

Dear Mack® Owner

Congratulations on your new truck and thank you for your confidence! We hope you will derive great satisfaction and benefit from your truck for many years to come.

This driver's manual contains information tailored to your particular truck. It covers the truck's equipment, care and maintenance, as well as tips for safe and fuel-efficient driving. To help you get the most out of your truck, we recommend that you take advantage of our advice and tips.

If you have any questions or want to know more about your truck, contact your authorized Mack dealer.

Mack Trucks

Greensboro, NC USA

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Service and Assistance

Mack® OneCall™

The OneCall™ customer support system is a toll-free nationwide hotline that operates 24 hours a day, seven days a week, including holidays.

If you break down on the road, simply call 1-800-866-1177. There is a staff of trained, experienced technicians ready to help. They can help troubleshoot a problem, arrange roadside assistance or towing to the nearest Mack dealership.

OneCall™ provides personalized service. Your personal representative can resolve your situation quickly and to your satisfaction and handle any additional follow-up calls.

OneCall™ technicians can also help you plan ahead to keep your operation running efficiently. They can schedule routine maintenance and lubrication service or locate the nearest Mack dealership.

Questions and Complaints

Your satisfaction is our most important concern.

If questions or complaints arise, first discuss the matter with the service manager at the Mack facility involved. If you are not satisfied with the service managers response, contact the branch manager, principal or general manager of the distributorship. If assistance is required at a service dealer, contact the owner of the establishment.

If for any reason you need further assistance after dealing with the personnel at a Mack subsidiary or distributor, contact the regional service manager. The regional service manager has the responsibility and authority to recommend action and (with the aid of relevant district service personnel) make every effort to conduct a fair review of the situation.

Addresses

The address, telephone and fax numbers of the Mack Trucks regional offices are:

United States

Northeast Region – 2402 Lehigh Parkway South, Allentown, PA 18103

TEL: (610) 351-8770,

FAX: (610) 351-8737

Southeast Region – 2077 Convention Center Concourse, College Park, GA 30337

TEL: (404) 766-5515,

FAX: (404) 766-4710

Central Region – 900 South Frontage Rd., Suite 100, Woodridge, IL 60517,

TEL: (630) 910-3330,

FAX: (630) 910-3331

Southwest Region – 7 Village Circle, Suite 340, Dallas, TX 76262

TEL: (817) 541-3602

West Region – 1263 West Maya Way, Peroia, AZ 85383

TEL: (949) 636-0473,

FAX: (817) 541-3610

Canada

Executive Office – Mack Canada, Inc., 2100 Derry Road West, Suite 410, Mississauga, ON L5N 0B3

TEL: (289) 998-0070,

FAX: (289) 998-0065

Australia

Executive Office -20 Westgate St., Wacol 4076, Mail: P.O. Box 4047,

Mt Ommaney, QLD 4074, Australia,

TEL: 61-7-3718-3500,

FAX: 61-7-3718-3391

Additional Assistance

When contacting the regional service offices or Customer Service Department, provide the following information:

- Vehicle Identification Number (VIN) — This 17-digit number is typically located on the driver-side door latch post and behind the front axle on the right, front frame rail.
- Model and year of the vehicle
- Date that the vehicle was purchased and put into service
- Date(s) and mileage of repair(s)
- Dealer that sold and/or serviced the vehicle
- Description of unresolved service complaint or inquiry
- Summary of action taken to date (by the dealer and the regional service office)
- Names of individuals (if known) contacted at the dealer and the Mack Trucks regional service office

Reporting Safety Defects

United States

If you believe that your vehicle has a defect which could cause a crash, injury or death, immediately contact the National Highway Traffic Safety Administration (NHTSA), in addition to notifying Mack® Trucks.

If NHTSA receives similar complaints, it may open an investigation. If NHTSA 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 distributor, or Mack® Trucks.

To contact NHTSA, either call the U.S. Governments Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153); Go to <http://www.NHTSA.gov>; Or write to:

Administrator, National Highway Traffic Safety Administration,
400 Seventh Street, S.W., Washington, DC 20590. You can also obtain other information about motor vehicle safety from the Vehicle Safety Hotline.

Canada

Canadian customers who wish to report a safety-related defect to Transport Canada — Defect Investigations and Recalls, telephone the toll free hotline at 1-800-333-0510, or contact Transport Canada by mail at Transport Canada, ASFAD, Place de Ville Tower C, 330 Sparks Street, Ottawa ON K1A 0N5. For additional road safety information, please visit the Road Safety website at <http://www.tc.gc.ca/roadsafety/menu.htm>.

Mexico

Volvo Trucks de Mexico, S.A. de C.V. should be informed immediately if you believe the vehicle has a defect that could cause a vehicle accident, injury or death. Contact Volvo Trucks de Mexico by calling 011-52-55-50-81-68-50 or by writing to: Volvo Trucks de Mexico, S.A. de C.V., Prol. Paseo de la Reforma 600, 1er. Piso — 121, Col. Santa Fe Pena Blanca, C.P. 01210, Mexico, D.F. Within Mexico, call 01 (800) 90 94 900.

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INTRODUCTION

Read the Driver's Handbook

The contents of this driver's manual are determined by the equipment, the systems and the functions that the truck has. Due to the VIN specific nature of this manual the information should be stored in the truck to which it belongs.

Please read through the driver's manual before you drive the truck for the first time. This is a good way to learn more about the functions and equipment the truck has, and to be able to use them properly.

The table of contents in the front of the manual gives you an overview of the chapter structure and contents. In the alphabetical index at the back you can search directly for specific characteristics or functions.

Premium Tech Tool™ (PTT)



Premium Tech Tool™ (PTT) is a Windows-based diagnostic application specially designed to test, calibrate and program engine parameters. This software supports all Mack trucks.

You can find more information about purchasing PTT and other hardware & software components at www.premiumtechtool.com.

! NOTE

Support for Mack trucks may be limited with model years 1998 and older.

PTT Technical Support

For Technical Support (help with using the software, problems encountered while using the software, communication issues, etc.), please call 877-978-6586.

Parts and Service Support

For Parts and Service information needs please visit our eMedia center on the web at www.macktrucks.com.

Special Texts

The driver's manual uses the following levels of observation and warning texts.

! DANGER

Indicates a potentially dangerous situation that, unless avoided, will lead to death or serious personal injury.

! WARNING

Indicates a potentially dangerous situation that, unless avoided, may lead to fatal injury, serious personal injury or damage to the product.

! CAUTION

Indicates a potentially dangerous situation that unless avoided may lead to minor or moderate personal injury or damage to the product.

! NOTE

Indicates a situation, use or circumstance that should be emphasized.

Menu Text

When the text refers to any of the menus the search path is shown in a table.

Driver Information Display

Main menu 1

↳ Submenu 2

↳ Submenu 3

Tell-Tales

A tell-tale is a display that indicates the actuation of a device, a correct or defective condition, or a failure to function. The operator should become familiar with these symbols in order to

recognize and react (if necessary) to the indicated condition. Tell-tale symbols are shown in the instrument cluster.

Colors

To promote visual recognition internationally, specific colors for tell-tales have been established. Unless governmental regulations (in the area where the vehicle is to be used) or engineering directives specify otherwise, the standard colors are:

- Steady Blue — high-beam headlights
- Flashing Green — turn signals
- Flashing Red — hazard condition involving the safety of personnel
- Steady Green — system in operation
- Steady Red — warning, immediate action required
- Amber — early warning, such as low fuel or Anti-Lock Brake System (ABS) malfunction

Event Data Recording Devices

This vehicle is equipped with a device generally referred to as an "event data recorder" or "EDR." While the term "event data recorder" is typically used throughout the motor vehicle industry, not every EDR is the same; i.e., they do

not all record the same data elements. The EDR on the vehicle records vehicle speed, engine rpm, time and date, plus a variety of pedal and switch positions, both before and after an "event." Sudden vehicle deceleration or the occurrence of certain other vehicle operational characteristics define / (trigger) an "event."

Optional equipment available for the vehicle, such as the Eaton® VORAD® Collision Warning System, may also provide event data recording features.

For answers to any questions pertaining to the EDR, please contact a certified Mack dealer or regional service office.

GuardDog® Connect

! NOTE

Do not run any electrical accessories or inverter during remote software update operation.

Your vehicle is equipped with one or more recording devices (Telematics Device), associated with Mack's Connected Vehicle Services and (Telematics Services).

These services, which are described in greater detail at www.macktrucks.com, allow you to manage vehicle maintenance and repair in a cost-effective manner by providing:

- proactive, diagnostic repair planning assistance with detailed analysis of diagnostic trouble codes
- streamlined service procedures with parts-on-hand confirmation before a truck arrives for service
- live dealer and customer communication
- remote updates to vehicle software and configuration

The service eliminates or reduces diagnostics time, enhances repair efficiency, expedites decision process, improves communications, and maximizes uptime.

To access the Telematics Services, you must enter into a Telematics Subscription Agreement. This can be done at the time of the vehicle delivery or through the website.

The Telematics Device collects, stores and/or transmits information about your vehicle. Such information may include direction and rate of speed, fuel consumption, engine performance, gearing, rpm, altitude, geo-location (including a history of where the vehicle travels), safety information related to the use and operation of the vehicle, vehicle performance, diagnostic data, configuration information, and error codes.

The Telematics Device has the capacity to store historical data about the use and performance of your vehicle, and to remotely update vehicle software and configuration to improve performance. The Telematics Device has the ability to transmit information to a central communications system. The information contained in your Telematics Device may be periodically transmitted to or accessed by Mack and others authorized by Mack, along with your vehicle's VIN number or other identifying information.

Mack does not collect any driver information. Mack retains and uses this information to understand the operation

use of your vehicle, to remotely tune your vehicle and to help facilitate maintenance and vehicle improvements. To the extent allowed by law, Mack reserves the right to access, use, and control this information.

Declining to enter into a Telematics Subscription Agreement with Mack or canceling a Telematics Subscription Agreement will not end the transmission of data from your Telematics Device or the collection of information by Mack. Mack may access Telematics Data, to the extent it is available, and use it in connection with providing services and vehicle improvements to you and your vehicle.

Mack will regularly purge from its systems all data collected from your Telematics Device, at time intervals determined by Mack at its sole discretion.

Breaking In a New Vehicle

To ensure many years of reliable, trouble-free operation, the following break-in procedures are recommended.

Refer to the preventive maintenance schedules for recommended change intervals for the following items:

- Gear oils (transmission, rear axle carrier[s], front drive axle carrier, transfer case, flywheel PTO)
- Engine oil
- Oil filters
- Fuel filters
- Coolant conditioner

During the First 5000 Kilometers (3000 Miles)

- After the first 200 km (125 miles), retorque the wheel nuts using an accurately calibrated torque wrench. Recheck this torque again after 800 km (500 miles).
- Check oil and coolant levels frequently.
- Check brake and clutch adjustments per recommended maintenance schedule, and adjust as needed.

- Observe the instruments often, and shut down the engine at the first sign of any abnormal readings.
- Report all leaks, loose fasteners, unusual noises, etc., to the service representative at the nearest Mack dealership so they can be checked and corrected.

Although this quality-built vehicle has been inspected, lubricated and adjusted at the Mack Trucks Assembly Plant, occasional air, oil or coolant leaks develop. Quick action to correct these minor items prevents major repairs later. Take the vehicle to the nearest Mack service center if an abnormal condition becomes evident.

Initial Valve Adjustment Intervals

Refer to the Maintenance and Lubrication section for detailed information concerning the Initial Valve Adjustment Interval.

Temporary Loss of Power Output

When driving in difficult driving conditions e.g. high temperatures, high engine speeds and high loads, the temperature in the exhaust system may become abnormally high. This could activate the engine's protection system. The engine's power output is reduced temporarily. The power output is

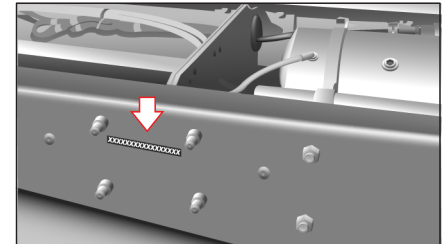
restored to normal performance when the temperature has dropped.

Contact an authorized Mack dealership if the engine power output is not restored.

VIN Locations

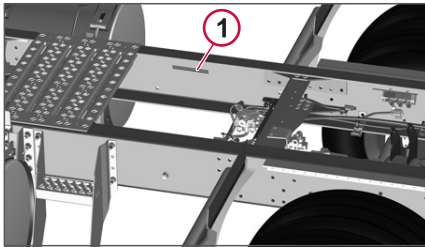
The Vehicle Identification Number (VIN) is displayed in three locations (a frame rail stamping and a label). The 17-digit VIN must be identical in all locations.

The VIN frame stamping is located on the right outside frame rail and the left inside frame rail.



IDENTIFICATION LABELS

1 *Vehicle Identification Number*



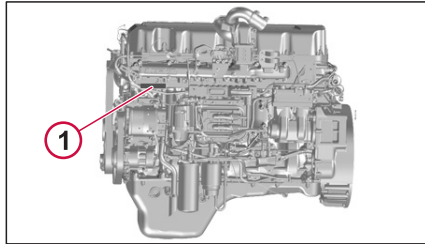
1 *Vehicle Identification Number*

1 *VIN Label*

The VIN label is located on the inside door frame below the driver seat.

Engine Identification

On the Mack MP engines, the engine serial number is stamped on the left side of the engine block, below the inlet manifold.



1 Engine Identification Label

Engine Information Plate

In compliance with Federal and California emission requirements, an engine information label is affixed to all Mack diesel engines. This label, which is located on the cylinder head cover at the front of the engine, gives basic engine identification information (engine model, serial number, etc.), advertised horsepower at rated speed, emissions regulations to which the engine conforms and inlet and exhaust valve lash settings. Examples of the 49 state EPA approved, and 50 state EPA and California approved engine identification labels are given below.

MACK IMPORTANT ENGINE INFORMATION RENSEIGNEMENTS IMPORTANTS MOTEUR				MACK TRUCKS, INC.	
ENGINE FAMILY: AYP7H12	8501	ENGINE MODEL: MP8-505C	SERIAL NO.: 123456	VALVE LASH (LASH) SOUPAPES:	
FAMILY DE MOTEURS:		MODEL MOTEUR:	NO. SERIE:	INLET ROCKER: 2 mm	ADMISSION CULBUTEUR
DISPLACEMENT: ADVERTISED HP @ RPM	FUEL RATE @ ADVERTISED HP	TOLE SPEED	ENGINE BRAKE	EXHAUST ROCKER: 8 mm	ECARPEMENT CULBUTEUR
CYLINDER: 12.8 L	505/1500	342 mm ³ /stroke	550-700 RPM	NO. FEEL	NO. FEEL
		mm ³ /COOP		NO. FEEL (g/Day-hr)	NO. FEEL (g/Day-hr)
THIS ENGINE CONFORMS TO U.S. EPA REGULATIONS APPLICABLE TO 2010 MODEL YEAR, NEW HEAVY-DUTY ENGINES AND HAS A PRIMARY INTENDED SERVICE APPLICATION AS A HEAVY HEAVY-DUTY DIESEL ENGINE.				NO. FEEL	NO. FEEL
Ce moteur est conforme aux réglementations de l'Agence de Protection de l'Environnement des États-Unis applicables aux moteurs moteurs diesel Heavy Duty (Groupe lourd) modèle 2010. La principale application d'admission aux usages de type groupe lourd (Heavy Heavy Duty).				PARTICULATE FEEL	PARTICULATE FEEL
EXHAUST EMISSION CONTROL SYSTEM					
DISPOSITIF ANTI-POLLUTION	THIS ENGINE IS CERTIFIED TO OPERATE ON ULTRA LOW SULFUR DIESEL FUEL ONLY.			DELEGATED ASSEMBLY	LABEL NO.
EM, EC, TC, CAC, D1, EGR, DPF, SCR					21338494

MACK IMPORTANT ENGINE INFORMATION RENSEIGNEMENTS IMPORTANTS MOTEUR				MACK TRUCKS, INC.	
ENGINE FAMILY: AYP7H12	8501	ENGINE MODEL: MP8-505C	SERIAL NO.: 123456	VALVE LASH (LASH) SOUPAPES:	
FAMILY DE MOTEURS:		MODEL MOTEUR:	NO. SERIE:	INLET ROCKER: 2 mm	ADMISSION CULBUTEUR
DISPLACEMENT: ADVERTISED HP @ RPM	FUEL RATE @ ADVERTISED HP	TOLE SPEED	ENGINE BRAKE	EXHAUST ROCKER: 8 mm	ECARPEMENT CULBUTEUR
CYLINDER: 12.8 L	505/1500	342 mm ³ /stroke	550-700 RPM	NO. FEEL	NO. FEEL
		mm ³ /COOP		NO. FEEL (g/Day-hr)	NO. FEEL (g/Day-hr)
THIS ENGINE CONFORMS TO U.S. EPA AND CALIFORNIA REGULATIONS APPLICABLE TO 2010 MODEL YEAR, NEW HEAVY-DUTY ENGINES AND HAS A PRIMARY INTENDED SERVICE APPLICATION AS A HEAVY HEAVY-DUTY DIESEL ENGINE.				NO. FEEL	NO. FEEL
Ce moteur est conforme aux réglementations de la Californie et de l'Agence de Protection de l'Environnement des États-Unis applicables aux moteurs moteurs diesel Heavy Duty (Groupe lourd) modèle 2010. La principale application d'admission aux usages de type groupe lourd (Heavy Heavy Duty).				PARTICULATE FEEL	PARTICULATE FEEL
EXHAUST EMISSION CONTROL SYSTEM					
DISPOSITIF ANTI-POLLUTION	THIS ENGINE IS CERTIFIED TO OPERATE ON ULTRA LOW SULFUR DIESEL FUEL ONLY.			DELEGATED ASSEMBLY	LABEL NO.
EM, EC, TC, CAC, D1, EGR, DPF, SCR					21338499



Clean Idle Engines

The California Air Resources Board (CARB) requires that 2008 and later model year vehicles be equipped with engines having tamper-resistant software which limits the time at which the engine can idle at speeds above low idle (550–700 rpm). At speeds above low idle, and without a PTO engaged, idle time will be limited to five minutes. The engine then reverts to low idle. Vehicles equipped with a Clean Idle engine have a label affixed to the vehicle.

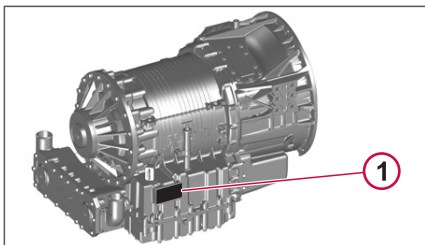
IDENTIFICATION LABELS

Transmission Identification

1 *Carrier Identification Label*

Allison Identification Label

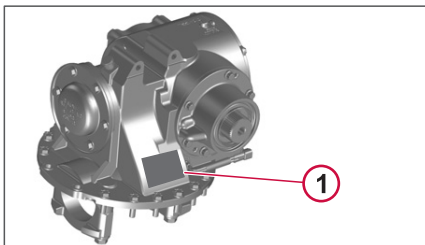
The Allison RDS and HS transmission identification plate is located on the rear right side of the main case, near the lower end.



1 *Allison Identification Label*

Carrier Identification Label

The Mack carrier assembly serial number is located on the front right side of the housing.



GENERAL SAFETY INFORMATION

Safety Statement and Labels

Mack Trucks cannot anticipate every possible occurrence which may involve a potential hazard. An accident can be avoided by recognizing potentially hazardous situations before a dangerous situation occurs. Correctly performed service procedures are critical for technician safety and safe, reliable operation of the vehicle.

DANGER

Do not operate the engine in an enclosed area. All internal combustion engines give off various fumes and gases while running. Inhalation of exhaust fumes can cause death.

DANGER

Do not sit in a parked vehicle for any extended amount of time with the engine running if there are leaks in the exhaust system. Exhaust fumes could leak into the cab area and death can result. On a regular basis inspect the exhaust system for leaks and repair any leakage.

DANGER

Driver attitude is the most important part of any effective vehicle safety system. Mack Trucks encourage all drivers and passengers to use their seat belts, drive defensively, remain alert and respect the speed limits. Many accidents can also be avoided through regular vehicle maintenance.

DANGER

Engine-driven components such as Power Take-Off (PTO) units, fans and fan belts, driveshafts and other related rotating assemblies, can be very dangerous. Do not service engine-driven components unless the engine is shut down. Always keep body parts and loose clothing out of range of these powerful components to prevent serious personal injury. Be aware of PTO engagement or nonengagement status. Always disengage the PTO when not in use.

WARNING

Certain everyday procedures such as washing the vehicle and cleaning the windshield can also be hazardous because of the vehicles height. Mack Trucks does NOT recommend climbing up on the vehicle to perform those operations. Instead, stand on the ground and use brushes and squeegees mounted on an extension pole. When better access is necessary (for instance, when washing the cab roof), use sturdy ladders held in place by someone on the ground.

WARNING

Secure loose objects. Loose objects in the cab or sleeper can be dangerous in a sudden stop or on bad roads. Secure any appliance added to the vehicle, such as a refrigerator or a radio.

WARNING

Keep clear of fan when engine is running. Fan may start to rotate at high speed without warning.

Labels

Safety Certification Label

National Highway Traffic Safety Administration (NHTSA and Transport Canada) regulations require affixing a certification label to all vehicles.

The regulations also require that the certification label be affixed to either the hinge pillar, door latch post or the door edge that meets the door latch post next to the driver seat. If none of these locations are practical, it may be attached to the left side of the instrument panel or to an inward facing surface of the driver-side door.

Your vehicle has a safety certification label affixed in one of the approved locations listed above. This label may be either an Incomplete Vehicle or Completed Vehicle label. Both labels are described below.

Incomplete Vehicles

A chassis-cab is an incomplete vehicle with a completed occupant compartment that requires the addition of cargo-carrying, work-performing or load-bearing components to perform its intended functions.

When the vehicle is completed the chassis-cab manufacturer must affix a final stage manufacturer certification

label to the complete vehicle in one of the approved locations listed above.

This label indicates that the chassis cab was completed and complies with the applicable Motor Vehicle Safety Standards (MVSS). This label is required to contain the same information as shown below for a completed vehicle.

MACK INCOMPLETE VEHICLE MANUFACTURED IN 020005 BY MACK TRUCKS, INC. VEHICLE IDENTIFICATION NUMBER: 1M0AD5C0X0001044 GVWR 40371 KG (89000 LB) GVWR -- FRONT AXLE 9072 KG (20000 LB) GAWR -- 1ST INTERMEDIATE AXLE 10430 KG (23000 LB) GAWR -- 2ND INTERMEDIATE AXLE 10430 KG (23000 LB) GAWR -- 3RD INTERMEDIATE AXLE 403 (LB) GAWR -- 4TH INTERMEDIATE AXLE 403 (LB) GAWR -- 5TH INTERMEDIATE AXLE 403 (LB) GAWR -- REAR AXLE 10430 KG (23000 LB)	
MACK INCOMPLETE VEHICLE (VEHICLE INCOMPLETE) MANUFACTURED IN 080005 BY MACK TRUCKS, INC. VEHICLE IDENTIFICATION NUMBER: 1M0AL01C00001038  GVWR/PN3 37184 KG GAWR/PN3 -- FRONT AXLE 9072 KG GAWR/PN3 -- 1ST INTERMEDIATE AXLE 5443 KG GAWR/PN3 -- 2ND INTERMEDIATE AXLE 5443 KG GAWR/PN3 -- 3RD INTERMEDIATE AXLE 8618 KG GAWR/PN3 -- 4TH INTERMEDIATE AXLE 403 KG GAWR/PN3 -- 5TH INTERMEDIATE AXLE 403 KG GAWR/PN3 -- REAR AXLE 8618 KG	

Completed Vehicles

In addition to the label supplied by MACK as the chassis-cab manufacturer, a Completed Vehicle certification label, supplied by the body manufacturer, is affixed in the same general location. This label provides information pertaining to Gross Vehicle Weight Rating (GVWR), Gross Axle Weight Rating (GAWR), tire and rim information, etc.

On completed vehicles, this label contains the date of manufacture, VIN, GVWR, GAWR, and tire and rim data. It is found in one of the approved locations listed above.

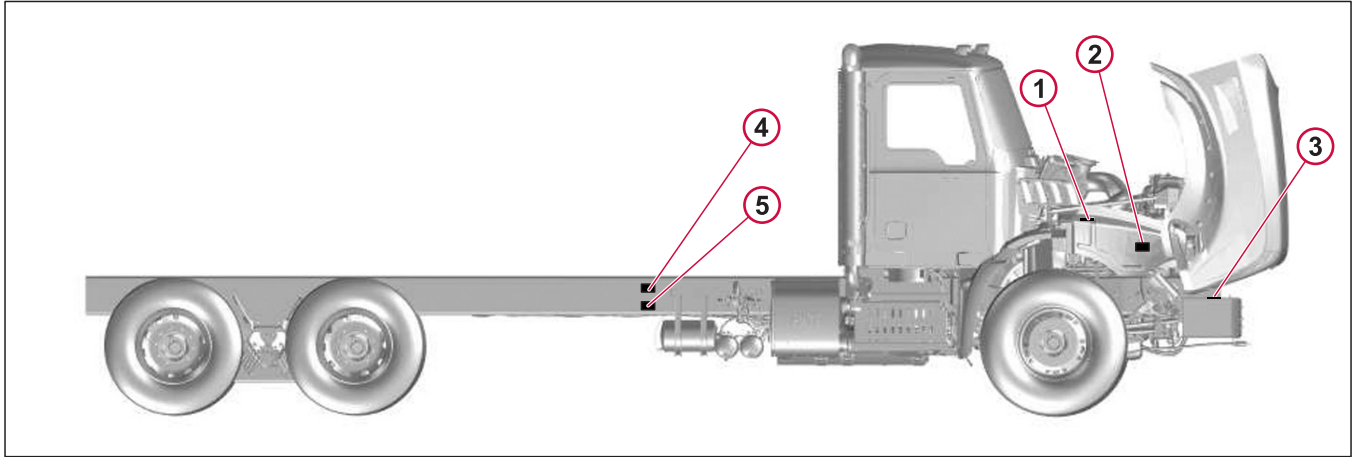
MACK MANUFACTURED BY MACK TRUCKS, INC. IN 11/0005 GVWR 23867 KG (53000 LB) THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE. VEHICLE IDENTIFICATION NUMBER: 1M1A00Y706012587 DATE: 08/07/2005 TIME: 08:00	
FRONT: 5443 KG (12000 LB) WITH 11R22.5 G, 22.5 X 8.25, AT 827 KPA (100 PSI) COLD SINGLE 1ST INT: 9072 KG (20000 LB) WITH 11R22.5 G, 22.5 X 8.25, AT 724 KPA (100 PSI) COLD DUAL 2ND INT: 403 (LB) WITH 11R22.5 G, 22.5 X 8.25, AT 724 KPA (100 PSI) COLD DUAL 3RD INT: 403 (LB) WITH 11R22.5 G, 22.5 X 8.25, AT 724 KPA (100 PSI) COLD DUAL REAR/ACST: 9072 KG (20000 LB) WITH 11R22.5 G, 22.5 X 8.25, AT 724 KPA (100 PSI) COLD DUAL VEHICLE TYPE: TRUCK TRACTOR	
MACK MANUFACTURED IN 080005 BY MACK TRUCKS, INC. VEHICLE IDENTIFICATION NUMBER: 1M1AP02Y00001003 	
GVWR/PN3 36800 KG VEHICLE TYPE: TRUCK TRACTOR/CAMION TRACTEUR GAWR/PN3 -- FRONT: 9072 KG WITH 40-46R82G.6 TRES, 22.5 X 12.25 RIMS, 827 KPA COLD SINGLE GAWR/PN3 -- 1ST INT: 10430 KG WITH 11R24.5 G TRES, 24.5 X 8.25 RIMS, 724 KPA COLD DUAL GAWR/PN3 -- 2ND INT: 403 KG WITH 11R24.5 G TRES, 24.5 X 8.25 RIMS, 724 KPA COLD DUAL GAWR/PN3 -- 3RD INT: 403 KG WITH 11R24.5 G TRES, 24.5 X 8.25 RIMS, 724 KPA COLD DUAL GAWR/PN3 -- REAR: 10430 KG WITH 11R24.5 G TRES, 24.5 X 8.25 RIMS, 724 KPA COLD DUAL	

Advisory Labels

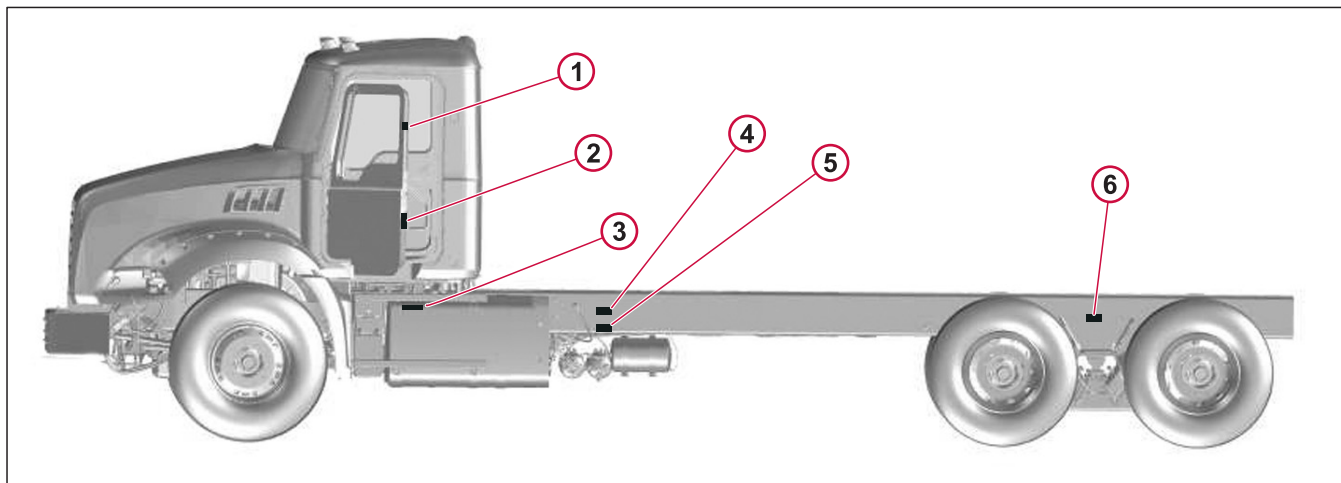
Throughout this book you will find paragraphs labeled Danger, Warning, Caution, Note and Service Hint. Danger, Caution and Warning labels are also found in various locations on the vehicle to alert drivers, operators and service technicians to situations which can cause personal injury or equipment damage. The labels shown are applicable to the truck model chassis at the time of publication and are representative of what can be typically found on your vehicle. Your vehicle may not contain all of the labels illustrated in this handbook. These labels are for your benefit. Please look through this section and note the labels, their locations and what they explain. Be sure to replace any label that is damaged.

GENERAL SAFETY INFORMATION

Advisory Labels On Chassis

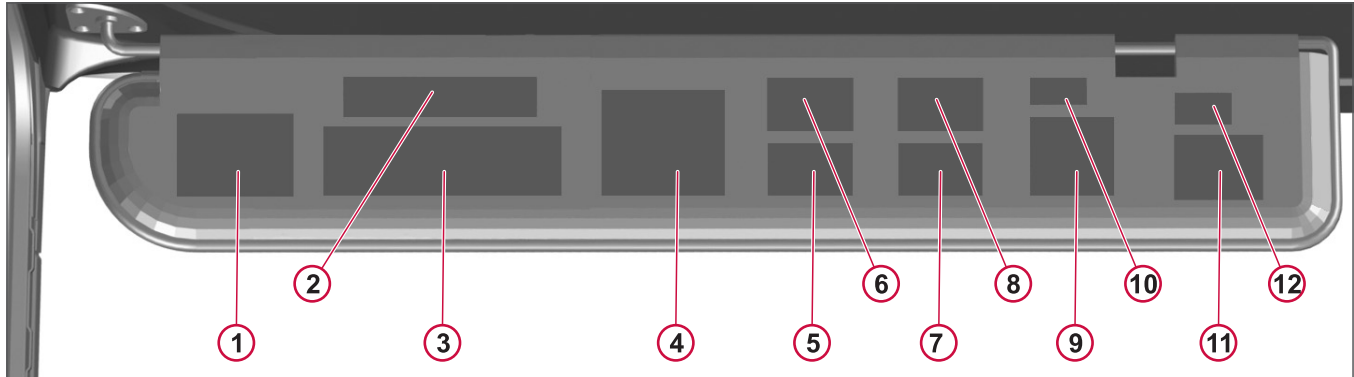


- 1 *Transmission Fluid Label*
- 2 *Hood Label*
- 3 *Belt Placement Label*
- 4 *Frame Heat Treat*
- 5 *Rear Impact Label*

GENERAL SAFETY INFORMATION

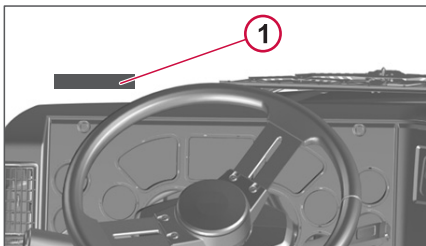
- 1** *Entering / Exiting Label*
- 2** *Low Sulfur Diesel Fuel Only Label*
- 3** *Personal Injury Label*
- 4** *Frame Heat Treat*
- 5** *Rear Impact Label*
- 6** *Air Suspension (if equipped)*

Advisory Labels On Driver-Side Sun Visors



- 1 *Speed Restricted Tires Label*
- 2 *Exhaust Aftertreatment (EATS) Label*
- 3 *Engine Starting Warning Label*
- 4 *mDRIVE™ Label or Shift Label*
- 5 *Clutch Pedal Shift Label*
- 6 *Personal Injury Label*
- 7 *Exhaust Temperature Label*
- 8 *Personal Injury Label*
- 9 *Seat Belt Adjustment Label*
- 10 *Electronic Stability Label*
- 11 *Road Stability Advantage Label*
- 12 *Engine Brake Warning Label*

GENERAL SAFETY INFORMATION



1 *Airbrake System Label*

Warranty Information

This chassis is equipped with an exhaust aftertreatment system (Diesel Particulate Filter). Use of Ultra Low Sulfur Diesel (ULSD) fuel and EO-O Premium Plus (or VDS-4) specification high performance diesel engine oil is required in this vehicle.

⚠ NOTE

Note: Use of improper or unapproved fuel or engine oil will void the engine and aftertreatment system warranty.

Air Brake System

The Mack Trucks Standard Vehicle Warranty applies to the air brake system, as set forth in the Warranty, but only if the air brake system has not been subjected to unauthorized additions, deletions or modifications. If any such unauthorized additions, deletions or modifications are performed, Mack Trucks disclaims any and all liability for any loss or damage arising out of a malfunction of the air brake system.

The air brake system was designed and built to conform to all applicable federal motor vehicle safety standards in effect at the time of manufacture.

Tractor air systems are designed for operation as a tractor only, and truck air systems are designed to be operated as

a truck only. If a tractor is going to be converted for operation as a truck, the air brake system must be reconfigured to that of a truck. Conversely, if a truck is going to be converted for operation as a tractor, the air brake system must be reconfigured to that of a tractor. Consult your local Mack distributor for additional information.

If any unauthorized additions, deletions or modifications are made to any portion of the air brake system which is required by Federal Motor Vehicle Safety Standards, Mack Trucks makes no representation as to conformity with the Standards.

For complete warranty information, refer to the Pedigreed Protection Plan provided with each vehicle.

Federal and Canadian Emission Control System Warranty Statement

This section covers the requirement of the United States Clean Air Act which states: "The manufacturer shall furnish with each new motor vehicle or motor vehicle engine such written instructions for the maintenance and use of the vehicle or engine by the ultimate purchaser as may be reasonable and necessary to assure the proper functioning of emission control devices

and systems." This section also covers the requirements of the emissions regulations promulgated under the Canadian Environmental Protection Act, 1999.

Manufacturer Warranty Coverage

Mack Trucks warrants the Emission Control Systems on each new Mack diesel engine in a new Mack Truck to comply with all United States Federal and Canadian emissions regulations applicable at the time of manufacture of the engine, and to be free from defects in material and workmanship under normal use and service up to 60 months, or 160934 km (100,000 miles), whichever occurs first, provided that all maintenance requirements are followed as described in this manual. All warranty periods are calculated from the date-in-service of the new vehicle. The repair or replacement of defective parts will be made without charge for the cost of parts and if repairs are made at an authorized Mack dealership, there will be no charge for labor.

Mack's obligation under this warranty is limited to the repair or replacement, at Mack's option, of any part(s) of the Emission Control Systems of such engine and/or vehicle found to be defective upon examination by Mack Trucks and provided that such part(s)

were returned to Mack Trucks or its nearest authorized Dealer within a reasonable period of time.

ⓘ NOTE

Note: For emission control systems information on engines other than Mack, refer to the engine vendor's publication.

Tampering With Emission Control Systems Prohibited

The Federal Clean Air Act prohibits the removal or rendering inoperative of any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with Federal Emission Regulations by:

- 1 Any person prior to its sale and delivery to the ultimate purchaser, or
- 2 Any manufacturer or distributor after its sale and delivery to the ultimate purchaser, or
- 3 Any person engaged in the business of repairing, servicing, selling, leasing, or trading motor vehicles or motor vehicle engines following its sale and delivery to the ultimate purchaser, or
- 4 Any person who operates a fleet of motor vehicles following its sale and delivery to the ultimate purchaser.

ⓘ NOTE

Note: For specifics of the prohibited vehicle/engine modifications refer to the Mack Body Builders documentation.

California Emission Control Warranty Statement

The California Air Resources Board and Mack Trucks are pleased to explain the emission control system warranty on your 2017 / 2018 vehicle. In California, new motor vehicle engines must be designed, built and equipped to meet the State's stringent anti-smog standards. Mack Trucks must warrant the emission control system on your engine for the period of time listed below provided there has been no abuse, neglect, or improper maintenance of your engine. Your emission control system may include parts such as the fuel-injection system, turbocharger assembly, electronic control module and other emission related assemblies. If an emission-related part of your engine is defective, the part will be repaired or replaced by Mack Trucks. This is your Emission Control System DEFECTS WARRANTY.

Owner Warranty Responsibilities

As the motor vehicle engine owner, you are responsible for the performance of

the required maintenance listed in this manual. Mack Trucks recommends that you retain all receipts covering maintenance of your vehicle, but Mack Trucks cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance listed in other manuals which were supplied with your vehicle. You are responsible for presenting your motor vehicle engine to a Mack Trucks dealer as soon as a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days. As the motor vehicle engine owner, you should also be aware that Mack Trucks may deny you warranty coverage if your vehicle or a part has failed due to abuse, neglect, improper maintenance, or unapproved modifications. If you have any questions regarding your warranty rights and responsibilities, you should contact Mack Trucks Warranty Activities P.O. Box 26259, Greensboro, NC 27402, or the California Air Resources Board at 9480 Telstar Avenue, El Monte, California 91731.

Federal, Canadian and California Emission Control Warranty Statement

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES

AND REPRESENTATIONS OR CONDITIONS, STATUTORY OR OTHERWISE, EXPRESSED OR IMPLIED INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

The following engine components are covered by the supplemental emissions control system warranty policy as required by the Code of Federal Regulations, California Code of Regulations, and the regulations under the Canadian Environmental Protection Act, 1999.

Component Coverage

- 1 Engine Turbocharger Assembly
 - Variable Geometry Turbo (VGT) Actuator
- 2 Charge Air Cooler (CAC)
- 3 Engine Control Module (ECM)
- 4 Injectors
- 5 EGR Cooler
- 6 EGR Valve and EGR Valve Control
- 7 EGR Venturi
- 8 Crankcase Breather (Does not include Crankcase Pressure Sensor)
- 9 Crankcase Separator
- 10 Crankcase Tubing and Hoses before Separator

- 11 Aftertreatment Wiring Harness (DPF)
- 12 Aftertreatment Wiring Harness (SCR)
 - Jumper to AHI Pressure Regulator
 - ACM Power Supply
 - Heater NOx Care
 - DEF Tank
- 13 Aftertreatment Control Module (ACM)
- 14 Aftertreatment Diesel Particulate Filter (DPF) with Aftertreatment Diesel Oxidation Catalyst (DOC)
 - Aftertreatment Doser
 - Aftertreatment Fuel Shutoff Valve
 - Aftertreatment Fuel Pressure Sensor
 - Engine Exhaust Gas Temperature (EGT) Sensor
 - Aftertreatment DPF Intake Temperature Sensor
 - Aftertreatment DPF Outlet Temperature Sensor
 - Aftertreatment DPF Differential Pressure Sensor:
- 15 Sensors
 - Crankshaft Position (CKP) Sensor
 - Transmission Speed Sensor
 - Engine Coolant Temperature (ECT) Sensor
 - Intake Manifold Air Temperature/ Pressure Sensor
 - Exhaust Gas Recirculation (EGR) Temperature Sensor
 - Aftertreatment Outlet NOx Sensor
 - Aftertreatment Intake NOx Sensor
 - Engine Exhaust Gas Recirculation Differential Pressure Sensor

- Ambient Air Temperature (AAT) Sensor
- Particulate Matter (PM) Sensor

16 SCR

- Aftertreatment Selective Catalytic Reduction (SCR) Catalyst
- Aftertreatment Diesel Exhaust Fluid (DEF) Pump
- Aftertreatment DEF Dosing Absolute Pressure Sensor
- Aftertreatment DEF Return Valve
- Aftertreatment DEF Dosing Valve
- Aftertreatment DEF Tank
- Aftertreatment DEF Tank Heater/ Sender
- Aftertreatment DEF Tank Heater
- Aftertreatment DEF Tank Heater Valve
- Aftertreatment DEF Tank Temperature Sensor
- Aftertreatment DEF Level Sensor
- Aftertreatment DEF Heated Lines
- Aftertreatment DEF Quality Sensor

17 Instrument Cluster (Repair of Microprocessor)

18 Exhaust Gas Piping (from Microprocessor) Turbocharger to Aftertreatment System)

The emission warranty for the diesel particulate filter (DPF) and SCR System covers defects in workmanship only. Normal maintenance, such as cleaning ash from the filter at regular maintenance intervals and cleaning the Aftertreatment Fuel Injector on Diesel

Oxidation Catalyst (DOC) DPF Systems, is not covered by the emission warranty.

❗ NOTE

In response to customer requests, Mack Trucks may build vehicles with engines supplied by other manufacturers. In these cases, each engine manufacturer through its service organization, is responsible for emission control systems warranty on all parts of the engine assembly, as furnished.

❗ NOTE

Any unauthorized adjustments to the emission control components can cause severe damage to the engine.

1 Repairs by Mack Trucks Dealers, Sub-Dealers and Service Dealers

Repairs covered by the Emission Control Systems Warranty will be performed by any authorized Mack Trucks repair facility with no charge for parts and labor (including diagnosis), using Mack parts for any part of the emission control systems covered by this warranty and found defective.

2 In an Emergency

In an Emergency where an authorized Mack Trucks facility is not

available, repairs may be performed at any available service establishment, or by the owner, using any replacement part, within the limitations of paragraphs 3 and 4 in this section. An emergency condition exists under this section if, after 30 days, repairs have not been completed or parts are not yet available. Mack Trucks will reimburse the owner for such repairs that are covered under this warranty, including diagnosis, not to exceed Mack's suggested retail price for parts replaced and labor charges based on Mack's recommended time allowance and geographically appropriate hourly labor rate. Replaced parts and paid invoices must be presented at a Mack Trucks facility as a condition of reimbursement for emergency repairs performed elsewhere.

3 Repairs by Non-Mack Trucks Facilities

Owners may elect to have maintenance, replacement, or repair of emission control systems performed by any repair facility, and may elect to use parts other than Mack parts without invalidating the warranty on other components, but the cost of such service or parts will

not be covered by Mack Trucks under its warranty.

4 Use of Non-Mack Trucks Parts

Use of replacement parts which are not the equivalent of Mack parts may impair the effectiveness of emission control systems. If other than Mack parts are used, the owner should obtain assurances that such parts are warranted by their manufacturer to be the equivalent of Mack parts in performance and durability. Mack assumes no liability under this warranty with respect to parts other than Mack parts; however, the use of non-Mack parts does not invalidate the warranty on other components unless non-Mack parts cause damage to warranted parts.

5 Maintenance and Maintenance Records

The vehicle owner is responsible for the performance of all required maintenance specified in this manual. Mack Trucks will not deny a warranty claim solely because there is no record of maintenance; however, Mack Trucks may deny a warranty claim if failure to perform required maintenance results in the failure of a warranted part. Receipts or other records covering the performance of scheduled

maintenance should be retained to answer questions that may arise concerning maintenance. Maintenance records should be transferred to subsequent owners if the vehicle is sold.

6 Items Not Covered by the Emission Control Systems Warranty

- Malfunctions caused by misuse, improper adjustments, modification, alteration, tampering, disconnection, improper or inadequate maintenance and use of improper diesel fuel.
- Damage resulting from accident, acts of nature or other events beyond the control of Mack Trucks.
- Inconvenience, loss of use of the vehicle, commercial loss of any kind including, but not limited to, consequential or incidental damages.
- Any vehicle in which the odometer has been altered or damaged so that mileage cannot be readily determined.

7 Customer Assistance

Mack Trucks wishes to assure that the Emission Control Systems Warranty is properly administered. In the event that owners do not receive the warranty service to which they

believe they are entitled under the Federal, Canadian, or California Emission Control Systems Warranty, they should contact the nearest Mack Regional Office for assistance.

The address and telephone number for each Regional Office can be found at the front of this Driver Manual.

ⓘ NOTE

In the event that damage results from unauthorized adjustments to any emission control system components, as evidenced by settings other than as specified, or broken fastener seals, the cost of repairing such damage WILL NOT BE COVERED under warranty

Emission Green House Gas Component Warranty

Mack Trucks warrants certain individual greenhouse gas (GHG) components and controls of each new Mack vehicle certified to the requirements of Chapter 40 of the United States Code of Federal Regulations, Part 1037. Mack GHG certified vehicles are warranted to be designed, built, and equipped so they conform at the time of sale to the ultimate purchaser to the requirements of the Part and to be free from defects in material and workmanship which, under

normal use and service, would cause the vehicle to fail to conform to the requirements of the Part up to the periods specified, provided all Mack Trucks maintenance and inspection requirements are followed. See your local authorized Mack Trucks dealer for recommended maintenance and inspection procedures. All warranty periods are calculated from the date in service of the vehicle. All coverage is 100% for parts and labor subject to the qualifications, limitations and exclusions as noted.

LIMITATIONS AND EXCLUSIONS TO THIS WARRANTY APPEAR ON THE FOLLOWING PAGES. THESE LIMITATIONS AND EXCLUSIONS ARE IMPORTANT AND MUST BE READ AND UNDERSTOOD.

This warranty applies to new Mack vehicles certified to the requirements of 40 CFR part 1037. Mack Trucks reserves the right to make any changes in design, or make additions to or upon its products, without incurring any obligations to install the same changes on vehicles previously built.

Emissions Components Coverage, Vehicle

Not Covered by the Emissions Control System Warranty:

- Malfunctions caused by misuse, improper adjustment, modification alteration, tampering, disconnection, improper or inadequate maintenance and use of improper diesel fuel or DEF.
- Damage resulting from accident, act of nature or other events beyond the control of Mack Trucks.
- Inconvenience, loss of use of the vehicle, commercial loss of any kind including, but not limited to consequential or incidental damages.
- Any vehicle in which the odometer has been altered or damaged so that mileage cannot be readily determined.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES AND REPRESENTATIONS OR CONDITIONS, STATUTORY OR OTHERWISE, EXPRESSED OR IMPLIED INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE

Tires, Drive and Steer Only

The first 24 months or 38624 km (24,000 miles) of vehicle operation, whichever occurs first, and applying only to the first set of tires on the vehicle when delivered to the ultimate purchaser. Subject to the terms and conditions of the tire manufacturer's warranty, excluding

retreads. Emissions related warranty coverage only, refer to the specific tire manufacturer's warranty policy for other term lengths.

Source of Parts and Repair

A repair shop or person of the owner's choosing may maintain, replace, or repair emission control devices and systems.

Replacement of Tires that are GHG Certified

The original equipment tires installed on this vehicle at the factory were certified to the U.S. EPA Greenhouse Gas (GHG) and NHTSA Fuel Efficiency regulations. Replacement of these tires should be with a tire of equal or lower rolling resistance levels (TRRL or CRR). Please consult your tire supplier(s) for appropriate replacement tires.

Maintaining a GHG Certified Tire

In order to maintain the certified rolling resistance of the tires which optimize fuel economy, the maintenance procedures provide by the tire manufacturer must be followed.

All Other Vehicles

Emission controls are warranted to 60 months or 160934 km (100,000 miles), whichever occurs first.

Other Vehicle Components

60 months or 160934 km (100,000 miles), whichever occurs first.

Emission Control System Warranty

Vehicles sold for use in California must have the Operator's Manual in the vehicle which contains the California Emission System Warranty.

Coverage Tires

Drive and Steer Only: The first 24 months or 38624 km (24,000 miles) of vehicle operation, whichever occurs first, and applying only to the first set of tires on the vehicle when delivered to the ultimate purchaser. Subject to the terms and conditions of the tire manufacturer's warranty, excluding retreads. Emissions related warranty coverage only, refer to the specific tire manufacturer's warranty policy for other term lengths.

Exterior Components: Highway Tractors Only

Chassis Fairings, Ground Effect Extensions, Roof Deflectors, Cab Side Deflectors, Adjustable Roof Extensions, Side Deflector Extensions, Bumper Deflectors, A-pillar Deflectors

60 Months or 160934 km (100,000 Miles), whichever occurs first.

Air Conditioning Components: Only those vehicles certified as "Tractors" according to the requirements of Chapter 40 of the Code of Federal Regulations, Part 1037.

Hoses, Compressor to Condenser
Hoses, Condenser to Drier Hoses, Drier
to Climate Unit Hoses, Climate Unit to
Compressor Hoses, Bunk Climate Unit
Receiver Drier, Spring Loaded, 12 cubic
in. A/C Compressor A/C Condenser A/C
Pressure Switches & Transducers Main
Climate Unit Bunk Climate Unit
60 Months or 160934 km (100,000
Miles), whichever occurs first.

WARRANTY CERTIFICATES**Standard Truck Warranty Certificate**

Mack Trucks, warrants certain individual components of the new Mack truck to be free from defects in material and workmanship under normal use and service up to the periods as specified, provided all Mack Trucks, maintenance and inspection requirements found in the Operator's Manuals and service manuals/instructions are followed. All warranty periods are calculated from date in service. All coverage is 100% for parts and labor except as noted.

LIMITATIONS AND EXCLUSIONS TO THIS WARRANTY APPEAR ON THE REVERSE SIDE OF THIS CERTIFICATE. THESE LIMITATIONS AND EXCLUSIONS ARE IMPORTANT AND MUST BE READ AND UNDERSTOOD.

This warranty applies to **Model Year 2016** and newer CHU, CXU, GU, LEU, LR, MRU and TD models manufactured by Mack Trucks, operated in the United States and Canada. Specific coverage is based on the application and weight class as described in the following chart:

Mack Trucks warrants certain individual components of the new Mack truck to be free from defects in material and workmanship under normal use and service up to the periods as specified, provided all Mack Trucks' maintenance and inspection requirements are followed. See your local authorized Mack dealer for recommended maintenance and inspection procedures. All warranty periods are calculated from date in service of the vehicle. All coverage is 100% for parts and labor subject to the qualifications, limitations, and exclusions as noted.

LIMITATIONS AND EXCLUSIONS TO THIS WARRANTY APPEAR ON THE FOLLOWING PAGES OF THIS CERTIFICATE. THESE LIMITATIONS AND EXCLUSIONS ARE IMPORTANT AND MUST BE READ AND UNDERSTOOD.

This warranty applies to Model Year 2018 and newer models manufactured by Mack Trucks, operated in the United States and Canada. Specific coverage is based on the application and weight class as described in the following chart:

	Standard Normal Duty	Standard Heavy Duty	Standard Severe Duty
Typical Vocation	Line / Long Haul, Short Haul, or Pickup & Delivery	Heavy Line Haul, Construction, Refuse, Fire or Rescue Service	Heavy Construction, Heavy Refuse, Off-Road, Heavy Haul, Mining, Logging, or Oil Field

WARRANTY CERTIFICATES

	Standard Normal Duty	Standard Heavy Duty	Standard Severe Duty
Weight Class Qualifications	Vehicle must have GVWR ≤ 63,000 lbs. (≤ 28 metric ton) or GCWR ≤ 110,000 lbs. (≤ 50 metric ton)	Vehicle must have GVWR ≤ 80,000 lbs. (≤ 36 metric ton) or GCWR ≤ 143,000 lbs. (≤ 65 metric ton)	Vehicle must have GAWR > 46,000 lbs. (> 21 metric ton) or GVWR > 80,000 lbs. (> 36 metric ton) or GCWR > 143,000 lbs. (> 65 metric ton)
Basic Coverage *	12 months or 100,000 miles (160 934 km)	12 months or 100,000 miles (160 934 km)	12 months or 100,000 miles (160 934 km)
Chassis Towing	Towing/Road Service coverage is limited to 90 days or 5,000 miles (8047 km), whichever occurs first, and to a single tow per incident to the nearest authorized Mack Trucks service center. Charges in excess of \$1,000.00 are not covered unless Mack OneCall™ service is contacted and approves additional amounts prior to tow.		Not Applicable
Air Conditioning	Air conditioning (sealed system only) is covered for 12 months with no mileage limitation.		
Engine / Emission	Not covered under this warranty certificate. See respective engine manufacturer's warranty certificate. See paragraph 19 under Exclusions.		
Transmission, Driveline, Rear Axle, Front Non-Drive Steer Axle	36 months or 350,000 miles (563 270 km) Covered Components are as follows: • Manual Transmission – Transmission Assembly • Driveline – Bearings, Hangers and Shafts • Rear Axle – Differential Carrier Assembly and Axle Housing • Front Non-Drive Steer Axle – Axle Beam, Steering Knuckle, and Tie Rod Allison Automatic Transmissions are not covered under this warranty certificate. See paragraph 19 under Exclusions.		12 months or 100,000 miles (160 934 km)
Mack Carrier & Axle Housing	60 months or 500,000 miles (804 672 km)	36 months or 300,000 miles (482 803 km)	12 months or 100,000 miles (160 934 km)
Mack T300 Transmission	60 months or 750,000 miles (1 207 008 km)	36 months or 400,000 miles (643 738 km)	12 months or 100,000 miles (160 934 km)

WARRANTY CERTIFICATES

	Standard Normal Duty	Standard Heavy Duty	Standard Severe Duty
<i>m</i>DRIVE™ Transmission	Engine Torque ≤ 1760 ft-lb: 60 months or 750,000 miles (1 207 008 km) ** Engine Torque > 1760 ft-lb: 36 months or 500,000 miles (804 672 km)	<i>m</i> DRIVE™ 36 months or 250,000 miles (402 336 km); <i>m</i> DRIVE™ HD: 36 months with no mileage limitation	<i>m</i> DRIVE™ : 12 months or 100,000 miles (160 934 km); <i>m</i> DRIVE™ HD: 24 months with no mileage limitation
<i>m</i>DRIVE™ Clutch	36 months or 300,000 miles (482 803 km)	36 months or 250,000 miles (402 336 km) <i>m</i> DRIVE™ and <i>m</i> DRIVE™ HD	<i>m</i> DRIVE™: 12 months or 100,000 miles (160 934 km) <i>m</i> DRIVE™ HD: 24 months or 250,000 miles (402 336 km)
<i>m</i>DRIVE™ & T300 Towing	Towing/Road Service on warrantable transmission failures is covered to 24 months or 250,000 miles (402 336 km) whichever occurs first, and to a single tow per incident to the nearest authorized Mack Trucks service center. Charges in excess of \$1,000.00 are not covered unless Mack OneCall™ service is contacted and approves additional amounts prior to tow.		Not Applicable
Trunnion Bracket	36 months or 300,000 miles (482 803 km) Limited to Trunnion Bracket & Spindle, Suspension Trunnion (Except Bushings)		12 months or 100,000 miles (160 934 km) (same restrictions as Normal & Heavy)
Cab Structure	60 months or 500,000 miles (804 672 km)	24 months or 200,000 miles (321 869 km)	12 months or 100,000 miles (160 934 km)
Internal Cab Corrosion	60 months or 500,000 miles (804 672 km)	60 months or 500,000 miles (804 672 km)	60 months or 500,000 miles (804 672 km)
	Covered only where metal is perforated from the inside to the outside. See paragraph 18 under Exclusions.		
Frame Rail / Crossmembers	60 months or 500,000 miles (804 672 km) CHU/CXU Models Only: 72 months or 750,000 miles (1 207 008 km)	36 months or 300,000 miles (482 803 km) GU Model only: 60 months or 500,000 miles (804 672 km)	12 months or 100,000 miles (160 934 km)

WARRANTY CERTIFICATES

	Standard Normal Duty	Standard Heavy Duty	Standard Severe Duty
Noise Emission	LIFE OF VEHICLE: Mack Trucks, warrants to the first purchaser of this vehicle for purposes other than resale, and to each subsequent purchaser, that this vehicle was designed, built and equipped to conform, at the time of sale to such first purchaser, with all applicable U.S. EPA noise control regulations. This warranty is not limited to any vehicle particular part, component, or system of the vehicle. Defects in the design, assembly, or any part, component or system of the vehicle, which at the time of sale to such first purchaser, caused noise emission levels to exceed Federal standards, are covered by this warranty for the life of the vehicle. EXCLUSIONS: Failures which arise as a result of tampering rather than from defects in the design, assembly, or any part, components, or system of the vehicle are not covered by this warranty.		
*Covered for 30 Days: Fluorescent Lights or Ballast, Light Bulbs, Fuses, Wiper Blades, and All Filters (oil, fuel, air, etc.). Covered for 90 Days: Loose Fasteners, Leaking Fittings, or Loose Hose Clamps.			
**Includes engine torque to 1860 ft-lb with up to and including 455 HP.			

THESE LIMITATIONS AND EXCLUSIONS ARE IMPORTANT AND MUST BE READ AND UNDERSTOOD.

LIMITATIONS – Mack Trucks obligation is limited to, at its sole option, repair or replacement of parts which are acknowledged by it to be defective. The defective parts or assemblies replaced shall become the property of Mack Trucks North America. Warranty repairs performed by an authorized Mack dealer in accordance with the terms of the warranty set forth herein are free of charge. Warranty consideration can only be given if the deficiency is brought to the attention of an authorized Mack dealer upon discovery and the vehicle must be made available, in a timely fashion during the coverage period, for repair.

EXCLUSIONS:

- 1. REPAIR:** In the case of acknowledged defective Covered Parts, exchange with factory remanufactured parts may occur. Warranty repairs do not constitute an extension of any warranty period for any vehicle, component or part.
- 2. DAMAGES:** Damages due to misapplication, misuse, accidents, negligence, improper operations, alterations, storage or transport, operation at excessive speeds, loading beyond the factory rated load capacity, failure to follow Mack Trucks' recommended inspection, maintenance, and service procedures, and improper or insufficient maintenance services are not covered.
- 3. PROGRESSIVE DAMAGE:** Damages due to failure of operator to take reasonable precautions to mitigate damage are not covered. Damages to a Covered Part due to failure of non-covered part are not covered. Coverage is limited to failure of a Covered Part directly causing failure of a non-covered part, where reasonable precautions were taken to mitigate damages.
- 4. APPLICATION:** The selling dealer is responsible for designating the correct application and/or specification for a vehicle sold to a customer. Damages due to misapplication, including but not limited to, failures of component parts of vehicles being operated in excess of factory rated load capacities, or the use of a vehicle, component or part for a purpose for which it was not intended are not covered.

WARRANTY CERTIFICATES

5. ALTERATIONS: Any vehicle, component or part repaired, altered, or inspected in any way, so as to adversely affect, in Mack Trucks' sole judgment, its stability, durability, or reliability, is not covered.

6. NON-ORIGINAL EQUIPMENT: Any part of the vehicle that fails, malfunctions, or does not perform as a result of improper conversion or installation of bodies or equipment by other manufacturers or suppliers is not covered.

7. MAINTENANCE AND PARTS CONSUMED: Maintenance and inspection requirements found in the Operator's Manuals and service manuals/instructions, including, but not limited to, engine tune-up, fuel system cleaning, replacement of lubricants and filter elements, adjustments of the engine injection pump/transmission/brakes/linkages, as well as diagnosis, test time and all other adjustments must be followed and are not covered. Parts which are normally consumed or worn out during the vehicle's normal service life and customarily replaced during usual maintenance service, including, but not limited to, mud flaps and brackets, brake linings, clutch brake, and clutch linings, are not covered.

8. PERFORMANCE COMPLAINTS: Performance complaints are not covered (including, but not limited to, low power and/or poor fuel economy). Coverage is limited to defects in material and workmanship of a Covered Part directly causing the performance issue.

9. WEAROUT: Mack Trucks does not cover normal wear of Covered Parts. Failures attributable to wear are excluded. For example and without limitation, the wear rate of parts in any engine or transmission, and especially those parts within the combustion area and clutch housing area, will vary depending upon operating conditions and environment. Conditions, such as load, trailer configuration, road speed and road conditions, as well as the quality of fuel, lubrication oil, and all filters bear a direct relationship to the wear rate and resulting life of parts. Depending upon the severity of these various conditions, parts wear and resulting failure could occur within the time limit of the coverage.

10. NON-GENUINE PARTS: Any failure of any vehicle, component or part caused by the use of parts and accessories, or major assemblies and exchange units, which do not meet factory standards is not covered.

11. ODOMETER READING: Any vehicle on which the actual mileage or hours cannot readily be determined, or on which the odometer, hour meter, or Electronic Control Unit has been disconnected, disabled, or altered, may not be covered by this warranty.

12. ACCESS TO INFORMATION: Owner must allow Mack Trucks full access to all data stored in all Electronic Control Modules; failure to do so may result in the loss of warranty coverage.

13. LABOR: Labor to remove and install a Covered Part is included only if a Mack Trucks authorized dealer originally installed the Covered Part. Labor for overtime and/or shift differential is not covered. Excessive labor for a warrantable repair due to the prior installation of equipment or body is not covered.

