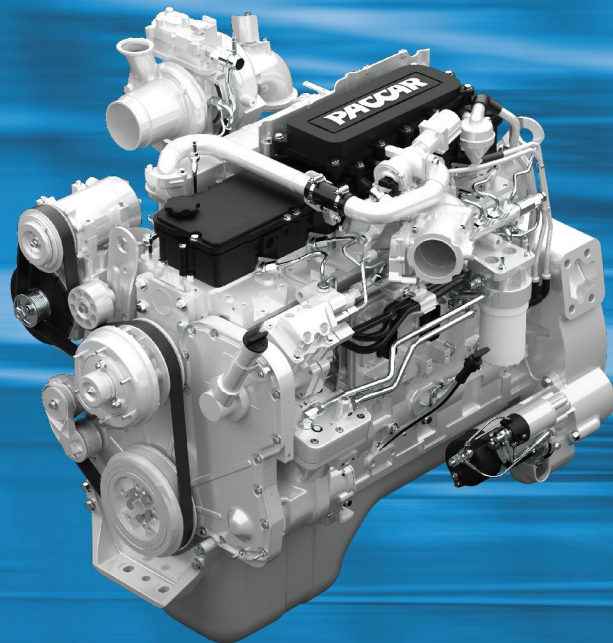


PACCAR PX-9

<https://truckmanualshelp.com/>



Operator's Manual

2013 Emissions
2014-2015 Model Years

<https://truckmanualshub.com/>

Safety

1

Emergency

2

Controls

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This manual illustrates and describes the operation of features or equipment which may be either standard or optional on this vehicle. This manual may also include a description of features and equipment which are no longer available or were not ordered on this vehicle. Please disregard any illustrations or descriptions relating to features or equipment which are not on this vehicle.

PACCAR reserves the right to discontinue, change specifications, or change the design of its vehicles at any time, without notice and without incurring any obligation.

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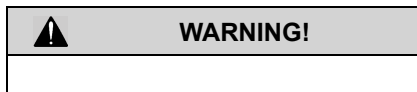
<https://truckmanualshub.com/>

INTRODUCTION

Safety Alerts

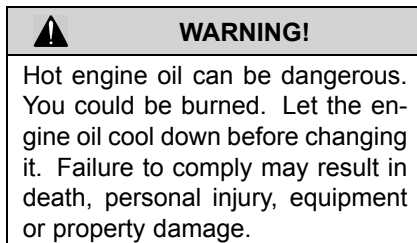
Please read and follow all of the safety alerts contained in this manual. They are there for your protection and information. These alerts can help you avoid injury to yourself, your passengers, and help prevent costly damage to the vehicle. Safety alerts are highlighted by safety alert symbols and signal words such as “**WARNING**”, “**CAUTION**”, or “**NOTE**”. Please DO NOT ignore any of these alerts.

WARNING

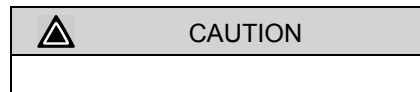


The safety alert following this symbol and signal word provides a warning against operating procedures which could cause death or injury. They could also cause equipment or property damage. The alert will identify the hazard, how to avoid it, and the probable consequence of not avoiding the hazard.

Example:

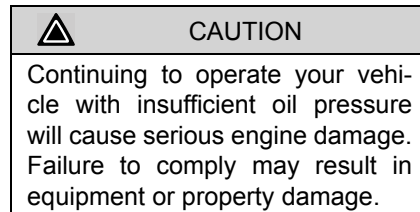


CAUTION



The safety alert following this symbol and signal word provides a caution against operating procedures which could cause equipment or property damage. The alert will identify the hazard, how to avoid it, and the probable consequence of not avoiding the hazard.

Example:



NOTE

	NOTE

The alert following this symbol and signal word provides important information that is not safety related but should be followed. The alert will highlight things that may not be obvious and is useful to your efficient operation of the vehicle.

Example:

	NOTE
Pumping the accelerator will not assist in starting the engine.	

Foreword

This manual contains information for the correct operation and maintenance of your PACCAR engine. Read and follow all safety instructions. Refer to the WARNING in the “General Safety Instructions” beginning on page 1-5. Keep this manual with the equipment. If the equipment is traded or sold, give the manual to the new owner.

The information, specifications, and recommended maintenance guidelines in this manual are based on information in effect at the time of printing. PACCAR reserves the right to make changes at any time without obligation. If you find differences between your engine and the information in this manual, contact your local PACCAR Authorized Repair Location or write to:

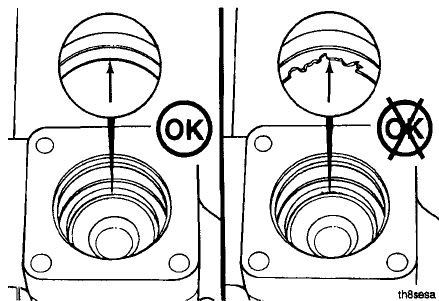
PACCAR c/o PACCAR Engines
PO Box 1518
Bellevue, WA 98009

The latest technology and the highest quality components were used to produce this engine. When replacement parts are needed, we recommend using only genuine parts from PACCAR.

	NOTE
Warranty information including the EPA and California Emission Warranty is located in the section entitled “WARRANTY” on page 6-8. Make sure you are familiar with the warranty or warranties applicable to your engine.	

Illustrations

General Information



Some of the illustrations throughout this manual are generic and will NOT look exactly like the engine or parts used in your application. The illustrations can contain symbols to indicate an action required and an acceptable or NOT acceptable condition.

The illustrations are intended to show repair or replacement procedures. The procedure will be the same for all

applications, although the illustration may differ.

General Safety Instructions

Important Safety Notice



WARNING!

Improper practices, carelessness, or ignoring any warnings may cause death, personal injury, equipment or property damage.

Before performing any repair, read and understand all of the safety precautions and warnings. The following is a list of general safety precautions that must be followed to provide personal safety. Failure to follow these instructions may cause death or injury. Special safety precautions are included in the procedures when they apply.

- Use the proper tool for manually rotating the engine. DO NOT attempt to rotate the crankshaft by pulling or prying on the fan. This practice can cause death, personal injury, equipment damage, or damage to the fan

1

blades, causing premature fan failure.

- Work areas should be dry, well lit, well ventilated, free from clutter, loose tools, parts, ignition sources and hazardous substances.
- Wear protective glasses and protective shoes when working.
- DO NOT wear loose-fitting or torn clothing. Tie back and/or tuck in long hair. Remove all jewelry when working.
- 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. See "Cooling System" on page 5-15 for more information on cooling system maintenance.



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 any 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.
- When working on the vehicle, be alert for hot parts on systems that have just been turned off, exhaust gas flow, and hot fluids in lines, tubes, and compartments. Contact with any hot surface may cause burns.
- Always use tools that are in good condition. Make sure you have the proper understanding of how to use the tools before performing any service work. Use only

genuine replacement parts from PACCAR.

- Always use the same fastener part number (or equivalent) when replacing items. DO NOT use a fastener of lesser quality if replacements are necessary. (e.g., DO NOT replace a 10.9 grade with 8.8 grade.)
- Always torque fasteners and fuel connections to the required specifications. Overtightening or under-tightening can allow leakage. Close the manual fuel valves prior to performing maintenance and repairs, and when storing the vehicle inside.
- DO NOT perform any repair when impaired, tired, fatigued or after consuming alcohol or drugs that can impair your functioning.
- Some state and federal agencies in the United States of America

1

have determined that used engine oil can be carcinogenic and can cause reproductive toxicity. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.

- DO NOT connect the jumper starting or battery charging cables to any ignition or governor control wiring. This can cause electrical damage to the ignition or governor.
- Coolant is toxic. If not reused, dispose of coolant in accordance with local environmental regulations.
- 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.
- The catalyst substrate located in the Diesel Particulate Filter (DPF)

contains vanadium pentoxide, which has been determined by the State of California to cause cancer. Always wear protective clothing and eye protection when handling the catalyst assembly. Dispose of the catalyst in accordance with local regulations. If catalyst material gets into the eyes, immediately flood eyes with water for a minimum of 15 minutes. Avoid prolonged contact with skin. In case of contact, immediately wash skin with soap and water. In case of harmful contact, immediately contact a physician.



CAUTION

Corrosive chemicals can damage the engine. DO NOT use corrosive chemicals on the engine. Failure to comply may result in equipment, or property damage.

WHAT TO DO IF...

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WHAT TO DO IF...

You Need Roadside Assistance

Call toll-free to talk to someone at the PACCAR Customer Center:

- Kenworth customers, call 1-800-KW-ASSIST (1-800-592-7747).
- Peterbilt customers, call 1-800-4-PETERBILT (1-800-473-8372).
- Open 24-7-365 days a year.
- They can help you get roadside assistance.
- They have a custom mapping system which locates authorized PACCAR engine dealers and Independent Service Providers (ISPs) near you and lists types

of services offered, hours of operation and contact information.

- They can assist with jump and pull starts, tires, trailers, fines and permits, chains, towing, hazardous clean-up, out of fuel (roadside), mechanical repairs and preventive maintenance services.
- They have multilingual agents and access to a translation service to ensure quality assistance for customers who speak any language.
- They can't answer your warranty questions, but can get you in contact with an authorized dealer who can.
- The PACCAR Customer Center service is FREE.

Stop Engine Lamp Turns On



Stop Engine Lamp - If the Stop Engine warning lamp illuminates, it means you have a serious engine system problem.



WARNING!

This should be considered an emergency. You should stop the vehicle as safely as possible and turn OFF the ignition. The vehicle must be serviced and the problem corrected before driving again. Failure to do so may result in personal injury, severe engine damage, equipment or property damage.

Engine Oil Pressure Lamp Turns On



Engine Oil Pressure Gauge - 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 may cause severe engine damage, 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 “Lubricating Oil System” on page 5-14, 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 “Inspection of the Engine Oil Level” on page 5-3.)
 7. Add oil if necessary. If the problem persists, contact an authorized PACCAR engine dealer as soon as possible.

Check Engine Lamp Turns On



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.

Engine is Overheating

 CAUTION
The cooling system may overheat if the engine coolant is at the minimum level. A sudden loss of coolant, caused by a split hose or broken hose clamp could also lead to an overheat condition. Always inspect to ensure hoses and clamps are not cracked, worn, or loose. Failure to comply may result in equipment or property damage.

 NOTE
The system may also temporarily overheat during severe operating conditions such as: • Climbing a hill on a hot day. • Stopping after high-speed/high-load driving. • Debris blocking air flow through the cooling module (radiator).

If the engine coolant temperature warning lamp comes on and the audible alarm sounds showing an overheat condition, or if you have any other reason to suspect the engine may be overheating, **DO NOT TURN OFF THE ENGINE** unless a low water warning device indicates a loss of coolant. Follow these steps:

- Reduce engine speed, or stop. When stopped, place the

transmission in neutral (N) and set the parking brake. "See the vehicle operator's manual for instructions on transmission shifting and parking brake information."

- Check to ensure that the oil pressure gauge reads normal.
- Increase the engine speed to 1,100 to 1,200 RPM maximum for two to three minutes.
- Monitor the engine temperature. After the temperature returns to normal, allow the engine to idle three to five minutes before shutting it off. This allows the engine to cool gradually and uniformly.
- If the overheating came from severe operating conditions, the temperature should have cooled by this time.

- Be sure the vehicle is parked on level ground or the readings may be incorrect. Check the coolant level at the cooling module surge tank.

**WARNING!**

To reduce the chance of personal injury and/or vehicle damage caused by engine overheating, never leave the engine idling when the vehicle is unattended. If the engine overheats, immediate action is required to correct the condition. Continued unattended operation of the engine, even for a short time, may result in serious engine damage or a fire. Failure to comply may result in death, personal injury, equipment or property damage.

**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. See the vehicle operator's manual for instructions on checking and filling the cooling module surge tank.



CAUTION

Prolonged periods of idling after the engine has reached operating temperatures can decrease engine temperature and could cause engine damage from inadequate lubrication. The normal torsional vibrations generated can also cause transmission wear. An idle shutdown feature, available on PACCAR engines, can be programmed to shut the engine down after a period of low idle operation with no driver activity. A flashing warning lamp will inform the driver of an impending shutdown. Failure to comply may result in equipment or property damage.



CAUTION

If the truck is equipped with power take off (PTO) equipment, the engine shutdown system can be deactivated when the PTO is operational; however, engine idle periods should not exceed five minutes whenever possible. Failure to comply may result in equipment or property damage.

OPERATING INSTRUCTIONS

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OPERATING INSTRUCTIONS

Engine Warning Lamps

General Information

The following engine warning lamps section covers only the lamps controlled by the engine's Electronic Control Module (ECM). Please refer to the vehicle "Operator's Manual" and "Engine Aftertreatment Systems" manual for additional warning lamp information.

Wait to Start Lamp



The "Wait to Start" lamp illuminates when the intake air heater (grid heater) needs to warm the intake air prior to starting the engine.

The ON-time for the "Wait to Start" lamp will vary depending on the ambient air temperature. See "Normal Starting Procedure" on page 4-4.

For vehicles equipped with an "Engine Starting-Motor Protection" feature, another function of the "Wait to Start" lamp is to flash for two minutes if the starting motor is engaged for 30 seconds or more.

The "Wait to Start" lamp can look like:

- The words "Wait to Start" spelled out
- A symbol similar to the graphic illustrated
- The color of the symbol or words can vary, based on the manufacturer of the vehicle, but will typically be red or amber.

