Foreword

This manual contains information concerning the operation and function of the Mack Engines. Please keep this manual in the vehicle at all times.

Note: Illustrations in this manual are used for reference only and may differ slightly from the actual vehicle. However, key components addressed in this document are represented as accurately as possible.

The National Highway Traffic Safety Administration (NHTSA) and Mack Trucks, Inc. should be informed immediately if you believe that the vehicle has a defect that could cause a crash, injury or death.

Contact NHTSA by calling the Auto Safety Hotline at 1 (888) 327-4236, by writing to NHTSA, U.S. Department of Transportation, Washington, DC 20590, by TTY at 1 (800) 424-9153, or visit their website at www.nhtsa.dot.gov.

Mack Trucks, Inc.
Greensboro, NC USA

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Safety Information

IMPORTANT: Before driving this vehicle, be certain that you have read and that you fully understand each and every step of the driving and handling information in this manual. Be certain that you fully understand and follow all safety warnings.

IT IS IMPORTANT THAT THE FOLLOWING INFORMATION BE READ, UNDERSTOOD AND ALWAYS FOLLOWED.
The following types of advisories are used throughout this manual:

- **DANGER**
  
  Danger indicates an unsafe practice that could result in serious personal injury or death. A danger advisory banner is in white type on a black background with a black border.

- **WARNING**
  
  Warning indicates an unsafe practice that could result in personal injury. A warning advisory banner is in black type on a gray background with a black border.

- **CAUTION**
  
  Caution indicates an unsafe practice that could result in damage to the product. A caution advisory is in black type on a white background with a black border.

**Note:** Note indicates a procedure, practice, or condition that must be followed in order for the vehicle or component to function in the manner intended.
CALIFORNIA PROPOSITION 65 WARNING
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

CALIFORNIA PROPOSITION 65 WARNING
Battery posts, terminals and other related accessories contain lead and lead compounds, chemical known to the State of California to cause cancer and other reproductive harm. Batteries also contain other chemicals known to the State of California to cause cancer. Wash hands after handling.

Important
Your new Mack truck contains many new technological advancements that may require new servicing techniques and methods. An authorized Mack truck dealer is in the best position to provide technicians who have the necessary training, experience and tools to properly service your truck.
Overview of the Mack Engines

Introduction

In 2010, the Mack engine family will consist of three engines: MP7, MP8 and MP10. The Mack engines meet the very stringent new emissions standards which apply to all heavy-duty diesel engines built after January 1, 2010 for on-highway trucks. The new standards for EPA2010 requires 83% reduction in nitrogen oxide (NOx) and 0% reduction in Particles (Pt) relative to US07.

Key Features of the Mack Engines:

- Improved Fuel Economy
- Extended Oil Drain Intervals
- Improved Cooling Capacity
- Low Maintenance Catalyzed Aftertreatment Diesel Particulate Filter (DPF)
- Enhanced Engine Brake Performance
- Selective Catalytic Reduction (SCR)
Fuel

**CAUTION**

Diesel engines for 2010 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. Manufacturer’s 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 by Mack Trucks, Inc..

Fuel sold for use in diesel-powered engines for 2010 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.

Bio Diesel

The only BioDiesel Fuel approved by Mack Trucks, Inc. for use in Mack Engines is Soy Methyl Ester (SME or SOME) in blends up to B5 Concentration (5% blend).

Note: Although higher concentrations are available, concentration up to B5 (maximum) are the only blends currently approved by Mack Trucks, Inc.

Engine Oil

EO-O Premium Plus (or VDS-4) diesel engine oil is mandatory for use in all 2010 emission compliant Mack engines. Chassis equipped with a 2010 emission compliant engine, which can be identified by the presence of an Aftertreatment Selective Catalytic Reduction (SCR) system, also require the use of Ultra Low Sulfur Diesel (ULSD) fuel. EO-O Premium Plus oils exceed the new API service category CJ-4.
Engine Operation

**DANGER**
Do not use ether or other combustible starting aids in any Mack engine. Introduction of ether or similar starting aids could cause a fire or explosion resulting in severe property damage, serious personal injury or death.

**CAUTION**
DO NOT crank the engine for more than 30 seconds at a time; wait 15 minutes after each try to allow the starter to cool. Failure to follow these instructions could cause starter damage.

**Note:** Some starters are equipped with starter protection. If the engine is running, the starter temperature is too high, the transmission is not in neutral or the clutch pedal is not depressed, starter engagement is inhibited.

Allow the engine to slow down and idle for 3 to 5 minutes before shutting it off. This allows the turbocharger to cool down and the cooling system to dissipate the engine heat. Switch the engine off by turning the ignition key to the OFF position.

**CAUTION**
Mack Trucks, Inc. does not recommend the use of winterfronts, shutters or any other shield in front of the grille or radiator package under normal circumstances. Today’s electronically controlled engines are designed to operate in cold temperatures without a winterfront. These devices, if not used properly, can cause higher exhaust gas temperatures, power loss, excessive fan usage, failure of the charge-air-cooler and a reduction in fuel economy. Winterfronts can be used in the wintertime during very cold weather if used properly. In these cases, engine coolant and intake air temperatures must also be carefully monitored and controlled. Please see your authorized Mack Truck dealer for Mack recommended winterfronts.

**CAUTION**
Mack is now using the ambient air temperature (AAT) sensor for OBD monitoring. If a customer installs a winterfront or blocks the radiator opening and blocks airflow to the sensor, they will likely set an OBD diagnostic trouble code (DTC) for inaccurate sensor data due to restricted airflow across the sensor.
Engine Shutdown System

**DANGER**

Failure to take the necessary precautions when the STOP telltale is on can result in automatic engine shutdown and the loss of power steering. Vehicle crash can occur.

