- Before beginning any repair, disconnect the battery (negative [-] cable) and discharge any capacitors.
- Put a “DO NOT OPERATE” tag in the operator's compartment or on the controls.
- Allow the engine to cool before slowly loosening the coolant filler cap to relieve the pressure from the cooling system.

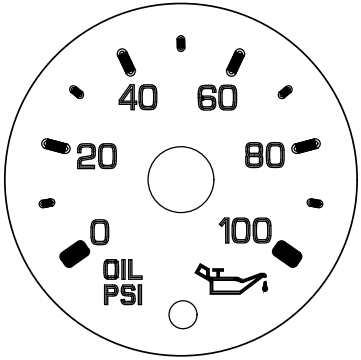
WARNING

Removing the fill cap on a hot engine can cause scalding coolant to spray out and burn you badly. If the engine has been in operation within the previous 30 minutes, be very careful in removing the fill cap. Protect face, hands, and arms against escaping fluid and steam by covering the cap with a large, thick rag. DO NOT try to remove it until the surge tank cools down or if you see any steam or coolant escaping. In any situation, remove the cap very slowly and carefully. Be ready to back off if any steam or coolant begins to escape.

- Always use wheel chocks or proper jack stands to support the vehicle or vehicle components before performing any service work. DO NOT work on anything that is supported only by lifting jacks or a hoist. Before resting a vehicle on jack stands, be sure the stands are rated for the load you will be placing on them.
- Before removing or disconnecting any lines, fittings, or related items, relieve all pressure in the air, oil, fuel, and cooling systems. Remain alert for possible pressure when disconnecting any device from a system that contains pressure. High pressure oil or fuel can cause death or personal injury.
- Always wear protective clothing when working on any refrigerant lines and make sure that the workplace is well ventilated. Inhalation of fumes can cause death or personal injury. To protect the environment, liquid refrigerant systems must be properly emptied and filled using equipment that prevents the release of refrigerant gas. Federal law requires capturing and recycling refrigerant.
- When moving or lifting any heavy equipment or parts, make sure to use proper techniques and assistance. Ensure all lifting devices such as chains, hooks, or slings are in good condition and are of the correct load capacity. Make sure all lifting devices are positioned correctly.
- Corrosion inhibitors and lubricating oils may contain alkali. DO NOT get the substance in eyes and avoid prolonged or repeated contact with skin. DO NOT swallow. If ingested, seek immediate medical attention. DO NOT induce vomiting. In case of contact, immediately wash skin with soap and water. In case of harmful contact, immediately contact a physician. Always keep any chemicals OUT OF REACH OF CHILDREN.
- Naptha and Methyl Ethyl Ketone (MEK) are flammable materials and must be used with caution. Follow the manufacturer's instructions to ensure safety when using these materials. Always keep any chemicals OUT OF REACH OF CHILDREN.

Engine Oil Pressure Lamp Turns On

What to do if the engine oil pressure lamp turns on.



It is important to maintain oil pressure within acceptable limits. If oil pressure drops below the minimum psi a red warning lamp on the oil pressure gauge and the Stop Engine Lamp will come ON.

CAUTION

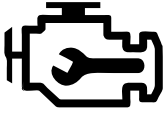
Continuing to operate your vehicle with insufficient oil pressure will cause serious engine damage. Failure to comply may result in equipment or property damage.

- If the oil pressure fails to rise within 10 seconds after the engine starts, stop the engine and determine the cause.
- See Engine Oil Specification for the correct oil pressure ranges for your vehicle's engine.
- If the oil pressure suddenly drops, or the audible alarm and engine oil pressure warning light come on while driving, do the following:

1. Slow down carefully.
2. Move a safe distance off the road and stop.
3. Place the transmission in neutral (N) and set the parking brake. (See Parking Brake Valve and Operating the Transmission in your vehicle Operator's Manual, for transmission shifting and parking brake information.)
4. Turn OFF the engine.
5. Turn ON the emergency flasher and use other warning devices to alert other motorists.
6. Wait a 15–20 minutes to allow oil to drain into the engine oil pan, and then check the oil level. See Engine Oil Level.
7. Add oil if necessary. If the problem persists, contact an authorized PACCAR engine dealer as soon as possible.