Check Engine Lamp



The “Check Engine” lamp illuminates when the engine needs service at the first available opportunity.

The “Check Engine” lamp is amber, and can look like:

- The words “WARNING” or “CHECK ENGINE” spelled out.
- A symbol of an engine, similar to the graphic illustrated.

The “Check Engine” lamp is located on the face of the tachometer and illuminates when a problem exists, but the vehicle can still be safely driven. The vehicle should be serviced to correct the problem, but the situation should not be considered an

emergency. The “Check Engine” lamp will activate for several reasons. These include but are not limited to: Water in fuel and Diesel Particulate Filter (DPF) regeneration required.

The “Check Engine” lamp is to flash for 30 seconds at key ON when one of the following occurs. This flashing function is referred to as the “maintenance” lamp. The “maintenance” lamp could flash for any of the following reasons:

- Maintenance required (if the Maintenance Monitor is enabled).
- Water-in-fuel is detected.
- Coolant level is low.

Malfunction Indicator Lamp



The “Malfunction Indicator Lamp” (MIL) illuminates when an engine emissions failure has occurred. The vehicle can be safely driven but should be serviced to correct the problem. The situation should not be considered an emergency. In some cases, the MIL will activate in conjunction with the “High Exhaust System Temperature,” DPF and “Diesel Exhaust Fluid” (DEF) warning lamps.

Stop Engine Lamp



The stop engine warning lamp will illuminate, and an audible tone will sound, when a major engine problem exists.



WARNING!

This should be considered an emergency. You should stop the vehicle as safely as possible and turn OFF the ignition. The vehicle must be serviced and the problem corrected before driving again. Failure to comply may result in personal injury, severe engine damage, equipment or property damage.

For engines with the engine-protection shutdown feature enabled, the stop engine lamp will begin to flash 30 seconds before the engine automatically shuts down. The warning lamp alerts the operator to the impending shutdown.

The lamp will also illuminate when the DEF tank is almost empty or the soot level in the DPF is at full capacity. At this level warning, regeneration cannot be performed and engine power will be derated.

Engine may automatically shut down if the check engine lamp and stop engine lamp are illuminated and the operator does not correct the condition.

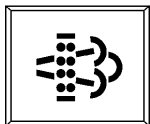
High Exhaust System Temperature (HEST) Warning Lamp



HEST Warning Lamp

Keep vehicle a safe distance from combustible items. Refer to “Engine Aftertreatment Systems Operator’s Manual, Notification of High Exhaust System Temperature” for important safety information.

Diesel Particulate Filter (DPF) Warning Lamp



3

DPF Warning Lamp

Refer to "Engine Aftertreatment Systems Operator's Manual" for additional information.

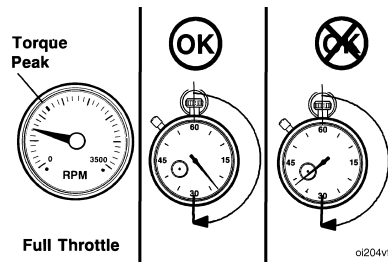
Diesel Exhaust Fluid (DEF) Lamp



Diesel Exhaust Fluid (DEF) Lamp

Refer to "Engine Aftertreatment Systems Operator's Manual" for additional information.

Engine Operating Range General Information



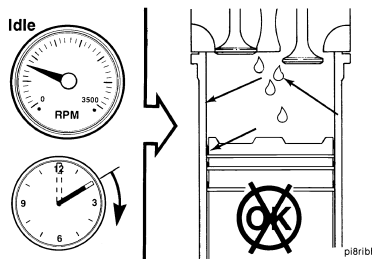
CAUTION

Operating the engine at full throttle below peak torque will shorten engine life to overhaul, can cause serious engine damage, and is considered engine abuse. DO NOT operate the engine at full throttle operation below peak torque RPM for more than 30 seconds. Failure to comply may result in equipment or property damage.

PACCAR engines are designed to operate at full throttle under momentary conditions down to peak torque engine speed. This is consistent with recommended operating practices.

**CAUTION**

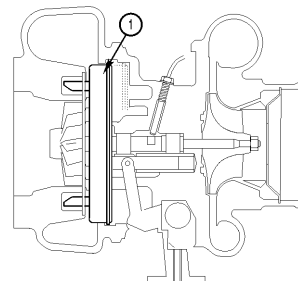
Operating the engine beyond the maximum engine speed can cause severe engine damage. Use proper operating techniques for the vehicle to prevent engine overspeed. The maximum engine speed specification is listed in the “General Engine Specifications” on page 5-13. Failure to comply may result in equipment or property damage.

**CAUTION**

DO NOT idle the engine for excessively long periods. Long periods of idling, more than 10 minutes, can cause poor engine performance

**NOTE**

For applications with high idle-time, to help reduce soot loading in the aftertreatment system, avoid long periods of idling. If idling is required, increase idle-speed using the cruise control function.

Engine Braking System**Variable Geometry Turbo (VGT) Brake System General Information**

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1. Sliding Nozzle

This engine may be equipped with a variable geometry turbocharger (VGT) with an exhaust brake feature. This feature allows the variable geometry turbocharger to act as an exhaust brake by retarding the speed of the engine to provide additional vehicle braking power and extend the life of the vehicle service brakes. The ON/OFF

function is controlled by a switch located on the dash of the vehicle. The engine (VGT) exhaust brake works by retarding engine speed by creating high exhaust back pressure. This back pressure is obtained by restricting airflow through the turbine housing of the turbocharger. This restriction through the turbine housing is created through positioning of the sliding nozzle (1) located internally to the turbocharger. The position of the sliding nozzle is controlled by the engine electronic control module (ECM). This option may not be available on your vehicle.



WARNING!

The exhaust brake is not intended as the primary brake for the vehicle, nor is it an emergency brake. The service brakes must be used in an emergency. Relying solely on the exhaust brake to stop the vehicle in an emergency could cause an accident and lead to personal injury. The exhaust brake only helps the service brakes by using pressure to slow the drive train. You must use the service brakes for quick or emergency stops. Failure to comply may result in death, personal injury, equipment or property damage.



WARNING!

DO NOT use the exhaust brake when operating on surface with poor traction (such as wet, icy or snow covered roads). Retarders can cause the wheels to skid on a slippery surface. You could lose control of the vehicle and jackknife if the wheels begin to skid, resulting in an accident. Failure to comply may result in death, personal injury, equipment or property damage.



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.



NOTE

When the engine (VGT) exhaust brake switch is in the "ON" position, the engine's electronic control module (ECM) monitors inputs (such as accelerator pedal position and engine speed). From these inputs, the ECM determines when to enable the engine (VGT) exhaust brake feature when the proper braking conditions are present.

Other features/switches like cruise control, can also affect when the engine (VGT) exhaust brake activates. For more information on how the engine (VGT) exhaust brake functions, refer to vehicle operation manual or contact a PACCAR Authorized Repair Location.



WARNING!

To reduce the possibility of personal injury or property damage, always be prepared to use the vehicle service brakes for emergency stopping. The safe control speed of a vehicle will vary with the size of the load, the type of load, the grade, and the road conditions. Failure to comply may result in death, personal injury, equipment or property damage.



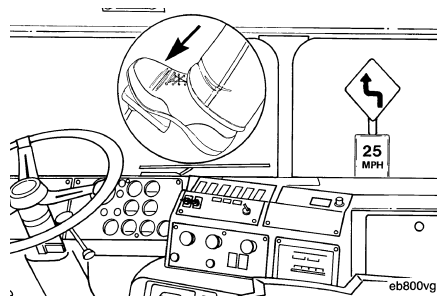
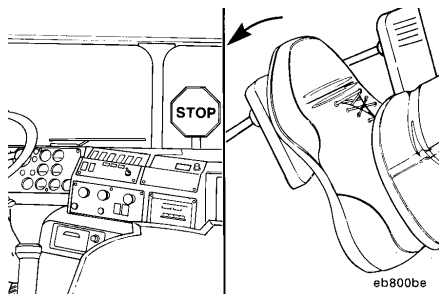
NOTE

The exhaust brake can only be activated when the accelerator pedal is at its "low-idle" position. With the throttle at "low-idle" position, fueling commands to the cylinders will not detract from the braking power of the brake system.



NOTE

The engine (VGT) exhaust brake is designed to assist the vehicle's service brakes when slowing the vehicle to a stop.



Vehicle service brakes must always be used. The engine brake is not intended to be used as the primary brake of the vehicle, nor is it an emergency brake. The engine retarder only helps the service brakes by using pressure to slow the drivetrain. Use the service brakes for quick stops.



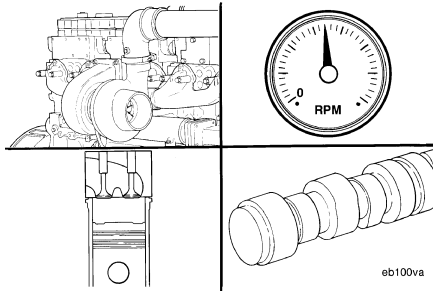
CAUTION

Exceeding governed engine speed can cause engine damage. Operating the engine beyond the maximum engine speed may cause serious engine damage and is considered engine abuse. Use the engine and vehicle braking systems to control engine speed.

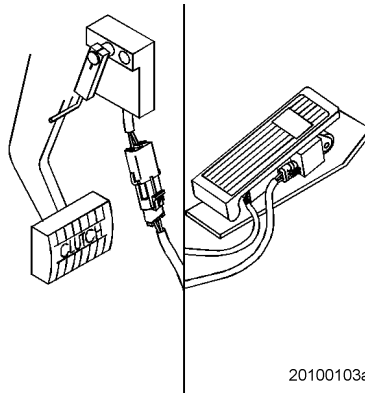
The optimum braking power of the engine (VGT) exhaust brake is reached at rated engine speed. Correct gear selection, therefore, is critical.

Typically, on vehicles equipped with automatic transmissions, the engine electronic control module (ECM) and the transmission will determine the correct gear selection.

Compression Brake System



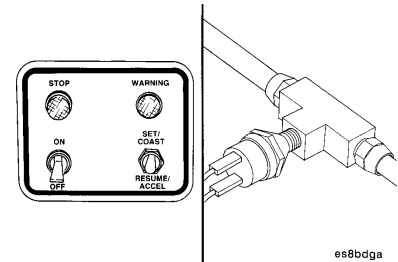
The amount of braking power available in a given engine series varies. Braking power depends on turbocharger boost pressure, engine speed, compression ratio, injector timing, and when the engine brakes open the exhaust valves.



Engine brake controls, with the fuel system, consists of the following:

- A two-position selector switch standard (three-position selector optional).
- An ON/OFF switch.
- A clutch switch.
- A throttle sensor.

With the ON/OFF switch in the “ON” position, the brake automatically creates its braking effect when you remove your foot from the accelerator pedal.

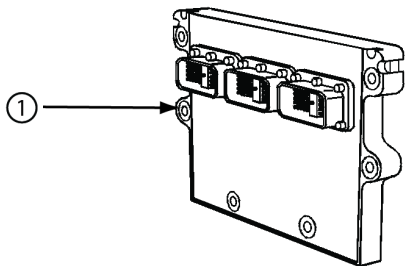


Other switches for cruise control that affect engine brake operations are:

- Service brake air pressure switch (if service brake actuator feature is selected).
- Clutch switch.
- Throttle sensor.

The ECM allows the engine brakes to operate while the cruise control is turned on.

The two-position selector switch (standard) or three-position (optional) is located next to the “ON/OFF” switch in the cab, and allows you to select the retarding power of one or two brakes.



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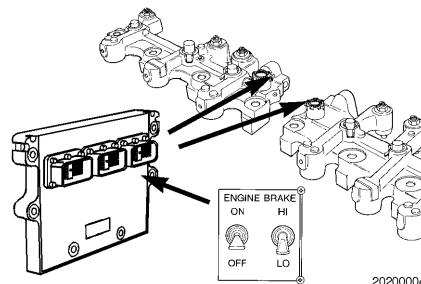
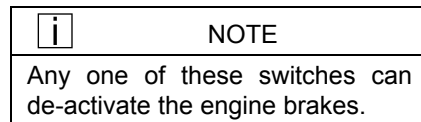
1 Switches

On/Off	CC/PTO
Clutch	Service
Throttle	Brake

“LOW” activates the engine brake on three cylinders, and “HI” activates the engine brake on six cylinders.

Signals from the “ON/OFF” switch, clutch switch, throttle sensor, and the

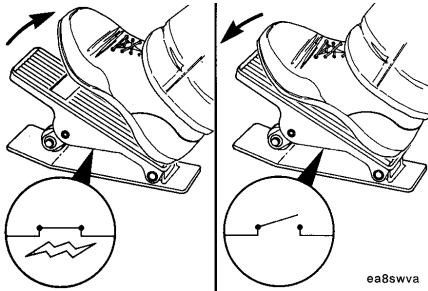
cruise/PTO switches are fed into the ECM.



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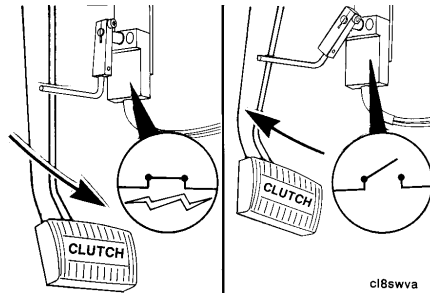
The ECM then electronically enables or disables the engine brakes.

i	NOTE
Engine brakes cannot be enabled:	
• When cruise control is active and the engine brakes in cruise control feature is turned off. • When engine speed goes below 850 RPM. • When the engine computer recognizes a system problem.	