The engine shutdown system will automatically derate or stop the engine when one or more of the conditions listed below reaches a critical stage:

- High Engine Coolant Temperature (ECT)
- Low Engine Oil Pressure (EOP)
- Low Engine Coolant Level (ECL)
- High Crankcase Pressure (CCP)

When the shutdown is activated, the telltales come on along with display symbols and the buzzer is also activated. After a brief time, the engine shuts down. Find a safe place to pull off the road as soon as possible.

After the engine has been shut down by the system, turn the ignition key to the off position. If necessary, the engine can be restarted for a brief time so that the vehicle may be pulled off the road.

The alarm will remain activated until repairs have been made to correct the problem that caused the shutdown.

**CAUTION**

Continuously restarting the engine once the shutdown system is active may result in severe engine damage.

Refer to the Driver Information Display manual for information about the display symbols.
Engine Overview, MP7 and MP8 Left Side View

MP8 Engine Shown, MP7 Engine Similar

1. Breather Tube
2. Intake Manifold
3. Air Compressor
4. Power Steering Pump
5. Fuel Pump
6. Engine Control Module (ECM)
7. Fuel Filter
8. Fuel/Water Separator
9. Fuel Filter
10. Hand-Priming Pump
11. Crankcase Ventilator
12. Alternator
13. AC Compressor
14. Alternator/AC Compressor Belt
15. Fan/Coolant Pump Belt
16. EGR Mixing Chamber
### Engine Overview, MP7 and MP8 Right Side View

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.</td>
<td>Exhaust Manifold</td>
</tr>
<tr>
<td>18.</td>
<td>Valve Cover</td>
</tr>
<tr>
<td>19.</td>
<td>Intake Air Heater (IAH) optional</td>
</tr>
<tr>
<td>20.</td>
<td>Thermostat</td>
</tr>
<tr>
<td>21.</td>
<td>Belt Tensioner</td>
</tr>
<tr>
<td>22.</td>
<td>Coolant Pump</td>
</tr>
<tr>
<td>23.</td>
<td>Coolant Filter</td>
</tr>
<tr>
<td>24.</td>
<td>Venturi Pipe</td>
</tr>
<tr>
<td>25.</td>
<td>Oil Filters</td>
</tr>
<tr>
<td>26.</td>
<td>Oil Pan</td>
</tr>
<tr>
<td>27.</td>
<td>EGR Cooler</td>
</tr>
<tr>
<td>28.</td>
<td>Turbocharger</td>
</tr>
<tr>
<td>29.</td>
<td>Starter Motor</td>
</tr>
<tr>
<td>30.</td>
<td>EGR Valve</td>
</tr>
</tbody>
</table>

MP8 Engine Shown, MP7 Engine Similar
Engine Overview, MP10 Left Side View

1. Breather Tube
2. Intake Manifold
3. Air Compressor
4. Power Steering Pump
5. Fuel Pump
6. Crankcase Ventilator
7. Engine Control Module (ECM)
8. Fuel Filter
9. Fuel/Water Separator
10. Fuel Filter
11. Hand-Priming Pump
12. Alternator
13. AC Compressor
14. Alternator/AC Compressor Belt
15. Fan/Coolant Pump Belt
16. Venturi Pipe
17. EGR Mixing Chamber
18. Exhaust Manifold
19. Valve Cover
20. Intake Air Heater (IAH)
21. Thermostat
22. Belt Tensioner
23. Coolant Pump
24. Coolant Filter
25. Oil Filters
26. EGR Cooler
27. Oil Pan
28. Starter Motor
29. Turbocharger
30. EGR Valve
1. Selective Catalytic Reduction (SCR) Catalyst
2. Aftertreatment DEF Dosing Unit
3. Aftertreatment Diesel Particulate Filter (DPF)
4. Aftertreatment DEF Tank
LEU and MRU Standard System View

1. Selective Catalytic Reduction (SCR) Catalyst
2. Aftertreatment DEF Dosing Unit
3. Aftertreatment Diesel Particulate Filter (DPF)
4. Aftertreatment DEF Tank
Safety Information

The exhaust aftertreatment system utilizes technology that oxidizes trapped particles and unburned hydrocarbons thereby reducing emissions. This oxidation occurs during the regeneration process. While regeneration is occurring, very high exhaust gas temperatures will occur. In some vehicles, regeneration can occur when the vehicle is stationary.

DANGER

Exhaust gases and components can be at extremely high temperatures during regeneration. When parking the vehicle, keep away from any flammable materials, vapors, or structures.

DANGER

The temperature of the exhaust system components during the regeneration process can exceed 350 degrees C (660 F). The exhaust gas leaving the system can reach 505 degrees C (930 F). Various factors (including ambient temperature and duration of the regeneration process) determine when these components will return to normal operating temperature after regeneration has completed. Be extremely careful around these hot components. Contact with these components can result in serious personal injury.
Selective Catalytic Reduction (SCR)

Selective Catalytic Reduction (SCR) is an emissions-reduction technology with the ability to deliver near-zero emissions of nitrogen oxides (NOx), a smog-causing pollutant and greenhouse gas. SCR’s performance has been proved in millions of miles of real-world truck operations in other countries, as well as in long-term field tests in the U.S.

SCR reduces NOx emissions to very low levels, while at the same time delivering excellent fuel economy and reliability. The system doesn’t change the design or operation of the basic engine. Rather, SCR is an aftertreatment system which converts NOx in the exhaust stream into harmless gases. Modern diesels already use exhaust aftertreatment systems, called diesel particulate filters, to control emissions of another pollutant, soot (also known as particulate matter or PM).