14. MISC. EXPENSE: Meals, lodging, communications charges, travel time and expense, loss of cargo, downtime, loss of profit/revenue, rental vehicles, driver's wages and other miscellaneous expenses are not covered. Shop supplies, lube oil, lubricants, sealers, anti-freeze, filter elements and labor performed by a non-approved location are not covered.

15. ADDITIONAL COMPONENTS: Components or parts that are not installed by Mack Trucks, including winches, power take-offs, dumper, mixer and refuse assemblies, hoists and bodies or other special equipment are not covered. During a warrantable repair,

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additional time to remove any customer installed components will not be covered under warranty. Mack Trucks' factory manufacturing records will be determinative as to factory installed components.

16. TOWING: Unless expressly provided in this Warranty Certificate, expenses for towing or road service are not covered. Failures caused by improper towing technique are not covered.

17. SUSPENSION PARTS: Suspension parts, including but not limited to rubber bushings, torque rod bushings, spring pins and bushings, and greased lubrication points that fail due to improper maintenance, abnormally severe service or abuse are not covered.

18. CAB STRUCTURE AND CORROSION: Cab structural defects or cab corrosion that occurs in areas of the cab that previously were damaged, repaired, altered or modified are not covered. Cab corrosion where metal is perforated from the outside to the inside is not covered.

19. VENDOR ENGINES, ALLISON AUTOMATIC TRANSMISSIONS and ALTERNATE FUEL STORAGE AND DELIVERY SYSTEMS: Vendor engines, Allison automatic transmissions and alternate fuel (CNG/LNG/DME) fuel storage/delivery components used in Mack trucks are warranted by their respective manufacturers and not by Mack Trucks, Inc. Refer to the manufacturers' warranty statements.

20. OIL CONSUMPTION: Before a claim based upon excessive oil consumption will be considered, the owner must provide proof that all recommended maintenance has been performed and submit adequate documentation to show that oil consumption exceeds Mack Trucks' published standards. Under no circumstances will warranty pay for repairs related to excessive oil consumption after the earlier of 24 months, 250,000 miles, 402,000 kilometers, or 6,250 engine hours.

21. ENVIRONMENTAL DAMAGE: Parts made out of cloth, leather, wood, rubber, synthetics, paint or chrome which have been affected by exposure to the elements or chemical influence including, but not limited to, road salts/chemicals, industrial fall-out or the use of improper cleaners, polishes and/or waxes are not covered.

22. ALIGNMENT: Alignment of axle(s), balance of tires, changing of axle camber, caster, toe and thrust angle are not covered.

23. GLASS: Glass breakage and scratches are not covered unless physical proof of manufacturing responsibility is established.

24. TIRES: Tires are not covered by this warranty, but may be covered by separate warranties given by their respective manufacturers.

25. CHANGES: Mack Trucks reserves the right to make any changes in design, or make additions to or upon its products, without incurring any obligations to install the same changes on vehicles previously built.

THIS WARRANTY IS MADE EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, REPRESENTATIONS OR CONDITIONS, STATUTORY OR OTHERWISE, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATION OR LIABILITY ON THE PART OF THE MANUFACTURER INCLUDING, WITHOUT LIMITATION OF THE FOREGOING, CONSEQUENTIAL, INDIRECT, AND INCIDENTAL DAMAGES. MANUFACTURER NEITHER ASSUMES NOR AUTHORIZES ANY PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF VEHICLES, COMPONENTS OR PARTS.

WARRANTY CERTIFICATES**Standard Engine Warranty Certificate (EPA 17 and newer)**

Mack Trucks warrants certain individual components of each new Mack MP®7, MP®8, and MP®10 EPA 17 and newer emission engine in a new Mack truck to be free from defects in material and workmanship under normal use and service up to the periods specified, provided all Mack Trucks' maintenance and inspection requirements are followed. See your local authorized Mack dealer for recommended maintenance and inspection procedures. All warranty periods are calculated from the date in service of the vehicle. All coverage is 100% for parts and labor subject to the qualifications, limitations, and exclusions as noted.

LIMITATIONS AND EXCLUSIONS TO THIS WARRANTY APPEAR ON THE FOLLOWING PAGES OF THIS CERTIFICATE. THESE LIMITATIONS AND EXCLUSIONS ARE IMPORTANT AND MUST BE READ AND UNDERSTOOD.

This warranty applies to only new Mack MP®7, MP®8, and MP®10 engines meeting EPA 17 and newer emission requirements in new Mack trucks operated in the United States and Canada.

Standard Mack Engine Components Coverage: 24 months or 250,000 miles (402 336 km), whichever occurs first, unless otherwise noted.

Major Components Coverage: 60 months or 500,000 miles (804 672 km), whichever occurs first.

USE OF IMPROPER OR UNAPPROVED FUEL OR ENGINE OIL WILL VOID THE ENGINE AND AFTERTREATMENT SYSTEM (DIESEL PARTICULATE FILTER) WARRANTIES. EPA 17 EMISSION MACK ENGINES REQUIRE THE USE OF MACK SPECIFICATION EOS 4.5 HIGH PERFORMANCE DIESEL ENGINE OIL AND ULTRA LOW SULFUR DIESEL (ULSD) FUEL.

USE OF FLUIDS OTHER THAN API CERTIFIED DIESEL EXHAUST FLUID (DEF) WILL COMPROMISE AFTERTREATMENT SYSTEM PERFORMANCE, INCREASE EMISSIONS, AND MAY IMPACT THIS TRUCK'S PRODUCT WARRANTIES.

SEE FOLLOWING TABLE FOR SPECIFIC COVERAGES:

Covered Standard Components List: 24 Months or 250,000 Miles (402 336 km)	Qualifications and Limitations
Air Compressor	Includes: Sprocket and Mounting Bolts
Bearings	All internally lubricated Bearings and Bushings only.
Camshaft, Caps, and Bolts	Failures resulting from the Valve and Injector adjustments not being maintained properly are NOT covered. Normal maintenance adjustments are NOT covered.
Connecting Rods, Caps, and Bolts	

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Covered Standard Components List: 24 Months or 250,000 Miles (402 336 km)	Qualifications and Limitations
Coolant Duct Cover	
Crankcase Ventilation Assembly	
Crankshaft	
Crankshaft Hub	
Cylinder Block	Includes: Casting, Main Caps, and Bolts
Cylinder Block Heater	
Cylinder Head	Includes: Assembly, Casting, Bolts, Plugs, and Sleeves
Diesel Particulate Filter Assembly (DPF) / Diesel Oxidation Catalyst (DOC) / Selective Catalytic Reduction (SCR)	Includes: Aftertreatment Hydrocarbon Injector (AHI), Aftertreatment Wiring Harness, Aftertreatment Control Module, Diffuser Pipe (AHI Mounting), Fuel Lines to AHI Injector, AHI Shutoff Valve, AHI Fuel Pressure Sensor, Pre-Catalyst Temperature Sensor, Post-Catalyst Temperature Sensor, downstream DPF Temperature Sensor, Differential Pressure Sensor, Particulate Matter (PM) Sensor, SCR Assembly, DEF Pump Assembly (Pump Reverting Valve, Pump Pressure Sensor), DEF Injector, DEF Tank Heating Control Valve, NOx Sensor (SCR Inlet and Outlet)
EGR (Exhaust Gas Recirculation) Components	All components including Clamps, Control Valve, Cooler, Fittings, Gaskets, Mixer, Pipes, and EGR Wiring Harness. Excludes: EGR Cooler Vibration Damper which is a maintenance item.
Electrical EA Harness Supplied with Engine	From EECU to Sensors and Injectors and Actuators
Engine Electronic Control Unit (EECU)	
Engine Brake Mechanism - PowerLeash™	Factory Installed Only Includes: PowerLeash™ Control Valve and PowerLeash™ Rocker Arms Turbo Compound (TC) Engine: Closed Loop Butterfly (CLB)
Exhaust Manifold	Includes: Casting, Joint Seals, Rings, and Wraps
Fan Belt Tensioner Assembly and Bracket	Excludes: Fan Belt
Flywheel	Includes: Housing and Ring Gear
Fuel Filter Housing	Excludes: Filters
Fuel Injection System	Includes: Injectors, common rail assembly (Electronic Fuel Pressure Regulator and Pressure Sensor)

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Covered Standard Components List: 24 Months or 250,000 Miles (402 336 km)	Qualifications and Limitations
Fuel Transfer Pump	
Gaskets, Seals, O Rings, and Silicon Sealant	
Gears	All internally lubricated Gears only (Timing and Idler Gears)
Hoses and Lines, Supplied with Engine	Fluid carrying: Engine to Engine Mounted
Idler Pulleys	
Intake Manifold and Throttle Assembly	
Ladder Frame	
Oil Cooler	Engine Oil Cooler Only
Oil Fill Tube and Cap	
Oil Filter Housing	Excludes: Oil Filters
Oil Pan	
Oil Pump	
Piston Assembly	Includes: Cooler Nozzles, Liners, Pistons, and Rings
Pneumatic Control System	TC Engine: Air Valve Unit, Buffer Valve Unit, and Check Valve
Power Steering Pump	
Pre-Heater	Factory Installed Only. Includes: Preheat Relay, Terminals, and Power Cables
PTO Drive / REPTO (Rear Engine Mounted PTO Drive)	Factory Installed Only. Excludes: All Pumps or Drive Gears
Rocker Arm Assembly and Shafts	Includes: PowerLeash™ Rockers and non- PowerLeash™ Rockers. Failures resulting from the Valve and Injector Adjustments not being maintained properly are NOT covered. Normal maintenance Adjustments are NOT covered.
Sensors (On Engine)	Includes: Coolant Temperature, Crankcase Pressure, Crankshaft (Engine Timing), EGR Temperature and Pressure, Engine Oil Level and Temperature, Engine Oil Pressure, Engine Position (Camshaft), Fuel Pressure and Temperature, Intake Boost Pressure and Temperature, and Inlet Manifold Air (Temperature and Pressure)
Starter Motor	
Thermostat (Coolant)	Includes: Thermostat Side Cover

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Covered Standard Components List: 24 Months or 250,000 Miles (402 336 km)	Qualifications and Limitations
Timing Gear Cover and Mounting Plate	
Towing	Towing/Road Service on warrantable engine failures is covered to 24 months or 250,000 miles (402 336 km) whichever occurs first, and to a single tow per incident to the nearest authorized Mack service center. Charges in excess of \$1,000.00 are not covered unless Mack OneCall™ service is contacted and approves additional amounts prior to tow.
Turbocharger Assembly	Includes: VGT Actuator Module and Turbo Compound (TC) Assembly, if included
Valve Assembly	Includes: Guides, Keepers, Rotators, Seats, Springs and Valves. Failures resulting from the Valve Adjustments not being maintained properly are NOT covered. Normal maintenance adjustments are NOT covered.
Valve Cover	
Valve Yokes (Bridge) and Pins	Failures resulting from the Valve Adjustments not being maintained properly are NOT covered. Normal maintenance adjustments are NOT covered.
Vibration Dampers and Bolts	
Water Pump Assembly	
Covered Major Components List: 60 Months or 500,000 Miles (804 672 km)	Qualifications and Limitations
Camshaft, Caps and Bolts	Failures resulting from the Valve & Injector Adjustments not being maintained properly are NOT covered. Normal maintenance adjustments are NOT covered.
Connecting Rods, Caps, and Bolts	
Crankshaft Forging	
Cylinder Block Casting, Main Caps, and Bolts	
Cylinder Head Casting and Bolts	
Exhaust Manifold Casting	
Flywheel Housing	
Gears	All internally lubricated Gears only (Timing and Idler Gears)
Intake Manifold Housing	
Ladder Frame	

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Covered Major Components List: 60 Months or 500,000 Miles (804 672 km)	Qualifications and Limitations
Thermostat Housing	
Timing Gear Cover and Mounting Plate	

THESE LIMITATIONS AND EXCLUSIONS ARE IMPORTANT AND MUST BE READ AND UNDERSTOOD.

LIMITATIONS – Mack Trucks obligation is limited to, at its sole option, repair or replacement of parts which are acknowledged by it to be defective. The defective parts or assemblies replaced shall become the property of Mack Trucks North America. Warranty repairs performed by an authorized Mack dealer in accordance with the terms of the warranty set forth herein are free of charge. Warranty consideration can only be given if the deficiency is brought to the attention of an authorized Mack dealer upon discovery and the vehicle must be made available, in a timely fashion during the coverage period, for repair.

EXCLUSIONS:

1. REPAIR: In the case of acknowledged defective Covered Parts, exchange with factory remanufactured parts may occur. Warranty repairs do not constitute an extension of any warranty period for any vehicle, component or part.

2. DAMAGES: Damages due to misapplication, misuse, accidents, negligence, improper operations, alterations, storage or transport, operation at excessive speeds, loading beyond the factory rated load capacity, failure to follow Mack Trucks' recommended inspection, maintenance, and service procedures, and improper or insufficient maintenance services are not covered.

3. PROGRESSIVE DAMAGE: Damages due to failure of operator to take reasonable precautions to mitigate damage are not covered. Damages to a Covered Part due to failure of non-covered part are not covered. Coverage is limited to failure of a Covered Part directly causing failure of a non-covered part, where reasonable precautions were taken to mitigate damages.

4. APPLICATION: The selling dealer is responsible for designating the correct application and/or specification for a vehicle sold to a customer. Damages due to misapplication, including but not limited to, failures of component parts of vehicles being operated in excess of factory rated load capacities, or the use of a vehicle, component or part for a purpose for which it was not intended are not covered.

5. ALTERATIONS: Any vehicle, component or part repaired, altered, or inspected in any way, so as to adversely affect, in Mack Trucks' sole judgment, its stability, durability, or reliability, is not covered.

6. NON-ORIGINAL EQUIPMENT: Any part of the vehicle that fails, malfunctions, or does not perform as a result of improper conversion or installation of bodies or equipment by other manufacturers or suppliers is not covered.

7. MAINTENANCE AND PARTS CONSUMED: Maintenance and inspection requirements found in the Operator's Manuals and service manuals/instructions, including, but not limited to, engine tune-up, fuel system cleaning, replacement of lubricants and filter elements, adjustments of the engine injection pump/transmission/brakes/linkages, as well as diagnosis, test time and all other adjustments must be followed and are not covered. Parts which are normally consumed or worn out during the vehicle's

normal service life and customarily replaced during usual maintenance service, including, but not limited to, mud flaps and brackets, brake linings, clutch brake, and clutch linings, are not covered.

8. PERFORMANCE COMPLAINTS: Performance complaints are not covered (including, but not limited to, low power and/or poor fuel economy). Coverage is limited to defects in material and workmanship of a Covered Part directly causing the performance issue.

9. WEAROUT: Mack Trucks does not cover normal wear of Covered Parts. Failures attributable to wear are excluded. For example and without limitation, the wear rate of parts in any engine or transmission, and especially those parts within the combustion area and clutch housing area, will vary depending upon operating conditions and environment. Conditions, such as load, trailer configuration, road speed and road conditions, as well as the quality of fuel, lubrication oil, and all filters bear a direct relationship to the wear rate and resulting life of parts. Depending upon the severity of these various conditions, parts wear and resulting failure could occur within the time limit of the coverage.

10. NON-GENUINE PARTS: Any failure of any vehicle, component or part caused by the use of parts and accessories, or major assemblies and exchange units, which do not meet factory standards is not covered.

11. ODOMETER READING: Any vehicle on which the actual mileage or hours cannot readily be determined, or on which the odometer, hour meter, or Electronic Control Unit has been disconnected, disabled, or altered, may not be covered by this warranty.

12. ACCESS TO INFORMATION: Owner must allow Mack Trucks full access to all data stored in all Electronic Control Modules; failure to do so may result in the loss of warranty coverage.

13. LABOR: Labor to remove and install a Covered Part is included only if a Mack Trucks authorized dealer originally installed the Covered Part. Labor for overtime and/or shift differential is not covered. Excessive labor for a warrantable repair due to the prior installation of equipment or body is not covered.

14. MISC. EXPENSE: Meals, lodging, communications charges, travel time and expense, loss of cargo, downtime, loss of profit/revenue, rental vehicles, driver's wages and other miscellaneous expenses are not covered. Shop supplies, lube oil, lubricants, sealers, anti-freeze, filter elements and labor performed by a non-approved location are not covered.

15. ADDITIONAL COMPONENTS: Components or parts that are not installed by Mack Trucks, including winches, power take-offs, dumper, mixer and refuse assemblies, hoists and bodies or other special equipment are not covered. During a warrantable repair, additional time to remove any customer installed components will not be covered under warranty. Mack Trucks' factory manufacturing records will be determinative as to factory installed components.

16. TOWING: Unless expressly provided in this Warranty Certificate, expenses for towing or road service are not covered. Failures caused by improper towing technique are not covered.

17. SUSPENSION PARTS: Suspension parts, including but not limited to rubber bushings, torque rod bushings, spring pins and bushings, and greased lubrication points that fail due to improper maintenance, abnormally severe service or abuse are not covered.

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18. CAB STRUCTURE AND CORROSION: Cab structural defects or cab corrosion that occurs in areas of the cab that previously were damaged, repaired, altered or modified are not covered. Cab corrosion where metal is perforated from the outside to the inside is not covered.

19. VENDOR ENGINES, ALLISON AUTOMATIC TRANSMISSIONS and ALTERNATE FUEL STORAGE AND DELIVERY SYSTEMS: Vendor engines, Allison automatic transmissions and alternate fuel (CNG/LNG/DME) fuel storage/delivery components used in Mack trucks are warranted by their respective manufacturers and not by Mack Trucks, Inc. Refer to the manufacturers' warranty statements.

20. OIL CONSUMPTION: Before a claim based upon excessive oil consumption will be considered, the owner must provide proof that all recommended maintenance has been performed and submit adequate documentation to show that oil consumption exceeds Mack Trucks' published standards. Under no circumstances will warranty pay for repairs related to excessive oil consumption after the earlier of 24 months, 250,000 miles, 402,000 kilometers, or 6,250 engine hours.

21. ENVIRONMENTAL DAMAGE: Parts made out of cloth, leather, wood, rubber, synthetics, paint or chrome which have been affected by exposure to the elements or chemical influence including, but not limited to, road salts/chemicals, industrial fall-out or the use of improper cleaners, polishes and/or waxes are not covered.

22. ALIGNMENT: Alignment of axle(s), balance of tires, changing of axle camber, caster, toe and thrust angle are not covered.

23. GLASS: Glass breakage and scratches are not covered unless physical proof of manufacturing responsibility is established.

24. TIRES: Tires are not covered by this warranty, but may be covered by separate warranties given by their respective manufacturers.

25. CHANGES: Mack Trucks reserves the right to make any changes in design, or make additions to or upon its products, without incurring any obligations to install the same changes on vehicles previously built.

THIS WARRANTY IS MADE EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, REPRESENTATIONS OR CONDITIONS, STATUTORY OR OTHERWISE, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATION OR LIABILITY ON THE PART OF THE MANUFACTURER INCLUDING, WITHOUT LIMITATION OF THE FOREGOING, CONSEQUENTIAL, INDIRECT, AND INCIDENTAL DAMAGES. MANUFACTURER NEITHER ASSUMES NOR AUTHORIZES ANY PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF VEHICLES, COMPONENTS OR PARTS.

Standard Emissions Component Warranty Certificate (EPA 17)

Mack Trucks warrants certain individual components of the Emission Control system in a new Mack truck equipped with a new Mack MP®7, MP®8, and MP®10 EPA 17 emission engine in a new Mack truck to be free from defects in material and workmanship under normal use and service up to the periods specified, provided all Mack Trucks' maintenance and inspection requirements are followed. See your local authorized Mack Trucks dealer for recommended maintenance and inspection procedures. All warranty periods are calculated from the date in service of the vehicle. All coverage is 100% for parts and labor subject to the qualifications, limitations, and exclusions as noted.

LIMITATIONS AND EXCLUSIONS TO THIS WARRANTY APPEAR ON THE FOLLOWING PAGES OF THIS CERTIFICATE. THESE LIMITATIONS AND EXCLUSIONS ARE IMPORTANT AND MUST BE READ AND UNDERSTOOD.

This warranty applies to new MP®7, MP®8, and MP®10 engines meeting EPA 17 emission requirements in new Mack trucks operated in the United States and Canada.

Emission Control System Warranty

Engine emission controls manufactured by Mack Trucks are warranted to 60 months or 100,000 miles (160 934 km), whichever first occurs. Vehicles sold for use in California must have the Operator's Manual in the vehicle which contains the California Emission System Warranty.

USE OF IMPROPER OR UNAPPROVED FUEL OR ENGINE OIL WILL VOID THE ENGINE AND AFTERTREATMENT SYSTEM (DIESEL PARTICULATE FILTER) WARRANTIES. MACK ENGINES REQUIRE THE USE OF MACK SPECIFICATION EOS 4.5 HIGH PERFORMANCE DIESEL ENGINE OIL AND ULTRA LOW SULFUR DIESEL (ULSD) FUEL.

USE OF FLUIDS OTHER THAN API CERTIFIED DIESEL EXHAUST FLUID (DEF) WILL COMPROMISE AFTERTREATMENT SYSTEM PERFORMANCE, INCREASE EMISSIONS, AND MAY IMPACT THIS TRUCK'S PRODUCT WARRANTIES.

SEE FOLLOWING TABLE FOR SPECIFIC COVERAGES:

Covered Emission Components List: 60 Months or 100,000 Miles (160 934 km)	Qualifications and Limitations
Aftertreatment Control Module (ACM)	

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Covered Emission Components List: 60 Months or 100,000 Miles (160 934 km)	Qualifications and Limitations
Aftertreatment Diesel Particulate Filter (DPF) with Aftertreatment Diesel Oxidation Catalyst (DOC)	Includes: Aftertreatment Doser, Aftertreatment Doser Module (Aftertreatment Fuel Shutoff Valve, Aftertreatment Fuel Pressure Sensor), Engine Exhaust Gas Temperature (EGT) Sensor, Aftertreatment DPF Intake Temperature Sensor, Aftertreatment DPF Outlet Temperature Sensor, Aftertreatment DPF Differential Pressure Sensor
Aftertreatment Wiring Harness (DPF)	
Aftertreatment Wiring Harness (SCR)	Includes: Jumper to AHI Pressure Regulator, ACM Power Supply, Heater NOx Care, DEF Tank
Charge Air Cooler (CAC)	
Crankcase Breather	Excludes: Crankcase Pressure Sensor
Crankcase Separator	
Crankcase Tubing & Hoses before Separator	
EGR Cooler	
EGR Valve and EGR Valve Control	
EGR Venturi	
Engine Electronic Control Unit (EECU)	For the failure to be covered under Emission Components, the failure must affect the emissions of the unit.
Engine Turbocharger Assembly	Includes: Variable Geometry Turbo (VGT) Actuator
Exhaust Gas Piping	From Turbocharger to Aftertreatment System
Injectors	
Instrument Cluster	Limited to repair of Microprocessor, MIL, Real Time Clock, DEF Gauge, DEF Lamp
Selective Catalytic Reduction (SCR)	Includes: Aftertreatment Selective Catalytic Reduction (SCR) Catalyst, Aftertreatment Diesel Exhaust Fluid (DEF) Pump (Aftertreatment DEF Dosing Absolute Pressure Sensor, Aftertreatment DEF Return Valve), Aftertreatment DEF Dosing Valve, Aftertreatment DEF Tank, Aftertreatment DEF Tank Heater/Sender, Aftertreatment DEF Tank Heater, Aftertreatment DEF Tank Heater Valve, Aftertreatment DEF Tank Temperature Sensor, Aftertreatment DEF Level Sensor, Aftertreatment DEF Heated Lines, Aftertreatment DEF Quality Sensor
Sensor, Aftertreatment Intake NOx	

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Covered Emission Components List: 60 Months or 100,000 Miles (160 934 km)	Qualifications and Limitations
Sensor, Aftertreatment Outlet NOx	
Sensor, Ambient Air Temperature Sensor	
Sensor, Crankshaft Position (CKP)	
Sensor, Engine Coolant Temperature (ECT)	
Sensor, Engine Exhaust Gas Recirculation (EGR) Differential Pressure Sensor	
Sensor, Engine Exhaust Gas Recirculation (EGR) Temperature	
Sensor, Intake Manifold Air Temperature/ Pressure	
Sensor, Particulate Matter (PM)	
GHG Covered Component 24 Months or 24,000 Miles (38 624 km)	Qualifications and Limitations
Tires	Drive and Steer Only: The first 24 months or 24,000 miles (38 624 km) of vehicle operation, whichever occurs first, and applying only to the first set of tires on the vehicle when delivered to the ultimate purchaser. Subject to the terms and conditions of the tire manufacturer's warranty, excluding retreads. Emissions related warranty coverage only; Refer to the specific tire manufacturer's warranty policy for other term lengths.

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GHG Covered Components 60 Months or 100,000 Miles (160 934 km), whichever occurs first. (Only those vehicles certified as “Highway Tractors” according to the requirements of Chapter 40 of the Code of Federal Regulations, Part 1037)	Qualifications and Limitations
Exterior Components	Limited to: Chassis Fairings, Ground Effect Extensions, Roof Deflectors, Cab Side Deflectors, Adjustable Roof Extensions, Side Deflector Extensions, Bumper Deflectors, A-pillar Deflectors
Air Conditioning Components	Limited to: A/C Compressor, A/C Condenser, A/C Pressure Switches and Transducers, Bunk Climate Unit, Hoses (Compressor to Condenser, Condenser to Drier, Drier to Climate Unit, Climate Unit to Compressor, Bunk Climate Unit), Main Climate Unit, Receiver Drier

THESE LIMITATIONS AND EXCLUSIONS ARE IMPORTANT AND MUST BE READ AND UNDERSTOOD.

LIMITATIONS – Mack Trucks obligation is limited to, at its sole option, repair or replacement of parts which are acknowledged by it to be defective. The defective parts or assemblies replaced shall become the property of Mack Trucks North America. Warranty repairs performed by an authorized Mack dealer in accordance with the terms of the warranty set forth herein are free of charge. Warranty consideration can only be given if the deficiency is brought to the attention of an authorized Mack dealer upon discovery and the vehicle must be made available, in a timely fashion during the coverage period, for repair.

EXCLUSIONS:

- 1. REPAIR:** In the case of acknowledged defective Covered Parts, exchange with factory remanufactured parts may occur. Warranty repairs do not constitute an extension of any warranty period for any vehicle, component or part.
- 2. DAMAGES:** Damages due to misapplication, misuse, accidents, negligence, improper operations, alterations, storage or transport, operation at excessive speeds, loading beyond the factory rated load capacity, failure to follow Mack Trucks' recommended inspection, maintenance, and service procedures, and improper or insufficient maintenance services are not covered.
- 3. PROGRESSIVE DAMAGE:** Damages due to failure of operator to take reasonable precautions to mitigate damage are not covered. Damages to a Covered Part due to failure of non-covered part are not covered. Coverage is limited to failure of a Covered Part directly causing failure of a non-covered part, where reasonable precautions were taken to mitigate damages.
- 4. APPLICATION:** The selling dealer is responsible for designating the correct application and/or specification for a vehicle sold to a customer. Damages due to misapplication, including but not limited to, failures of component parts of vehicles being operated in excess of factory rated load capacities, or the use of a vehicle, component or part for a purpose for which it was not intended are not covered.

5. ALTERATIONS: Any vehicle, component or part repaired, altered, or inspected in any way, so as to adversely affect, in Mack Trucks' sole judgment, its stability, durability, or reliability, is not covered.

6. NON-ORIGINAL EQUIPMENT: Any part of the vehicle that fails, malfunctions, or does not perform as a result of improper conversion or installation of bodies or equipment by other manufacturers or suppliers is not covered.

7. MAINTENANCE AND PARTS CONSUMED: Maintenance and inspection requirements found in the Operator's Manuals and service manuals/instructions, including, but not limited to, engine tune-up, fuel system cleaning, replacement of lubricants and filter elements, adjustments of the engine injection pump/transmission/brakes/linkages, as well as diagnosis, test time and all other adjustments must be followed and are not covered. Parts which are normally consumed or worn out during the vehicle's normal service life and customarily replaced during usual maintenance service, including, but not limited to, mud flaps and brackets, brake linings, clutch brake, and clutch linings, are not covered.

8. PERFORMANCE COMPLAINTS: Performance complaints are not covered (including, but not limited to, low power and/or poor fuel economy). Coverage is limited to defects in material and workmanship of a Covered Part directly causing the performance issue.

9. WEAROUT: Mack Trucks does not cover normal wear of Covered Parts. Failures attributable to wear are excluded. For example and without limitation, the wear rate of parts in any engine or transmission, and especially those parts within the combustion area and clutch housing area, will vary depending upon operating conditions and environment. Conditions, such as load, trailer configuration, road speed and road conditions, as well as the quality of fuel, lubrication oil, and all filters bear a direct relationship to the wear rate and resulting life of parts. Depending upon the severity of these various conditions, parts wear and resulting failure could occur within the time limit of the coverage.

10. NON-GENUINE PARTS: Any failure of any vehicle, component or part caused by the use of parts and accessories, or major assemblies and exchange units, which do not meet factory standards is not covered.

11. ODOMETER READING: Any vehicle on which the actual mileage or hours cannot readily be determined, or on which the odometer, hour meter, or Electronic Control Unit has been disconnected, disabled, or altered, may not be covered by this warranty.

12. ACCESS TO INFORMATION: Owner must allow Mack Trucks full access to all data stored in all Electronic Control Modules; failure to do so may result in the loss of warranty coverage.

13. LABOR: Labor to remove and install a Covered Part is included only if a Mack Trucks authorized dealer originally installed the Covered Part. Labor for overtime and/or shift differential is not covered. Excessive labor for a warrantable repair due to the prior installation of equipment or body is not covered.

14. MISC. EXPENSE: Meals, lodging, communications charges, travel time and expense, loss of cargo, downtime, loss of profit/revenue, rental vehicles, driver's wages and other miscellaneous expenses are not covered. Shop supplies, lube oil, lubricants, sealers, anti-freeze, filter elements and labor performed by a non-approved location are not covered.

15. ADDITIONAL COMPONENTS: Components or parts that are not installed by Mack Trucks, including winches, power take-offs, dumper, mixer and refuse assemblies, hoists and bodies or other special equipment are not covered. During a warrantable repair,

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additional time to remove any customer installed components will not be covered under warranty. Mack Trucks' factory manufacturing records will be determinative as to factory installed components.

16. TOWING: Unless expressly provided in this Warranty Certificate, expenses for towing or road service are not covered. Failures caused by improper towing technique are not covered.

17. SUSPENSION PARTS: Suspension parts, including but not limited to rubber bushings, torque rod bushings, spring pins and bushings, and greased lubrication points that fail due to improper maintenance, abnormally severe service or abuse are not covered.

18. CAB STRUCTURE AND CORROSION: Cab structural defects or cab corrosion that occurs in areas of the cab that previously were damaged, repaired, altered or modified are not covered. Cab corrosion where metal is perforated from the outside to the inside is not covered.

19. VENDOR ENGINES, ALLISON AUTOMATIC TRANSMISSIONS and ALTERNATE FUEL STORAGE AND DELIVERY SYSTEMS: Vendor engines, Allison automatic transmissions and alternate fuel (CNG/LNG/DME) fuel storage/delivery components used in Mack trucks are warranted by their respective manufacturers and not by Mack Trucks, Inc. Refer to the manufacturers' warranty statements.

20. OIL CONSUMPTION: Before a claim based upon excessive oil consumption will be considered, the owner must provide proof that all recommended maintenance has been performed and submit adequate documentation to show that oil consumption exceeds Mack Trucks' published standards. Under no circumstances will warranty pay for repairs related to excessive oil consumption after the earlier of 24 months, 250,000 miles, 402,000 kilometers, or 6,250 engine hours.

21. ENVIRONMENTAL DAMAGE: Parts made out of cloth, leather, wood, rubber, synthetics, paint or chrome which have been affected by exposure to the elements or chemical influence including, but not limited to, road salts/chemicals, industrial fall-out or the use of improper cleaners, polishes and/or waxes are not covered.

22. ALIGNMENT: Alignment of axle(s), balance of tires, changing of axle camber, caster, toe and thrust angle are not covered.

23. GLASS: Glass breakage and scratches are not covered unless physical proof of manufacturing responsibility is established.

24. TIRES: Tires are not covered by this warranty, but may be covered by separate warranties given by their respective manufacturers.

25. CHANGES: Mack Trucks reserves the right to make any changes in design, or make additions to or upon its products, without incurring any obligations to install the same changes on vehicles previously built.

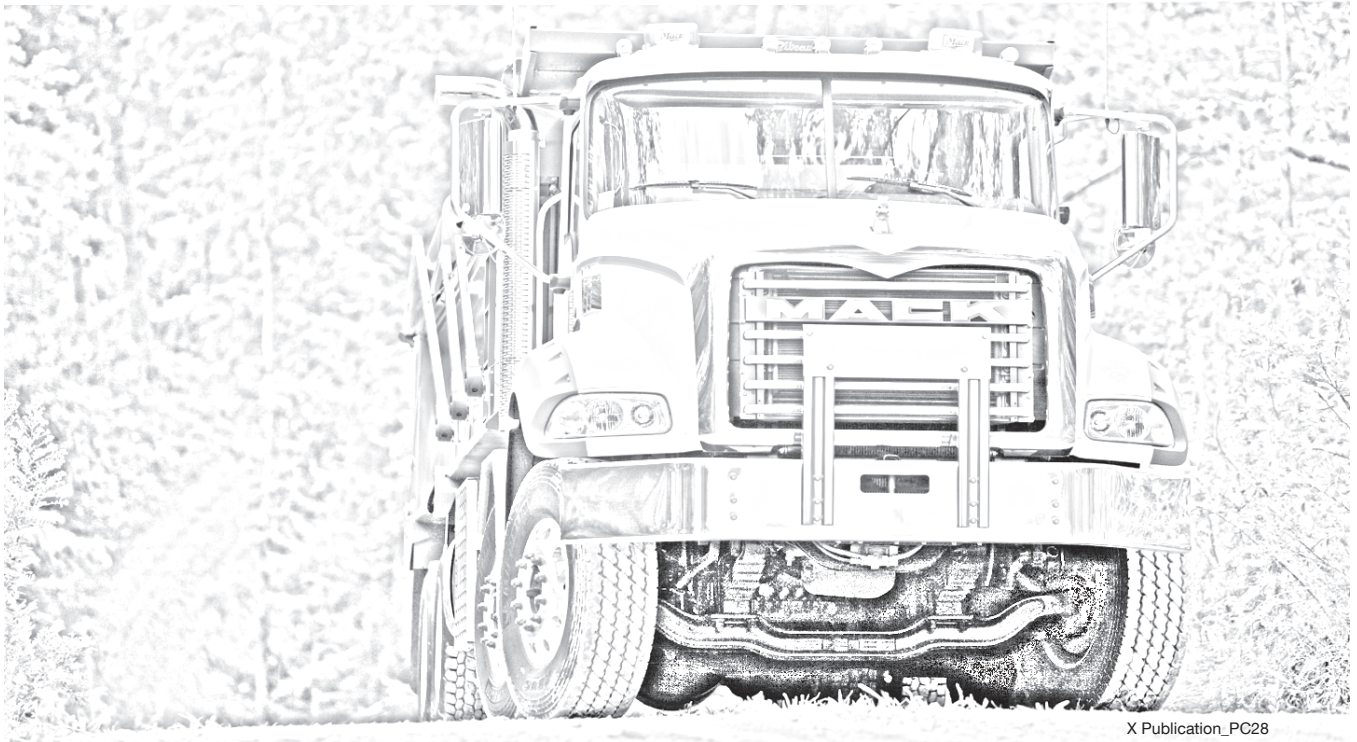
THIS WARRANTY IS MADE EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, REPRESENTATIONS OR CONDITIONS, STATUTORY OR OTHERWISE, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATION OR LIABILITY ON THE PART OF THE MANUFACTURER INCLUDING, WITHOUT LIMITATION OF THE FOREGOING, CONSEQUENTIAL, INDIRECT, AND INCIDENTAL DAMAGES. MANUFACTURER NEITHER ASSUMES NOR AUTHORIZES ANY PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF VEHICLES, COMPONENTS OR PARTS.

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DRIVING TIPS

DRIVER ENVIRONMENT

- *Always wear a seat belt*
- *Adjust the driver seat and mirrors for a good driving position*
- *Use the cab's storage compartments*



Driver Environment

For your safety at work, always wear a seat belt. Remember that it is a legal requirement.

Driving Position

It is important that you sit comfortably and have good visibility while you are driving. Arms and back must have a restful, natural posture. So take the time to adjust mirrors, steering wheel, and seat to an optimal position before driving.

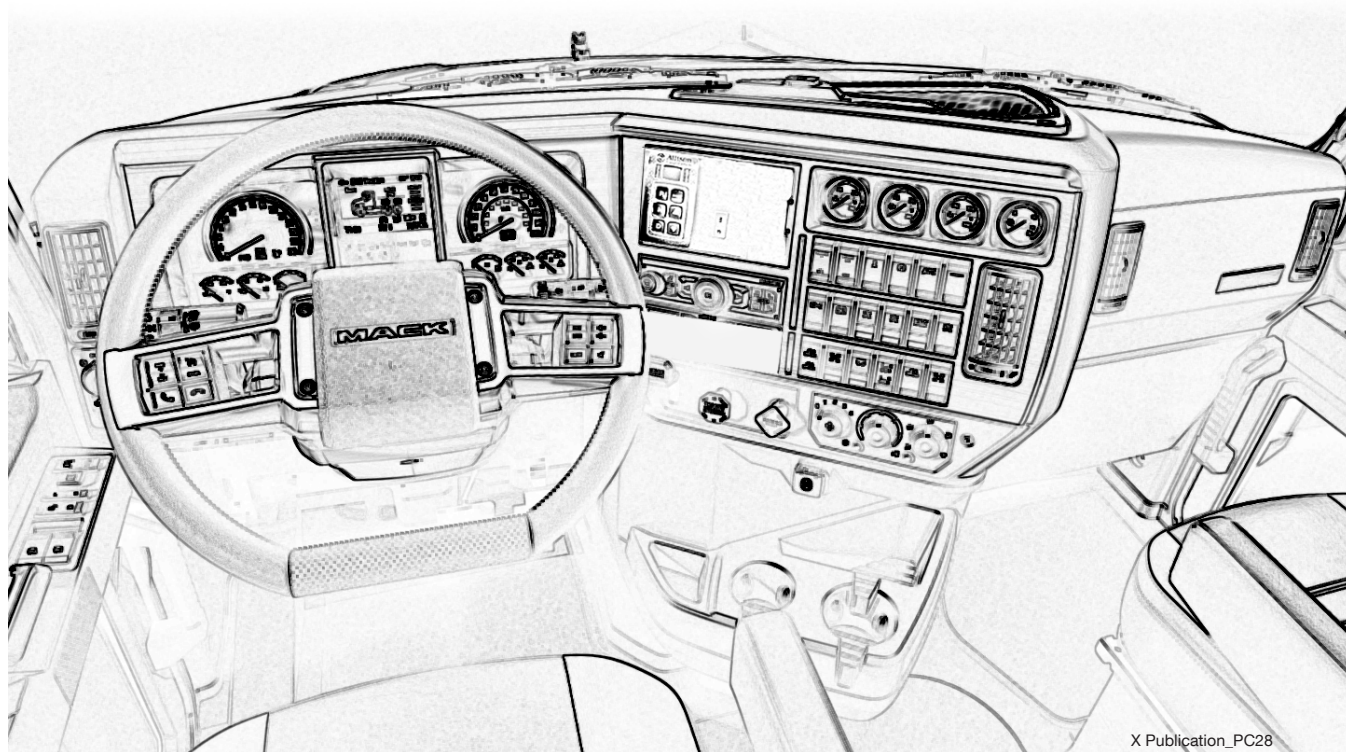
When driving long distances, change your driving position at regular intervals. Keep the backrest and head restraint upright when driving on uneven road surfaces to avoid back and neck injuries.

Climate System

You can use the climate control recirculation function to raise or lower the temperature in the cab.

Use the parking heater in order to quickly raise the temperature in a cold cab while driving.

- *Cold starting, use engine block heater*
- *Warm up the truck by driving at low engine speeds instead of running it at idling speed*



Starting

When you start your truck, there are several things you can do to save fuel and reduce wear on the truck.

Cold Starting

You can avoid cold starting by using the engine block heater.

If you start with a cold engine you should switch on the air intake heating function in your truck. The engine will then be supplied with preheated air which results in easier and more environmentally-friendly starting.

Never rev a cold engine. Warm up the engine by driving gently at low engine speeds instead of letting it run at idling speed while stationary.

DRIVING IN AN URBAN AREA

- *Plan your driving*
- *Use the truck's mirrors and direction indicators*
- *Always watch out for pedestrians*



Driving in an Urban Area

When driving in an urban area, there are several tricks that can enhance efficiency.

Smart Driving

Plan your route to avoid unnecessary stops. You save more fuel and the truck's service brakes, by using the truck's auxiliary brakes as often as is possible. If you have cruise control, you should not use it in heavy traffic. If you use it incorrectly it can lead to unnecessary braking and acceleration, which results in increased fuel consumption.

Think about Cyclists and Pedestrians

Many serious accidents occur between trucks and the softer road users such as cyclists and pedestrians. Correctly adjusted mirrors give you good visibility around the vehicle, but be aware of the blind spots behind and in front of the truck also on the passenger side.

DRIVING ON A HIGHWAY

- *Plan your driving*
- *Maintain an even, steady speed when possible*



Driving on a Highway

There are many ways to enhance efficiency when driving on a highway.

Remember that roads with many uphill inclines and bends result in higher fuel consumption. For this reason, it is often wise to plan the most efficient route ahead of time.

Adapted Speed

It is important to maintain a correctly adapted speed. Higher speeds result in increased wind resistance and increased fuel consumption. Remember that doubled speed results in quadrupled wind resistance. You can reduce the trucks wind resistance and therefore reduce fuel consumption by using a spoiler.

Gear Changing

Use the Auxiliary Brakes

You can reduce the wear on the truck's service brakes by using the truck's auxiliary brakes.

You can also use the "Brake Blending" function for controlled braking. "Brake Blending" assists the auxiliary brakes while you are braking.

Rolling Resistance

Rolling resistance plays a major role in your fuel consumption. It is important to use correctly adapted tires with proper

tire pressure. Check the tire pressure at every refueling. Incorrect tire pressure results in increased tire wear and increased fuel consumption. Check the wheel axle settings on a regular basis at a Mack Trucks dealership.

DRIVING IN HILLY TERRAIN

- *Accelerate in uphill gradients*
- *Let the truck coast when the terrain allows it*



Driving in Hilly Terrain

Your driving technique in hilly terrain can make a major difference to fuel consumption.

Uphill

When approaching an uphill incline you should try to maintain your speed and allow the engine to use the truck's pulling power at low revs to get you up the hill. Release the accelerator pedal just before you reach the summit and coast over it. When you change gear, try to drive according to the tachometer instead of by engine noise.

Downhill

On downhill inclines you should try to avoid accelerating, and instead allow the truck to increase speed by coasting. Regulate the downhill speed with the truck's auxiliary brakes. Make it a habit to completely remove your foot from the accelerator pedal while you are coasting. Use cruise control sparingly in hilly terrain as excessive use may result in increased fuel consumption.

Automatic Transmission

You can use the truck's "Kick-down" function in order to obtain maximum engine power for driving on a steep hill for example. This will give you an automatic downshift.

DRIVING IN THE RAIN

- *Make sure you have good visibility*
- *Adapt your speed*
- *Check the tread depth of the tires*



Driving in the Rain

When driving in rain it is important that you have good visibility and maintain a suitable speed. If your truck is equipped with air conditioning then you can use it to remove moisture from the cab. If you need to remove ice from the windows then you can use the defroster.

Hydroplaning

The best way to avoid hydroplaning is to:

- Have good tread depth on the tires
- Reduce your speed

DRIVING ON A SLIPPERY ROAD

- *Adapt the speed according to road surface*
- *Use the truck's auxiliary systems on difficult road surfaces*



Driving on a Slippery Road Surface

Although your vehicle is equipped with many traction enhancing features, the most effective action is to adapt your speed to the present driving conditions.

Differential Lock

On an extremely slippery surface, you can engage the differential lock so that the wheels drive at the same speed. Drive carefully when you have the differential lock engaged. Do not forget to disengage it when you leave the slippery area. If you drive with the differential lock engaged on firm ground you risk damaging the driven axles and wheels.

Weight Distributed over Drive Axle

For a better grip on slippery road surfaces you can temporarily redistribute the weight on the driving axle.

DRIVING ON A WINTRY ROAD

- *Keep the windshield clear*
- *Make sure you have good visibility*
- *Adapt your speed*
- *Use snow chains or similar*



Driving on Wintery Road Surfaces

When driving on wintery road surfaces, there are several functions available for you to use.

Climate System

If there is mist or ice on the windows then you can use the defroster function to clear the windows. In snow flurries for example, you should set air distribution to just the floor in order to avoid melting the snow on the windshield which then freezes in a headwind.

DRIVING IN A DUSTY AND SMOKY ENVIRONMENT

- *Use recirculation*



DRIVING IN A DUSTY AND SMOKY ENVIRONMENT

Driving in a Dusty and Smoky Environment

You can use air recirculation in the cab in order to keep out dust and other unsuitable air. Only use recirculation for short periods. Clean the inside of the windshield with normal window cleaning agent on a regular basis.

You can use air recirculation in the cab in order to keep out dust and other unsuitable air. Only use recirculation for short periods. Clean the inside of the windshield with a normal window cleaning agent on a regular basis.

- *Use the Parking Brake*
- *Avoid use of Idling Speed*



Parking

When you stop to park there are several things you should think about:

Avoid Idling

The truck does not need to run at idling speed before driving off. Warm up the engine at low engine speeds. Avoid idling during normal driving as well. Idling normally accounts for 5-6% of total fuel consumption, of which 50-80% is unnecessary idling.

Hard Driving

After a lot of hard driving you should allow the engine to run at idling speed for several minutes while stationary before switching it off in order to reduce exhaust temperature.

DEF Fluid

When driving in colder climates 0 °C (32 °F), idle for at least 90 seconds before turning the vehicle off. This will ensure that all DEF Fluid has exited the system.

Hot Tires

Tires may become hot after driving long distances. This can create a hazard when parking on inclines in wintery conditions if the tires melt the surface underneath to form ice, leading a vehicle to slide. To avoid, park on a level road surface under wintery conditions.

- *Check the Tire Pressure*
- *Fill Washer Fluid*
- *Check the Level of DEF Fluid*



Refueling

When you stop to refuel you should take the opportunity to do the pre-trip inspection and check all functions of your vehicle.

DEF Fluid

Make it a habit to check the DEF Tank fluid level while you are refuelling. Running the engine without DEF Fluid can damage the exhaust gas cleaning system.

Make sure you wipe up any spillage when filling DEF Fluid. The solution may react with certain metal surfaces. The DEF Fluid tank is only intended for DEF Fluid. Other fuels or dirt in the tank can damage the engine and the fuel system.

Correct Tire Pressure

Check the tire pressure while refueling. Incorrect tire pressure results in increased fuel consumption and increased tire wear. The truck's driving characteristics can be affected by incorrect tire pressure.

SERVICE AND MAINTENANCE

- *Use the correct fuel for your truck*
- *Follow the service schedule for your truck*



Service and Maintenance

You can reduce costs and extend the life of your vehicle by performing regular maintenance. Always use the fuel and oils recommended by Mack Trucks.

Ask your Mack Trucks dealership to assist by providing a customized service schedule for your particular truck.

Wheel Alignment

Remember to regularly check the wheel and axle alignment on both tractor and trailer. Wheel alignment is important for keeping fuel consumption low and reducing wear on the tires. Tire life can be extended by avoiding uneven loads or loads that exceed capacity.

Air System

To keep the vehicle's Air System working properly, periodically drain the primary tank (or one of the circuit tanks). If any water is visible, replace the Air Dryer Filter Insert as soon as possible.

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SAFETY

SAFETY EQUIPMENT

Safety triangles and fire extinguishers are available as optional equipment. The Federal Motor Carrier Safety Administration requires commercial motor vehicles to be equipped with an appropriate sized fire extinguisher and safety warning devices. The equipment can be ordered from and installed by Mack Trucks or installed by the vehicle owner.

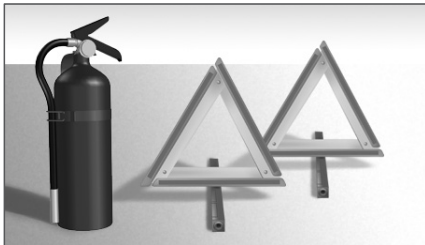
The fire extinguisher must be located so that it is readily accessible for use. The extinguisher must be securely mounted to prevent sliding, rolling, or vertical movement relative to the motor vehicle.

The safety triangles must be securely attached to any light-tight, enclosed, and easily accessible compartment.

Please refer to Federal Motor Carrier Safety Regulation 49CFR393.95, Emergency Equipment and Federal Motor Vehicle Safety Standard 49CFR571.125, Warning Devices for a complete listing of the requirements.

Warning Triangles, Rear Wall

The warning triangles are stored in a box, secured to the floorboard, located against the rear wall of the cab.



Seat Belts

Retractable Seat Belts

The locking retractable seat belt is designed to lock (prevent belt travel out of the retractor) only during sudden stops or impacts. This feature allows the operator to move freely under normal conditions.

Seat belts cannot be locked by jerking on the belt, except during sudden stops or harsh bumps.

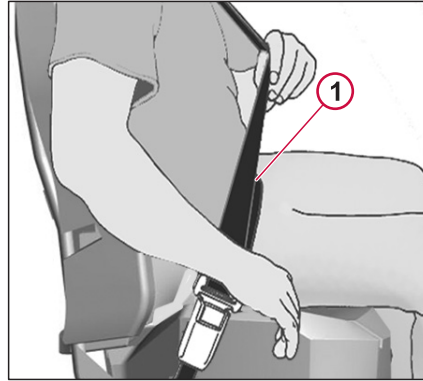
The belt will relock at about one-inch intervals as it rewinds into the retractor. Be sure to pull enough webbing out of the retractor before stopping to insert the end of the belt into the seat belt buckle. Once it is buckled, the retractor will pull up the excess webbing and relock.

Belt Fastening Steps

- 1 Pull clip so the belt crosses your shoulder and lap and insert it into the buckle until an audible snap is heard.
- 2 Make sure the clip is securely fastened into the buckle.
- 3 To tighten the lap portion of the combination belt, pull upward on the shoulder portion until the lap portion fits snugly. The belt should rest as low on your hips as possible.

Belt Unfastening

Push down on the button to release the belt.



1 Safety Belt

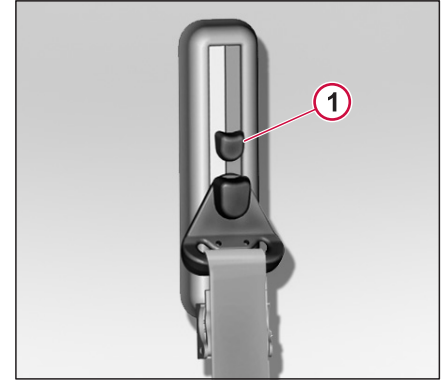
Clean and Inspect

For proper seat belt maintenance, see Seat Belt Maintenance page 303.

Adjustable D-Ring Shoulder Belts

When equipped, the shoulder belt portion of the three-point belt is adjustable so that the belt can be adjusted to lay properly and comfortably across the shoulder. To adjust the belt, squeeze the release lock and move the belt to the desired position. The belt

locks into place when the lock is released.



1 D-Ring Adjuster

Komfort® Latch System

Seat Belt Assembly

The Track III three-point seat belts installed in this chassis are designed to provide the highest degree of operator safety, comfort and convenience. Additional comfort is provided by the Komfort Latch mechanism, which is incorporated into the seat belt assembly, and may be used to relieve any discomfort caused by the constant pressure of engaged seat belts.

Seat Belt Operation

To buckle the seat belt, grasp the latch portion of the buckle, bring it across your lap (from outboard to inboard) and insert it into the fixed buckle which is mounted to the floor or seat (depending on seat type). With the belt properly latched, the pelvic and upper torso restraints will be in place and automatically adjusted to provide a snug fit.

Komfort® Latch Feature

If the constant tension of the buckled seat belt causes any discomfort, engage the Komfort® Latch as follows:

Engagement — Pull the webbing of the shoulder belt away from the upper torso, pulling only as much slack as needed while still allowing the belt to exert slight pressure against your chest and shoulder. (Maximum amount of slack should not exceed one inch when measured from the chest to the belt.) While holding the slack, lift the lever located on top of the Komfort® Latch mechanism upward to clamp the webbing in place.

Normal Release — To unfasten the seat belt, simply release the buckle and give the shoulder belt a quick tug to release

the Komfort® Latch mechanism. Allow the belt to retract into the retractor.

Emergency Release — In the event of an emergency, release the seat belt buckle. It is not necessary to release the Komfort® Latch in an emergency situation.

DANGER

Do NOT attempt to engage the Komfort® Latch feature while the truck is in motion.

DANGER

If forward movement is required while the Komfort® Latch mechanism is latched, the latch automatically releases when you lean against the shoulder portion of the belt. Repeat the above steps to reset the Komfort® Latch, if desired, after forward movement is no longer required.

CARBON MONOXIDE DETECTION

A by-product of combustion, carbon monoxide is invisible, tasteless, odorless and is produced by all engines.

! DANGER

Actuation of this device indicates the presence of carbon monoxide (CO) which can be FATAL. In the event of an alarm, immediately open the cab windows, safely stop the vehicle, shut down the engine and turn off the ignition. Exit the cab and leave the doors and windows open to vent the vehicle.

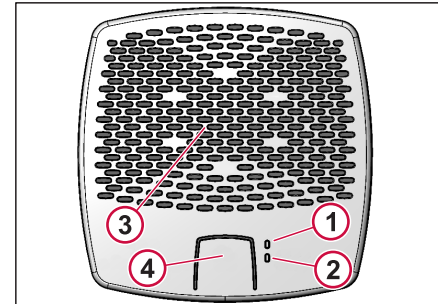
! CAUTION

The following symptoms are related to CARBON MONOXIDE POISONING and should be discussed with ALL passengers:

- Mild exposure: Slight headache, nausea, vomiting and fatigue (often described as "Flu like symptoms").
- Medium exposure: Severe throbbing headache, drowsiness, confusion, and fast heart rate.
- Extreme exposure: Unconsciousness, convulsions, cardio-respiratory failure, and death.
- Many cases of reported CARBON MONOXIDE POISONING indicate that while victims are aware they are not well, they become so disoriented they are unable to save themselves by either exiting the location or calling for assistance.

! NOTE

To reduce the risk of carbon monoxide poisoning, test alarm operation when not in use for 10 days or more.

Alarm Unit

1 Power Indicator

2 Danger Indicator

3 Horn

4 Test/Silence button

Normal Operation - The Green LED, (1) Power Indicator, flashes once every 3 minutes while in normal operation.

Alarm- When the CO alarm enters the danger alarm, the (2) Danger Indicator, flashes red and the horn beeps four times and pauses 4-5 seconds in a repeat pattern. This indicates that the COHb level has been reached.

System Operation

The system uses a microprocessor to measure and accumulate CO levels. Should a high level of carbon monoxide exist, the system sounds an alarm. However, if small quantities of CO are

present or high levels are short-lived, the micro controller accumulates the information and determines when an alarm level has been reached. This feature eliminates nuisance alarms.

The CO alarm conducts a self-diagnosis of critical components every 180 seconds. Should a major component fail, the CO alarm will enter a fault mode. Both audible and visual warning indicators are activated.

The CO alarm circuit board is sealed against moisture and corrosion to withstand the harshest environments and ensure durability.

WARNING

- This carbon monoxide alarm is designed to detect carbon monoxide gas from ANY source of combustion. It is NOT designed to detect smoke, fire or any other gas.
- The alarm system will not detect carbon monoxide that is not in the vicinity of the alarm. Carbon monoxide in other rooms or areas will not be detected. Alarms mounted near obstructions or in 'dead' air spaces will not detect carbon monoxide.
- The alarm system does not guarantee or imply that CO poisoning will not occur. Do NOT use the CO Sentinel as a replacement for ordinary precautions or periodic inspections of equipment. NEVER rely on alarm systems to save your life, common sense is still prudent and necessary.

Nuisance Alarms

Although the system alarm detects only carbon monoxide in a normal environment, studies have found that unusually high concentrations of chemicals and/or vapors may affect the sensor.

The device may be triggered by any number of hydrocarbons at very high levels.

While these may be considered nuisance alarms, levels high enough to

create an alarm condition are also hazardous. Treat these "nuisance" alarms as an actual carbon monoxide alarm condition. Evacuate and ventilate the area. Before, during, and immediately after working with any chemicals, make sure enough fresh air ventilation is available.

NOTE

- The audible horn on the alarm system meets UL requirements; however, the horn may not be heard in remote areas.
- The nature of an alarm system is to produce an irritating and loud noise. The audible signal of the alarm system may shock or startle persons near the alarm. Hearing damage can occur if prolonged exposure to the audible alarm is allowed.
- All electric devices have limited life spans and may fail without warning. Inspect the alarm system on a periodic basis. Do NOT assume that the alarm system will prevent CO poisoning. It is a supplement-warning device only.

WARNING

Actuation of your CO alarm indicates the presence of Carbon Monoxide (CO), which can kill you.

Unit Alarm Guidelines

If the alarm system sounds follow the guidelines below:

1. Operate Reset/Silence button
2. Call your emergency services (Fire department OR 911).
3. Immediately move to fresh air—outdoors or by an open door/window. Check that all persons are present. Do not re-enter the premises or move away from the open door/window until emergency services responders have arrived, the premises have been aired out and alarm remains in its normal condition..
4. After following steps 1-3, if alarm reactivates within a 24-hour period, repeat steps 1-3 and call a qualified appliance technician to investigate for sources of CO from fuel burning equipment and appliances, and inspect for proper operation of the equipment. If problems are identified during this inspection, have the equipment serviced immediately.

Note any combustion equipment not inspected by the technician and consult the manufacturers' instructions, or contact the manufacturers directly, for more information about CO safety and this equipment.

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LOCKS AND ALARM

⚠ DANGER

To lessen the chance of being thrown from the vehicle in an accident, always lock the doors and wear the safety belt while driving. Failure to do so can cause serious personal injury or death if involved in an accident.

The cab doors can be unlocked and locked with the same key used for the ignition. There is also a keyless remote entry available. Keys can be made to fit only one vehicle or all the vehicles in a fleet. The key fits in the door lock either way. Insert the key and turn it 1/4 turn counterclockwise to unlock or clockwise to lock the door.

ⓘ NOTE

The vehicle is delivered with two identical keys. If more keys are needed, order them through your authorized dealer.



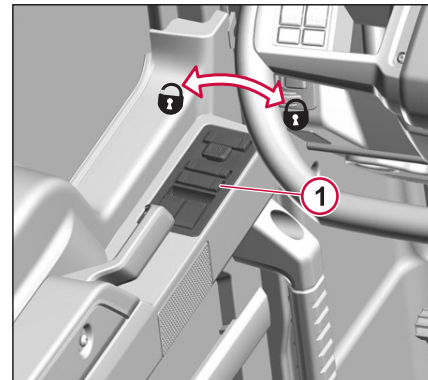
Locking and Unlocking

The door locks are mechanically or electronically operated. The lock is activated by either the key from the outside or the door lock switch from the inside. With mechanical locks, only one door can be locked and unlocked at a time.

The key in the outside lock will only lock or unlock the door that it is in.

Electronic Locks

With electronic locks, to lock both doors from inside the cab, push the power door lock switch. To unlock the doors using the key, insert the key in either door lock.



- 1 Unlock (Clockwise)
- 2 Lock (Counter Clockwise)

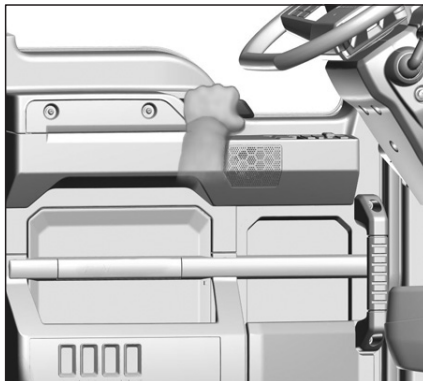
Outside Locks

To unlock the doors using the key, insert the key in either door lock. To unlock, turn the key to the unlock position (1). To lock, turn the key to the lock position (2).

Doors

The door has a position lock that enables the door to remain open in two different positions. An indented bar is holding the door at approximately 30° and in the fully open position at approximately 85°.

To close the door from the inside, place hand on the lever and pull the door inward.



To close the door from the outside, place hand flat against the door lock area and push the door shut.



CAUTION

DO NOT shut the door by pushing on the door panel. Hard pushing may distort the metal in the door panel.

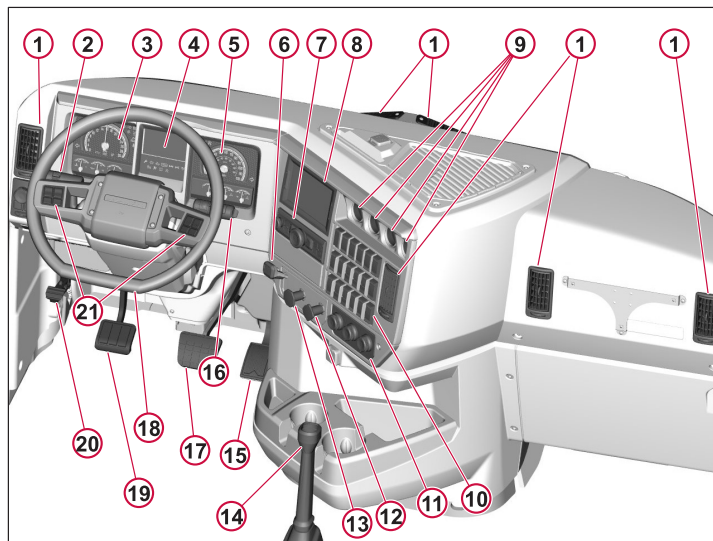
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DRIVING ENVIRONMENT

OVERVIEW OF INSTRUMENTS

Overview of Instruments

Before driving this vehicle, locate the instruments and controls, and become thoroughly familiar with their operation. After starting and when driving, ensure that the instrument readings are normal.