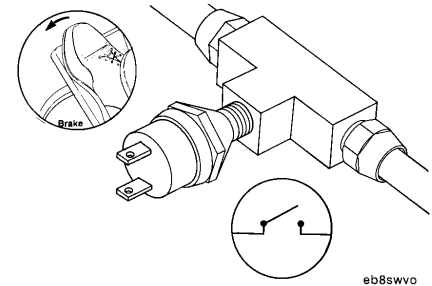


The throttle sensor is part of the accelerator pedal assembly located in the cab and will deactivate the engine

brakes when the acceleration pedal is depressed.



The clutch switch uses the motion of the clutch linkage to deactivate the engine brakes when the clutch pedal is depressed.



The service brake pressure switch is attached to the service brake air supply line.

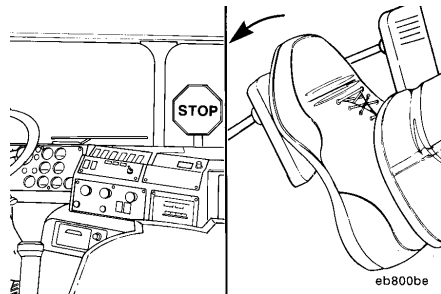
Applying the service brakes while in cruise control will disengage the cruise control and enable the engine brakes.

If the pedal-activated engine brake feature is enabled, the service brake pedal must be depressed (tapped) before the engine brakes will be activated.



CAUTION

DO NOT operate the engine brake until the engine oil temperature is above 86°F (30°C). Operation below 86°F (30°C) could cause severe damage to the engine. Idle the engine four minutes at approximately 1000 RPM to warm the engine before activating the engine brakes.



To activate the engine brakes, switch the "ON/OFF" switch to the "ON"

position. Once activated, the operation of the engine brake is fully automatic.



NOTE

See the "Tips for Operation" steps in this section for specific information about engine brake operation under certain road conditions.

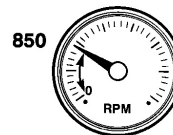


NOTE

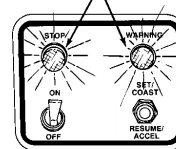
The engine brakes are designed to assist the vehicle's service brakes when slowing the vehicle to a stop.

Remember, service brakes will be required to bring the vehicle to a stop.

RPM



Fault Lamps



Engine Brakes

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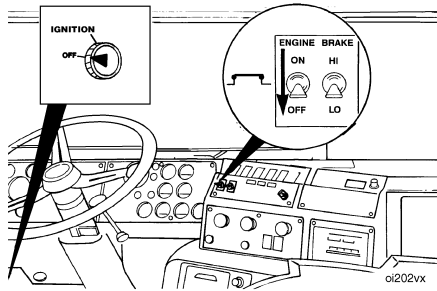


CAUTION

Using the engine brakes to aid in clutchless gear shifting will cause the engine to stall or lead to engine damage. Engine brakes used in clutchless shifting causes additional strain on the engine valve train and causes severe internal engine damage. DO NOT use engine brakes to assist in gear shifting.

The ECM will disable the engine brakes when engine speed is below

850 RPM or when an electronic fault code is active.



If the engine brakes will not shut off, shut off the engine immediately, and contact a PACCAR authorized repair location.



CAUTION

Operating the engine with an engine brake that will not deactivate will cause severe engine damage. Inoperable engine brakes can cause an additional strain on the engine valve train causing severe internal engine damage. **DO NOT** operate the engine if the engine brake will not deactivate.

OPERATING INSTRUCTIONS

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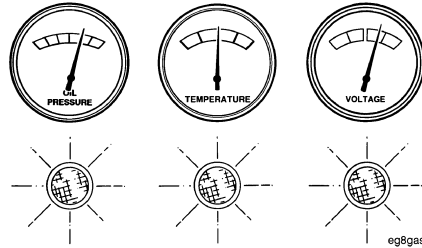
OPERATING INSTRUCTIONS

General Information

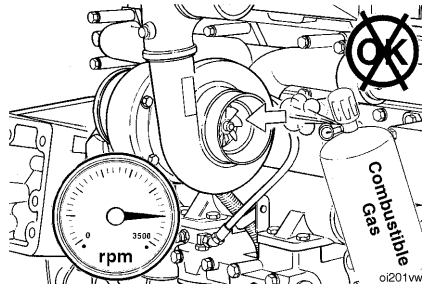
Correct care of your engine will result in longer life, better performance, and more economical operation.

Follow the daily maintenance checks listed in "Maintenance Schedule" on page 5-3.

The new PACCAR engine associated with this manual does not require a "break-in" procedure. This section of the manual provides all of the necessary information required for proper engine operation.



Check the oil pressure indicators, temperature indicators, warning lights, and other gauges daily to make sure they are operational.



WARNING!

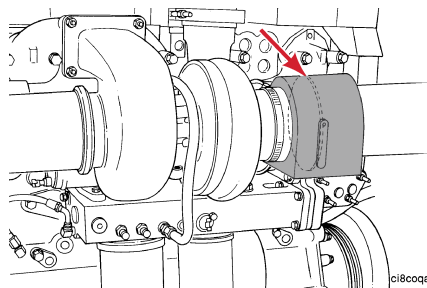
Combustible vapors near the air intake system could be ingested into the engine, causing the engine to suddenly accelerate and over-speed. This condition could result in operator losing control of the vehicle if an unexpected increase in engine RPM occurs. Combustible vapors could also cause a fire. DO NOT operate your vehicle in an area where combustible chemicals or vapors may be present. Failure to comply may result in death, personal injury, equipment or property damage.

IT IS THE RESPONSIBILITY OF THE OWNER AND OPERATOR TO OPERATE THE VEHICLE IN A SAFE ENVIRONMENT.



NOTE

Numerous safety devices (i.e. engine shutoff devices) are available to minimize the risk of engine overspeeding caused by combustible vapors being ingested into the air intake system.



ci8coqg

PACCAR recommends the installation of an air intake shutoff device or a similar safety device to minimize the risk of overspeeding, as can occur when the vehicle is being operated in a combustible environment, such as from a fuel spill or gas leak.

Normal Starting Procedure

1. Ensure the parking brake is set ON and the transmission shift lever is in neutral (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. Wait an additional 10 seconds to allow the starter motor to cool, then try starting the engine again.



NOTE

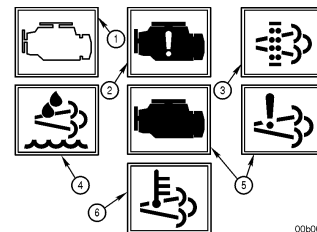
If the engine is running, DO NOT increase engine speed (RPM) or operate the vehicle until the low oil pressure warning lamp turns off.



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.



00b00028

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

1. Check engine lamp; amber in color.
2. STOP engine lamp; red in color.
3. Diesel particulate filter (DPF) status indicator; yellow in color.
4. Diesel exhaust fluid (DEF) lamp; amber in color.
5. Malfunction Indicator Lamp; amber in color.
6. High exhaust system temperature (HEST); amber in color.



The DEF Warning screen is displayed when the DEF Fluid level has reached a critically low level. It may be suppressed by pushing enter on the MCS (Menu Control Switch). This

warning may be accompanied by the DEF Level in the low range, DEF Lamp on solid or flashing, the Check Engine lamp, the Stop Engine lamp, the MIL lamp, and/or engine derate.

If any of the lamps remain on or begin to flash, refer to “Engine Indicator Lamps” on page 3-3.



Under cold conditions, the “Wait-to-Start” lamp will illuminate at key on, and will stay on for a period of up to 30 seconds.

i	NOTE
	The length of time the “Wait-to-Start” lamp remains illuminated depends on the ambient temperature. The lower the ambient temperature, the longer the lamp will be illuminated.

Once the “Wait-to-Start” lamp turns off, turn the key to the starting position to start the engine.

i	NOTE
	Engines equipped with air starting motors require a minimum of 70 PSI (480 kPa).



NOTE

Some engines are equipped with an engine starting motor protection feature. If the starting motor is engaged for 30 or more seconds, without the engine starting, the starter will be locked out from operating, allowing for proper cooling of the starting motor. During this time, the “Wait-to-Start” lamp will flash for two minutes. Once the lamp discontinues flashing, the starting motor will be allowed to function.



CAUTION

The engine must have adequate oil pressure within 15 seconds after starting the engine. If the oil pressure gauge does not register the minimum pressure, or drops below the minimum pressure, a red warning light in the gauge will come on, a warning buzzer will sound, and the “Stop Engine” lamp will come on. This should be considered an emergency. Operating the engine in this condition may cause severe engine damage. You should stop the vehicle as safely as possible. The vehicle must be serviced and the problem corrected before driving again.

Cold Weather Starting General Information



CAUTION

To reduce the possibility of damage to the lubricating oil pan, due to the composite materials used in the manufacture of the lubricating oil pan, under no circumstances should an external heat source be applied directly or indirectly to the lubricating oil pan.

Follow the “Normal Starting Procedure” on page 4-4. If equipped with an intake air heater, the “Wait-to-Start” lamp will stay on longer.

Refer to the vehicle operator's manual instructions for any additional cold weather starting procedures.

If starting a cold engine, slowly increase the engine speed. This provides adequate lubrication to the

bearings and gives ample time to allow the oil pressure to stabilize.

If an engine must idle for an extended period of time, it should be done at a fast idle (1,000 RPM maximum) at coolant temperatures below 150°F (70°C).

For coolant temperatures below 150°F (70°C), use a low gear and drive at moderate engine speed until the engine coolant has reached operating temperature. DO NOT let the engine idle longer than necessary.



CAUTION

DO NOT operate the engine at low idle for long periods with engine coolant temperature below the minimum specification in "Cooling System" on page 5-15. This can result in the following:

- Fuel dilution of the lubricating oil
- Carbon buildup in the combustion chamber
- Sticking of the valves in the cylinder head
- Reduced performance
- Damage to aftertreatment components



NOTE

For engines equipped with the engine warm-up protection feature; this feature limits engine speed and torque following engine start-up until sufficient oil pressure is available to the engine components. This feature reduces the risk of engine part damage due to operating at engine speeds too high or loads before adequate oil pressure is achieved.

Some engines are equipped with a "Fast-Idle Warm-Up" feature. When enabled, this feature elevates the idle speed of the engine in cold ambient conditions, in order to shorten the time necessary to warm up the engine. When the idle speed is elevated, the engine noise may change, this is normal. To bring the engine back to low idle speed:

- For vehicles equipped with a manual transmission and clutch switch: Depress the clutch pedal.
- For vehicles equipped with a brake switch: Depress the service brake pedal.
- Depress the accelerator pedal.

For more information on the “Fast-Idle Warm-Up” feature, contact a PACCAR authorized repair location.

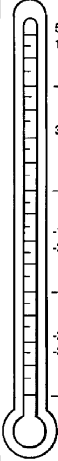
Cold Weather

It is possible to operate engines in extremely cold environments if they are properly prepared and maintained. Satisfactory performance of an engine in low ambient temperature conditions requires modification of the engine, surrounding equipment, operating practices and maintenance procedures.

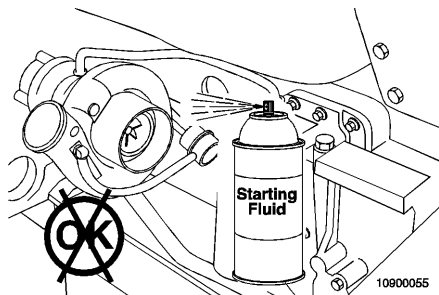
The correct engine coolant, lubricating oil and fuels must be used for the cold weather range in which the engine is being operated. See the “Maintenance Section” on page 5-3 for these critical engine fluids recommendations and specifications.

Cold Weather Operating Aids

The following cold weather operating aids are required for cold weather situations:

Cold Weather Operating Aids										
Temperature	Starting Aid	Coolant Heater	Oil Heater	Under-hood Air	Fuel Heater	Battery Heater	Radiator Shutters	Engine Enclosure	Winter Front	Thermatic Fan
 50 to 32° F 10 to 0° C										
32 to -10° F 0 to -23° C	↑	↑	↑	↑	↑	↑	↑	↑		Suggested
-10 to -25° F -23 to -32° C	Required	Required	* Required	Required	* Required	Required	Required	Required	Required	Required
-25 to -65° F -32 to -54° C	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
* Required dependent upon viscosity/pour point.										
oi202vj										

Using Starting Aids



4

This engine is equipped with an intake grid heater to help start the engine in cold weather conditions. Contact your authorized PACCAR repair location for other cold weather starting aid options.



WARNING!

Using starting fluid to help start the engine could cause a fire or explosion, resulting in personal injury, property damage and severe engine damage. **DO NOT** use starting fluid to start this engine.

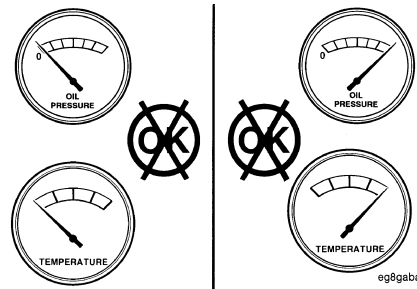
Starting Procedure After Extended Shutdown or Oil Change

General Information

Follow the “Normal Starting Procedure” on page 4-4. The engine will run at idle only until the minimum oil pressure is detected by the ECM. It can take more cranking time to start the engine after an extended shut down or oil change.

