# DRIVER TIPS FOR FIRE AND EMERGENCY VEHICLES.

(00)

FOR CUMMINS EPA ON-HIGHWAY ENGINES WITH AFTERTREATMENT.

1



This guide covers engine, aftertreatment and emissions-related indicator lamps<sup>\*</sup> found on your vehicle's instrument panel and explains what they mean and the actions drivers need to take when the lamps illuminate. Important information about fuel, oil, Diesel Exhaust Fluid (DEF) and operating tips is also included.

The information in this tips card is specific to Cummins-powered fire and emergency vehicles. If you need information regarding other on-highway applications, please reference Bulletin 4971518.

# **GENERAL ENGINE INDICATOR LAMPS.**



### CHECK ENGINE LAMP OR AMBER WARNING LAMP

The Check Engine Lamp (which may also be referred to as the Amber Warning Lamp) illuminates when the engine needs to be serviced at the first available opportunity.



#### **STOP ENGINE LAMP**

The red Stop Engine Lamp indicates, when illuminated, that the vehicle needs to be stopped as soon as it is safe to do so.

## **ON-BOARD DIAGNOSTICS.**

Starting in 2013, all on-highway engines include On-Board Diagnostics as a part of the emissions regulation requirement. On-Board Diagnostics monitor all emissions-related engine systems during operation. If the system detects any emissions-related malfunctions, it will alert the operator to these detected malfunctions through a dash lamp known as the Malfunction Indicator Lamp (MIL).



## **MALFUNCTION INDICATOR LAMP (MIL)**

The MIL illuminates when the On-Board Diagnostics system detects a malfunction related to the emissions control system. The illuminated MIL indicates that the engine and aftertreatment system should be diagnosed and serviced at your next available opportunity. The MIL can be illuminated along with any of the engine indicator lamps.

If the MIL is illuminated with the red Stop Engine Lamp, the vehicle should be stopped as soon as it is safe to do so. It should then be taken to an authorized Cummins location for repair.



\* Lamps shown are for illustrative purposes only. Be sure to reference your vehicle manufacturer's Owners Manual for specific lamps and details.

## **CUMMINS AFTERTREATMENT SYSTEM.**

Cummins engines for fire and emergency vehicles should not experience any emissions-related vehicle speed or engine torque derates.

- The Cummins Diesel Particulate Filter (DPF) reduces particulate matter (PM) by over 90 percent.
- The Cummins Selective Catalytic Reduction (SCR) Catalyst converts oxides of nitrogen (NOx) into harmless nitrogen gas and water vapor.
- Achieves near-zero emissions and has no power loss when system is regenerating while driving or pumping.

#### **SCR - HOW IT WORKS**

Exhaust gas containing NOx exits the Cummins Particulate Filter and enters the Decomposition Reactor, where a fine mist of DEF from the holding tank is sprayed into the hot exhaust stream. DEF is a solution of 32.5 percent urea and deionized water, which breaks down into ammonia (NH3) during hydrolysis in the Decomposition Reactor. The NOx and NH3 pass into the SCR element, where a catalytic reaction converts the NOx into harmless nitrogen gas (N2) and water vapor (H2O). They then pass over a secondary catalyst, which converts any leftover traces of ammonia before the exhaust exits the system.

## DIESEL EXHAUST FLUID (DEF) LAMP SEQUENCE



**ILLUMINATED** An illuminated DEF Lamp is an indication that the DEF level is low. This can be corrected by refilling the DEF tank with the correct type of Diesel Exhaust Fluid. If the lamp stays on after refill, schedule service.



**SOLID DEF LAMP WITH CHECK ENGINE LAMP** Indicates lower DEF level, incorrect DEF type or an SCR system issue. This can be corrected by refilling the DEF tank with the correct type of DEF as soon as possible. If the lamps stay on, schedule service immediately.



FLASHING DEF LAMP WITH CHECK ENGINE LAMP/ AMBER WARNING LAMP A flashing DEF Lamp combined with an illuminated Check Engine Lamp/Amber Warning Lamp indicates that the DEF level is critically low. Refill the DEF with the correct type of DEF as soon as possible. If the lamps stay on, schedule service immediately.





STOP ENGINE LAMP WITH FLASHING DEF LAMP AND SOLID CHECK ENGINE LAMP Indicates that DEF level

is critically low and fuel tank has been refilled without refilling DEF tank, or engine has idled for an hour or been shut down. This can be corrected by refilling the DEF tank with the correct type of Diesel Exhaust Fluid as soon as possible. If the lamps stay on, schedule service immediately.

# **DPF - HOW IT WORKS.**

Diesel Particulate Filters (DPF) were introduced with most EPA 2007 engines, excluding the ISM. Exhaust flows from the engine into the Diesel Oxidation Catalyst and then into the DPF, where Particulate Matter collects on the walls of the filter.



The collected carbon is then oxidized to remove it from the DPF; this process is called regeneration. Passive Regeneration occurs when the vehicle's dutycycle and exhaust temperature drive the continuous oxidation of carbon. Active generation occurs when there is not enough heat in the exhaust system. To create the heat required, the ECM commands the addition of unburned fuel to the exhaust stream.