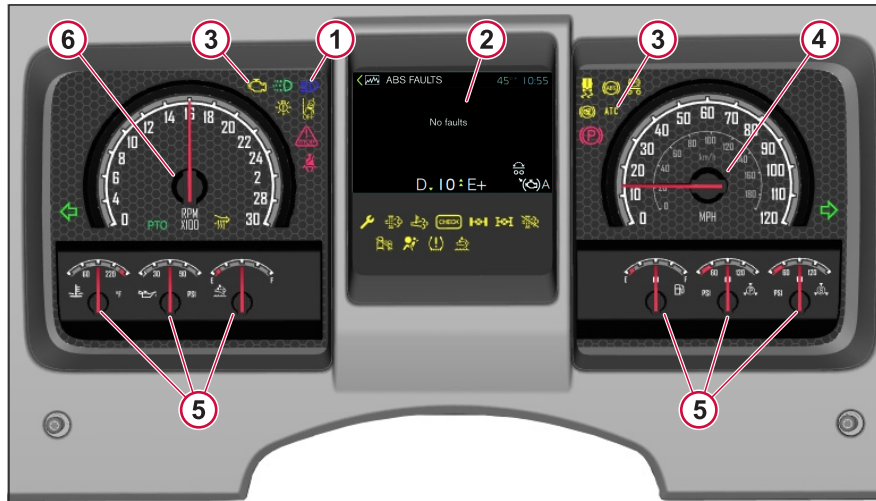


- | | | |
|-------------------------------------|--------------------------------------|--|
| 1. Air Vent | 8. Infotainment Screen/Display (SID) | 15. Accelerator Pedal |
| 2. Stalk Control | 9. Secondary Gauges | 16. Stalk Control |
| 3. Tachometer | 10. Dash Switches | 17. Brake Pedal |
| 4. Driver Information Display (DID) | 11. Climate Control Unit | 18. Steering Wheel |
| 5. Speedometer | 12. Trailer Air Supply | 19. Clutch Pedal |
| 6. Trailer Hand Brake | 13. Tractor Parking Brake | 20. Steering Column Tilt Control Pedal |
| 7. Radio (SEM) | 14. Manual Shifter | 21. Steering Wheel Switches |

Instrument Cluster

The instrument cluster provides system/component condition information to the driver. This information is available to assist the driver in determining any necessary actions.

The instrument cluster consists of the following components; condition indicators (telltales), driver information display (DID), gauges, speedometer and tachometer, on board diagnostic (OBD) fault and warning indicators.

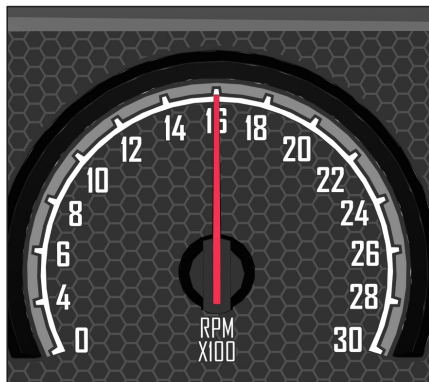


- 1 Condition Indicator (Telltale)
- 2 Driver Information Display (DID)
- 3 On Board Diagnostic (OBD) Fault and Warning Indicators
- 4 Speedometer
- 5 Gauges
- 6 Tachometer

Gauge Layout

1 Tachometer

The tachometer displays the engine's revolutions per minute (RPMs).



2 Speedometer

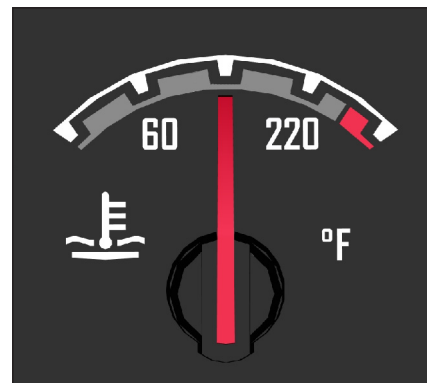
Indicates the speed of the vehicle. The speedometer is driven by the vehicle's electronic system.



3 Coolant Temperature Gauge

The coolant temperature gauge indicates engine coolant temperature. The normal operating temperature for Mack engines is 80 to 105° C (176 - 220° F). If the temperature remains below or exceeds the normal temperature range, the cooling system should be checked for problems by an authorized Mack truck dealer. When coolant temperature is excessive, the red STOP tell-tale will come on and the buzzer will sound. The engine is at risk and the ECM may

derate the engine power. Stop at the first safe place where the problem can be checked.

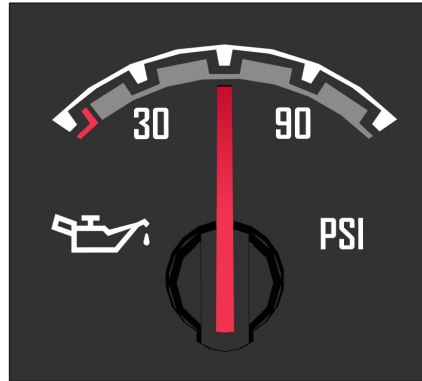


4 Engine Oil Pressure Gauge

Indicates engine oil pressure. When the engine oil pressure is too low, the red STOP tell-tale illuminates and the buzzer sounds. If the engine oil pressure becomes low, the engine is at risk. Bring the vehicle to a safe stop where the problem can be checked.

DANGER

Failure to take necessary action when the STOP tell-tale is on can ultimately result in automatic engine shutdown and loss of power steering assist. Vehicle crash can occur, resulting in personal injury or death.



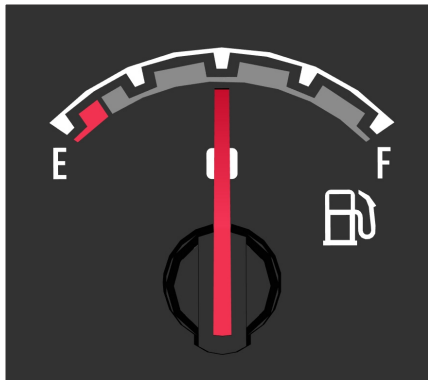
5 Aftertreatment DEF Gauge

Indicates the amount of Diesel Exhaust Fluid (DEF) in the tank.



OVERVIEW OF INSTRUMENTS**6 Fuel Gauge**

Indicates fuel level. The fuel gauge is connected to a fuel sensor unit in the fuel tank. There is only one sensor even if the vehicle is equipped with dual tanks.


DANGER

Failure to observe these precautions can result in the loss of braking performance. This can lead to a vehicle accident, which can result in personal injury or death.


DANGER

Failure to observe these precautions can result in the loss of braking performance. This can lead to a vehicle accident, which can result in personal injury or death.

**7 Secondary Brake Air Pressure Gauge**

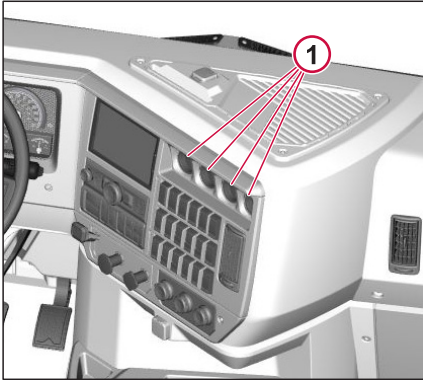
The secondary brake air pressure gauge is connected to the front circuit tank via sensors mounted on the passthrough wall. The front and rear air gauges should register equal air pressure. By observing the gauge pointers, the operator can detect a pressure drop if an air leak develops and can readily identify the circuit affected.

8 Primary Brake Air Pressure Gauge

The primary brake air gauge is connected to the rear circuit tank via sensors mounted on the passthrough wall. The front and rear air gauges should register equal air pressure. By observing the gauge pointers, the operator can detect a pressure drop if an air leak develops and can readily identify the circuit affected.

9 Secondary Gauges

On certain vehicles, secondary gauges are included. These gauges are located to the right of the steering wheel, above the main switch location.



1 Secondary Gauges

Tell-Tales

A tell-tale is a display that indicates the actuation of a device, a correct or defective condition, or a failure to function. The operator should become familiar with these symbols in order to recognize and react (if necessary) to the indicated condition. Tell-tale symbols are shown in the instrument panel cluster.

Colors

To promote visual recognition internationally, specific colors for tell-tales have been established. Unless governmental regulations (in the area where the vehicle is to be used) or engineering directives specify otherwise, the standard colors are:

- Steady Blue — high-beam headlights
- Flashing Green — turn signals
- Flashing Red — hazard condition involving the safety of personnel
- Steady Green — system in operation
- Steady Red — warning, immediate action required
- Amber — early warning, such as low fuel or Anti-Lock Brake System (ABS) malfunction

Alarm, Check and Information Symbols

Symbol	Meaning
	Malfunction Indicator Lamp
	Hill Assist Indicator
	Stop
	Interaxle lock
	Differential lock (Interwheel)
	Turn Signal Indicator
	Parking Brake engaged
	Safety Belts Reminder
	Aftertreatment DPF Regeneration
	Aftertreatment High Exhaust System Temperature
	ABS Malfunction Trailer

Symbol	Meaning
	ABS Malfunction Tractor
	Preheating Active or Preheating Fault
	High Beam Indicator
	Aftertreatment DEF Tank Low Indicator
	Check Indicator
	Light Indicator
	Traction Control System (TCS) Indicator
	Lane Departure Warning System (LDWS) Indicator
	Power Take-Off (PTO) Indicator
	Electronic Stability Control (ESC) Indicator
	Daytime Running Light (DRL) Indicator

OVERVIEW OF INSTRUMENTS

Symbol	Meaning
	Lane Changing System (LCS) Indicator
	Airbag Indicator
	Tire pressure Monitoring System (TPMS) Indicator
	Automatic Traction Control (ATC)

1 Malfunction Indicator Lamp

Malfunction Indicator Lamp indicates government Regulation On Board Diagnostics (OBD) faults

2 Hill Assist Indicator

Indicates hill assist is active.

3 Stop Tell-Tale

Illuminates when conditions require the driver to stop the vehicle. This usually occurs when vehicle conditions fall below designated standards for operation.

DANGER

Failure to take necessary action when the STOP tell-tale is on can ultimately result in automatic engine shutdown and loss of power steering assist. Vehicle crash can occur, resulting in personal injury or death.

4 Interaxle Lock

Illuminates when interaxle lock is engaged.

5 Differential Lock

Illuminates when differential lock is engaged.

6 Turn Signal Indicator

Flashes when turn signals are active.

7 Parking Brake Engaged

Indicates parking brake is engaged

8 Safety Belt Reminder

Indicates safety belt needs to be fastened.

9 Aftertreatment DPF Regeneration

Indicates aftertreatments DPF regeneration is required.

10 High Exhaust System Temperature (HEST)

The High Exhaust System Temperature (HEST) Icon comes on when the exhaust temperature becomes elevated. The Icon also comes on during the REGEN.

11 ABS Trailer Malfunction

Indicates a problem being reported by the Trailer ABS system.

12 ABS Tractor Malfunction

Indicates a problem being reported by the Tractor ABS System

13 Preheating Active

Indicates preheating is active.

14 High Beam

Illuminates when high beam lights are engaged.

15 Aftertreatment DEF Tank Low

Illuminates when the fluid level is low. It also Flashes when the level becomes critically low.

16 Check Indicator

Illuminates when there is an engine or aftertreatment system issue or other electrical malfunction.

17 Light Indicator

Illuminates when there is a lighting system error.

18 Traction Control System (TCS) Indicator

Indicates the Traction Control System (TCS) is active or disabled.

19 Lane Departure Warning System (LDWS) Indicator

Indicates the Lane Departure Warning System (LDWS) is off.

OVERVIEW OF INSTRUMENTS

20 Power Take-Off (PTO)

Indicator

Indicates that the Power Take-Off (PTO) is active.

21 Electronic Stability Control (ESC) Indicator

Indicates that the Electronic Stability Control (ESC) system is active.

22 Daytime Running Light (DRL) Indicator

Indicates that the Daytime Running Lights (DRL) are active.

23 Lane Change System (LCS) Indicator

Indicates that the Lane Change System (LCS) is off or disabled.

24 Airbag Indicator

Indicates that there is an airbag error. Maintenance is required.

25 Tire Pressure Monitoring System (TPMS) Indicator

Indicates that there is an issue with the vehicle's tire pressure. Maintenance is required.

26 Automatic Traction Control (ATC)

Indicates the vehicle is losing traction and the Automatic Traction Control (ATC) is engaging.

Trailer Air Supply

The trailer air supply valve is a red octagonally-shaped knob. Pull the knob to apply the trailer emergency brakes. Push the knob to pressurize the trailer air reservoir and release the trailer emergency brakes. The trailer air supply valve should not be used for parking.



Parking Brake

The parking brake valve is a yellow diamond-shaped knob. Pull the knob to apply the parking brakes. Push the knob to release the parking brakes.

! NOTE

The Daytime Running Lights will activate when the parking brake is released.



Stalk Controls

The stalk on the right-hand side of the steering column is used to navigate through the Driver Information Display (DID). Two buttons and the toggle section assist in browsing the DID menus.

The buttons allow the user to perform the following DID functions:

- Toggle
- Enter
- Open the Applications menu (various sub-menus are included)
- Open the Options menus (various sub-menus are included)
- Return to the Home screen

NOTE

To return to the Home screen, press and hold the Home button. Release the button once the Home screen displays. Or scroll through the DID screens until the Home screen displays.

NOTE

Also, included on the stalk are the engine brake toggle and cruise control brake button.

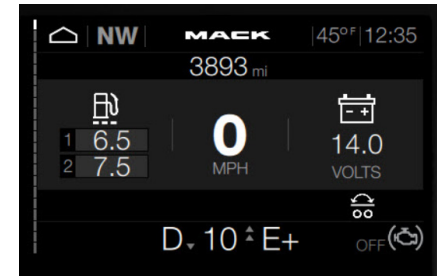


- 1 Engine Brake Toggle
- 2 Applications/Home Button
- 3 Toggle Up Position
- 4 Options/Enter Button
- 5 Cruise Control Brake Increase (+)/ Decrease (-) Button
- 6 Toggle Down Position

DID Menu

There are two menu types available: Applications and Options. Several sub-menus are password-protected while the vehicle is parked.

The following screen is an example of the DID Home screen.



NOTE

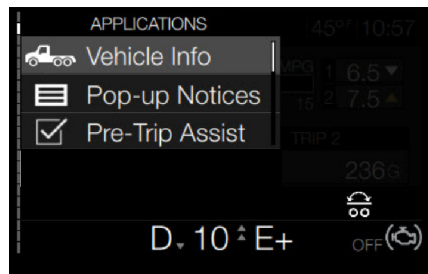
Some menus known as Non-Driving menus are accessible only when the vehicle is parked.

Applications Menus

The Applications menu contains the following sub-menus:

- Vehicle Info: This menu provides standard vehicle information.
- Tire Monitor: This menu provides the tire pressure and temperature for each axle.

- **Pop-up Notices:** This menu provides a list of active vehicle communication notices.
- **Pre-Trip Assist:** This menu provides the pre-trip test options.
- **Truck Data:** This menu provides vehicle overview information necessary for maintenance and diagnostics.
- **Settings:** This menu provides various settings options that the driver can adjust.



Vehicle Info

Included in this menu is information based on a driver's Favorites settings. Examples of the available screens include:

- **Fuel Economy:** displays engine's fuel economy (L/100 km [MPG]).

- **Oil Temps (Temperature):** displays engine and transmission oil temperature.
- **Other Gauges:** displays other pre-set gauges. Examples would be High Exhaust System Temperature or Battery Voltage.
- **Trip 1:** includes various trip data including average speed, fuel economy, hours driven, distance traveled, etc.
- **Trip 2:** provides the same information as the Trip 1 option. Allows the driver to track multiple trips.
- **EATS Status:** provides various pieces of aftertreatment information. For additional information on the EATS system refer to the Aftertreatment chapter.
- **Drive Train:** provides the engine load and throttle percentage for the drive train.
- **Suspension:** provides pressure information (pounds per square inch) for the front and rear axle.
- **Rear Axle Temps (Temperature):** provides temperature information for all vehicle axles.
- **Fuel Incentive:** is a performance bonus feature used to promote driver efficiency. This menu provides the

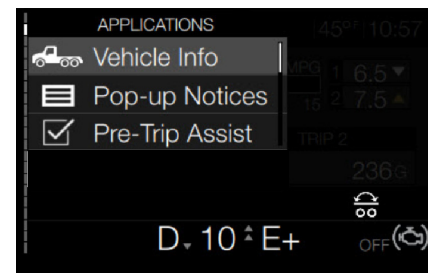
amount of fuel used optimally during vehicle operation.

- **ECS Status:** provides rear axle(s) pressure and ride height. These options are controlled by the Electronic Controlled Suspension (ECS) system. For additional information on the ECS system refer to the ECS chapter.

To access the Vehicle Info menus from the Driver Information Display, complete the following steps:

1 Press the Applications button on the right-hand stalk.

The Applications menu screen displays.

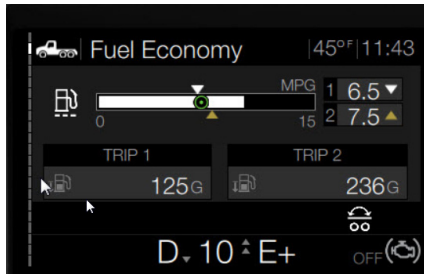


2 If necessary, use the Toggle button to scroll to Vehicle Info.

3 Press Enter.

The initial Vehicle Info screen displays.

DRIVER INFORMATION DISPLAY

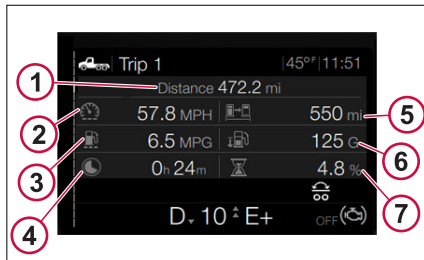


4 Use the Toggle/Enter button to scroll through the available Vehicle Info sub-menus.

Trip 1/2

The Trip 1 or 2 menus are accessible through the Applications/Vehicle Info menus.

The following is an example of the Trip 1 screen.



1 Distance (driven): Provided in either miles or kilometers depending on the driver's settings.

- 2 Average Speed: Displayed as MPH (miles per hour) or kilometers per hour (km/h).
- 3 Average Fuel Economy: Displayed as MPG (miles per gallon) or liters used per 100 kilometers (L/100 KM).
- 4 Time Driving: Display in hours and minutes.
- 5 Distance Until Fuel Tank Empty: Displayed in miles (mi) or kilometers (km).
- 6 Fuel Used: Displayed in gallons (G) or liters (L).
- 7 Idle Time: lists percentage of driving time spent in idle.

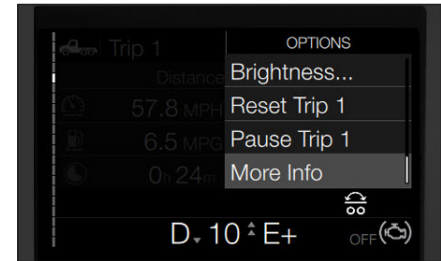
To adjust the Trip data complete the following:

- 1 From the Trip (1 or 2) menu, press the Options button.



1 Options Button

The Trip menu screen displays.



The available options are:

- Screen Off: turns off the DID screen. Only a black screen displays.
- Brightness: allows adjustment of the DID screen brightness.
- Reset Trip X: resets all trip information to zero.
- Pause Trip X: pauses the trip information updates.
- Resume X: resumes the trip updates after being paused.
- More Info: provides additional trip information such as cruise control time, engine brake time, max RPM, etc.

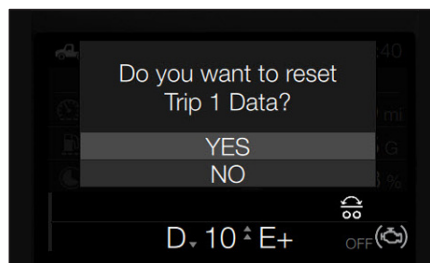
2. Use the Toggle button to scroll to the desired action (Reset Trip X, Resume Trip X, etc.).

3. To select a menu, press Enter.

The Trip menu reset, resume or pause depending on the selection.

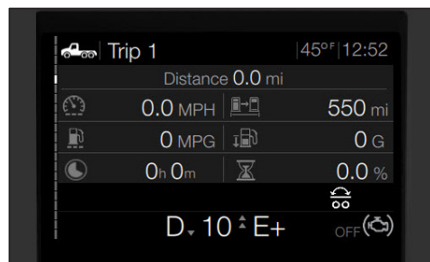
Reset Trip X

After selecting Reset Trip X from the Options menu, the following screen displays.



1 Press Enter (Yes) to reset the Trip menu.

The screen returns to the Trip menu. All measurements are reset to 0.



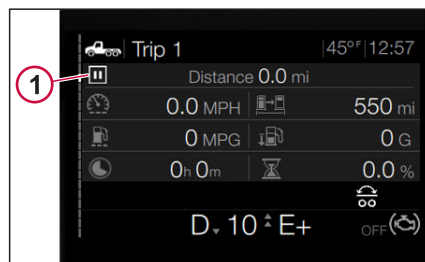
Pause Trip X

1 From the Trip Options menu, scroll to Pause Trip X.

2 Press Enter.

The Trip menu is paused. No new information is recorded.

The following screen displays. A pause icon displays in the upper, left-hand side of the screen.



1 Pause Icon

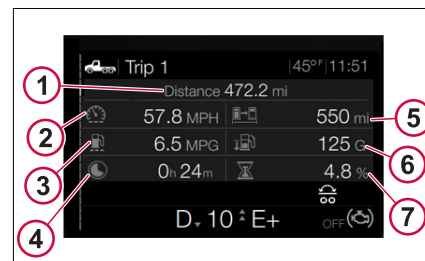
Resume Trip X

1 From the Trip Options menu, scroll to Resume Trip X.

2 Press Enter.

The Trip menu enters active status. New information is recorded.

The standard Trip screen displays. The Pause icon is removed.



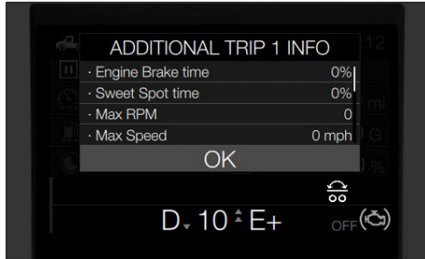
- 1 Distance (driven): Provided in either miles or kilometers depending on the driver's settings.
- 2 Average Speed: Displayed as MPH (miles per hour) or kilometers per hour (km/h).
- 3 Average Fuel Economy: Displayed as MPG (miles per gallon) or liters used per kilometer (L/100 KM).
- 4 Time Driving: Display in hours and minutes.
- 5 Distance Until Fuel Tank Empty: Displayed in miles (mi) or kilometers (km).
- 6 Fuel Used: Displayed in gallons (G) or liters (L).
- 7 Idle Time: lists percentage of driving time spent in idle.

More Info

1 From the Trip Options menu, scroll to More Info.

2 Press Enter.

The Additional Trip X Info screen displays.



3 Press Enter to return to the main Trip menu.

Tire Monitor

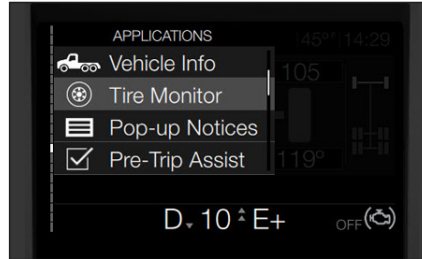
The Tire Monitor DID screen provides the following information:

- Tire Pressure: Pounds per Square Inch (PSI) or Kilopascal (KPA) depending on the setting.
- Tire Temperature: Fahrenheit (F°) or Celsius (C°).
- Axle: The tire information for each axle is displayed based on the axle selected.

To access the Tire Monitor sub-menu from the Driver Information Display, complete the following steps:

1 Press the Applications button on the right-hand stalk.

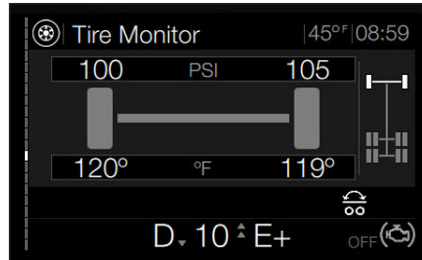
The Applications menu screen displays.



2 Use the Toggle button to scroll to Tire Monitor.

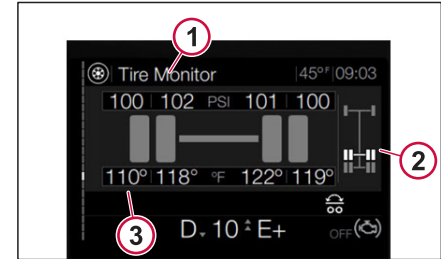
3 Press Enter.

The Tire Monitor main screen displays.



4 Use the Toggle button to scroll through the available tire information for each axle.

The selected axle highlights on the right-hand side of the screen.



1 Axle Pressure

2 Specific Axle Displayed

3 Axle Temperature

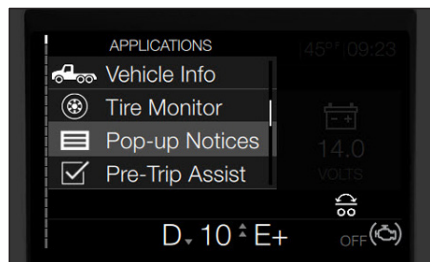
Pop-up Notices

This screen provides a list of the active vehicle communication notices.

To access the Pop-up Notices sub-menu from the Driver Information Display, complete the following steps:

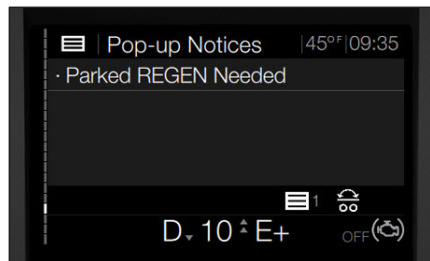
1 Press the Applications button on the right-hand stalk.

2 From the Applications menu, use the Toggle button to scroll to Pop-up Notices.



3 Press Enter.

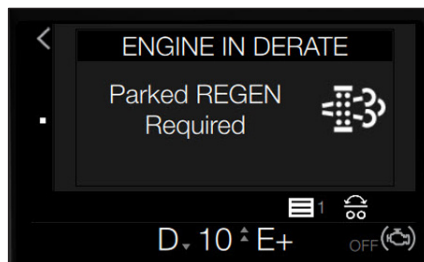
The Pop-up Notices screen displays.



4 To open notifications, using the Toggle button, scroll down to the preferred message.

5 Press Enter.

The Notification screen displays.



Pre-Trip Assist

The Pre-Trip Assist sub-menu allows the operator to perform basic pre-trip tests via the Driver's Information Display (DID). The following tests are available:

- **Activate Exterior Light Inspection Test:** Allows the driver to perform system controlled test of the vehicle's lighting systems.
- **Light Switch Test Check List:** Allows the driver to physically activate each switch. If the switch operates properly it is noted on the Switch Test DID screen.
- **Air Brake Leak-Down Test:** Allows the driver to check the air system for leaks. Any leaks are noted on the Leak-Down Test DID screen.

For the step by step procedure using the Pre-Trip Assist via the DID refer to the Pre-Trip Inspection and Daily Maintenance chapter.

Truck Data

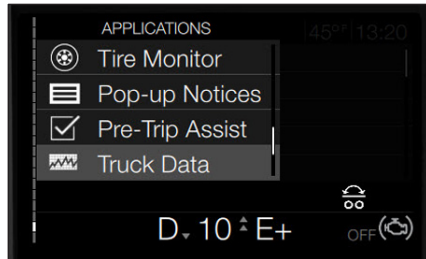
The Truck Data Driver Information Display (DID) menu provides various types of general information about a vehicle. Included in the main sub-menus are:

- **Vehicle Diagnostics:** This sub-menu provides active fault details, a cluster test option and the status of the Telematics Gateway system. Within each of these sub-menus are additional menus that are specific to vehicle diagnostics.
- **Engine Oil Level:** This sub-menu provides a visual status of the engine oil level.
- **ACC (Adaptive Cruise Control) Configuration:** This sub-menu provides visual markers for the system's Following Distance Alerts (FDA).
- **General Info:** This sub-menu provides basic vehicle information such as current location, Vehicle ID, Fleet Info, etc.
- **Life of Vehicle Totals:** This sub-menu provides the current vehicle totals such as mileage, time in service, fuel used, etc.

DRIVER INFORMATION DISPLAY**Truck Data Menu Access**

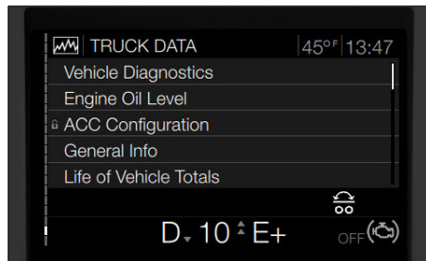
To access the Truck Data sub-menus from the Driver Information Display, complete the following steps:

1 From the main DID screen, using the right stalk Toggle button, scroll to Truck Data.



2 Press Enter.

The Truck Data main screen displays.

**NOTE**

For information on the stalk controls related to the Driver Information Display (DID), refer to the Stalk Controls section.

3 Using the Toggle button, scroll to the desired sub-menu.

4 Press Enter.

The selected menu main screen displays.

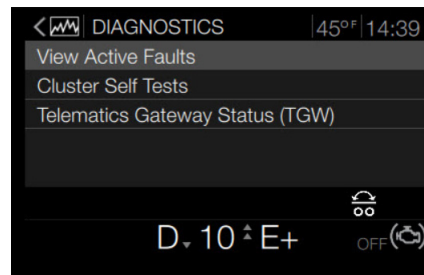
The following sections detail the available Truck Data menus.

Vehicle Diagnostics

1 From the Truck Data main screen, scroll to Vehicle Diagnostics.

2 Press Enter.

The Vehicle Diagnostics main screen displays.



There are three sub-menus available from the Vehicle Diagnostics DID screen:

View Active Faults, Cluster Self Test and Telematics Gateway (TGW) Status.

Use the Toggle button to scroll to one of these menus. To select a menu, press Enter.

View Active Faults

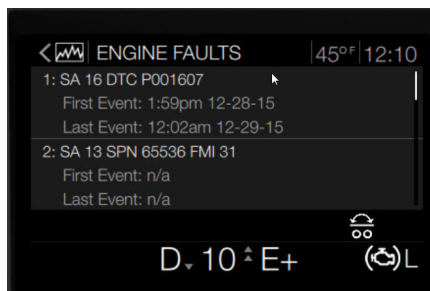
The View Active Faults sub-menu provides information about all Electronic Control Unit (ECU) faults.

Use the Toggle button to scroll to a sub-menu. To select a menu, press Enter.

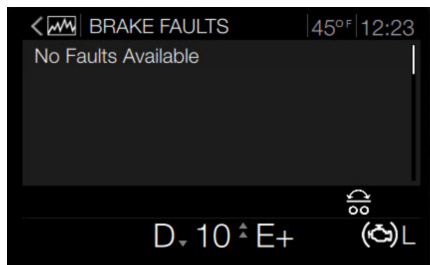
Active Faults Screen

The Active Faults screen provides a list of fault messages reported from the corresponding vehicle ECUs.

When a sub-menu is selected from the Active Faults list, the active faults screen displays any reported fault codes for the selected ECU as shown in the image below (ex. Transmission, Brake, Instrument Cluster, etc.).



If no faults are reported for a selected menu, the 'No Faults Available' screen displays for that ECU.



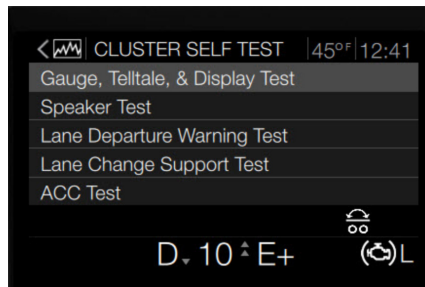
Cluster Self Test

The Cluster Self Test menu allows for testing of various functions performed by the instrument cluster. To access the Cluster Self Test menus, complete the following:

1 From the Vehicle Diagnostics main screen, use the Toggle button to scroll to Cluster Self Tests.

2 Press Enter.

The Cluster Self Test screen displays.



The available tests include the following:

- **Gauge, Telltale, & Display Test:** This test provides a visual test of all gauges, telltales and display functionality in the instrument cluster. Press the Enter button to exit the test.
- **Speaker Test:** This test provides an auditory test of instrument cluster's speakers. A DID screen displays representing the speakers tested.
- **Lane Departure Warning Test:** This test provides both a visual and auditory test of the LDW system. A DID screen displays during this test

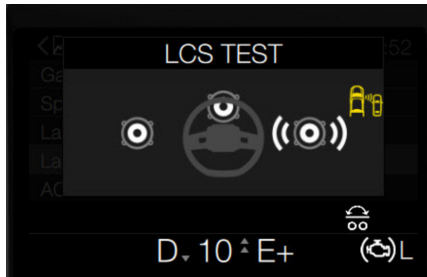
representing both the visual and auditory alerts for this system.

- **Lane Change Support (LCS) Test:** This test provides both a visual and auditory test of the Lane Change Support system. A DID screen displays during this test representing both the visual and auditory alerts for this system.
- **ACC (Adaptive Cruise Control) Test:** This test provides both a visual and auditory test of the VADA system. A DID screen displays during this test representing both the visual and auditory alerts for this system.

3 Use the Toggle button to scroll to a specific cluster test.

The example below is Lane Change Support test.

4 Press Enter to initiate the test.

*Speaker Test Screen*

5 To exit any Cluster Self Test, press Enter.

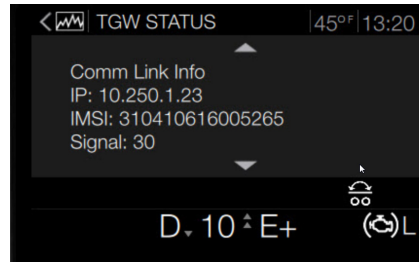
Telematics Gateway Status (TGW)

The Telematics Gateway Status (TGW) diagnostics menu, provides status information for the system.

To access this menu, complete the following:

- 1 From the Vehicle Diagnostics main screen, use the Toggle button to scroll to Telematics Gateway Status (TGW).
- 2 Press Enter.

The TGW Status screen displays.



3 Use the Toggle button, to scroll through the available TGW messages.

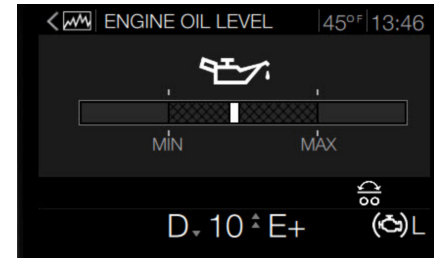
Engine Oil Level

The Engine Oil Level menu provides a visual status of the engine oil level. The minimum (MIN) and maximum (MAX) levels are shown. The Engine Oil Level screen indicates whether the current engine oil level falls above or below those levels.

To access the Engine Oil Level menu, complete the following:

- 1 From the Truck Data main screen, use the right-hand steering stalk Toggle button to scroll to Engine Oil Level.
- 2 Press Enter.

The Engine Oil Level screen displays.



Adaptive Cruise Control (ACC)

NOTE

The vehicle operator cannot adjust the FDA (Following Distance Alert) intervals. These can only be adjusted by a certified technician. For additional information on ACC refer to Adaptive Cruise/Stability Advantage chapter.

The Adaptive Cruise Control (ACC) Configuration menu provides visual markers for the system's Following Distance Alerts (FDA).

The Following Distance Alert (FDA) is active whenever the vehicle is moving. The alert provides both audible and visual warnings. These warnings occur whenever the following distance between your vehicle and the vehicle ahead is less than the set time gap.

General Info

The General Info screen provides the following vehicle information:

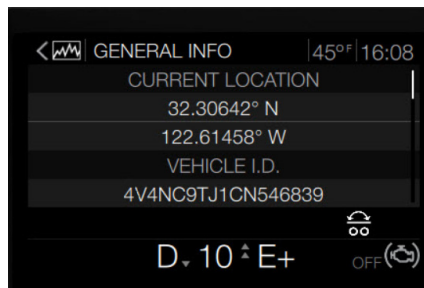
- **Current Location:** This is the current vehicle's location based on latitude and longitude.
- **Vehicle ID:** Also, know as the Vehicle Identification Number (VIN).
- **Fleet Info:** Includes the vehicle's fleet ID number, RPM limit and speed limit.
- **Cluster Hardware:** Includes the vehicle cluster's part number and build information.
- **Cluster Software:** Includes the vehicle cluster's programming information.

To access the General Info menu, complete the following:

1 From the Truck Data main screen, use the right-hand steering stalk Toggle button to scroll to General Info.

2 Press Enter.

The General Info screen displays.



Life of Vehicle Totals

The Life of Vehicle Totals menu provides compiled vehicle information. Some examples of the available information include:

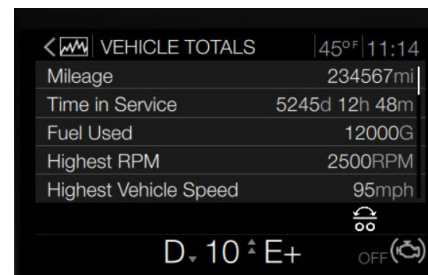
- Mileage
- Time in Service
- Fuel Used
- Highest RPM
- Highest Vehicle Speed
- Average Vehicle Speed
- Average Fuel Economy
- Idle Time
- Cruise Control Time
- Sweet Spot Time
- Engine Brake Time
- PTO Time

To access the Life of Vehicle Totals menu, complete the following:

1 From the Truck Data main screen, use the Toggle button to scroll to Life of Vehicle Totals.

2 Press Enter.

The Life of Vehicle Totals screen displays.



Settings

The Settings menu allows the driver to adjust various settings associated with the instrument cluster and DID screen. The menus available include:

- **Display:** this sub-menu provides several options to adjust the DID screen. These options include turning the DID screen off, enabling a black panel DID and adjusting the brightness.

DRIVER INFORMATION DISPLAY

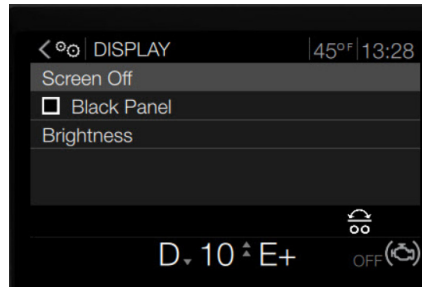
- **Driver Speed Alert:** this sub-menu provides a setting for a speed alert. If the driver exceeds a set speed limit an alert is provided if turned ON. The ON/OFF setting and set speed limit are selected from this menu.
- **Fuel Consumption Units:** this sub-menu provides a measurement setting of fuel consumption by the engine.
- **Global Units:** this sub-menu provides measurement settings for all DID readings (metric or U.S.).
- **Language:** this sub-menu allows the driver to adjust the language displayed in the DID. The three available languages are English, Spanish and French.
- **Lane Change Support (LCS) Alert Sound:** this sub-menu allows the driver to select the NO (OFF) or YES (ON) setting for the Lane Change Support alerts.
- **Set Economy (ECO) Target:** this sub-menu allows fleet owners to set targets for vehicle operation regarding fuel consumption.
- **System Volumes:** this sub-menu allows the driver to adjust the sound volume for four settings. The settings available include system, ACC, LDWS and Hazard volumes.

- **Time & Date:** This sub-menu allows the driver to adjust the clock (12 hour or 24 hour), current time and date.

The following sections provide additional information on the Settings sub-menus.

NOTE

For information on the Lane Change Support (LCS) refer to the related chapter.



To access the Settings sub-menus, complete the following:

- 1 Press the Applications button.
- 2 Use the Toggle button to scroll to Settings.
- 3 Press Enter.
- 4 Use the Toggle button to scroll to a specific sub-menu.

5 Press Enter.

The selected sub-menu screen displays.

Display

The Display sub-menu provides the following options:

- **Screen Off:** this setting allows the driver to turn off the DID portion of the instrument cluster.
- **Black Panel:** this setting allows the driver to turn off the Instrument Cluster except for the Speedometer and Tachometer.
- **Brightness:** this setting allows the driver to adjust the brightness of the DID lighting.

These menus are also available in the Options menu list. Refer to the Options section for operation instructions of these sub-menus.

Driver Speed Alert

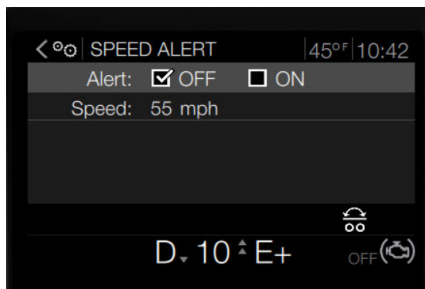
This sub-menu provides a setting to activate a speed alert. If the driver exceeds a set speed limit an alert is provided if turned ON. The ON/OFF setting and set speed limit are selected from this menu.

To access the Driver Speed Alert sub-menu, complete the following:

- 1 Use the Toggle button to scroll to Driver Speed Alert sub-menu.

2 Press Enter

The selected Driver Speed Alert screen displays.

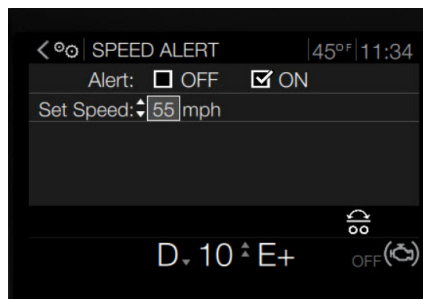


The Driver Alert Screen displays with the Alert mode set to OFF.

3 To turn the alert ON, press Enter. The Alert mode will display as ON. The ON checkbox will have a check.

4 To set the alert speed limit, use the Toggle button to scroll to Speed mode.

5 Press Enter. The number box highlights.



6 To change the speed limit, use the Toggle button to scroll to the desired number.

7 Once the number is reached, press Enter. The speed limit is set and the alert is ON.

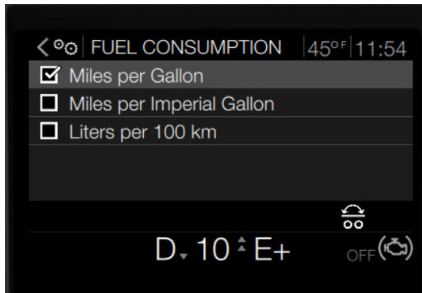
Fuel Consumption Units

To change the fuel consumption measurement setting in the DID, complete the following:

1 Use the Toggle button to scroll to the Fuel Consumption Units sub-menu.

2 Press Enter.

The Fuel Consumption screen displays.



3 Use the Toggle button to scroll to the desired fuel consumption measurement (Miles per Gallon, Miles per Imperial Gallon or Liters per 100 km).

4 Press Enter.

The new fuel consumption measurement displays on all DID screens that contain fuel consumption information.

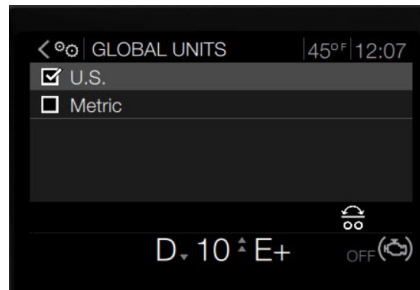
Global Units

To change the Global Units setting in the DID, complete the following:

1 Use the Toggle button to scroll to the Global Units sub-menu.

2 Press Enter.

The Global Units screen displays.



3 Use the Toggle button to scroll to the global unit measurement (U.S. [Imperial] or Metric).

4 Press Enter.

All Driver Information Display measurements display in the selected global unit option.

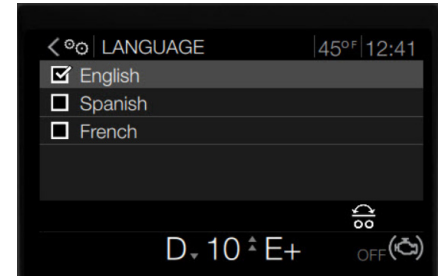
Language

To change the Language setting in the DID, complete the following:

1 Use the Toggle button to scroll to the Language sub-menu.

2 Press Enter.

The Language screen displays.



3 Use the Toggle button to scroll to the desired language.

4 Press Enter.

All Driver Information Display screens display in the selected language.

Set ECO (Economy) Target (If Equipped)

The Set ECO Target menu allows the driver to set fuel consumption targets for vehicle operation.

To change the Set ECO Target setting in the DID, complete the following:

1 Use the Toggle button to scroll to the Set ECO Target sub-menu.

2 Press Enter.

The Set ECO Target screen displays.



3 Press Enter to highlight the target setting.



4 Use the Toggle button to adjust the target number.

5 Press Enter to accept the selected target number.

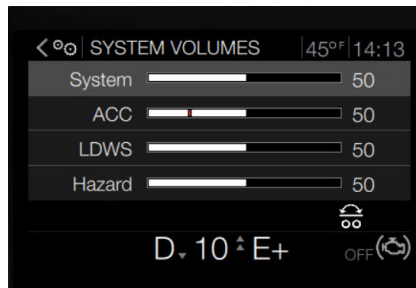
System Volume Levels

To change the System Volume Levels settings in the DID, complete the following:

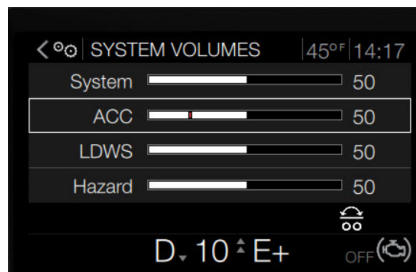
1 Use the Toggle button to scroll to the System Volume Levels sub-menu.

2 Press Enter.

The System Volume Levels screen displays.

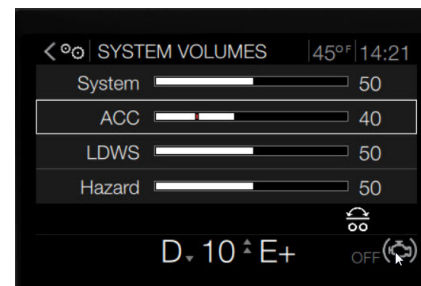


3 Use the Toggle button to scroll to the desired system volume setting.



4 Press Enter.

5 Use the Toggle button to adjust the system volume setting.



6 Press Enter to accept the changes.

Time and Date

To change the Time & Date settings in the DID, complete the following:

1 Use the Toggle button to scroll to the Time & Date sub-menu.

2 Press Enter.

The Time & Date screen displays.



3 Press Enter to change the Clock time format (12 hr or 24 hr).

4 Use the Toggle button to scroll to another Time & Date setting (Time: or Date:).

5 Press Enter.

The first field of the menu highlights.



6 Use the Toggle button to adjust the time setting.

7 Press Enter to accept a setting.

Options

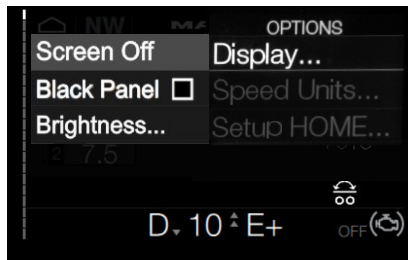
The Options menu allows the driver to adjust various settings associated with the instrument cluster and Driver Information Display (DID) screen. The menus available include:

- Display: this menu offers several submenus that adjust the DID screen. The submenus include:
 - Screen Off: this setting allows the driver to turn off the DID portion of the instrument cluster.
 - Black Panel: this setting allows the driver to turn off the instrument cluster except for the Speedometer and Tachometer.
 - Brightness: this setting allows the driver to adjust the brightness of the DID lighting.
- Speed Units: km/h or MPH: this setting allows the driver to set the DID speedometer reading. Either kilometers per hour (km/h) or miles per hour (MPH) displays.
- Setup HOME: this setting allows the driver to set the Favorites selections displayed in the HOME screen.

Screen Off

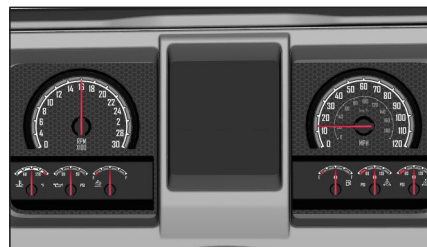
To change the Screen Off setting in the DID, complete the following:

- 1 From the DID Home screen, press the Options button on the right-hand side of the right steering stalk.
- 2 From the Options menu, scroll to the Display submenu (if necessary).
- 3 From the Display submenu, scroll to Screen Off (if necessary).



- 4 Press Enter.

The DID screen goes dark. The instrument cluster remains illuminated according to the settings.



- 5 Press any stalk button to turn on the DID screen.

Black Panel

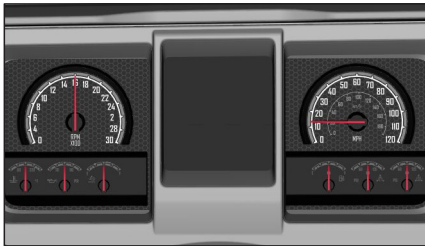
To change the Black Panel setting in the Driver Information Display (DID), complete the following:

- 1 From the DID Home screen, press the Options button on the right-hand side of the right steering stalk.
- 2 From the Options menu, scroll to the Display submenu (if necessary).
- 3 From the Display submenu, scroll to Black Panel.



4 Press Enter.

The majority of the instrument cluster is turned off. In the instrument cluster, only the Speedometer and Tachometer are illuminated. In the DID, only the bottom portion displays.



5 Press any steering wheel control button to illuminate the entire instrument cluster and DID.

6 Press Enter to uncheck the Black Panel check box. This step turns the Black Panel option off.

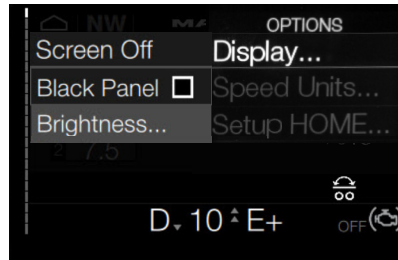
Brightness

To change the Brightness setting in the Driver Information Display (DID), complete the following:

1 From the DID Home screen, press the Options button on the right-hand side of the right steering stalk.

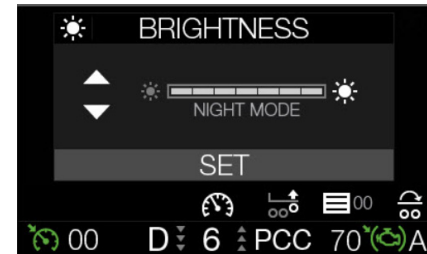
2 From the Options menu, scroll to the Display submenu.

3 From the Display submenu, scroll to Brightness.



4 Press Enter.

The Brightness adjustment screen displays.



5 Use the Toggle button to raise or lower the brightness level.

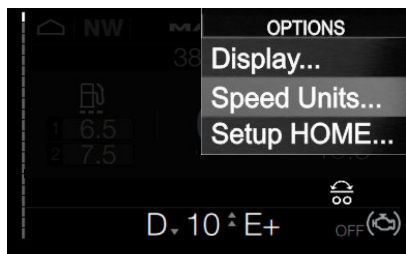
6 Press Enter to set the brightness level.

The Brightness level stays at the selected level even if the vehicle is turned off and restarted.

Speed

To change the Speed setting to either MPH (miles per hour) km/h (kilometers per hour) in the Driver Information Display (DID), complete the following:

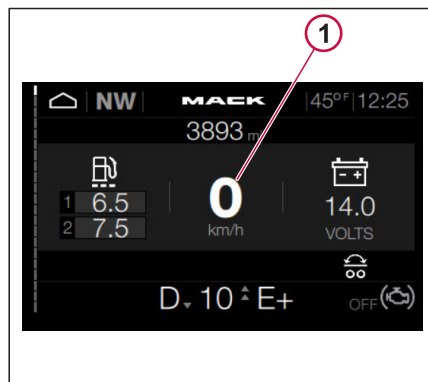
1 From the Options menu, use the Toggle button to scroll to Speed.



2 Press Enter.

The Driver Information Display (DID) Speedometer setting changes to the opposite measurement.

An example would be if the original Speedometer setting was miles per hour (MPH). The new setting would be kilometers per hour (km/h).



1 Speedometer Setting

Setup HOME

The 'favorites' menus available for the HOME screen include:

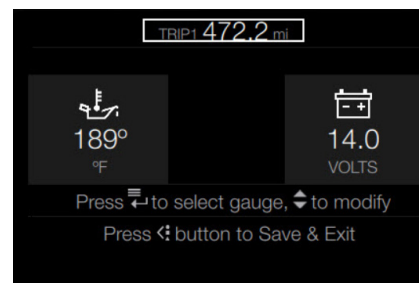
- Engine Oil Temperature
- Transmission Oil Temperature
- Distance to Empty
- Battery Voltage
- Fuel Economy
- Air Suspension Gauge Rear
- Air Suspension Gauge Front
- Front Rear Axle Temperature
- Rear Rear Axle Temperature
- Center Axle
- Throttle Percentage
- Engine Load Percentage
- Pyrometer
- Sweet Spot Status Icon
- Electronic Control Suspension

To change the Setup HOME settings in the Driver Information Display (DID), complete the following:

1 From the Options main screen, use the Toggle button to scroll to Setup HOME.

2 Press Enter.

The Setup HOME screen displays.



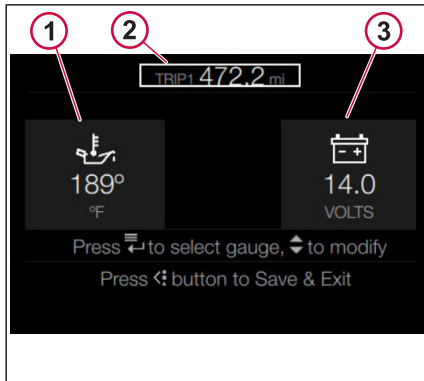
The Home screen is divided into three sections. Each section represents a 'favorite' menu.

Upon opening the Setup HOME menu the first 'favorite' menu is highlighted. To adjust each section's 'favorite' selection complete the following:

3 Use the Toggle button to scroll through the available favorites.

4 Press Enter to select the visible favorite in the section.

The next 'favorite' section is automatically highlighted.



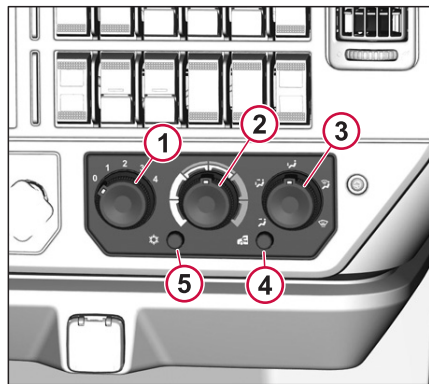
1 Favorites Menu 1

2 Favorites Menu 2

3 Favorites Menu 3

To save the changes, press the Home button. The screen automatically opens at the Home screen.

Cab Climate Control



- 1 Blower Control Knob
- 2 Temperature Control Knob
- 3 Mode Knob
- 4 Fresh/Recirculation Button
- 5 A/C ON/OFF Button

1 Blower Control Knob

This knob controls fan speed from OFF to 4 (highest speed).

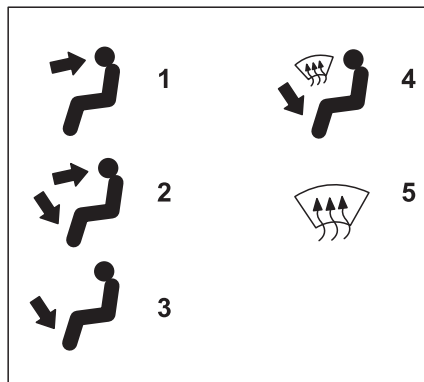
2 Temperature Control Knob

Controls the temperature of the air in the cab from COOL (far left) to HOT (far right).

3 Mode Selection Knob

Controls the direction of air flow around the cab seen below.

- 4 **Fresh/Recirculation Switch or Button**
Selects the cab intake air between fresh air (from outside the cab) and recirculated air (inside the cab).
- 5 **Air Conditioner ON/OFF Switch or Button**
Activates the air conditioning system.



- 1 Directs airflow through the dash panel air vents only.
- 2 Directs airflow through both the dash panel and floor air vents (bi-level).
- 3 Directs airflow through the floor vents only.
- 4 Directs airflow through the floor vents and the windshield for defrosting and/or defogging.
- 5 Directs airflow only to the windshield for defrosting and/or defogging.

NOTE

The Mode Selection knob can be rotated to any position. This allows the operator to select the desired amount of blend between the positions.

NOTE

For maximum air conditioner performance, select recirculated air.

NOTE

Turn the bunk and dash blower fan to 0 or OFF before initiating remote software update operations.

General

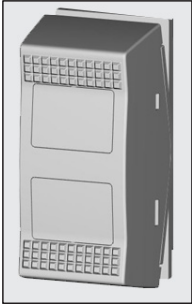
Switches that may be fitted in your truck are on the following pages. The available switches in your particular truck are dependent on the truck's equipment.

Movable Switches

The location of the majority of the switches can be easily adapted to your requirements. A few switches cannot be moved for safety reasons. Contact an authorized dealership for more information.

Switch Styles

There are 3 types of switches that are used on the dash panel.

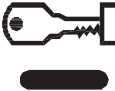
		
LOCKING	STANDARD	BodyBuilder Assignable

Symbols

SYMBOL	MEANING	STYLE
	TASK LAMP	Standard

SYMBOL	MEANING	STYLE
CAB  	AUX CAB FAN	Standard
	SHUTDOWN OVERRIDE	Standard
RETRDR 	RETARDER	Standard
 	PLOW LAMPS	Standard
STROBE 	STROBE	Standard
RES. ACCEL ↑ SET DECEL ↓	RES. ACCEL / SET DECEL	Standard

SYMBOL	MEANING	STYLE
	WINDSHIELD DEFROST	Standard
	DOVE LAMP SLEEPER (LECM)	Standard
	ECS RAISE / LOWER	Standard
	FAN CLUTCH OVERRIDE	Standard
	SPEED CONTROL	Standard
	TIME GAP (ACC)	Standard

SYMBOL	MEANING	STYLE
	DOME LAMP	Standard
	ATC OFF (MUD/SNOW)	Standard
	IGNITION POWER	Standard
	BATTERY POWER	Standard
	ATC (MUD/SNOW)	Standard
	INTER WHEEL DIFF LOCK	Standard

SYMBOL	MEANING	STYLE
	GRADE GRIPPER DISABLE	Standard
	FLOOR LIGHT BUNK	Standard
	TRAILER AUX (CENTER PIN)	Standard
	POWER FLOAT	Standard
	LOW HYDRA OIL OVERRIDE	Standard
	SPREADER LIGHT	Standard

SYMBOL	MEANING	STYLE
	IGNITION (20A)	Standard
REAR AMBER FLASHER 	REAR AMBER FLASHER	Standard
	ENGINE BRAKE	Standard
BEACON 	BEACON LIGHT	Standard
SANDER LIGHT 	SANDER LIGHT	Standard
CHAIN LIGHT 	CHAIN LIGHT	Standard

SYMBOL	MEANING	STYLE
ROTATING LIGHT 	ROTATING LIGHT	Standard
ALT LIGHT 	ALT LIGHT	Standard
	CHASSIS HEIGHT	Standard
	LDWS DISABLE	Standard
	BOGIE CONTROL	Standard
	OHC PIPE LAMP	Standard

SYMBOL	MEANING	STYLE
SLPR  	SLEEPER HVAC	Standard
LOAD LIGHT 	LOAD LIGHT	Standard
	ASSIGNABLE ON/OFF (Refer to Assignable Switches sub section, at end of chapter)	BodyBuilder Assignable
	ASSIGNABLE ON/OFF (Refer to Assignable Switches sub section, at end of chapter)	BodyBuilder Assignable
	ASSIGNABLE MOMENTARY (Refer to Assignable Switches sub section, at end of chapter)	BodyBuilder Assignable
TAILGATE UNLOCK	TAIL GATE LOCK/UNLOCK	Locking

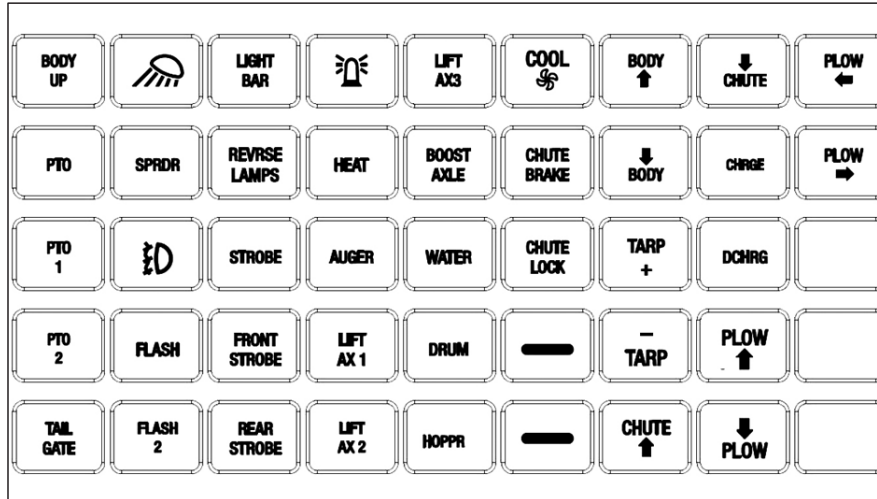
SYMBOL	MEANING	STYLE
TAILGATE UNLOCK	TAIL GATE LOCK/UNLOCK	Locking
ENG AIR CNTRL	SNOW INGESTION	Locking
	INTERAXLE	Locking
NEUT CNTRL	NEUTRAL CONTROL	Locking
ENG AIR CNTRL	INSIDE/OUTSIDE AIR	Locking
	SUSP. HEIGHT CONTROL	Locking

SYMBOL	MEANING	STYLE
	5TH WHEEL	Locking
PTO	PTO CONTROL	Locking
PTO	PTO CONTROL (MUNCIE)	Locking
ECS	ECS MODE	Locking
	FORWARD LIFT AXLE	Locking
	REAR LIFT AXLE	Locking

Assignable Switches

Here are the switches that can be Assignable for the BodyBuilder.