Operating the Engine Normal

Monitor the oil pressure and coolant temperature gauges frequently. Refer to “Lubricating Oil System” on page 5-14 and “Cooling System” on page 5-15 for recommended operating pressures and temperatures. Shut off the engine if any pressure or temperature does **not** meet the specifications.



Continuous operation with engine coolant temperature above or below the engine coolant temperature specifications listed in "Cooling System" on page 5-15 can damage the engine.

Engine Shutdown Before Stopping the Engine

	NOTE
DO NOT shut off the engine immediately. A hot engine stores a great amount of heat and it does not cool down immediately after it is shut off. Always cool the engine down before shutting it off. You will greatly increase its service life.	

Idle the engine at 1,000 RPM for four minutes. Then low idle for 30 seconds before shutdown. This will allow circulating coolant and lubricating oil to carry heat away from the cylinder head, valves, pistons, cylinder liners, turbocharger, and bearings. This way you can prevent engine damage that may result from uneven cooling.

	NOTE
For engines equipped with an electronic control module (ECM) ensure the key switch is turned OFF for a minimum of 70 seconds prior to disconnecting the continuous (unswitched) battery power supply. If the unswitched battery power supply is disconnected in less than 70 seconds after the key switch is turned OFF, active fault codes and incorrect ECM information can occur.	

Turn the ignition switch to the OFF position. If the engine does not shut down, refer to "Troubleshooting Symptom" (Section TS) in the appropriate maintenance manual.

**CAUTION**

Failure to follow the correct shut-down procedure may result in damage to the turbocharger and shorten the turbocharger life.

Electromagnetic Interference (EMI)

General Information

If not installed correctly, some vehicle accessories (CB radios, mobile transmitters, etc.) can generate and use radio frequency energy that may cause electromagnetic interference (EMI) between the accessory and the electronic controlled fuel system. Under these conditions, PACCAR is not liable for any performance problems with either the fuel system or the accessory. EMI is not considered by PACCAR to be an engine failure and therefore is not warrantable.

System EMI Susceptibility

PACCAR products are designed and tested for minimum sensitivity to incoming electromagnetic energy. The fuel system EMI susceptibility has been designed with a high tolerance against EMI and in most normal circumstances, if not all, electromagnetic energy-emitting devices that meet the Federal Communications Commission legal requirements should cause no interference.

System EMI Radiation Levels

Electronic components are required to pass various PACCAR and industry EMI specifications. Our testing has shown that when the engine is properly installed and maintained, it will not interfere with properly installed onboard communication equipment.

If any interference condition is noticed, follow these suggestions to reduce the amount of EMI:

1. Locate the accessory receiving antenna further away.
2. Check with the accessory supplier representative in your area to:
 - Accurately calibrate the accessory for proper frequency, power output, and sensitivity.

- Determine the optimum antenna location by obtaining antenna reflective energy data measurements.
- Ensure that the optimum antenna type and mounting arrangement is being used.
- Ensure the accessory equipment is properly constructed for maximum filtering to reject incoming electromagnetic noise.

Tips for Operation on Level and Dry Pavement



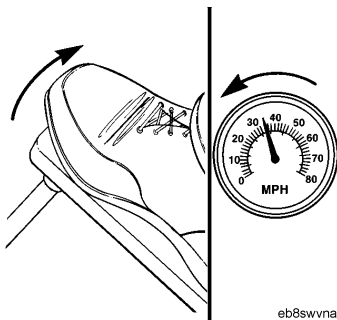
WARNING!

DO NOT use the engine brake when operating on road surfaces with poor traction (such as wet, icy, or snow covered roads or gravel). Retarders can cause the wheels to skid on a slippery surface. You could lose control of the vehicle and/or jackknife if the wheels begin to skid, resulting in an accident. Failure to comply may result in death, personal injury, equipment or property damage.



WARNING!

DO NOT use an engine 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 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.



eb8swvna

To reduce vehicle speed, put the engine brake "ON/OFF" switch in the "ON" position. Remove your foot from the accelerator pedal and clutch pedal. The engine brakes will immediately begin to operate, slowing the vehicle.

For operation on dry and relatively flat surfaces, when greater retarding power is not required, put the two-position selector switch in the "LOW" position.

For operation on dry pavement when maximum retarding power is required, put the two-position selector switch in the "HI" position.

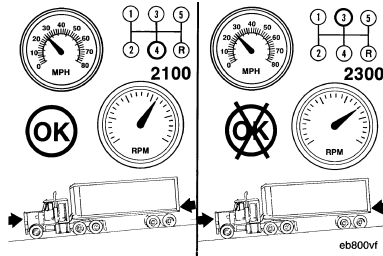
Tips for Operation on Grades with Dry Pavement



WARNING!

The engine brake is not intended as the primary brake for the vehicle, nor is it an emergency brake. The service brakes must be used in an emergency. Relying solely on the engine brake to stop the vehicle in an emergency could cause an accident and lead to personal injury. The engine brake only helps the service brakes by using pressure to slow the drive train. You must use the service brakes for quick or emergency stops. Failure to comply may result in death, personal injury, equipment or property damage.

"Control speed" is the speed at which the forces pushing a vehicle down a grade are equal to the forces holding it back.



WARNING!

DO NOT use the engine brake when operating on surface with poor traction (such as wet, icy, or snow covered roads). Retarders can cause the wheels to skid on a slippery surface. You could lose control of the vehicle and jackknife if the wheels begin to skid, resulting in an accident. Failure to comply may result in death, personal injury, equipment or property damage.



WARNING!

DO NOT use an engine 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 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.



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.

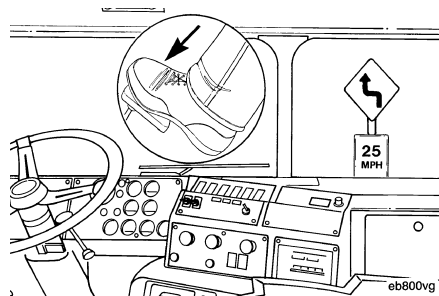


NOTE

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.

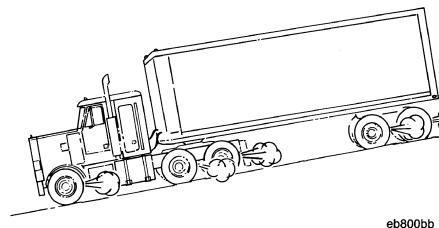
The two-position selector switch can be used to vary braking power as road conditions change.

Vehicle service brakes must be used when additional braking power is required.



4

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.

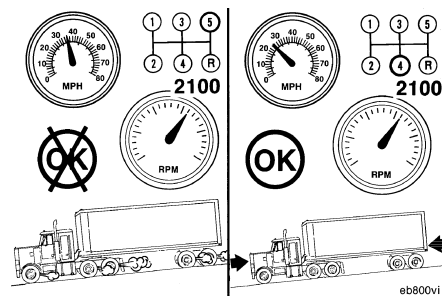


WARNING!

DO NOT drive with frequent or continuous use of the service brakes. This can overheat the brakes and result in excessive lining wear, increased stopping distances, possibly an accident and may lead to personal injury. Before descending a steep grade, shift to a lower gear, keep the vehicle speed low, and avoid continuous application to the brakes. Failure to comply may result in death, personal injury, equipment or property damage.

NOTE

The longer or steeper the hill, the more important it is to use your engine brakes. Make maximum use of your engine brakes by gearing down and letting the engine brakes do the work.



If frequent use of the vehicle service brakes is required, it is recommended that a slower control speed be used by selecting a lower transmission gear.

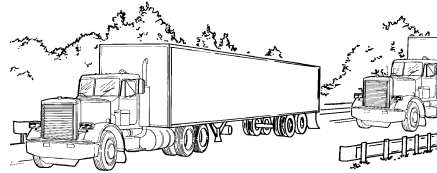
Tips for Operation on Slick Roads



WARNING!

To reduce the possibility of personal injury or property damage, always allow for extra distance between your vehicle and other objects when using the service brakes or engine brakes on slick roads.

The operation of any vehicle is difficult to predict on slick roads. The first 10 to 15 minutes of rainfall are the most dangerous, as road dirt and oil mixed with rain create a very slippery surface.



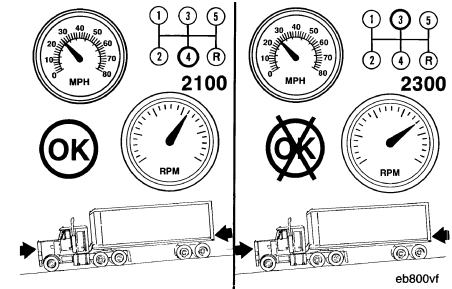
eb800bc



WARNING!

DO NOT operate the engine 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. Braking caused by the normal operation of the engine brake could cause you to lose control of the vehicle resulting in an injury accident. Failure to comply may result in death, personal injury, equipment or property damage.

When driving on slick roads, start with the “ON/OFF” switch in the “OFF” position and the two-position selector switch in the “LOW” position.



If your tractor is equipped with a twin-screw rear axle, position the power divider switch in the “unlocked” position.

Remove your foot from the accelerator pedal to make sure the vehicle will maintain traction with the retarding power of the engine alone.

If the vehicle drive wheels begin to skid or if there is a fishtailing motion, DO NOT activate the engine brakes.

If traction is maintained using the retarding power of the engine alone and more braking power is required, switch the two-position selector switch to the "LOW" position and activate the engine brakes by switching the "ON/OFF" switch to the "ON" position.

4

If the vehicle's drive wheels begin to skid or there is a fishtailing motion, switch the "ON/OFF" switch to the "OFF" position.

If traction is maintained when the engine brakes are activated and more braking power is required, move the two-position selector switch to the "HI" position.

Again, if the vehicle has lost traction or if there is a fishtailing motion, switch the "ON/OFF" switch to the "OFF"

position. DO NOT attempt to use the engine brakes in the "HI" position.

MAINTENANCE GUIDELINES

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MAINTENANCE SPECIFICATIONS

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MAINTENANCE GUIDELINES

Overview

General Information

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.

Maintenance Schedule

General Information

Perform maintenance at whichever interval occurs first.

At each scheduled maintenance interval, perform all previous maintenance checks that are due for scheduled maintenance.

Daily or Refueling – Maintenance Check

- Engine Lubrication Oil Level - Check/Correct: See “Inspection of the Engine Oil Level” on page 5-28.
- Engine Fuel Filter/Water Separator – Automatic water drain, no maintenance required.
- Chassis Fuel Filter/Water Separator – Drain trapped water (if equipped).
- Air Intake Piping – Inspect:
 - Hose/Pipe condition – deterioration/signs of leaking
 - Hose clamps for tightness and pinching/cutting of hoses.
 - Clearance to other components
 - Check Air Restriction gauge

- Aftertreatment Exhaust Piping – Inspect:
 - Check for cracks
 - Clearance to other components (i.e. electrical harnesses, etc.)
 - Hose/pipe condition – deterioration/signs of leaking
- Cooling Fan – Inspect:
 - Check for cracks
 - Clearance to other components

- Engine Coolant Level – Check/Correct:
While parked on a level surface with engine off and low coolant temperature.
 - Check coolant level. It should be visible through the clear plastic surge tank.
 - Add coolant as necessary by removing the coolant fill cap on the neck of the surge tank or sight glass,
 - The pressure cap (on the side of the surge tank) should NEVER be removed. The fill cap (On the top, not the side of the surge tank) is the correct fill point.
 - Replacement or top up coolant should have the same antifreeze concentration and corrosion inhibitor content as the original coolant in the

cooling system. If operating in sub-freezing conditions, a 60/40 mix of antifreeze and distilled water may be substituted.

- Always dilute antifreeze to the correct concentration based on freeze protection before adding it to the cooling system. Adding or using 100% antifreeze in a cooling system may result in cooling system plugging and overheating problems.
- Diesel Exhaust Fluid (DEF) Level – Check/Top Up:

	NOTE
It is recommended to top up DEF when refueling. See “Engine Aftertreatment Systems Operator’s Manual” for DEF information.	

- Check for any signs of fluid leaks

- Ensure all access caps/covers are properly installed and tight.

Every 7,500 mi (12,000 km), 250 Hours, or 3 months – Maintenance Check

- Air Cleaner Restriction - Check/Correct
 - Service filter element when air cleaner restriction gauge (option) locks in the extreme high position.
 - Hose/Pipe condition - deterioration/signs of leaking
 - Hose clamp torque
- Charge Air Piping - Check/Correct
 - Hose/Pipe condition - deterioration/signs of leaking
 - Hose clamps for tightness
 - Clearance to other components
- Charge Air Cooler - Check/Correct

- Cracked tubes or header
- Clogged fins/tubes
- Hose/Pipe condition - deterioration/signs of leaking
- Hose clamp torque
- Exhaust system - Check/Correct
 - Check for leaks and proper support

Every 15,000 mi (24,000 km), 500 Hours, or 6 months – Maintenance Check

- Fuel filter (spin on type) - Replace⁸
- Lubricating oil – Change²
- Lubricating oil filters – Replace²
- Antifreeze concentration - Check¹
- Radiator pressure cap - Check
- Batteries – Check⁵
- Battery cables and connections – Check⁵
- Battery condition - electrolyte level, cracks, signs of leaking, overcharging
- Harness/Cables - loose connections, corrosion, chafing, broken retention clips
- Battery hold-downs - for tightness

- Battery box mounting bolt - torque

Every 30,000 mi (48,000 km), 1000 Hours, or 1 Year - Maintenance Check

- Drive belt (cooling fan) - Change
- Automatic belt tensioner (water pump) - Check
- Cooling system - Check
 - Radiator pressure cap - Check
 - Supplemental additive/conditioner level
 - Coolant level
 - Coolant protection
 - Replace coolant filter (if equipped)

i	NOTE
Test the engine coolant at least once per year to determine if the coolant must be replaced. If it is determined that the coolant should be replaced, make sure to flush the coolant system. Contact a PACCAR authorized repair location for flushing the coolant system.	