## HIGH EXHAUST SYSTEM TEMPERATURE (HEST) LAMP



The HEST Lamp illuminates to indicate that high exhaust temperatures may exist. Make sure the

exhaust pipe outlet is not directed at any combustible surface or material. Reference your Cummins Owners Manual for complete instructions.

#### DPF LAMP SEQUENCE STEP 1 - DPF LAMP SOLID



The DPF Lamp indicates that soot load has reached the point that regeneration is needed. Regeneration is

accomplished by:

1. Ensuring that the inhibit switch is not in the inhibit position.

2. Driving at highway speeds for 20-30 minutes to increase exhaust temperatures OR performing a parked regeneration.

#### **STEP 2 - DPF LAMP SOLID**





A solid DPF Lamp combined with a solid Check Engine Lamp indicates that the soot load has continued to increase and there is a more urgent need for action.

#### STEP 3 - DPF LAMP FLASHING AND CHECK ENGINE LIGHT SOLID



A flashing DPF Lamp combined with an illuminated Check Engine Lamp/ Amber Warning Lamp indicates that the aftertreatment DPF needs regeneration immediately. A parked regeneration is required. DPF soot load is high. Take action with highway speed.

#### STEP 4 - DPF LAMP AND STOP ENGINE LAMP ILLUMINATED



If a parked regeneration is not performed, the red Stop Engine Lamp will illuminate. As soon as it

is safe to do so, the vehicle should be stopped. It should then be taken to an authorized Cummins location for repair. Soot load has reached levels requiring a Cummins location to remedy the situation.

## **REGENERATION INHIBIT SWITCH.**

The purpose of this switch is to prevent or disable active aftertreatment DPF regeneration. Reference the vehicle's Owners Manual for complete operation instructions and directions for the use of this switch. Unnecessary or excessive use of the Regeneration Inhibit Switch will result in the need for more frequent parked regeneration or DPF plugging.

## HOW TO PERFORM A PARKED (STATIONARY) REGENERATION.

If the vehicle has a Manual Regeneration Switch and the DPF Lamp is illuminated or flashing:

- Manual regeneration removes soot from the DPF when vehicle duty-cycle does not allow self-cleaning. Performing when engine is at operating temperature will result in faster completion times.
- Park your vehicle in an appropriate location, set parking brake and place transmission in Park (if provided) or Neutral. Allow up to one hour for the regeneration.
- Set up a safe exhaust area. Confirm that nothing is on or near the exhaust system surfaces.
- Ensure that your fast-idle and power take-off (PTO) switches are off before starting regeneration.
- Push the Manual Regeneration Switch to begin a parked regeneration. Note: Engine speed will increase, and there may be a noticeable change to the sound of the turbocharger during the regeneration process. Once the DPF is regenerated, the engine will automatically return to the normal idle speed.
- Monitor the vehicle and surrounding area during regeneration. If an unsafe condition occurs, shut off the engine immediately. To stop a parked regeneration, depress the brake or throttle pedal.
- Once regeneration is complete, exhaust gas and exhaust surface temperatures will remain elevated for three to five minutes.

Reference your Cummins Owners Manual and vehicle's Owners Manual for complete operating instructions.

## FUEL, OIL AND DEF.

- Use only Ultra-Low Sulfur Diesel (ULSD) fuel.
- CK-4 (low ash) is the recommended oil.



- Be sure to check the DEF gauge at every refueling. Cummins recommends topping off the DEF tank when refueling. DEF meeting ISO 22241-1 must be used.
- Please read your vehicle manufacturer's Owners Manual to familiarize yourself with the location and capacity of the DEF tank.
- Put only DEF in the DEF tank, which has a blue cap.

## **ITEMS DRIVERS MAY NOTICE.**

- Under certain conditions (cold or very dry), condensation in the form of water vapor can be seen coming from the vehicle's tailpipe. This is normal. It will clear within a few minutes of normal vehicle operation.
- If the engine is left at idle for significant periods of time without reaching the minimum exhaust operating temperatures, the engine will automatically increase the engine idle speed for several minutes to maintain the condition of the particulate filter. This can be interrupted by pressing the service brake.
- After prolonged idle, you may notice momentary white vapor and an odor. This is normal.
- When the High Exhaust System Temperature Lamp is illuminated, you may notice an odor. This is normal. If the odor is excessive and you also notice white vapor, have the exhaust system inspected for leaks.

# TIPS FROM FIRE SERVICE DEALERS AND CUSTOMERS.

- Cummins engines will experience no loss of power while system is regenerating when pumping or driving.
- If the DPF Lamp comes on during a run, regenerate right after returning to the station. Stationary regens are more efficient and take less time when the system is already warm.
- Store less frequently used gear in compartments above the exhaust discharge to minimize exposure to hot exhaust gas.
- ECM (Engine Control Module) can be programmed to allow regeneration as low as zero miles per hour and/or while pumping.

Our authorized service technicians are fully trained to address any diagnostic or repair concern. Call Cummins Care at 1-800-CUMMINS (1-800-286-6467), and representatives will be available to answer product questions and provide assistance during a repair or service event for your operational or service needs.





Cummins Inc. Box 3005 Columbus, IN 47202-3005 U.S.A.

1-800-CUMMINS™ (1-800-286-6467) cummins.com

Bulletin 5600279 Printed in U.S.A. 7/19 ©2019 Cummins Inc.