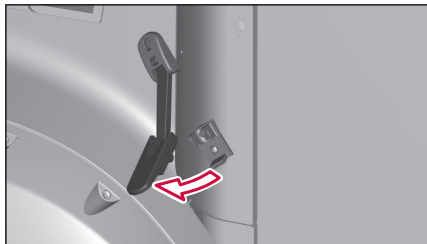
When the kit is ordered these thumbnails can be added so the driver knows what the assigned switch is for.



Hood Operation

Opening the Hood

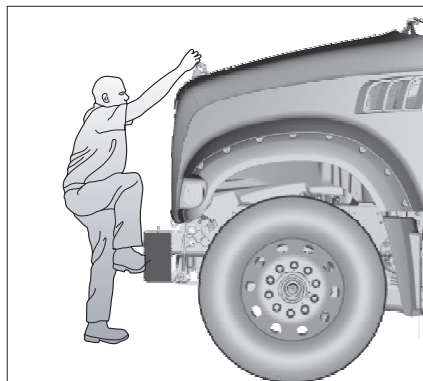
1. With the hood in the locked position, pull outward on the plastic handle and disengage the locking tab from the hood latch.
2. Swing the rubber strap up and out of the way.
3. Repeat this procedure on the other side of the hood.



ⓘ NOTE

When the hood is opened, the safety latch will drop down into the locked position.

4. Using the Bulldog as a handle, pull on the hood to raise it over the engine. You may put one foot on the bumper if necessary.
5. Pull steadily on the hood until it comes over the center and stops fully open.



⚠ WARNING

NEVER take both feet off the ground to tilt the hood. Keep at least one foot on the ground to avoid a slip or fall. If it is difficult for you to raise the hood, get the help of someone who can lift from the rear of the hood.

⚠ WARNING

Little effort is required to open or close the hood. NEVER take both feet off the ground to tilt the hood. Keep at least one foot on the ground to avoid a slip or fall.

Closing the Hood

ⓘ NOTE

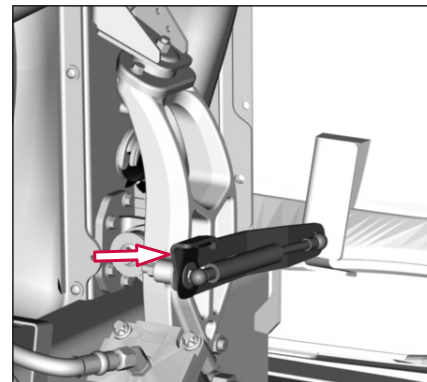
Remember to remove all tools, rags and test equipment from the engine compartment before closing the hood.

⚠ WARNING

Before closing the hood, be sure no one is in the way of the hood's descent.

ⓘ NOTE

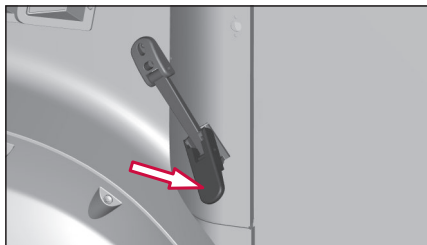
The safety latch must be released (reset) before the hood will close. (See arrow in illustration.)



Locking the Hood

To lock the hood, secure the rubber hold-down straps on each side of the hood:

1. With the hood down, set the rubber strap in position and force the locking discs into the hood latch.
2. Push inward on the plastic handle to lock the rubber strap in place.
3. Repeat this procedure on the other side of the hood.



CAUTION

Be sure the hood is latched securely. If the latch is not completely engaged, the hood could open during and cause vehicle damage.

Light Control Panel

This panel controls the parking lights, interior panel lights, headlights and fog lights (if equipped).

ⓘ NOTE

If the LCP is in OFF or park position and the windshield wiper is active for longer than 5 sec (programmable parameter), headlights will come on.



- 5 Hazzard
- 6 IP Dimmer
- 7 Floor Lighting

- 1 DRL Disabled
- 2 OFF Position
- 3 Park Lamps
- 4 Headlamps and Park Lamps

Steering Wheel Adjustment

WARNING

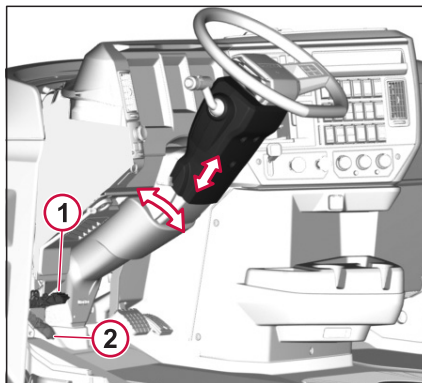
Adjust the steering wheel position
BEFORE attempting to move the vehicle
to avoid losing control of the vehicle.

Tilt-Telescope Steering Column

The Steering Column adjustment is actuated by a pedal on the left side of the floor.

To adjust the steering wheel position:

- 1 With both hands on the steering wheel, fully depress the adjustment pedal so it is in the unlocked position (2).
- 2 Move the steering wheel to the desired location.
- 3 Release the pedal, and allow it to return to the static/locked position (1).



1 Locked Position

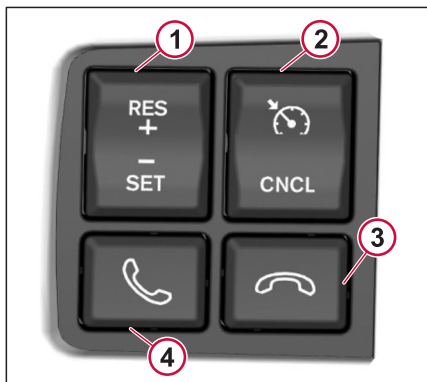
2 Unlocked Position

STEERING WHEEL CONTROLS

Left-Hand Controls

There are four steering wheel control buttons on the left-hand side of the steering wheel. Use these buttons to control the functions of the cruise control and telephone.

To answer an incoming phone call, press the button with the green phone. To end a current phone call, press the button with the red phone.



- 1 Cruise Control Resume/Set
- 2 Cruise Control ON/OFF/Cancel
- 3 Phone Hang Up
- 4 Phone Answer/Mute

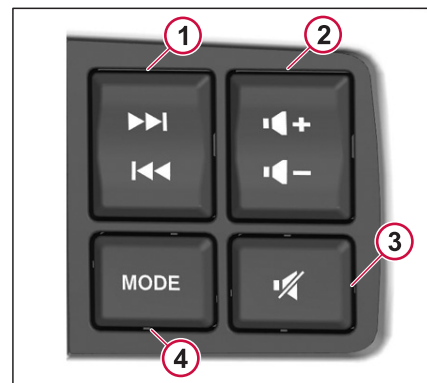
NOTE

For information on the cruise control, refer to cruise control section.

Right-Hand Controls

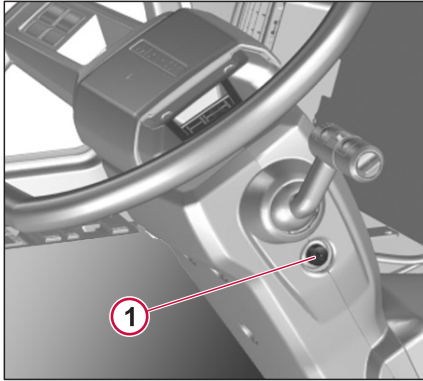
There are four steering wheel control buttons on the right-hand side of the steering wheel. Use these buttons to control the functions of the radio.

Press the button left or right to change radio stations. The radio will seek the next station with a strong signal. Press +, up or -, down button to change the radio volume. Press the mute button, to stop radio from playing. Press the mode button, to switch between different devices.



- 1 Radio Seek Up/Down
- 2 Radio Volume +/-
- 3 Radio Mute
- 4 Radio Mode

Steering Column Combination Starter and Electrical Switch



1 Ignition

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 follow these instructions could cause starter damage.

The ignition switch operates the engine and accessory relay. To start the engine, turn the ignition switch clockwise to the start position. When the engine starts, release the key to the run position.

When the switch is turned ON (in a clockwise direction), a warning buzzer sounds if air system pressure is below 448 ± 34 kPa (65 ± 5 psi). The buzzer shuts off as soon as sufficient air pressure is restored.

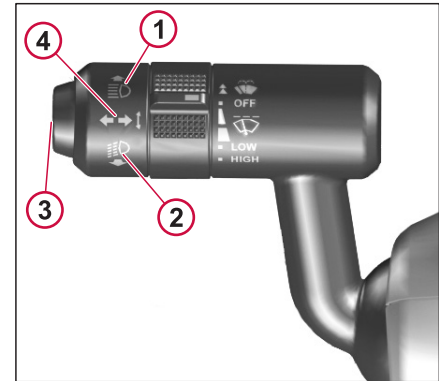
To stop the engine, turn the key counterclockwise to the off position.

To activate the accessory relay, turn the switch counterclockwise to the accessory position.

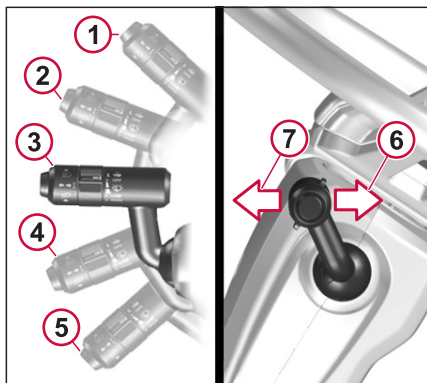
Left Stalk

The turn signal lever is located on the steering column. It performs a number of functions, including wiper controls, switching from high/low beams, and turn signal switch. The turn signal switch can be used for courtesy flashing of marker lights and for the flashing of high beams.

Marker Interrupt button is used for flash to pass.



- 1** High Beam Lock
- 2** High Beam Flash
- 3** Marker Interrupt
- 4** Turn Signal Indicator



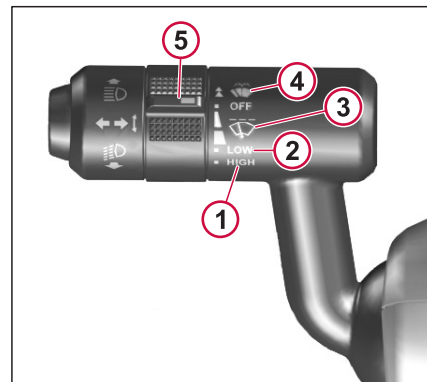
- 1 Handle in Right Turn Position for Right Turn Signal
- 2 Highway Turn Right (five blinks) to change lanes
- 3 Handle in rest position
- 4 Highway Turn Left (five blinks) to change lanes
- 5 Handle in Left Turn Position for Left Turn Signal
- 6 Pull Lever for Courtesy Flashing of High Beams (Daylight or Dark)
- 7 Push Lever Toward IP to Turn High Beams ON

Wiper Controls

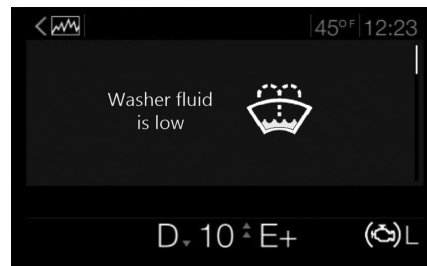
The wiper/washer functions are operated by a scroll ring. The wipers have normal and fast speeds which are activated by moving the scroll ring down one or two positions. To let the wipers engage for a few passes, lightly turn the scroll ring until the wipers start. The wipers return to the parking position when the scroll ring is released.

The interval wiper function is engaged by moving the lever down to the dash position on the stalk. The normal programmed speed is one pass every 10 seconds. To shorten the interval time, move the wheel on the stalk, there are 2 intermittent speeds provided.

To operate the windshield washer, push the scroll ring upward. If washer fluid needs to be added, use a commercially reputable washer fluid that has good cleaning capability and does not freeze in cold weather. An indicator will appear in the DID when the washer fluid level is low.



- 1 High Speed
- 2 Low Speed
- 3 Intermittent Speeds
- 4 Windshield Washer
- 5 Wiper/Washer Scroll Ring



Right Stalk

The stalk on the right hand side of the steering column is used to use the Driver Information Display (DID). Two buttons and a toggle section assist in browsing throughout for the DID menus.

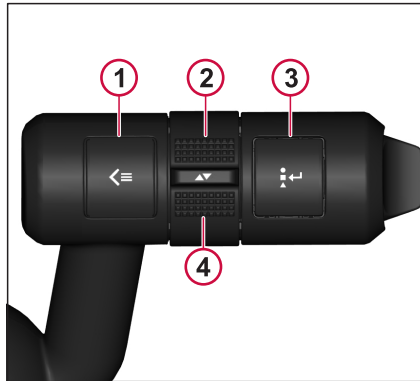
The buttons allow the user to perform the following DID functions:

- Toggle
- Enter
- Open the Applications menus
- Open the Options menus
- Return to the Home screen

Also, included on the stalk are the engine brake toggle and cruise control brake button.



- 1 *Engine Brake Lever*
- 2 *Applications Menu (Short Press)/Home (Long Press) Button*
- 3 *Menu UP Scroll Ring*
- 4 *Options/Enter Button*
- 5 *Brake Cruise Increase (+)/ Decrease (-) Button*
- 6 *Menu DOWN Scroll Ring*



- 1 *Applications Menu (Short Press)/Home (Long Press) Button*
- 2 *Menu UP Scroll Ring*
- 3 *Options/Enter Button*
- 4 *Menu DOWN Scroll Ring*

General Information

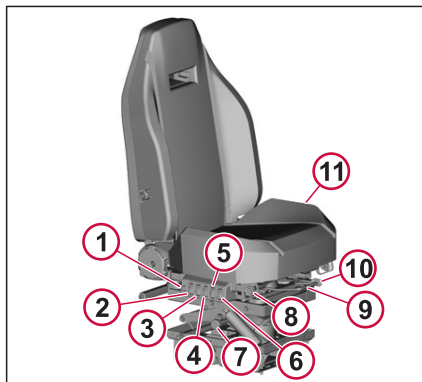
DANGER

All adjustments are to be made while the operator is seated and the vehicle is stationary. **DO NOT** adjust the seat position while driving the vehicle. Failure to follow this warning can result in loss of vehicle control, which can result in serious personal injury or death in the event of a vehicle accident.

The vehicle seats keep the driver positioned safely behind the wheel. Depending on the configuration of the vehicle, it may be equipped with one of the following seats in this section.

The seats have many functions designed to enhance driver comfort. Mack recommends getting to know these features well before operating the vehicle.

Sears Premium Seat



- 1 Heat Switch
- 2 Seat Bolster Valve
- 3 Back Bolster Valve
- 4 Lumbar Valve
- 5 Lumbar Valve
- 6 Suspension Valve
- 7 Damper Adjustment
- 8 3 Position Seat Tilt/Extension
- 9 Fore-Aft Slide Handle
- 10 Fore-Aft Isolator Handle
- 11 Recliner Handle

Sears Mid-Level Seat



- 1 Seat Bolster Valve
- 2 Back Bolster Valve
- 3 Lumbar Valve
- 4 Lumbar Valve
- 5 Suspension Valve
- 6 3 Position Seat Tilt/Extension
- 7 Fore-Aft Slide Handle
- 8 Fore-Aft Isolator Handle
- 9 Recliner Handle
- 10 Swivel Handle

Sears Base Seat



- 1** Lumbar Valve
- 2** Suspension Valve
- 3** 3 position Seat Tilt/Extension
- 4** Fore-Aft Slide/Isolator Handle
- 5** Recliner Handle

Sears Static Seat



Sears Toolbox Seat



- 1** Seat Tilt (To Access Toolbox)

Storage

DANGER

Heavy objects must be stored only in the outside storage areas or secured on the floor. Cabinets and storage compartments are designed for clothing and lighter personal effects only. In the event of a collision, heavy, unsecured objects in overhead storage can come loose and cause severe personal injury or death to the driver or passengers.

WARNING

All items within the cab must be secured before the vehicle is set in motion. This list includes, but is not limited to, drinks, clothes, books, televisions, and so on. In the event of a collision, loose items could fly around inside the cab. These loose items could cause personal injury.

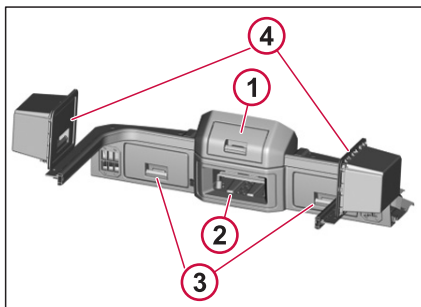
CAUTION

DO NOT overload the cab suspension. Make sure the weight distribution is equal in the cab. Overloading the suspension leads to poor ride and lowered driving comfort.

The overhead storage compartment is mounted over the windshield. Available storage areas can have netting, a CB radio area, switch panels and closed storage compartments.

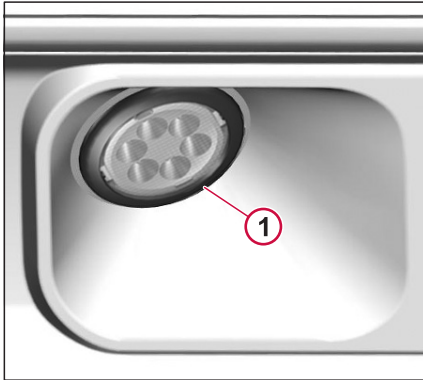


Storage weight: 1.1 kg (2.5 lb) per opening. If evenly distributed, the total storage is 5.6 kg (12.5 lb).



- 1** 0.6 kg (1.3 lb)
- 2** 1.35 kg (3 lb)
- 3** 0.75 kg (1.7 lb)
- 4** 1.65 kg (3.6 lb)

Dome Light



1 Dome Light

Dome lights are located on the roof of the truck and controlled by the switch located in the overhead front compartment. Each switch can be manually controlled by the driver and passenger or the driver can turn both on together.

Fresh Air Vent

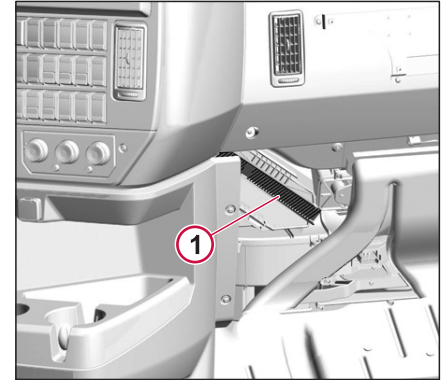


1 Fresh Air Vent

An air vent is provided to circulate outside air to the cab. Move the vent scroll wheel to the right to open the vent and to the left to close the vent.

When heating the cab, all fresh air vents should be closed. However, the vents on the outer parts of the dash can be used for defrosting the cab door windows. When operating the air conditioning, all air vents should be completely open and the air flow directed upward.

Cab Air Filter



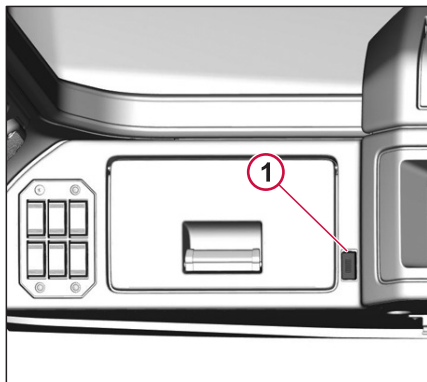
1 Cab Air Filter

To provide comfortable and clean fresh air in the cab, the heating and air conditioning system is designed with a replaceable filter. Under normal operating conditions the filter should be replaced every 6 months to ensure the efficiency of the heating and air conditioning system. Failure to replace the filter may cause damage to heater/AC components.

! NOTE

Dusty conditions may require more frequent replacement.

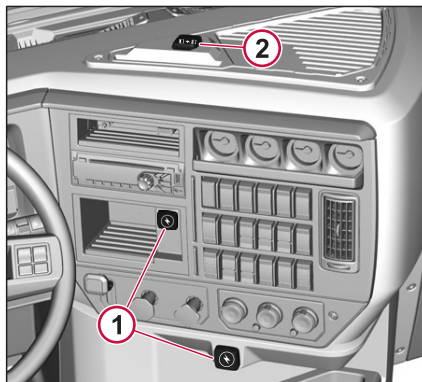
Microphone



1 Microphone

The microphone is located above the driver in the overhead compartment. It is available for use with radios equipped with Bluetooth/hands free option. The microphone transmits sound to the phone via Bluetooth.

Accessory Power Outlets



1 Power Outlets
2 USB Port

There are multiple 12-volt accessory power outlets conveniently located for the operator. One is located in the lower dash panel and another is in the middle of the dash next to the storage bin just above the air brake buttons.

There are two USB ports in the sleeper control panel that can be used for charging a phone or any USB powered device.

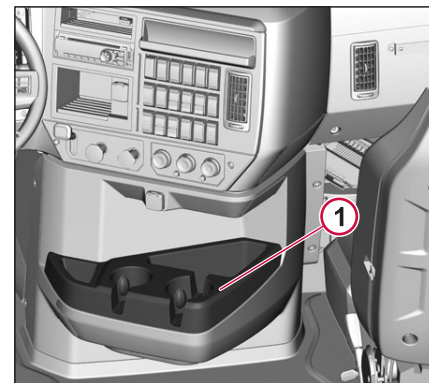
The AUX jack is used for playing stored music or media through the radio.

The 12V connector is utilizing the truck's 12V network to supply power to external units.

CAUTION

Maximum amperage for all power receptacles in the cab is 20 amps. Do NOT exceed the maximum amperage as equipment damage may result.

Cup Holders



1 Cup Holders

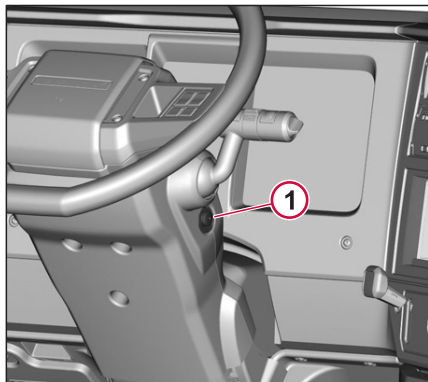
There are two cup holders located on the lower dash panel under the radio.

<https://truckmanualshub.com/>

STARTING AND DRIVING

Combination Starter and Electrical Switch

The ignition switch is located on the right side of the column. Insert the key and start the engine by turning the switch clockwise. The switch also activates the accessory relay, when turned counterclockwise. When the switch is turned ON (in a clockwise direction), a warning buzzer sounds if air system pressure is below 448 ± 34 kPa (65 ± 5 psi). The buzzer shuts off as soon as sufficient air pressure is restored.



1 *Ignition Switch, Engine Start*

General Information

CAUTION

Do not engage the starting motor too soon after an incomplete start of the engine, or the starter can be damaged. Wait at least five seconds before attempting to restart the engine.

CAUTION

If the engine does not start immediately, limit cranking periods to 30 seconds to avoid overheating and damaging the starter.

NOTE

Do not rev the engine at start-up. Turbocharger damage can result because lubricants need time to establish a film between moving parts.

Before putting the key in the ignition switch, set the parking (spring) brake, disengage the clutch (if equipped) and put the transmission in NEUTRAL.

Starting MP Engines

- 1 Crank the engine until it starts.

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 follow these instructions could cause starter damage.

NOTE

Do NOT apply the throttle pedal during engine cranking.

- 2 After the engine has started, warm the engine until the coolant temperature reaches normal operating range 77–107°C (170–225°F). Once the engine reaches this temperature, it can be operated in a normal fashion.

NOTE

Low Idle speed is sufficient for warming up the engine. Make sure that the parking brake is engaged during warm-up. This reduces the warm-up time for the engine by allowing an engine warm up process to be performed correctly.

NOTE

You may notice a change in engine note during this process.

NOTE

For bobtail or unloaded applications, the engine can be warmed up by moving the vehicle with "light" throttle application after only one minute of idle.

Priming the MP Fuel System

DANGER

Before working on or inspecting a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

DANGER

To avoid potential fire hazard, do not service any part of the fuel system while smoking or near flames, sparks or hot surfaces. Also, do not service the engine when working on an operating engine. Failure to follow these precautions can result in fire. To guard against burns from hot fuel contact, wear adequate protective clothing (face shield, heavy gloves, apron, and so on) when working on a hot engine.

STARTING THE VEHICLE

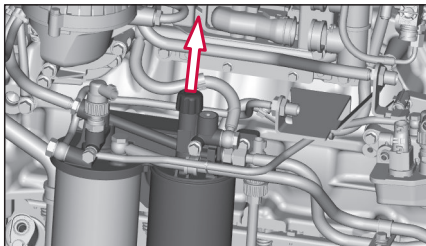
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WARNING

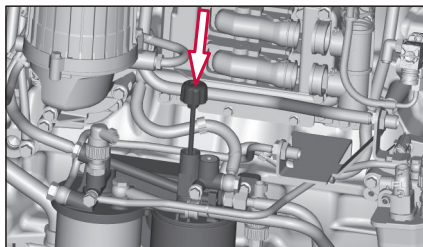
DO NOT work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.

Priming the MP Fuel System

Unlock the hand primer pump by pushing the pump handle in and turning it counterclockwise.



- 2 Pump the hand primer until the force of pumping increases.



NOTE

When the fuel system is empty, 200 or more pump strokes can be required to properly prime the system.

NOTE

There are NO bleed nipples to be opened in order to prime the fuel system.

- 3 Lock the hand primer pump by retracting it into the housing and turning it clockwise.
- 4 Start the engine and run it at an increased idle speed for approximately 5 minutes to remove any remaining air in the system.
- 5 Check the fuel system for leaks.

NOTE

If the engine does not start following this procedure, contact your local certified dealer.

Engine Warm-Up

CAUTION

Idling the engine unnecessarily for long periods of time wastes fuel and fouls injection nozzles. Unburned fuel causes carbon formation and oil dilution. To avoid engine damage, NEVER race an engine during warm-up.

Engine damage can occur if the engine is not warmed up to a minimum operating temperature of 77°C (170°F) before operating the vehicle.

Heavy-duty diesel engines are designed to operate at optimum efficiency when they are running loaded at normal operating temperature. This condition is where the most efficient combustion takes place. When the engine is operated unloaded, lightly loaded (such as stop-and-go operations, PTO operations, or periods of extended engine idling) optimal operating conditions are inhibited. Also, cold-weather conditions, prevents the achievement and maintaining of normal operating temperature. As a result,

carbon and/or varnish build-up occurs and lubricating oil becomes contaminated with combustion by-products.

Cold-weather operations place added demands on a diesel engine. When operating in cold climates (particularly in stop-and-go operations, PTO operations or periods of extended engine idling), maintain minimum operating temperature. Otherwise engine damage resulting from valve varnishing and carbon build-up can occur.

❗ NOTE

Many accessories are available for cold-weather operations. Refer to the Maintenance and Lubrication Manual for additional information concerning cold-weather accessories.

Engine Idling

Idling the engine unnecessarily for long periods of time wastes fuel, fouls injector nozzles and can lead to valve carbon and varnish deposits. Unburned fuel causes carbon formation and oil dilution. Shut down engine when prolonged loading or unloading of cargo is required.

To prevent wear and possible damage to the engine when it is cold, gradually bring it up to operating temperature

before operating at high engine speeds or full load. Ensure that the Park Brake is engaged, and allow 10 minutes of idle time before departing. Low Idle speed is sufficient for warming up the engine, and you may notice a change in engine note. Operate at partial load until the coolant temperature reaches 75°C (167°F).

Engine Shut Down

Standard Shutdown

After a hard run, allow the engine to idle three minutes before shutdown in order to stabilize the temperature of all engine parts. Quick shutdowns can cause engine damage and prevent the turbocharger from being properly lubricated.

Shutdown Option: Idle Cooldown

This feature provides a means of cooling down the engine and turbocharger. If the idle cooldown option is enabled and the system senses that the turbocharger can be hot, the engine will not shut down. Specifically this situation occurs when the vehicle stops, the parking brake is set, and the key switch is turned to the OFF position. This feature allows the driver to lock the truck and walk away while still providing adequate cooldown. All switched accessories then turn off once the engine has stopped. If this option is set, the engine can be shut

down immediately by cycling the key switch or by pressing the shutdown override switch.

The idle cooldown timer is set to 3.5 minutes when the engine load exceeds 25%. This state occurs if the engine has been running at least 60 seconds. After the load drops below 25%, the timer begins counting down. If the key switch is turned off before the timer expires, the engine continues to run until the timer reaches zero.

If a pyrometer is installed, the idle cooldown function uses the pyrometer reading to shut down the engine. This action occurs when the temperature drops below 232°C (450°F), or after 3.5 minutes, whichever comes first.

The default for this option is set at OFF from the factory.

❗ NOTE

The parking brake must be set for the idle cooldown function to work.

Engine Shutdown System (If Enabled)

The engine is protected by a system that prevents engine damage. The system shuts down the engine whenever a potentially damaging condition (such as loss of oil pressure, loss of coolant or engine overheating) is detected. If the

STARTING THE VEHICLE

system detects such a condition, a warning indicator light and an alarm alerts the driver before the engine actually shuts down. Selecting the Shutdown Override in the DID menu shortly after the vehicle sounds the engine shutdown alarm, allows 30 more seconds of operation. This process can be repeated several times to park the vehicle.

- There is not a time link between when the warning is activated and when the engine shuts down.
- For low oil pressure the engine is forced to idle immediately.
- For Coolant/Oil temperatures, the warning light can come on and the engine begins to de-rate, but nothing else occurs unless the temperature continues to rise past the shutdown threshold. Then the engine is forced to idle immediately.
- The engine is not shut down until the vehicle speed has dropped below 3 kph (2 mph).
- Moving a stationary vehicle to a safe area with an engine protection fault active. The engine runs for approximately 30 seconds before shutting down again.

CAUTION

Continuously overriding the shutdown system can result in severe engine damage.

Engine Shutdown Indicator

During normal operating conditions, this indicator illuminates when the key switch is turned on. After the engine is started, it will remain illuminated until engine oil pressure reaches normal idling range. During shutdown, if the system detects a condition that could lead to engine failure, the Engine Shutdown indicator illuminates before engine shutdown.

Starting

WARNING

When starting the engine, make sure the service brakes are applied. Failure to apply service brakes may result in unexpected vehicle movement.

No special procedure is required. The keypad and strip pushbutton selectors will automatically initialize in N (Neutral) when the ignition is turned on. For keypad pushbutton and bumpshift lever selectors, the Vacuum Fluorescent Display (VFD) will display "N" for Neutral between the SELECT and MONITOR labels. This indicates that Neutral has

been selected and attained, and the engine may now be started. Strip pushbutton selectors illuminate a lamp in the corner of the N button since they do not have a VFD.

Cold Weather Starts

If a vehicle is started in cold ambient conditions below -5° C (23° F), the transmission will be limited to 2nd, Neutral, and Reverse operation until the sump temperature exceeds -1° C (30° F). Once the sump temperature reaches this threshold, normal operation will resume for the transmission.

If the transmission fluid temperature is below 10° C (50° F) follow these procedures when making directional shift changes:

- To shift from forward to reverse, select N (Neutral) and then R (Reverse).
- To shift from reverse to forward, select N (Neutral) and then D (Drive) or another forward range.

NOTE

During cold fluid conditions, always place the transmission in N (Neutral) prior to any direction changes.

 NOTE

Failure to follow these procedures during cold fluid conditions, may cause the CHECK TRANS light to illuminate and the transmission to be restricted to N (Neutral).

Preheating
 CAUTION

Transmission malfunction or damage may occur if you operate the transmission with the fluid temperature below the minimum fluid temperature specification limit.

 CAUTION

The engine should never be operated for more than 10 seconds at full throttle with the transmission in range and the output stalled. Prolonged operation of this type will cause the transmission fluid temperature to become excessively high and will cause severe overheat damage to the transmission.

If ambient temperatures drop below the specified minimum levels for the fluid type, preheat the transmission fluid before beginning transmission operation.

Preheat the transmission fluid using one of the following methods:

- Use an auxiliary heat source such as a sump heater.
- Operate the transmission in N (Neutral) with the engine running at idle for a minimum of 20 minutes before attempting range operation.

Transmission Temperature

The Allison transmission fluid is minimum temperatures are:

- Fluid Type; TES 295, Minimum Temperature: -35° C (-31° F).
- Fluid Type; TES 389, Minimum Temperature: -25° C (-13° F).

The transmission is considered overheated if the temperatures are:

- Sump fluid; 121° C (250° F)
- Fluid to cooler; 149° C (300° F)
- Retarder out fluid; 165° C (330° F)

Typical continuous sump temperature is 93° C (200° F).

If the engine temperature gauge indicates a high temperature, the transmission is probably overheated. Stop the vehicle and check the cooling system. If it appears to be functioning properly, run the engine at 1200–1500 rpm with the transmission in N (Neutral). This should reduce the transmission and

engine temperatures to normal operating levels in 2 or 3 minutes.

If the transmission and engine temperatures do not decrease, reduce the engine rpm. If the engine temperature indicates a high temperature, an engine or radiator problem is indicated. If high temperature in either the engine or transmission persists, stop the engine and have the overheating condition investigated by maintenance personnel.

 NOTE

Some shift schedules may be inhibited as a result of operating conditions, such as engine or transmission fluid temperature.

COLD-WEATHER OPERATION

DANGER

Do NOT, under any circumstances, use starting fluid (ether) on an engine equipped with an inlet manifold air heater element. An explosion can occur.

Cold-Weather Starting Tips

- Save the batteries. Do not overtax the batteries by cranking the starter for more than 30 seconds without interruption. Allow about two minutes between attempts at starting the vehicle; this time allows the starter to cool and the batteries to re-energize.

NOTE

Always make sure that the battery is fully charged in cold weather.

- Use the correct grade of oil for the prevailing winter temperature.
- Drain the fuel tanks and filters regularly to prevent water accumulation in the fuel system. This accumulation can freeze in fuel tanks, fuel lines, and filters.

WARNING

Do NOT — under any circumstances — add gasoline, alcohol, used oil, or additives with metallic particles to the fuel.

- Fuel can gel and clog filters and small passages. If this issue occurs mix a small percentage of No. 1D fuel

(kerosene) with Ultra-Low Sulfur (15 ppm) No. 2D (diesel) fuel.

NOTE

Adding kerosene is NOT recommended for general use because both performance and fuel economy is reduced.

Winterfronts

Engine Block Heaters

An engine block heater works by heating the coolant surrounding the combustion chambers. Engine heaters are recommended to help combat the extreme demands of cold weather operating conditions. When the temperature drops, the engine heater can be plugged in overnight. The location of the engine heater power receptacle varies according to vehicle design.

COLD-WEATHER OPERATION

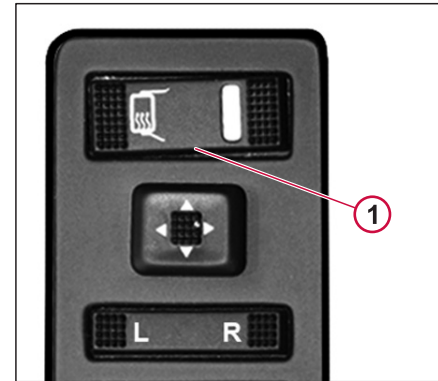
Engine Heater Benefits

- Eliminates cold weather starting problems.
- Increases engine life by keeping the engine warm and avoiding excessive idling.
- Prevents external water leaks caused by excessive cold.
- Allows the cab to heat more quickly.
- Reduces the temperature at which ether is required.

Outside Mirror Heater

Outside mirror heaters can be either cab mounted or fender mounted. The heaters have two modes. Operation is as follows:

- 1 Mode 1 turns on the mirror heaters for 30 minutes and is activated by pressing the left side of the Mirror Defrost button for less than one second (short push). The heaters will deactivate automatically after 30 minutes.
- 2 Mode 2 turns on the mirror heaters and keeps them on until turned off by the button, and is activated by pressing the left side of the Mirror Defrost button for more than one second (long push).
- 3 To turn off the heated mirrors at any time (from any mode), press the right side of the Mirror Defrost button.



1 Heated Mirror Switch

Fuel Tank Cap

Use Mack approved non-vented cap only or tank damage and/or poor engine performance may result. DO NOT fill to more than 95% of liquid capacity.



Diesel Exhaust Fluid (DEF)

For information on filling or using DEF Fluid, please refer to the DEF section of this manual.

 DANGER

DO NOT carry extra fuel containers in the cab. Fuel containers, full or empty, may leak, explode or give added fuel to a fire. Failure to follow this precaution may lead to serious personal injury or death.

 DANGER

DO NOT smoke while fueling the vehicle. The glow from the cigar/cigarette can ignite the diesel fuel, causing an explosion resulting in serious personal injury or death.

 DANGER

Do not remove the fuel tank cap near an open flame. Diesel fuel vapors are combustible and can cause an explosion or fire, resulting in severe personal injury or death.

 CAUTION

Diesel-powered engines for heavy-duty trucks built on or after January 1, 2010 are designed to operate only with Ultra Low Sulfur Diesel (ULSD) fuel. Improper fuel use will reduce the efficiency and durability of engines, permanently damage advanced emissions control systems, reduce fuel economy and possibly prevent the vehicles from running at all. Manufacturer warranties will be voided by improper fuel use. Additionally, burning Low Sulfur Diesel fuel (instead of ULSD fuel) in 2007 and later model year diesel-powered cars, trucks and buses is illegal and punishable with civil penalties.

Air is always present inside the fuel tanks, entering mainly through the tank ventilation. With the air being heated and cooled, condensation is formed and water is mixed in the fuel. To avoid condensation when the vehicle is parked for longer periods, fill the tanks up to 95% of capacity. Do not fill more than that, as the fuel needs to have room for expansion during the heat of the day.

Mack engines are certified to comply with U.S. EPA and California emissions standards based upon the use of test fuels with specifications established by these regulatory agencies. Alternative fuels, including biodiesel, that are not substantially similar to the required test fuels may adversely affect engine emissions compliance and may impact the performance of certain emissions aftertreatment components. As a result, Mack does not warrant the engine will conform to applicable Federal or California emissions limits when operated on, or having been operated on, biodiesel or other alternative fuels that are not substantially similar to specified test fuels used for certification.

The use of biodiesel up to a maximum of 10% (B10) in and of itself, will not affect the manufacturer's mechanical warranty as to engine or emissions system, provided the bio fuel used in the blend conforms to ASTM D6751, and B1 to B5 blends conform to ASTM D975, and B6 to B10 blends conform to ASTM D7467.

FIFTH WHEEL INSTRUCTIONS

DANGER

Always have all fifth wheel maintenance and repairs done by a qualified technician. An incorrect repair can cause the trailer to separate from the tractor causing an accident with serious personal injury or death.

Fifth Wheel General Information

Things to think about with trailer hook-up:

- Always chock the trailer wheels.
- Grease the plate unless it is a low lube or no lube top plate.
- Verify visually that plungers are locked on slider.
- Verify 5th wheel is in unlatched position before coupling to trailer.
- Verify visually that coupling has occurred.
- Check for slack between the fifth wheel and the trailer kingpin.
- Check the load distribution between axles.

Follow the instructions on the advisory labels attached to the various manufacturers' fifth wheels.

Please refer to manufacture's website for additional information.

DANGER

Always keep the fifth wheel plate well lubricated to prevent binding between the tractor and trailer. A binding fifth wheel could cause erratic steering and loss of vehicle control that may result in serious personal injury or death.

DANGER

To ensure a positive hook-up or coupling, these procedures should be followed in every case. A trailer that is not connected correctly may disconnect from the tractor while in motion, resulting in an accident, personal injury or death.

CAUTION

Attempting to couple with the trailer at an improper height could result in a false or improper couple and cause damage to the tractor, fifth wheel and trailer.

DANGER

It is important that the operating procedures contained in this manual are fully understood and closely followed. Failure to properly couple the tractor and trailer can result in their separation, causing death and property damage. Proper pick-up and coupling to a trailer is a serious matter. A trailer that becomes disconnected while in motion is extremely dangerous to other traffic and may result in death or severe personal injury. To ensure a positive hook-up or coupling, the procedures should be followed in every case.

Chock the trailer wheels. Use two chocks (both on the front and rear of the wheel) on both sides of the trailer.

Back up close to the trailer, centering the kingpin on the throat of the fifth wheel, and STOP.

Fifth Wheel Trailer Height

Check to see that the trailer is at the proper height for coupling. The leading edge of the trailer plate should initially contact the fifth wheel top plate surface about 200 mm (8 in.) behind the pivot point as the tractor backs under the trailer. Raise or lower the trailer landing gear as required to obtain this position.

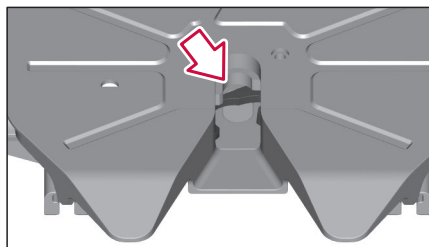
Back under the trailer, keep the trailer kingpin centered in the throat of the fifth wheel.

FIFTH WHEEL INSTRUCTIONS

Fifth Wheel Visual Check

As an initial check, pull forward slightly to test the completeness of the coupling with trailer brakes applied.

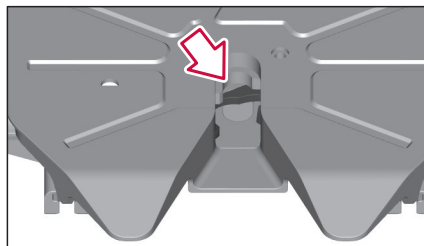
A direct visual check is required to ensure proper coupling. Several types of improper couplings will pass the initial pull test. Sound is not reliable. Do not take for granted that you are properly coupled. Get out of the cab and look.



Visual Check

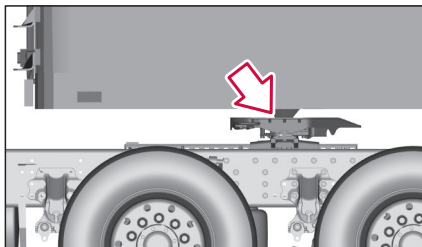
Trailer Kingpin

Make sure the trailer kingpin is in the jaw slot and that the jaw is closed behind the pin. The kingpin should not overhang the fifth wheel or be caught in the grease groove. To verify that the kingpin is actually in the fifth wheel slot and the jaw is closed, the pin must be visually inspected from the rear. Use a flashlight, if necessary.



Visual Check

Make sure the trailer bed is resting on the top surface of the fifth wheel plate and that there is no visible gap between the fifth wheel and the trailer bed plate.



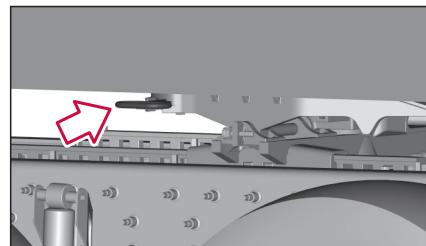
Rest on Trailer Plate

Make sure the operating rod is fully engaged, and is equipped with a safety latch. Be sure the latch is in the locked position.

If the fifth wheel is equipped with a manual secondary lock, check to see that it is properly engaged.

NOTE

If you cannot get a proper coupling, repeat this procedure. **DO NOT** use any fifth wheel which fails to operate properly.



Fifth Wheel Handle

Fifth Wheel Kingpin

Check the kingpin to fifth wheel clearance by moving the tractor backward and forward with the trailer brakes applied. If the clearance appears excessive (more than 3 mm [1/8 in.]), or if the jaw does not lock, the fifth wheel should be inspected by a qualified technician before proceeding.

Wind up the trailer landing gear (trailer support) to its fully retracted position. Fold down or remove the crank handle and place it in the crank handle holder.

Check the air brake lines, glad hand seals and the trailer light cord connections.

FIFTH WHEEL INSTRUCTIONS

Connect the air brake lines and the electrical power cord. Make sure that any slack in the lines is supported so that the brake lines do not become entangled. Set the trailer brakes by pulling out the Trailer Supply control on the dashboard.

Remove the wheel chocks from the trailer wheels.

Trailer Uncoupling

Apply the park brake on the tractor.

Apply the trailer brakes by pulling out the trailer air supply knob.



1 Trailer Air Supply

Chock the trailer wheels. Use two chocks (one on the front and one on the

rear of the wheel) on both sides of the trailer.

Wind down the landing gear until it touches the ground and then give it a few extra turns in low gear. Do not raise the trailer off of the fifth wheel. Fold down or remove the crank handle and place it in the crank handle holder.

⚠ NOTE

In poor ground conditions, it may be necessary to provide a stable base for the landing gear.

⚠ NOTE

If the operating rod is too difficult to pull, back the tractor up slightly to relieve any kingpin load against the fifth wheel jaw.

Release Tractor Park Brakes

- Apply the TRAILER brakes
- Release the Tractor Park brakes
- Back the TRACTOR only, to release pressure on the kingpin
- Apply the Tractor Park brake
- Lower the landing gear to support the weight of the trailer
- Pull the lever to release the king pin lock
- Release the Tractor Park brake

- Pull the Tractor away from the kingpin about 300 mm (12 inches) and STOP
- Apply the Tractor Park brakes
- Disconnect the Air lines and electrical connection to the trailer, store them properly
- Release the Park brakes
- Slowly Pull Away

Disconnect Air Brake Lines

Disconnect the light cord and air brake lines. Use the dummy air couplings to keep foreign material from entering the brake lines.

FUEL ECONOMY DRIVING

General

The absolute fuel consumption (counted in liters per 100 kilometers or miles per US gallon) is determined by a large number of circumstances which can be related to one of the following main areas:

- Build specification and equipment
- Service and maintenance
- External environment
- Driving habits

Due to these factors, fuel consumption can vary considerably within what is called "normal fuel consumption." Fuel consumption can vary from over 24 L/100 Km (10 mpg) when driving empty on a nice and dry summer road to 67 L/100 Km (3.5 mpg) while driving with maximum permitted GVW, with vehicle and trailer, on a hilly and slushy winter road.

Build Specification and Equipment

Whenever a vehicle is used for transportation, its build specification, equipment and gross vehicle weight have a decisive effect on both fuel consumption and performance. The factors which have the greatest influence on fuel consumption are primarily: driveline combination, height of trailer or superstructure, use of air

fairings, tire type, number of wheels, gross vehicle weight, and accessories.

Driveline Combination

Engine, transmission and final drive must be selected in such a way that the engine can operate within the economic speed range at normal driving speed. This range is defined as where the engine makes the best use of the energy content of the diesel fuel. A poorly selected rear axle ratio, which results in the engine speed being constantly above the optimum speed, will increase fuel consumption.

Tires

Heavy duty tires increase rolling resistance considerably. For long haul, choose a smoother, ribbed type tire. Choose a lugged type tire only when the added traction in mud and snow is needed.

The number of wheels (axles) has a direct effect on the rolling resistance and, thereby, the fuel consumption. For low volume and/or low weight transports, use of a 4 x 2 instead of a 6 x 4 should be considered.

If the tire pressure is too low, the rolling resistance increases and, thereby, increases the fuel consumption. The overall economy is also affected as tire wear increases considerably.

Gross Vehicle Weight

The gross vehicle weight of a vehicle combination has a large impact on the rolling resistance.

Accessories

As a rule, accessories such as roof rack, advertising signs, bug screens, exposed air horns, etc., have a negative effect on fuel consumption.

Service and Maintenance

A modern heavy-duty vehicle requires regular and preventive maintenance to ensure that all its components function as they should. Use the recommended preventive maintenance (PM) program that has been developed for the vehicles. This ensures optimal energy efficiency from all components that are important to fuel consumption.

Brakes

Dragging brakes increase fuel consumption. They should be checked regularly. It is important that the release action of the air valves is fast and that the moving parts of the wheel brakes are checked for good adjustment and operation.

Axles

An axle out of alignment increases rolling resistance. Regularly check the front wheel alignment and axles on both the tractor and trailer/semi-trailer. If they are correct, there will be less rolling resistance and, therefore, lower fuel consumption. A good sign of an axle or wheel out of alignment is uneven tire wear.

Tires must be checked every time the vehicle is operated as part of the pre-trip inspection.

Engine

Faulty or incorrectly adjusted engine components increase fuel consumption. The list below gives some typical components that can influence fuel consumption:

- Blocked (on the outside) charge air cooler/radiator package
- Faulty thermostat
- Blocked fuel filters

- Blocked air intake filter
- Faulty injectors
- Blocked or malfunctioning turbocharger
- Air in fuel system
- Faulty fuel supply pump
- Faulty fan thermostat/clutch

External Environment

Under unfavorable conditions, the external environment can have a negative effect on fuel consumption. This can be broken down into two main groups: weather and wind, and the nature of the roads. Rain, snow, icy conditions and headwinds have a large negative impact on fuel economy, as do hilly roads and uneven road surfaces.

Headwinds

Headwinds have a large negative impact on fuel consumption. With tailwinds, fuel saving is only marginal.

Air Temperature

Low ambient temperature contributes to increased fuel consumption.

Rain, Snow and Road Surface

A wet road surface increases rolling resistance and, thereby, fuel consumption. Slush will increase consumption even more. In certain cases, the surface structure of the road

can also have a negative effect on fuel consumption.

Gradients

A hilly road with many bends demands a higher output from the engine. The difference between flat, straight roads and hilly, winding roads can amount to as much as a 50 percent increase in fuel consumption. When choosing your route, avoid hills, rough roads and frequent stops.

FUEL ECONOMY DRIVING

Driving Habits

The way in which a vehicle is being driven is the one factor which has the greatest influence on fuel consumption. Correct driving saves fuel and reduces vehicle wear. To achieve optimal running economy, the driver should always remember to:

- Start the engine correctly (especially important in winter season).
- Maintain an even and correct speed.
- Keep the engine at its optimum speed range.
- Use the correct uphill and downhill driving technique.

Starting the Engine

Start the engine according to the instructions in the operator's manual of the engine manufacturer. A proper start, especially during the cold season, saves fuel and reduces engine wear. Sluggish lube oil in the engine makes cold starting more difficult. Therefore, it is important to always use engine oil with the correct viscosity. (For the sake of the overall fuel economy, it is also important to have the right viscosity of transmission and rear axle oils.)

Avoid High Engine Speeds

High engine speeds mean high fuel consumption. Erratic driving also

increases fuel consumption when the vehicle is constantly accelerated and slowed down. Avoid a higher consumption by steady, even driving. Refer to each engine manufacturer's operator's manual for information on the engine's optimum operating range.

Hill Driving Technique

Use the inertia of the vehicle to go over the crest of a hill under reduced power. Use gravity to help with acceleration when going down the hill. Build up speed before reaching the next uphill.

List of Warnings

WARNING

Using the retarder on wet or slippery roads may cause loss of traction on the drive wheels—your vehicle may slide out of control. To help avoid injury or property damage, turn the retarder enable to OFF when driving on wet or slippery roads.

WARNING

To help avoid injury or property damage caused by sudden movement of the vehicle, do not make shifts from N (Neutral) to D (Drive) or R (Reverse) when the throttle is open. The vehicle may lurch forward or rearward and the transmission can be damaged. Avoid this condition by making shifts from N (Neutral) to a forward range or R (Reverse) only when the throttle is closed and the service brakes are applied.

DANGER

To help avoid unexpected vehicle movement that might cause death, serious injury, or property damage, always have your foot on the brake, the throttle released, and the engine at idle before making a N (Neutral) to D (Drive); N (Neutral) to R (Reverse); D (Drive) to R (Reverse); or R (Reverse) to D (Drive) selection.

WARNING

If you let the vehicle coast in N (Neutral), there is no engine braking and you could lose control. Coasting can also cause severe transmission damage. To help avoid injury and property damage, do not allow the vehicle to coast in N (Neutral).

CAUTION

When starting the engine, make sure the service brakes are applied. Failure to apply the service brakes can result in unexpected vehicle movement.

NOTE

D (Drive) may not be attained due to an active inhibitor. Always apply the service brakes when selecting D (Drive) to prevent unexpected vehicle movement and because a service inhibit may be present. When the selected range is flashing, it indicates the shift to D (Drive) is inhibited. Determine if diagnostic codes are active if D (Drive) is not attained.

NOTE

R (Reverse) may not be attained due to an active inhibitor. Always apply the service brakes when selecting R (Reverse) to prevent unexpected vehicle movement and because a service brake inhibit may be present. When R is flashing, it indicates the shift to R (Reverse) is inhibited. Determine if diagnostic codes are active if R (Reverse) is not attained.

DANGER

To avoid loss of control, use a combination of downshifting, braking, and other retarding devices. Downshifting to a lower transmission range increases engine braking and can help you maintain control. The transmission has a feature to prevent automatic upshifting above the lower range selected. However, during downhill operation, if engine governed speed is exceeded in the lower range, the transmission will upshift to the next higher range to prevent engine damage. This will reduce engine braking and could cause a loss of control. Apply the vehicle brakes or other retarding device to prevent exceeding engine governed speed in the lower range selected.

ALLISON TRANSMISSION **DANGER**

Use of the hydraulic retarder during inclement weather or when road surfaces are slippery could result in death, serious injury, or property damage. On vehicles which have a primary retarder control based upon closed throttle position, brake pedal position, or brake apply pressure, always manually disable the retarder controls during inclement weather or slippery road conditions, using the OEM provided retarder enable switch if present.

 DANGER

If the transmission retarder does not apply, death, serious injury, or property damage may occur. Operator should be prepared to apply vehicle brakes or other retarder device if the transmission retarder does not apply.

 DANGER

If the transmission retarder does not function, death, serious injury, or property damage may occur. Be sure to test for proper retarder function periodically. If a retarder is present but is not detected by “autodetect,” the retarder will not function. Whenever the retarder does not apply, seek service help immediately.

 WARNING

To avoid personal injury or vehicle damage, do not use the retarder during inclement weather or when road surfaces are slippery.

 DANGER

To avoid personal injury and component damage, do not leave the vehicle with the engine is running. The vehicle can move unexpectedly and you or others could be injured. To leave the engine running, do not leave the vehicle until you have completed all of the following procedures:

- 1 Put the transmission in N (Neutral).
- 2 Be sure the engine is at low idle (500–800 rpm).
- 3 Apply the parking brakes and emergency brake and make sure they are properly engaged.
- 4 Chock the wheels and take any other steps necessary to keep the vehicle from moving.

 WARNING

Avoid contact with the hot fluid or the sump when draining transmission fluid. Direct contact with the hot fluid or the hot sump may result in bodily injury.

 NOTE

Without the SAE J1939 communication datalink, the shift selector cannot display the selected transmission range. Vehicle operation will be affected.

 NOTE

Assuming proper installation of direction signal wire 134, most Allison shift selectors may still be used to command transmission direction changes in these circumstances. Due to the failure of the SAE J1939 datalink communication, however, the shift selector cannot display the selected range. When this condition exists, it is advisable to slowly and carefully apply the throttle each time a change of direction has been selected in order to verify the direction of operation before accelerating the vehicle.

Scope of Manual

This Operator's Manual contains a variety of information about the Allison 3000 and 4000 Product Families Transmission, and its Allison 5th Generation Controls features.

Additional information about your transmission is available at www.allisontransmission.com using the publications links shown on the home page. Refer to the Sales and Service Locator at www.allisontransmission.com

to find contact and location information for Allison Transmission distributors and dealers.

Overview

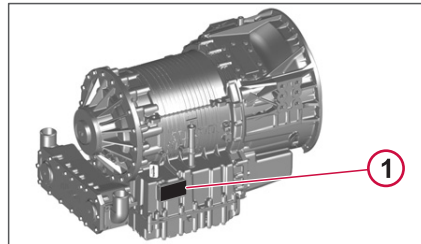
Smooth automatic upshifts and downshifts, without interruption of power to the wheels, occur in your Allison automatic transmission based on engine rpm, throttle position, vehicle load, road speed, and driver or feature request, such as manually preselecting ranges.

Allison automatic transmissions, along with a vehicle specification appropriate for the particular duty cycle, can provide superior fuel efficiency and optimum fuel economy. On trucks with a manual or automated manual transmission, the power interrupts that occur during shifts reduce the engine's inertia energy, resulting in lower average wheel horsepower. Because the engine is not working efficiently, it cannot run at full load. With an Allison automatic transmission, there is no power interrupt during shift changes. The inertia energy built up by the engine is maintained, equating to higher wheel horsepower. As a result, not as much engine horsepower is needed to get the job done. Allison automatic transmissions provide smooth, seamless shifts at all points of the power curve; there is no jarring

power interrupts to jostle the truck, driver or damage valuable cargo. Allison automatic transmission equipped trucks are more nimble in traffic and easier to maneuver in congested loading zones, narrow alleys and around tight corners. You will have fewer freight claims and reduced cycle times, no matter how difficult the route.

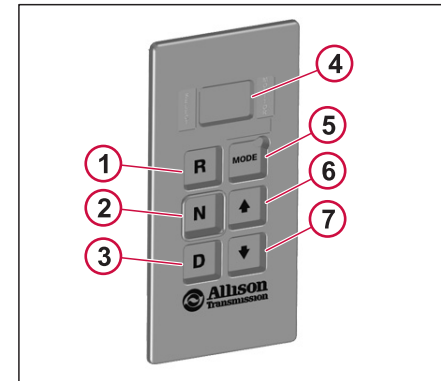
Transmission Nameplate

The model number, part number (assembly number), and serial number are stamped into the transmission nameplate. These numbers describe the transmission and all of its components. Use these numbers when ordering replacement parts or requesting service information.



1 Allison Nameplate Location

Shifting



- 1 Reverse Button
- 2 Neutral Button
- 3 Drive Button
- 4 Digital Screen
- 5 Mode Button
- 6 Upshift Button
- 7 Downshift Button

⚠ WARNING

To help avoid unexpected vehicle movement that might cause death, serious injury, or property damage, always have your foot on the brake, the throttle released, and the engine at idle before making a **N** (Neutral) to **D** (Drive); **N** (Neutral) to **R** (Reverse); **D** (Drive) to **R** (Reverse); or **R** (Reverse) to **D** (Drive) selection.

❗ NOTE

Conditions responsible for illuminating the CHECK TRANS indicator will not allow any shift selector changes until the DTC related to the condition goes inactive. The MONITOR display shows the range the transmission has locked in because of an active DTC. The SELECT display goes blank when the CHECK TRANS indicator is on. Move the vehicle to a safe location before turning off the vehicle and seek qualified assistance if needed. Even if the transmission is not in **N** (Neutral), the operator will be able to view DTCs by simultaneously pressing the **↑** (Upshift) and **↓** (Downshift) arrows, if equipped with the keypad pushbutton shift selector, or by pressing the DISPLAY MODE/ DIAGNOSTIC (DMD) button, if equipped with the bumpshift lever selector.

With an Allison Transmission, the shift selector is used by the operator to select **N** (Neutral), **R** (Reverse), or a range of forward gears. When a forward range

has been selected, the transmission starts in the lowest gear of the range and, as conditions permit, automatically upshifts to the highest gear in the selected range.

Shifter Gears

- **R – REVERSE:** selects Reverse gear.
- **N – NEUTRAL:** selects Neutral. The area around the **N** button is a raised ridge so the driver can identify the pushbuttons by touch, without looking at the display. It is not necessary to press this button prior to starting the vehicle.
- **D – DRIVE:** selects the highest available forward range. The transmission shifts to the starting gear and will automatically upshift through the gears, as operating conditions permit, until the highest available gear is attained.

Upshifting and Downshifting

The (Upshift) and (Downshift) arrows are used to change the range selected to a higher or lower forward range:

- One press of the (Downshift) arrow sets range SELECT to the same forward range as the current forward range attained shown in the MONITOR position on the display.

This type of preselect is called an Express Preselect.

- Each subsequent press of the **↓** (Downshift) arrow decreases the range selected by one range.
- One press of the (Upshift) arrow increases the range selected by one range.
- If the (Upshift) or (Downshift) arrow is held continuously, the selected range will continue to change up or down until the button is released or until the highest or lowest possible range of gears is selected.

Shift Schedules

Each transmission shift calibration includes multiple shift schedules which are used to control transmission shifts in various operating conditions. The shift schedules affect the timing of shifts between gears. The actual number of forward gears is determined based on the transmission model and the selected range position of the shift selector.

Vehicle performance may be affected when shift schedules change. The transition between shift schedules can be initiated by several different actions.

The transmission initially attains first range when **D** (Drive) is selected (except for those units programmed to start in 2nd range). As vehicle speed increases,

the transmission automatically upshifts through each range. As the vehicle or equipment slows down, the transmission automatically downshifts to the correct range. The **SELECT** display shows the highest range available in D (Drive).

ⓘ NOTE

The vehicle OEM or bodybuilder is responsible for evaluating the driveability of shift schedules in the intended vehicle and duty cycle. For additional details regarding these shift schedules and/or other options for primary and secondary shift schedules, contact a qualified Allison Transmission service outlet for further information.

Upshifting

As long as the Transmission Control Module (TCM) calculates that there is enough vehicle power and vehicle acceleration available to grant and keep the next upshift, then there are no other limitations imposed on upshifting until the vehicle attains its top range displayed in the **SELECT** display on the selector. Vehicle power and acceleration characteristics are monitored by the transmission controls to attempt to eliminate shift cycling. Shift cycling is an upshift followed closely by a downshift, which is then followed by another upshift, and so on.

ⓘ NOTE

If shift cycling is noted, use the alternate shift schedule by pressing the **MODE** button. The operator can also manually select the next lower range (using the shift selector) to hold that lower range until conditions are met to grant the upshift point again without shift cycling.

Hold Schedule for Upshifts

As a standard feature of each shift calibration, the transmission controls incorporate a "hold upshift" shift schedule, which the operator may select if the transmission is not operating in its highest range. When this schedule is active, the shift points for upshifts are raised in order to hold the transmission in its current gear and inhibit upshifting beyond the current range. Holds are activated by selecting the current range or a lower range on the shift selector.

⚠ CAUTION

A typical use of the "hold" feature is to maximize engine braking when operating downhill. However, in order to prevent overspeeding the engine, the hold function is not infinite. It will permit shifts from the hold range to the next higher range at some speed above the shift calibration speed.

Downshifting

Downshifts are allowed to occur as long as transmission output speed is low enough to keep from overspeeding the engine after completing the downshift. When a range downshift is manually selected by the operator, but the transmission output speed is determined to be above the limits, the transmission remains in the range even though a lower range was requested by the operator. A shift to a lower range can occur when the operator applies the vehicle service brakes or a retarding device, such as an exhaust brake, engine brake, or retarder. This action reduces the transmission output speed which in turn lowers the vehicle speed, allowing the transmission to shift to the lower range.

