PACCAR

Engine Aftertreatment Systems

Operator's Manual

2013 Emissions

Contents

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Y53-1190-1B1

Safety

Safety

About This Manual

Please take the time to get acquainted with your vehicle by reading this Operator's Manual. We recommend that you read and understand this manual from beginning to end before you operate your truck. This manual explains the safe, efficient operation and maintenance of your vehicle.

NOTE
After you've read this manual, it should be stored in the cab for convenient reference and remain with this truck when sold.

Your vehicle may not have all the features or options mentioned in this manual. Therefore, you should pay careful attention to the instructions that pertain to just your vehicle. In addition, if your vehicle is equipped with special equipment or options not discussed in this manual, consult your dealer or the manufacturer of the equipment. All information contained in this manual is based on the latest production information available at the time of publication. PACCAR reserves the right to make changes at any time without notice.

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

⚠ WARNING!

The safety message following this symbol and signal word provides a warning against operating procedures which could cause injury or even death. 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:

⚠ WARNING!
Do not carry additional fuel containers in your vehicle. Fuel containers, either full or empty, may leak, explode, and cause or feed a fire. Do not carry extra fuel containers. Even empty ones are dangerous. Failure to comply may result in death, personal injury, equipment or property damage.

CAUTION

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:

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

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.

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 vehicle.

Aftertreatment System (ATS)

Diesel Particulate Filter (DPF) System

Aftertreatment System (ATS)

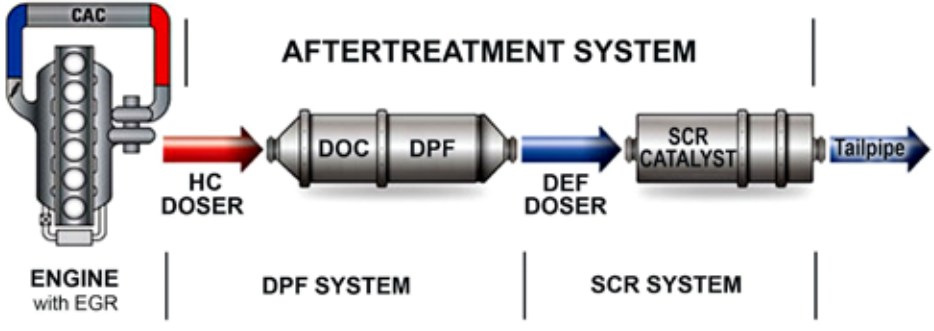
Introduction

The Aftertreatment System (ATS) on your vehicle is made up of two systems:

1. Diesel Particulate Filter (DPF) System
2. Selective Catalytic Reduction (SCR) System

They fulfill two primary functions; particulate reduction & nitrogen oxide (NOx) reduction.

This section of the manual describes how to interact and control these two systems. See the INFORMATION section starting on page 6-3 of this manual for more detailed information about the aftertreatment process and its components.



Diesel Particulate Filter (DPF) System

Introduction

The DPF system consists of a Hydrocarbon (HC) Doser (may not apply to all engines), a Diesel Oxidation Catalyst (DOC), and a DPF. The DPF filters soot out of the exhaust. When activated, the HC Doser sprays a small amount of diesel fuel (the HC) into the exhaust. The catalyst in the DOC reacts with the HC to generate heat. The heat is used to clean (regenerate) the DPF by reducing the trapped soot to ash.

Controlling the Regeneration Process

Your vehicle is equipped with either a two-position or three-position Regeneration Switch, mounted on the dash.

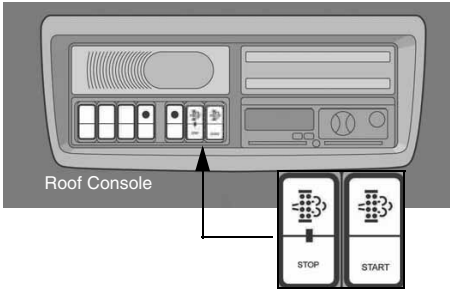
If equipped with a two-position Regeneration Switch, the driver can initiate a Parked Regeneration when certain operating conditions are suitable for regeneration; however, you will NOT be able to Stop a regeneration if the ATS has initiated one automatically. Refer to Parked Regeneration on page 3-11.