Check Engine Lamp Turns On

What to do if the check engine lamp turns on.



Or

Check Engine Lamp - Turns on when a problem exists, but the vehicle can still be safely driven. Vehicle should be serviced to correct the problem but the situation should not be considered an emergency.
The lamp will also illuminate when a DPF regeneration or addition of diesel exhaust fluid (DEF) is required. Another function of

combustibles at least 1.5 m (5 ft) away from the exhaust outlet while the HEST lamp is illuminated. Failure to do so could result in serious injury.

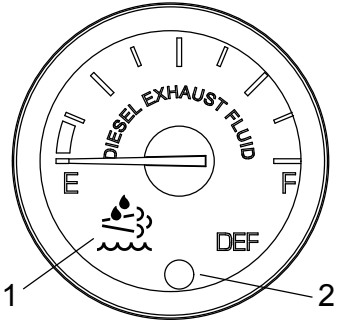
- Do not approach the exhaust system or surrounding areas without allowing adequate time for the system to cool down. Failure to do so could result in serious burns to the skin.

Diesel Exhaust Fluid (DEF) Lamp

Engine aftertreatment system includes a diesel exhaust fluid (DEF) warning lamp on the DEF gauge and additional warning lamps in the instrument cluster.

DEF Warning Lamp in Instrument Cluster

Diesel Exhaust Fluid (DEF) Gauge



1. DEF Symbol
2. DEF Gauge Warning Lamp

The DEF lamp(s) will illuminate when the fluid in the DEF tank reaches a low level. If the lamp illuminates but the level is full, seek service immediately for DEF fluid quality or DEF equipment repair.

Engine Braking System

Information on using the engine braking system.

An engine compression brake is standard on the MX-11 engines. Optionally, this engine may be equipped with an exhaust brake. When activated, these devices create a braking effect on the drive wheels. Because it can help keep your vehicle's brakes from overheating, it can save wear and tear on the service brakes. However, the engine compression or exhaust brake is not an emergency brake or the primary vehicle brake.

WARNING

Do not operate the engine compression brake when driving/operating your vehicle bobtail or with a loaded or unloaded trailer on road surfaces with poor traction (wet, icy, or snow covered roads) or in heavy traffic. There may not be enough weight on the rear axle to provide traction. Braking caused by the normal operation of the engine compression brake could cause you to lose control of the vehicle, resulting in an injury accident. Make sure the engine brake is switched "OFF" when bobtailing or with an unloaded trailer. Failure to comply may result in death, personal injury, equipment or property damage.

NOTE

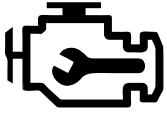
If the engine is running, do not increase engine speed (rpm) or operate the vehicle until the low oil pressure warning lamp turns off.

CAUTION

Engaging the starter motor for more than 30 seconds in any five minute period may cause it to overheat and can damage the starter.

- If starter is engaged continuously for 30 seconds, you must wait five minutes before trying to start the engine to allow the starter motor to cool down.

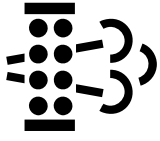
With the key in the ON position, the engine warning lamps will come on momentarily and then go out. The engine warning lamps include:



Or

Check engine lamp; yellow in color.

Stop engine lamp; red in color.



Diesel particulate filter (DPF) status indicator; yellow in color.

High exhaust system temperature (HEST); amber in color.

Normal Starting Procedure

Steps for starting the engine in normal temperatures.

Follow this engine starting procedure when the outside temperature is above 50° F (10° C).

