes at 600 rpm (700 rpm for 4-cylinder engines) before operating the engine under load.
4. Check the oil pressure gauge for any drop in lubricating oil pressure or mechanical malfunction in the lubricating oil system. Minimum oil pressure at idle is 7 psi (50 kPa).

⚠ CAUTION

Do not rev the engine if the oil pressure gauge indicates no oil pressure. Shut down the engine if no oil pressure appears within approximately ten seconds. Check to determine the cause of the problem. Operating the engine with no oil pressure will damage the engine.

Caterpillar

NOTE: Before doing these steps, do the steps in "Pre-Start."

1. Turn the ignition switch to the on position (Fig. 7.5). The CHECK ENGINE indicator comes on for five seconds. The INTAKE HEATER indicator comes on for a minimum of two seconds, regardless of coolant temperature.

IMPORTANT: If the INTAKE HEATER indicator stays on for more than two seconds, wait until the indicator goes out before attempting to start the engine.

2. Turn the ignition switch to the start position. Release the switch the moment the engine starts.
   - 2.1 If the engine does not start after 15 to 20 seconds of cranking, turn the ignition switch off.
   - 2.2 Wait two minutes to allow the starter motor to cool. Turn the ignition switch back to the on position and try to start the engine again.
   - 2.3 As soon as the engine starts, release the ignition switch, allowing the engine to run at a slow idle.

⚠ CAUTION

If the oil pressure is too low, shut down the engine immediately to prevent serious damage. If the vehicle is equipped with an automatic shutdown system, the engine will shut down after 30 seconds.

3. The engine may be operated at low load and speed once the engine oil pressure has reached 10 psi (69 kPa) and air pressure (if applicable) has reached 64 to 76 psi (441 to 524 kPa).

4. When the engine has reached the minimum operating temperature of 160°F (71°C), the engine may be operated at full load.

Cummins

⚠ CAUTION

Never attempt to start any Cummins IS series electronic engine (ISB, ISC, ISL) using ether or any other starting fluid. Serious engine damage could result.

NOTE: Before doing these steps, do the steps in "Pre-Start."

1. Turn the ignition switch to the on position (Fig. 7.5). The CHECK ENGINE indicator will come on. The INTAKE HEATER indicator comes on for a minimum of two seconds, regardless of coolant temperature. Leave the ignition switch on until the CHECK ENGINE indicator goes out.

IMPORTANT: If the INTAKE HEATER indicator stays on for more than two seconds, wait until the indicator goes out before attempting to start the engine.

2. Turn the ignition switch to the start position. After the engine starts, release the key.
3. Bring the engine up to operating speed gradually as it warms up and develops stable oil pressure.

NOTE: When the engine is started, it takes a short time to build up a lubricating oil film between the shafts and bearings, and between the pistons and liners. The oil pressure gauge indicates any drop in lubricating oil pressure within 15 seconds of engine start-up.

4. If minimum engine oil pressure at idle of 10 psi (69 kPa) does not register within 15 seconds, shut down the engine.

⚠ CAUTION

Protect the turbocharger during the start-up by not opening the throttle or accelerating the engine above 1000 rpm until minimum engine idle oil pressure registers on the gauge. Failure to do so could damage the turbocharger.

5. Idle the engine for three to five minutes at 1000 rpm before operating the engine under load.

Cold-Weather Starting

⚠ WARNING

Do not use any starting aid, such as ether, in engines with an intake air preheater. This could cause an explosion, resulting in serious personal injury or death.

Modern electronic engines do not normally require special starting aids. At low temperatures, intake air preheaters, manifold preheaters, or water jacket heaters are sometimes used to assist in starting.

Mercedes-Benz

The intake air preheater is activated by turning the ignition switch to the on position (Fig. 7.5). If the engine is at normal temperature, the INTAKE HEATER indicator goes out after two seconds.

If the temperature is low enough to require the heater, the INTAKE HEATER indicator stays on while the intake air preheater warms up. After the indicator goes out, start the engine. If the engine doesn't start after about 30 seconds of cranking, turn the key to the off position and wait two minutes, then repeat the starting procedure.

NOTE: If the engine doesn't start on the second try, wait at least five minutes before using the intake air preheater again.

Caterpillar

Caterpillar truck engines with direct injection are designed to start at temperatures above 32°F (0°C) without using start systems. If the temperature is below 32°F (0°C), startability will be improved by the use of an automatic ether injection system and/or a jacket water heater.

⚠ CAUTION

Directing ether at the heater element in the intake air preheater could cause extensive engine damage.

The intake air preheater is activated by turning the ignition switch to the on position (Fig. 7.5). If the engine is at normal temperature, the INTAKE HEATER indicator goes out after two seconds.

If the temperature is low enough to require the heater, the INTAKE HEATER indicator stays on while the intake air preheater warms up. After the indicator goes out, start the engine.