If your vehicle is equipped with a three-position Regeneration Switch, the driver can control the regeneration by overriding the ATS when certain operating conditions are not suitable for regeneration. Refer to Stop an Automatic or Parked Regeneration on page 3-13.

⚠ WARNING!

If you operate in environments that contain explosive vapors or flammable materials, look to see if your vehicle's Regeneration Switch is equipped with a STOP function. The STOP function must be activated prior to entering the above environment(s) to prevent automatic engine regeneration from occurring, which could cause an explosion or fire. Failure to equip your vehicle with the proper switch (function) or failing to activate the STOP function before entering a combustible environment may cause an explosion or fire that could lead to death, personal injury, equipment or property damage.

Regeneration Switches



Depressing the START button for 4 seconds will initiate a parked regeneration.

When STOP is pressed the system will not regenerate under any conditions.

⚠ CAUTION
Do not leave the STOP switch in the STOP position unless you need to cancel or stop regeneration.

ATS specific warning lights and indicator symbols will reside in the Master Display Panel.

Funcionality / Notification Information

The ATS will regenerate the DPF by using hot exhaust gases normally generated by the engine. This typically occurs during highway operation. This is referred to as a “Passive” Regeneration and is transparent to the operation of the vehicle. Occasionally, the exhaust gases are too cool for passive regeneration. When this occurs, the ATS will regenerate the DPF by increasing the exhaust temperature. This is referred to as an “Automatic” Regeneration and is also transparent to the operation of vehicle.

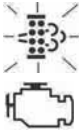
An Automatic Regeneration event typically lasts 30 minutes. During and shortly after the event, the exhaust gases from the DPF may reach temperatures in excess of 650 C (1200 F). See the information in the table below on probable causes and recommended actions related to the warning lights and indicator symbols of the ATS.

The ATS may not be able to regenerate the DPF when the vehicle is driven at extended low speeds or with frequent start and stops. In such cases, warning lights and indicator symbols will alert the operator to take action. The operator should be aware of whether the lights are on alone or in combination with others. The following table will describe each warning light(s) and what actions are needed from the operator.

Notification of High Exhaust System Temperature:

Indicator	Information	What to do
 "EXHAUST SYST. TEMP HIGH"	The High Exhaust Temperature (HEST) warning lamp will illuminate, regardless of ATS status, as the vehicle's exhaust outlet temperature becomes extremely hot (at least 450 deg C / 842 deg F) and subsequently the vehicle speed slows to below 5 mph / 8 kph. This will typically occur when: An Automatic or Parked Regeneration is in process **or** During normal vehicle operation when engine is under high or heavy loading	Follow all warnings listed below. Use the STOP switch if the situation requires. Follow the instructions described “Stop an Automatic or Parked Regeneration” on page 3-13.  ***WARNING! Temperatures of the exhaust pipes and at the outlets of the exhaust system during and shortly after a regeneration event will be extremely hot. If the High Exhaust System Temperature (HEST) warning lamp is on:*** ***• Do not park in an area of combustible vapors or materials. You must keep combustibles at least five (5) feet away from the side and top of the vehicle while the HEST light is illuminated. Always park your vehicle outside. Failure to do so could ignite an explosion or harm bystanders which could result in serious injury.*** ***• Do not park in an area where people are close by. You must keep bystanders at least five (5) feet away from the exhaust outlet while the HEST light is illuminated. Failure to do so could result in serious injury.*** ***• The exhaust piping, diesel particular filter (DPF) or tail pipe become extremely hot during engine operation or any regeneration event and can cause serious burns to the skin. Allow adequate cooling time before working on or near any part of the exhaust system.***

Notification That Regeneration Is Required:

Indicator	Information	What to do
 "EXHAUST SYST. WARNING" On Steady	The DPF status indicator symbol will illuminate when the soot level in the DPF is above the desired level and it needs regenerating.	The DPF needs regenerating soon. Follow the instructions described "DPF Regeneration" on page 3-11.  ***NOTE: If you ignore the warning lamp and do not initiate regeneration at the soonest, safest possible time, the DPF will become increasingly clogged with soot and can lead to engine shutdown.***
 Blink once every second	The DPF status indicator symbol will blink when the soot level in the DPF continues to stay above the desired level and it needs regenerating.	Regenerate the DPF as soon as safely possible. Follow the instructions described "DPF Regeneration" on page 3-11.  ***CAUTION: If you do not initiate regeneration after the DPF Indicator lamp is blinking, you only have a short time before the check engine light will illuminate and the engine will go into protection mode and de-rate power.***
 Blinking On Steady	The DPF status indicator symbol will blink when the soot level in the DPF continues to stay above the desired level and it MUST be regenerated. The engine will de-rate power.	Regenerate the DPF immediately. Follow the instructions described "DPF Regeneration" on page 3-11.  ***CAUTION: If you do not initiate regeneration after the DPF Indicator lamp is blinking and the check engine light is illuminated, you only have a short time before the stop engine light will illuminate and the engine will automatically begin to shutdown.***

Indicator	Information	What to do
 Blinking  On Steady  On Steady	**(Caterpillar Engine)** The DPF status indicator symbol will blink when the soot level in the DPF continues to stay above the desired level The soot level in the DPF is now at full capacity.	At this point, you CANNOT regenerate the DPF and the engine will begin a shutdown sequence. ***WARNING! If the Stop Engine warning lamp illuminates, it means you have a serious engine system problem. 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 cause severe engine, DPF damage or personal injury.*** ***NOTE: The engine shutdown sequence is engine specific; therefore to learn how this works on your vehicle, refer to the Engine Manufacturer's Operation and Maintenance Manual supplied with your vehicle.***
 On Steady	**(Cummins and PACCAR Engines)** The Stop Engine light is illuminated when the soot level in the DPF continues to stay above the desired level The soot level in the DPF is now at full capacity.	At this point, you CANNOT regenerate the DPF and the engine will begin a shutdown sequence. ***WARNING! If the Stop Engine warning lamp illuminates, it means you have a serious engine system problem. 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 cause severe engine, DPF damage or personal injury.*** ***NOTE: The engine shutdown sequence is engine specific; therefore to learn how this works on your vehicle, refer to the Engine Manufacturer's Operation and Maintenance Manual supplied with your vehicle.***

Quick Reference Guide

Warning Symbols Quick Reference Guide

FOR INFORMATION

HEST

Hot Exhaust
Keep vehicle a safe distance from combustible items

DPF

Diesel Particlate Filter
Perform regeneration

DEF

Diesel Exhaust Fluid
Fill DEF tank if gauge reads low level. Otherwise seek service immediately for DEF fluid quality or DEF equipment repair.

SEEK SERVICE

CHECK ENGINE

Engine

MIL

Engine - Emissions

EMISSIONS SYSTEM

Emissions Related Engine Derate

- **Perform stationary regeneration**
- **Add DEF fluid** (more than 1/4 tank)
- **Seek service at the next stop if the warning light is still on.**

TAKE IMMEDIATE ACTION

COOLANT TEMP

Stop vehicle and idle engine

ENGINE OIL PRESSURE

Stop the engine or the engine may automatically shutdown.

STOP ENGINE

(May not apply for fire or emergency vehicle applications)

Any of the above icons may appear alone or together to alert of necessary action to be taken as soon as possible.
Warnings may be either tell-tales or lights within the gauge associated with that fluid.
These lights will start flashing to notify of the upcoming engine derate.

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DPF Regeneration

Carefully read the following instructions to regenerate the DPF. If you have any problems or difficulties contact your nearest Peterbilt authorized dealer for assistance.

The ATS needs conditions typically found in highway driving to regenerate the DPF. If your DPF Indicator lamp is illuminated, the easiest option is to help the ATS by proceeding to the nearest highway.

- Make sure the Regeneration STOP Switch is NOT in the STOP position.
- Select a highway that has a posted legal speed of more than 40 mph.
- Drive your vehicle until the DPF light goes off. This may take 30 - 45 minutes of speeds greater than 20 mph (32 kph) for a Caterpillar engine or 40 mph (64 kph) for a PACCAR or Cummins engine.