Preselect Schedule for Downshifts

The preselect downshift schedule is similar to the hold feature. The operator may initiate the preselect downshift shift schedule by selecting any forward gear on the shift selector that is lower than the gear currently in use. When a range has been "preselected" in this manner, shifts to and from gears above the preselected gear range occur at higher than normal engine speeds. Shifts below the preselected range are not affected. Preselect downshifting is beneficial in

maintaining higher engine speed, resulting in increased engine braking or engine brake performance during downhill operation or vehicle deceleration cycles. However, preselect shifts are permitted only if an engine overspeed condition will not occur after completion of the downshift.

! NOTE

Preselecting during normal operation may result in reduced fuel economy.

Performance/Economy Shift Schedules

Currently, Allison Transmission offers the following commonly available shift schedules:

- **S1 & S5 Performance:** WOT upshifts near Full Load Governed Speed (FLGS).
- **S2 & S6 Performance:** WOT upshifts at a fixed (less than 100) percent of FLGS.
- **S3 & S7 Economy:** Upshifts at speeds which pull engine down to a fixed rpm after the shift.
- **S4 & S8 Economy:** Upshifts at speeds which pull engine down to a fixed rpm (and less than S3) after the shift.

- **S9 Economy:** Upshifts and downshifts occur at speeds that are even lower than the S4 shift strategy.
- **SA Economy:** WOT upshifts are similar to S1 & S5. The SA part-throttle upshifts and downshifts occur at significantly lower speeds than the S5 part-throttle shifts.
- **SB Economy:** WOT upshifts and downshifts similar to SA. The SB part-throttle upshifts occur at slightly higher speeds than the SA part-throttle upshifts.
- **SC Economy:** WOT upshifts are similar to S3 & S7. The SC part-throttle and closed-throttle upshifts and downshifts are similar to the SA part-throttle and closed-throttle shifts.
- **SD Economy:** WOT upshifts and downshifts similar to S3 & S7. The SD part-throttle and closed-throttle upshifts and downshifts are similar to the SB part-throttle and closed-throttle shifts.

Schedules S1 through S4 are typically used with engines using variable speed or all-speed governors. The differences between the schedules is typically close to full throttle. Schedules S5 through S8 are designed to provide the same WOT upshifts as the corresponding S1 through S4 schedules. However, the S5

through S8 part throttle shift schedules have been modified.

Non-Engine Brake Operation

Two choices of preselect shift schedules are available for governing preselected downshifts during normal transmission operation. One of the following choices is selected when the Transmission Control Module (TCM) is programmed by the dealer or truck manufacturer:

- **Standard Preselects** – downshifts occur so the engine speed after the shift is approximately 300 rpm above the engine governed speed
- **Low Preselects** – downshifts occur so the engine speed after the shift is approximately 150 rpm above the engine governed speed

Engine Brake Operation

When the Transmission Control Module (TCM) detects the engine brake is enabled, it commands use of a preselect shift schedule in order to enhance engine brake performance. The default speeds for these shifts are known as the Alternate Engine Brake Preselects.

- **Alternate Engine Brake Preselects** – downshifts occur at engine speeds approximately midway between 1000 rpm and the Standard

Preselects for your transmission model

As an option, the preselect shift points during engine brake operation can be specified to be the same schedule selected when the TCM is programmed by the vehicle OEM for non-engine brake operation:

- **Standard Preselects** – downshifts occur so the engine speed after the shift is approximately 300 rpm above the engine governed speed
- **Low Preselects** – downshifts occur so the engine speed after the shift is approximately 150 rpm above the engine governed speed

❗ NOTE

Specify Standard or Low Preselects when the TCM is programmed.

The preselect schedule chosen above will be activated for downshifts that occur while the engine brake is active and until operation in a specified gear is reached. This specified gear is the Engine Brake Preselect Range Customer Modifiable Constant (CMC) that is programmable using Universal Allison DOC®. If this CMC is set to a value higher than 2nd gear, then downshifts from the Engine Brake Preselect Range to 2nd gear will be made as standard

(nonengine brake) closed throttle downshifts. Additionally, if the TCM is programmed to make engine brake preselect downshifts at Standard Preselects or Low Preselects speeds, downshifts between the Engine Brake Preselected Range to an even lower gear can be specified to use the Alternate Engine Brake Preselect downshift speeds. The lowest gear to use this downshift schedule is also a CMC (Alternate Engine Brake Preselect Range). If this option is specified and the Alternate Engine Brake Preselect Range CMC is higher than 2nd gear, downshifts from the Alternate Engine Brake Preselect Range to 2nd gear uses normal (nonpreselect) closed throttle shift speeds.

❗ NOTE

If an exhaust brake or engine compression brake is installed on the engine, then they must be integrated to the transmission controls. Shift quality issues will arise if not properly integrated to the transmission controls.

Retarder Mode

The retarder mode shift schedule is automatically activated when the retarder is switched on in order to raise closed throttle downshifts for additional cooling during retarder operation.

Retarder closed throttle downshifts occur at speeds approximately halfway between the normal closed throttle downshift and the preselect downshift for each range.

Accelerator Control

The position of the accelerator pedal influences when automatic shifting occurs. An electronic throttle position signal tells the Transmission Control Module (TCM) how much the operator has pressed the pedal. When the pedal is fully pressed, upshifts occur automatically at higher engine speeds. A partially pressed position of the pedal causes upshifts to occur at lower engine speeds.

Kickdown

Kickdown is an optional shift schedule which is activated when the kickdown input function is enabled. If shift schedule S2, S3, or S4 is in use and kickdown is active, all shifts revert to schedule S1, Wide Open Throttle (WOT) shift points. Similarly, if shift schedule S6, S7, or S8 is in use and kickdown is active, all shifts revert to schedule S5, WOT shift points.

Avoid transmission performance issues by contacting an Allison Transmission distributor or dealer when one of these conditions occur:

ALLISON TRANSMISSION

- A shift quality issue
- A drivability issue such as a vibration
- Transmission, hydraulic line or fitting is leaking fluid
- One of the transmission warning telltales displays

Transmission Warning Telltales

	Transmission Oil Temperature
	High Transmission Oil Temperature
	Transmission Malfunction

Transmission Oil

	CAUTION
Transmission damage can result from extended operation at low fluid level conditions.	

NOTE

Do not overfill the transmission. Overheating, oil foaming out of the breather, and power loss may occur if driven while transmission is overfilled.

Only use fluids meeting Allison Transmission specification TES 295 or TES 389 in the transmission. For a list of currently approved transmission fluids, go to the Allison Transmission web site at: www.allisontransmission.com, select SERVICE, Fluids.

Allison Transmission recommends the following into consideration when selecting the appropriate fluid type for your transmission:

- Fluids meeting specification TES 295 are preferred over TES 389 fluids for use in all 3000 and 4000 Product Families transmission applications.
- TES 295 fluids are fully qualified for Severe Duty and Extended Drain intervals.
- A TES 295 fluid allows you to operate at a lower ambient temperature than a TES 389 type fluid. For transmission oil temperatures refer to Transmission Temperature section.
- A TES 389 fluid is the minimum fluid requirement approved for use in 3000 and 4000 Product Families transmissions.

- To extend the TES 389 fluid drain intervals beyond the recommended mileage or hours change interval, use a fluid analysis program.

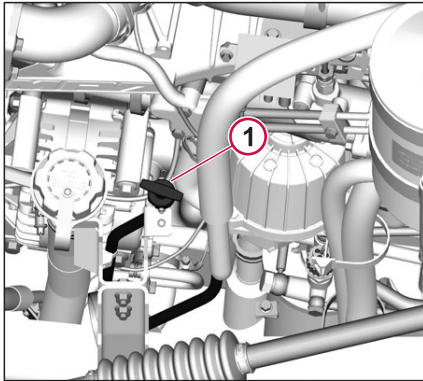
- When choosing a fluid type to use, consider what the minimum fluid operating temperature of the fluid will be based on the ambient temperatures reached in the geographical location for the vehicle.

Even though transmission fluid is not consumed during transmission operations engine oil might be, periodic fluid level checks should be made prior to placing the vehicle in service or just after returning from service. Periodic fluid level checks help prevent mechanical failure of a vehicle or transmission component. Periodic checks also help to detect fluid leaks, cooler failure (contaminating the transmission fluid), fluid overfill, fluid underfill or the wrong kind of fluid used the last time the transmission was serviced.

Check the transmission fluid level using the dipstick. The dipstick is marked with temperature bands for a COLD and HOT fluid level check. The fluid check marked COLD is designed to allow the fluid level to be checked from 16° C (61° F) to 60° C (140° F).

There are two temperature bands marked on the dipstick to allow for

transmission fluid expansion when the temperature increases. The lower band, referred to as **COLD CHECK**, is used when the transmission fluid is below operating temperature. The upper band, referred to as **HOT CHECK**, is used when the transmission fluid is at normal operating temperature. The OEM may refer to these as **COLD FULL/COLD ADD (COLD CHECK)** and **HOT FULL/HOT ADD (HOT CHECK)**.



1 Allison Dipstick, 11 Liter Engine

Cold Check

WARNING

If you leave the vehicle and the engine is running, the vehicle can move unexpectedly and you or others could be injured. If you must leave the engine running, do not leave the vehicle until you have completed all of the following procedures:

- 1 Put the transmission in **N (Neutral)**.
- 2 Be sure the engine is at low idle (500–800 rpm).
- 3 Apply the parking brakes and emergency brake and make sure they are properly engaged.
- 4 Chock the wheels and take any other steps necessary to keep the vehicle from moving.

CAUTION

DO NOT start the engine until the presence of sufficient transmission fluid has been confirmed. Remove the transmission fluid dipstick and be sure the static fluid level is near the **HOT FULL** mark.

CAUTION

The fluid level rises as fluid temperature rises. DO NOT fill the transmission above the **COLD CHECK** band if the transmission fluid is below normal operating temperatures. During operation, an overfull transmission can become overheated, leading to transmission damage.

NOTE

With engine off, the fluid level should reach the hot run band or higher on the dipstick even at cold ambient temperatures. The cold check band is calibrated on the stick for the fluid level attained while the transmission is running and in **N (Neutral)**. Do not move the vehicle until the fluid level reaches the cold full mark with engine running and transmission in **N (Neutral)**.

NOTE

The correct fluid level cannot be determined unless the transmission is in a level position.

The **COLD CHECK** band verifies the transmission has adequate fluid for startup and operation until it can be checked at the operating (hot) temperature. Only use this check to confirm adequate fluid level for a cold startup and not to set fluid levels for

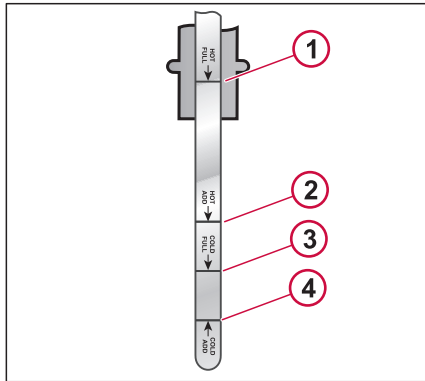
ALLISON TRANSMISSION

continued operation. Typically, the check is most accurate with fluid temperatures of 16° C (61° F) to 60° C (140° F).

Complete a COLD CHECK procedure using the dipstick as follows:

- 1 Move the vehicle to a level surface, put the transmission in N (Neutral) and set the parking brake.
- 2 With the engine idling (500–800 rpm), shift to D (Drive) and then to R (Reverse) to clear air from the hydraulic circuits.
- 3 Run the engine at idle (500–800 rpm) in N (Neutral) for about one minute.
- 4 Clean debris from around the end of the fill tube before removing the dipstick.
- 5 Remove the dipstick and wipe it clean.
- 6 Insert the dipstick into the fill tube, pushing down until it stops, but still in its loose or unscrewed position.
- 7 Remove the dipstick and observe the fluid level. If the fluid on the dipstick is within the COLD CHECK band, the level is satisfactory. If the fluid level is not within this band, add or drain as necessary to bring the level within the COLD CHECK band.
- 8 Perform a HOT CHECK at the first opportunity after normal operating

temperature (71–93° C (160–199° F)) is reached.



Transmission Description:

4000 Product Family;

- Dimension 1: 106.7 mm (4.2 in)
- Dimension 2: 76.2 mm (3 in)
- Dimension 3: 66 mm (2.6 in)
- Dimension 4: *

3000 Product Family;

- Dimension 1: 101.6 mm (4 in)
- Dimension 2: 73.7 mm (2.9 in)
- Dimension 3: 50.8 mm (2 in)
- Dimension 4: *

3000 Product Family;

- Dimension 1: 101.6 mm (4 in)
- Dimension 2: 63.5 mm (2.5 in)

- Dimension 3: 45.7 mm (1.8 in)
- Dimension 4: *
-

NOTE

* Dimension determined by installation.

Hot Check

CAUTION

Perform a HOT CHECK at the first opportunity after normal operating temperature

NOTE

Always check fluid level with the dipstick in the unscrewed or loose position.

Hot Check

To complete a HOT CHECK procedure using the dipstick, do the following:

1. Be sure fluid has reached normal operating temperature of 71-93° C (160-200° F). If a transmission temperature gauge is not present, measure fluid level when the engine water temperature gauge has stabilized.
2. Park the vehicle on a level surface and shift to N (Neutral).
3. Apply the parking brake and allow the engine to idle (500-800 rpm).

4. Clean debris from around the end of the fill tube before removing the dipstick.

5. Remove the dipstick and wipe it clean.

6. Insert the dipstick into the fill tube, pushing down until it stops, but still in its loose or unscrewed position.

7. Remove the dipstick and observe the fluid level. The safe operating level is anywhere within the HOT RUN band on the dipstick.

8. If the level is not within the HOT RUN band, add or drain fluid as necessary to bring the level within the HOT RUN band.

9. Measure fluid level more than once. Be sure fluid level measurements are consistent. If readings are not consistent, be sure the transmission breather is clean and not clogged.

10. If readings are still not consistent, contact your nearest Allison distributor or dealer.

ALLISON TRANSMISSION**Oil Change Interval
General Vocation***

Fluid Type	Fluid Change Intervals	High Capacity Main*** and Lube Filter Change Intervals	Suction Filter Assembly Change Interval
TES 295**	Whichever is first of the following: • 480 000 km (300,000 miles) • 6000 hours of operation • 48 calendar months NOTE: Always replace main and lube filters with the fluid change***.	Whichever is first of the following: • Any time the fluid is changed • 120 000 km (75,000 miles) • 3000 hours of operation • 36 calendar months	At time of transmission overhaul
TES 389**	Whichever is first of following: • 40 000 km (25,000 miles) • 1000 hours of operation • 12 calendar months NOTE: Always replace main and lube filters with the fluid change**	Whichever is first of the following: • Any time the fluid is changed • 40 000 km (25,000 miles) • 1000 hours of operation • 12 calendar months	

* General Vocation includes all non-retarder transmissions not identified as severe and intercity coaches with duty cycles of less than one stop per mile.

** A mixture of TES 389 and TES 295 fluid must continue to use the TES 389 schedule shown in this table until two fluid changes with only TES 295 fluid have occurred, at which time the TES 295 schedule may be used.

*** This information is based on using Allison Transmission High Capacity filters and a TES 389 or TES 295 fluid type with Prognostics Features not available or turned off.

Severe Vocation*

Fluid Type	Fluid Change Intervals	High Capacity Main*** and Lube Filter Change Intervals	Suction Filter Assembly Change Interval
TES 295**	Whichever is first of the following: • 240 000 km (150,000 miles) • 6000 hours of operation • 48 calendar months NOTE: Always replace main and lube filters with the fluid change***.	Whichever is first of the following: • Any time the fluid is changed • 120 000 km (75,000 miles) • 3000 hours of operation • 36 calendar months	At time of transmission overhaul
TES 389**	Whichever is first of following: • 20 000 km (12,000 miles) • 500 hours of operation • 6 calendar months NOTE: Always replace main and lube filters with the fluid change**	Whichever is first of the following: • Any time the fluid is changed • 20 000 km (12,000 miles) • 500 hours of operation • 6 calendar months	

* Severe Vocation includes all retarder equipped transmissions, or vocations for On/Off Highway, Refuse, Transit, and Intercity Coach with duty cycle greater than one (1) stop per mile.

** A mixture of TES 389 and TES 295 fluid must continue to use the TES 389 schedule shown in this table until two fluid changes with only TES 295 fluid have occurred, at which time the TES 295 schedule may be used.

*** This information is based on using Allison Transmission High Capacity filters and a TES 389 or TES 295 fluid type with Prognostics Features not available or turned off.

Oil and Filter Change

WARNING

Avoid contact with the hot fluid or the sump when draining transmission fluid. Direct contact with the hot fluid or the hot sump may result in bodily injury.

NOTE

Do not drain the transmission fluid if only filters are being replaced.

NOTE

At each fluid change, examine the drained fluid for evidence of dirt or water. A normal amount of condensation appears in the fluid during operation.

Drain Fluid

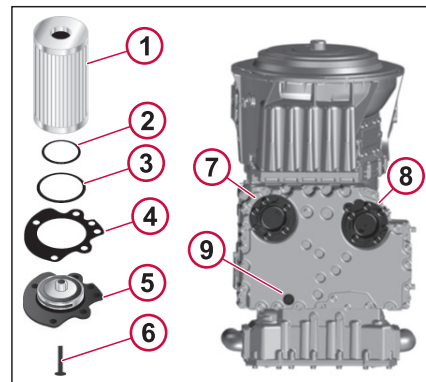
- 1 Drain the fluid when the transmission is at operating temperature of 71–93°C (160–200°F). Hot fluid flows quicker and drains more completely.
- 2 Remove the drain plug from the control module and allow the fluid to drain into a suitable container.
- 3 Examine the fluid for contamination.

CAUTION

Do not use the bolts to draw the filter covers to the control module. Do not use an impact wrench to tighten the bolts. Using an impact wrench to tighten the bolts may cause stripped threads and expensive parts replacement. Use a torque wrench to tighten the bolts.

Replace Filters

- 1 Remove 12 bolts (6), two filter covers (5), two gaskets (4), four O-rings (2 and 3), and two filters (1) from the bottom of the control module.
- 2 When reinstalling parts, lubricate and install new O-rings (2 and 3) on each filter cover (5). Lubricate O-ring inside filter (1) and push filter onto cover (5). Install new gaskets (4) on cover (5) and align holes in gaskets with holes in cover.
- 3 Install filter and cover assemblies into the filter compartment. Align each filter/cover assembly with the holes in the channel plate/sump. Push the cover assemblies in by hand to seat the seals.
- 4 Install 12 bolts into filter cover and tighten to 51–61 Nm (38–45 lb ft).
- 5 Replace the drain plug O-ring. Install the plug and tighten to 25–32 Nm (18–24 ft-lb).



- 1 Filter
- 2 O-ring
- 3 O-ring
- 4 Gasket
- 5 Filter Cover
- 6 Bolt
- 7 Lube Filter
- 8 Main Filter
- 9 Drain Plug

Transmission Fluid Refill

The fluid refill volume will be less than the volume listed for the initial fill due to some fluid remaining in the external circuits as well as in various transmission component cavities. After refill, verify the fluid level is correct.

Transmission Fluid Capacity

Sump	Initial Refill		Refill	
	Liters	Quarts	Liters	Quarts
3000 Product Family				
4 inch	27	29	18	19
2 inch	25	26	16	17
4000 Product Family				
4 inch	48	51	40	42
2 inch	41	43	33	35

Power Take-Off

DANGER

A Rotating PTO shaft can snag clothes, hands, etc., causing severe personal injury or death. To avoid injury or death:

- Do NOT go near rotating shafts when the engine is running.
- STOP the engine before attempting to work on a PTO, its controls or related equipment.

CAUTION

It is important to only engage the switch when the PTO is required. Leaving the PTO pump engaged when not needed can lead to poor performance and pump damage.

NOTE

Some PTOs cannot be operated while driving the vehicle. To do so will cause component damage.
To avoid component damage, contact a certified dealer to confirm if the vehicle's PTO can be used while driving.

A Power Take-Off (PTO) is a device that delivers power from the engine to another piece of equipment attached to the vehicle. Some examples include

cement mixers and the compactor on a garbage truck.

A maximum of four PTOs can be operated in unison. One PTO is preset as a priority component. The remaining PTOs are preset as secondary, third or fourth in priority. The priority settings are dependent on the PTO preset arrangement and the number of PTOs available.

There are three basic types of PTOs available: engine-mounted, transmission-mounted, and drive shaft-mounted.

The **transmission-mounted PTO** is clutch-dependent, which means that operation can be regulated by depressing or releasing the clutch pedal. If the vehicle has an automatic transmission the PTO operation and speed adjustment is controlled via an interior switch.

Depending on customer specification, some transmission-mounted PTOs are not operable when driving the vehicle.

The **engine-mounted PTO** is direct-mounted to the engine and is engaged with a bypass valve operated by an internal switch.

The **drive shaft-mounted PTO** consists of an additional gearbox that divides the drive shaft into two shafts. One shaft

drives the vehicle's axle. The other shaft drives the PTO.

When the PTO is engaged the PTO tell-tale displays in the instrument cluster.

PTO

PTO Tell-Tale

Use the following switch to activate/deactivate the PTO.



PTO Switch

Transmission-Mounted PTO

The transmission-mounted PTO is clutch-dependent, which means that operation can be regulated by depressing or releasing the clutch pedal.

For manual transmissions:

1. From a parked location, depress the clutch pedal.

NOTE: The PTO can be configured to operate without depressing the clutch pedal. To confirm the vehicle's PTO configuration contact a certified dealer.

2. Engage the PTO by pressing the PTO switch. Press the locking tab and at the same time, depress the main part of the switch.

3. Release the clutch pedal to start the PTO.

For automatic or automated transmissions:

1. Engage the PTO by pressing the PTO switch. Press the locking tab and at the same time, depress the main part of the switch.

The PTO engages.

Engine-Mounted PTO

Prior to engaging the PTO, stop the vehicle. Then run the engine at low idle or at a low speed.

1. Engage the PTO by pressing the PTO switch. Press the locking tab and at the same time, depress the main part of the switch.

The PTO is now in operation and hydraulic flow is regulated by the engine speed.

PTO Speed Adjustment

For the PTO speed adjustment to function, the Cruise Control and PTO must be activated. If the PTO can be activated while driving the vehicle the vehicle speed must be under approximately 8 Km/h (5 mph).

To set engine speed:

1. Press the Cruise Control/Speed Control Switch to the ON position. This switch can be located on the steering wheel or on the dash of the vehicle.

2. Press the PTO switch to the ON position.

The PTO is now active. The PTO rotations per minute (RPM) automatically adjusts to the preset PTO speed.

For vehicles with the cruise control switches in the steering wheel:

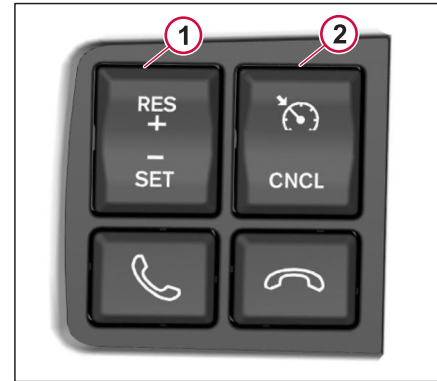
3. Press and hold the RESUME/SET or ACCEL/DECEL button to increase or decrease PTO engine speed. Then press SET to have the PTO maintain the desired speed.

For vehicles with the cruise control switches in the dash:

3. Press and hold the RESUME/ACCEL or SET/DECEL button to increase or decrease PTO engine speed. Then press SET/DECEL to have the PTO maintain the desired speed.

NOTE

For additional information about the Cruise Control feature, refer to the Cruise Control chapter.

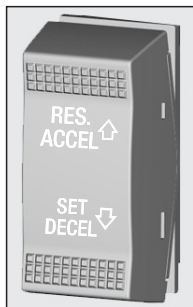


1 Cruise Control Resume/Set Steering Wheel Switch

2 Cruise Control ON/OFF/Cancel Steering Wheel Switch



Speed Control (Cruise Control) Switch



Resume/Set or Accel/Decel Dash Switch

The initial PTO speed is preset. To adjust the PTO speed preset contact a certified dealer.

Differential Locks

DANGER

DO NOT drive on dry, paved surface with the differential lock engaged. The vehicle strives to maintain a straight line. Taking a curve with the differential lock engaged can cause an accident, leading to serious personal injury or death.

CAUTION

Never operate the vehicle with the differentials locked any longer than is necessary. This state places a great strain on the axles and can cause rapid tire wear.

Under normal traction conditions, do not engage the differential lock. If possible, do not use the differential lock while taking a curve. With good traction and the differential lock engaged, the vehicle is under steered and therefore tends to drive straight in a curve. When using the lock on good traction surface, drive cautiously and do not exceed 40 Km/h (25 mph). Disengage the lock as soon as possible.

When the differential lock is disengaged, the couplings can be under tension. Disengage the lock by returning the switch to the OFF position. Help with the disengagement by briefly letting up on

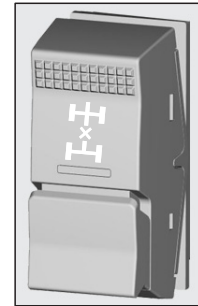
the accelerator to relieve the torque on the couplings.

The drive axle can be equipped with the differential lock. The single drive axle only has a wheel differential lock. With tandem drive axles; there could be both interwheel differential lock and an interaxle differential lock.

Use the differential lock on icy or slippery surfaces. When the slippery surface is passed, disengage the differential lock. The differential lock must not, under any circumstances, be engaged when in a wheel-spin situation. Engage the lock ahead of the slippery area. If already slipping, stop the wheels, engage the lock, and then continue. Engaging the differential lock when the wheels are spinning, damages the differential and the rear axle drive unit could possibly fail.

All efforts must be made to avoid spinning the wheels at high speeds on slippery surfaces. This fact is true whether the differential lock is engaged or not. Excessive wheel spin can result in failure of the cluster gears, axle shafts and other components found within the rear axle housing. If unable to obtain traction, engage the differential lock as described. If still unable to move the truck, seek assistance from a qualified tow operator. Engaging the differential locks must always be done as follows:

- 1 Press the service brakes. If necessary, press the clutch pedal. Wait for the drive wheels to stop spinning.
- 2 Press the Differential Lock switch.
- 3 Select a suitable gear for the transmission.
- 4 Release the service brakes. If necessary, release the clutch pedal.



Interaxle Differential Lock Switch



Interwheel Differential Lock Switch

⚠ CAUTION

DO NOT rely on gauges to determine axle pressure. Weight must be verified on scales. Adjust the air spring pressure accordingly.

Regulators for adjusting the air spring pressure are on the outside of the cab, below the rear corner of the driver side door. Regulators are operated by turning the knob counterclockwise for lowering pressure, and clockwise for increasing pressure.

⚠ CAUTION

The maximum safe operating oil temperature for a Mack rear axle is 121°C (250°F) for mineral-based oil, and 148°C (300°F) for synthetic-based oil. Continued operation with oil above this temperature will result in rapid deterioration of the oil's lubricating properties and is NOT recommended.

ⓘ NOTE

Even when no traction is available at the spinning wheel, the driver can "feather" the brakes (apply the brakes slightly), creating enough resistance at that wheel to allow power to the axle with traction. Feathering brakes should not be done with power divider lockout engaged.

Engaging the Power Divider Lockout

Inter-Axle Power Divider Lockout

The Mack power divider can be rendered inoperative, during short periods of poor traction, using a power divider lockout. When the power divider lockout is engaged, both axles are locked together (in positive through-drive) for maximum traction with no differential action between axles.

It is not necessary to stop the vehicle to engage the power divider lockout.

However, the lockout should be engaged while the vehicle is stationary or is moving at less than 40 Kph (25 mph).

⚠ CAUTION

To avoid component damage, do not engage the power divider lockout if the wheels are spinning.

Normally, the Power Divider switch is in the OUT (disengaged) position. In poor traction conditions, it may be necessary to provide positive through-drive to both axles by flipping the switch to the locked (engaged) position.

- 1 Push switch to engage.
- 2 Momentarily release the accelerator pedal to allow the shift to take place, then drive through the slippery area.
- 3 When driving conditions permit, unlock the power divider by moving the Power Divider switch back to the OUT (disengaged) position. Then release the accelerator pedal momentarily (to shift out of the locked position) and drive as usual.

 CAUTION

Do NOT (under any circumstances) engage or disengage the lockout while the drive wheels are actually slipping or spinning; clashing between the lockout sliding clutch and the outer cam may result.

 NOTE

A lockout indicator lamp will remain lit as long as the lockout is engaged. This is to remind the driver to release the lockout as soon as normal traction is regained.

TRACTION CONTROL SYSTEM (TCS)

The Traction Control System (TCS) provides improved traction on slippery surfaces by reducing wheel spin. If a drive wheel starts to spin the system operates automatically as follows:

- The TCS applies air pressure to the brake of the spinning wheel. Doing this transfers engine torque via the axle differential to the wheels that have better traction. Brake control is active at vehicle speed up to 25 MPH.
- The TCS limits engine torque which, in turn, reduces wheel spin to provide improved traction. The driver may override torque control by further pressing the accelerator pedal. Engine torque is active at all vehicle speeds.
- When the TCS automatically becomes active, the TCS indicator lamp turns on to alert the operator. The lamp turns off when the wheel(s) stops spinning.

TCS OFF

The TCS may also include the TCS OFF option that is selectable via the TCS OFF switch. The switch is located on the dashboard.

When this function is activated, the TCS OFF function will turn off the system.

Torque can be applied to all drive wheels as required by the driver. Also, the

system will not reduce wheel spin by applying the brakes or reducing engine torque.

When the operator selects the TCS OFF function, the TCS indicator lamp is on continuously to indicate that the system is not available. The lamp will turn off when the TCS OFF mode switch is turned off.



Heavy Mud/Snow Function

The Traction Control System (TCS) may also include a heavy mud/snow function which allows the operator to access additional traction when needed.

When the function is activated, with the mud/snow mode switch, the heavy mud/snow function increases available traction by increasing permissible wheel spin. The switch is located on the dashboard.

Also, the TCS indicator lamp blinks continuously.

The TCS lamp stops blinking when the TCS mode switch is turned off.



Engaging Cruise Control

DANGER

DO NOT use the cruise control in heavy traffic, with ice/snow on the road or during other unfavorable conditions. This can lead to a loss of vehicle control, causing a vehicle crash, personal injury or death.

CAUTION

Transmission gear changes must not be made without the use of the clutch while in the cruise control mode. Failure to use the clutch will cause the engine speed (RPM) to increase to the high idle limit, which can cause severe powertrain damage.

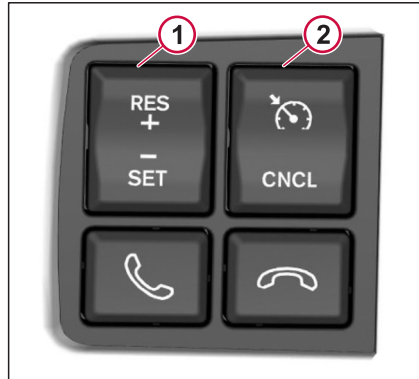
The cruise control maintains a set speed and allows acceleration and deceleration through the system switches.

To set the cruise control for normal highway operation, the following conditions must be met:

- The vehicle road speed must be above the customer-programmable speed value of 24 to 56 kph (15 to 35 mph).
- The service and parking brake must not be applied.
- The clutch must be engaged (pedal released).

Once the above conditions are satisfied, activate the cruise control as follows

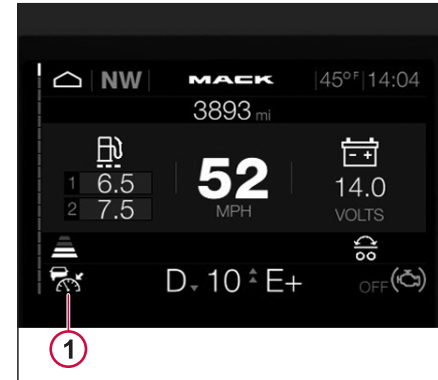
1 On the left-hand steering wheel controls, press the Cruise Control ON/OFF button.



1 Cruise Control Resume/Set

2 Cruise Control ON/OFF/Cancel

When the cruise control is activated the Cruise Control icon displays in the Driver Information Display (DID)



1 Cruise Control Icon

2 At the desired road speed, press and release the Cruise Control Resume/Set button. The Cruise Control icon turns green. Also, the set cruise control speed displays next to the icon.

The vehicle maintains the set speed.

Increasing the Cruise Control Set Speed

NOTE

The cruise control speed will not increase above the maximum programmed speed limit.

1 To increase the Set speed, press the Cruise Control Resume/Set button up (+).

A momentary press of the button (half second or less) increases the vehicle Set speed in small increments.

2 Release the button when the desired speed has been reached.

The new cruise control maximum speed is set.

Decreasing the Cruise Control Set Speed

ⓘ NOTE

The cruise control cannot be engaged at speeds below approximately 30 Km/h (18 mph).

ⓘ NOTE

The cruise control Set speed will not decrease below the minimum programmed Set speed limit.

1 To decrease the Set speed, press the Cruise Control Resume/Set button down (-).

A momentary press of the button (half second or less) will decrease the vehicle Set speed in small increments.

2 Release the button when the desired speed has been reached.

The new cruise control maximum speed is set.

Disengaging Cruise Control

The cruise control is disengaged if the brake is depressed, or if the cruise control button is set to Cancel (OFF).

If configured, the cruise control remains engaged if the clutch pedal is depressed for short durations (to allow shifting while in cruise control). However, if the clutch pedal is depressed for an extended period (typically greater than 5 seconds), cruise control is disengaged.

ⓘ NOTE

For vehicles with a manual transmission, when the clutch is pressed the cruise control temporarily disengages. When the clutch is released and the transmission reengaged, then the cruise control reactivates.

Resuming Vehicle Speed

The previously selected cruise speed is retained in the memory. When the Resume button is pressed, the vehicle resumes the previous Set speed. This occurs provided the vehicle speed exceeds approximately 15 Km/h [10 mph] and the speed is not above the maximum programmed speed.

Acceleration

Momentary acceleration (such as for passing another vehicle) does not interrupt cruise control operation. After passing, release the accelerator and let the vehicle slow to cruise control speed. The previously set speed is maintained without having to press the Resume/Set button.

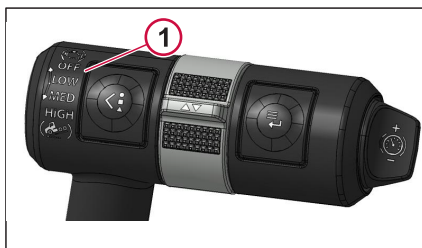
The engine brake controls vehicle speed using engine compression and exhaust braking. Engine braking reduces wear on the foundation brakes and helps a driver maintain control of the vehicle. Also, engine braking works in unison with the vehicle's cruise control system.

To activate the engine brake, move the right hand steering stalk, to the first (LOW) position. The first position activates the engine brake unit for 40% power. The second position (MED) provides 70% power. The third position (HIGH) provides 100% power. The engine brake switch can be in either 1st or 2nd ON position during speed control operations, but the brake functions only if no fuel is requested by vehicle management and control (V-MAC) IV and engine speed (RPM) is greater than 900 RPM. To disengage the brake, move the stalk to the OFF position, or press the accelerator pedal (AP).

The last stalk position (B+) is the maximum engine brake position.

To activate the engine brake, move the right hand steering stalk, to the first (LOW) position. The first position activates the engine brake unit for 40% power. The second position (MED) provides 70% power. The third position (HIGH) provides 100% power. The engine brake switch can be in either 1st or 2nd ON position during speed control

operations, but the brake functions only if no fuel is requested by vehicle management and control (V-MAC) IV and engine speed (RPM) is greater than 900 RPM. To disengage the brake, move the stalk to the OFF position, or press the accelerator pedal (AP).



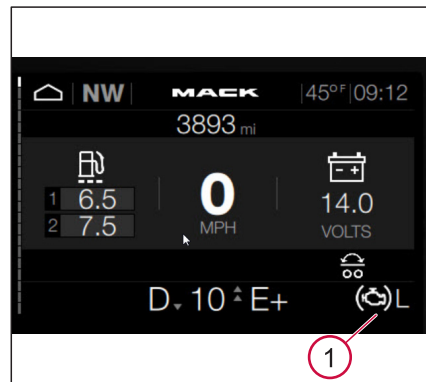
1 Engine Brake Stalk

When the engine brake is activated the Engine Brake icon displays in the lower, right corner of the Driver Information display. The engine brake icon and the level selected are shown.

The engine brake levels are:

- OFF - The engine brake is not activated.
- LOW - The engine brake is activated at the lowest power.
- MED - The engine brake is activated to the next highest or mid-range power.

- HIGH - The engine brake is activated to the highest standard power.



1 Engine Brake Icon

Cruise Control Brake

NOTE

For additional information on the cruise control, refer to the Cruise Control section.

A cruise control brake is available. This option allows for downhill braking using the engine brake, while the cruise control is engaged. The cruise control must be activated in unison with the engine brake.

To change the downhill cruise control braking speed, use the cruise control braking speed button. This button is

located on the end of the right-hand stalk.



1 Cruise Control Braking Speed Button

To set the cruise control braking speed complete the following steps:

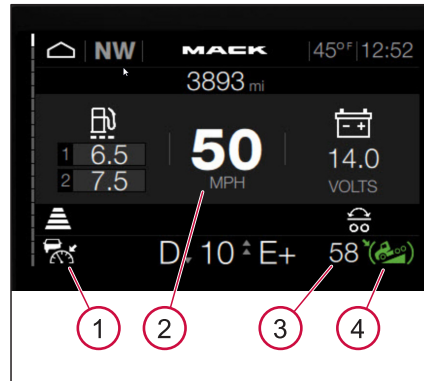
- 1 Activate the engine brake.
- 2 Press the Cruise Control ON/OFF/Cancel button.
- 3 Set the cruise control speed.



1 Cruise Control Resume/Set

2 Cruise Control ON/Off/Cancel

When the cruise control and engine brake are activated the following icons display in the Driver Information Display (DID).



1 Cruise Control Icon

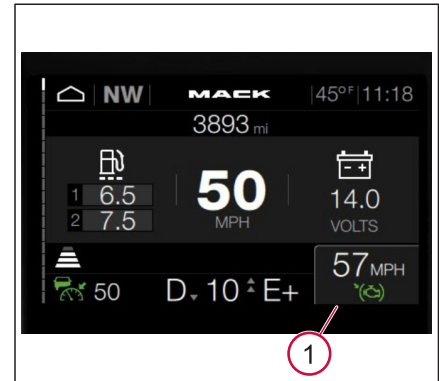
2 Current Speed

3 Current Cruise Control Braking Speed

4 Cruise Control Braking Icon

4 To increase the cruise control braking speed, press the Cruise Control Braking Speed button away from you. To decrease the cruise control braking speed, pull the Cruise Control Braking Speed button toward you. The Cruise Control Braking Speed is adjustable to maximum of 9 mph from the current set speed.

The second pop-up displays in the DID when adjusting the cruise control braking speed. The pop-up displays the new braking speed.



1 New Cruise Control Braking Speed

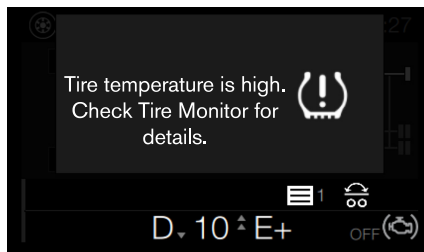
TIRE TEMPERATURE SYSTEM

The cavity air temperature of each programmed tire is monitored via the Driver Information Display (DID). The system monitors cavity air temperature in all tires independently. If the tire cavity temperature reaches 77°C (170°F) the system alerts the operator. All associated telltales display in the instrument cluster. A tire temperature DID screen displays. There is also an audible alert.

NOTE

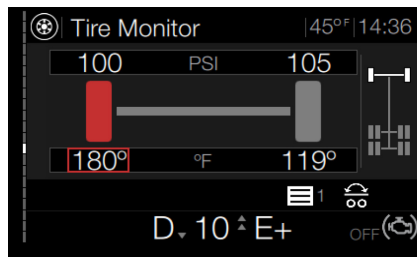
For additional information about the Tire Monitoring System refer to the Tire Monitor sub-section of the Driver Information Display (DID) section.

If the tire temperature is excessively high, the Tire Temperature HIGH screen displays in the DID. The Check and Tire Warning icons display in the Instrument Cluster (IC).



To acknowledge the tire temperature warning, press the Enter button on the right-hand steering stalk.

The Tire Monitor screen displays. The tire with a high temperature reading is highlighted in the DID.



VEHICLE SPEED RETARDING DEVICES **DANGER**

When operating a tractor bobtail (without a trailer) or on slippery roads, the engine brake switch must be in the "OFF" position. Failure to follow this instruction can result in loss of vehicle control and serious personal injury or death.

 NOTE

The vehicle ABS will automatically turn off the vehicle speed retarding device, IF one of the sensed rear wheels is locking up as a result of vehicle speed retarding device operation. The vehicle speed retarding device will be turned back on automatically when the wheels become unlocked. Consider switching to a lower braking level if this occurs frequently.

 NOTE

It is normal for there to be a slight delay in the application of a vehicle speed retarding device. When using devices of this type, be sure to think ahead and analyze conditions in order to use the device properly.

A vehicle speed retarding device is not intended to bring the vehicle to a stop. A vehicle speed retarding device is only intended to retard the vehicle speed under certain conditions.

ANTI-LOCK BRAKING SYSTEM

WARNING

For proper ABS operation, DO NOT change tire sizes. The size of the tires installed during production is programmed into the electronic control unit. Installing different sized tires could result in a reduced brake force, leading to longer stopping distances or accidents.

The vehicle has a standard brake system, equipped with an electronic speed monitoring and control system, Anti-lock Braking System (ABS). ABS monitors wheel speed continuously but is not involved in controlling the wheel speed unless there is an emergency. In normal braking applications, the standard air brake system is in effect.

There is a sensor installed in each wheel on a monitored axle. The sensors transmit information to the electronic control unit (ECU). The ECU interprets the signals and calculates wheel speed, wheel retarding and a vehicle reference speed. If the calculations indicate a wheel lock-up situation, a signal is sent from the ECU to the appropriate ABS modulator valve to reduce braking pressure. During emergency braking, the modulator valve alternately reduces, increases or maintains air pressure in the brake chamber to prevent wheel lock-up.

During emergency or reduced-traction stops, fully depress the foot brake pedal until the vehicle comes to a safe stop. DO NOT PUMP the brake pedal. With the brake pedal fully depressed, the ABS controls all wheels to provide steering control and a reduced braking distance.

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

The ABS control unit contains a self-testing program that is engaged each time the ignition is turned on. The operator can verify the testing by listening for the ABS modulator valves actuating twice in series. To increase the sound, hold down the foot brake pedal when the ignition is turned on.

If any of the ABS tell-tales come on during driving or do not go out after a short time after turning on the ignition, take the vehicle to an authorized dealer to repair the ABS or brake system. The vehicle can still be driven with a problem in the ABS system. However, ABS is disengaged and the standard braking system operates only.



ABS Malfunction Tractor Telltale

The instrument cluster also contains an ABS tell-tale lamp, which indicates when a Trailer ABS system issue occurs.



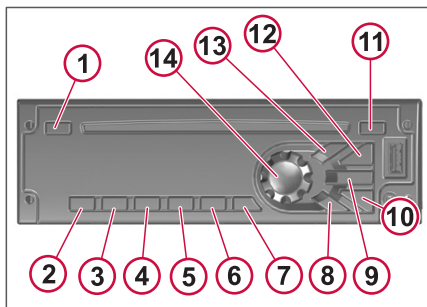
ABS Malfunction Trailer Telltale

<https://truckmanualshub.com/>

INFOTAINMENT

Introduction

The information provided are general features found for the operation of the DEA5XX Radio.



- 1 Phone
- 2 Play/Pause
- 3 Browse
- 4 Check/Alarm
- 5 RPT (Repeat)
- 6 RDM (Random)
- 7 ESC (Escape)
- 8 DSP (Display)
- 9 Scan/ASCN (Scan/Autoscan)
- 10 PREV (Previous)
- 11 Eject
- 12 Next (Next)
- 13 SRC/PWR (Source/Power)
- 14 Knob

Radio Button Operation

- **SRC/PWR:** Press to switch to FM -> AM -> WX -> SXM -> CD -> USB/ iPod -> AUX -> Bluetooth Audio (if equipped) and to turn Radio ON. Press and hold to turn radio OFF.
- **One-Hour Timer:** With the ignition off, pressing the SRC/PWR button will turn on the receiver and activate the receiver's one-hour timer.
- **VOLUME KNOB/OK:** Press for less than 3 seconds to display Audio Control Menu. Press for more than 3 seconds to Show the User Menu. Rotate to Increase/decrease Volume or during a Menu for Navigation. Press while in a Menu to confirm the selection.
- **PREV (Previous/Reverse):** Press to select previous track or station. Press and hold for FR or Tune Down
- **NEXT (Next/Forward):** Press to select next track or station. Press and hold for FF or Tune Up.
- **EJECT:** Press to eject the CD
- **PHONE (If equipped):** Press the Phone button for more than 3 seconds to Show the Bluetooth Menu. When Bluetooth is enabled, press the button to display the Dial Menu or to accept and Incoming Call (if a Phone is paired). During a call Press the button for more than 3 seconds to transfer the call from the radio to the Phone.
- **CLOCK ALARM:** Press during Alarm activation to cancel the Alarm.
- **SCAN/ASCAN:** Scans stations/CD tracks/MP3/ WMA files and folders and stores strongest stations to presets.
- **PLAY/PAUSE:** Press to pause/unpause current Media.
- **RPT (Repeat):** Press to repeat current track. Press again to stop repeat. Look for the RPT icon to turn on in the radio display.
- **BROWSE:** Press to Navigate on the device and select a specific song or play context (Applicable to USB sticks, CD MP3 discs and iPods)
- **RDM (Random):** Press to play the tracks randomly. Press again to stop random mode. Look for the RDM icon to turn on in the radio display.
- **ESC (ESCAPE):** Press to exit one Menu Level.
- **DISP (DISPLAY):** If vehicle Ignition is ON: Press to Change Source Display Views. Press for more than 3 seconds to show the Clock for a short time. If vehicle Ignition is OFF:

Press to turn on the Radio and show the clock for a few seconds.

Radio Features

To access AM, FM, WX, SXM (if equipped), iPod, USB, Rear Aux, Front Aux, CD or BT Audio do one of the following:

- Press the SRC radio button to scroll through the options and select the desired one.
- Press the SRC button and then scroll the source menu by knob rotation or NEXT/PREV short presses and then select by short-pressing the knob.CD/MP3, USB/iPod, Front AUX and BT Audio shall be accessed only if the radio model supports them and a device is connected/inserted for that specific source.

AM-FM-WX Radio

Tuning: Select the desired “Tuner Configuration” following the steps in the Audio Controls Menu section.

If is set to MANUAL, the radio will: Execute Manual Tuning when the NEXT/ PREV buttons are short pressed and Execute Seek when the NEXT/ PREV buttons are long pressed. If is set to AUTO, the radio will: Execute Seek when the NEXT/PREV buttons are short pressed and Execute Manual Tuning

when the NEXT/PREV buttons are long pressed.

Manual Tuning: The current frequency will be increased/decreased by 1 step of 0.2MHz (USA FM mode), 10 kHz (USA AM mode) and one channel in WX mode (CH1, CH2. etc.)

Seeking a Station: When the Seek function is activated the radio increments/ decrements the frequency until a tunable station is found. If a tunable station is not found the radio will display “NO STATION FOUND”.

Storing Radio Station Presets : Tune the desired frequency, and then long press any of the Preset(1-6) buttons until the radio produces a beep.

Tuning Radio Station Presets: Short press on any of the Preset(1-6) buttons.

SCAN: To initiate the Scan function, short press the SCAN/ASCN button. When SCAN is initiated, the radio seeks up in frequency and stops on the next strong frequency for 8 seconds before continuing to seek for the next strong station.

AUTOSCAN: This function temporally stores the strongest 6 stations of the current band in the presets until the radio is powered off or the source is changed. To initiate the AUTOSCAN function, long press the SCN/ASCN button until the radio performs a beep;

then the “AUTO SCAN” icon will blink while the radio is storing the temporary presets.

SiriusXM®

Vehicles with a valid SiriusXM® satellite radio subscription can receive SiriusXM programming.

Display labels: To easily recognize the displayed text, the radio uses the following convention: Channel Number: CH, Channel Name: CH, Artist Name: ART, Content Info: INFO, Song Title: SONG, Category name: CAT.

SXM Categories To change the current category long press the NEXT/PREV button and the radio will tune the first channel on next or previous category. Category mode Enable/Disabled Category Search Mode Enabled means that only channels in the current Category are searched. When enabled, the CATEGORY icon is turned on. Category Search Mode Disabled means that all channels are searched. When disabled, the CATEGORY icon is turned off.

SXM Radio ID: If tuned to channel 0, “RADIO ID” label alternates with the SXM radio eight-digit code. This code is needed to activate the service.

Radio System Settings

Audio Controls Menu

Clock

To adjust the time in the radio, press the knob to show the Audio Control Menu. Rotate the knob until the Clock is shown on the display and press the knob to enter the Clock Menu.

Once in the Clock Menu you can select 12 Hour or 24 Hour format by rotating the knob and pressing it to confirm. Finally after the format configuration and confirmation, adjust the time settings and confirm the changes by pressing the Knob.

Alarm

To set the Alarm press, enter the Audio Control Menu, select Alarm and press the knob. Once in the Alarm Menu, change the ALARM ON/OFF by rotating the knob and pressing the knob to confirm the selection. When the user selects ALARM ON, the Alarm Icon will be set to ON and the following configuration options will be shown:

- **TIME:** The hour digits for the alarm time will begin to flash. The format will be the same as you set for the clock (12 or 24 hour mode). Change by rotating the knob and confirm the

hour and minutes by pressing the knob.

- **SET TONE or SET MUSIC:** Change between SET TONE or SET MUSIC by rotating the knob and pressing the knob.
- **VOLUME:** For Tone change between Low, Mid and High. For Music adjust from 0 to 30.
- **Turning the Alarm Off:** When the alarm is triggered, short press the preset 3 button. If you do not turn the alarm off, it will automatically shut off after 63 minutes.
- **Activating Snooze:** To use SNOOZE, press any button for less than 2 seconds when the alarm sounds, except Preset 3 button. SNOOZE will appear for 3 seconds and the alarm will be postponed for 9 minutes.

User Menu

The User Menu is shown when the Volume knob is pressed for more than 2 seconds. In this menu the user can configure the following options:

- Speakers (SPEAKERS)
- Seek Sensitivity (SEEK SEN)
- Tune Configuration (TUNE CFG)
- Playback Configuration (PLBK CFG)
- Dimming (DIMMING)

- Category Enable/Disable (CAT E/D)
- HUE Adjustment (HUE ADJ)
- Speed Dependent Volume (SPEEDDV)

Playback Configuration (PLBK CFG):

This option is used to configure the Next/Prev Button for the long press functionality (between FF/FR and Folder Up/ Down). The display will show the current selected option SEEK (folder Up/ Down) or FAST F/F. Rotate the knob to change between SEEK or FAST F/F, press the Knob to select the desired option. This option is only available when radio is playing CD, USB or iPod Mode.

Category Enable/Disable (CAT/E/D): The display will show CAT ENABLE or CAT DISABLE depending on the current selection. Rotate the knob to change between the two options and press the Knob to confirm the selection. This option is only available in SXM Mode.

Speed Dependent Volume (SPEEDDV):

User can select between OFF/LOW/MID/HIGH settings. Volume will be increased accordingly in the radio as vehicle speed increases/decreases.

NOTE

The Regulatory notices are listed in the owner's manual located in the following web site.
<http://www.panapacific.com/support>

Media Players

CD Player

With the vehicle on, insert a disc into the slot, label side up. The system is capable of playing:

Most audio CDs, CD-R and CD-RW.MP3 or unprotected WMA formats.

Folder Up/Down (only available when playing

MP3 CDs and USB devices) Press to select next/Previous Folder, if playing a specific playable scope, when pressing the radio plays track 1 as newly inserted USB.

Music Navigation CD MP3 and USB
 Press the magnifying glass (preset 2) button while CD, MP3 or USB source is active to access the CD MP3/USB Music Menu. Use the Volume Knob or Next/Prev button to navigate through the different options.

The Radio has two Options

Folder Mode: Press the Volume Knob to view the folders stored on the disc.

Select a folder to view the list of all songs in that folder.

Playlist Mode Press the Volume Knob to view the playlists stored on the disc. Select a playlist to start playing the first track in current selected playlist.

Special Considerations

Root Directory: The root directory is treated as a folder. All files contained directly under the root directory are accessed prior to any root directory folders.

Empty Folders: If a root directory or folder is empty or contains only folders, the player advances to the next folder in the file structure that contains a compressed audio file. The empty folder(s) are not displayed or numbered.

iPod

This Radio supports the following iPod models: iPod classic® (6th generation), iPod nano® (6G), iPod touch® (4G), iPhone® (3G, 3GS, 4, and 4S)

Other iPods may be played, but functionality is not guaranteed.

Playing from an iPod

1. Connect one end of the standard iPod USB cable to the iPod's dock connector.
2. Connect the other end to the USB port in the front radio display (it begins to play).

3. Radio will start playing the iPod and shows the track number, Song, Artist, elapsed time, and Album information displays when available.

4. The iPod battery recharges automatically while the vehicle is on.

5. If the iPod is an unsupported model, it can still be listened to in the vehicle by connecting to the auxiliary input jack using a standard 3.5mm (1/8 in) stereo cable.

iPod Menu Press the magnifying glass (preset 2) button while USB source (iPod connected) is active to access the iPod Music Menu. Use the Volume Knob or Next/Prev button to navigate through the different options.

Use the iPod Audio Menu to select: Playlists, Artists, Albums, Genres, Podcasts, Songs, Composers, Audio Books.

USB

A USB mass storage device can be connected to the USB port.

The USB port is in the front of the radio display. Five volts DC power is limited to one-amp from this port. Devices such as iPad that require greater current will not charge from this port.

USB MP3 Player and USB Drives:

The USB MP3 players and USB drives connected must comply with the USB Mass Storage specification.

Front Auxiliary / Rear Auxiliary

In front auxiliary mode, you can play an external device such as an iPod® or MP3 player via the auxiliary input jack on the front of the receiver. To use an external device simply connect the device via the auxiliary input jack.

In rear auxiliary mode, you can play an external device that you have connected via the receiver's rear power auxiliary input lines. To use an external device simply connect the device via the auxiliary input jack and select it using the source button

Bluetooth®

The Bluetooth Menu is available when the Phone button is pressed for more than 3 seconds. To navigate through it, rotate the knob. The Bluetooth Menu consists on the following options:

- BT ENABLE
- CONNECT PH
- DISCONNECT PH
- ADD PHONE
- DELETE PH (Some options are only available when a device has been paired previously)
- **Enabling/Disabling Bluetooth:** Enter the BT menu and Rotate the Volume Knob until the display shows: BT Disable or BT Enable. Press the Volume Knob to Enable or Disable the Bluetooth.
- **Pairing a Bluetooth Device:** Enable the BT in the Radio and your device. Enter the BT Menu and Rotate the Volume Knob until the display shows: ADD PHONE, press the volume The radio will display ADDING PH for 3 seconds and the Bluetooth status icon will blink. The radio will be in discoverable mode, set your cell phone to add a Bluetooth device and look for the name "Delphi500 Radio." Follow the instructions on your phone to add a connection. When necessary, use 4 PIN numbers 0000 to connect to the radio. When the cell phone has been successfully added, the radio will display PH CONNECTED for 3 seconds and then the Bluetooth device name for 3 seconds. Phone Icon will be active on the display.
- **Connecting a Device:** If your device was previously paired, you can simply connect to the device: Go to the BT Menu and select CONNECT PH. The radio will attempt the connection to the selected device. The Phone icon will be active and the arrows icon will flash. When the radio connects, the Bluetooth icon will blink. This signifies that the receiver is attempting to download the cell phone's CONTACTS (for the DIAL CONTACTS function). The icon will cease to blink if all contacts have been downloaded or if the radio times out from receiving contacts from the cell phone device. Phone Icon remains active.
- **Disconnecting a Device:** If your device is currently connected and you require disconnecting it from the radio: Go to the BT Menu, select DISCONNECT PH by pressing the knob, The radio will show DISCONNECT PH for a short time. Once the Phone is disconnected the radio will display DISCONNECTED first and then the Bluetooth device name. The Phone Icon will be inactive.
- **Deleting one or all Devices:** To delete from the radio one or all devices previously paired: Go to the BT Menu, select DELETE PH and press the knob. The radio will show a device list (navigate through it by rotating the knob). Select the device to be deleted or select DELETE ALL

to erase all the paired devices in the list by pressing the Volume Knob.

- **Hands Free/ Bluetooth Features:** Once your device is properly paired (see pairing a Bluetooth Device) and connected (See Connecting a Device), the radio may support the following Hands Free features if the connected device has that capability.

DIAL MENU

The radio can retrieve the last calls and contact information from the device. The dial menu is accessed when the device is not in a call and the Phone button is pressed.

- **Redial:** The user can retrieve the last number called and place a call. Press the Phone button and the last number called will be dialed.
- **Quick Dial:** The radio is capable of storing phone numbers in any of the five available preset buttons. To save a phone number, you can select the contact using either the DIAL CONTACTS feature or the LAST CALLS feature. When the desired contact phone number is displayed, press and hold any of the PRESET buttons until you hear a beep confirming the phone number has been saved. To dial a saved phone number, select QUICK DIAL from the menu and rotate the knob to select
- the appropriate PRESET number. Press the knob to place the call to the saved phone number.
- **Dial Contact:** The radio is able to read and display the phone contacts from the device. Press the Phone button to show the DIAL MENU and rotate the knob until DIAL CONTACTS is shown, press the knob to select this feature. Rotate the knob to select between the different stored contacts. Press the OK button if you want to dial to the listed contact. The radio will attempt to download the following phone numbers from each contact: HOME, WORK, MOBILE, OTHER and PREFERRED. Within the menu they will be displayed as either: H, W, M, O or P plus the 10 digit number (XXX-XXX-XXXX).
- **Last Calls:** The radio is capable of listing the last 10 calls (DIALED, RECEIVED AND MISSED). Rotating the knob will navigate the user through the selected call list. Press the OK button to place the call.
- **Call Options:** The following options are available during a hands free call:

Accepting a Call: When an incoming call is received, the radio will display the name and number of the caller. To

accept the call, press the OK, NEXT, knob or Phone button.

Rejecting a Call: To reject the call, press the ESC or PREV button.

Ending a Call: To end a call, press the ESC button.

Microphone Mute: Pressing Pause/Play will mute the radio's microphone during a call. Press again to deactivate mute.

Call Transfer: If a call is in progress, press the Phone button for more than 3 seconds to transfer the call to the cell phone for private conversations. Repeat this process if you want to return into Hands Free mode again.

BT Audio: Bluetooth Player

If your cell phone supports it, it can be used as an audio source input to the radio, allowing you to enjoy the music files stored on your phone. To access music files on your phone press the SRC button and select BT AUDIO.

In BT AUDIO you can use the following buttons (See Play/Pause, PREV (Previous)/NEXT (Next), FF/FR (Fast Forward/Fast Reverse) and RDM (Random)/RPT (Repeat).

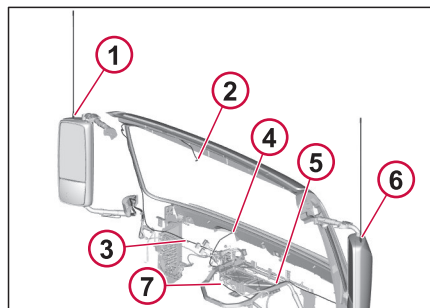
Antennas

- Multiband
- Radio AM/FM
- TV Antenna

Multiband Antenna

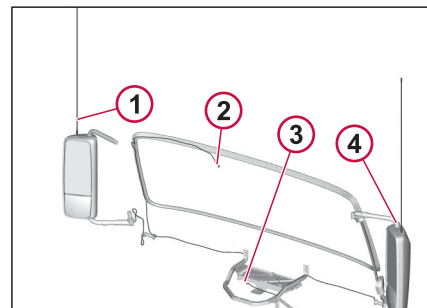
There are antennas mounted on the top of the mirror brackets for wideband reception. They receive or send signals for the AM/FM radio, and CB radio. Each antenna carries multiple wire windings that work together with mirror bracket devices to cover the needs of many uses.

If the antenna is damaged, replace it only with a multiband type antenna. A regular antenna does not have the wiring necessary to give good reception for all uses.



1 Whip Antenna

- 2 Overhead CB Cable
- 3 Dash CB Cable
- 4 Dash CB Cable Connector
- 5 Audio Radio Cable
- 6 Whip Antenna
- 7 Audio Radio Connector



- 1 Whip Antenna
- 2 Overhead CB radio Connection
- 3 Audio Radio Connector
- 4 Whip Antenna

<https://truckmanualshub.com/>

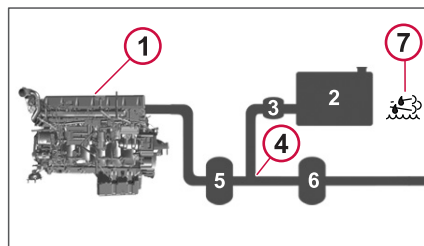
EMISSION SOLUTION AND CONTROL

Selective Catalytic Reduction (SCR)

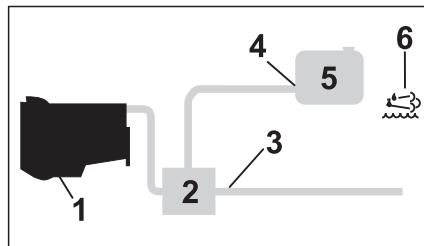
Selective Catalytic Reduction (SCR) is an emissions-reduction aftertreatment technology with the ability to deliver near-zero emissions of nitrogen oxides (NOx), a smog-causing pollutant, and greenhouse gas.

SCR reduces NOx emissions to low levels, and delivers excellent fuel economy and reliability. The system does not change the design of the basic engine. Rather, SCR is an aftertreatment system which converts NOx in the exhaust stream into harmless gases.

The SCR works by injecting Diesel Exhaust Fluid (DEF) into the exhaust. DEF is a solution of ultra-pure water and urea. DEF works with the heat of the exhaust and a catalyst to convert NOx into nitrogen and water vapor. Both substances are harmless and natural components. The result is cleaner air, fuel efficiency, and a reliable emissions control system.