1. Ensure the parking brake is set ON and the transmission shift lever is in neutral. For automatic transmissions, be sure the shift lever is in the neutral position (N). For automatic transmissions that have park (P) position, place the shift lever in park.
2. With the accelerator pedal in the idle position, turn the ignition key to the START position to start the engine.
3. If the engine does not start after 10 seconds, release the key. Wait an additional 10 seconds to allow the starter motor to cool, then try staring the engine again.
4. Once the engine has started, wait for the oil pressure to rise, and the low oil pressure warning lamp to turn off, before increasing RPM.

If the engine does not start, or runs erratically, see *Starting After the Fuel Tank*

WARNING

DO NOT use an exhaust brake when driving bobtail or with an unloaded trailer. There may not be enough weight on the rear axle to provide traction. This could cause a loss of control and jackknife resulting in an injury accident. Make sure the exhaust brake is switched “OFF” when bobtailing or with an unloaded trailer. Failure to comply may result in death, personal injury, equipment or property damage.

CAUTION

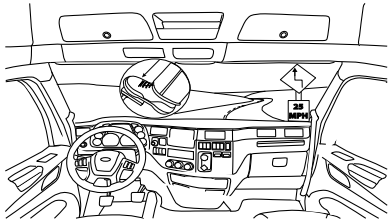
Never exceed governed engine speed because engine damage can occur. Operating engine beyond the governed speed causes additional strain on valve train and internal engine components. Operate the engine within governed engine speed.

NOTE

Once you have determined what the safe speed is for your vehicle, operate the engine brakes with the transmission in the lowest gear that will not cause the engine speed to exceed the rated engine speed. The optimum braking power of the engine brakes is reached at rated engine speed. Correct gear selection, therefore, is critical.

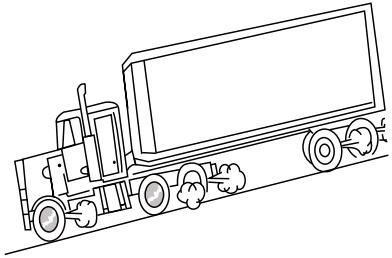
The selector switch can be used to vary braking power as road conditions change. Vehicle service brakes must be used when additional braking power is required.

Slow Down Around Curves



The engine brake is **NOT** intended as the primary brake for the vehicle, nor is it an emergency brake. The engine brake only helps the service brakes by using pressure to slow the drivetrain. Use the service brakes for quick stops.

Braking Truck on Grade



Maintenance Requirements

Engine Maintenance

Introduction and important maintenance requirements.

PACCAR recommends that the engine be maintained according to the maintenance schedule in this section.
If the engine is operating in ambient temperatures below 0°F (-18°C) or above 100°F (38°C), perform maintenance at shorter intervals. Shorter maintenance intervals are also required if the engine is operated in a dusty environment or if frequent stops are made.
Some of these maintenance procedures require special tools or must be completed by qualified personnel. Contact your local PACCAR authorized repair location for detailed information.
If your engine is equipped with a component or accessory not manufactured by PACCAR Inc, refer to the component manufacturer's maintenance recommendations.

WARNING

Never idle your vehicle for prolonged periods of time if you sense that exhaust fumes are entering the cab. Investigate the cause of the fumes and correct it as soon as possible. If the vehicle must be driven under these conditions, drive only with the windows open. Failure to repair the source of the exhaust fumes may result in death, personal injury, equipment or property damage.

WARNING

Exhaust fumes from the engine contain carbon monoxide, a colorless and odorless gas. Do not breathe the engine exhaust gas. A poorly maintained, damaged or corroded exhaust system can allow carbon monoxide to enter the cab. Entry of carbon monoxide into the cab is also possible from other vehicles nearby. Failure to properly maintain your vehicle could cause carbon monoxide to enter the cab, resulting in death or personal injury.

Cleaning the Engine

Engine cleaning precautions.

When cleaning the engine, follow the instructions from the vehicle manufacturer operator's manual and observe all environmental protection regulations.

CAUTION

Do not direct water onto electrical components, plug connectors, seals or flexible hoses on the engine. Water may enter the part causing electrical damage or contaminating the engine oil. To prevent damage to engine components, keep the water moving at all times while cleaning the engine. Failure to comply may result in equipment damage.