If your operation or planned route in the immediate future limits your ability to reach highway speeds, proceed to the next section titled Parked Regeneration.

Parked Regeneration

In very limited applications or operations the DPF must be regenerateed by initiating a Parked Regeneration. Follow these six steps to initiate a Parked Regeneration:

1. Pull the vehicle over to a safe loca tion
2. Ensure no one is in the immediate vicinity to the tail pipe
3. Maintain a minimum of 5 feet of clearance to any combustible ma- terials from the edge and top of the vehicle

WARNING!

Parking the vehicle too close to any combustible materials or vapors may start a fire, ignite an explosion or burn someone standing close by. Before pushing the Regeneration START switch in the roof console, walk around your vehicle and ensure you have at least five (5) feet clearance from the sides and top of your vehicle to any combustibles. Ensure no one is in the immediate vicinity to the tailpipe. Failure to do so could cause a fire or lead to serious injury to you and/or bystanders.

WARNING!

Never initiate an regeneration in a closed building or enclosure. Always park your vehicle outside and ensure no one is in the immediate vicinity. Failure to do so could ignite an explosion or harm bystanders which could result in serious injury.

NOTE:

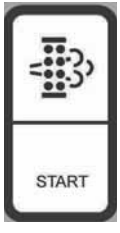
Typical operation areas or materials that can contain explosive vapors, flammable materials or people in close proximity of the vehicle are

- Fuel depots
- Grain elevators
- Dry grass, leaves or trees
- Transfer refuse stations/dumps
- Parking lots
- Load/unload terminals

NOTE:

While the list above may appear comprehensive, it is your responsibility to take the necessary precautions and be aware of your surroundings and ensure that no combustibles (materials or vapors) or bystanders are close by before initiating a regeneration.

4. Verify that the following conditions are met before proceeding. A Parked Regeneration will not initiate if any of these conditions are not met.
   - Parking brake is applied / set
   - Engine is at low idle
   - No throttle, brake or clutch applied
   - PTO is disengaged
   - Transmission is in neutral
5. Get out and walk all around vehicle to ensure that the vehicle is at least 5 feet away from all combustible materials and no one is in the immediate vicinity.
6. Climb back into the vehicle
7. Push the Regeneration (START) Switch located in the roof console for at least 4 seconds to initiate a Parked Regeneration



NOTE:

Acknowledgment that a Parked Regeneration has initiated will vary by engine. The most predominant acknowledgement to you will be an increase in engine RPM and overall engine noise.

NOTE:

A Parked Regeneration may take 30 or more seconds to initiate as the ATS system conducts various self-checks to verify all the system requirements have been met.

NOTE:

A Parked Regeneration will initiate only if the DPF status light is illuminated or blinking.

If you are unable to initiate a Parked regeneration and the DPF status light is illuminated, contact your nearest Peterbilt authorized dealer for assistance.

Stop an Automatic or Parked Regeneration

If an Automatic or Parked Regeneration is in process and you want the regeneration to stop, OR you want to prevent a regeneration from occurring, the Regeneration STOP Switch can be used to stop an Automatic or Parked Regeneration. Since Automatic Regenerations can occur at any time with this engine, you must depress the Regeneration STOP Switch ANYTIME you plan to drive your vehicle into a building, enclosure or area where the activation of a regeneration is not allowed. If the regeneration does not stop, turn the vehicle ignition OFF.

WARNING!

Never allow an Automatic regeneration to automatically start while inside a building such as a service bay, shop or building of any kind. Any time you are parking your vehicle inside a building or enclosure, ALWAYS press the Regeneration (STOP) switch prior to entering the building. Failure to do so could ignite an explosion which could result in serious injury to you and/or bystanders.

WARNING!

Never initiate a Parked Regeneration in a closed building or enclosure. Always park your vehicle outside. Failure to do so could ignite an explosion which could result in serious injury to you and/or bystanders.

CAUTION

Do not leave the STOP switch in the STOP position unless you need to cancel or stop regeneration.

WARNING!