SCR works by injecting Diesel Exhaust Fluid (DEF) into the exhaust. DEF is a safe, simple solution of water and urea. DEF works with the heat of the exhaust and a catalyst to convert NOx into nitrogen and water vapor - two harmless and natural components of the air we breathe. The end result is cleaner air, excellent fuel efficiency and a reliable emissions control system for today’s modern diesel engine.

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
There are 2 different shapes for the SCR catalysts, they are vertical and horizontal. The horizontal SCR catalyst comes in 2 different sizes, a full size or a compact. The vertical SCR catalyst comes in 1 size, with two different intakes, it will either have a bottom intake or a side intake.

The Mack SCR system is simple and effective, with few components. It consists of a Aftertreatment DEF tank positioned near the standard diesel tank, plus a 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 -- and higher oxygen levels -- for better combustion, while meeting 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 results in better fuel economy from your Mack engine.

1 Diesel engine optimized for high performance, low particle emissions and low fuel consumption.

2 Aftertreatment DEF tank
3 The Aftertreatment Control Module (ACM) continuously monitors and adjusts the Aftertreatment DEF pump pressure in response to current engine load conditions.
4 DEF is injected into the exhaust gases in between the Aftertreatment DPF (5) and the SCR catalyst (6).
5 Aftertreatment Diesel Particulate Filter (DPF).
6 In the SCR catalyst, nitrogen oxides are transformed into harmless nitrogen gas and water.
7 The system notifies the driver when it is time to refill tank with DEF.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not put diesel fuel in the Aftertreatment DEF tank. Diesel fuel, if sprayed into the hot exhaust along with the DEF, could ignite explosively causing a fire resulting in personal injury or damage to the exhaust system.</td>
</tr>
</tbody>
</table>
Diesel Exhaust Fluid (DEF)

Diesel Exhaust Fluid (DEF) is a reactant that’s key to the SCR process. It’s a nontoxic, aqueous solution of 32.5% urea and 67.5% water. Urea is a compound of nitrogen that turns to ammonia when heated. It is used in a variety of industries, perhaps most commonly as a fertilizer in agriculture. The fluid is not inflammable, nor is it dangerous when handled normally. However, it is highly corrosive to metal, particularly copper and aluminium. Read the separate section concerning the handling of DEF solution.

Diesel Exhaust Fluid (DEF) Handling

When handling DEF solution, it is important that electrical connectors to be connected or well encapsulated. Otherwise there is a risk that the DEF will cause oxidation that cannot be removed. Water or compressed air do not help, since DEF quickly oxidizes metal. If a connector comes into contact with the DEF solution it must be replaced immediately to prevent the DEF solution from creeping further into the copper wiring, which takes place at a speed of about 60 cm (2.4 in) per hour.

CAUTION

When detaching hoses and components, do not spill DEF on disconnected connectors. If DEF is spilled on a connector, the connector must be replaced immediately.

Things to know about spilled Diesel Exhaust Fluid (DEF)

<table>
<thead>
<tr>
<th>If urea solution comes into contact with the skin</th>
<th>rinse with plenty of water and remove contaminated clothing.</th>
</tr>
</thead>
<tbody>
<tr>
<td>If urea solution comes into contact with the eyes</td>
<td>rinse for several minutes and call for medical help if necessary.</td>
</tr>
<tr>
<td>If inhaled</td>
<td>Breathe fresh air and call for medical help if necessary.</td>
</tr>
<tr>
<td>Do not allow the DEF solution to come into contact with other chemicals.</td>
<td></td>
</tr>
<tr>
<td>The DEF solution is not flammable. If the DEF solution is exposed to high temperatures, it breaks down into ammonia and carbon dioxide.</td>
<td></td>
</tr>
<tr>
<td>The DEF solution is highly corrosive to certain metals, including copper and aluminium.</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

Note: Do not flush DEF spillages into the normal drain system.

WARNING

DEF spilt onto hot components will quickly vaporize. Turn your face away!
Diesel Exhaust Fluid (DEF) Consumption

DEF consumption is related to fuel consumption. A highway truck may travel 225-300 miles or more on one gallon of DEF. If a driver runs out 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 to derate mode. When the DEF tank is refilled, the engine will resume normal power.

Diesel Exhaust Fluid (DEF) Availability

DEF will be available in 2.5-gallon containers, 55-gallon drums, 275 gallon IBC and in bulk storage for fleet locations, truck stops and dealerships. DEF will be everywhere drivers are. All major truck stops, dealers and distributors will carry DEF. For more information on DEF and availability please visit the website www.truckscr.com.

Aftertreatment Control Module (ACM)

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 Tank Level Sensor

The ACM also monitors the following values in the exhaust aftertreatment system:

- Aftertreatment DEF Dosing Absolute Pressure
- Aftertreatment DEF Tank Temperature
- Aftertreatment DEF Tank Level
- Aftertreatment DPF Inlet/Outlet Temperature
- Aftertreatment DPF Differential Pressure
- NOX Sensors

The ACM is a stand alone module. Depending on your configuration it may be mounted as part of the DEF tank (as shown above) or on a bracket near the DEF tank.
Aftertreatment Diesel Particulate Filter (DPF)

CAUTION

Use of diesel fuel other than ULSD and engine oils other than EO-O Premium Plus (or VDS-4), will adversely affect performance, efficiency and durability of the Aftertreatment DPF system and the engine, to the point where the engine may not run at all. Manufacturer’s 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. Exhaust vapor (water condensation) may be visible during a cold start. If exhaust smoke is visible during engine operation, this indicates a problem with the exhaust aftertreatment system. Take the vehicle to an authorized Mack Truck dealer immediately.