Daily or Refueling Maintenance Checks

Engine Fuel Filter / Water Separator

Daily and refueling maintenance check for the engine fuel filter/water separator.

Automatic water drain, no maintenance required.

Engine Maintenance Schedule

Component [2]	Maintenance Task	Recommended Preventative Maintenance Interval								
		A	B	C	D	E	F	G	H	J
Aftertreatment System	*Diesel Particulate Filter (DPF) Dry Cleaning* on page 72 - Dry Cleaning Strategy					•				
	Diesel Particulate Filter (DPF) Wet Cleaning on page 73 - Wet Cleaning Strategy								•	
	Diesel Exhaust Fluid (DEF) Filter on page 73						•			
Air System & Compressor	*Air Compressor* on page 75	•								
	Air Cleaner on page 75	•								
Charge Air System	*Charge Air Piping* on page 75	•								
	Charge Air Cooler on page 75	•								
Charging / Cranking System	*Electrical Harness / Cables* on page 78	•								
	Batteries, Cables, and Connections on page 78		•							

The cooling system in your vehicle was factory filled with extended life coolant that meets or exceeds all ASTM D6210 and Caterpillar EC-1 requirements. PACCAR recommends only using a 50/50 mixture of distilled water and ELC when cooling system service is required. A 50/50 mixture of ELC and distilled water will provide freeze protection down to –34°F (–36.7°C), which is adequate for most locations in North America. For extremely cold operating conditions, a 60/40 mixture (coolant/water ratio) can be used to provide freeze protection down to -62°F (-52.2°C).

Unless otherwise optioned, factory fill coolant is an ethylene glycol, nitrited organic acid technology (NOAT) extended life coolant (ELC) formulation at a 50:50 coolant-to-distilled water mixture. The factory fill exceeds ASTM D6210 and Caterpillar EC-1 requirements. Maintaining coolant chemistry and freeze protection is critical to engine and cooling system component health and longevity.

WARNING

Coolant is toxic. DO NOT get the fluid in eyes. If contact occurs, flood eyes with large amounts of water for 15 minutes. Avoid prolonged or repeated contact with skin. In case of contact, immediately wash skin with soap and water. DO NOT take internally. If swallowed, seek immediate medical attention. DO NOT induce vomiting. Failure to comply may result in death, personal injury, equipment or property damage.

CAUTION

The engine cooling system has very specific maintenance and inspection requirements. Failure to follow requirements can damage the engine. Engine damage can include but is not limited to freezing, boiling, corrosion, pitted cylinder liners. This information is found in the engine manufacturers owner's manual. It is the owner's responsibility to follow all requirements listed in the engine manufacturers owner's manual.

NOTE

Coolant is harmful to the environment. Unused coolant must be stored as a toxic hazardous material in leakproof containers. Used coolant must be processed as industrial chemical waste. Please follow HAZMAT guidelines with both used and unused coolants.

CAUTION

Use of non-genuine coolant filters can cause severe engine damage.

Concentration

Check the level of freeze/boilover protection, which is determined by the glycol concentration. Use a glycol refractometer to determine glycol level. Add coolant to obtain the coolant/water ratio required to provide the protection you need. A 50/50 mix of coolant and water is adequate for most applications. For extremely cold operating conditions, the ratio can be adjusted to a higher concentration of coolant.

CAUTION

Unapproved fuel can reduce economy or possibly damage fuel system components. Unapproved fuels typically do not have enough lubricity elements in the fuel to properly lubricate the fuel injection system. Be sure you follow the fuel recommendations as indicated in this section of the manual. Failure to comply may result in equipment or property damage.

CAUTION

Using diesel fuels blended with lubricants may cause damage to your exhaust aftertreatment system. Service intervals for aftertreatment systems will be reduced. DO NOT use diesel fuel blended with lubricating oil in engines equipped with an aftertreatment system. Failure to comply may result in equipment or property damage.