If you operate in environments that contain explosive vapors or flammable materials, look to see if your vehicle's Regeneration Switch is equipped with a STOP function. The STOP function must be activated prior to entering the above environment(s) to prevent automatic engine regeneration from occurring, which could cause an explosion or fire. Failure to equip your vehicle with the proper switch (function) or failing to activate the STOP function before entering a combustible environment may cause an explosion or fire that could lead to death, personal injury, equipment or property damage.

> NOTE
>
> To obtain a Regeneration Switch with a STOP function, contact an authorized PACCAR dealer to obtain the proper switch and reprogramming of your engine's ECU.

Idling in Freezing Temperatures

Idling the engine for 3 or more hours in freezing temperatures causes the build up of soot and moisture in the DPF. Extra heat is required to oxidize the soot and moisture by using the following methods:

- **DPF Regeneration:**
  If the DPF Lamp turns on, follow the instructions described under DPF Regeneration on page 3-11.

> NOTE
>
> If you ignore the warning lamp and do not initiate regeneration at the soonest, safest possible time, the DPF will become increasingly clogged with soot and can lead to engine shutdown.

- **PACCAR PX-7 Engine:**
  Regardless if the DPF lamp is on or off, the engine speed will automatically increase to 1000 to 1100 RPM and remain at this speed for 10 minutes to perform an automated DPF cleaning. If necessary, the RPMs can be lowered by depressing the throttle, clutch, or brake pedal. If the engine continues to idle, the aftertreatment system will try again to raise the idle speed until the aftertreatment temperatures are suitable.

Information

Diesel Particulate Filter (DPF) System

Selective Catalytic Reduction (SCR) System

Information

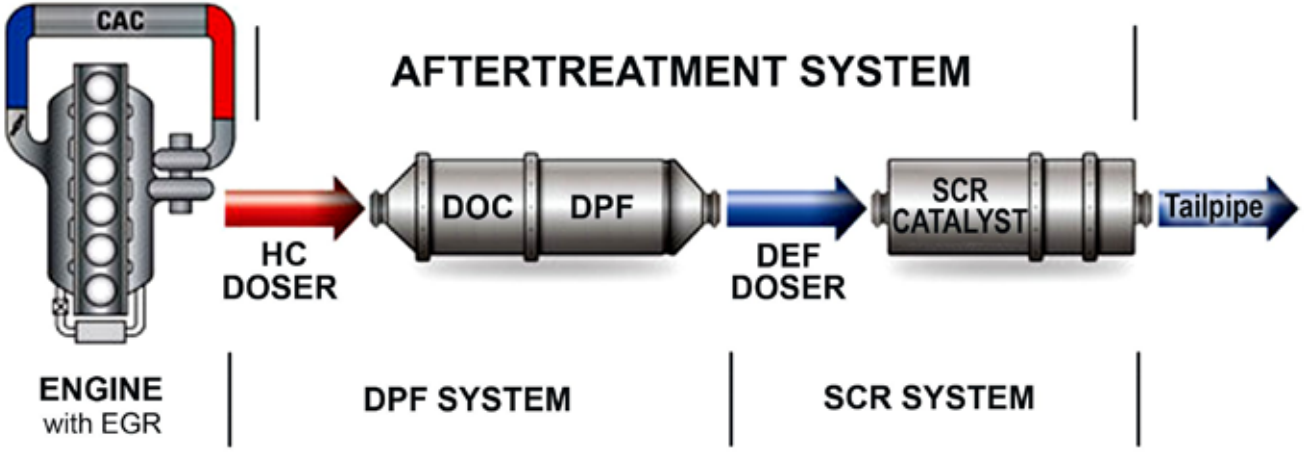
Introduction

The Aftertreatment System (ATS) on your vehicle is made up of two systems:

1. Diesel Particulate Filter (DPF) System
2. Selective Catalytic Reduction (SCR) System

They fulfill two primary functions: particulate reduction & nitrogen oxide (NOx) reduction.

This section of the manual provides more detailed information about the aftertreatment process and its components.



Tampering with Aftertreatment System

The aftertreatment system for your vehicle as installed from the factory was specifically designed to meet the emissions requirements of the US Environmental Protection Agency and California Air Resources Board. Any changes of component locations or modifications of any aftertreatment system components may reduce the emission effectiveness and you may be subject to fines under the United States Clean Air Act.