Vehicles equipped with a 2010 emission compliant engine have an exhaust aftertreatment system which includes a Selective Catalytic Reduction (SCR) system and a Catalyzed Aftertreatment Diesel Particulate Filter (DPF). The Aftertreatment DPF takes the place of the standard muffler, and it reduces soot and particulate emissions into the atmosphere. Soot and other particulate matter are collected by a filter where it is eventually oxidized using a regeneration process. Vehicles equipped with a Aftertreatment DPF require the use of EO-O Premium Plus (or VDS-4) specification high performance diesel engine oil and Ultra Low Sulfur Diesel (ULSD) fuel.
Exhaust Aftertreatment System Operation

Aftertreatment DPF Regeneration

**DPF Smart Switch**—This is a three-position switch where the middle position is neutral.

1. Upper Position – Regeneration Position
2. Middle Position – Neutral Position
3. Down Position – Inhibit Position (if equipped)
CAUTION

During the Aftertreatment DPF Regeneration Required, 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 in a location that may be hazardous when Aftertreatment DPF Regeneration Required begins (i.e., in close proximity to flammable materials or gases, inside tunnels, parked under flammable objects, etc.), the Aftertreatment DPF Regeneration Required should be stopped (if equipped). If Aftertreatment DPF Regeneration Required is stopped by the vehicle operator, it must be initiated at a later time when the vehicle is in a safer location. Aftertreatment DPF Regeneration Required that are stopped and never restarted at a later time, however, will require that the vehicle be taken to an authorized Mack Truck dealer to have the Aftertreatment Regeneration manually started with special service tools.

Note: If Aftertreatment DPF Regeneration Required occurs during vehicle operation, idle speed may increase when the vehicle is stopped at a traffic light to maintain proper Aftertreatment DPF Regeneration Required conditions.

There are two types of Aftertreatment DPF Regeneration Required: Moving and Parked. Moving Aftertreatment DPF Regeneration Required only occurs when the vehicle is moving at uninterrupted highway speed. Parked Aftertreatment DPF Regeneration Required is manually initiated when the vehicle is stationary. This is the standard configuration. Other configurations are available.
Moving Regeneration

"Moving" regeneration occurs while the vehicle is being driven and can be automatic (no operator input needed to start regeneration) or manual (operator input needed to start regeneration). The operator is notified that a regeneration is needed when the icons on the DPF Smart switch illuminate (refer to Figure listed below).

**Note:** The vehicle operator should try to maintain vehicle speed during the regeneration process. If the vehicle must be stopped (at a traffic light for example), allow the vehicle to idle and do not apply the park brake. Applying the park brake will disrupt and end a regeneration that started while the vehicle was being driven.

Please refer to the instructions below on how to use the DPF Smart switch during a regeneration that occurs while the vehicle is being driven.

**Moving (Automatic) Regeneration**

1. When the icons on the DPF Smart switch light up, maintain vehicle speed if possible.
2. During regeneration, the icons on the switch will shut off.
3. Regeneration will take between 20 and 30 minutes to complete.
4. To stop regeneration, press the switch down to the inhibit position (if equipped). When the bottom of the switch is illuminated, regeneration is stopped. The switch will remain locked in this position and the light will stay illuminated. The driver has the option of stopping a regeneration if the vehicle is in an area where elevated exhaust temperatures will pose a hazard (i.e., tunnel, under trees, in an area where there is flammable material, etc.).
Moving (Manual) Regeneration (If Available)

1. When the icons on the DPF Smart switch light up, maintain vehicle speed and press and hold the top part of the switch momentarily.

2. During regeneration, the icons on the switch will shut off.

3. Regeneration will take between 20 and 30 minutes to complete.

4. To stop regeneration, press the switch down to the inhibit position (if equipped). When the bottom of the switch is illuminated, regeneration is stopped. The switch will remain locked in this position and the light will stay illuminated. The driver has the option of stopping a regeneration if the vehicle is in an area where elevated exhaust temperatures will pose a hazard (i.e., tunnel, under trees, in an area where there is flammable material, etc.).

Depending on the vehicle’s set up, it may be possible to perform a parked regeneration if necessary.
Parked Regeneration

Parked regeneration allows the operator to start and/or stop the regeneration manually when the vehicle is parked and the engine is idling. The operator is notified that a regeneration is needed when the icons on the DPF Smart switch illuminate. The operator should perform the regeneration as soon as possible.

Please refer to the instructions below on how to use the DPF Smart switch for parked regenerations.

1. Move the vehicle to a safe location, apply the park brake and allow the engine to idle.

2. Press and hold the top part of the DPF Smart switch momentarily to initiate the regeneration.

3. During regeneration, the icons on the switch will shut off. The HEST indicator on the instrument cluster will light up to notify of high exhaust temperatures.

4. For aftertreatment DPF filter systems which are not Spark Assisted, the engine speed may ramp as high as 1,100 rpm. For Aftertreatment DPF filter spark assisted systems, the engine will continue to idle during the regeneration.

5. Regeneration will take between 20 and 30 minutes to complete.

6. After regeneration has completed and the exhaust temperature has returned to normal, the HEST indicator will shut off.

7. To stop regeneration, press the switch down to the inhibit position (if equipped). When the bottom of the switch is illuminated, regeneration is stopped. The switch will remain locked in this position and the light will stay illuminated. The driver has the option of stopping a regeneration if the vehicle is in an area where elevated exhaust temperatures will pose a hazard (i.e., tunnel, under trees, in an area where there is flammable material, etc.).
CAUTION

Failure to perform a regeneration in a timely manner after notification may result in engine derate, a clogged DPF, damage to the DPF and engine shutdown.