- 1 Diesel Engine
- 2 Aftertreatment DEF Tank
- 3 Aftertreatment DEF Pump
- 4 Aftertreatment DEF Dosing Unit
- 5 Aftertreatment Diesel Particulate Filter (DPF)
- 6 Selective Catalytic Reduction (SCR) Catalyst
- 7 Aftertreatment DEF Tank Gauge



- 1 Diesel Engine
- 2 Combined Aftertreatment System (SCR and DPF)
- 3 Aftertreatment DEF Dosing Unit
- 4 Aftertreatment DEF Pump
- 5 Aftertreatment DEF Tank

6 Aftertreatment DEF Tank Gauge

⚠ CAUTION

Do not put diesel fuel in the Aftertreatment DEF tank. Diesel fuel, if sprayed into the hot exhaust along with the DEF, could ignite causing personal injury or damage the exhaust system.

ⓘ NOTE

The SCR is equipped with an insulation blanket, this blanket is critical to the performance of the Exhaust Aftertreatment System (EATS). If this blanket is compromised or damaged the EATS system might not perform as designed and you should take the vehicle to an approved dealer for inspection.

This information is for the 2 box Aftertreatment System only.

⚠ CAUTION

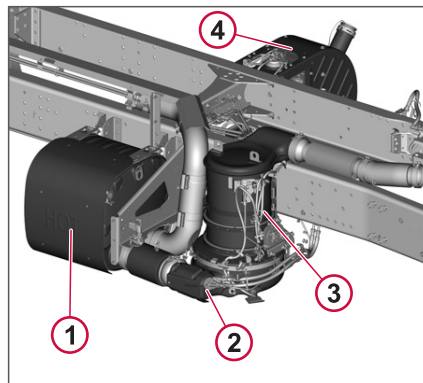
When handling the blankets and or straps, gloves should be worn to protect from cuts and abrasions.

There are three different configurations for the SCR catalysts, they are vertical, horizontal and the one box EATS.

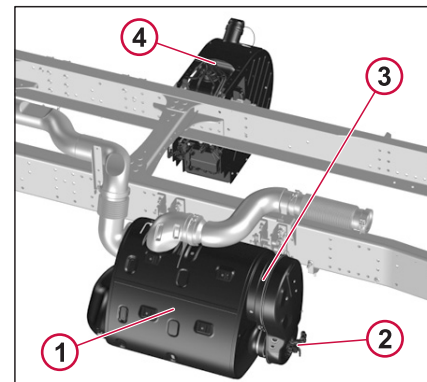
The SCR system is simple and effective, with few components. It consists of an Aftertreatment DEF tank positioned near the standard diesel tank, plus an

Aftertreatment DEF pump, Aftertreatment DEF Dosing unit, and SCR catalyst. The advantage of using DEF is that it enables the engine to use less EGR, which results in more efficient combustion. Using DEF also meets the EPA near-zero NOx emissions requirement of 0.2 g/hp-hr NOx. By using DEF, we avoid the disadvantages of increasing EGR to massive levels. This benefit results in better fuel economy from your Mack engine.

Aftertreatment System



- 1 Selective Catalytic Reduction (SCR) Catalyst
- 2 Aftertreatment DEF Dosing Unit
- 3 Aftertreatment Diesel Particulate Filter (DPF)
- 4 Aftertreatment DEF Tank



- 1 One Box EATS
- 2 Aftertreatment DEF Dosing Unit
- 3 Replaceable Diesel Particulate Filter (DPF)
- 4 Aftertreatment DEF Tank

⚠ NOTE

In some instances you may have a different configuration for your aftertreatment system.

Extended Idling and Aftertreatment System

During periods of extended idling, normally greater than 8 hrs, the Diesel Particulate Filter (DPF) system performs a routine conditioning cycle. The Engine ECU controls the conditioning cycle and

starts and stops automatically as needed. The Exhaust Aftertreatment System (EATS) conditioning is required to maintain normal exhaust aftertreatment system function and not be stopped.

Extended idling performed on this vehicle equipped with an exhaust aftertreatment system should be carried out at a low engine idle speed with the parking brake set. There is no benefit to using a raised engine idle speed for extended idling. The only exception is for active PTO. Utilizing an engine speed above 1300 rpm is recommended for vehicles which perform extended idling with an active PTO.

In order to complete the exhaust aftertreatment conditioning cycle during these events the engine speed increases to approximately 1050–1400 rpm (non-PTO). Exhaust temperatures elevate slightly but remain much lower than temperatures reached during regeneration and present no danger.

Aftertreatment Control Module (ACM)

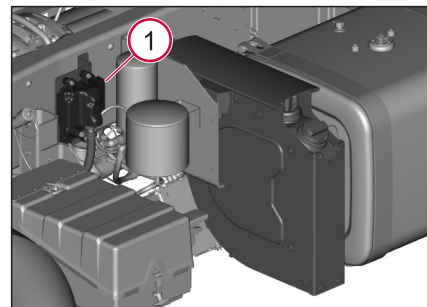
The ACM is an independent module. Depending on the configuration, the module can be mounted as part of the DEF tank or on a bracket near the DEF tank.

The ACM controls the following components in the exhaust aftertreatment system:

- Aftertreatment DEF Dosing Unit
- Aftertreatment DEF Tank Heater Valve
- Aftertreatment DEF Line Heaters
- Aftertreatment DEF Pump
- Aftertreatment DEF Return Valve
- Aftertreatment DEF Quality Sensor
- Aftertreatment Particulate Matter (PM) Sensor.

The ACM also monitors the following values in the exhaust aftertreatment system:

- Aftertreatment DEF Dosing Pressure
- Aftertreatment DEF Tank Temperature
- Aftertreatment DEF Tank Level
- Aftertreatment DPF Inlet/Outlet Temperature
- Aftertreatment DEF Tank Level Sensor
- Aftertreatment DPF Differential Pressure
- Aftertreatment DEF Quality
- Aftertreatment DPF Particulate Matter (PM) Sensor



1 Aftertreatment Control Module (ACM)

Warning and Inducement

Instrument Cluster Icons

Aftertreatment icons are displayed on the instrument cluster. There are three aftertreatment icons:

- Parked Aftertreatment DPF Regeneration Required
- High Exhaust System Temperature (HEST)
- Aftertreatment DEF Tank Low Level Indicator

The aftertreatment DPF Regeneration Required icon flashes when the Diesel Particulate Filter is full or overfull and regeneration is needed.



The High Exhaust System Temperature icon illuminates when a parked Regeneration is initiated. It also indicates high exhaust gas temperature during passive regeneration. When the HEST icon is illuminated, do not park or operate the vehicle near people, or any flammable materials, vapors, or structures.



The Aftertreatment DEF Tank Low Level Indicator icon illuminates when the fluid level is low. It also flashes when the level becomes critically low.



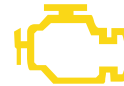
Malfunction Indicator Lamp

If the MIL lamp comes on (or stays on after the vehicle has started), the engine diagnostic system has detected a possible fault in the emission control system. Driveability may be affected, see an authorized Mack® dealer as soon as possible for inspection.

- MIL indicates government Regulated On Board Diagnostics (OBD) faults.
- The MIL is illuminated when there is an OBD malfunction. When a malfunction is detected, the OBD system stores a pending code. If the identified malfunction is again detected before the end of the next driving cycle, the OBD system illuminates the MIL continuously. The system stores the pending confirmed

code. The MIL cannot be used for any other purpose.

- If the malfunction is no longer detected in three drive cycles, the MIL is turned off at the next engine start.
- **Call the dealership when the MIL is illuminated to schedule time to repair the vehicle. Lamp can remain active after repair until system confirms repair.**



DEF Tank Level

Aftertreatment DEF tanks are sized to have no less than two times the diesel fuel tank mileage or one-hour range.

The vehicle instrument cluster has an aftertreatment DEF tank level gauge.

! NOTE Repeated acts of tampering can result in more severe Inducement.
--

	Display Screen: ENGINE IN DERATE Refill DEF tank to avoid 5 MPH limit Trigger: DEF tank empty and refueling event with parking brake applied
	Display Screen: DEF TANK EMPTY Vehicle speed limited to 5 MPH Refill DEF fluid. Trigger: Vehicle Stationary for 1 Hour or Engine re-start (Key OFF, Key ON)

DEF Quality

The vehicle instrument cluster has an aftertreatment DEF quality indicator.

Triggers	Aftertreatment DEF Quality Indicator	Driver Information Display Screen
Good DEF Quality	None	None
Poor DEF Quality DTC Initial Detected	CHECK	POOR DEF QUALITY Engine will derate in approx. ____ mins
Poor DEF Quality DTC Initial Detected + 1 hours	CHECK	ENGINE IN DERATE Poor DEF quality. 5 MPH in approx. ____ mins Note: : Once this DEF Quality fault occurs the DID timer displays. The timer displays the minutes available before the 5 mph derate occurs. The timer can be cleared using the Escape (ESC) button on the stalk switch control lever. When the vehicle is restarted after shutdown the remaining minutes before derate occurs will reappear.
Poor DEF Quality DTC Initial Detected + 4 hours	CHECK	Service DEF 5 MPH limit next veh stop.
Refueling Event with Parking Brake ON	CHECK	POOR DEF QUALITY Service DEF Vehicle speed limited to 5 MPH.

Triggers	Aftertreatment DEF Quality Indicator	Driver Information Display Screen
Vehicle Stationary for 1 Hour or Engine re-start (Key OFF, Key ON)		POOR DEF QUALITY Service DEF. Vehicle speed limited to 5 MPH.
Ignition Key Cycle		POOR DEF QUALITY Service DEF. Vehicle speed limited to 5 MPH.

Exit conditions for DEF Quality "8 Km/h (5 mph) road speed limit" Inducement:

Next 1 Engine Starts: Return to 25% torque reduction until there is a proper DEF quality evaluation. If poor DEF quality is detected during the next monitoring cycle, then 8 Km/h (5 mph) is resumed after the vehicle is stationary for 1 Hour. After one engine start has been exhausted, then a Tech Tool is required to exit the 8 Km/h (5 mph) road speed limit.

Aftertreatment Tampering

When the SCR tampering fault is active for one or more hours, a new Driver Information Display (DID) screen appears. The text changes for the Driver Information Display (DID) screen associated with this fault are listed in the following table.

Triggers	Aftertreatment Tampering Indicator	Driver Information Display Screen
No Fault	None	None
Tampering Fault Detected Note: For examples of the various SCR sensor tampering types refer to the "SCR Sensor Disconnected Tampering Type" table below.		SCR System Fault Engine will Derate in approx. __ mins
Driving with Active Fault for + 1 hrs		SCR system fault. Engine in derate 5 MPH limit in approx. <__mins Note: Once this SCR tampering fault occurs the DID timer displays. The timer displays the minutes available before the 5 mph derate occurs. The timer can be cleared using the Escape (ESC) button on the stalk switch control lever. When the vehicle is restarted after shutdown the remaining minutes before derate occurs will reappear.

Triggers	Aftertreatment Tampering Indicator	Driver Information Display Screen
Driving with Active Fault for + 4 hrs		SCR system fault. Repair needed. 5 MPH limit after next vehicle stop.
1 Refueling Event (> 15 % fuel level increase) with stationary brake 2 Vehicle stationary for 1 Hour (vehicle speed < 1.6 Km/h (1 mph) 3 Ignition Key Cycle		SCR system fault. Veh speed limited to 5 MPH

SCR Sensor Disconnect

SCR Sensor Disconnected Tampering Type
Exhaust Temperature Sensors Disconnected
Aftertreatment Control Module (ACM) Disconnected
Aftertreatment NOx Sensor Disconnected
Aftertreatment NOx Sensor Disconnected
DEF Pump Disconnected
DEF Dosing Valve Disconnected
DEF Tank Level Sensor Disconnected
DEF Supply Line to DEF Pump Disconnected
DEF Return Line Blocked or Plugged

Diesel Exhaust Fluid

CAUTION

To avoid tank damage, do not attempt to top-off Diesel Exhaust Fluid (DEF). DEF expands when frozen and air volume space at the top of the tank is needed.

Diesel Exhaust Fluid (DEF) is a reactant that is key to the SCR process. DEF is a nontoxic, ultra-pure solution of urea and ultra-pure water. Urea is a compound of nitrogen that turns to ammonia when heated. The fluid is non-flammable, and is not dangerous when handled as recommended. However, it is highly corrosive to certain metals, especially copper and brass. Read the separate section concerning the handling of DEF solution.

Use only Diesel Exhaust Fluid that is clearly labeled as meeting ISO-22241 standards, and certified by the American Petroleum Institute. The container must display the API certification seal. Never use agricultural or industrial grade urea. Use of fluids other than API certified Diesel Exhaust Fluid will compromise aftertreatment system performance, increase emissions, and may impact your product warranties. There is a DEF quality sensor that detects diluted DEF. If diluted DEF is detected the emissions system will enter into inducement. Never dilute DEF with water or any other fluid.

NOTE

Diluted Urea will negatively effect engine performance.

It is recommended that DEF is not stored in extreme hot or cold conditions, or for prolonged periods. Follow the instructions for proper storage and handling as indicated on the container or provided with the purchase.

NOTE

Agriculture mixtures are not pure enough for use in the SCR system and impurities in the solution comprise the SCR system.

Diesel Exhaust Fluid (DEF) Handling

When handling DEF solution, it is important to prevent contact with electrical connections. There is a risk that the DEF causes oxidation that cannot be removed. Water or compressed air do not help, since DEF quickly oxidizes certain metals. A disconnected connector can come into contact with the DEF solution. If this situation occurs, the connector must be replaced immediately to prevent the DEF solution from creeping further into the copper wiring.

CAUTION

When detaching hoses and components, do not spill DEF on disconnected or unsealed connectors. If DEF is spilled on a disconnected or unsealed connector, the connector must be replaced immediately.

Things to know about spilled Diesel Exhaust Fluid (DEF)

If DEF solution comes into contact with the skin: Rinse with plenty of water and remove contaminated clothing.

If DEF solution comes into contact with the eyes: Rinse for several minutes and call for medical help if necessary.

If inhaled: Breathe fresh air and call for medical help if necessary.

Do not allow the DEF solution to come into contact with other chemicals.

The DEF solution is not flammable. If the DEF solution is exposed to high temperatures, the fluid breaks down into ammonia and carbon dioxide.

The DEF solution is highly corrosive to certain metals, including copper and brass.

If the DEF solution is spilled onto the vehicle, wipe off the excess and rinse with water. Spilled DEF solution can form concentrated white crystals on the vehicle. Rinse off these crystals with water.

ⓘ NOTE

Do not flush DEF spillage into the normal drain system.

Diesel Exhaust Fluid (DEF) Consumption**⚠ CAUTION**

To avoid tank damage, do not attempt to top-off Diesel Exhaust Fluid (DEF). Diesel Exhaust Fluid (DEF) expands when frozen and air volume space at the top of the tank is needed.

DEF consumption is related to fuel consumption. A highway truck may travel 362-482 Km (225-300 miles) or more on one gallon of DEF. A gauge much like a fuel gauge will indicate the level of DEF in the tank. A DEF low-level warning will activate when DEF is low. If a driver runs out of DEF completely, vehicle power will be reduced. When the DEF tank is refilled, the engine will resume normal power.

ⓘ NOTE

DEF tanks are sized for a two to one fuel to DEF ratio in order to meet US 2010 requirements.

Diesel Exhaust Fluid (DEF) Availability

DEF is available in 2.5-gallon containers, 55-gallon drums, 275 gallon IBC and in bulk storage for fleet locations, truck stops, and dealerships.

DEF freezes at -11°C (12°F). Protect DEF from extended periods of severe cold. For, more information on DEF and availability visit the website www.mackscr.com or contact Mack One-Call at 1-800-866-1177.

Misfilling Diesel or Aftertreatment DEF Tanks**⚠ CAUTION**

The misfilling of either Diesel Exhaust Fluid (DEF) or diesel fuel can cause vehicle diagnostic trouble codes, improper component operation or damage. If misfilling occurs do not start the vehicle. Also, tow the vehicle immediately to a certified technician for service.

Although diesel fuel and Aftertreatment Diesel Exhaust Fluid (DEF) caps are clearly labeled and filler necks and nozzles are different accidents can happen.

Contamination of fluids by misfilling of diesel or DEF in the wrong tank can result in vehicle malfunction.

Results of misfilling DEF in Diesel Tank

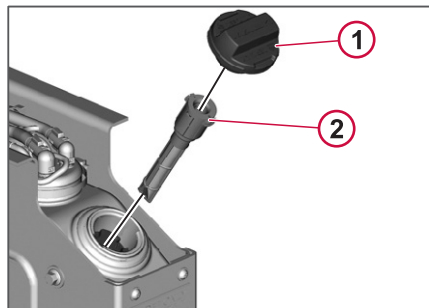
- Engine can run poorly or fail
- Injectors can be damaged
- Exhaust system corrosion can occur between turbocharger and Aftertreatment DPF
- On Board Diagnostic (OBD) Diagnostic Trouble Codes (DTC)
- Costly repairs

Results of misfilling diesel in Aftertreatment DEF Tank

- Diesel can damage the Aftertreatment SCR system
- Diesel can damage the SCR Catalyst (chemical damage)
- Emissions can be non-compliant
- On Board Diagnostic (OBD) Diagnostic Trouble Codes (DTC)
- Costly repairs

DEF Tank Filler Filter

Remove and inspect the Filler neck filter (2) at each oil change. Clean the filler filter if debris is present. Replace only if the component is excessively contaminated or damaged.



1 DEF Tank Cap

2 DEF Tank Filler Neck and Filter

Aftertreatment Diesel Particulate Filter

CAUTION

Use of improper diesel fuel and engine oils, adversely affects performance, efficiency, and durability of the aftertreatment DPF system and engine. Potential engine failure is possible. Manufacturers warranties can also be rendered void due to usage of improper fuel. Unapproved fuel additives (including engine oil) are NOT permitted. Blends of No. 1D and No. 2D grades of ULSD are recommended and allowable for cold-weather operations.

The exhaust aftertreatment system virtually eliminates exhaust smoke. White exhaust vapor (water condensation) can be visible during a cold start. If black exhaust smoke is visible during engine operation, a problem exists with the exhaust aftertreatment system. Take the vehicle to an authorized Mack Truck dealer immediately.

Vehicles equipped with a 2010 or newer emission-compliant engine have an exhaust aftertreatment system. This system includes a Selective Catalytic Reduction (SCR) system and a Conventional aftertreatment Diesel Particulate Filter (DPF). The aftertreatment DPF takes the place of

the standard muffler, and it reduces particulate emissions into the atmosphere. A filter collects soot and other particulate matter where it is eventually oxidized using a regeneration process. Vehicles equipped with an aftertreatment DPF require the use of EO-O Premium Plus (or VDS-4) diesel engine oil and Ultra Low Sulfur Diesel (ULSD) fuel.

Diesel Particulate Filters

WARNING

For chassis equipped with a heated dump body, temperature around the area where the exhaust enters the body can be elevated. This state is evident particularly during DPF regeneration.

CAUTION

When active regeneration occurs, the temperature of the exhaust is elevated. DO NOT park the vehicle with the exhaust outlet under low hanging overhead flammable objects such as trees, awnings, and structures. Elevated exhaust temperatures could damage these objects. DO NOT remove the diffuser.

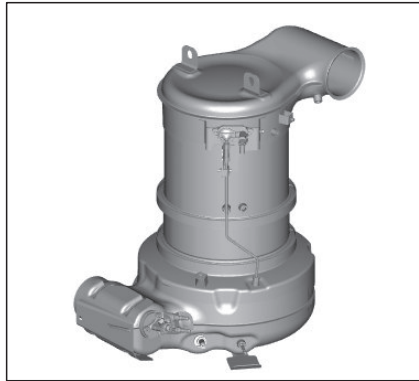
⚠ CAUTION

Do not perform active regeneration, if the vehicle is located in a hazardous location. If the vehicle is located in such a location, stop the regeneration by pushing the DPF switch to the "Stop Regeneration" position. If active regeneration is stopped, restart when the vehicle is in a safe location. However, if active regeneration is stopped repeatedly, take the vehicle to a certified service facility. The technician uses a service tool to initiate the regeneration.

⚠ CAUTION

Use of improper diesel fuel or engine oils adversely affects performance, efficiency, and durability of the DPF system and the engine. Engine failure can occur. Warranties are rendered void due to usage of improper fuel. Unapproved fuel additives (including engine oil) are NOT permitted.

The chassis is equipped with a 2010 or newer emission-compliant engine, with a Diesel Particulate Filter (DPF) and Selective Catalytic Reduction (SCR) system. Vehicles equipped with a DPF require EO-O Premium Plus (or VDS-4) high performance diesel engine oil and Ultra Low Sulfur Diesel (ULSD) fuel.



A Diesel Particulate Filter (DPF) takes the place of the standard muffler. The DPF is used to meet EPA requirements to help reduce soot and particulate

emissions into the atmosphere. The particulates are removed by collecting in the DPF unit, where they are eventually oxidized with passive regeneration or active regeneration of the filter. The Engine Control Unit (ECU) and exhaust aftertreatment system determines when regeneration is required.

Conventional exhaust aftertreatment systems use passive and active regeneration. The passive regeneration process oxidizes the particulates captured in the DPF while the vehicle is in operation. An oxidation catalyst raises the exhaust temperature to approximately 260°C (500°F). This temperature is when a chemical reaction takes place to oxidize the soot (passive regeneration).

Aftertreatment DPF Regeneration

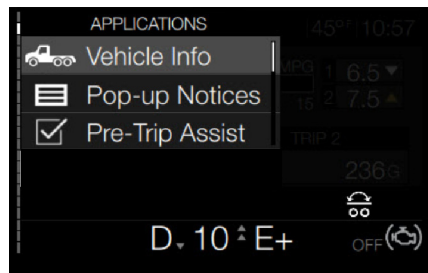
EATS Status

The EATS Status sub-menu is located in the Vehicle Info DID menu. From this sub-menu the driver can check the ash and soot level in the EATS system. Also, regeneration can be performed if required.

To access the EATS Status menu from the Driver Information Display, complete the following steps:

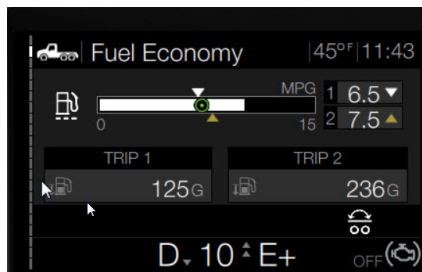
1. Press the Applications button on the right-hand side of the steering wheel.

The Applications menu screen displays.



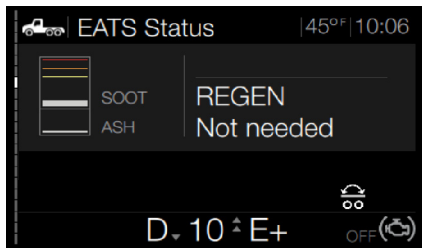
2. If necessary, use the Toggle/Enter button to scroll to Vehicle Info.
3. Press Enter.

Then initial Vehicle Info screen displays.



4. Use the Toggle/Enter button to scroll to the EATS Status sub-menu.

The EATS Status sub-menu displays.



The EATS Status menu displays the soot and ash level. If either of these measure above acceptable levels, a regeneration is required.

Regeneration

CAUTION

During the aftertreatment DPF regeneration, the exhaust gas temperature will be elevated. **DO NOT** park the vehicle with the exhaust outlet near flammable objects such as trees, awnings, etc. that could be damaged by elevated exhaust gas temperatures.

CAUTION

If the vehicle is **PARKED** in a location that may be hazardous when a parked regeneration begins (i.e., in close proximity to flammable materials or gases, inside tunnels, parked under flammable objects, etc.), the aftertreatment DPF regeneration should be stopped. If regeneration is stopped by the vehicle operator, it must be initiated at a later time when the vehicle is in a safer location. Regenerations that are stopped and never restarted at a later time, however, will require that the vehicle be taken to an authorized dealer to have the aftertreatment parked regeneration manually started with special service tools.

❗ NOTE

If passive regeneration occurs during vehicle operation, idle speed may increase when the vehicle is stopped at a traffic light to maintain proper Regeneration conditions.

There are two types of aftertreatment DPF regeneration: Passive regeneration and Parked or 'Active' regeneration.

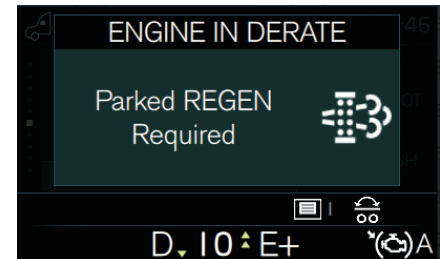
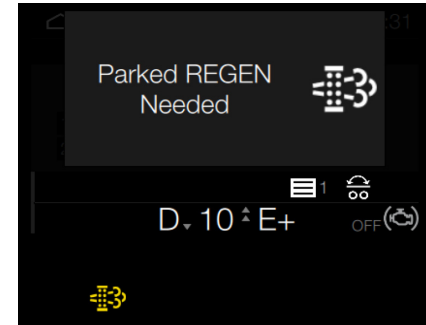
Passive regeneration occurs when the exhaust gas within the aftertreatment system is hot enough to burn soot without injecting additional fuel into the DPF system. On chassis equipped with a US07 aftertreatment system, DPF's required an active regeneration, that includes this injection of fuel.

Parked or 'Active' regeneration is initiated manually by the driver when alerted by the DID. The vehicle must be stationary to begin the regeneration, and remain stationary to complete.

The Aftertreatment DPF Regeneration system is self-monitoring. When the aftertreatment Diesel Particulate Filter is full, aftertreatment DPF regeneration is needed. The Aftertreatment DPF Regeneration Needed icon illuminates in the instrument cluster. Also, the "**Parked REGEN Needed**" message is displayed.



- 1 Engine Brake Toggle
- 2 Applications/Home Button
- 3 Toggle Up Position
- 4 Options/Enter Button
- 5 Cruise Control Brake Increase (+)/ Decrease (-) Button
- 6 Toggle Down Position

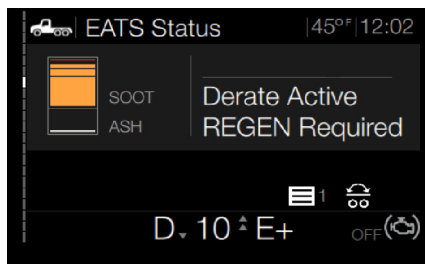


To return to the main menu, press the Options/Enter button on the right-hand stalk.

To access the EATS Status menu, and perform a regeneration, complete the following procedure.

1. Use the Toggle button to scroll to the EATS Status sub-menu.

The EATS Status sub-menu displays.



The EATS Status menu displays the soot and ash level. If either of these levels is above acceptable levels, a regeneration is required.

When the EATS Service DID screen display and the Stop Light illuminates, stop the vehicle immediately and perform a Parked Regen. If that Parked Regen fails take the vehicle immediately to a Mack service center for EATS.



The High Exhaust System Temperature (HEST) Icon comes on when the vehicle exhaust temperature becomes elevated. The Icon also comes on during the REGEN.



NOTE

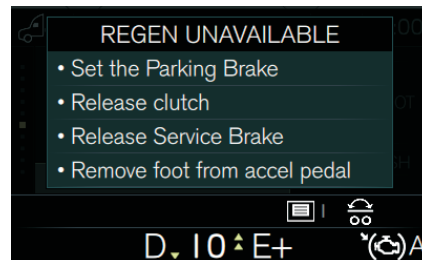
It is important to perform a regeneration when required to avoid engine problems. Long-term engine operation with Aftertreatment DPF Regeneration Required screen displayed may result in a loss of engine performance, reduced horsepower, torque and speed, and derate. Also, the aftertreatment DPF may become overloaded with soot and require service at a authorized Mack dealer.

Aftertreatment DPF Regeneration cannot be initiated if not required. The following conditions must be met for parked Regeneration:

- Parking brake on and transmission in neutral
- Minimum 10-volts battery charge
- Engine running
- Accelerator and clutch pedal released
- PTO not active

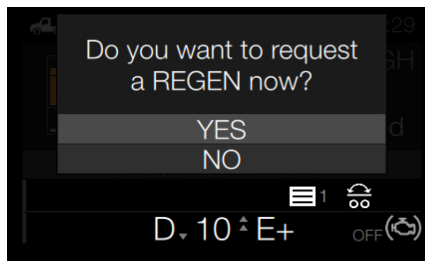
- Parked Aftertreatment Regeneration required, message displayed

If the conditions are not met and a parked REGEN is attempted the "Regen Unavailable" screen displays.



Once all the regeneration conditions are met, press Enter.

The Do you want to request a REGEN now? screen displays.

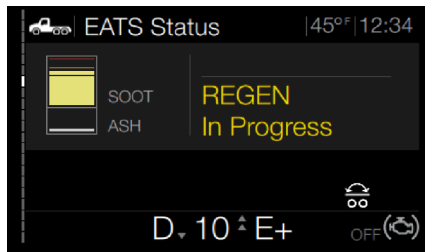


Press Enter (YES) to start the regeneration.

NOTE

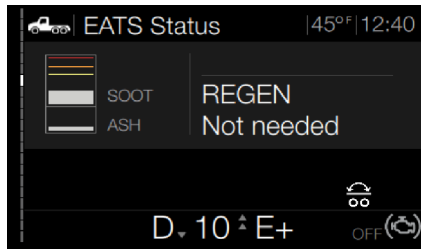
To cancel the regeneration, using the Toggle/Enter switch, scroll to NO. Press Enter. The DID returns to the EATS Status screen.

If a regeneration is initiated the "REGEN in progress" screen displays. This screen displays as long as the regeneration occurs.



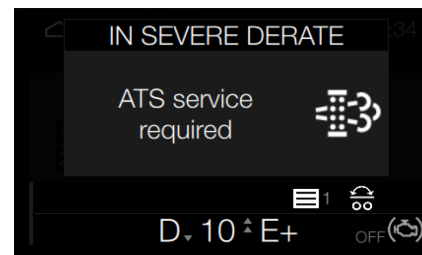
When the regeneration is completed, the soot and ash levels return to acceptable levels.

The Soot Level: OK REGEN Not needed screen displays.

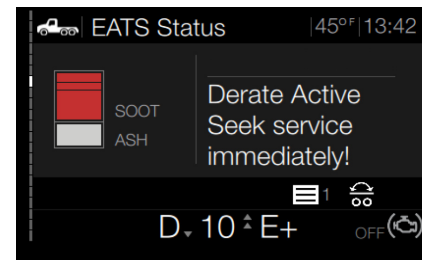


EATS Condition Critical

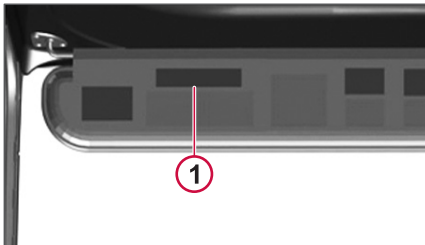
If the Aftertreatment DPF Regeneration Required icon is flashing and the CHECK light illuminates, the Aftertreatment Diesel Particulate Filter is critically full. Engine performance is limited. To avoid further engine derate, immediately move the vehicle to a safe location and initiate a parked Aftertreatment DPF Regeneration. If a parked regeneration is not available take the vehicle immediately to an certified technician.



Also, the EATS Status Critical screen displays in the Vehicle Info menu.



Refer to the Exhaust Aftertreatment System Information sun visor label for additional aftertreatment DPF information.



<https://truckmanualshub.com/>

MAINTENANCE, LUBRICATION AND SERVICE

PRE-TRIP INSPECTION AND DAILY MAINTENANCE

DANGER

Before working on or inspecting a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

NOTE

Make sure that all fluid levels are at their proper levels. If the fluids are not at their proper levels, add as necessary.

NOTE

While Checking the fluid levels, visually inspect hoses, pipes and their connections for signs of leakage. Inspect the ground under the engine, transmission and rear axle(s) for signs of leakage.

NOTE

Failure to address leaks in a timely manner, may lead to preventable failure and void warranty on that component.

Safety is the most important and obvious reason for doing a pre-trip inspection. Federal and state laws require inspection performed by the driver. Federal and state inspectors also inspect commercial vehicles. An unsafe vehicle can be placed "out of service" until the driver or owner corrects the

deficiency. Owners and operators should familiarize themselves with sections 49 CFR 396.11 and 396.13 concerning Federal requirements for vehicle inspection. Certain other laws may also apply.

Section 49 CFR 396.13 states that all motor carrier drivers must complete a written report at the end of each work day for each vehicle operated, covering most of what is covered in the pre-trip list. The report should list all defects or deficiencies discovered by the driver. A pre-trip inspection prepares for the end-of-work report.

In this section are the suggested guidelines to be used in performing truck, tractor and trailer pre-trip inspections. Depending on the application of the vehicle being used, these guidelines should be modified to include other necessary inspection points. For example, steps and grab handles should be checked daily on refuse trucks because the operator is getting in and out of the cab more frequently.

If any component or system does not pass this inspection, it must be corrected before operating the vehicle. Whenever equipment requires adjustment, replacement, repair or lubrication, refer to the Service Manuals or contact an authorized dealer for the

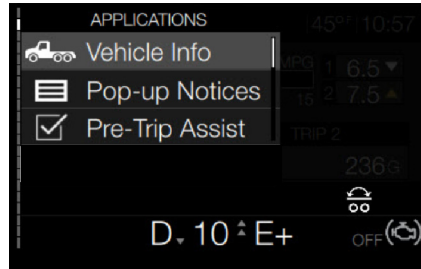
correct procedures, specifications and intervals. Take your time going through the pre-trip inspection. Remember that a careful pre-trip inspection saves time by eliminating unscheduled stops for correcting a faulty item. The following information has been provided by the American Trucking Association as developed by the D.O.T. Office of Motor Carriers (BMCS).

PRE-TRIP INSPECTION AND DAILY MAINTENANCE**Pre-Trip Assistant**

The Pre-Trip Assistant option is a tool to assist the driver in completing the pre-trip inspection of the vehicle. Use this feature via the Driver Information Display (DID). This option is not a substitute for a complete pre-trip inspection. If any system of the vehicle does not pass inspection, the problem must be corrected before operating the vehicle.

The following tests are available:

- Activate Exterior Light Inspection Test; Allows the driver to perform system controlled test of the vehicle's lighting systems.
- Light Switch Test Check List; Allows the driver to physically activate each switch. If the switch operates properly it is noted on the Switch Test DID screen.
- Air Brake Leak-Down Test; Allows the driver to check the air system for leaks. Any leaks are noted on the Leak-Down Test DID screen.

**NOTE**

The Hazard and High/Low beam switches are momentary switches and return to the OFF position when released during testing.

Activate Exterior Light Inspection Test

- 1 The Activate Exterior Light Inspection Test repeatedly turns all exterior lights ON/OFF for the vehicle. This check allows the operator to start the test, exit the vehicle and do a visual check and determine that all exterior lighting is functioning properly.

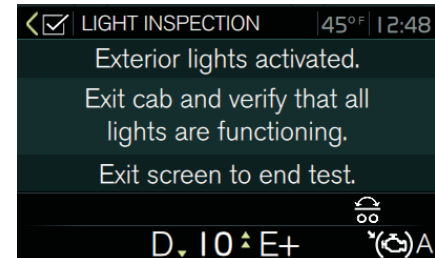
The following exterior lights are cycled through the check:

- Parking
- Hazard

- Turn signals (left and right)
- High/Low beam headlights
- Brake
- Fog/Driving (Optional)

To start the test, from the Pre-Trip Assistant main screen, select Activate Exterior Light Inspection Test.

Press Enter.



Once the test is started all exterior lights flash on and off so that you can perform a visual check. The test continues to run until the Applications button on the steering wheel controls is pressed. The test turns off if the vehicle is moving faster than 5 km/h (3 mph).

Light Switch Test Check List

- 1 The Light Switch Test Check List checks the functionality of the

PRE-TRIP INSPECTION AND DAILY MAINTENANCE

switches and their corresponding circuits. To start the tests, the driver must turn the individual switches on/off. As the switches turn ON/OFF, the cluster updates the DID to show switch option being tested and its status.

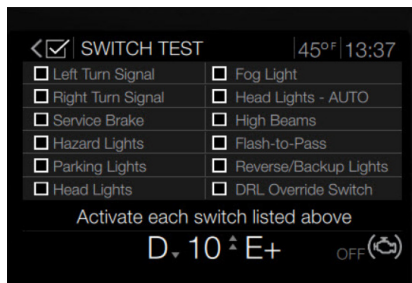
NOTE

For additional information concerning the stalk controls, refer to the Stalk Controls sub-section of the Driver Information Display (DID) chapter.

From the Pre-Trip Assistant main screen, select Light Switch Test Check List.

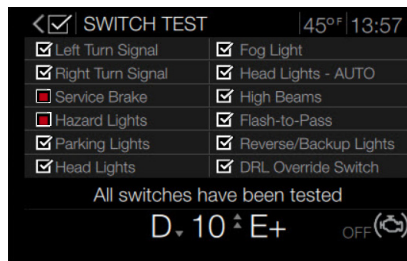
Press Enter.

The Switch Test screen displays.



Manually turn ON/OFF each switch listed on the checklist.

The check list is updated with the results of each switch test as they are completed. Check boxes represent a successfully completed test. Red boxes represent failed tests.



A red checkbox could mean that the switch is not available or an error has occurred. If any of the checkboxes display red, for available switches, maintenance is required by a certified technician before driving the vehicle.

Air Brake Leak-Down Test

- 1 The Air Brake Leak-Down Test allows the driver to measure the amount of air pressure drop in the primary and secondary brake air systems. After selecting Air Brake Leak-Down Test from the Pre-Trip Assistant main screen, you are prompted to apply the service brake for 60 seconds. After applying and

holding the service brake for 60 seconds, the DID will display the amount of pressure drop in the brake system.

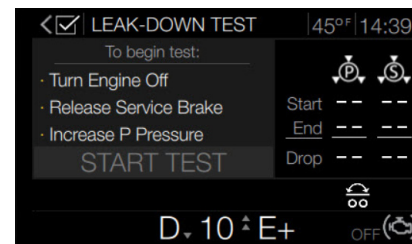
Before starting the test through the DID, complete the following:

- Start the engine and check that the brake pressure gauges are greater than 100 psi.
- Turn the engine off.
- Release the park brake.

The initial Leak-Down test screen displays.

NOTE

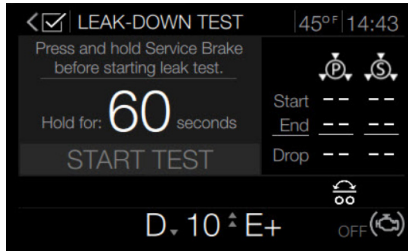
Before starting the leak-down test secure the vehicle by parking it on a level surface, applying the parking brake, and chocking the front wheels.



The air tanks must have 100 psi of pressure, in order for the Leak-Down test to initiate.

PRE-TRIP INSPECTION AND DAILY MAINTENANCE

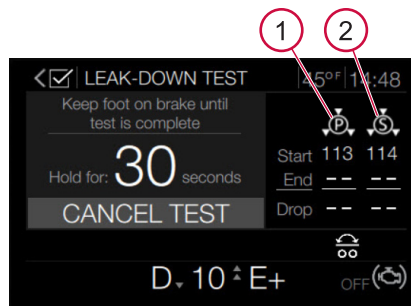
- 2 When the test is ready to start, the following screen displays.



Press and hold the brake pedal until the test is completed.

To begin the test, press Enter.

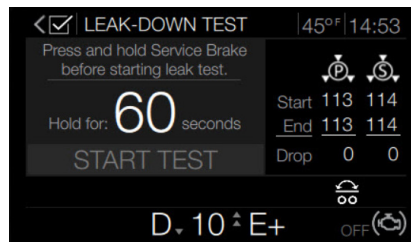
PRE-TRIP INSPECTION AND DAILY MAINTENANCE



1 Initial Primary Brake Air Pressure

2 Initial Secondary Brake Air Pressure

When the test is completed, the following screen displays. The test results are displayed on the right side of the screen for both the primary and secondary brake circuits.



1 Pre-trip Approach Vehicle

Inspect the vehicle in a circular manner.

Approaching the Vehicle

- Check under the vehicle for oil, fuel, coolant leaks or other signs of damage.
- Check body surfaces for signs of breaks or damage.

Preparation

- Open drain cocks on air tanks to let the tanks drain.
- Chock wheels on vehicle and, if hooked up, trailer.
- Close air tank drain cocks.
- Start the engine and let the air pressure build up to normal. Stop engine check for air leaks.
- Switch on parking lights and hazard lights.
- Apply parking brakes. Listen for air leaks.
- Raise cab so belts can be checked.

2 Left Side of the Cab

Left Front Wheel

- Check condition of wheel rim. Especially look for cracks,

missing lockrings, bent or broken studs, missing clamps or lug nuts.

- Check condition of tire: properly inflated, no serious cuts, bulges, tread wear or any signs of misalignment; valve stem not touching wheel, rim or brake drum; valve cap in place.
- Check wheel bearing and hub: no obvious leaking on outside or inside wheel. Verify correct oil level in hub.

Left Front Suspension

- Check condition of spring, spring hangers, shackles, u-bolts: no cracks, breaks or shifting.
- Check shock absorber condition.

Left Front Brake

- Condition of brake drum. With brakes released, look for a noticeable gap between lining and drum. This check cannot be made if dust covers are in place.
- Condition of brake air hose.
- Check brake chamber mounting bolts and bracket.
- Check slack adjuster and chamber pushrod travel for proper brake adjustment.

Left Front Axle and Steering System

- No loose, worn, bent, damaged or missing parts.

Engine Compartment, Left Side

- Check coolant hose condition.
- Check condition of fan drive belts.
- Check engine and surrounding areas for coolant, oil and fuel leaks.
- Check wiring harnesses for signs of damage.

3 Front of Cab Area Condition of Windshield

- Check for damage and clean if dirty.
- Check windshield wiper arms for proper spring tension.
- Check wiper blades for any damage, "dead" rubber and attachment to arm.

Lights and Reflectors

- Lower cab and inspect parking, clearance and identification lights on cab. They should be clean, operating and of the proper color.

PRE-TRIP INSPECTION QUICK LIST

- Reflectors clean and proper color.
- Turn on headlights. High and low beams should be operating and lenses clean. If equipped, check daytime running lights.
- Left and right front turn signal lights clean, operating and proper color.

Grille

- Check that charge air cooler and radiator or bugscreens are clean and undamaged.

4 Right Side of Cab Area Right Front Wheel

- Check condition of wheel rim. Especially look for cracks, missing lockrings, bent or broken studs, missing clamps or lug nuts.
- Check condition of tire: properly inflated, no serious cuts, bulges, tread wear or any signs of misalignment; valve stem not touching wheel, rim or brake drum; valve cap in place.
- Check wheel bearing and hub: no obvious leaking on outside or inside wheel. Verify correct oil level in hub.

Right Front Suspension

- Check condition of spring, spring hangers, shackles, u-bolts: no cracks, breaks or shifting.
- Shock absorber condition.

Right Front Brake

- Condition of brake drum. With brakes released, look for a noticeable gap between lining and drum. This check cannot be made if dust covers are in place.
- Condition of brake air hose: check for any chafing.
- Check slack adjuster and chamber pushrod travel. With brakes applied or released, look for conspicuously different positions of the slack adjusters for proper brake adjustment.
- Check brake chamber mounting bolts and bracket.

Condition of Front Axle and Steering System, Right Side

- No loose, worn, bent, damaged or missing parts.

Engine Compartment, Right Side

- Check condition coolant and heater hoses.
- Check condition of fan drive belts.

- Check engine and surrounding areas for coolant, oil and fuel leaks.
- Check fuel separator sight glass and drain if necessary. Check for leaks.
- Check wiring harness for sign of damage.
- Check air filter with brackets and hoses for loose connections or damage. Check filter gauge, if mounted on the filter.

! NOTE

example note

5 Right Saddle Tank Area Right Fuel Tank(s)

- Securely mounted Diesel and Diesel Exhaust Fluid are not damaged or leaking.
- Fuel lines secure and not leaking. Check that shut-off valves are open.
- Tank(s) full of fuel. Cap on and secure.

Condition of Visible Components

- Rear of engine: not leaking.
- Transmission: not leaking. If equipped with oil cooler, check

cooler, hoses and fittings for leaks.

- Check drive shaft.
- Exhaust system: secure, not leaking, not touching wires, fuel or air tubing.
- Frame and cross members: no bends, cracks or breaks. DPF/SCR check hoses and fittings for leaks.
- Air tubing and electrical wiring: secured against snagging and chafing.

6 Right Rear Vehicle Area **Dual Wheels, One or Two Axles**

- Check condition of wheels and rims. Especially look for cracks, missing lockrings, bent or broken spacers, studs, missing clamps or lug nuts.
- Check condition of tires: properly inflated, no serious cuts, bulges, tread wear or any signs of misalignment; valve stems not touching wheels, rims or brake drums; valve caps in place and no objects stuck between the wheels.
- Check that both tires are of same type, for example, not mixed

radial and bias type and that their circumferences are matched.

- Check wheel bearing and hub: no obvious leaking on outside or inside wheel.

Suspension

- Check condition of springs (leaf), spring hangers, shackles and u-bolts.
- Axle alignment.

Brakes

- Condition of brake drums. With brakes released, look for a noticeable gap between lining and drum. This check cannot be made if dust covers are in place.
- Condition of brake hoses: check for any chafing.
- Check brake chamber mounting bolts and brackets.
- Check slack adjusters and chamber push rod travel. With brakes applied or released, look for conspicuously different positions of the slack adjusters for proper adjustment.
- Check spring brakes.

7 Rear of Vehicle Area

- Frame or cross members not bent, cracked or otherwise damaged or missing.
- Check that air tubing and electrical lines are properly secured to the frame with no damage or chafing.

Lights and Reflectors

- Tail lights, brake lights and turn signal lights: operating, clean and proper color.

8 Coupling System Area **Fifth Wheel**

- Securely mounted to the frame.
- No missing or damaged parts.
- Check that trunnion and plate are properly lubricated.

Sliding Fifth Wheel

- Mechanism not worn, bent, damaged or parts missing.
- Properly lubricated.
- All locking pins present and locked in place.
- If air operated: no air leaks.

Air Tubing and Electric Lines Visible From This Point

- Should be secure from dangling.

- Both air lines and electric line should be free from damage, oil and grease.

9 Left Saddle Tank and Left Rear Vehicle Wheels Area Dual Wheels, One or Two Axles

- Check condition of wheels and rims. Especially look for cracks, missing lockrings, bent or broken spacers, studs, missing clamps or lug nuts.
- Check condition of tires: properly inflated, no serious cuts, bulges, tread wear or any signs of misalignment; valve stems not touching wheels, rims or brake drums; valve caps in place and no objects stuck between the wheels.
- Check that both tires are of same type, for example, not mixed radial and bias type and that their circumferences are matched.
- Check wheel bearing and hub: no obvious leaking on outside or inside wheel.

Suspension

- Check condition of springs (leaf or air), spring hangers, shackles and u-bolts, no cracks, breaks or shifting.

Brakes

- Condition of brake drums. With brakes released, look for a noticeable gap between lining and drum. This check cannot be made if dust covers are in place.
- Condition of brake hoses: check for any chafing.
- Check brake chamber mounting bolts and brackets.
- Check slack adjusters and chamber push rod travel. With brakes applied or released, look for conspicuously different positions of the slack adjusters for proper brake adjustment.
- Check spring brakes.

Condition of Visible Components

- Transmission: not leaking.
- Driveshaft: looks OK.
- Exhaust system: secure, not leaking, not touching wires, fuel or air tubing.
- Frame and cross members: no bends, cracks or breaks.
- Air tubing and electrical wiring: secured against snagging and chafing.

Left Fuel Tank(s)

- Securely mounted and not damaged or leaking.
- Fuel lines secure and not leaking. Check that shut-off valves are open.
- Tank(s) full of fuel. Cap on and secure.

Battery Area

- Open the battery box. Battery box securely mounted to vehicle.
- Batteries secured against movement.
- Battery cases not broken or leaking. Battery cables free from damage.
- Tops of batteries and terminals clean and free from foreign material.
- If equipped, replace battery lid and make sure it is securely fastened.

In the Cab

Check steps and grab handles for looseness or breakage. Also, clean them if there is any substance that makes them slippery, which makes cab entry/exit hazardous.

- Start the engine. If equipped, check that exhaust rain cap opens when accelerating engine.

- Check gauges and tell-tale light function. See the Instruments and Controls section.
- Check function of low air warning.
- Check clutch function. If equipped, check for clutch brake function.
- Check windshield wipers and washers and horns, including back-up alarm, if equipped.
- Clean inside windshield, door windows and instruments. Clean mirrors.
- Check temperature control and defroster. If equipped, check mirror heater.
- Check condition of warning triangles, fire extinguisher and flares.
- Adjust the seat. Check mirror adjustment.
- Check safety belts for function and damage.
- Apply service brakes. After initial drop, pressure should hold steady, or increase slightly, with engine at idle.
- Check steering wheel for excessive free play.

- Check for loose items in the cab. Secure them if necessary.

Hooking Up To Trailer

Hook-Up Preparation

- Check kingpin and mounting plate on trailer, free from wear, bends or damage.
- Chock trailer wheels.

Fifth Wheel or Trailer Hitch

- No visible space between fifth wheel and trailer.
- Locking jaws around the shank and not the head of kingpin.
- Release lever properly seated and safety latch/lock engaged.
- Check all connections to dolly or trailer hitch and safety chains are secured.
- Check function of trailer air supply valve and trailer brakes.

Sliding Fifth Wheel

- Check that fifth wheel is not so far forward that the tractor frame will strike the landing gear during turns.

10 Trailer Front Area **Air and Electrical Connections**

- Glad hands properly mounted, free from damage and not leaking.
- Trailer cord receptacle properly mounted, free of damage; plug properly seated and safety catch engaged to prevent accidental disconnect.
- Air and electrical lines properly secured against tangling, snagging and chafing with sufficient slack for turns.

! NOTE

Refer to the trailer manufacturer's manual for specific information on the trailer checks.

11 Right Side of Trailer Area **Landing Gear or Dolly Area**

- Fully raised; no missing or damaged parts.
- Crank handle present and secured.
- If power operated, no air/hydraulic leaks.

Spare Wheel(s)

- Carrier or rack not damaged.
- Spare wheel securely mounted in rack.

- Tire and wheel condition adequate for a spare: proper size, properly inflated.

Lights and Reflectors

- Trailer side clearance lights: clean, operating and proper color.
- Reflectors clean and proper color.

Frame and Body

- Frame and crossmembers not bent, cracked, damaged or missing.
- Proper placarding.
- Body parts not damaged or missing.

12 Right Rear Trailer Wheel Dual Wheels, One or Two Axles

Check condition of wheels and rims. Especially look for cracks, missing lockrings, bent or broken spacers, studs, missing clamps or lug nuts.

Check condition of tires: properly inflated, no serious cuts, bulges, tread wear or any signs of misalignment; valve stems not touching wheels, rims or brake drums; valve caps in place and no objects stuck between the wheels.

Check that both tires are of same type, for example, not mixed radial and bias type and that their circumferences are matched.

Check wheel bearing and hub: no obvious leaking on outside or inside wheel.

Suspension

- Condition of springs (leaf or air), spring hangers, shackles and u-bolts.
- Axle alignment.
- Condition of torque rod arms.
- If equipped with sliding axles, check position and alignment. Look for damaged, worn or missing parts, all locks present, fully in place and locked.
- Flexible air tubing not cracked, cut, crimped or otherwise damaged. Secured against tangling, dragging and chafing.

Brakes

- Condition of brake drums. With brakes released, look for a noticeable gap between lining and drum. This check cannot be made if dust covers are in place.
- Condition of brake hoses: check for any chafing.

- Check brake chamber mounting bolts and brackets.
- Check slack adjusters and chamber push rod travel. With brakes applied or released, look for conspicuously different positions of the slack adjusters for proper brake adjustment.
- Check spring brakes.

13 Rear of Trailer Area Lights and Reflectors

- Rear clearance, identification and tail lights clean, operating and proper color.
- Reflectors clean and proper color.

Cargo Securement

- Cargo properly blocked, braced, tied, chained, etc.
- Tailboard up and properly secured. End gates free from damage, properly secured in stake pockets.
- Canvas or tarp (if required) properly latched down to prevent water damage, tearing, billowing or blockage of either mirrors or tail lights.

- Rear doors securely closed, latched or locked; required security seals in place.
- Underside guard in place: not cracked, bent or broken.

14 Left Rear Trailer Wheels Area Dual Wheels, One or Two Axles

- Check condition of wheels and rims. Especially look for cracks, lockrings missing, bent or broken spacers, studs, missing clamps or lug nuts.
- Check condition of tires: properly inflated, no serious cuts, bulges, tread wear or any signs of misalignment; valve stems not touching wheels, rims or brake drums; valve caps in place and no objects stuck between the wheels.
- Check that both tires are of same type, for example, not mixed radial and bias type and that their circumferences are matched.
- Check wheel bearing and hub: no obvious leaking on outside or inside wheel.

Suspension

- Condition of springs (leaf or air), spring hangers, shackles and u-bolts.

- Axle alignment.
- Condition of torque rod arms.
- If equipped with sliding axles, check position and alignment. Look for damaged, worn or missing parts, all locks present, fully in place and locked.
- Flexible air tubing not cracked, cut, crimped or otherwise damaged. It should be secured against tangling, dragging and chafing.

Brakes

- Condition of brake drums. With brakes released, look for a noticeable gap between lining and drum. This check can not be made if dust covers are in place.
- Condition of brake hoses: check for any chafing.
- Check brake chamber mounting bolts and brackets.
- Check slack adjusters and chamber push rod travel. With brakes applied or released, look for conspicuously different positions of the slack adjusters.
- Check spring brakes.

15 Left Side of Trailer Area Landing Gear or Dolly Area

- Fully raised; no missing or damaged parts.
- Crank handle present and secured.
- If power operated, no air/hydraulic leaks.

Spare Wheel(s)

- Spare wheel securely mounted in rack with no damage to rack.
- Tire and wheel condition adequate for a spare: proper size, properly inflated.

Lights and Reflectors

- Trailer side clearance lights: clean, operating and proper color.
- Reflectors clean and proper color.

Frame and Body

- Frame and crossmembers not bent, cracked, damaged or missing.
- Proper placarding.
- Body parts not damaged or missing.

Before Leaving the Parking Area

- Remove chocks from the wheels.

PRE-TRIP INSPECTION QUICK LIST

- Test trailer hook-up by slowly pulling while applying the trailer brakes with the trailer brake hand control valve.
- Test the service brakes before leaving the parking area.
- Test parking brakes by stopping on a 20% grade and applying the parking brakes. The parking brakes shall hold the combined vehicle and trailer without moving.

Service Charts

The vehicle had a pre-delivery inspection before being delivered to you, the customer. Regular maintenance inspections should be continued. The maintenance program and lubrication intervals that are listed in this manual may not suit your operation. Contact your nearest authorized dealer, who can help with designing a maintenance program that works in your application.

- For regular service or maintenance, call the dealer in advance and arrange for a service appointment. This gives the dealer time to schedule the correct equipment and provide a trained technician to service the vehicle.
- Setting an appointment can decrease vehicle downtime.
- When in for service at an authorized dealer, ask for outstanding safety related recalls that relate to the vehicle. This service is available only at an authorized dealership.

NOTE

It is strongly recommended that you do not attempt to service, repair or maintain the vehicle yourself unless you are fully trained and have the proper tools, equipment and parts. Some procedures are better performed by an authorized dealer who has the proper equipment and trained technicians.

Scheduled Service Date

[illegible]

[illegible]

Repair Record

[illegible]

[illegible]

Fuel and Oil Record

[illegible]

Engine Data

Engine Data
Vehicle Identification Number (VIN)
Engine Model
Engine Serial Number
Primary Fuel Filter Part Number
Secondary Fuel Filter Part Number
Oil Filter Part Number, Full Flow
Oil Filter Part Number, By-pass
Air Cleaner Element Part Number
Coolant Filter Part Number
Fan Drive Belt Part Number
Accessory Drive Belt Part Number
Diesel Particulate Filter Part Number (If Equipped)
Diesel Oxidation Catalyst Part Number (If Equipped)

Precautions and Warnings

WARNING

Misuse or modification of a turbocharger can result in serious injury and property damage. In addition, extreme care must be taken to avoid foreign material induction, excessive exhaust temperatures and lack of lubrication.

CAUTION

The maximum allowable engine speed is listed on the warning label on the sun visor. DO NOT exceed 2,300 rpm.

CAUTION

If a winterfront is needed, use only a winterfront that was designed for this specific chassis. Winterfronts are not recommended, but can be used during cold weather with sustained temperatures below -25°C (-13°F).

CAUTION

Be sure to avoid high intake/exhaust temperatures when using winterfronts under normal operating conditions (above freezing). The restriction of airflow can cause higher exhaust temperatures, power loss, excessive fan usage and reduced fuel economy.

CAUTION

If a winterfront is used, a Mack-approved exhaust pyrometer must be installed and closely monitored while the engine is in operation. Do NOT exceed the maximum temperature indicated by the red line on the gauge. To reduce exhaust temperature, downshift or reduce engine power and open the winterfront.

CAUTION

Do not permit a heavy load to drive the engine above the governed speed.

CAUTION

Operate in a gear low enough to allow the engine to accelerate to (or maintain) governed speed when applying the throttle.

DANGER

Before working on or inspecting a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

DANGER

DO NOT attempt to repair or service this vehicle without having sufficient training, correct service literature and the proper tools. Failure to follow this could lead to personal injury or death, or making your vehicle unsafe.

NOTE

Read all safety information before working on the vehicle.

NOTE

Do NOT use extended-life coolant in engines equipped with a coolant conditioner filter. A coolant filter that contains no supplemental coolant additives (SCA) is available for use when extended-life coolant is used.

Service Planning and Schedules

Preventive maintenance is vital to the life of your new vehicle. This section of the Operator Handbook covers items of importance concerning the proper care of your vehicle. A well-run maintenance and lubrication program is the best way

Engine Service, Mack

to ensure a long life of productive operation.

By performing daily checks and observing the equipment while in operation, minor defects can be

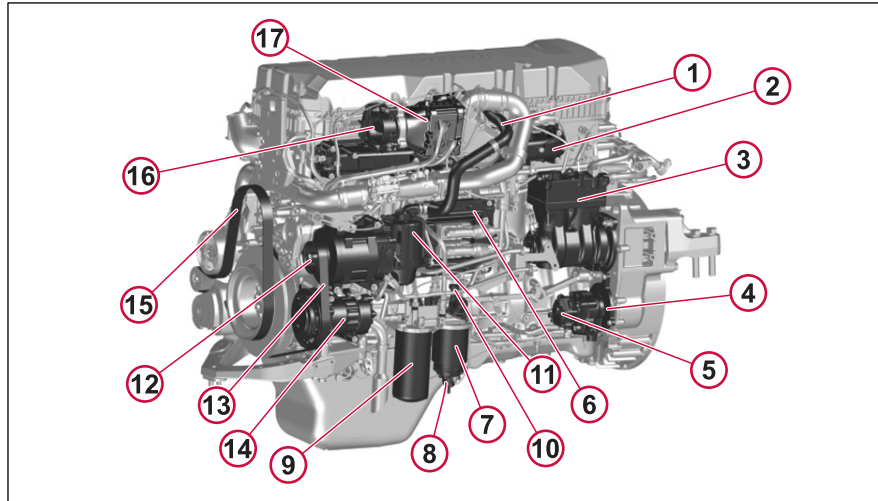
corrected before putting the equipment into operation.

If you have any questions concerning the proper care, maintenance and lubrication of your vehicle, contact your local dealer.

Component	Operation	Km (Miles) / Maximum Months/Hours
Fuel Filter	Change	Each oil change*
Water Separator (Engine Mount)	Filter Change	Each oil change*
Fuel / Water Separator (Chassis Mount)	Change	Each oil change*
Fuel Tank Ventilation Filter	Change	Every 12 Months
Fuel Tank Ventilation Filter (Stanchion Mount)	Change	Every 12 Months
Air Filter (Engine)	Change	At maximum restrictions as indicated on gauge, or 12 months
Coolant (Normal or Heavy Duty)	Change	500 000 km (300,000 mi) or 24 months whichever comes first
Coolant (Severe Duty)	Change	240 000 km (150,000 mi) or 12 months whichever comes first
Coolant, Extended Life (ELC)	Change	1 609 344 km (1,000,000 mi) or 96 months, whichever comes first
Coolant Filter	Change	At every engine oil change.
Coolant Filter Extended Life (ELC)	Change	240 000 km (150,000 mi) or 12 months, whichever comes first
Coolant Conditioner	Change	Traditional coolants requiring Supplemental Coolant Additive (SCA) 80 000 km (50,000 mi) or 6 months
Valves/Injectors ***	Initial Adjust	240 000 km (150,000 mi) or 12 months, whichever comes first

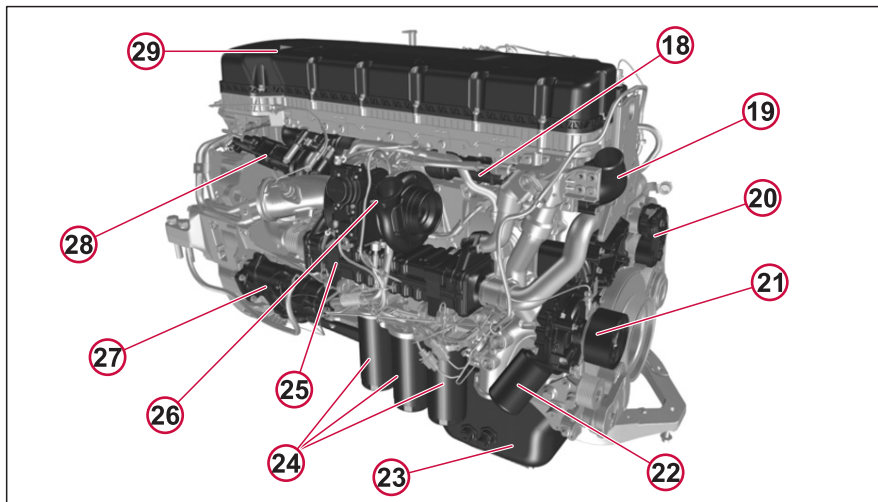
Component	Operation	Km (Miles) / Maximum Months/Hours
Valves/Injectors ***	Adjust	500 000 km (300,000 mi) or 24 months, whichever comes first
Drive Belts (Normal or Heavy Duty)	Change	500 000 km (300,000 mi) or 36 months, whichever comes first
Drive Belts (Severe Duty)	Change	240 000 km (150,000 mi) or 12 months, whichever comes first
Accessory Drive Belt (Normal or Heavy Duty)	Change	500 000 km (300,000 mi) or 36 months, whichever comes first
Accessory Drive Belt (Severe Duty)	Change	240 000 km (150,000 mi) or 12 months, whichever comes first
Aftertreatment Diesel Exhaust Fluid (DEF) Tank Flushing and Filler Neck Filter	Clean	240 000 km (150,000 mi) or 4,500 hours, whichever comes first
Aftertreatment Diesel Exhaust Fluid (DEF) Pump Filter**	Change	240 000 km (150,000 mi) or 4,500 hours, whichever comes first
Aftertreatment Diesel Particulate Filter (DPF) (Normal or Heavy Duty)	Clean	650 000 km (400,000 mi) or 10,000 hours, whichever comes first
Aftertreatment Diesel Particulate Filter (DPF) (Severe Duty)	Clean	400 000 km (250,000 mi) or 4,500 hours, whichever comes first
Aftertreatment Hydrocarbon Doser (If equipped)	Clean	240 000 km (150,000 mi) or 4,500 hours, whichever comes first
*Under certain conditions (for example, irregular fuel quality), the fuel/water separator filters may require more frequent replacement.		
**Under certain conditions (for example, dirt and dust) filters may require more frequent replacement.		
***Valves must be adjusted whenever the rocker shaft has been removed and reinstalled for any reason.		