Every 60,000 mi (96,000 km), 2000 Hours, - Maintenance Check

- Crankcase breather element - Change

Every 60,000 mi (96,000 km), 2000 Hours, or 2 Years - Maintenance Check

- Cooling system - Drain/Flush/Fill¹
- Engine steam cleaning - Clean
- Air compressor discharge lines - Clean
- Radiator hoses – Check
 - Hose condition - deterioration/signs of leaking
 - Hose clamp torque
- Crankshaft vibration damper - Check⁴
 - Damper for cracks, nicks, gouges
 - Condition of damper rubber isolator
 - Damper fastener torque

Every 150,000 mi (241,000 km), 5,000 Hours, or 4 Years – Maintenance Check

- Engine brake assembly - Adjust
- Exhaust system - Change
- Overhead set – Adjust ⁶
 - Replace exhaust flex pipe(s)

Every 200,000 mi (321,500 km), 6500 Hours – Maintenance Check

- Aftertreatment Diesel Particulate Filter (DPF) cleaning, using DPF cleaning machine⁷
 - Complete cleaning of filter using a DPF cleaning machine
 - Replace filter if necessary
- Aftertreatment Diesel Exhaust Fluid (DEF) Dosing Unit (DEF Module) Filter – Change

Every 750,000 mi (1,200,000 km), 22,000 Hours, or 6 years – Maintenance Check

- Change extended life coolant
** (See note 1 below)

	NOTE
Refer to the following footnotes when referenced in the preceding maintenance schedules.	

1. A heavy-duty extended life coolant (ELC) that meets ASTM D 6210 chemical composition specifications must be used. The change interval is 750,000 mi (1,200,000 km) or 22,000 hours on-road use (8 years or 15,000 hours off-highway use) on initial fill with no extender added. The change interval is 1,000,000 mi (1,600,000 km)/20,000 hours/8 years with an extender addition at 500,000 mi (800,000 km)/10,000 hours/4 years. Antifreeze is essential for freeze and corrosion protection. The use of supplemental coolant additives (SCAs) is not recommended.
2. The lubricating oil and lubricating oil filter interval can be adjusted based on application, fuel consumption, gross vehicle weight, and idle time. See the "Oil Drain Intervals" table in this procedure.
3. Service interval is every oil change or 15,000 mi (24,000 km), 500 hours, or 6 months, whichever occurs first. A heavy-duty year-round antifreeze that meets the chemical composition of GM6038M must be used. The change interval is 2 years or 240,000 mi (385,000 km), whichever occurs first. Antifreeze is essential for freeze and corrosion protection. SCA is essential for liner pitting and scaling protection.
4. If equipped with rubber type crankshaft vibration damper.
5. Follow the manufacturers' recommended maintenance procedures for the starter, alternator, batteries, electrical components, engine brake, exhaust brake, charge-air cooler, radiator, air compressor, air cleaner, refrigerant compressor, and fan clutch.
6. Reset valve lash, if needed, to nominal specifications. Refer to "General Engine Specifications" on page 5-13.
7. The aftertreatment diesel particulate filter clean/replace interval is based on the use of lubricating oils that meet the Cummins Engineering Standard (C.E.S.) 20081 oil specification. If a non-low ash lubricating oil meeting the American Petroleum Institute (API) performance

classification CI-4/SL and/or C.E.S. 20078 is used, the service intervals for the aftertreatment systems will be reduced to 150,000 mi (241,000 km) or 5000 hours.

8. *Replace the suction side and the pressure side fuel filters at the same time. It is recommended to replace the fuel filters at the same interval as the oil and oil filter are changed.*

Oil Drain Intervals

See the following table to determine the maximum recommended oil change and oil filter change intervals in kilometers (miles)/hours or months, whichever comes first.

i	NOTE
Idle time must be factored into calculating average vehicle speed.	

The intervals are based on the vehicle's average vehicle speed. Locate your vehicle's average vehicle speed in the first column to determine the oil change/filter change interval to use. If the vehicle is equipped with an hour meter, it is acceptable to use the engine hours listed for the oil change and oil filter change interval.

If the average vehicle speed is unknown and the vehicle is not equipped with an hour meter:

1. Reference the Typical Applications column in Table - 1 on page 5-11. Use the lowest interval listed for your application.
2. Connect an electronic service tool. The electronic service tool can provide the average vehicle speed recorded by the engine's ECM.

Table - 1 Oil Drain Intervals

Average Vehicle Speed	Miles	Kilometers	Hours	Months	Typical Applications
Below 5 mph	1,500	2,400	500	6	Shuttle Bus, Transit Bus
5 to 10 mph	4,000	6,450	500	6	Cement Mixer, Dump Truck, Feedlot Truck, Refuse Truck, Shuttle Bus, Transit Bus, Yard Spotter
10 to 15 mph	6,000	9,650	500	6	
15 to 20 mph	8,500	13,700	500	6	
20 to 25 mph	10,500	16,900	500	6	Cement Mixer, Delivery Truck, Dump Truck, Emergency Vehicle, Fire Truck, School Bus, Truck Crane
25 to 30 mph	12,000	19,300	500	6	
30 to 40 mph	15,000	24,100	500	6	Emergency Vehicle, Fire Truck, Linehaul Truck, Motor Coach Bus, School Bus
Above 40 mph	20,000	32,200	500	12	Recreation Vehicle

	NOTE
A Maintenance Monitor feature is available through the engine's ECM. This feature can be enabled by a PACCAR Authorized Repair Location.	

PACCAR bases its oil drain specifications on duty cycle and oil contamination. This contamination occurs in all engines at varying rates regardless of design.

Maintaining the correct oil and filter change interval is a vital factor in preserving the integrity of an engine. Filters must be changed when the oil is changed.

MAINTENANCE SPECIFICATIONS

General Engine Specifications

Horsepower		See engine dataplate.
Firing order		1-5-3-6-2-4
Crankshaft rotation (viewed from front of engine)		Clockwise
Displacement		540 in ³ (8.9 liters)
Bore and stroke		4.49 in. × 5.69 in. (114 mm × 144.5 mm)
Dry weight		1,695 lb (769 kg)
Wet weight		1,770 lb (803 kg)
Overhead adjustment	Intake valve adjustment	0.012 in. (0.305 mm)
	Exhaust valve adjustment	0.022 in. (0.559 mm)
Engine brake adjustment		0.090 in. (2.286 mm)

Lubricating Oil System

Oil pressure	At low idle (minimum allowable)	10 psi (69 kPa)
	At road speed (minimum allowable)	30 psi (207 kPa)
Regulated oil pressure		55 psi (379 kPa)
Lubricating oil filter capacity		4 qt (3.78 liters)
Oil pan capacity, low to high	Standard oil pan	16 to 20 qt (15.1 to 18.9 liters)
	Standard oil pan with cylinder block stiffener plate	19 to 23 qt (18 to 21.8 liters)
	High capacity oil pan	20 to 24 qt (18.9 to 22.7 liters)
Total system capacity (oil pan and new oil filter)	Standard oil pan	24 qt (22.7 liters)
	Standard oil pan with cylinder block stiffener plate	27 qt (25.6 liters)
	High capacity oil pan	28 qt (26.5 liters)

**NOTE**

If the type/oil capacity of each lubricating oil pan is not known:

- Contact a PACCAR® Authorized Repair Location.
- Determine the capacity of the oil pan option for the engine being serviced by using QuickServe™ Online and the engine serial number.
- Fill the lubricating oil pan to the smallest oil pan capacity listed for the engine being serviced. Then add 1 qt (0.95 liters) of oil at a time until it reaches the high mark on the dipstick. Record the number of liters/quarts added, so the capacity is known the next time the oil is drained.

Cooling System

Coolant capacity (engine only)	16.5 qt (15.6 liters)
Standard modulating thermostat range	180 to 200°F (82 to 93°C)
Minimum recommended pressure cap	13 psi (90 kPa)
Maximum top tank coolant temperature	225°F (107°C)
Minimum fill rate (without low-level alarm)	3 gpm (11.4 liters/minute)
Maximum deaeration time	25 minutes
Maximum top tank coolant temperature	225°F (107°C)
Winterfronts — Minimum allowed air passage area	120 in. ² (774 cm ²)

**WARNING!**

Coolant is toxic. DO NOT get the fluid in eyes. If contact with the eyes 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.



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.

Filter Specifications

General Information

Fleetguard filters are standard on new PACCAR engines. PACCAR recommends their use.

Fleetguard products meet all PACCAR test standards to provide the quality filtration necessary to achieve the engine's design life. If other brands are substituted, the purchaser should ensure the filter specification meet or exceed the Fleetguard specifications.



CAUTION

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



NOTE

The fuel system requires the use of two fuel filters.

The suction-side filter must have the following characteristics:

- Water separating
- 10-micron rating
- Water-in-fuel sensor with shunt resistor
- Water drain valve
- Engine mounted or chassis mounted.
- Water separating

The pressure-side filter must have the following characteristics:

- 5-micron rating
- Engine mounted or chassis mounted.



NOTE

Early production pressure side fuel filters were built with a square drive feature for installation and removal. Later built pressure side fuel filters transitioned to a hex drive feature. The drive feature is the only difference between the pressure side fuel filters.

Diesel Exhaust Fluid Recommendations and Specifications



WARNING!

It is unlawful to tamper with or remove any component of the aftertreatment system. It is also unlawful to use a DEF that does not meet the specifications provided or to operate the vehicle/equipment with no DEF.



WARNING!

DEF contains urea. DO NOT get the substance in your eyes. In case of contact, immediately flush eyes with large amounts of water for a minimum of 15 minutes. DO NOT swallow internally. In the event the diesel exhaust fluid is ingested, contact a physician immediately. Reference the Materials Safety Data Sheets (MSDS) for additional information. Failure to comply may result in personal injury.



CAUTION

Never attempt to create DEF by mixing agricultural grade urea with water. Agricultural grade urea does not meet the necessary specifications required and the aftertreatment system may be damaged. Failure to comply may result in equipment damage.



NOTE

Some locations may reference the DIN 70070 standard. DEF specification limits of this standard are identical to ISO 22241-1. See the “Engine Aftertreatment Systems Operator’s Manual” for further information on Diesel Exhaust Fluid.

PACCAR Inc. is not responsible for failures or damage resulting from what PACCAR Inc. determines to be abuse or neglect, including but not limited to: operation without correctly specified DEF; lack of maintenance of aftertreatment; improper storage, or shutdown practices; unauthorized modifications of the engine and aftertreatment. PACCAR Inc. is also not responsible for failures caused by incorrect DEF or by water, dirt or other contaminants in the DEF. See the “Engine Aftertreatment Systems Operator’s Manual” for further information on DEF.

Fuel Recommendations



WARNING!

The use of diesel fuel that has been mixed with other fuels may cause an explosion. DO NOT mix gasoline, alcohol, or gasohol with diesel fuel. Make sure you know your fuel source and use the recommended diesel fuel as indicated in this section of the manual. Failure to comply may result in death, personal injury, equipment or property damage.



CAUTION

Dirt or water in the fuel system can cause severe damage to both the fuel pump and the fuel injectors. Due to the precise tolerances of diesel injection systems, it is extremely important that the fuel be kept clean and free of dirt or water. Know your fuel source and make sure all steps are taken for dispensing or using clean fuel in your vehicle. Failure to comply may result in equipment or property damage.



CAUTION

Unapproved fuel can reduce economy or possibly damage fuel system components. Lighter 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 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. Ultra-low-sulfur diesel fuel is required for correct operation of the aftertreatment system. The engine has been optimized for use with an aftertreatment system to meet the 2013 U.S. Environmental Protection Agency regulations. Failure to comply may result in equipment or property damage.



NOTE

The engine has been optimized for use with an aftertreatment system together with ULSD fuel to meet the 2013 U.S. Environmental Protection Agency (EPA) regulations.

Ultra-low sulfur diesel fuel is defined as diesel fuel not exceeding 0.0015 (15 ppm) mass percent sulfur content (ultra-low diesel fuel is also defined by ASTM S-15). There are no acceptable substitutes.

PACCAR recommends the use of ASTM number 2D fuel. The use of number 2 diesel fuel will result in optimum engine performance.

At operating temperatures below 32°F (0°C), acceptable performance can be obtained by using blends of number 2D and number 1D.

Using diesel fuel with a lower-than-recommended cetane number can cause hard starting, poor idle 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 sulfur diesel (ULSD) fuel is required for this engine in order to meet emission regulations and to prevent damage to the engine and exhaust system. The use of other grades of diesel fuels other than ULSD fuel will be considered a use of incorrect fuel for the engine. PACCAR

is not responsible for failures caused by the use of incorrect fuel, oil or DEF or by water, dirt or other containments in the fuel or DEF.