DANGER

During the regeneration process (with either system), the temperature of the exhaust gases will be elevated. DO NOT park or stop for an extended period under low hanging overhead flammable objects such as trees, awnings, structures, etc., that could be damaged by elevated exhaust temperatures. Further, if the vehicle is being operated in an area where flammable vapors exist, the regeneration process must be interrupted. Failure to heed these cautions may result in fire or explosion causing serious personal injury or death.

When regeneration is needed, an icon at the top of the DPF Smart switch will illuminate to notify the vehicle operator. The DPF Smart switch allows the vehicle operator to either stop or start regeneration. (Certain conditions must be met, however, before regeneration can be manually started.)

Note: If the vehicle is in a location that may be hazardous when an active regeneration begins (i.e., in close proximity to flammable materials or gases), the regeneration should be stopped by pushing the DPF switch to the "Stop Regeneration" position.

If an active regeneration is stopped by the vehicle operator, it should be initiated at a later time when the vehicle is in a safe location. However, if an active regeneration is stopped too many times, the vehicle must be taken to a MACK service facility. The service facility will use a service tool to manually initiate the regeneration.

WARNING

The temperature of the exhaust system components during the regeneration process can exceed 500°C (1000°F). Various factors (including ambient temperature and duration of the regeneration process) determine when these components will return to normal operating temperature after regeneration has completed. Be extremely careful around these hot components. Contact with these components can result in serious personal injury.
CAUTION

When the inhibit position is pressed, the switch will remain in a locked position. It is important, therefore, to immediately set the switch back to the neutral position when safe to do so. Failure to set the switch back to the neutral position may result in an engine derate, clogged diesel particulate filter or damage to the filter.

DPF INHIBIT ROAD SPEED LIMITING (RSL)

The DPF Smart Switch can be locked into the DOWN (or Inhibit Regen) position by the driver (if equipped). If the DPF Smart Switch remains in the locked position, the following vehicle speed limiting will occur:

1. Vehicle Moving. If vehicle is moving with the DPF Smart Switch in the locked (DOWN) position, the vehicle speed will decrease down to 16 kph (10 mph) below the current speed until the driver releases the switch back to the neutral (MIDDLE) position.

2. Vehicle Stationary and then Moving. If the vehicle is stationary with the DPF Smart Switch in the locked (DOWN) position and the driver then begins to move the truck, the vehicle speed will be limited to 16 kph (10 mph) until the driver releases the switch back to the neutral (MIDDLE) position.
Refer to the Exhaust Aftertreatment System Information sun visor label for additional Aftertreatment DPF information.

### ENGINE EXHAUST AFTERTREATMENT SYSTEMS (EATS)

<table>
<thead>
<tr>
<th>DPF Indicators</th>
<th>The DPF filter is full. Initiate a parked manual regeneration at next available stop.</th>
<th>The DPF filter is overfull. Engine is in derate mode. IMMEDIATELY stop and initiate a parked manual regeneration</th>
<th>The DPF filter may be clogged with soot. Engine is in shutdown mode. Service EATS system immediately.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel Particulate Filter (DPF) Condition:</td>
<td>DPF Action:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diesel Exhaust Fluid (DEF) Condition:</td>
<td>DEF Action:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The DEF tank is low</td>
<td>Refill the DEF tank</td>
<td>The DEF tank is empty. Engine is in derate mode. Refill the DEF tank now (before adding diesel)</td>
<td>The DEF tank is empty. The vehicle is limited to 5 mph. Refill the DEF tank now (before operating vehicle).</td>
</tr>
<tr>
<td>DEF Indicators</td>
<td></td>
<td>Message</td>
<td></td>
</tr>
</tbody>
</table>
Driver Warnings and On Board Diagnostics (OBD)

On Board Diagnostics (OBD)
Beginning with your EPA2010 compliant Vehicle, On Board Diagnostics (OBD) is introduced. This is very similar to the On Board Diagnostics (OBD) system that has been required on passenger cars for many years.

On Board Diagnostics (OBD) is a system that monitors the functions of emissions related components and alert the vehicle operator to any detected need for an emission related repair. When the systems detects a needed repair to an emissions related component it activates the Malfunction Indicator Lamp (MIL).

The list of emissions related components can be found in the Warranty and Maintenance section of this manual.

Instrument Cluster
The aftertreatment icons are located in the instrument cluster per the following images.

CHU, CXU, GU and TD Instrument Cluster

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Malfunction Indicator Lamp (MIL)</td>
</tr>
<tr>
<td>2.</td>
<td>CHECK Lamp</td>
</tr>
<tr>
<td>3.</td>
<td>Aftertreatment DEF Low Lamp</td>
</tr>
<tr>
<td>4.</td>
<td>High Exhaust Temperature (HEST) Lamp</td>
</tr>
<tr>
<td>5.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Aftertreatment DEF Tank Gauge</td>
</tr>
</tbody>
</table>
LEU and MRU Instrument Cluster

A Left Side Indicator Set       B Right Side Indicator Set

1. Malfunction Indicator Lamp (MIL)  2. CHECK Lamp  3. Aftertreatment DEF Low Lamp

Instrument Cluster Icons

Aftertreatment icons are displayed on the instrument cluster. There are 3 aftertreatment icons:

- Aftertreatment DPF Regeneration Required
- High Exhaust System Temperature (HEST)
- Aftertreatment DEF Tank Low Level Indicator

The Aftertreatment DPF Regeneration Required icon illuminates when the Diesel Particulate Filter is becoming full and regeneration is needed. The icon flashes when the filter is full or overfull.

DPF Regeneration Required is initiated. It also indicates high exhaust gas temperature during an at-speed regeneration. When the HEST icon is illuminated, do not park or operate the vehicle near people, or any flammable materials, vapors, or structures.