CAUTION

DO NOT use high-sulfur diesel fuel as it will damage the exhaust aftertreatment system. Also, the engine will not meet emission regulations. Use only ultra-low-sulfur diesel (ULSD) fuel. Failure to comply may result in equipment or property damage.

CAUTION

If ultra-low-sulfur diesel (ULSD) fuel is not used, the engine may not meet emission regulations, and damage may occur to the exhaust aftertreatment system. The use of high-sulfur diesel fuel will damage the exhaust aftertreatment system and impact the engine emission. ULSD fuel is required for correct operation of the aftertreatment. The engine has been optimized for use with an aftertreatment system together with ULSD fuel to meet the 2013 U.S. Environmental Protection Agency regulations. Failure to comply may result in equipment or property damage.

NOTE

PACCAR recommends that the cetane number of diesel fuel be a minimum of 45 for engines that are expected to operate at temperatures below 32ºF (0ºC) and a minimum of 42 for engines that are operated at temperatures above 32ºF (0ºC).

Using diesel fuel with a lower-than-recommended cetane number can cause hard starting instability, and excessive white smoke. To maintain satisfactory operation at low ambient temperatures, it is important to specify diesel fuel of the correct cetane number.

PACCAR requires all permissible fuels to have adequate fuel lubricity. Lubricity can be determined by ASTM, specification D6079, ISO 12156, High Frequency Reciprocating Rig (HFRR) in which the fuel must have a wear scar diameter of 0.02 in. (0.5 mm) or less.

The use of Ultra-low-sulfer-diesel (ULSD) fuel is required for this engine in order to

WARNING

Electrical shock hazard: Never disconnect the battery clamp when the engine is running. Disconnecting the battery clamps while the engine is running may result in death, personal injury or equipment damage from electrical arcing or damage to electrical components.

1. Disconnect the chassis battery cable at the negative battery terminal.
2. Place an oil collection pan directly under the oil filter.

Oil Filter Removal

Procedure for removing the oil filter on PACCAR MX-11 engines.

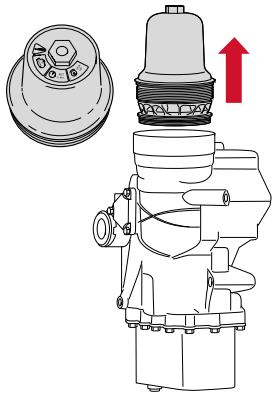
1. Clean the oil filter cap and surrounding area to ensure dirt does not fall into the oil filter module.

CAUTION

Dirt in the engine oil lubrication system can lead to significant damage to the engine. Failure to comply may result in equipment or property damage.

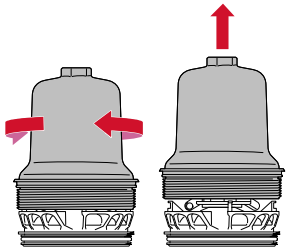
2. Remove the screw cap with the centrifugal oil filter from the oil module. Use a hexagonal socket or a box wrench to avoid damaging the oil filter cap.

Removing Oil Filter Cap



3. Turn the screw cap clockwise to unlock the centrifuge base.

Unlocking the Centrifuge Base

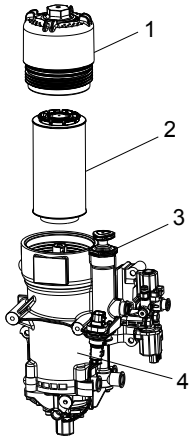


Fuel Filter Removal

Procedure for removing the PACCAR MX-11 fuel filter.

Follow the steps below to remove the fuel filter:

Fuel Module



1. Fuel Filter Cap
2. Fuel Filter
3. Manual Priming Pump
4. Fuel Filter Housing

1. Clean the fuel filter cap and surrounding area to ensure dirt does not fall into the fuel module.

CAUTION

Dirt in the fuel system can lead to significant damage to the fuel system. Failure to comply may result in equipment or property damage.