IMPORTANT: Attempting to start the engine before the INTAKE HEATER indicator has gone off could result in excessive white smoke at start-up.

If the engine doesn't start after 15 to 20 seconds of cranking, turn the key to the off position and wait two minutes; then repeat the starting procedure.

Cummins

The cold-start system approved for use on Cummins engines has been based upon starting aid capabilities to –25°F (–32°C).

Turn the ignition switch to the on position (Fig. 7.5). If the engine is at normal temperature, the INTAKE HEATER indicator goes out after two seconds.

If the temperature is low enough to require the heater, the INTAKE HEATER indicator stays on while the intake air preheater warms up. After the indicator goes out, start the engine.

Run the engine slightly above idle until oil pressure shows on the gauge. If oil pressure doesn't show on the gauge within 30 seconds of starting, turn the key to the off position and wait one minute; then repeat the starting procedure.

Starting After an Extended Shutdown or Oil Change

Do the following steps after an oil change or after the engine has been shut down for more than three days:

1. Disconnect the electrical connector from the fuel pump solenoid valve.
2. Crank the engine until oil pressure shows on the gauge.
3. Connect the electrical connector to the fuel pump solenoid valve.
4. Start the engine. After one minute, shut down the engine and check for leaks.
5. Allow five minutes for the oil to settle, then check the engine oil level and add oil if needed. Do not overfill.

Engine Break-In

Every engine is tested on a dynamometer before shipment, eliminating the need for a break-in period. Before running the engine for the first time, follow the instructions in the engine operator's manual for the vehicle.

Engine Operation

⚠ DANGER

Do not operate the engine in an area where flammable vapors such as gasoline or diesel fumes are present. Shut down 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.

All diesel engines have been built to 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. Good operating practices, regular maintenance, and correct adjustments are factors which will help to stay within the regulations.

Proper maintenance of the engine, which is the responsibility of the owner/operator, is essential to keep the emission levels low.

Engine Protection

On electronic engines, an engine-protection system monitors all engine sensors and electronic components, and recognizes system malfunctions. If a critical fault is detected, an amber check-engine warning lamp and a red stop-engine lamp illuminate.

The standard parameters that are monitored for engine protection are: low coolant level, high coolant temperature, low oil pressure, high soot level (DPF), and uncontrolled DPF regeneration.

Amber Check-Engine Warning Lamp

When the amber check-engine warning lamp comes on for any reason, the vehicle can still be operated, and the driver can proceed to the required destination. This condition should be reported to an authorized service center as soon as possible.

Red Stop-Engine Lamp

⚠ WARNING

When the red stop-engine light 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.

The red stop-engine lamp illuminates to indicate that the engine-protection system has been activated. The conditions that will cause the red stop-engine lamp to come on are:

- high coolant temperature
- loss of coolant
- low oil pressure
- high soot level (DPF)
- uncontrolled DPF regeneration

On some engines, the engine ECU will derate the engine, allowing it to run at low rpm and slow vehicle speed, until the vehicle can be driven to a safe location or to a service facility. On other engines, the engine ECU will first derate the engine, then if the condition does not improve, shut it down completely 30 seconds after the light comes on. The driver must safely bring the vehicle to a stop on the side of the road before the engine shuts down.

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

IMPORTANT: Do not attempt to restart the engine while the vehicle is moving. Bring the vehicle to a safe stop and restart the engine with the vehicle stopped.

Stop-Engine Override Switch

If the vehicle is equipped with a stop-engine override (SEO) switch, it can be used to override the shutdown sequence. This override resets the shutdown timer, restoring power to the previous level before the red stop-engine lamp was illuminated. The switch must be recycled after five seconds to obtain a subsequent override.

⚠ CAUTION

Using the override button so the engine operates for an extended period may result in engine damage. The operator has the responsibility to take action to avoid engine damage.

Mercedes-Benz

While you are driving, watch for any signs of engine problems. If the engine overheats, uses excessive fuel or lubricating oil, vibrates, misfires, makes unusual noises, or shows an unusual loss of power, turn the engine off as soon as possible and determine the cause of the problem. Frequently, engine damage may be avoided by a quick response to early indications of problems.

1. Use the tachometer to determine when to shift. Follow the pattern on the shift lever when moving through the gears.
2. Depending on the vehicle gearing, the posted speed limit can sometimes allow operation in either of the top two gears; however, for improved operating efficiency (fuel economy and engine life), operate in the top gear at reduced rpm rather than in the next lower gear at the maximum rpm.
3. Cruise at partial throttle whenever road conditions and speed requirements permit. This driving technique permits operating within the most economical power range of the engine.
4. Use lower gears in steep downhill driving. Normally, the gear used to descend a hill is the same gear used to climb a hill of the same grade.
5. Never allow the engine to exceed the rated speed. Use the exhaust brake and the optional constant-throttle brake, if installed, to lower engine rpm below the rated speed.