The High Exhaust System Temperature icon illuminates when a parked Aftertreatment DPF Regeneration Required is initiated. It also indicates high exhaust gas temperature during an at-speed 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.

Malfuction Indicator Lamp (MIL)

- MIL indicates government Regulation On Board Diagnostics (OBD) faults
- Lamp may remain active after repair until system operation confirms repair
**Aftertreatment DEF Tank Level - Driver Warning & Inducement**

Aftertreatment DEF tanks are sized to have no less than 2 times the diesel fuel tank mileage or hour range.

The vehicle instrument cluster has a Aftertreatment DEF Tank Level Gage Triggers

<table>
<thead>
<tr>
<th>Triggers</th>
<th>Aftertreatment DEF Tank Low Level Indicator</th>
<th>Amber Warning Lamp</th>
<th>Inducement</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;12% Aftertreatment DEF Tank Level Gauge (&gt;16% DEF Remaining)</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>&lt;=12% Aftertreatment DEF Tank Level Gauge (~16% DEF Remaining)</td>
<td><img src="W2029416" alt="" /></td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>0% Aftertreatment DEF Tank Level Gauge (~4% DEF Remaining)</td>
<td><img src="W2029415" alt="" /></td>
<td>None</td>
<td>25% torque reduction</td>
</tr>
<tr>
<td>0% Aftertreatment DEF Tank Gauge Insufficient DEF Pump Pressure Diesel Fuel Refueling &gt;15%</td>
<td><img src="W2029415" alt="" /></td>
<td>None</td>
<td>5 mph Road Speed Limit (RSL) (^1)</td>
</tr>
</tbody>
</table>

\(^1\) Vehicle has to be stationary before 5 mph RSL becomes Active

**Exit conditions for DEF Quality "5 mph road speed limit" Inducement:**

**Next 10 Engine Starts:** Return to 25% torque reduction until proper DEF quality evaluation. If poor DEF quality is detected during the next monitoring cycle then and 5 mph resumed after vehicle stationary for 20 minutes. After 10 engine starts have been exhausted then a Service Tool is required to exit the 5 mph RSL.

**With Scan Tool DTC Clearing:** Invoke 25% torque reduction until proper DEF quality evaluation. If poor DEF Quality is detected during the next monitoring cycle then 5 mph resumed after vehicle stationary for 20 minutes.
## Aftertreatment DEF Quality - Driver Warning & Inducement

<table>
<thead>
<tr>
<th>Triggers</th>
<th>Aftertreatment DEF Tank Low Level Indicator</th>
<th>Amber Warning Lamp</th>
<th>Inducement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good DEF Quality</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Poor DEF Quality</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>DTC Initial Detected 1 2 3</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor DEF Quality</td>
<td>None</td>
<td></td>
<td>25% torque reduction</td>
</tr>
<tr>
<td>DTC Initial Detected + 10 hours</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor DEF Quality</td>
<td>None</td>
<td></td>
<td>5 mph Road Speed Limit (RSL) 4</td>
</tr>
<tr>
<td>DTC Initial Detected + 20 hours Diesel Fuel Refueling &gt;15%</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary Exit from 5 mph Inducement</td>
<td>None</td>
<td></td>
<td>25% torque reduction</td>
</tr>
</tbody>
</table>

1 Based on an NOx sensor evaluation of measured versus predicted SCR NOx conversion
2 Poor DEF Quality defined as DEF diluted with water in 50/50% proportions
3 Confirmation occurs during the initial OBD drive cycle
4 Vehicle has to be stationary before 5 mph RSL becomes Active

**Exit conditions for DEF Quality "5 mph road speed limit" Inducement:**

**Next 10 Engine Starts:** Return to 25% torque reduction until proper DEF quality evaluation. If poor DEF quality is detected during the next monitoring cycle then and 5 mph resumed after vehicle stationary for 20 minutes. After 10 engine starts have been exhausted then a Service Tool is required to exit the 5 mph RSL.

**With Scan Tool DTC Clearing:** Invoke 25% torque reduction until proper DEF quality evaluation. If poor DEF Quality is detected during the next monitoring cycle then 5 mph resumed after vehicle stationary for 20 minutes.
Misfilling Diesel or Aftertreatment DEF Tanks

Although diesel fuel and Aftertreatment DEF caps are clearly labeled and filler necks and nozzles are different accidents can happen.

Contamination of fluids by- misfiling of diesel or DEF in the wrong tank may result in vehicle malfunction.

Results of misfilling DEF in Diesel Tank

- Engine may run poorly or not at all
- Injectors may be damaged
- Exhaust system corrosion may occur between turbocharger and Aftertreatment DPF
- On Board Diagnostic (OBD) Diagnostic Trouble Codes (DTC)
- Costly repairs

Results of misfilling Diesel in Aftertreatment DEF Tank

- Aftertreatment SCR system may be damaged by Diesel
- SCR Catalyst may be damaged by diesel (chemical damage)
- Emissions may be non-compliant
- On Board Diagnostic (OBD) Diagnostic Trouble Codes (DTC)
- Costly repairs
## SCR Tampering - Driver Warning & Inducement

<table>
<thead>
<tr>
<th>No Tampering</th>
<th>Tampering DTC Pending&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Tampering DTC Confirmed&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Tampering DTC Initial Detected + 10 hour</th>
<th>Tampering DTC Initial Detected + 40 hours Diesel Fuel Refueling &gt;15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lens</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Warning Lamp</td>
<td><img src="image" alt="W3031623" /></td>
<td><img src="image" alt="W3031623" /></td>
<td><img src="image" alt="W3031623" /></td>
<td><img src="image" alt="W3031623" /></td>
</tr>
<tr>
<td>Inducement</td>
<td>None</td>
<td>None</td>
<td>25% torque reduction</td>
<td>5 mph road speed limit&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

1. Tampering DTC Pending does not apply to DEF Tank Level Sensor
2. Confirmation occurs at the next OBD drive cycle
3. Vehicle has to be stationary before 5 mph RSL becomes Active
Exit conditions for DEF Quality "5 mph road speed limit" Inducement:

**Next 10 Engine Starts:** Return to 25% torque reduction until proper DEF quality evaluation. If poor DEF quality is detected during the next monitoring cycle then 5 mph resumed after vehicle stationary for 20 minutes. After 10 engine starts have been exhausted then a Service Tool is required to exit the 5 mph RSL.