2. Loosen the fuel tank cap to relieve any pressure in the fuel tank.
3. Remove the fuel filter cap by rotating it counter-clockwise with a wrench, automatic draining of fuel will be initiated, wait 5 minutes for complete fuel draining to prevent fuel from leaking or dripping on the starter motor.

NOTE

The fuel filter cartridge is a disposable filter and must not be cleaned and reused. Dispose of the filter as chemical waste.

4. Remove the fuel filter cartridge.

Fuel Filter Installation - PACCAR MX-11

Procedure for installing the PACCAR MX-11 fuel filter.

Follow the steps below to install a new fuel filter:

1. Verify the sealing O-ring that is supplied with the filter kit is installed on the fuel filter cap and lightly coat the O-ring with fuel.
2. Install the new fuel filter cartridge to the cap, then insert into the fuel module.

NOTE

Depending on the vehicle's fuel system configuration the fuel filter housing may not completely drain of fuel. If this is the case, take care when installing the new filter as this may cause fuel to spill from the filter housing.

3. Tighten the fuel filter cap by rotating it clockwise until the filter cap O-ring makes contact with the fuel module. Then tighten the filter

4. Tensioners
5. Engine Dampener
6. A/C Compressor
7. Alternator

> **NOTE**
>
> Always fit the same type of belts as the ones replaced.

Engine Belt Checks

Maintenance check for engine drive belts.

Perform these maintenance procedures according to the Preventative Maintenance Schedule.

1. Inspect the engine drive belts for the following conditions:
   - Condition, signs of wear/ deterioration.
   - Alignment.

Fan Belt Tensioner

Maintenance checks for fan belt tensioner.

Perform these maintenance procedures according to the Preventative Maintenance Schedule.

1. Check and correct fan belt tensioner.
   - Mounting bolt torque.
   - Tensioner maintains proper belt tension.

Engine Fan

General maintenance information and precautions about the engine fan.

> **WARNING**
>
> Do not work on or near the fan with the engine running. Anyone near the engine fan when it turns on could be injured. If it is set at MANUAL, the fan will turn on any time the ignition key switch is turned to the ON position. In AUTO, it could engage suddenly without warning. Before turning on the ignition or switching from AUTO to MANUAL, be sure no workers are near the fan. Failure to comply may result in death or personal injury.

Your truck may be equipped with an On/Off or Viscous Fan Drive. Follow these guidelines to check your engine fan:

- Check the fan bearings for fan hub bearing looseness, loss of lubricant and any abnormal conditions. (For example, fan belt misaligned or excessive wear/damage.) Before starting the engine and with the engine off, look and feel for looseness in the fan hub.
- With the engine idling and the hood open, stand at the front of the vehicle. Listen for any noises coming from the fan hub. Bearings that have lost lubricant, and are dry, will typically emit a squeal or a growl when the engine is at operating temperature and the fan clutch is engaged. If noise is detected, have the fan bearings inspected by an authorized dealership.

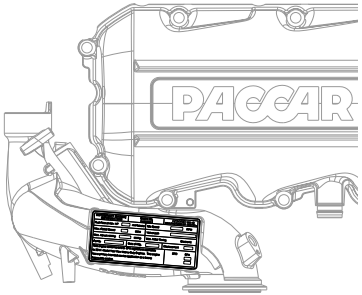
4. Fuel Filter
5. Air Compressor
6. Starter
7. Power Steering Pump
8. Low Pressure Fuel Pump
9. A/C Compressor
10. Alternator

EPA Label

EPA label location and label information.

The EPA label provides important facts about the engine. This label is located on top of the engine valve cover or on the mixer manifold. The engine EPA label must not be changed unless approved by PACCAR.