The following chart lists acceptable types of fuels for this engine.

Acceptable Types of Fuels									
Number 1D Diesel⁽¹⁾ (2)	Number 2D Diesel⁽²⁾	Number 1K Kerosene	Jet-A	Jet-A1	JP-5	JP-8	Jet-B	JP-4	CITE
OK	OK	NOT OK	NOT OK	NOT OK	NOT OK	NOT OK	NOT OK	NOT OK	NOT OK
48-34 ⁽³⁾	40-24 ⁽³⁾	50-35 ⁽³⁾	51-37 ⁽³⁾	51-37 ⁽³⁾	48-36 ⁽³⁾	51-37 ⁽³⁾	57-45 ⁽³⁾	57-45 ⁽³⁾	57-45 ⁽³⁾
- Any adjustment to compensate for reduced performance with a fuel system using alternate fuel is not warrantable. - Winter blend fuels, such as found at commercial fuel dispensing outlets, are combinations of number 1D and number 2D diesel fuel and are acceptable. - BTU Content/Degree API Gravity - Low API gravity fuels have a higher thermal energy content (BTU). As a general rule, there is a three to five percent decrease in BTU content for every 10 degree increase in API gravity, there is also a 0.7 degree API gravity increase with an increase in fuel temperature. This decrease in energy content equates roughly to the same percentage of power loss. Use of fuels with higher API gravity will cause higher than normal fuel consumption.									

Recommendation to Avoid Fuel Gelling

- Use appropriate fuel grade/blend for conditions.
- Specify vehicle with proper cold weather equipment (fuel filter, line and tank heaters).

PACCAR does not recommend the use of fuel additives, however, should a customer decide there is a need for temporary use of a winter fuel additive, PACCAR offers the following guidance:

- Use an industry known, high quality product (EPA approved).
- Only use the additive for the minimum time needed.
- Follow additive manufacturer's instructions exactly.
- Refuel with proper grade fuel as soon as possible.

Warranty and the Use of Biodiesel Fuel

PACCAR Inc. approves the use of biodiesel fuel blends up to 20% by volume in diesel fuel providing that the following conditions are met:

- The biodiesel used in the blend meets ASTM Standard D6751 or EN 14214 specifications.
- The biodiesel used in the blend is sourced from a BQ-9000 Accredited Producer.
- The finished blend meets the fuel properties of the ASTM Standard D975 (up to B5 blend) or D7467 (B6 to B20 blend).
- The engine oil and oil filter are changed at 40,000 miles/64,000 km (or six months).
- The fuel filter is changed every 25,000 miles/40,000 km.

The use of approved biodiesel fuel does not affect the PACCAR engine warranty. Failures caused by the use of non-approved biodiesel fuels or other fuel additives that are of unacceptable quality or DO NOT meet specified industry standards are not considered as defects of parts or workmanship by PACCAR and therefore will not be covered by the PACCAR engine warranty.

PACCAR recommends that customers intending to use biodiesel blends become familiar with the additional handling considerations of these fuels such as ageing, metal compatibility and tendency to absorb water. Please reference the fuel supplier's technical information or industry guidelines such as the American Trucking Association Truck Maintenance Council document RP 357.

In particular, operators should be aware that biodiesel blends are more prone to cold flow (gelling) and filter plugging issues compared to conventional diesel fuel. If vehicles are expected to be operated in temperatures below freezing, care should be taken to ensure that both the biodiesel fuel used and the appropriate vehicle fuel system accessory heaters are utilized.

Operators should also be aware that biodiesel energy content (by volume) is lower than diesel which can reduce fuel economy by up to two percent.

Lubricating Oil Recommendations and Specifications

General Information



CAUTION

Extending the oil and filter change interval beyond the recommendations will decrease the engine life due to factors such as corrosion, deposits, and wear. Engine oil filters capture dirt and remove deposits from the oil to prolong the life of internal moving components. Follow the oil and filter change intervals as recommended in this section of the manual. Failure to comply may result in equipment or property damage.

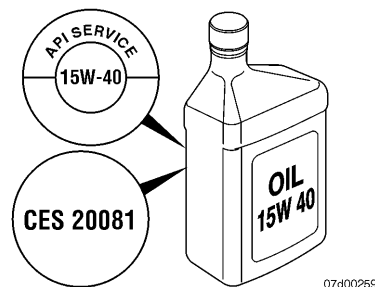
The use of quality engine lubricating oils, combined with appropriate oil drain and filter change intervals, is a critical factor in maintaining engine performance and durability. Extending the oil and filter change interval beyond the recommendations will decrease engine life due to factors such as corrosion, deposits, and wear. Refer to "Oil Drain Intervals" on page 5-11 to determine which oil drain interval to use for an application.



NOTE

It is the owners responsibility to correctly follow lubricating oil recommendations. If recommendations are ignored, the engine warranty could be affected.

i	NOTE
	• API: American Petroleum Institute • CES: Cummins Engineering Standard • PACCAR allows, for midrange applications, the use of lubricating oils that meet or exceed Cummins Engineering Standard (CES) 20078 or CES 20081 with no change in oil drain interval. But, if a non-low ash lubricating oil meeting the CES classification CES 20078 is used, the service interval(s) for the aftertreatment system will be reduced.



section identifies the SAE oil viscosity grade.

The following table shows how the CES compares to the American Petroleum Institute (API) classification.

To determine if the lubricating oil meets CES 20078 or CES 20081, review the label on the back of the lubricating oil bottle for the CES 20078 or CES 20081 reference. If acquiring the lubricating oil in bulk, contact the supplier for the lubricating oil specifications and confirm that the oil meets CES 20078 or CES 20081.

Also located on the lubricating oil bottle is the API service symbol which is shown in the illustration. The upper half of the symbol displays the appropriate oil categories. The center

Cummins Engine Standard Classification (CES)	American Petroleum Institute Classification (API)	Comments
CES-20071 CES-20072 CES-20076 CES-20077	API CH-4/SJ	NOT recommended. Lubricating oil drain interval must be reduced by 50%. Aftertreatment maintenance interval will be reduced.
CES-20078	CI-4/SL	Aftertreatment maintenance interval will be reduced.
CES-20081	CJ-4/SL	Maximum aftertreatment maintenance interval. No change in lubricating oil drain interval.

**NOTE**

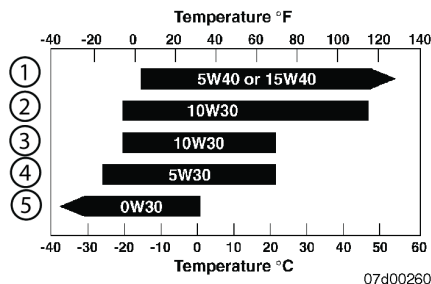
A lubricating oil that meets the API performance classification CJ-4/SL may not meet the CES 20081 requirement. Always make sure the lubricating oil used meets the CES 20081 requirement in addition to the API performance classification CJ-4/SL.

PACCAR recommends the use of high-quality SAE 10W30 API CJ-4 heavy-duty engine oil.

The primary PACCAR recommendation is for the use of 10W30 multigrade lubricating oil for normal operation at ambient temperatures above 5°F (-15°C). For ambient temperatures below 5°F (-15°C) SAE 5W30 may be used, provided it meets API CJ-4 oil specifications and biodiesel or biodiesel blended fuel is not used as fuel for the engine. Using a multigrade oil helps improve engine cranking in low-temperature conditions, reduces

deposit formation and increases engine durability.

Use of “synthetic engine oils” (those made with API group 3 or group 4 base stocks) is permitted subject to the same performance and viscosity limitations of petroleum (mineral) based engine oils. The same oil change intervals must be applied to synthetic oils that are applied to petroleum (mineral) based engine oils.



1. All seasons
2. All seasons
3. Winter conditions
4. Winter conditions
5. Arctic conditions

5

While the preferred viscosity grade is 10W-30, lower viscosity multigrade oils can be used in colder climates. See the accompanying chart. Any viscosity grade lower than 10W-30 must still meet CES 20081.

Synthetic engine oils, API Group III and Group IV basestocks, are recommended for use in PACCAR

engines operating in ambient temperature conditions consistently below -13°F (-25°C). Synthetic 0W-30 oils that meet the requirements of API Group III or Group IV basestocks, can be used in operations where the ambient temperature never exceeds 32°F (0°C). Multiviscosity oils rated 0W-30 DO NOT offer the same level of protection against fuel dilution as do higher multigrade oils. Higher cylinder wear can be experienced when using 0W-30 oils in high-load situations.

As these oils have directionally thinner oil films than 10W-30 oils, top-quality Fleetguard® filters must be used above 70°F (20°C). Some oil suppliers might claim better fuel economy for these oils. PACCAR can neither approve nor disapprove any product not manufactured by PACCAR. These claims are between the customer and oil supplier. Obtain a commitment from the oil supplier that the oil will give

satisfactory performance in PACCAR engines or DO NOT use the oil.

New Engine Break-In Oils

PACCAR does not approve the use of special "break-in" engine lubricating oils for new or rebuilt PACCAR engines. It is recommended to use the same lubricating oil for engine break-in that will be used during normal operation.

**CAUTION**

A sulfated ash limit of 1.85 percent has been placed on all engine lubricating oils recommended for use in PACCAR engines. Higher ash oils can cause valve and/or piston damage and lead to excessive oil consumption. Failure to comply may result in equipment damage.

**CAUTION**

The use of a synthetic-base oil does not justify extended oil change intervals. Extended oil change intervals can decrease engine life due to factors such as corrosion, deposits, and wear. Failure to comply may result in equipment damage.

Additional information regarding lubricating oil availability throughout the world is available in the EMA Lubricating Oils Data Book for Heavy-Duty Automotive and Industrial Engines. The data book can be ordered from: Engine Manufacturers Association, Two North LaSalle Street, Chicago, IL 60602; (312) 827-8733, (www.enginemanufacturers.org).

Aftermarket Oil Additive Usage

PACCAR does not recommend the use of aftermarket oil additives. Today's high-quality engine lubricating oils are very sophisticated. Most oils already contain precise amounts of additives blended into the lubricating oil to meet stringent performance requirements.

These furnished oils meet performance characteristics that conform to the lubricant industry standards. Aftermarket lubricating oil additives are not necessary to enhance engine oil performance and in some cases can reduce the furnished oil's capability to protect the engine.

Inspection of the Engine Oil Level



NOTE

It takes approximately 15 minutes for all the oil to run into the sump when the engine is 'warm.' If the level is checked immediately after switching off the engine, the dipstick will show a low oil level.

After the engine is shut off it will take at least 15 minutes for all the engine oil to return to the sump. If the level is checked immediately after switching off the engine, the dipstick will show a low oil level.

1. Engine coolant should be at or above the operating temperature of 180°F (82°C).
2. Make sure that the vehicle suspension is sitting flat, both lengthwise and crosswise. Check

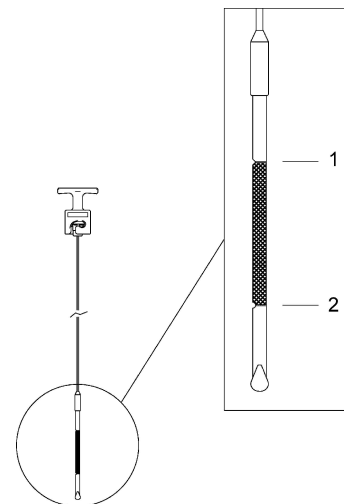
this carefully on a vehicle with air suspension.

3. Twist the dipstick handle to unlock it, then pull the dipstick out of the holder.
4. Wipe the dipstick clean with a lint-free cloth.
5. Reinsert the dipstick into the holder.
6. Remove the dipstick from the holder and check the oil level. The oil level should always be between the two marks on the dipstick.
7. Reinstall the dipstick and twist to lock it in place.



NOTE

On the engine oil dipstick, the difference between the low oil level mark (2) and high oil level mark (1) is two US quarts (1.9 liters).



1. High oil level
2. Low oil level

Topping Up the Engine Oil

1. If checking the engine oil just after stopping the engine, wait 15 minutes for the oil to drain back into the oil pan before checking the fluid level.
2. Top up with oil, if necessary, via the filler opening. Use the correct grade in the correct quantity.
3. After topping up, wait one minute and check the oil level again.
4. Reinstall the oil fill cap and twist to lock it in place.



NOTE

See "Lubricating Oil Recommendations and Specifications" on page 5-23.

Coolant Recommendations and Specifications

The cooling system in your vehicle was factory filled with Extended Life Coolant (ELC) that meets or exceeds all ASTM D 6210 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).

Your engine may be equipped with an optional coolant filter designed to capture and remove harmful deposits from the cooling system to help prolong system life.

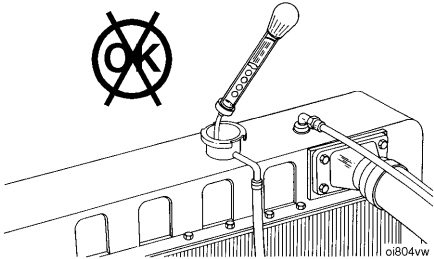
Checking Coolant Condition

To ensure the Extended Life Coolant (ELC) in your vehicle always provides maximum freeze protection, perform the following tests:

1. Check the coolant color at every maintenance interval. It should be a bright red with no signs of debris or any oil.
2. Test the freeze point at least two times a year. A refractometer or test strips can be used to measure the protection level.
3. Keep the cooling system at full levels by topping-up using ELC pre-diluted to 50/50 blend.