Engine Overview, MP7™ Left Side View



- | | | |
|-------------------------------|----------------------------------|--------------------------|
| 1 Breather Tube | 9 Fuel Filter | 16 Intake Throttle Valve |
| 2 Intake Manifold | 10 Hand-Priming Pump | 17 EGR Mixing Chamber |
| 3 Air Compressor | 11 Crankcase Ventilator | |
| 4 Power Steering Pump | 12 Alternator | |
| 5 Fuel Pump | 13 Alternator/AC Compressor Belt | |
| 6 Engine Control Module (ECM) | 14 AC Compressor | |
| 7 Fuel Filter | 15 Fan/Coolant Pump Belt | |
| 8 Fuel/Water Separator | | |

Engine Overview, MP7™ Right Side View



18 Exhaust Manifold

19 Thermostat

20 Belt Tensioner

21 Coolant Pump

22 Coolant Filter

23 Oil Pan

24 Oil Filters

25 EGR Cooler

26 Turbocharger

27 Starter Motor

28 EGR Valve

29 Valve Cover

General

Keep the engine oil at the proper level and change it at the recommended intervals. Always replace the oil filters at the same time as when the oil is changed.

Oil Quality

Engine oils that meet or exceed the standards given by American Petroleum Institute (API) for the oil classifications are listed in this manual. Only oils licensed to carry the API symbol should be used. Lubricants meeting API standards have provided maximum engine life when used together with the recommended oil and oil filter change intervals.

EO-O Premium Plus (or VDS-4) diesel engine oil is mandatory for use in all current emission compliant engines. Chassis equipped with a Diesel Particulate Filter (DPF) require the use of Ultra Low Sulfur Diesel (ULSD) fuel. EO-O Premium Plus oils exceed the API service category CJ-4.

CAUTION

DO NOT add extra oil additives. Additives such as break-in oils, top oils, graphitizers and friction-reducing liquids are not necessary and can harm the engine.

Oil Change Intervals

The length of time an engine can operate before an oil change depends on the quality of oil used, the type of fuel used, fuel consumption, engine oil consumption, vehicle application, level of dust in the air and fuel consumption. The change intervals given in this manual are maximum intervals. If the vehicle is operating in heavy-duty, dusty or off-road conditions more frequent oil changes should be scheduled.

For additional information about oil change intervals and approved oils, contact a certified dealer.

NOTE

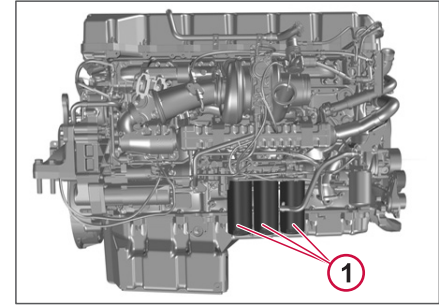
Oil filters should always be changed when changing oil.

Oil Filters

There are three filters on the engine, one of which is a bypass filter. This should be changed at the same time as the full-flow filter(s).

CAUTION

Oil filters are designed to provide the proper level of filtration and protection for the engines. Filters that do not meet the same stringent requirements may void engine warranty.



1 Spin-Off Oil Filters

Synthetic Lubrication

Synthetic oils are offered by some oil suppliers as an alternative to the traditional, petroleum based oils for engines. These oils may be used in Mack engines, provided they meet the quality levels specified on the previous pages.

The use of synthetic oils does not permit the extension of the recommended oil change intervals. It is the contamination rate, i.e., soot, and the depletion of additives, rather than base oil quality that determines the useful engine oil life and therefore the oil change intervals.

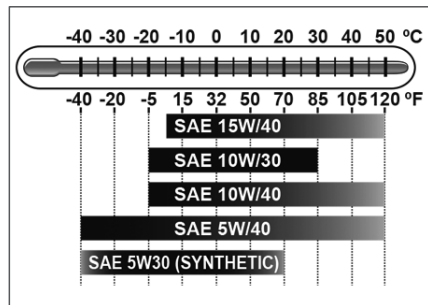
Oil Viscosity

The viscosity grade defines the thickness of the oil. The oil must be thin enough at low temperatures for easy cold starts and thick enough to protect

at high temperatures. An oil is not fully defined until both the oil quality (see previous pages) and the viscosity grade are specified.

Choose the viscosity grade for the typical ambient temperature for the application. Multigrade oils have a broad range that suit operation in changing temperature. The standard engine oil weight is 10W/30.

The engine viscosities shown in the viscosity/temperature table is recommended.



Oil Additives

⚠ CAUTION

Extra oil additives must never be added to any engine oil used. Additives such as break-in oils, top oils, graphitizers, and friction reducing liquids are not necessary and may even harm the engine.

Using oils to the quality standards recommended in this manual makes the use of extra oil additives unnecessary, as these oils already contain a balanced treatment of additives.

Oil Consumption

Once the engine is stopped, check the oil level daily. If the engine has just been stopped and it is warm, wait approximately five minutes to allow the oil to drain back to the oil pan before checking. Add oil as necessary.

ⓘ NOTE

DO NOT overfill engine with oil.

All diesel engines are designed to consume some oil, so it is normal to add oil periodically. An engine used in heavy-duty operation will consume more oil than one in normal operation.

Oil Change

⚠ WARNING

A hot engine or engine oil can be dangerous. Serious burns can result from contact with a hot engine or oil. Take precautions when draining the oil. Wear gloves or let the engine cool down before draining.

⚠ WARNING

When draining the oil, use the proper tools and keep away as far as possible. Raise the elbow so the forearm is parallel to the ground to prevent oil running down the arm, causing burns.

⚠ CAUTION

Always dispose of all lubricants (motor oil, coolant, gear box oils, etc.) and filters according to Federal and local regulations. Used oil disposed of in nature or waterways contaminates our drinking water and kills wildlife.

⚠ CAUTION

Prolonged contact with used engine oil may be harmful. Use rubber gloves when handling used oil. Wash skin thoroughly if it comes in contact with used oil.

It is important to drain as much oil as possible. Try to change oil immediately after driving, when the oil is warm. Always replace the oil filters when changing oil.

Oil Filters Change

⚠ WARNING

Hot oil can cause severe burns. DO NOT allow hot oil to contact the skin. When changing oil, wear protective gloves.

⚠ CAUTION

Mack-branded oil filters are designed to provide the proper level of filtration and protection for Mack engines. Filters that do not meet the same stringent requirements may cause unsatisfactory results.

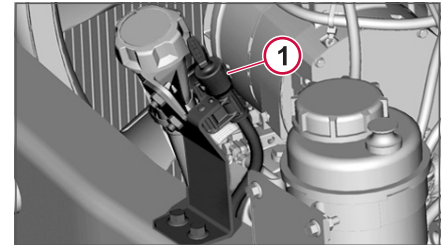
- 1 Coat the filter gasket with oil.
- 2 Install the filter and turn it by hand until the gasket makes contact with the sealing surface.
- 3 Manually turn the filter an additional 3/4 to one full turn.

Checking Oil Level

ⓘ NOTE

DO NOT let the oil level fall below the marking on the dipstick. DO NOT overfill so the level is above the upper marking on the dipstick. This could lead to excessive oil temperature and/or poor crankcase breather performance.

Ensure that the vehicle is parked on level ground before checking the oil level. Wait five minutes after shutting off the engine, then proceed with checking oil.



1 Oil Dipstick

ENGINE OIL AND FILTER INTERVALS

Powertrain Operating Conditions (POC)

Transport cycle	Long distance driving							Distribution				Construction sites ¹			
								Regional		City					
CMT	≤ 44		45 - 70		71-80		> 80	≤ 32	33-44	45-70	≤ 32	≤ 32	33-44	45-80	>80
Topography	PF	H	PF	H	PF	H	PF/H					H	H	H	VH
POC	L ²	M ³	H ³	S ³	S ³	VS	VS	M	H	S	S	H	S	VS	VS+

Maximum permitted fuel consumption

POC	L	M	H	S	VS	VS+
l/100 km (quarts/miles)	≤ 33 (35)	≤ 39 (41)	≤ 50 (53)	≤ 64 (68)	> 64 (68)	-
km/liters (miles/quarts)	≥ 3.0 (1.8)	≥ 2.5 (1.5)	≥ 2.0 (1.2)	≥ 1.5 (0.9)	≥ 0.8 (0.5)	-

Note: In some regions, B-double or B-train applications with GCW > 55 ton shall be classified as POC S.

Note: The POC determined for a particular application shall be used for all components to which POC is applied. If there is a conflict with the fuel consumption interval for the determined POC and the actual fuel consumption (if known), then the actual fuel consumption shall decide the POC for the vehicle.

¹ Typical vehicle configurations normally involved in Construction applications are sugar cane, tipper, dumper, swap carrier, concrete mixer or refuse bodies.

² If vehicle speed frequently exceeds 90 km/h (56 mph), move to the next higher POC classification.

³ If the combined PTO (at zero vehicle speed) and idle time exceeds 25% of total operating time, move to the next higher POC classification.

MP7™ Engines

Engine Operating Condition	Severe Duty	Heavy Duty	Normal Duty
Total Fuel Consumption (L/100 km)	>50	<50	<39
Total Fuel Consumption (mpg)	<4.7	>4.7	>6.0
Engine Oil and Filter Change Interval - 42 L (44 quarts) oil capacity	45 000 km (25,000 mi) 625 hours	60 000 km (35,000 mi) 1,000 hours	75 000 km (45,000 mi) 1,300 hours



NOTE

Using oils that meet EO-O Premium Plus quality standards at all times, is recommended.



NOTE

If idle time is greater than 30%, use the next lower change interval.

OIL CAPACITY TABLE AND VISCOSITY CHARTS

! NOTE

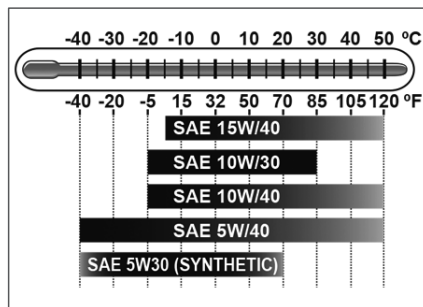
Use the information in the table below to determine the operating condition and usage applicable to your vehicle.

Oil Fill Capacity

	Filter Volume	Pan Volume	Oil Change Fill
11L Steel	6 liters (6 quarts)	30 liters (32 quarts)	36 liters (38 quarts)

! NOTE

Check the dipstick and top-off as needed.



Oil Viscosity

The viscosity grade defines the thickness of the oil. The oil must be thin enough at low temperatures for easy cold starts and thick enough to protect at high temperatures. An oil is not fully defined until both the API quality classification and the viscosity grade are specified.

Choose the viscosity grade for the typical ambient temperature for the application. Multigrade oils have a broad range that suit operation in changing temperature. The standard oil weight for Mack® engines is 10W/30.

Mack® recommends the viscosities shown in the viscosity/temperature table for Mack® engines.

If the vehicle must be parked for a period (more than 30 days), protect it as follows:

- 1** Drain the engine oil.
- 2** Fill up to the proper level with oil of the recommended quality and viscosity.
- 3** Fill up the fuel tanks with the recommended grade of fuel.
- 4** Run the engine for two minutes around 1000 rpm. Shut the engine down. DO NOT drain the oil after this run.
- 5** Check the coolant for proper levels of antifreeze and inhibitor protection. Service as necessary.
- 6** Seal all engine openings using protective covers.

To return to service an engine preserved in this manner, remove previously installed protective covers. Check all fluid levels and if necessary replace engine oil contaminated by condensation.

Batteries

WARNING

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

WARNING

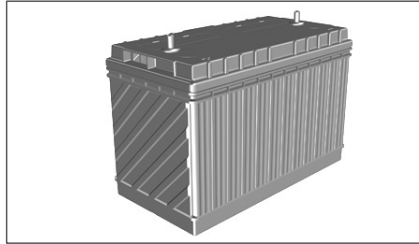
Always wear eye protection when working around batteries to prevent the risk of injury due to contact with sulfuric acid or an explosion.

CAUTION

When using a pressure washer to clean the vehicle, do not direct the spray at electrical components in the engine compartment such as the alternator, starter and compressors. Water spray from pressure washers can damage electrical components.

A maintenance-free battery does not require the addition of water for its normal expected life. Typical features include heavy-duty construction and wrought lead-calcium grid to resist vibration, shock, overcharge, heat and thermal runaway. Nevertheless, these

batteries are vulnerable to the ravages of cold weather operation if totally ignored.



Battery Rating

Be sure that the batteries used in this particular vehicle are rated for the specified Cold Cranking Amperes (CCAs) necessary to ensure reliable cold weather starts. This is important, since even well-maintained batteries chilled to -18°C (0°F) may temporarily be capable of providing only 40% of their rated capacity at 27°C (80°F).

Keep the terminals clean to prevent formation of power-robbing corrosion. In winter, to avoid freezing the electrolyte, the battery must be fully charged. A fully discharged battery will freeze solid at -5°C (23°F) and possibly sustain permanent damage.

Before the onset of cold weather, be sure to protect this vital component by monitoring its condition as well as

inspecting the charging and starting systems.

Battery Warmer

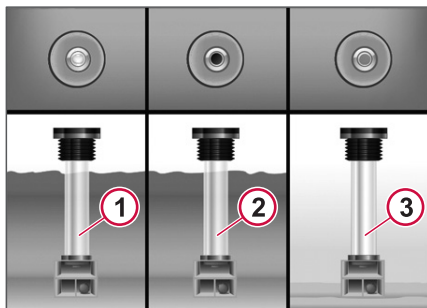
A battery warmer can be added to raise the temperature of the battery core and facilitate quick starting in cold weather.

Battery Condition

The first procedure when testing a battery is to check for external damage such as a cracked case, loose or corroded terminals, or signs of excessive gassing or overcharging.

A battery must be fully charged before a load test is performed. Test the battery with a hydrometer to determine the level of charge.

On maintenance-free batteries equipped with a built-in hydrometer (eye), the battery condition is interpreted as follows:



1 Green Dot visible

Any green appearance should be interpreted as a green dot and means that the battery is at or above a 65% state of charge and is ready for use or testing. This does not automatically mean that the battery is in good condition.

2 Green Dot not visible (Black Dot)

This indicates that the battery is below a 65% state of charge and must be charged before testing. A black dot does not mean that the battery is automatically bad.

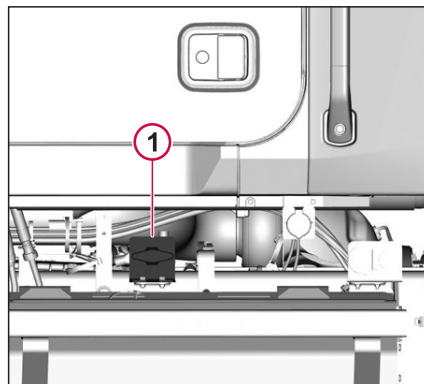
3 Clear or Light Yellow

This means that the electrolyte level is below the level of the built-in hydrometer, which may have been caused by tipping of the battery, a cracked case, or overcharging. This battery should be replaced.

Battery Disconnect

The battery disconnect handle is located under the cab above the top step on driver side.

- Turn the battery disconnect handle to the OFF position to prevent battery rundown when truck is parked for an extended time. The battery disconnect handle can be locked in the OFF position to prevent tampering.
- Turn the battery disconnect handle to the ON position to operate vehicle.



1 Battery Disconnect Handle

Electric and Electronic Systems

WARNING

Always wear eye protection when working around batteries to prevent the risk of injury due to contact with sulfuric acid or an explosion.

Check regularly around the engine and engine compartment for loose or frayed wires. Have all loose or frayed electrical wires and cables repaired before operating the vehicle.

Grounding Practices

Proper grounding for vehicle and engine electrical and electronic systems is necessary for proper vehicle and engine performance and reliability. Improper grounding will result in uncontrolled and unreliable electrical paths.

Uncontrolled engine electrical circuit paths can result in damage to main bearings, crankshaft journals surfaces and aluminum components. Uncontrolled electrical circuit paths can also cause electrical noise which may degrade vehicle and radio performance.

Operating engines without the engine-to-frame ground strap installed can cause damage to the engine. To prevent electrical discharge damage, check to

make sure the engines electrical system has an engine-to-frame ground strap. All ground connections should be tight and free of corrosion.

 DANGER

The engine uses high voltage to the electronic unit injectors. DO NOT come in contact with the unit injector terminals while the engine is running. An electric shock can cause an involuntary muscle spasm and cause loss of balance and falls leading to severe personal injury or death.

Electronic Engine Control System

Tampering with the electronic system installation can be dangerous and could result in personal injury or death and/or engine damage. It is very important to take the proper precautions with the electrical and electronic system when charging the batteries, jump-starting or performing electric welding on the vehicle.

This vehicle is equipped with monitoring features that may cause reduced power or shutdown under certain conditions. Monitoring and idling features can only be programmed and/or changed with electronic service tools and passwords.

Certain features, such as low oil pressure, high coolant temperature or low coolant level could cause the engine

power and/or vehicle speed to be limited and the engine may also shut down.

 DANGER

Failure to take necessary action when the STOP tell-tale is on can ultimately result in automatic engine shutdown and loss of power steering assist. Vehicle crash can occur, resulting in personal injury or death.

Wiring Harness / Cable and Connector Protection

If corrosion is seen at any external ring-type terminal connections, such as those used at the starter, alternator, chassis and/or engine grounds, etc. Corrosion protectant must be applied to the connection after disconnecting, cleaning and reconnecting the ring terminal. Additionally, corrosion protectant should be applied to any ring-type terminal connector following any type of service procedure which involved disconnecting/reconnecting the ring terminals (such as component replacement, troubleshooting, service and repair, etc.).

To help protect your vehicle's external high amperage electrical cables and connections from corrosion due to the effects of newer salts (calcium chloride and magnesium chloride) on the

roadways, use an approved corrosion inhibitor.

Coat all high amperage (positive and ground) exposed electrical connections at a minimum of every 6 months or, whenever the connector has been disassembled. The following list contains the recommended connections that should be liberally coated with the corrosion inhibitor;

- Battery connections
- Battery main shut off switch connections
- Maxi and/or Mega fuse connections
- All ground stud connections
- Electrical pass-thru connections
- All alternator connections
- All starter connections
- Intake preheater and preheater relay connections
- Electrical power inverter connections

All connections should be cleaned and free of previously applied inhibitors, oil, dirt, dust or other contaminants prior to application. Allow time for the product to dry before use (drying time may vary depending temperature, humidity, etc.)

Charging

Charging should be conducted carefully under controlled conditions. Never charge a frozen battery. If a frozen battery is suspected, thaw it in a warm area for several hours before charging.

The following chart shows the normal charging times necessary to reach a full charge at 26 °C (80 °F). In colder temperatures, the necessary charging time may increase.

Battery Charging

Open Circuit Voltage	Battery Specific Gravity*	State of Charge	Charging Time to Full Charge at 80°F**					
			at 60 amps	at 50 amps	at 40 amps	at 30 amps	at 20 amps	at 10 amps
12.6	1.265	100%	Full Charge					
12.4	1.225	75%	15 min	20 min	27 min	35 min	48 min	90 min
12.2	1.190	50%	35 min	45 min	55 min	75 min	95 min	180 min
12.0	1.155	25%	50 min	65 min	85 min	115 min	145 min	280 min
11.8	1.120	0%	65 min	85 min	110 min	150 min	195 min	370 min
*Correct for temperature								
**If colder, it will take longer								

Completely Discharged Batteries

Extremely cold or completely discharged batteries may not initially show a charge since the electrolyte is nearly pure water and, therefore, a poor conductor. As the acid level in the electrolyte increases during charging, the charging current will also increase. Use the following procedure when charging a completely discharged battery:

- 1 Measure the voltage at the battery terminals. If it is below 10 volts, current will be very low and may not show up on many battery charger ammeters.
- 2 Set the charger on the high setting.
- 3 Some chargers have a polarity protection feature which prevents accidental reversal of the charger leads. A completely discharged battery will not have enough voltage to override this feature, making it appear that the battery will not accept a charge. Check the charger manufacturer's instructions on how to bypass this feature.
- 4 Once the battery starts to accept a charge, the charging rate will rise very rapidly. Carefully monitor the ammeter to prevent too-high a charging rate.

- 5 Proceed to charge battery at one-tenth of its rated capacity for one-half hour. Example: For battery rated at 64 (amps-hour), charge at 6.4 amp setting.

NOTE

Batteries with very low voltage (below 11.6 volts) or those that do not initially accept a charge are not necessarily defective. Batteries that have been discharged for long periods of time may be heavily sulfated or hydrated (containing lead shorts that cause the battery to self-discharge). To accept a charge, batteries with either of these conditions may require a longer charging time or a very high initial charge.

Use the following chart to determine the time required for the battery to begin accepting a measurable charge. (If the battery has not started to accept a charge after the specified time, it should be replaced.)

Charger Voltage	Hours
16.0 or more	Up to 4
14.0 to 15.9	Up to 8
13.9 or less	Up to 16

Load Test

A battery must be fully charged before performing a load test. To load-test a battery follow the manufacturer's written instructions.

Lighting

WARNING

Using incorrect bulbs or lamps may result in failures that could lead to a fire or a vehicle accident caused by improper lighting.

Check all lights on the vehicle daily for proper function. Replace burned out inserts and bulbs. Replace any broken or cracked side or rear reflectors. Headlights should be checked for aim at least once per year.

Precautions When Installing Electrical Equipment

Connecting electrically powered or electrically controlled equipment to a vehicle may cause interference with other vehicle electrical or electronic equipment (such as ABS systems, Rollover Stability Systems, etc.). The amount of interference depends upon the operating frequency of any new signals and the degree to which transient signals are coupled to the vehicle system.

⚠ NOTE

Whenever new electrical equipment is installed, it is the obligation of the installer to ensure that the new equipment does not interfere with the proper operation of all other electrical systems on the vehicle.

If new electrical equipment is installed, a vehicle checkout procedure should be performed.

- 1 Perform the checkout procedure under the following conditions:
 - Engine running
 - Brake system air pressure in operating range
 - Vehicle stationary
 - Brake pedal fully depressed

- 2 Operate the new equipment under all starting, running and shutdown conditions.
- 3 Listen for signs of air exhausting from the ABS modulator valves (which is an indication of an interference condition).
- 4 Correct all interference conditions before operating the vehicle.

⚠ NOTE

The center pin of the standard seven-pin trailer electrical connector has been standardized as the dedicated connection for uninterrupted power for trailer ABS. This pin is always powered when the tractor ignition is turned on.

⚠ DANGER

Some trailers manufactured prior to the trailer ABS regulations may use the center pin to power certain trailer auxiliary equipment. The possibility exists that this auxiliary equipment may be unexpectedly activated by the truck or tractor electrical system, resulting in personal injury or damage to equipment. Caution must be used when connecting the trailer electrical connector to ensure that power to the center pin will not unintentionally activate any trailer auxiliary equipment.

Fuses and Relays

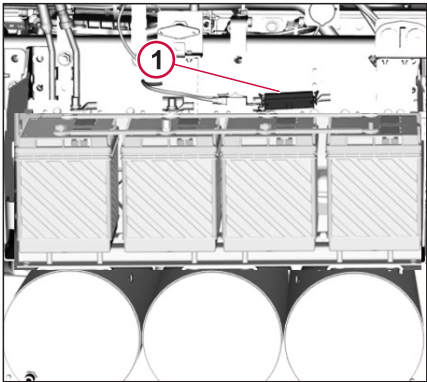
The truck's fuses are designed to protect the electrical system's circuits from overload and are usually only tripped as a result of a short circuit. For this reason, if a fuse has blown you should always have an authorised Volvo workshop determine the cause.

⚠ WARNING

Always replace fuses with the correct rating. Never overfuse. Never install a fuse higher than the instructed rating.

Main Fuse

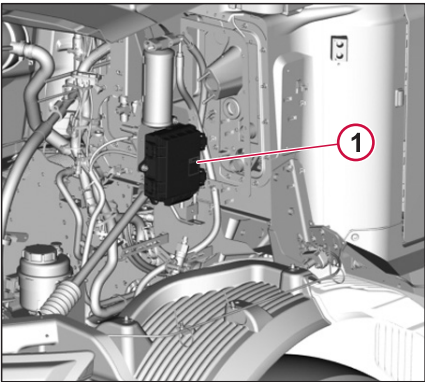
The main fuse is located in a box located inside the battery box compartment. The main fuse amperage is 150. Normally, the main fuse lasts for the lifetime of the vehicle. If the fuse does blow then the truck should be taken to an authorised workshop for inspection of the electrical system.



1 Main Fuse

External Fuse and Relay Center (EFRC)

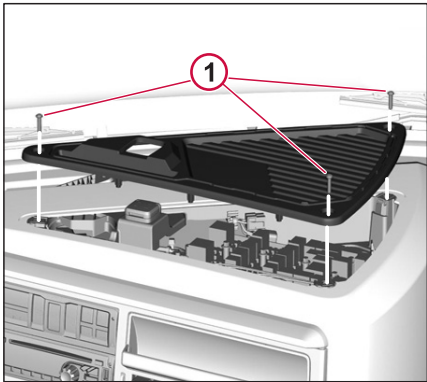
This fuse panel (EFRC) is located under the hood toward the driver's side of the truck. The fuse and relay locations are etched into the inside cover. Normally the fuses and relays last for the truck's entire service life without blowing. If a fuse does blow then the truck should be taken to an authorized workshop for inspection of the electrical system.



1 External Fuse and Relay Center (EFRC)

Fuse and Relay Instrument Panel Cover

To open the fuse and relay center access panel, remove the 3 screws and lift the panel up for removal.



1 Screws

No.	Rated current	Function
FE1	30 A	TRAILER STOP LAMP
FE2	20 A	TRAILER CLEARANCE LAMPS
FE3	20 A	TRAILER MARKER LAMPS
FE4	30 A	EMS MAIN
FE5	5 A	ACM EMS
FE6	10 A	VECU
FE7	5 A	BODY BUILDER MODULE
FE8	15 A	EMS 1
FE9	15 A	EMS2
FE10	30 A	TRAILER AUXILARY

No.	Rated current	Function
FE11	10 A	ABS IGNITION
FE12	20 A	FUEL HEAT (CB)
FE13	15 A	AIR DRYER (CB)
FE14	5 A	TPM
FE15	5 A	APADS
FE16		SPARE
FE17		SPARE
FE18		SPARE
FE19	15 A	ALLISON TRANS
FE19	30 A	EATON TRANS
FE20	20 A	TRAILER TURN L
FE21	20 A	TRAILER TURN R
FE22		SPARE
FE23		SPARE
FE24		SPARE
FE25		SPARE

Relays

No.	Function
RE01	TRAILER STOP LAMPS
RE02	TRAILER CLEARANCE LAMPS
RE03	TRAILER MARKER LAMPS

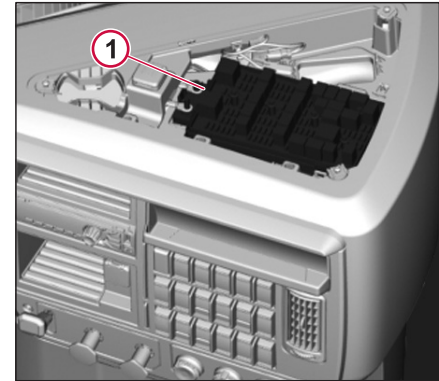
No.	Function
RE04	ENGINE MGT SYSTEM
RE05	IGNITION POWER
RE06	SPARE
RE07	SPARE

Fuses and Relays Center Instrument Panel

The truck's fuses and relays are located under the cover in the center of the instrument panel.

There are decals under the cover which notes the location of the fuses and relays. Also, the purpose of each fuse and relay is detailed.

The vehicle's normal exterior lighting is controlled by control units. These include control functions for each respective lighting circuit. Should a circuit be broken, due to overload or short circuit, then a message display in the Drivers Information Display (DID). The function is reset when the fault has been corrected.



1 Fuse and Relay Center



WARNING

Always replace fuses with the correct rating. Never overfuse. Never install a fuse higher than the instructed rating.



NOTE

Set the electrical component in the "OFF" position if possible, before changing the fuse. The fuse holder can be burned, if the voltage remains switched on.

MAINTENANCE, LUBRICATION AND SERVICE

ELECTRICAL SYSTEM

<https://truckmanualshub.com/>

No.	Rated current	Function
F1	20 A	OPEN
F2	10 A	HVAC
F3	20 A	DR HEATED SEAT/COOLER
F3	25 A	DR & PASS HEATED SEATS
F4	10 A	RADIO
F4	20 A	RADIO WITH AMPLIFIER
F5	30 A	LIVING ENVIRONMENT CONTROL MODULE 4
F6	20 A	RH SLEEPER PWR PORTS / CONSOLE
F7	20 A	LH SLEEPER PWR PORTS
F8	15 A	AUX SWITCHES 1
F9	10 A	USB CHARGE PORTS
F10	20 A	CUSTOMER USE (LOW VOLTAGE DISCONNECT 1)
F11	10 A	INTERIOR AUXILIARY FAN
F12	20 A	DASH POWER PORTS
F13	20 A	OPEN
F14	10 A	OPEN
F15	30 A	LIVING ENVIRONMENT CONTROL MODULE 1
F16	20 A	OPEN
F17	15 A	AUX SWITCHES 6

No.	Rated current	Function
F18	30 A	LIVING ENVIRONMENT CONTROL MODULE 3 HVAC FAN
F18	10 A	48" SLEEPER
F19	30 A	NEUTRAL POWER
F20	10 A	HORN
F21	5 A	OPEN
F22	20 A	DOOR CONTROL PANEL, RIGHT
F23	15 A	CUSTOMER USE / AUXILIARY SWITCH 4
F24	20 A	DOOR CONTROL PANEL, LEFT
F25	5 A	TELEMATIC GATEWAY
F26	10 A	DOME/DOOR INT LAMPS
F27	20 A	LIGHT CONTROL MODULE 3
F28	20 A	CUSTOMER USE (LOW VOLTAGE DISCONNECT 2)
F29	5 A	EXTERNAL FUSE RELAY CENTER
F30	5 A	ULTRASHIFT
F31	5 A	CUMMINS IGN
F32	15 A	CUSTOMER USE / AUXILIARY SWITCH
F33	10 A	AIR SOLENOID SWITCH

No.	Rated current	Function
F34	10 A	OPEN
F35	15 A	AUXILIARY SWITCH 5
F36	5 A	QUALCOMM/PEOPLETNET
F37	5 A	FUME DETECTOR
F38	5 A	LIVING ENVIRONMENT CONTROL MODULE / MIRROR TEMP
F39	10 A	OPEN
F40	5 A	LIGHT CONTROL MODULE
F41	30 A	ANTI-LOCK BRAKING SYSTEM
F42	10 A	OPEN
F43	15 A	LIVING ENVIRONMENT CONTROL MODULE 2
F44	10 A	KEY SWITCH / M-DRIVE START
F45	5 A	OPEN
F46	15 A	OPEN
F47	30 A	BODY BUILDER IGNITION
F48	15 A	HEATED WINDSHIELD
F49	15 A	REVERSE LAMPS/LIFT AXLES
F50	20 A	M-DRIVE TRANSMISSION ECU

No.	Rated current	Function
F51	10 A	M-DRIVE GEAR SHIFT ECU
F52	10 A	INSTRUMENT CLUSTER (IC)
F53	5 A	BODY BUILDER MODULE/ INSTRUMENT CLUSTER EMS POWER
F54	10 A	TRANS / PARKER PTO
F55	10 A	OPEN
F56	10 A	BENDIX FUSION LANE DEPARTURE WARNING SYSTEM
F57	15 A	SNOW PLOW LAMPS LH
F58	15 A	SNOW PLOW LAMPS RH
F59	10 A	SEAT SAFETY RESTRAINT SYSTEM
F60	30 A	HVAC FAN
F61	5 A	LVD SENS/VENDOR TELEMATICS
F62	10 A	CB POWER
F63	15 A	CUSTOMER USE / AUXILIARY SWITCH 3
F64	15 A	OPEN
F65	10 A	OPEN
F66	30 A	M-DRIVE
F67	10 A	OPEN

No.	Rated current	Function
F68	10 A	RADIO
F69	10 A	VEHICLE ECU (ELECTRIC CONTROL UNIT)
F70	10 A	OPEN
F71	15 A	CENTER PIN HOT (PRIMARY SAEJ560)
F72	5 A	OPEN
F73	5 A	ACC/ SIDE SENSOR/ECS
F74	10 A	OPEN
F75	25 A	WIPER
F76	30 A	CENTER PIN HOT, ISO 3731
F77	10 A	BENDIX FUSION
F78	25 A	LIGHT CONTROL MODULE 2
F79	25 A	LIGHT CONTROL MODULE 4
F80	10 A	DIAGNOSTIC CONN
F81	20 A	LIGHT CONTROL MODULE 1
F82	20 A	LIGHT CONTROL MODULE 6
F83	20 A	LIGHT CONTROL MODULE 5
F84	10 A	POWER DOOR LOCKS

No.	Rated current	Function
F85	5 A	TELEMATIC GATEWAY
F86	15 A	BEACON LAMP
F86	10 A	ELECTRONIC CONTROLLED SUSPENSION
F87	15 A	CUSTOMER USE

Relays

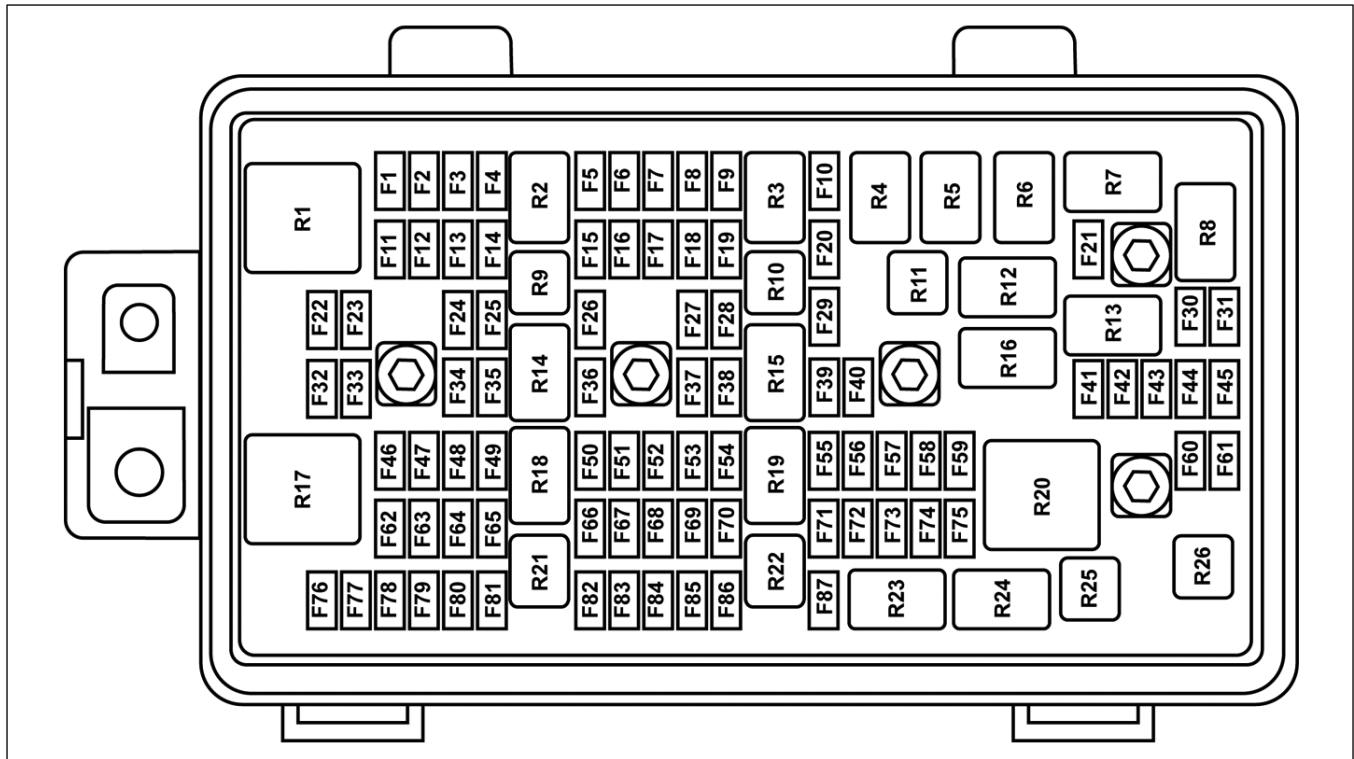
No.	Function
R1	ACCESSORY POWER
R2	RADIO WAKE
R3	NEUTRAL POWER
R4	VENDOR START ENABLE
R5	CENTER PIN HOT
R6	ISO PIN HOT
R7	SNOW PLOW RH
R8	SNOW PLOW LH
R9	DOME/DOOR LAMPS
R10	CITY HORN
R11	START ENABLE
R12	HVAC BLOWER
R13	SNOW PLOW LCM INPUT
R14	LIFT AXLE/REVERSE SIGNAL
R15	ALLISON BODYBUILDER

No.	Function
R16	ALLISON BODYBUILDER
R17	POWER IGNITION 1 BUS
R18	M-DRIVE POWER
R19	EMS 2 ENGINE MANAGMENT SYSTEM 2
R20	IGNITION + BUS
R21	OPEN

No.	Function
R22	ECS POWER
R23	INTERMITTENT WIPER
R24	INTERMITTENT WIPER
R25	OPEN
R26	OPEN

Expansion

No.	Function
F28	CUSTOMER LVD1
F10	CUSTOMER LVD2
F87	BAT1
F32	CUSTOMER IGN1
F63	CUSTOMER IGN2
F23	CUSTOMER IGN3



Fuse Panel Layout

TURBOCHARGER / CHARGE AIR COOLER

DANGER

If oil leaks internally from the turbocharger to the engine intake, the oil acts as a fuel. Watch for excessive exhaust smoke. DO NOT operate engine until problem is corrected. There is no way to regulate the engine speed if it runs on oil and it may over speed. Loss of control of vehicle may lead to an accident causing severe personal injury or death.

WARNING

DO NOT remove, attach, or tighten turbocharger air intake ducting while the engine is operating, or operate the engine while the ducting is removed. Working around the turbocharger with the ducting removed may cause severe personal injury.

Visually inspect turbo mountings, intake and exhaust ducting and connections for leaks on a daily basis. Check oil inlet and outlet for leaks or signs of restrictions to oil flow. Check for unusual noise or vibration. If any faults are detected, do not operate the engine until the cause is determined and repaired.

Charge Air Cooler and Radiator Package Cleaning

WARNING

Always wear eye protection when cleaning radiator, charge-air cooler and condenser. Failure to follow this recommendation may result in eye injury.

CAUTION

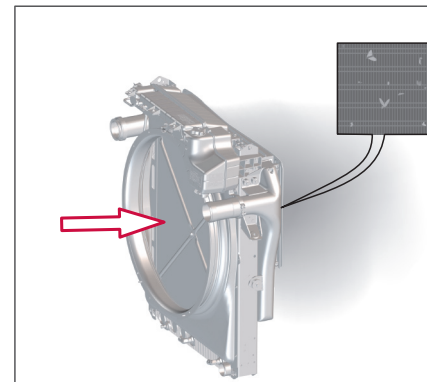
When using a pressure washer to clean the vehicle, do not direct the spray at electrical components in the engine compartment such as the alternator, starter and compressors. Water spray from pressure washers can damage electrical components.

Periodically inspect the front of the radiator/charge-air-cooler package. Over time, there may be a build-up of dirt, mud, insects, etc., between the radiator and charge air cooler.

Over time the reduced air flow reduces the heat transfer from the components to the air. This increases the load on the fan and air conditioning compressor and can result in engine overheating and other performance related problems, such as high fuel consumption. Inspect for build-up and contact your authorized dealer, if necessary.

The simplest method to clean the package is to use air pressure or a water

stream. This should be done from the back of the core. Air pressure should not exceed 30 psi (200 kPa) for radiator and charge air cooler cores. The use of a fin comb is also a good tool to loosen bugs and dirt from the fins. If dirt cannot be cleaned off with this procedure, consult your dealer.



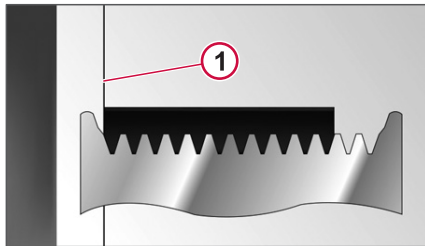
Inspect the charge air cooler for cracks at every inspection. DO NOT operate the vehicle with a damaged or broken charge air cooler. To do so would void the warranty and the engine will not meet emission regulation requirements.

Drive Belt Installation

To install a poly V-belt, swing the automatic tensioner to the full sprung position (fully toward the install stop), then place the belt over the pulleys. Slowly return the automatic tensioner back to its original position. Do not allow the tensioner to snap against the stops. Before installing the new belt, ensure that the pulley grooves are clean and free of debris.

Drive Belt Routing

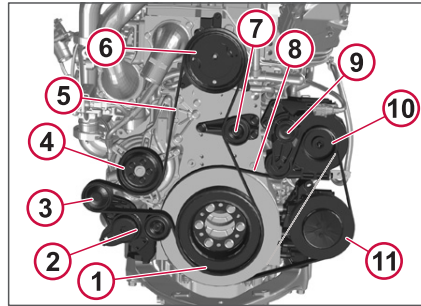
Certain model chassis equipped with MP7™ engines utilize a 10-rib belt on 12-rib pulleys. When replacing the belt, the belt must be installed against the rear face of the pulley (edge of pulley closest to the engine).



1 Install 10-rib belt against rear edge of 12-rib pulley.

Accessory Drive Belt Routing

Accessory drive belt and main belt routing with and without air conditioning. This diagram is located in a clear area on the outside of the left frame between the radiator and center line of the front axle.

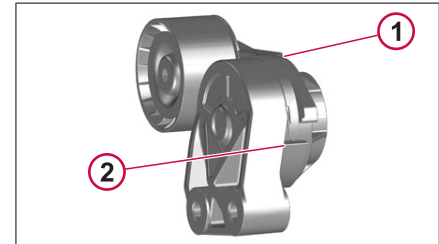


- 1** Crankshaft Pulley
- 2** Automatic Tensioner
- 3** Idler Pulley
- 4** Coolant Pump
- 5** Main Drive Belt
- 6** Fan Drive
- 7** Idler Pulley (when applicable)
- 8** Accessory Drive Belt
- 9** Automatic Tensioner
- 10** Alternator
- 11** Air Conditioner Compressor (if equipped)

Automatic Belt Tensioner

The automatic belt tensioner is designed to maintain proper belt tension throughout the life of the tensioner. The belt tensioner cannot be adjusted or repaired. At each D inspection interval or once per year, whichever occurs first, check the following:

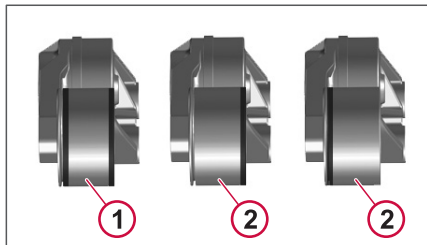
- With the belt on the drive, check the following:
Check to see if the tensioner is resting against the install stop or the free-arm stop. If the tensioner is resting against either stop, the tensioner must be replaced.



- 1** Install Stop
- 2** Free Arm Stop

On main drive belt tensioners, check belt tracking. If the belt is tracking all the way to one side of the tensioner pulley (either the front- or back-side), replace the tensioner. Belt tracking can be determined by looking at the witness

mark (the shiny area on the pulley where the belt rides). The witness mark should be approximately the same width of the belt.



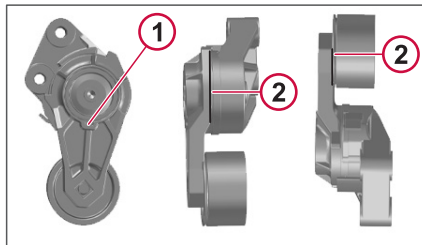
- 1** Acceptable (Witness Mark Approximately Same Width as Belt)
- 2** Not Acceptable (Witness Mark Tracking Off Edge of Pulley)

Remove the belt by using a 1/2 inch breaker bar to pull the tensioner back to the install stop. Slowly return the tensioner to the free-arm stop.

With the belt removed, use the breaker bar to slowly pull the tensioner from the free-arm stop to the install stop and then slowly releasing it back to the free-arm stop. Any excessive roughness or hesitancy noticed while performing this check indicates that the tensioner must be replaced.

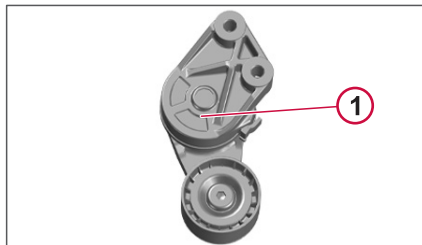
Check for metal-to-metal contact as follows:

Check for contact between the arm and the spring case. Replace if metal-to-metal contact is seen.



- 1** Free-Arm Stop Position
- 2** Contact between Arm and Spring Case Check.

Check for metal-to-metal contact between the arm and the end cap. Replace if contact is seen.



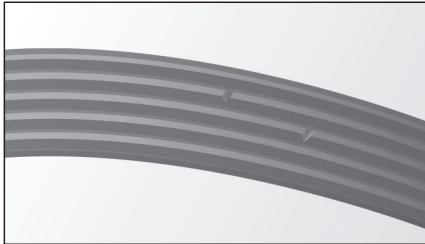
- 1** Contact between Arm and End Cap Check

DRIVE BELT REPLACEMENT INTERVALS

Check pulleys for debris, clean as needed.

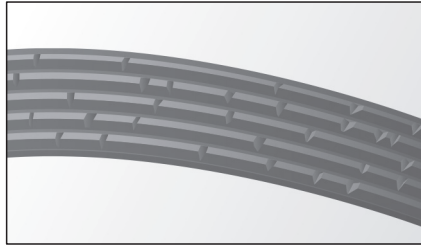
Rib Cracking

An in-service poly V-belt will go through several phases of cracking during its life. After an extended time in service, minor rib cracks may appear, usually one or two cracks per inch. This cracking is normal.



Belt With Minor Cracking

Belts should not be replaced unless the ribs exhibit severe multiple cracking as shown below. Multiple cracking will lead to rib chunking.



Belt With Multiple Cracking



Belt With Severe Cracking

Rib Sidewall Glazing

When the belt ribs appear to have a shiny surface that is hard and brittle, it is usually an indication of belt slippage. This is attributed to inadequate tension and/or extreme temperature. Both these conditions will lead to severe cracking and belt failure, often with little advance warning. If this occurs, locate the cause and correct before installing a new belt.

Belt Wear

Accelerated wear on any part of the belt (fabric backing, tensile cord or rib

rubber) is a concern and should be investigated for cause, and corrected before installing a new belt.

Possible Causes of Accelerated Belt Wear

- Drive belt performance will be adversely affected when misalignment exceeds 1/16 inch for every 12 inches of belt span.
- Belt length must be correct.
- Environmental conditions, temperature, exposure to engine fluids, etc.
- Abrasive materials, small stones, metal shavings, etc.

Foreign Objects

Any object protruding in the path of the belt drive and contacting the belt will cause damage and eventual failure. Locate the object before installing a new belt.

Noise, Vibration and Harshness (NVH)

Poly V-belt drive systems were designed to prevent Noise, Vibration and Harshness (NVH) problems. Field problems, however, which may be related to NVH causes occasionally occur.

DRIVE BELT REPLACEMENT INTERVALS

Possible Causes of (NVH)

Insufficient belt tension may create a high-pitched howl (squeal) or rasping sound during engine acceleration or deceleration.

Misalignment may cause a chirping noise, especially at, or near, idle speed. Rigid bracketing of accessories is a must for reasonably vibration-free belt spans. Some span vibration is to be expected during the range of engine speed and accessory loading.



WARNING

Failure to follow recommended application information and recommended procedures for installation, care maintenance and storage of belts may result in failure to perform properly and may result in damage to property and serious bodily injury. Make sure the belt selected for any application is recommended for that service.

⚠ DANGER

Coolant is toxic; risk of poisoning. DO NOT drink coolant. Use proper hand protection when handling. Keep coolant out of reach of children and animals. Failure to follow these precautions can cause serious illness or death.

⚠ WARNING

DO NOT raise the engine hood if you see or hear steam or coolant escaping from the engine compartment. Wait until steam or coolant cannot be seen or heard before raising the hood.

DO NOT remove the coolant fill cap if the coolant in the surge tank is boiling. Also, DO NOT remove the cap while the engine and radiator are still hot. Scalding fluid and steam may be blown out under pressure if the cap is taken off too soon and can cause personal injury.

⚠ WARNING

Coolant may be combustible. Coolant leaked or spilled onto hot surfaces or electrical components can cause a fire. Clean up coolant spills immediately.

⚠ CAUTION

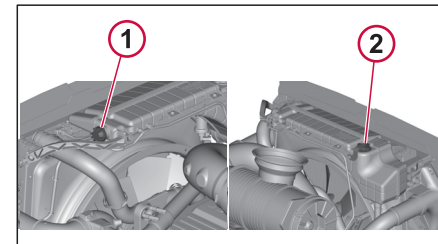
Mack Trucks does not recommend using plain water in the cooling system. Water alone is corrosive at engine operating temperatures and does not provide adequate boiling protection. The engine may develop corrosion and cavitation problems in the engine and radiator, and the boiling point of the coolant is lowered compared to a proper antifreeze and water mixture. Failure to follow Mack Trucks cooling system care/maintenance recommendations can render the warranty invalid.

The cooling system plays an important role in overall engine performance by keeping the engine within the normal operating temperature range; hot enough for efficient combustion, and cool enough to prevent engine damage caused by overheating. Good preventive maintenance practices, along with monitoring cooling system performance, go a long way in preventing engine damage that could result from cooling system problems. The maintenance items and tests outlined in this section should be performed at the intervals specified to ensure optimum performance from the cooling system.

Surge Tank Cap (Conventional Models)

The surge tank cap on your vehicle is mounted on top of the radiator. The

surge tank has a fill cap located on the top right-hand side of the tank, and a pressure cap rated at 16 lb. which incorporates an overflow tube located on the left-hand side of the tank. Check the coolant level regularly, making sure the coolant level is between the COLD MIN and COLD MAX lines on the back of the tank. Inspect the rubber gaskets on each of the caps. Replace the cap(s) if the gaskets show evidence of damage which could affect sealing.



1 Pressure Cap

2 Fill Cap

⚠ WARNING

DO NOT remove the fill cap while the cooling system is hot. Allow the system to cool sufficiently before removing. Turn the fill cap slowly counterclockwise and wait for the pressure in the system to dissipate. After the pressure has dissipated, completely remove the cap.

The main purpose of coolant is to transport heat from the hot parts of the engine to the radiator and to protect the cooling system from corrosion.

In addition to this, the coolant must:

- Protect against pitting and cavitation erosion damage of the water pump and cylinder liners.
- Protect against freezing and boiling.
- Prevent formation of scale, sludge deposits and clogging.
- Be harmless to polymer materials and seals in the cooling system.
- Maintain its liquid properties in cold climates.

Many engine failures can be traced back to a problem in the cooling system. If the coolant level is allowed to go below the bottom of the tank, there is the risk of the engine shutting down. See the operators manual for more information on the warning functions.

! NOTE

Always dispose of coolant according to Federal and local regulations. Take all used coolant to a recycling or waste collection center.

Coolant mixture consisting of an antifreeze solution in water should be

used year-round to provide freeze and boil-over protection.

! NOTE

DO NOT use antifreeze formulated for automobile gasoline engines. These have a very high silicate content that will clog the radiator and leave unwanted deposits in the engine.

Coolant System Capacities

! CAUTION

Capacities may vary due to hoses and size of radiator, as well as accessory cooling equipment. After running the engine until normal operating temperature is reached, check the coolant level and add coolant as needed.

Use the chart shown in conjunction with the Ethylene-Glycol and Propylene-Glycol Protection Charts in this section to determine the amount of antifreeze needed to protect your vehicle.

Coolant Capacity GU With MP7™

Chassis Model	Engine Model	Coolant Capacities in Liters (Quarts)
GU	MP7™	52 (55)
Coolant capacity listed is for chassis equipped with manual transmission. For automatic transmission add 9.5 liters (10 qts.)		

Use the following antifreeze protection charts to determine the percentage of antifreeze needed to achieve specific protection levels for various coolant systems.

Ethylene-Glycol Protection Chart

Ethylene Glycol	Ambient Air Temperature
40%	-24°C (-12°F)
50%	-37°C (-34°F)
60%	-52°C (-62°F)

Propylene-Glycol Protection Chart

Propylene-Glycol	Ambient Air Temperature
40%	-21°C (-6°F)
50%	-33°C (-27°F)
60%	-49°C (-56°F)

A well functioning and maintained cooling system is as important to the

engine as performing regular oil changes or using good fuel. To get the best result use quality products and service the system at the correct intervals. Please read this section carefully.

Keep the radiator (including charge air cooler) and the frontal area free from bugs, dirt, leaves, etc.

Check the coolant level in the tank regularly. Fill the tank as necessary with the correct coolant.

Inspection of the whole cooling system is important. Check for swollen or deteriorated heater and radiator hoses, loose hose clamps and connections, and coolant leaks.

 DANGER

DO NOT work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.

 CAUTION

Never add coolant to a hot or overheated engine. Engine damage can result. Allow the engine to cool first.

Additives

Additives help prevent rust, scale and mineral deposits from forming. Additives also protect metals from corrosion, prevent water pump and cylinder liner cavitation and contain anti-foaming agents. Additives are depleted during normal engine operation and need to be replaced. For non-extended life coolant mixture, this means the addition of Supplemental Coolant Additives (SCA) at any time the additive goes below the recommended level. For extended life coolant mixture, this means an extender package added halfway through the coolant lifetime.

Regular Coolant Change Interval

Coolant SCA level must be tested at least twice per year or whenever coolant loss occurs. For maximum coolant system efficiency, test the system at every engine oil change interval, every 1,000 hours or every 6 months (whichever comes first).



WARNING

Hot engine. Keep clear of all hot engine parts and fluids. A hot engine and fluids can cause serious burns.

Regular Coolant Filter Change Intervals

The charged coolant filter contains 8 units of SCA that are released slowly

over time to maintain the recommended level during operation. Consult engine service manual for proper SCA level and change intervals.



CAUTION

Extended life coolant will test as out of additives (SCA), but SCA should not be added. Shortened engine life may be the result of adding SCA.



NOTE

DO NOT add supplement coolant additives (SCA) to extended life coolant.

Should the extended life coolant system become contaminated with regular coolant exceeding 10% of the systems total capacity or if SCA is added to extended life coolant, drain the system and refill with new extended life coolant or regular coolant.



CAUTION

DO NOT use a filter that contains SCA. Damage to components can result.

 DANGER

A diesel engine will operate on any fuel which enters the cylinder, whether it is from the injectors or from the air intake system. Therefore, if any solvent is used to clean out the air cleaner element, the engine may over speed during start-up. Engine damage, severe personal injury or death from burns or explosion may occur.

 DANGER

DO NOT mix gasoline or alcohol with diesel oil fuel. This mixture can cause an explosion and result in severe personal injury or death.

 DANGER

DO NOT remove the fuel tank cap near an open flame. Diesel fumes are combustible and can cause an explosion or fire resulting in severe personal injury or death.

 WARNING

If a fuel leak is detected, stop the engine immediately. The vapors from hot fuel are highly flammable which may result in a fire.

 WARNING

DO NOT store fuel containers in the vehicle. They may leak, explode and cause or feed a fire. Empty or full, they present a hazard that may lead to burns in the event of a fire.

Diesel Fuel Specification

 CAUTION

Diesel engines for 2007 and later model year vehicles are designed to operate only with Ultra Low Sulfur Diesel (ULSD) fuel. Use of fuel other than ULSD will reduce the efficiency and durability of the engine, permanently damage the advanced emission control systems, reduce fuel economy and possibly prevent the engine from running at all. Manufacturers warranties are likely to be rendered void by usage of improper or incorrect fuel, and usage of fuels other than ULSD fuel in diesel-powered vehicles is illegal and punishable with civil penalties. Use of fuel additives to compensate for the lower sulfur content is NOT recommended.

Quality

The proper selection of fuel is essential for good economy, performance and engine life. No. 2D ULSD should be used when climatic conditions permit. No. 1D ULSD can be used during cold weather conditions. Blends of No. 1D

and No. 2D ULSD fuels can be used to suit various climatic conditions.

 NOTE

The use of lighter fuels (grade No. 1-D) can reduce fuel economy

Fuel Sulfur Content

Fuel sold for use in diesel-powered engines for 2007 and later model year vehicles may only contain a maximum sulfur content of 0.0015% by weight. This was done to reduce particle emissions in the exhaust

 NOTE

The use of ultra-low sulfur diesel fuel does not permit extension of engine oil change intervals or oil filter changes.

Cetane Number

Direct injected diesel engines require a minimum cetane number of 43 under normal starting conditions. Fuel with a higher cetane value may be required for high-altitude or cold-weather operation.

Filtration

Fuel should be clean and free of contamination. Clean fuels should have no more than 0.05% of sediment and water.

Fuel Additives

Fuel additives are generally not recommended or needed for fuels listed earlier. Cetane improvers can be used as necessary. Biocides may be needed to eliminate microorganism growth in storage tanks. In cold conditions, treatment for water in the vehicle tanks may also be necessary.

Consult your fuel supplier about the use of additives to prevent incompatibility among additives already in the fuel and the additives to be used.

Supplemental Fuel Enhancers

There are many aftermarket products available today which are intended to be added by the customer. They generally increase operating cost without providing benefits. Included are a variety of independently marketed products which claim to be:

- Cetane improvers
- Emission control additives
- Detergents
- Combustion improvers
- Smoke suppressants
- Cold weather flow improvers

CAUTION

Supplemental additives are not recommended because of a high risk of injection system problems or engine damage.

NOTE

Repair expenses resulting from malfunctions in the fuel system or with engine components when fuel enhancers have been used are not covered under warranty.

Some fuel additives may be used temporarily, but they do not replace good fuel handling practices. These products can be used:

- Isopropyl Alcohol Use 1/2 liter per 450 liters (1 pint per 125 gallons) of fuel for winter freeze-up protection.
- Biocide For treatment of microbe growth or black slime. Follow manufacturers instruction for treatment.

Prohibited Additives

The following additives are specifically NOT allowed and must NOT be mixed in with the vehicle diesel fuel:

- Gasoline: Adding gasoline to diesel fuel will reduce the cetane number and increase combustion temperature. If a tank contains a diesel fuel/gasoline mixture, it should be drained and cleaned as soon as possible.
- Used Lubricating Oil: Mack Trucks does not recommend the use of any type of used lubricating oil as an extender in the diesel fuel. Used lubrication oil contains solids and acids from the combustion process that can severely corrode parts of the injection

system, resulting in reduced power and higher maintenance cost over time.

Alternative Fuels

Alternative fuels can be of several different types. There are vegetable based fuels, aviation fuel and recycled petroleum based fuels that are used in combustion engines. These are in general not compatible with modern heavy-duty over-the-road diesel engines.

The use of unauthorized fuels may compromise the levels of pollutants in the exhaust to the point where the engine does not meet the emission requirements. This would make the vehicle illegal to drive on public roads. DO NOT use any kind of alternative fuel unless specifically authorized by Mack Trucks.

Fuel Storage

If fuel is stored on site:

- Keep storage tank covered to prevent water entry.
- DO NOT use a tank made of galvanized metal or any galvanized piping for diesel oil storage. Diesel will react with the zinc, forming solids that can clog fuel filters and cause engine damage.

- Fuel stored for a long time may oxidize and form solids, causing filtering problems.
- Keep the area around the fill cap clean.

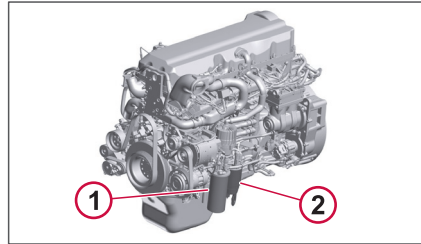
Generally, fuel contamination occurs as the result of improper fuel handling. The most common types of contamination are water, dirt and microbial growth (black slime). The formation of varnishes and gums resulting from poor fuel stability or long storage (stale fuel) also affects fuel quality. The best treatment for contamination is prevention by maintaining a clean storage system and choosing a reputable fuel supplier.

Fuel Filters

A primary fuel filter can be located on the engine or remote mounted on the frame rail. This filter consists of a filter cartridge, a water separation bowl and may have a fuel heater built in.