EPA Label Location



The EPA label provides many details regarding the engine. Some facts that are found on the EPA label include the following:

- Fuel rate
- Idle speed
- Maximum rated speed
- Valve lash
- Maximum power rating
- Date of manufacture
- Engine Displacement

EPA Label

IMPORTANT ENGINE INFORMATION	Engine No.	PACCAR MX-__ MANUFACTURED BY PACCAR
Fuel Rate at Adv. HP XXX.X mm³/stroke	Idle Speed XXX - XXX RPM	
Max. Rated Speed XXXX RPM	Valve Lash (mm) X.XX int. X.XX exh.	
Max. Advert. kW/hp XXX/XXX kW/hp	Max. Initial Timing Electronic	
Family EPCRH12.9M01	Date of Mfg.	Displacement 12.9 L

This engine conforms to U.S. EPA regulations and is applicable to 2014 Model Year New Heavy-Duty Engines.
This Engine has a primary intended service application as a heavy heavy-duty engine. This engine is certified to operate on ultra-low sulfur diesel fuel only. Exhaust Emission Control System: DDI, TC, CAC, ECM, EGR-C, OC, SCR-U, PTOX

	STD	EPA
NOx		X.XX
PM		X.XX

1952313

exhaust fluid. Failure of replacement parts used in repairs due to the above non-warrantable conditions is not warrantable.
This warranty does not apply to accessories supplied by the vehicle original equipment manufacturer (OEM) which are covered by the OEM vehicle warranty.
Failures resulting in excessive oil consumption are covered for the duration of the coverage or 250,000 miles (400,000 kilometers) or 6,250 hours from the date of delivery of the engine to the first purchaser or first lessee, whichever occurs first.
Before a claim for excessive oil consumption will be considered, the owner must submit adequate documentation to show that consumption exceeds PACCAR published standards.
Failures of belts and hoses supplied by PACCAR are covered for the first year from the date of delivery of the engine to the first purchaser or first lessee.
Parts used to repair a warrantable failure may be new parts, approved rebuilt parts, or repaired parts. PACCAR is not responsible for failures resulting from the use of parts not approved by PACCAR. A new approved or rebuilt part used to repair a warrantable failure assumes the identity of the part it replaced and is entitled to the remaining coverage hereunder.
PACCAR is not responsible for damage or loss resulting from engine horsepower/torque upgrades.
PACCAR reserves the right to interrogate electronic control module (ECM) data for purposes of failure analysis.
PACCAR does not warrant antifreeze, lubricants, filters, filter elements, or any other part which is considered a maintenance item. PACCAR does not warrant services to remove ash from the DPF either at or before a regular service interval as indicated in the maintenance schedule or when the system indicates that the DPF requires cleaning unless the service is required as part of a warrantable repair.
PACCAR DOES NOT COVER WEAR OR WEAROUT OF COVERED PARTS.
THIS WARRANTY AND THE EMISSION WARRANTY SET FORTH HEREINAFTER ARE THE SOLE WARRANTIES MADE BY PACCAR IN REGARD TO THESE ENGINES.
THIS LIMITED WARRANTY IS THE SOLE WARRANTY MADE BY PACCAR AND THE SELLING DEALER. EXCEPT FOR THE ABOVE LIMITED WARRANTY, PACCAR AND THE SELLING DEALER MAKE NO OTHER WARRANTIES, EXPRESS OR IMPLIED. PACCAR AND THE SELLING DEALER EXPRESSLY DISCLAIM ANY WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.
PACCAR AND THE SELLING DEALER SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES INCLUDING, BUT NOT LIMITED TO: LOSS OF INCOME OR LOST PROFITS; ENGINE OR VEHICLE DOWNTIME; THIRD PARTY DAMAGE, INCLUDING DAMAGE OR LOSS TO OTHER ENGINES, VEHICLES OR PROPERTY, ATTACHMENTS, TRAILERS AND CARGO; LOSS OR DAMAGE TO PERSONAL CONTENTS; COMMUNICATION EXPENSES; LODGING AND/OR MEAL EXPENSES; FINES; APPLICABLE TAXES OR BUSINESS COSTS OR LOSSES; ATTORNEYS' FEES; AND ANY LIABILITY YOU MAY HAVE IN RESPECT TO ANY OTHER PERSON OR ENTITY.
This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.