Diesel Particulate Filter (DPF) System

Overview

The DPF system consists of a Hydrocarbon (HC) Doser (may not apply to all engines), a Diesel Oxidation Catalyst (DOC), and a DPF.

The components of the DPF system perform the following functions:

- The ATS inlet and outlet adapt the vehicle exhaust piping to the ATS, and also provide a mounting location for the aftertreatment gas temperature sensors.
- The DPF differential pressure sensor measures the restriction across the DPF.
- The DPF filters soot out of the exhaust.
- When activated, the HC Doser sprays a small amount of diesel fuel (the HC) into the exhaust. The catalyst in the DOC reacts with the HC to generate heat. The heat is used to clean (regenerate) the DPF by reducing the trapped soot to ash.
- Soot is composed of the partially burned particles of fuel that occur during normal engine operation (black smoke).
- Over time, both soot and ash accumulate in the DPF and must be removed. Soot is removed by a process called regeneration. Ash is removed by removing the DPF and cleaning it at specified intervals.
- A vehicle with a DPF has up to two additional indicator lamps on the dashboard. The two additional lamps, along with the check engine lamp, alert the operator of the status of the DPF.

CAUTION

Do not submerge or allow water to enter the DPF assembly. Components of the assembly can be damaged and effect the performance of the aftertreatment system. Failure to comply may result in equipment or property damage.

NOTE

Refer to your engine manufacturer's Operator's Manual for diesel particulate filter (DPF) maintenance information.

NOTE

Refer to your vehicle or engine manufacturer's Operator's Manual for additional information on the engine indicator lamps.

NOTE

Ultra low sulfur diesel (ULSD) fuel is required for engines equipped with an aftertreatment diesel particulate filter. If ULSD is not used, the engine may not meet emissions regulations, and the DPF or aftertreatment Diesel Oxidation Catalyst (DOC) can be damaged.

Selective Catalytic Reduction (SCR) System

Overview

The SCR system is composed of several main components:

1. Diesel Exhaust Fluid (DEF) Controller
2. DEF Dosing Unit (DEF Module)
3. DEF Dosing Valve
4. SCR Catalyst

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

DEF is required for an engine equipped with a SCR system. DEF is a fluid that is sprayed into the exhaust gas prior to the SCR catalyst. The DEF vaporizes and decomposes to form carbon dioxide and ammonia. The ammonia reacts with the NOx emissions over the aftertreatment SCR catalyst to form nitrogen and water.

DEF:

- may have a slight ammonia smell
- is colorless
- is non-toxic and non-polluting
- is non-flammable

Diesel Exhaust Fluid (DEF) 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 Diesel Exhaust Fluid (DEF) that does not meet the specifications provided or to operate the vehicle/equipment without Diesel Exhaust Fluid (DEF).

WARNING!

Diesel Exhaust Fluid (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 Sheet (MSDS) for additional information.

CAUTION

Never attempt to create Diesel Exhaust Fluid (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.

CAUTION

PACCAR Inc requires the use of DEF meeting ISO 22241-1. There is NO acceptable substitute. Failure to use the correct DEF may cause engine damage and/or void the warranty.

NOTE

Some locations may reference the DIN 70070 standard. DEF specification limits of this standard are identical to ISO 22241-1.

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 is also not responsible for failures caused by incorrect DEF or by water, dirt or other contaminants in the DEF. Refer to your engine and vehicle operator's manuals for maintenance, storage, and shutdown information.

For engines using SCR operating in the United States and Canada, it is recommended that the DEF used be certified by the American Petroleum Institute (API).

NOTE

To ensure the correct DEF is used, PACCAR Inc recommends the use of TRP® CleanBlue Diesel Exhaust Fluid which is available in different quantity options from small to bulk containers.