The secondary fuel filter is located on the cold side of the engine, below the engine electronic control unit (EECU). The filter is a spin-on filter.

Mack MP engines utilize a spin-on primary and secondary fuel filter. Both filters are located on the cold side of the engine



1 Secondary Fuel Filter

2 Primary Fuel Filter

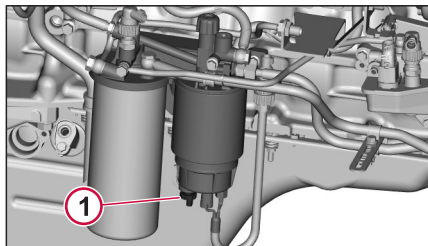
The primary fuel filter on Mack MP engines incorporates a plastic water separator bowl. Additionally, the plastic bowl includes a water-in-fuel sensor. A warning lamp on the instrument panel illuminates when water is detected in the fuel.

⚠ NOTE

There are optional fuel filter systems (such as Davco, Conmet, etc.) available for Mack MP engines. These fuel filter systems use a single remote-mounted filter, eliminating the spin-on primary and secondary filters. For service information concerning these filters, refer to the specific fuel filter manufacturers service literature.

Fuel/Water Separator (Engine Mounted)

A warning lamp on the instrument panel illuminates when water is detected in the fuel. When the lamp illuminates, drain the water from the separator by opening the drain valve and allowing the water to drain from the bowl into a suitable container. When fuel begins to drain, close the valve and tighten to 0.655 Nm (5 in-lb). Dispose of the drained water/fuel in an environmentally safe manner.



1 Water Separator Drain Valve

! NOTE

DO NOT drain the water separator bowl while the engine is running.

! NOTE

Drain the filter water trap daily. Change the fuel filters at every oil change.

Fuel / Water Separator (Chassis Mounted)

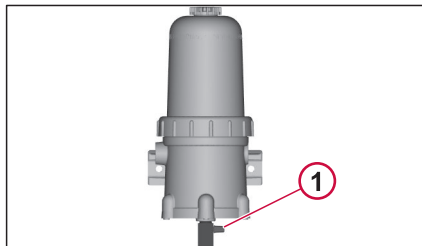
Water and large contaminants fall to the bottom of the body and can be drained away. Dispose of the drained water/fuel in an environmentally safe manner.

! NOTE

DO NOT drain the water separator bowl while the engine is running.

! NOTE

Drain the filter water trap daily. Change the fuel / water separator filter at every oil change or when the fuel reaches the top of the filter.

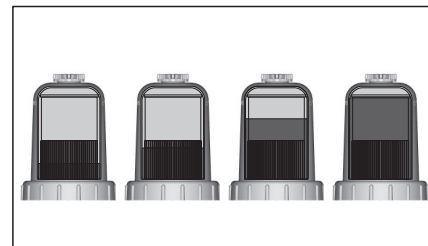


1 Drain Valve

ELEMAX® Filter “SEEING IS BELIEVING”®

The patented clear cover allows the user to know when to change the filter. Fuel level rises as the filter media becomes

contaminated, the fuel filter doesn't need replacement until fuel level is at the Top of the filter.



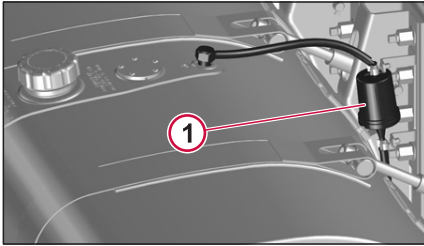
Fuel Tank Ventilation Filter

Some vehicles are equipped with a fuel tank ventilation filter. The purpose of this component is to filter out contaminants that can enter the fuel tank from the vent lines.

This filter should be replaced in conjunction with the vehicle air filter, when indicated by the air restriction gauge or the air filter restrictor indicator light in the instrument cluster.

The maximum time allowed before replacement is 24 months.

For non-severe environments a vehicle will have a frame-rail mounted filter.



1 *Frame Rail Mounted Filter*

For extremely dusty applications the fuel tank ventilation filter is added to the fuel tank vent lines and mounted on the stanchion exhaust bracket at the right side of the truck. For both single or dual tank applications, the vent-lines will run from the tank vent fittings to the fuel tank ventilation filter.

Tires

DANGER

DO NOT attempt to repair wheels or tires unless you are trained and equipped to do so. Wheel and tire assemblies cannot be worked on without proper tools and equipment. Failure to follow this may lead to serious personal injury or death.

DANGER

DO NOT install regrooved, retreaded or repaired tires on the steering axle(s). They could fail unexpectedly and cause the loss of vehicle control, leading to serious personal injury or death.

DANGER

DO NOT use mismatched tires on the same axle. Always use the same type (radial or bias ply) or size. Mixing tires on the same axle will affect the roadholding and can lead to an accident, and serious personal injury or death.

DANGER

Tires used on multi-piece rims must be assembled and inflated only by experienced, qualified personnel. Tires must be inflated in a safety cage whenever possible. If, however, a safety cage is not available, use a portable locking guard. The tire must be deflated prior to removal of the tire-and-rim assembly from the vehicle. Remove the valve core to ensure complete deflation.

DANGER

NEVER position your body in front of the rim during inflation.

DANGER

DO NOT install tires with a load rating that is less than stated on the Certification Label in the door frame. The tire could be unintentionally overloaded, leading to an accident, causing serious personal injury or death.

WARNING

UNDER NO CIRCUMSTANCES should you drive on underinflated or overloaded tires. A tire in this condition builds up excessive heat which can result in sudden tire destruction, property damage and personal injury.

CAUTION

NEVER use water-based sealants, puncture proofing, or liquid balance materials containing water in All-Steel Radial Ply truck tires.

CAUTION

Never bleed air from your tires in an attempt to gain traction for a vehicle stuck in snow, ice or mud. This practice provides no additional traction and typically results in under inflated tires. Never bleed air from a hot tire since that tire will then be under inflated.

Inflation Pressure

To ensure maximum mileage and overall performance from your tires, it is essential that they operate at the correct inflation pressure for the load carried. Check inflation pressure daily while the tires are cold. Always use an accurate tire pressure gauge. Refer to the specific tire manufacturer's information, or to the vehicle certification label for a complete listing of tire inflation pressures.

To adjust for pressure fluctuations induced by temperature changes associated with winter weather, check inflation pressure daily when the tires are cold (i.e., before the vehicle is driven).

Inspection

Inspect your tires daily. Look for bulges, cracks, cuts, penetrations and/or oil contamination. Also, check for uneven wear. If damage is found, have a qualified mechanic thoroughly inspect the tires, front end components and alignment. Replace or discard any damaged tires or components.

Tire Manufacturer Information

More detailed information can be obtained by referring to each tire manufacturer's documentation. Documentation can be obtained either from the Internet or directly from the manufacturer.

Technical data provided includes:

- High-speed or low-speed ratings
- Repair, retreading and regrooving
- Use of tire chains
- Mixing radial and bias tires on the same vehicle
- Tire mounting/dismounting

Oil Contamination of Tires

Lubricating oils, fuel oil, gasoline and other petroleum derivatives, can soften the rubber and destroy the tire. Preventive maintenance is necessary to ensure that oil leakage does not occur. Inspect the following areas on a regular basis:

- Axle end seals
- Engine seals
- Transmission seals
- Drive axle seals
- Oil filters
- Oil and hydraulic lines (if equipped)

Refer to specific tire manufacturer's books, or to the vehicle certification label, for additional information concerning tires and their care.

Wheels

DANGER

DO NOT use oil or grease on studs or nuts. The tightening torque is affected and can lead to incorrect clamping loads between the rim and hub. This could lead to a loss of the wheel. Loss of vehicle control and serious personal injury or death can occur.

DANGER

Before checking the wheels, set the parking brakes, place the transmission in neutral and chock the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

DANGER

DO NOT use mismatched wheel components. If they do not exactly match the original design specifications, they may cause failure or separation leading to blowout and an accident and personal injury or death.

DANGER

Wheels must be serviced only by a qualified technician. DO NOT do this work yourself. Inflated tires on wheels contain compressed air and if suddenly released, do so with an explosive force, resulting in serious personal injury or death.

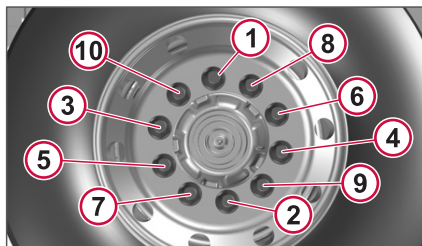
Check wheels for signs of rust streaks around the wheel nuts. This indicates looseness (steel rims). Inspect all types of rims for cracks. Cracks can appear in many places but typically radiate out from where a load is applied. Inspect closely around wheelnuts, handholes and inside circumference.

Wheel Nut Tightening

After the initial tightening, retightening must be made within the first 800 Km (500 miles). After the first retightening, only normal inspection of nut tightness is needed. Check front and rear wheel nut tightness with a torque wrench. All disc wheels for Mack vehicles have a tightening torque of 610 Nm (450 lb-ft). Tighten the nuts in the correct sequence. Inspect bolts and nuts for signs of wear or cracks. Make sure that the bolts are not bent. This tightening check is particularly important when rims or brake drums are newly painted. Paint can flake off from these surfaces, causing the nuts to lose their grip and the wheel to loosen.

DANGER

Failure to properly torque-tighten the wheel nuts can result in the breakage of wheel studs and the subsequent loss of wheels. Loss of vehicle control and serious personal injury or death can occur.



1 1-10 Stud Wheel Nut Tightening Sequence

Tire Wear

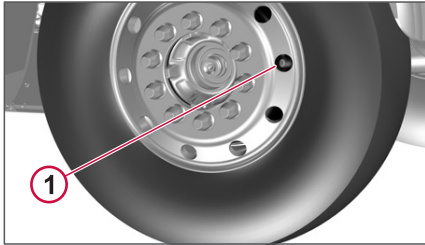
WARNING

DO NOT operate the vehicle with under-inflated tires. Always keep your tires inflated to the manufacturers recommendation. Increased flexing in the tire sidewall produces heat. The heat can build to the point of blowing the tire out causing an accident.

WARNING

Check tire pressure when the tire is cold. Never bleed the air from hot tires. Increased tire pressure measured in a hot tire is normal. Low pressures may cause side wall flexing, resulting in increased heat, leading to tire failure and vehicle accident.

Remove stones lodged in ribs or in between double-mounted wheels. Check the tire pressure and leak-test the valve stems.



1 Valve Stem

Measure the tread depth. The depth should not be less than 3.2 mm (4/32-in) on front tires and not less than 1.6 mm (2/32-in) on drive tires.

Most premium steer tires start with 14.2 mm (18/32-in) tread depth when new. Usually remove steer tires at 3.2 mm (4/32-in). Drive tires should be removed at not less than 1.6 mm (2/32-in).

It is important to have the wheels correctly aligned. Check for uneven tire wear frequently. Uneven tire wear is a sign of wheels out of alignment.

Tire Hints

Hints on How to Avoid Unnecessary Tire Wear

- Maintain correct tire pressure
- Check the tire pressure when the tires are cold
- Check that valve caps are not missing
- Keep the wheels balanced
- Tire wear increases with speed

- Overloading not only decreases tire life but also creates a hazard
- Incorrect front end alignment causes increased wear

Dual mounted wheels should always be of the same type and diameter (maximum diameter difference allowed is 6 mm (1/4 in).

Hubs

⚠ NOTE

Hub maintenance should be performed by a certified technician.

Front Wheel Hubs

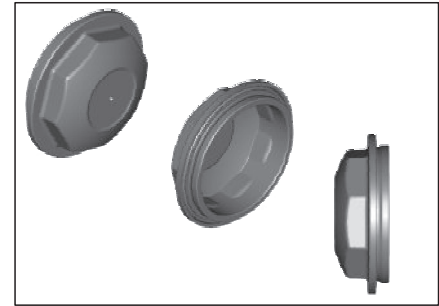
⚠ DANGER

Failure to keep wheel bearings properly adjusted and lubricated may result in accelerated tire wear, poor handling and, in extreme cases, wheel separation from the hub or from the spindle resulting in loss of vehicle control and serious personal injury or death.

Front Wheel Hubs

The front wheel hubs can be filled with one of several types of oil. Motor oil should be SAE 30 or 15W40. The oil can be either petroleum based or synthetic. Axle oil, API GL-5, SAE 75W-90, can also be used. There are no set change

intervals for hub lubrication. The only requirement is that if the hub is opened, the lubricant must be changed.



Unitized Front Hubs

The non-tapered axle hubs are sealed with lubricant inside the hub.

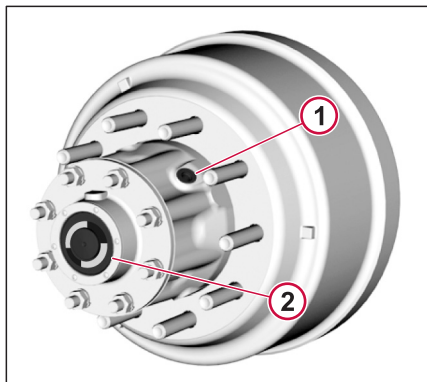
Pre-Set Rear Non-Driving Hubs

⚠ CAUTION

Do not remove the pre-set rear non-driving hub sight glass for any reason. Perform any lubrication refill at the hub refill plug location. Removing the hub sight glass will permanently damage the hub. The hub will have to be replaced if the sight glass is removed.

To determine if the pre-set rear non-driving hub requires lubrication, view the hub lubrication level via the hub front glass. If lubrication is required, refill is

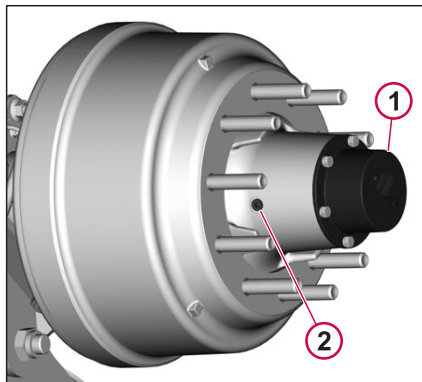
performed on the hub refill plug. DO NOT remove the front glass plug to refill or level the lubrication.



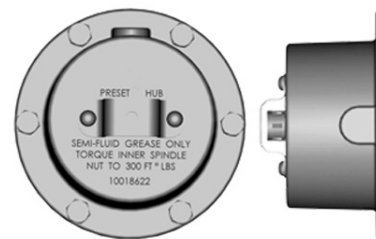
- 1 Hub Refill Plug
- 2 Hub Sight Glass

Semi-Fluid Grease Pre-Set Hub

For vehicles with the semi-fluid grease hub, inspect the hub annually or every 161 000 Km (100,000 miles).

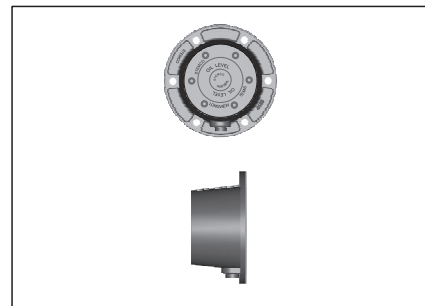


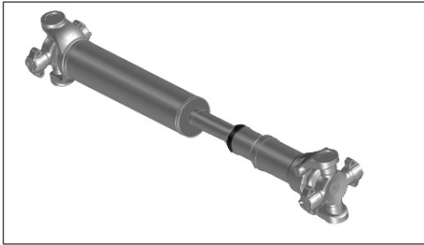
- 1 Semi-Fluid Grease Hub Cap
- 2 Hub Refill Plug



Tapered Axle End

The tapered axle hubs do require lubrication.





Meritor has developed the Arvin Meritor Extended Lube (MXL) driveshaft series.

Old	New
17N (RN)	17X (MXL)
176N (RN)	176X (MXL)
18N (RN)	18X (MXL)

Vehicle Lines	Intervals
Linehaul	From 80 500 km to 161 000 km (50,000 miles to 100,000 miles)
On-Highway	From 25 750 km to 161 000 km (16,000 miles to 100,000 miles)
General Service (City)	From 10 460 km to 40 250 km (6,500 miles to 25,000 miles)
On/Off Hwy (Construction)	As recommended (unchanged versus RN series)

NOTE

For recommended intervals, refer to Engine Maintenance Tables in the Engine section of this manual.

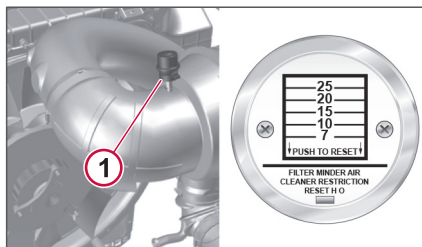
The air cleaner prevents dust, dirt and other harmful contaminants from entering the engine through the air intake system. Maximum engine protection can only be achieved through regularly scheduled maintenance practices that include periodic air intake system inspections and air filter element changes.

The most efficient method of determining air filter element change intervals is by regularly checking the air filter restriction gauge, which may either be mounted directly to the air cleaner canister, on the air cleaner outlet tube or inside the cab. The restriction gauge measures the amount of restriction in the air filter element. Some chassis may have a dash-mounted dial-type restriction gauge which measures filter restriction in mm/inches of water.

Change the air filter element in accordance with the procedures as outlined, or the dash-mounted gauge indicates inlet restriction as follows:

Mounted Gauge Inlet Restriction Indication

Engine	Millimeters (Inches) Water/KPa
MP7™	510 (20) /5 kPa



1 Air Filter Restriction Gauge

Damage to the air filter element, such as holes in the filter media, will give an inaccurate restriction reading. Therefore, even if a maximum restriction is not indicated, the air filter element should be changed yearly or at recommended intervals, as described in this manual.

When replacing the air filter element, or whenever the air inlet system has been disassembled, inspect the inlet air ducts between the air cleaner canister outlet and the turbocharger inlet as follows:

- Inspect the rubber elbows for cracks, splitting and/or holes. Rubber components must be flexible so that they conform to the plastic ducts and ensure a tight seal.

- Inspect plastic ducts for cracks and/or holes.
- Ensure that all hose clamps are properly installed and tightened to specifications.
- Make sure the plastic ducts do not rub against any components such as air conditioning hoses, wire harnesses, etc.

Filter Element Installation

- 1 Wipe the air cleaner housing clean.
- 2 Remove the filter element(s).
- 3 Inspect sealing areas for dirt tracks which would indicate that dust has leaked past the seal. If dirt tracks are found, the cause must be determined and corrected.
- 4 Thoroughly clean the inside of the air cleaner canister with a damp cloth or vacuum cleaner.
- 5 Inspect the sealing areas of the housing for damage. Repair or replace as necessary.
- 6 If equipped with a metal canister, inspect inside the canister for rust. If rust is present:
 - 1 Remove the air cleaner canister from the chassis.
 - 2 Remove all loose rust with a wire brush or a coarse Scotch Brite pad.

3 Sand with 180/240 grit wet or dry sand paper.

4 Thoroughly wash the area with PPG DX-440, DX-436, DX-437 wax and grease remover or equivalent, and wipe dry.

5 Prime immediately with PPG DEP-351 epoxy primer.

6 Reinstall the air cleaner canister.

- 7** Use Mack-approved replacement elements and gaskets. Make sure the new elements and gaskets are not damaged. Be sure to use new gaskets each time the element is changed. Install the cover and, depending upon cover configuration, tighten as follows:

- Air cleaner with large wing nut in center of cover; hand-tighten wing nut.
- Air cleaner with three thumb screws around outer edge of cover; hand-tighten thumb screws.
- Air cleaner with retaining nuts around outer edge of cover; tighten retaining nuts between 11 – 14 Nm (8 – 10 ft-lb).

ⓘ NOTE

DO NOT attempt to clean the air filter element with compressed air, as this could damage the filter media and possibly result in severe engine damage.

The following maintenance items should be performed on all air suspensions:

Preventive Maintenance

- **Visual Inspection:** Inspect all suspension components, checking for signs of wear, damage or unwanted movement. Look for bent or cracked parts. Replace all worn or damaged components as required.
- **Air Spring:** Inspect for chafing or any signs of spring or component damage. Ensure that the upper bead plate is tight against the underside of the frame. Check for lateral slippage at the lower air spring bracket.
- **Support Beam Assembly:** Inspect the overall condition of the support beam for dents, dings or other damage. On Hendrickson PRIMAX suspensions, check the D-pin bushings for tearing or extreme bulging. Check for metal-to-metal contact in the bushed joints. Replace worn or damaged components as required.
- **Frame Hanger Bracket:** Inspect for any signs of loosening or damage. On Hendrickson PRIMAX suspension, check for loosening or damage at the QUIK-ALIGN connections or longitudinal torque rod connections. Replace worn or damaged components as required.
- **Cross Beam:** Inspect for cracks, damage, metal shavings or looseness at the beam connections. Replace worn or damaged components as required.

- **Transverse Torque Rods:** Inspect for signs of looseness at the transverse torque rod connections. Check bushings for tearing or excessive bulging. Check the transverse torque rod for dents or bending. Replace worn or damaged components as required.
- **Shock Absorbers:** Inspect for signs of dents or leaking (oil misting is not considered leakage). Replace worn or damaged shocks as required.
- **Tire Wear:** Inspect tires for wear patterns that might indicate suspension damage or misalignment. Replace worn or damaged components as required.
- **Height Control Valve and Air Lines:** Check for loose, bent or damaged parts. Check air lines for chafing or leaking. Check height control valve and air lines for leakage. Replace worn or damaged components as required.

STEERING AND BRAKES MAINTENANCE**Steering System**

Excessive play in the steering system is checked by turning the steering wheel while the engine is stopped. With the front wheels pointing straight ahead, turn the steering wheel until the front wheels starts moving. Then, turn the steering wheel the other way until the front wheels move. Play should not be more than 25 mm (1 in) at the rim of the steering wheel. If the steering play is excessive, check the steering linkage for looseness, wear, etc. Make necessary repairs before driving the vehicle.

Power Steering Fluid

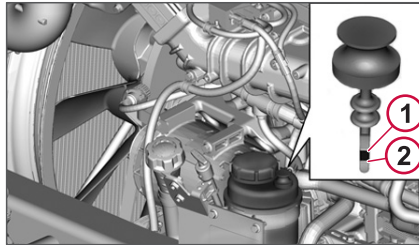
The power steering fluid reservoir is filled with Automatic Transmission Fluid (ATF) Dexron III. This fluid helps maintain the health of the power steering system. If the fluid has darkened, it indicates that the power steering system is running hotter than normal and the fluid is overheating. If this symptom is noticed, take the vehicle to a dealer for troubleshooting and have the fluid changed.

Checking Power Steering Fluid

Proper fluid level should be between the lines on the dipstick.

⚠ **NOTE**

CHECK COLD



1 *Maximum Level*

2 *Minimum Level*

Brake System

⚠ **DANGER**

DO NOT use replacement parts anywhere in the brake system unless it conforms exactly to original specifications. A nonconforming part in your vehicles brake system could cause a malfunction, leading to loss of control of the vehicle resulting in severe personal injury or death.

⚠ **DANGER**

DO NOT release the parking brake or attempt to move the vehicle until brake air pressure in both circuits is at least 100 psi (690 kPa). Failure to follow this procedure may lead to uncontrolled vehicle movement and cause severe personal injury or death.

Air Brake System

This chassis features a dual braking system which has two complete air circuits: a primary circuit for rear brakes and a secondary circuit for front brakes. Each circuit receives air from separate reservoirs. Although there are two air circuits, they operate as one brake system through the dual-circuit treadle valve. This provides the driver with easy, graduated control when applying and releasing the brakes.

The air pressure in the two circuits is monitored by gauges on the instrument

STEERING AND BRAKES MAINTENANCE

panel. When air pressure drops below 517 ± 34 kPa (75 ± 5 psi) in either system at any time other than vehicle startup, pull to the side of the road and determine the problem. If air pressure continues to drop below 55 ± 5 psi in BOTH systems, the Low Air Pressure Warning indicator and buzzer will be activated if low air pressure occurs in either circuit.

In tractor applications, the Trailer Supply Valve (red octagonal knob) will immediately pop out in the event of a trailer breakaway or sudden trailer air line failure, which will apply the trailer spring brakes. In the event of a slow leak in the trailer air system, the trailer supply valve will pop out when system Pressure reaches 70 psi. This protects the tractor air system from further pressure loss.

If the Trailer Supply Valve is held in, in an attempt to override application of the trailer spring brakes, the Park Brake Valve (yellow diamond knob) will automatically pop out and apply the parking brakes when system pressure drops to approximately 20–45 psi. The trailer will pop first and then the tractor.

The air brake system consists of three main elements:

- The compressor, governor and reservoirs supply and store the air pressure.

- The brake application valve controls the brake application pressures.
- The brake chambers control the brake mechanism.

Air Brake Operation

CAUTION

Avoid sudden stops. Constant, sudden stops may negatively affect the performance of braking and driving parts.

When slowing for a stop, leave the clutch engaged for as long as possible to use the braking effect of the engine. When forward speed has dropped to a little above idling speed, push clutch pedal in and brake to a complete stop.

Automatic Slack Adjuster

DANGER

Automatic slack adjusters **MUST NOT** be manually adjusted in an effort to correct excessive push rod stroke, as this condition indicates that a problem exists with the automatic adjuster, installation of the automatic slack adjuster or problems related to components of the foundation brakes. These conditions will not be corrected by manually adjusting the automatic slack adjusters. Manual adjustment of automatic slack adjusters is a dangerous practice that could result in serious consequences. This practice gives the vehicle operator a false sense of security about the effectiveness of the brakes, and the brakes will likely soon be out of adjustment again.

Automatic slack adjusters are designed to automatically maintain proper brake chamber pushrod travel and compensate for brake lining wear during normal use. Manual adjustment of an automatic slack adjuster should never be performed except when performing brake or wheel service (such as backing off the brake shoes for wheel removal, brake shoe relining/replacement, brake drum reconditioning, etc.).

When pushrod travel exceeds specifications (as given in the "BRAKE ADJUSTMENT" section of the Maintenance and Lubrication Manual,

on a vehicle equipped with automatic slack adjusters, a mechanical problem with the slack adjuster, brake components or improper installation of the slack adjuster is indicated. If brakes are found to be out of adjustment, the vehicle must be taken to the nearest repair facility to have the problem investigated and corrected.

ⓘ NOTE

The brake system is a critical vehicle safety system. For your safety and for those around you, follow the recommended preventive maintenance checks. If any problems occur, have them investigated immediately by an authorized service facility

Brake System Maintenance

- 1 Block the wheels to prevent the vehicle from moving.
- 2 Start the engine and build air system pressure to governor cutout.
- 3 Stop the engine.
- 4 Release the parking brakes.
- 5 Apply and hold the Service Brake.
- 6 Have an assistant check for proper results by observing the movement of the slack adjusters as indicated below:
 - The brakes on both the steering axle or the rear drive axle(s) should always apply as indicated by movement of the slack adjuster.
 - Check for air leakage.
- 7 Set park brake when done.

Air Tanks

⚠ DANGER

Drain the air system tanks at the recommended intervals. If condensation accumulates, moisture can enter the brake system air valves, causing corrosion or clogging. The safety of the brake system could be compromised, leading to an accident causing severe personal injury or death.

⚠ WARNING

When draining the air tanks, DO NOT look into the area of the draining air. Dirt or sludge particles may be in the air stream that could cause eye injury.

Air tanks should be drained daily. Make sure the drain cocks close properly after draining. Empty moisture from air tanks by pulling the drain valve lanyard or pull cord. The tanks should be checked for condensation fluid, even if an automatic drain valve is installed.

It is very important that the air system is kept clean. If sludge or oil is found in the drainage or an excessive amount of fluid is drained out of the tanks see your authorized dealer.

STEERING AND BRAKES MAINTENANCE

Air Dryers

Air dryers utilize an oil coalescing desiccant cartridge which removes atomized oil and other particulate matter from the air system. The oil coalescing desiccant cartridge must be changed yearly.

Springs

The spring package is fastened to the axle beam with U-bolts. It is important that the U-bolt nuts are properly tightened. The nuts may loosen up with time. Severe service will loosen them faster. Loose U-bolts can cause springs to break, axle misalignment, hard steering and abnormal tire wear. Inspect the chassis for broken springs, shocks, loose or broken axle U-bolts. If any of these are found, contact your local Mack dealer.

Spring Bushings

When lubricating the springs, lift the axle off of the floor, suspend the frame with axle stands and lower the axle. The spring bushings are now in the position where grease can be added to the contact surfaces. If the spring bushings are greased without taking the load off, high wear and lower lifetime will occur because grease is not able to reach the contact surfaces. If the vehicle is for severe service applications, increase the frequency of spring bushing lubrication.

Rubber Bushings

Rubber bushings are used for extended service life. If your vehicle is equipped with rubber bushings DO NOT lubricate them. Replace the leaf spring if it is damaged or has premature or excessive wear.

Cab Air Filter

To provide comfortable and clean fresh air in the cab, the heating and air conditioning system is designed with a replaceable filter.

Under normal operating conditions the filter should be replaced every 6 months to ensure the efficiency of the heating and air conditioning system. Failure to replace the filter may cause damage to heater/AC components.

Dusty conditions may require more frequent replacement.

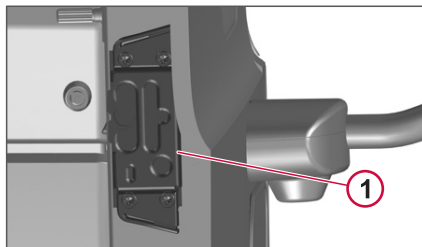


1 Cab Air Filter

Doors

The door lock mechanism should be greased annually using white grease. Lubricate the door lock cylinder with

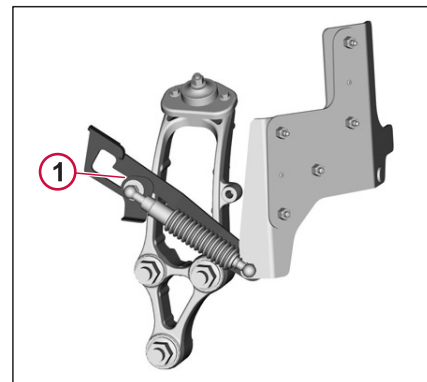
liquid graphite annually, or more often in climates with a lot of snow and salt on the roads. On wet and salted roads, road spray can enter the door lock key cylinder. Lubricate the cylinder with liquid graphite annually or more often if necessary. The door hinge pins are treated at manufacturing and then sealed. No lubrication is necessary. To keep the door rubber moldings and seals around the windows in good working order and to prevent them from freezing shut during the cold season, occasionally spray on a silicone compound.



1 Door Lock Mechanism

Hood

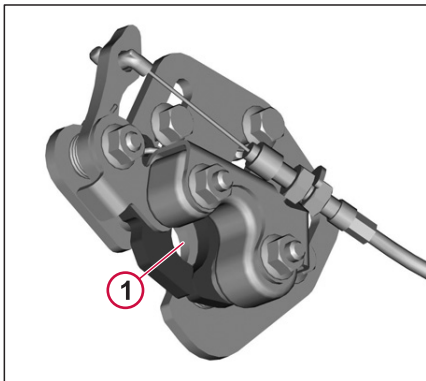
The hood latch mechanism should be greased with white grease yearly. If the mechanism is hard to work or binds, the latch should be cleaned before greasing.



1 Apply Grease

Hood Locks

The hood locks mechanism should be greased with lithium NLGL2 every 160934 Km (100,000 mi). If the mechanism is hard to work or binds, the latch should be cleaned before greasing.



1 *Apply Grease*

Rust Protection

The rust protection applied when the cab was produced is adequate for normal use and service. If an extension of the cab rust protection is desired or if the vehicle is used in a severe application, it is recommended that cavity wax is re-applied every 3rd year.

LUBRICATION

Chassis Lubrication

General lubrication includes lubricating all the grease fittings in the drivetrain, front and rear suspensions, power steering, and front axle, using a grease gun.

Grease the chassis every 24 000 km (15,000 mi). However, the lubrication intervals should be every 16 000 km (10,000 mi) or less to reflect heavy-duty use if the vehicle is in a demanding environment or running in a dirty or corrosive atmosphere.

Lubricating Grease

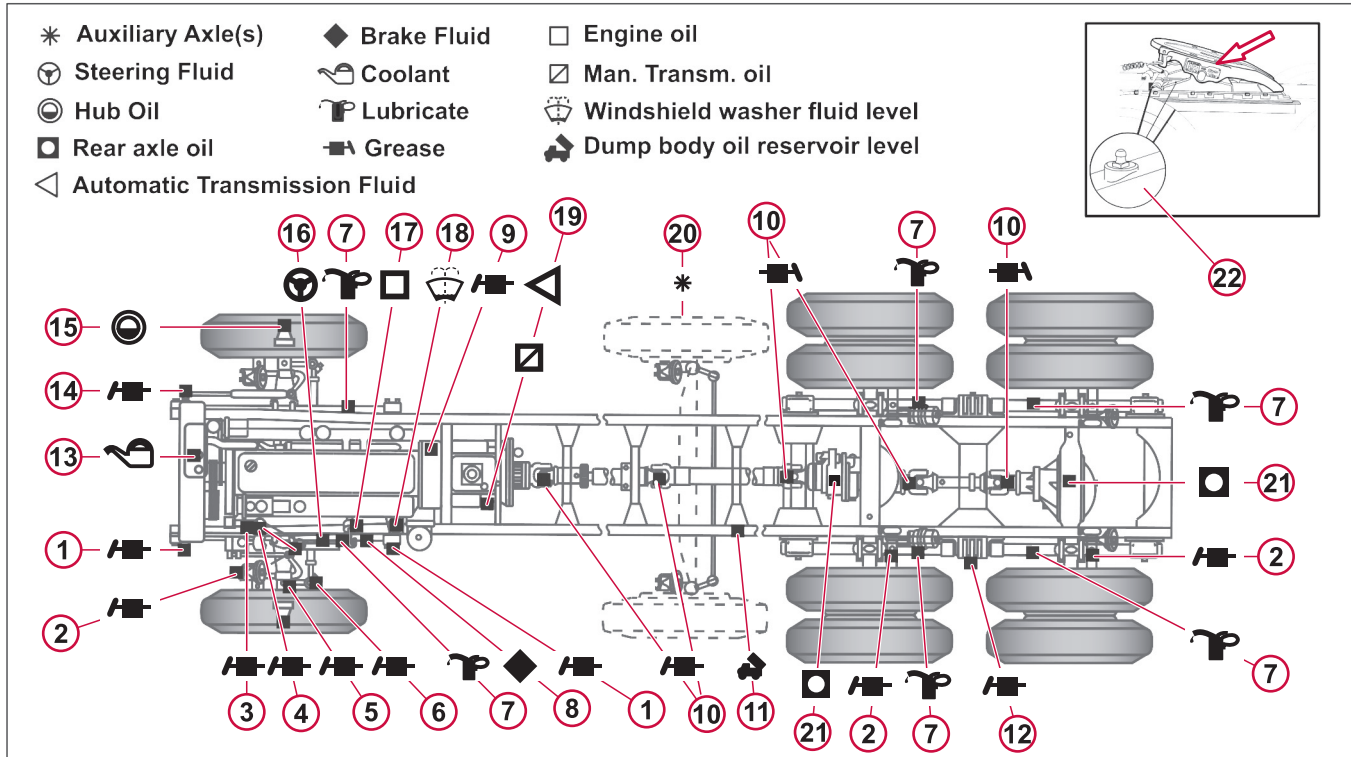
Use grease with a lithium base with EP additives and a consistency of NLGI No. 2. Care should be taken not to use any grease other than one with EP additives for the driveshaft. DO NOT use any solid lubricants, such as graphite, copper or molybdenum disulfide.

Lubrication Procedure

Make sure the grease fittings are cleaned off before greasing fill grease to the point where old grease and contaminants are forced out from the part and only new grease comes out. If new grease cannot be filled so old grease is flushed out, the part needs to be checked for problems. If a fitting does not accept lubrication due to damage or internal stoppage, replace it.

NOTE

Think of greasing the same way as an oil change. All old grease should come out and be replaced with new grease. Remove excess grease from fittings, shackles and other surfaces.



Lubrication Notes

1 Spring Hanger

Use a lithium based grease with specification API NLGI No. 2. When lubricating the left and right sides of the front springs, lift the axle off of the floor, suspend the frame with axle stands and lower the axle. The spring bushings are now in the position where grease can be added to the contact surfaces.

⚠ NOTE

The rock guard will have to be removed (if equipped).

⚠ NOTE

Always grease a Mack front axle with the wheels on the ground.

⚠ NOTE

To grease non-Mack axles, they are typically greased with the wheels on the ground. Consult with the axle manufacturer for the latest recommendation.

2 Slack Adjuster

Do not grease till 1st scheduled maintenance interval.

⚠ NOTE

See Manufactures Specifications for specific grease. Adjust according to the specific slack adjuster manufacturing specifications.

2A Brake Cam

⚠ NOTE

If the brake cam seal does not purge, make sure the inner seal does not purge into the brake drum and onto the brake linings.

3 Steering Gear

Use a lithium based grease with specification API NLGI No. 2. Only use a hand operated grease gun. The high pressure from an air operated grease gun will damage the seal.

4 Draglink and Steering Shaft

Use a lithium based grease with specification API NLGI No. 2.

5 Kingpin, Upper and Lower

Use a lithium based grease with specification API NLGI No. 2.

⚠ NOTE

Always grease a Mack front axle with the wheels on the ground.

⚠ NOTE

To grease non-Mack axles, they are typically greased with the wheels on the ground. Consult with the axle manufacturer for the latest recommendation.

6 Tie-Rod

Use a lithium based grease with specification API NLGI No. 2.

⚠ NOTE

Mack axles may use a greased-for-life tie-rod. No provisions for adding grease are available.

7 Leaf Springs

Front and rear leaf spring eye pins, should be pressure lubricated with chassis grease. Vehicles equipped with multi leaf springs should also have, the leaves lubricated with a spray gun or brush using a rust inhibiting oil.

⚠ CAUTION

Keep grease and oil, off of rubber bushings. Failure to do so will result in component damage.

ⓘ NOTE

If the vehicle is operated in sandy or dusty environments, the spring ends should be left dry. Dirt and grease can mix, resulting in a "sandpaper" action that may cause pre-mature wear to the spring ends.

8 Clutch Reservoir

Check the fluid level in the reservoir. Add brake fluid if necessary. Use only DOT 4 brake fluid in the clutch release system. Mixing DOT 4 brake fluid with petroleum based oil will cause seal damage which will cause leakage.

9 Clutch Bearing Linkage

Use a lithium based grease with EP additives to specification API NLGI No. 2.

ⓘ NOTE

Inspection cover removal is necessary. Lubricate according to Eaton's lubrication document and reinstall the inspection cover. See <http://www.roadranger.com> for the latest heavy-duty clutch service information.

10 U-Joints

Use a lithium based grease with EP additives to specification API NLGI No. 2.

ⓘ NOTE

Ensure that grease purges out of all four seals of the U-joints.

11 PTO/Hydraulic Reservoir

When lubricating the spring pin busing use a lithium based grease with specification API NLGI No. 2.

12 Rear Suspension (48k-70k suspension)**ⓘ NOTE**

Newer versions may have rubber bushing that do not need lubrication.

ⓘ NOTE

Earlier versions of the T-Ride and B-Ride spring cradle required lubrication.

13 Coolant Level

Add coolant if necessary. Only use pre-mixed clean water and antifreeze in a 50/50 mix.

Add only the same type antifreeze, that is: extended life or standard.

14 Steering Assist Cylinder

Use a lithium based grease with EP additives to specification API NLGI No. 2 to grease both ball joints.

15 Front Oil Lubricated Wheel Bearings

There is no set change interval. Change the oil (or grease) only in connection with work on the hub or if dirt is found in the lubrication. Use motor oil SAE 30. Lubricate both the right and the left wheel bearings.

16 Power Steering Fluid

Check the fluid in the reservoir with the dipstick. Add oil if necessary. Use ATF Dexron® III or better. Change fluid every 150,000 miles (240,000 km). Change filter every year.

17 Engine Oil and Filter

For oil change schedule see Service Information in Group 175-60.

18 Windshield Washer Fluid Level**19 Automatic / Manual Transmission****Automatic Transmission**

See the Manufacturer's Operator's manual for intervals and quantity. For Allison transmissions please refer to Allison transmission for the latest recommended fluid and maintenance interval.

Manual Transmission

Use a mineral or synthetic oil. Check oil level periodically. Level should be to the bottom of the inspection hole.

20 Auxiliary Axle(s)

If equipped with auxiliary steer, lift or steerable lift axles use a lithium based grease with specification API NLGI No. 2.

Also, lubricate the Brake, Cams, Slack adjuster and Tie-rod ends.

21 Rear Axle

Check the oil level in the differential by removing the fill/level plug in the housing. The oil should be level with the bottom of the fill/level plug hole. Add oil if necessary. The check should be performed parked on a flat level surface.

CAUTION

Most rear differentials have a large screw and nut protruding from the housing. The screw and nut hold the thrust plate shoe against the ring gear and are not to be confused with the fill/level plug.

NOTE

Refer to Service information for Oil Types and for Approved/Correct Oils.

22 Fifth wheel

The fifth wheel and slider assemblies should always be re-lubricated after steam cleaning or at least every oil change.

Due to different manufactures of 5th wheels and models, some 5th wheels may not have grease fittings.

Use a lithium based grease with specification API NLGI No. 2 on tracks and moving components.

NOTE

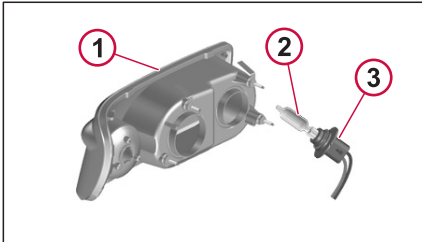
A heavy coating of grease is recommended on the fifth wheel plate by using the grease gun or a putty knife by direct application to the top of the plate.

ⓘ NOTE

Procedure can be performed without special tools.

⚠ CAUTION

Never touch the glass of a halogen bulb with your bare hands or a dirty rag. Oils and other contaminants can greatly reduce bulb life or cause the bulb to explode.



- 1 - Housing
- 2 - Headlamp Bulb
- 3 - Connector

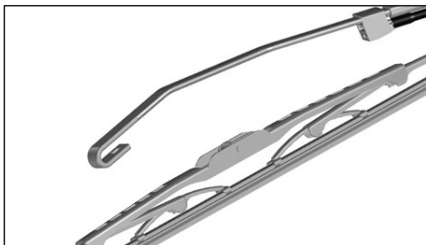
WIPER BLADES

Vehicle Wiper Blades

Check wiper blades for any damage, "dead" rubber and attachment to arm.

Hook-Slot Connector

Your vehicle is equipped with a hook-slot type connector attachment where the arm and blade meet. To remove the wiper blade, push the locking tab on the blade. Then using moderate pressure, push the blade toward the base of the wiper arm. Replace with a new unit.



Cab

CAUTION

When using a pressure washer to clean the vehicle, do not direct the spray at electrical components in the engine compartment such as the alternator, starter and compressors. Water spray from pressure washers can damage electrical components.

Wash all exterior painted surfaces frequently to remove dirt. It is especially important to wash off salt-laden snow and ice during the cold season. A mild detergent approved for automotive cleaning can be used but avoid strong detergents.

NOTE

DO NOT aim the water jet directly at door and window seals or door locks. If locks are filled with water, use compressed air to clean the water out and then apply liquid graphite. Be especially careful of leaving water in locks or around seals during freezing weather.

Apply a coat of wax regularly. This will help the paint and other surfaces keep their luster. If the surface gets dull, use a restoring cleaner specially designed for this. Clean off all tar spots and tree sap before waxing.

Chassis

Keep the chassis free from buildup of dirt. Make sure the chassis is cleaned before the maintenance inspections to help spotting leaks, etc. As salt can be part of the road sludge during the cold season, remove buildup of snow and ice so it does not promote corrosion. At the end of the cold season, thoroughly flush away all collected dirt from the chassis

If signs of delamination of the frame rail are apparent, complete the following steps:

- 1 Clean chassis with high pressure water spray. Use mild detergent if available; remove loose dirt and grease.
- 2 Continue high pressure wash to affected delamination areas of paint from the frame rails. Apply high pressure spray until paint holds on frame substrates.

NOTE

After completing these steps, to avoid further delamination, have the framersail serviced as soon as possible.

Stainless Steel

Stainless steel will rust if exposed to salt for too long. Wash frequently, especially during the cold season, to remove salt-

laden snow and ice. If rust appears, wash the surface and use a rubbing compound to remove the rust. Apply a coat of wax as a finish (do not wax parts that get hot, such as exhaust pipes, etc.).

NOTE

Never use steel wool to clean stainless steel. Pieces of the steel wool break off and can create rust stains on the surface.

Chrome

Chrome surfaces will rust if they are not cleaned and protected. This is especially important during the cold season when roads are salted or in coastal areas where the salt level in the air is high. Clean chrome surfaces with clean water. If the surface has heavy dirt or tar spots, use a tar remover. To remove rust spots, use a non-abrasive chrome cleaner and apply a coat of wax as a finish (do not wax parts that get hot, such as exhaust pipes, etc.).

NOTE

Never use steel wool to clean chrome. Pieces of the steel wool break off and can create rust stains on the surface.

Aluminum

Unprotected aluminum surfaces will form an oxide layer if not maintained.

This is especially important during the cold season when roads are salted or in coastal areas where the salt level in the air is high. Clean with steam or high pressure water. Use a mild detergent if the dirt is heavy. Rinse well. Clean aluminum surfaces with warm water. If the surface has heavy dirt or tar spots, use a tar remover. To prevent spotting, wipe aluminum surfaces dry after washing.

Upholstery

Clean vinyl and cloth upholstery with light brushing or vacuuming. If heavily soiled use a fabric stain remover.

Plastic

The plastic in the upholstery can be cleaned with a soft cloth and mild soap solution.

Alcantara Suede-Like Material

Suede-like upholstery can be cleaned with a soft cloth and mild soap solution.

Leather Care

Leather upholstery is manufactured with a protectant to repel soiling. Over time, sunlight, grease and dirt can break down the protection. Staining, cracking, scuffing, and fading can result.



CAUTION

DO NOT use gasoline, naphtha or similar cleaning agents on the plastic or leather since these can cause damage. Take extra care when removing stains such as ink or lipstick since the coloring can spread. Use solvents sparingly. Too much solvent can damage the seat padding. Start from the outside of the stain and work toward the center. Sharp objects (e.g. pencils or pens in a pocket) or Velcro fasteners on clothing may damage the upholstery.

Clean and Inspect

Keep the belt dry. Clean with a mild soap solution and lukewarm water.

Periodically inspect the following areas and replace any inadequate parts:

Buckle and Latchplate — The buckle and latchplate should mate easily with a solid click and release easily and quickly with moderate pressure on the release button. All metal seat belt components should be free of signs of damage, corrosion or rust.

Webbing — The webbing should show no signs of wear, fraying or holes, and it should be reasonably free of dirt which could find its way into the retracting mechanism.

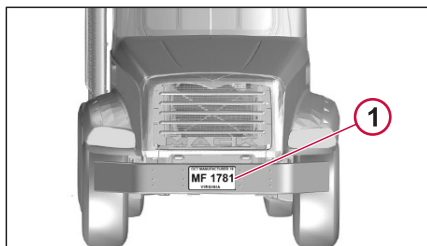
Retractors — The retractors should function smoothly and maintain an appropriate amount of tension. Loose webbing is an indicator that maintenance is needed; it's likely that a too-loose belt will fail to tighten properly when necessary.

Seat Belt Mounting Components — The tethering should be free of wear and debris; the webbing should show no signs of wear, fraying or holes; and the metal components should be free of signs of damage, corrosion or rust.

FRONT BUMPER / PLATE MOUNTING

**CAUTION**

DO NOT cover the opening in the front bumper with a license plate. Covering this hole will restrict airflow to the lower portion of the radiator. This can cause the engine to overheat, which can damage the engine.



1 *Plate Mounting*

 NOTE

Use all tools on the fasteners they were made to be used on. Use metric tools on SI metric units only. Never try to use metric tools on U.S. standard fasteners or U.S. standard tools on SI metric units.

 CAUTION

Potential external/internal thread mismatch condition(s) may occur with certain metric thread-inch thread fastener combinations, and with fastener combinations involving incompatible metric fastener systems. A given thread mismatch condition can result in thread stripping and/or assembly weakness leading to potential service failure, thereby rendering a vehicle non-operational and/or unsafe for operation.

METRIC CONVERSIONS

Conversion Chart		
SI to U.S. Conversions		
25.4 millimeters	=	1 inch
1.61 kilometers	=	1 mile
.473 liter	=	1 pint (U.S. liquid)
.946 liter	=	1 quart (U.S. liquid)
.01639 liter	=	1 cubic inch
1.3558 Newton meters	=	1 pound-foot
.746 kilowatt	=	1 horsepower
6.895 kilopascals	=	1 pound/square inch
(1.8 x degrees Celsius) + 32	=	degrees Fahrenheit
.83267 Imperial gallon	=	1 gallon (U.S. liquid)
U.S. to SI Conversions		
0.3937 inch	=	1 millimeter
.6214 mile	=	1 kilometer
2.1134 pints (U.S. liquid)	=	1 liter
1.0567 quarts (U.S. liquid)	=	1 liter
61.024 cubic inches	=	1 liter
.7376 pound-foot	=	1 Newton meter
1.34 horsepower	=	1 kilowatt
.145 pound/square inch	=	1 kilopascal
.556 x (degrees Fahrenheit -32)	=	degrees Celsius
1.2009 gallons (U.S. liquid)	=	1 Imperial gallon

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EMERGENCY ACTION

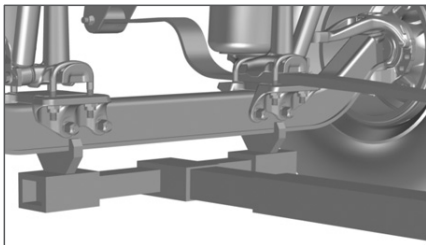
Towing With the Front Suspension Lifted

⚠ NOTE

During towing, the main switch and parking lamps shall be lit if the electrical system of the vehicle is functioning.

⚠ NOTE

During recovery, **Do Not** pull from front axle or damage to u-bolts clamp group could occur.



⚠ NOTE

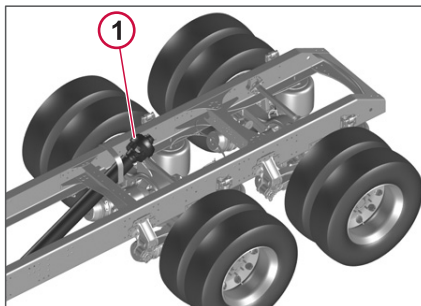
When the vehicle is towed with the front suspension lifted, the steering lock must be released.

⚠ CAUTION

When the driving wheels are still in contact with the ground the axle shaft(s), or prop shaft must always be removed in order not to damage the transmission.

If the axle shafts have to be removed, the hubs must always be provided with tight fitting covers. Sand and dirt could otherwise find their way in and cause considerable damage.

Disconnect the prop shaft from the rear axle and fix it securely to the chassis, or remove the entire prop shaft.



1 Prop Shaft

ABS

⚠ NOTE

During towing with the front suspension lifted, a fault code for "abnormal sensor signal front" is set in the ABS system. This should be considered during the next service, when the ABS fault codes are checked.

The fault code is deleted with the service tool; please refer to the service information for the ABS system.

Towing with the Rear Suspension

⚠ NOTE

When the vehicle is towed with the rear suspension lifted, the steering wheel must be locked with the steering locked.

This method is preferred when the proper equipment is not available to perform the wheel lift method and is necessary for wreckers not equipped with an under axle lift system.

⚠ NOTE

If roof deflectors cannot be removed, tow from the front of vehicle only.

Unloading

If circumstances allow, unload the vehicle before lifting the rear suspension.

The vehicle is unloaded to reduce the axle loading on the towing vehicle, limit the loading on the vehicle's lifting points to minimize the risk of damage to the towing vehicle.

If it is not possible to unload the vehicle where it is, it can be towed a short distance to a suitable place where unloading can take place.

Maximum Loading During Lifting and Towing

This information specifies the loading which can be applied when using a towing hook, towing hitch cross-member, axles and or torque stay anchorages.

Single Towing Hook: The hook must not be loaded by more than the vehicle's gross weight.

Double Towing Hooks: Each hook must not be loaded by more than half the vehicle's gross weight.

Towing Hitch, Towing Hitch Cross-Member: max. 200 mm (7.8 inches) from center of member web

- Lengthways: 20 tons

- Vertically (lift): 7 tons
- Sideways: 17 tons

Axles, Front And Rear:

- Static loading, lengthways and vertically: 2 times axle loading
- Dynamic, e.g. during towing: 1 times axle loading

Air Suspension Vehicles, Front Torque Stays:

Per side: max 5 tons

Gross: max 9.5 tons

DANGER

Do not use the tow eyes for raising the front of the vehicle; the tow eyes can break. Do not crawl under a vehicle suspended by tow eyes. Failure to follow these instructions can result in serious personal injury or death.

NOTE

The towing hooks on the vehicle must only be used for towing.

Lifting, General

Vehicles must only be lifted by the lifting points specified below. Always use suitable lifting devices, such as clevises and chassis guards, to avoid damaging the vehicle.

Lifting Vehicle with Leaf Springs

Front Suspension

Lift behind the front spring anchorage on the chassis member, or beneath the front axle.

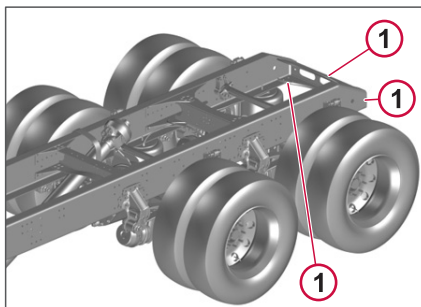
Rear Suspension

Lift underneath the towing hitch cross member. If the vehicle does not have a towing hitch cross member, use the chassis ends for lifting.



CAUTION

Remember to always use a chassis guard when using a cross member for lifting.



1 Lifting Locations

Rear Suspension

If possible, avoid lifting the rear of a truck with air springs. The consequence could be that the air bellows slide apart, unless you first secure the rear axle to the chassis.



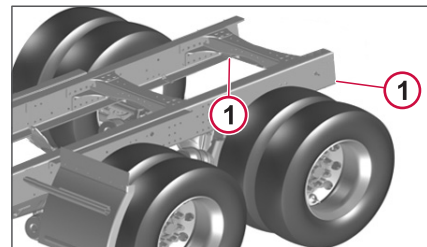
NOTE

If the rear axle is fixed to the chassis with straps etc. when the vehicle is lowered, the straps will burst when Automatic Ride Height control is activated later on.

If you have to lift the rear of the vehicle anyway, lift the towing hitch support cross member in the first instance. If the vehicle does not have a towing hitch support cross member, lift the chassis ends.

If you lift the vehicle by the chassis, the following applies:

- 1 The ignition lock must be in position I or II and the air suspension in "Automatic Ride Height" mode.
- 2 Lift the chassis until the wheels almost leave the ground. Wait until the air has drained out of the air bellows.
- 3 If possible, secure the rear axle to the chassis so that the air bellows cannot slide apart.
- 4 Lift to the desired height.



1 Lifting points on rear suspension, with air springs

Towing Configurations (Rear, Side, and Tow Hooks)

⚠ NOTE

Use these methods for vehicle recovery only.

⚠ WARNING

The steering does not have any servo effect if the engine is not running.

Parking Brake and Towing Hooks

The parking brake must be released during towing.

Use the vehicle's towing hook(s) for towing. If the truck is equipped with **one** towing hook, this may have the gross weight of the truck applied from straight in front. If the truck is equipped with **two** towing hooks, each one of them may have half the gross weight of the truck applied from straight in front.

⚠ WARNING

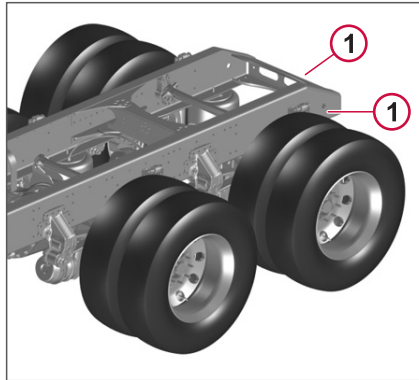
The vehicle's towing hook(s) must only be used for towing. Incorrect use can lead to personal injury if the towing hook is loaded with a greater weight than it is designed for.

The tow hooks are located behind the covers in the front fascia. The covers

must be removed and stored in the cab. Refer to picture for locations.

Towing Backwards

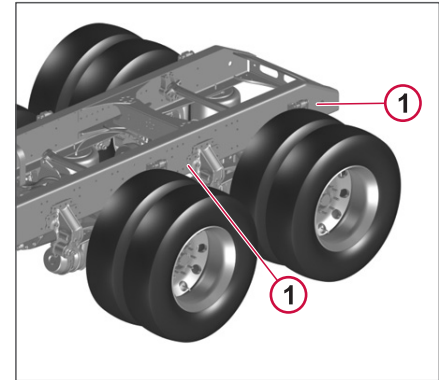
Tow from the rear spring anchorage or trailer hitch hook.



1 Tow from rear spring anchorage or trailer hitch hook

Towing Sideways

When towing sideways, select an attachment point close to the axle anchorage, such as a spring or torque stay anchorage. In other cases, the chassis could be subjected to such heavy loading that it could be bent.



1 Use a spring or torque stay anchorage

Releasing the Brakes

⚠ NOTE

Some trucks can have parking brake cylinders on two axles.

⚠ WARNING

Always start by applying chocks to the wheels, so that the truck cannot roll away. This is important, since you have to lie underneath the truck. If wheel chocks are not applied, personal injury or death may occur.

Parking Brake Mechanical Release (Drum Brakes)

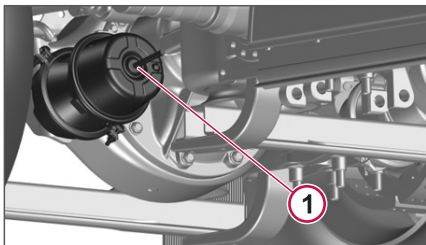
The parking brake can be released mechanically if compressed air is not available.

- Remove the cap on the end of the parking brake cylinder. Remove the t-bolt from the canister by loosening the nut, and insert into the hole matching the slots on canister to t-bolt. The bolt needs to be turned 1/4 turn and then securely tighten the nut.
- Remember to remove the t-bolt and secure in its original location, and put the protective cap back on the parking brake cylinder when towing is completed.

1 *Park Brake Release Screw*

⚠ NOTE

Do not remove the split pins from designs which have a split pin. Instead unscrew the screw and nut together.



Parking Brake Mechanical Release (Disc Brakes)

The brake cylinders have a release mechanism for the parking brake spring, which means that the release bolt does not come out of the brake cylinder.

When you start to release the parking brake manually, a red plastic plug comes out of the center of the nut. It is entirely out after three turns. A total of about 45 turns are needed to fully compress the parking brake spring. When the parking brake is fully reinstated, (spring released), the red plastic plug will return into the center of the nut.



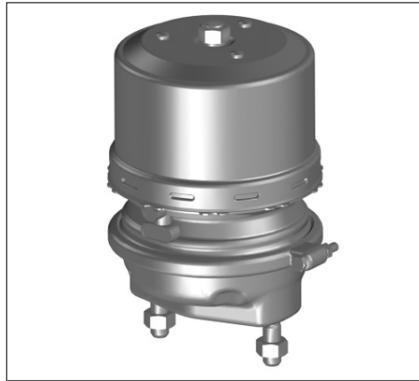
CAUTION

The maximum torque for the release mechanism nut is 47 Nm (34.67 ft-lbs).



NOTE

Always fill the parking brake tank with air when available, and release the parking brake, to reduce the amount of turning needed on the release mechanism nut. The nut should only be released in exceptional cases, with no air in the parking brake section.



Plastic Plug for Release Mechanism

JUMP-STARTING ENGINE

Jump-Starting Engine

If you encounter a situation in which it is necessary to jump-start an engine, use the following procedures.

WARNING

Batteries which are to be linked together must be of the same voltage (12 to 12, 24 to 24). Take care to observe proper polarity when connecting batteries. Batteries produce explosive gases. Keep sparks, flames, cigarettes, etc., away from batteries at all times. Protect your eyes by wearing safety goggles. Be sure vehicles are NOT touching each other.

WARNING

Remember that batteries contain a hydrogen and oxygen mixture, which is highly explosive. A spark which could occur when you apply the jumper cables incorrectly could be enough to cause the battery to explode and injure you and damage the truck. The battery contains sulfuric acid, which can cause serious chemical burns. If you get any acid in your eyes, skin or clothes - rinse with large quantities of water. If you get any splashes in your eyes, contact a doctor at once.

CAUTION

The battery contains acid which is corrosive and poisonous. It is thus important that the battery is handled in an environmentally compatible manner.

WARNING

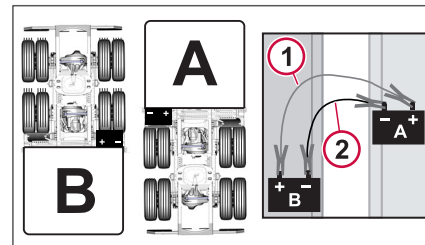
Always wear eye protection when working around batteries to prevent the risk of injury due to contact with sulfuric acid or an explosion.

WARNING

Battery posts, terminals and related accessories contain lead compounds, chemicals known to the state of California to cause cancer and reproductive harm. Wash hands after handling.

- 1 The ignition lock in both trucks should be in position 0 (OFF).
- 2 Make sure that the battery system voltage of both truck (A) and truck (B) have the same voltage. (A is 12 volt and B is 12 volt). Ensure there is NO physical contact between trucks.

3



1 Positive Cable (Red)

2 Negative Cable (Black)

A - The truck which gives start help

B - The truck with a dead battery

- 4 Connect one clamp on the black cable to the negative terminal on truck A, (2) a large jump start nut.
- 5 Check that the clamps are securely attached, so that no sparks occur.

CAUTION

Do not lean over the battery during the start attempts, to avoid the possibility of personal injury.

- 6 Start the engine in truck A. Allow the engine to run for approximately two minutes, at 1000 rpm, to ensure that adequate charge for a preheater equipped truck has been transferred to the weak batteries.

- 7 Start the engine in truck B.
- 8 Remove the cables in the reverse order from attachment.

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