**With Scan Tool DTC Clearing:** Invoke 25% torque reduction until proper DEF quality evaluation. If poor DEF Quality is detected during the next monitoring cycle then 5 mph resumed after vehicle stationary for 20 minutes.

**Ambient Air Temperature (AAT)**

During stationary or low vehicle speed operation, engine fan engagement may be required to obtain good airflow across the AAT sensor to obtain accurate data.

---

**CAUTION**

Mack is now using the ambient air temperature (AAT) sensor for OBD monitoring. If a customer installs a winterfront or blocks the radiator opening and blocks airflow to the sensor, they will likely set an OBD diagnostic trouble code (DTC) for inaccurate sensor data due to restricted airflow across the sensor.
Warranty and Maintenance

Exhaust Aftertreatment System Maintenance
The vehicle must be taken to an authorized Mack Truck dealer to remove the ash from the Aftertreatment Diesel Particulate Filter and clean the Aftertreatment Doser.

Emissions Maintenance
Emissions Maintenance Interval - EPA / CARB defines this as the adjustment, cleaning, repair, or replacement shall be recommended at intervals no less than described below.

Injector tips (cleaning only), crankcase ventilation valve, EGR filters and coolers:

Heavy Heavy Duty:
Miles: 50,000
Hours: 1500

Injectors, Turbocharger, ECM, sensors, actuators, EGR components (except filter and coolers), Aftertreatment DPF plus related components, this includes ash cleaning

Heavy Heavy Duty:
Miles: 150,000
Hours: 4500

1. If owner’s manual recommends Aftertreatment DPF replacement within useful life, the manufacturer must pay for the replacement; however, a random failure within the useful life is covered only per the above warranty provisions.

2. First maintenance interval in life of the engine is allowed at 100,000 miles, 3000 hours.

Engine Maintenance Intervals

<table>
<thead>
<tr>
<th>Component</th>
<th>Operation</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Filter</td>
<td>Change</td>
<td>Every oil change. Under certain conditions (for example, irregular fuel quality), the fuel/water separator filters may require more frequent replacement.</td>
</tr>
<tr>
<td>Water Separator</td>
<td>Filter Change</td>
<td>Every oil change. Under certain conditions (for example, irregular fuel quality), the fuel/water separator filters may require more frequent replacement.</td>
</tr>
<tr>
<td>Air Cleaner</td>
<td>Change</td>
<td>Control lamp indication or 24 months, whichever comes first</td>
</tr>
<tr>
<td>Coolant (Standard)</td>
<td>Change</td>
<td>500 000 km (300,000 miles) or 24 months, whichever comes first</td>
</tr>
<tr>
<td>Coolant (ELC)</td>
<td>Change</td>
<td>1 000 000 km (600,000 miles) or 48 months, whichever comes first</td>
</tr>
<tr>
<td>Component</td>
<td>Operation</td>
<td>Interval</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>---------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Coolant Filter (Standard)</td>
<td>Change</td>
<td>80 000 km (50,000 miles) or 6 months, whichever comes first</td>
</tr>
<tr>
<td>Coolant Filter (ELC)</td>
<td>Change</td>
<td>240 000 km (150,000 miles) or 12 months, whichever comes first</td>
</tr>
<tr>
<td>Valves/Injectors, MP7 and MP8</td>
<td>Initial Adjust</td>
<td>200 000 km (125,000 miles) or 12 months, whichever comes first</td>
</tr>
<tr>
<td>Injectors, MP7 and MP8</td>
<td>Adjust</td>
<td>Every 400 000 km (250,000 miles) or 24 months, whichever comes first</td>
</tr>
<tr>
<td>Valves/Injectors, MP10</td>
<td>Initial Adjust</td>
<td>100 000 km (60,000 miles) or 6 months, whichever comes first</td>
</tr>
<tr>
<td>Injectors, MP10</td>
<td>Adjust</td>
<td>Every 200 000 km (125,000 miles) or 12 months, whichever comes first</td>
</tr>
<tr>
<td>Main drive and accessory drive Belts, Highway Usage MP7 and MP8</td>
<td>Change</td>
<td>500 000 km (300,000 miles) or 36 months, whichever comes first</td>
</tr>
<tr>
<td>Main drive and accessory drive Belts, Vocational Usage MP7 and MP8</td>
<td>Change</td>
<td>240 000 km (150,000 miles) or 12 months, whichever comes first</td>
</tr>
<tr>
<td>Main drive and accessory drive Belts, Vocational Usage MP10</td>
<td>Change</td>
<td>500 000 km (300,000 miles) or 36 months, whichever comes first</td>
</tr>
<tr>
<td>Aftertreatment DPF Filter</td>
<td>Exchange</td>
<td>400 000 km (250,000 miles) or 4,500 hours, whichever occurs first</td>
</tr>
<tr>
<td>Aftertreatment DPF Ash Cleaning</td>
<td>Clean</td>
<td>400 000 km (250,000 miles) or 4,500 hours, whichever occurs first</td>
</tr>
<tr>
<td>Aftertreatment Doser</td>
<td>Clean</td>
<td>240 000 km (150,000 miles) or 4,500 hours, whichever occurs first</td>
</tr>
<tr>
<td>Aftertreatment Diesel Exhaust Fluid (DEF) Filter</td>
<td>Change</td>
<td>354 000 km (220,000 miles) or 7000 hours or 3 years, whichever comes first</td>
</tr>
</tbody>
</table>
Oil Change Intervals

The length of time an engine can operate before an oil change depends on the quality 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 or severe duty operation, dusty or off-road conditions, etc., reduce the intervals for more frequent oil changes.