- DEF is readily available at truck stops and at all PACCAR Engine dealers. For assistance locating DEF, contact your local PACCAR authorized repair location.
- If your vehicle is out of DEF and you are unable to locate a source to purchase DEF, please contact the vehicle OEM customer care center at the telephone number provided in the vehicle operator's manual. The vehicle OEM customer care center will be able to contact the nearest dealer location to you and arrange for an emergency shipment of DEF to your location 24 hours a day.

The following are other common names used for Diesel Exhaust Fluid (DEF):

- AUS 32 (Aqueous Urea Solution 32)
- AdBlue
- NOx Reduction Agent
- Catalyst Solution

Regardless of what the DEF is called, the DEF must meet the ISO 22241-1 specifications.

Storage

NOTE
The following information is for reference and is to be used as a guideline only. There are many factors that determine Diesel Exhaust Fluid (DEF) shelf life, with temperature and duration being two of the major determining contributors. If in doubt, replace the fluid with known quality DEF. DEF has a limited shelf life, both in the vehicle's diesel exhaust fluid tank and in storage/bulk/transportation containers.

The following conditions are ideal for maintaining DEF quality and shelf life during prolonged transportation and storage:

- Storage temperature between -5°C and 25°C (23°F and 77°F)
- Storage in sealed containers to avoid contamination
- Avoidance of direct sunlight

In these conditions, Diesel Exhaust Fluid (DEF) has a minimum expected shelf life of 18 months. If stored at higher temperatures for extended periods of time, the shelf life will be reduced by approximately 6 months for every 5°C (9°F) above the highest storage temperature listed above. Long term storage in a vehicle (in excess of 6 months) is not recommended.

NOTE
To assist in preventing DEF from deteriorating when stored in the vehicle's DEF tank, locate and plug the tank's venting to seal the tank exposure to the atmosphere.

Handling

CAUTION
If Diesel Exhaust Fluid (DEF) is spilled on metal surfaces (for example the steps, fuel tanks or grab handles) rinse and clean immediately with water. Failure to do so may leave permanent corrosive stains on the metal surfaces which can not be removed.

- Make sure to only use approved containers to transport and store DEF. Containers made of polyethylene and polypropylene are recommended.
- If DEF is spilled, rinse and clean immediately with water.
- Avoid prolonged contact with skin. In case of contact, wash with immediately with soap and water. If not washed immediately, a white film will be left when the DEF dries that can be more difficult to wash off.

NOTE
Spilled DEF, if left to dry or wiped away with a cloth only, will leave a white residue. Failure to clean the spilled DEF may result in an incorrectly diagnosed leak of the DEF Dosing system.

Before using containers, funnels, etc. that will be used to dispense, handle or store DEF, make sure to wash thoroughly to remove any contaminants and then rinse with distilled water.

NOTE
Do not use tap water to rinse components that will be used to deliver diesel exhaust fluid. Tap water will contaminate the DEF. If distilled water is not available, rinse with tap water and then rinse with DEF.

Disposal

If disposing Diesel Exhaust Fluid (DEF), always check with the local authority regulations on proper disposal and requirements.

Contamination/Incorrect Fluid

CAUTION
Never add water or any other fluid besides what is specified to the DEF tank. The aftertreatment system may be damaged.

In the event that the incorrect fluid is added to the Diesel Exhaust Fluid tank, such as, but not limited to:

- Water
- Diesel Fuel
- Hydraulic Fluid
- Coolant
- Windshield Washer Fluid

Contact a local PACCAR Authorized Repair location to determine the appropriate repair direction. If only water has been added to the DEF tank, drain the DEF tank, flush with distilled water and refill with new and/or known good DEF.

Freezing

CAUTION
The Diesel Exhaust Fluid (DEF) system purges to prevent damage from freezing. If your vehicle is equipped with battery disconnect switches, do NOT disconnect battery power within two minutes of switching the ignition key off. Failure to comply may result in vehicle or property damage.

CAUTION
Do NOT add any chemicals/additives to the Diesel Exhaust Fluid (DEF) in an effort to prevent freezing. If chemicals/additives are added to the DEF, the aftertreatment system may be damaged.

DEF will freeze around -12°C (11°F). The DEF system on the vehicle is designed to accommodate this and does not require any intervention.

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PACCAR Inc
P.O. Box 1518
Bellevue, WA 98009

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