Recommended Extended Life
Coolant Suppliers

Brand Name	Supplier
TRP® 	Authorized PACCAR engine dealer.

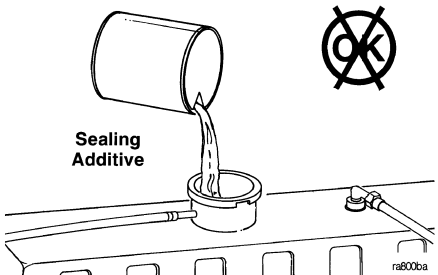




CAUTION

DO NOT use a floating ball hydrometer. The use of floating ball hydrometers can give an incorrect reading. Using a floating ball hydrometer for testing the freezing point of the coolant is an inaccurate test and will cause a false reading of the coolant freezing point. Use a refractometer to obtain an accurate test of the coolant freezing point. Failure to comply may result in equipment damage.

Cooling System Sealing Additives





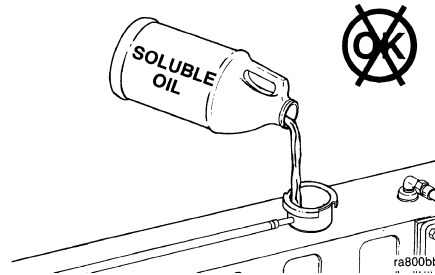
CAUTION

The use of sealing additives in the cooling system can cause damage to the engine. Sealing additives can plug various areas of the radiator, EGR system and oil cooler. The plugging of the cooling system can hamper heat transfer, causing internal engine damage. **DO NOT** use sealing additives in the cooling system. The use of sealing additives can:

- Build up in coolant low-flow areas.
- Plug the radiator and oil cooler.
- Damage the water pump seal.

Failure to comply may result in equipment or property damage.

Cooling System Soluble Oils



CAUTION

The use of soluble oils in the cooling system can cause damage to the engine. Soluble oils in the cooling system can:

- Damage heat transfer surfaces.
- Damage seals and hoses.

Failure to comply may result in equipment or property damage.

ENGINE IDENTIFICATION

Engine Dataplate	6-3
Fuel Injection Pump Dataplate	6-4
Engine Control Module Dataplate	6-4
PACCAR Engine Nomenclature	6-5
Air Compressor	6-5
Variable Geometry Turbocharger	6-6
PACCAR Engine Technology	6-6

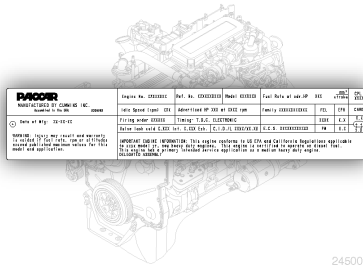
WARRANTY

PACCAR PX-9 Engine United States and Canada Coverage	6-8
United States and Canada Fire Apparatus Truck Applications Coverage	6-12
Emission Warranty	6-16
California Emission Control System Warranty, On-Highway	6-18

<https://truckmanualshub.com/>

ENGINE IDENTIFICATION

Engine Dataplate



PACCAR PX-9 MANUFACTURED BY CUMMINS INC. Assembled in the USA 5306992	1 Engine No. XXXXXXXX	Ref. No. XXXXXXXXXX	2 Model XXXXXXXX	Fuel Rate at adv. HP XXX	mm ³ stroke	3 CPL XXXX
	Idle Speed (rpm) XXX	Advertised HP XXX at XXXX rpm	Family XXXXXXXXXXXX	FEL	EPA	CARB
Date of Mfg: XX-XX-XX WARNING: Injury may result and warranty is voided if fuel rate, rpm or altitudes exceed published maximum values for this model and application.	Firing order XXXXXX	Timing: T.D.C. ELECTRONIC		XXXX	X.X	X.X
	Valve lash cold X.XXX Int. X.XXX Exh. X.XXX	C.I.D./L XXXX/XX.XX	E.C.S. XXXXXXXXXXXX	PM	X.X	X.X
IMPORTANT ENGINE INFORMATION: This engine conforms to US EPA and California Regulations applicable to xxxx model yr. new heavy duty engines. This engine is certified to operate on diesel fuel. This engine has a primary intended service application as a medium heavy duty engine. DELEGATED ASSEMBLY						

The dataplate is located on the top side of the gear housing.

Have the following engine data available when communicating with a PACCAR Authorized Repair Location:

1. Engine Serial Number (ESN)
2. Engine model information
3. Control Parts List (CPL)
4. Valve Lash
5. Horsepower and RPM rating



- If the engine dataplate (1) is not readable, the ESN (2) can be found on the engine block on top of the lubricating oil cooler housing. Additional engine information is on the electronic control module (ECM) dataplate.

00d00189

The dataplate contains the following information to assist in servicing or replacement:

1. Part number
2. Pump serial number
3. Factory code

24500002

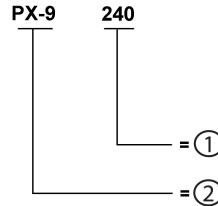
i	NOTE
Not all engines have ECM data-plates.	

Engines covered by this manual are equipped with a CM2350 ECM. A CM2350 ECM has two 96-pin connectors. One of the 96-pin connectors is for engine inputs and outputs only. The second 96-pin connector and 14-pin connector are for

aftertreatment and vehicle inputs and outputs.

	NOTE
	The presence of an ECM dataplate depends on the manufacturing plant and the date the engine was manufactured. If an ECM dataplate was not installed by the manufacturing plant, calibration data can be found on the engine dataplate.

PACCAR Engine Nomenclature



The PACCAR engine nomenclature provides the following information:

1. Horsepower Rating
2. Engine Model

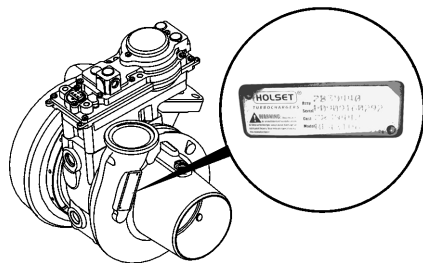
Air Compressor

	NOTE
	Not all engines are equipped with an air compressor.

The air compressor dataplate is typically located on the side of the air compressor. The dataplate contains the following information to assist in servicing or replacement:

- Part number
- Serial number
- Date code

Variable Geometry Turbocharger



12d00095

The Holset® variable geometry turbocharger (VGT) dataplate is located on the turbocharger inlet compressor housing.

The dataplate contains the following information to assist in servicing or replacement:

- Assembly part number
- Serial number

- Customer number
- Model number.

i	NOTE
	The electronic actuator on the VGT is a serviceable component and has a separate dataplate that contains information to assist in servicing or replacement.

PACCAR Engine Technology General Information

The service model name for this product is PX-9.

This engine is being released first to meet EPA 2013.

This engine has the following agency defined emissions control system (ECS) hardware:

- Charge-air cooler (CAC)
- Direct diesel injection (DDI)
- Engine control module (ECM)
- Exhaust gas recirculation (EGR)
- Oxidation catalyst (OC)
- Periodic trap oxidizer (PTOX)
- Selective catalytic reduction - urea (SCR-U)
- Turbocharger (TC).

This engine has the following emissions related hardware:

- Aftertreatment outlet NH3 gas sensor
- CM2350 ECM
- Engine intake throttle actuator
- Integrated aftertreatment DEF controller into the ECM
- Ambient air temperature sensor

WARRANTY

PACCAR PX-9 Engine United States and Canada Coverage Products Warranted

This warranty applies to new PACCAR PX-9 Engines sold and used in the United States¹ or Canada and operated in on-highway applications with one exception - there is different warranty coverage for engines used in the fire apparatus truck applications.

The PACCAR PX-9 Engine is warranted directly to the first purchaser by PACCAR.

Base Engine Warranty

This warranty covers any failures of the engine which result, under normal use and service, from a defect in material or factory workmanship (warrantable failure). This coverage begins on the date of delivery and ends two years or 250,000 miles (400,000 kilometers) or 6,250 hours, whichever occurs first, after the date of delivery of the engine to the first purchaser or first lessee.

Additional coverage is outlined in the Emission Warranty on page 6-16.

PACCAR Responsibilities

PACCAR will pay for all parts and labor needed to repair the damage to the engine resulting from a warrantable failure.

PACCAR will pay for the lubricating oil, antifreeze, filter elements, belts, hoses, and other maintenance items that are not reusable due to the warrantable failure. PACCAR will pay for reasonable labor costs for engine removal and reinstallation when necessary to repair a warrantable failure.

PACCAR will pay during the base engine warranty period of two years or 250,000 miles (400,000 kilometers) or 6,250 hours, whichever occurs first. Reasonable costs for towing a vehicle disabled by a warrantable failure to the nearest authorized repair station. In lieu of the towing expense and in its sole discretion, PACCAR may

1. United States includes American Samoa, the Commonwealth of Northern Mariana Islands, Guam, Puerto Rico, and the U.S. Virgin Islands.

pay reasonable costs for a mechanic to travel to and from the location of the vehicle when an engine repair is performed at the site of the failure.

Owner Responsibilities

The owner is responsible for the operation and maintenance of the engine as specified in the applicable PACCAR Operator's Manual. Owner is also responsible for providing proof that all recommended maintenance has been performed.

Before the expiration of the applicable warranty, Owner must notify a PACCAR authorized dealer or an authorized Cummins Distributor of any warrantable failure and make the engine available for repair by such facility. The warrantable failure must be brought to the attention of a PACCAR authorized engine dealer within 30 days of discovery. Owner must also deliver the engine to the authorized engine repair facility during the warranty period unless deliver is impossible because the engine has been disabled by a warrantable failure.

The owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items provided during warranty repairs unless such items are not reusable due to the warrantable failure. Owner is responsible for communication expenses, meals, lodging and similar costs incurred as a result of a warrantable failure.

The owner is responsible for non-engine repairs and for "downtime" expenses, cargo damage, fines, all applicable taxes, all business costs and other losses resulting from a warrantable failure.

Limitations

Your sole and exclusive remedy against PACCAR and the selling dealer arising from your purchase and use of this engine is limited to the repair or replacement of “warrantable failures” at authorized United States and Canadian PACCAR engine dealers, or an authorized Cummins Distributor, or an authorized PACCAR engine facility where applicable, subject to PACCAR’s time, mileage, and hour limitations of the engine warranty. The maximum time, mileage and hour limitations of the engine warranty begin running on the date of delivery to the first purchaser. The accrued time, mileage, or hours is calculated when the engine is brought into an authorized dealer for correction of warrantable failures.

PACCAR is not responsible for failures or damage resulting from what PACCAR determines to be

abuse or neglect, including, but not limited to: damage due to accident; operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the engine. PACCAR is also not responsible for failures caused by incorrect oil or fuel or diesel exhaust fluid or by water, dirt or other contaminants in the fuel, oil, or diesel 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 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 (402,336 kilometers) or 6,250 hours from the date of delivery of the engine to the first purchaser, whichever of the three occurs first. Before a claim for excessive oil consumption will be considered, 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.

PACCAR does not warrant antifreeze, lubricants, filters, filter elements, or any other part which is considered a maintenance item.

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 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 Inc reserves the right to interrogate electronic control module (ECM) data for purposes of failure analysis.

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.

United States and Canada Fire Apparatus Truck Applications Coverage Products Warranted

This warranty applies to new PACCAR PX-9 engines sold and used in the United States¹ or Canada and operated in fire apparatus truck applications.

Base Engine Warranty

The base engine warranty covers any failures of the engine which result, under normal use and service, from a defect in material or factory workmanship (warrantable failure). This coverage begins on the date of delivery to the first purchaser and ends five years or 100,000 miles (160,935 kilometers), whichever occurs first.

Engine aftertreatment components included in the PACCAR critical parts list (CPL) and marked with a PACCAR part number are covered under base engine warranty.

Additional coverage is outlined in the Emission Warranty on page 6-16.

PACCAR Responsibilities

PACCAR will pay for all parts and labor needed to repair the damage to the engine resulting from a warrantable failure.

PACCAR will pay for the lubricating oil, antifreeze, filter elements, belts, hoses and other maintenance items that are not reusable due to the warrantable failure. PACCAR will pay for reasonable labor costs for engine removal and reinstallation when necessary to repair a warrantable failure.

PACCAR will pay reasonable costs for towing a vehicle disabled by a warrantable failure to the nearest authorized repair location. In lieu of the towing expense and at its sole discretion, PACCAR will pay reasonable costs for a mechanic to travel to and from the location of

1. United States includes American Samoa, the Commonwealth of Northern Mariana Islands, Guam, Puerto Rico, and the U.S. Virgin Islands.

the vehicle when its engine repair is performed at the site of the failure.

Owner Responsibilities

The owner is responsible for the operation and maintenance of the engine as specified in PACCAR Operator's Manual. The owner is also responsible for providing proof that all recommended maintenance has been performed.

Before the expiration of the applicable warranty, Owner must notify a PACCAR authorized dealer or an authorized Cummins Distributor of any warrantable failure and make the engine available for repair by such facility. The warrantable failure must be brought to the attention of a PACCAR authorized engine dealer within 30 days of discovery. Except for engines disabled by a warrantable failure, owner must also deliver the engine to the repair facility.