**Note:** Use the information in the table below to determine the operating condition and usage applicable to your vehicle.

<table>
<thead>
<tr>
<th>Engine Operating Condition</th>
<th>Medium</th>
<th>Heavy</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fuel Consumption (mpg)</td>
<td>more than 6</td>
<td>more than 4.7</td>
<td>more than 3.7</td>
</tr>
<tr>
<td>Total Fuel Consumption (L/100 km)</td>
<td>less than 39</td>
<td>less than 50</td>
<td>less than 64</td>
</tr>
<tr>
<td>MP7 and MP8 Engine Oil and Filter Change Interval, km (miles) — 36L (38 quart) oil capacity</td>
<td>56 000 (35,000)</td>
<td>40 000 (25,000)</td>
<td>24 000 (15,000)</td>
</tr>
<tr>
<td>MP10 Engine Oil and Filter Change Interval, km (miles) — 42L (44 quart) oil capacity</td>
<td>80 000 (50,000)</td>
<td>56 000 (35,000)</td>
<td>40 000 (25,000)</td>
</tr>
</tbody>
</table>

**Note:** If idle time is greater than 25%, use the next lower drain interval.

For additional information about oil change intervals, see your Mack Truck dealer. Also, refer to Bulletin 175-60, Oil and Filters, Mack Components.

For a complete list of approved oils, see your Mack Truck dealer. Also, refer to Bulletin 175-61, Approved Oils, Mack Components.
Emissions Control System Warranty

The following engine components are covered by the supplemental emissions control system warranty policy as required by the Federal emissions regulations.

1 Turbocharger Assembly
   • VGT Actuator
2 Charge Air Cooler
   • CAC Pipes (Air inlet to/from CAC)
   • CAC Hoses
3 Injectors
4 Engine and Vehicle Wire harness (connected to OBD Signal, ECM, VECU, Instrument Cluster and Transmission Control Module with Vehicle Speed/Output Shaft Sensor)
5 EGR Mixer
6 EGR Cooler
7 EGR Valve and EGR Control Valve
8 EGR Pipes - Exhaust Manifold to EGR cooler
9 EGR Pipes - EGR cooler to inlet manifold
10 Crankcase Breather
11 Crankcase Separator
12 Crankcase Tubing and Hoses before Separator
13 Aftertreatment Wiring Harness
14 After treatment Control Module (ACM)
15 Aftertreatment Diesel Particulate Filter (DPF) Assembly

   A. Aftertreatment DPF Assembly with Diesel Oxidation Catalyst (DOC)
      • Aftertreatment Doser
      • Diffuser Pipe (Aftertreatment Doser mounting)
      • Fuel lines to Aftertreatment Doser
      • Aftertreatment Fuel Shutoff Valve

   • Aftertreatment Fuel Pressure Sensor
   • Discharge Recirculation Valve (DRV) (Heat Mode)
   • Discharge Recirculation Valve (DRV) Solenoid
   • Engine EGT Sensor
   • Aftertreatment DPF Intake Temperature Sensor
   • Aftertreatment DPF Outlet Temperature Sensor
   • Aftertreatment DPF Differential Pressure Sensor

B. Aftertreatment DPF Spark Assisted Assembly

   • Aftertreatment DPF Combustion Air Valve
   • Aftertreatment DPF Atomization Module
   • Aftertreatment DPF Ignition Coil
   • Aftertreatment DPF Fuel Control Valve
   • Aftertreatment DPF Ignition Electrode
   • Nozzle
   • Engine Exhaust Gas Temperature (EGT) Sensor
   • Aftertreatment DPF Intake Temperature Sensor
   • Aftertreatment DPF Outlet Temperature Sensor
   • Aftertreatment DPF Flame Temperature Sensor
   • Aftertreatment DPF Differential Pressure Sensor
16 Sensors:
- Crankshaft Position (CKP)
- Camshaft Position (CMP)
- Engine Coolant Temperature (ECT)
- Intake Manifold Air Temperature
- Intake Manifold Pressure (IMP)
- EGR Temperature
- EGR Differential Pressure
- Engine Coolant Level (ECL)
- Vehicle Speed (VSS)
- Ambient Air Temperature (AAT)

17 SCR
- SCR Catalyst
- Aftertreatment DEF Pump
  - Aftertreatment DEF Dosing Absolute Pressure Sensor
  - Aftertreatment DEF Return Valve
  - Aftertreatment DEF Dosing Unit
- Aftertreatment DEF Tank and lines
- Aftertreatment DEF Tank Heater Valve
- Aftertreatment DEF Tank Temperature Sensor
- Aftertreatment DEF Level Sensor
- Aftertreatment Outlet NOx
- Aftertreatment Intake NOx
- Aftertreatment DEF Line Heaters

21. Vehicle Electronic Control Unit (ECU)

22. Instrument Cluster (with ECU, MIL, Real Time Clock, Aftertreatment DEF Tank Gauge and, DEF Tank Low Level Indicator)

23. Exhaust gas piping (from turbocharger to aftertreatment)

24. Transmission Control Module (TCM) (with Vehicle Speed / Output Shaft Sensor)