The owner is responsible for the cost of lubricating oil, antifreeze, filter

elements and other maintenance items provided during warranty repairs unless such items are not reusable due to the warrantable failure.

The owner is responsible for communication expenses, meals, lodging and similar costs incurred as a result of a warrantable failure.

The owner is responsible for non-engine repairs and for downtime expenses, cargo damage, fines, all applicable taxes, all business costs and other losses resulting from a warrantable failure.

The owner is responsible for a \$100 (U.S. Dollars) deductible per each service visit under this plan in the 3rd, 4th, and 5th years of base engine warranty. The deductible will not be charged during the first two years of the base engine warranty.

Limitations

Your sole and exclusive remedy against PACCAR and the selling dealer arising from your purchase and use of this engine is limited to the repair or replacement of “warrantable failures” at authorized United States and Canadian PACCAR engine dealers, or an authorized Cummins Distributor, or an authorized PACCAR engine facility where applicable, subject to PACCAR’s time, mileage, and hour limitations of the engine warranty. The maximum time, mileage and hour limitations of the engine warranty begin running on the date of delivery to the first purchaser. The accrued time, mileage, or hours is calculated when the engine is brought into an authorized dealer for correction of warrantable failures.

PACCAR is not responsible for failures or damage resulting from what PACCAR determines to be

abuse or neglect, including but not limited to: damage due to accident; operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the engine. PACCAR is also not responsible for failures caused by incorrect oil, fuel or diesel exhaust fluid or by water, dirt or other contaminants in the fuel, oil or diesel 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 PACCAR which are covered by the OEM vehicle warranty.

Failures resulting in excessive oil consumption are not covered beyond the duration of the coverage or 100,000

miles (160,935 kilometers) or 6,250 hours from the date of delivery of the engine to the first purchaser, whichever of the three occurs first. Before a claim for excessive oil consumption will be considered, owner must submit adequate documentation to show that consumption exceeds PACCAR published standards.

Failures of belts and hoses supplied by PACCAR are not covered beyond the first year from the date of delivery of the engine to the first purchaser.

PACCAR does not warranty antifreeze, lubricants, filters, filter elements, or any other part which is considered a maintenance item.

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 or

approved 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 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.

Emission Warranty Products Warranted

This emission warranty applies to new PACCAR engines marketed by PACCAR that are used in the United States¹ in vehicles designed for transporting persons or property on a street or highway.

Coverage

PACCAR warrants to the first purchaser and each subsequent purchaser that the engine is designed, built and equipped so as to conform at the time of sale by PACCAR with all U.S. Federal emission regulations applicable at the time of manufacture and that it is free from defects in material or factory workmanship which would cause it not to meet these regulations within the longer of the following periods: (A) Five years or 100,000 miles (160,935 kilometers) of operation, whichever occurs first, as measured from the date of delivery of the engine to the first purchaser or first lessee; (B) The base engine warranty.

If the vehicle in which the engine is installed is registered in the state of California, a separate California Emission Warranty also applies.

Replacement Parts

PACCAR recommends that any service parts used for maintenance, repair or replacement of emission control systems be new or genuine approved rebuilt parts and assemblies, and that the engine be serviced by an authorized PACCAR engine dealer or an authorized Cummins Distributor. Your vehicle contains air, fuel, and electrical components that may affect engine emission controls. The use of non-genuine engine or vehicle replacement parts that are not equivalent to the PACCAR engine or OEM vehicle manufacturer's original part may impair the engine and vehicle emissions control system from working or functioning effectively, and may jeopardize your emissions warranty coverage.

1. United States includes American Samoa, the Commonwealth of Northern Mariana Islands, Guam, Puerto Rico, and the U.S. Virgin Islands.

Limitations

Your sole and exclusive remedy against PACCAR and the selling dealer arising from your purchase and use of this engine is limited to the repair or replacement of “warrantable failures” at authorized United States and Canadian PACCAR engine dealers, or an authorized Cummins Distributor, or an authorized PACCAR engine facility where applicable, subject to PACCAR’s time, mileage, and hour limitations of the engine emission warranty. The maximum time, mileage and hour limitations of the engine emission warranty begin running on the date of delivery to the first purchaser. The accrued time, mileage, or hours is calculated when the engine is brought into an authorized dealer for correction of warrantable failures.

Failures, other than those resulting from defects in material or factory

workmanship, are not covered by this warranty. PACCAR is not responsible for failures or damage resulting from what PACCAR determines to be abuse or neglect, including, but not limited to: damage due to accident; operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the engine. PACCAR is also not responsible for failures caused by incorrect oil, fuel or diesel exhaust fluid or by water, dirt or other contaminants in the fuel, oil or diesel exhaust fluid. Failure of replacement parts used in repairs due to the above non-warrantable conditions is not warrantable.

PACCAR is not responsible for non-engine repairs, downtime expenses, cargo damage, fines, all applicable taxes, all business costs

or other losses resulting from a warrantable failure.

THIS LIMITED EMISSION WARRANTY IS THE SOLE WARRANTY MADE BY PACCAR RELATING TO THE EMISSION EQUIPMENT. EXCEPT FOR THE ABOVE LIMITED WARRANTY, PACCAR MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED. PACCAR EXPRESSLY DISCLAIMS 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.

California Emission Control System Warranty, On-Highway Products Warranted

This emission control system warranty applies to diesel engines (hereafter, engines) certified with the California Air Resources Board beginning with the year 2013, marketed by PACCAR, and registered in California for use in on-highway applications.

Your Warranty Rights and Obligations

The California Air Resources Board and PACCAR are pleased to explain the emission control system warranty on your 2014 – 2015 model year diesel engine. In California, new motor-vehicle engines must be designed, built, and equipped to meet the State's stringent anti-smog standards. PACCAR must warrant the emission control system on your diesel engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your diesel engine.

Your emission control system may include parts such as the fuel injection system and engine electronic control module. Also included may be hoses, connectors and other emission related assemblies.

If an emission-related part on your engine is found to have a defect in material or factory the part will be repaired or replaced by PACCAR. This is your emission control system defects warranty.

Manufacturer's Warranty Coverage

This warranty coverage is provided for five years or 100,000 miles (160,935 km) or 3,000 hours of engine operation, whichever first occurs from the date of delivery of the engine to the first purchaser. Where a warrantable condition exists, PACCAR will repair your engine at no cost to you including diagnosis, parts and labor.

Owner's Warranty Responsibilities

As the engine owner, you are responsible for the performance of the required maintenance listed in your PACCAR operator's manual. You are responsible for presenting your engine to an authorized PACCAR dealer or an authorized Cummins Distributor as soon as a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

PACCAR recommends that you retain all receipts covering maintenance on your engine, but PACCAR cannot deny warranty solely for the lack of receipts or for the failure to ensure the performance of all scheduled maintenance.

As the engine owner, you should also be aware that PACCAR may deny you warranty coverage if your engine 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 the vehicle OEM manufacturer at the customer center telephone number provided with your vehicle operating instructions or the California Air Resource Board at:

California Air Resource Board
9528 Telstar Avenue
El Monte, CA 91731

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A warranted part which is scheduled for replacement as required maintenance is warranted up to the first scheduled replacement point.

Prior to the expiration of the applicable warranty, owner must give notice of any warranted emission control failure to an authorized PACCAR engine dealer and deliver the engine to such facility for repair.

Owner is responsible for incidental costs such as: communication expenses, meals, lodging incurred by owner or employees of owner as a result of a warrantable condition.

Owner is responsible for downtime expenses, cargo damage, fines, all applicable taxes, all business costs, and other losses resulting from a warrantable condition.

California Emissions Components Statement for the PX-9 Engine (2013) Emission Engine Coverage

This list of emission control parts may be covered by the emission control system warranty under certain failure modes.

Aftertreatment System

- Aftertreatment electroconnections
- Aftertreatment inlet and outlet modules
- Aftertreatment temperature interface module
- Aftertreatment temperature sensors
- Decomposition tube
- Diesel Exhaust Fluid (DEF) dosing unit (Pump)
- DEF dosing valve

- DEF level sensor
- DEF line heater control relay
- DEF quality sensor
- DEF tank heater coolant control valve
- DEF tank and lines
- DEF tank/lines heating elements of heat exchanger and pipe
- DEF temperature sensors
- Diesel oxidation catalyst
- Diesel particulate filter (except for ash maintenance)
- Diesel particulate filter differential pressure sensor EGR
- NH3 sensor
- NOx sensors
- SCR catalyst

- Exhaust gas piping from turbocharger out to the last aftertreatment device

Air Handling Component

- Ambient air temperature sensor
- Charge air cooler and associated plumbing
- Exhaust gas pressure sensor
- Exhaust manifold
- Grid heater
- Intake manifold
- Intake manifold temperature/pressure sensor
- Throttle actuator/valve
- Turbocharger actuator
- Turbocharger assembly
- Turbocharger compressor intake pressure/temperature sensor

- Turbocharger speed sensor

Base Engine System Component

- Camshaft
- Camshaft valve lobe
- Clean idle sticker
- Coolant temperature sensor
- Crankcase breather
- Engine oil pressure sensor
- Engine speed, position sensor, cam position sensor
- Exhaust valve

Electronic Control System Component

- Engine control module
- Wiring harness circuits connected at both ends to emissions warrantable components

- Engine control module calibration
- DEF lamp
- On Board Diagnostic (OBD) Malfunction Indicator Lamp (MIL)
- OBD connector

Exhaust Gas Recirculation (EGR) System Component

- EGR cooler
- EGR differential pressure sensor
- EGR mixer/venturi
- EGR temperature sensor
- EGR valve

Fueling System

- Fuel injectors
- Fuel lines
- Fuel pressure sensor

- Fuel pump actuator
- Fuel pump
- Secondary fuel pressure/temperature sensor

Replacement Parts

PACCAR recommends that any service parts used for maintenance, repair or replacement of emission control systems be new or genuine approved rebuilt parts and assemblies, and that the engine be serviced by an authorized PACCAR engine dealer or an authorized Cummins Distributor. Your vehicle contains air, fuel, and electrical components that may affect engine emission controls. The use of non-genuine engine or vehicle replacement parts that are not equivalent to the PACCAR engine or OEM vehicle manufacturer's original part may impair the engine and vehicle emissions control system from working or functioning effectively, and may jeopardize your emissions warranty coverage.

The owner may elect to have maintenance, replacement or repair of the emission control parts performed by a facility other than a PACCAR authorized dealer or an authorized Cummins Distributor and may elect to use parts other than new genuine approved rebuilt parts and assemblies for such maintenance, replacement or repair; however, the cost of such service or parts and subsequent failures resulting from such service or parts will not be covered under this emission control system warranty, except for emergency repairs as described below.

PACCAR Responsibilities

The warranty coverage begins when the engine is delivered to the first purchaser. Repairs and service will be performed by any authorized PACCAR engine, dealer or an authorized Cummins Distributor using new or genuine approved rebuilt parts and assemblies. PACCAR will repair any of the emission control parts found by PACCAR to be defective without charge for parts or labor (including diagnosis which results in determination that there has been a failure of a warranted emission control part).

Emergency Repairs

In the case of an emergency where an authorized PACCAR engine dealer or an authorized Cummins Distributor is not available, repairs may be performed by any available repair location or by any individual using any replacement parts. A part not being available within 30 days or a repair not being complete within 30 days constitutes an emergency. PACCAR will reimburse the owner for expenses (including diagnosis), not to exceed the manufacturer's suggested retail price for all warranted parts replaced and labor charges based on the manufacturer's recommended time allowance for the warranty repair and the geographically appropriate hourly labor rate.

Replaced parts and paid invoices must be presented at an authorized PACCAR engine dealer or authorized Cummins Distributor as a condition of reimbursement for emergency repairs not performed by an authorized PACCAR engine dealer or an authorized Cummins Distributor.

Warranty Limitations

Your sole and exclusive remedy against PACCAR and the selling dealer arising from your purchase and use of this engine is limited to the repair or replacement of “warrantable failures” at authorized United States and Canadian PACCAR engine dealers, or an authorized PACCAR engine facility where applicable, subject to PACCAR's time, mileage, and hour limitations of the engine emission warranty. The maximum time, mileage and hour limitations of the engine emission warranty begin running on the date of delivery to the first purchaser. The accrued time, mileage, or hours is calculated when the engine is brought into an authorized dealer for correction of warrantable failures.

PACCAR is not responsible for failures or damage resulting from what PACCAR determines to be

abuse or neglect, including, but not limited to: damage due to accident; operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of cooling, lubricating or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications to the engine. PACCAR is also not responsible for failures caused by incorrect oil, fuel or diesel exhaust fluid or by water, dirt or other contaminants in the fuel, oil or diesel exhaust fluid. Failure of replacement parts used in repairs due to the above non-warrantable conditions is not warrantable.

PACCAR is not responsible for failures resulting from improper repair or the use of parts which are not genuine approved parts.

PACCAR is not responsible for the material and labor costs of emission control parts and assemblies replaced

during “Scheduled Maintenance” of the engine as specified in PACCAR “Operator’s Manuals”.

THIS WARRANTY, TOGETHER WITH THE EXPRESS COMMERCIAL WARRANTIES ARE THE SOLE WARRANTIES MADE BY PACCAR IN REGARD TO THESE ENGINES.

THIS LIMITED EMISSIONS 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.

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