

Basic operation of the Detroit Diesel After Treatment Device

2007 engines are required to use an After Treatment Device (ATD) for controlling emissions. This means a special canister has replaced the typical muffler. This canister contains a Diesel Oxidation Catalyst (DOC) and a Diesel Particulate Filter (DPF). The DPF will trap particulate matter while the engine is running. Over time, soot and ash build up in the filter and **must** be removed. Soot build-up is removed by heating the filter until the soot oxidizes and turns into carbon dioxide gas. This process is commonly known as regeneration. Ash build-up is removed from the filter by periodic cleaning in a special cleaning machine. The typical ATD is equipped with two pressure transducers and three temperature transducers. These sensors allow the engine to monitor soot build up for cleaning requirements.

Fluid Requirements

2007 engines require the use of specific oil and diesel fuel. The diesel fuel to be used in any 2007 engine shall be Ultra Low Sulfur fuel containing 15 PPM sulfur content or less. Make sure the pump station being used has the proper fuel type when filling your fuel tank. If Ultra Low Sulfur fuel is **not** used, the engine might **not** meet emissions regulations, and the ATD can be damaged. Engine oil must have sulfate ash levels less than 1.0 weight %. Oils meeting this requirement are marked as CJ-4 oil. Using any other oil will cause damage to the ATD. Using oil that is not CJ-4 compliant for extended periods of time will damage components and require replacement of the ATD by an approved service facility.

Instrument Panel Lamps

Chassis built with 2007 model year Detroit Diesel Series 60 engines have five instrument panel lamps to monitor engine and exhaust after-treatment status. The Check Engine lamp and Stop Engine lamp refer to basic engine functions. The three new lamps are the Diesel Particulate Filter (DPF) lamp, the High Exhaust System Temperature (HEST) lamp, and the Malfunction Indicator Lamp (MIL) lamp..



The amber Check Engine warning lamp indicates a fault with the engine controls has occurred. The operator can drive the vehicle to the end of their shift and call service to remedy the problem.



The red Stop Engine warning lamp indicates a major engine fault that may result in engine damage has occurred. The operator should move the vehicle to a safe location and shutdown the engine.



The Diesel Particulate Filter (DPF) will illuminate when a regeneration is necessary. There are progressive stages of need for regeneration indicated by this lamp as described here.

- A solid lamp indicates a regeneration should take place within a reasonable amount of time.
- A flashing lamp indicates that the filter has become loaded to a point where a regeneration is required immediately.

The first stage (solid) should allow the vehicle to complete a typical shift of operation depending on vehicle duty cycle. This provides time for a vehicle to return to a maintenance facility or change duty cycle (increase exhaust temperatures by normal truck use) without impacting the current mission. In the event the DPF light has recently activated, the truck can be driven onto a highway or put into pump mode to put load on the engine allowing an automatic regeneration to clean the DPF.

The second stage (flashing) requires the operator to initiate a regeneration immediately to clean the DPF. This can be accomplished through either automatic regeneration (driving or pumping) or a parked regeneration. The DPF lamp will turn off during the parked regeneration event.

The third stage (DPF flashing and Check Engine lamp illuminated) indicates that an automatic regeneration will no longer be allowed. The vehicle should be moved to a safe location where a parked regeneration can be immediately initiated.

The fourth stage (DPF flashing, Check Engine lamp illuminated and Stop Engine lamp illuminated) indicates that damage to the after-treatment device is eminent and a parked regeneration should be performed immediately.



The High Exhaust System Temperature (HEST) lamp provides an indication to the vehicle operator that an active regeneration has been initiated and that the exhaust system temperature is elevated beyond the temperature threshold. This lamp does not indicate a failure of any type, it merely indicates elevated operating temperatures. The HEST lamp will not illuminate if road speed exceeds 5 mph.



The Malfunction Indicator (MIL) Lamp provides an indication to the vehicle operator that a fault has occurred on an emission related component. This lamp may illuminate at the same time as the Check Engine lamp. The operator can drive the vehicle to the end of their shift and call service to remedy the problem.

Passive Regeneration

The passive regeneration process allows cleaning of the DPF under normal engine operation and does not require operator interaction. The operator will see no difference in vehicle performance or vehicle control. When the engine has an adequate amount of exhaust heat, the DPF can go through a passive regeneration process. This occurs when the exhaust temperatures leaving the turbo are high enough to remove the soot caught in the DPF. No extra fuel will need to be burned in order for this event to occur.

Passive regeneration is possible while in pump mode operations. The heat being generated by a loaded engine while pumping water may be high enough to allow passive regeneration. The operator will not experience any change in engine performance or engine control during passive regeneration.

Active Regeneration

Active regeneration can occur in two manners, in automatic mode or in parked mode. An automatic regeneration occurs when the engine load, exhaust temperature, and engine speed are within an acceptable range. When the conditions are met, the engine will begin dosing fuel into the exhaust stream to clean the DPF in a regeneration mode. The automatic regeneration cycle does not require an operator to initiate. No change of engine control or engine speed is experienced during the automatic regeneration event.

Active regeneration can also occur when the truck is parked. Parked regeneration allows the cleaning of the DPF in stationary truck operations and requires operator involvement to initiate. The operator will be notified of the need for a parked regeneration by illumination of the DPF Lamp located in the cab. Parked regeneration cannot be initiated during pumping operations.

The sequence of indicator lamp(s) is as follows:

1. After use of the engine for a period of time, the DPF lamp may be illuminated. Once this lamp is lit, an active regeneration should be initiated within a reasonable amount of time, generally eight (8) to ten (10) hours depending on the duty cycle.
2. If no regeneration occurs after the DPF lamp illuminates, the DPF lamp will begin blinking and an active regeneration should be initiated as soon as possible.
3. If the flashing DPF lamp is ignored, the Check Engine lamp will illuminate. A parked regeneration must be performed to clean the DPF before further operation. The engine will not derate or shut down in this situation.
4. Continuous usage of the vehicle past the previous levels of warning without regeneration will force the need for a thorough cleaning of the DPF. The extreme level of soot build up will be identified by the following dashboard lamps, blinking DPF regeneration lamp, solid Check Engine lamp and solid Stop Engine lamp.

Operation of the engine as described in item four (4) may result in excessive soot accumulation. In this case, contact a Detroit Diesel service representative for assistance.

To initiate a parked regeneration, the following must occur:

1. Move the truck to a safe location that prevents the high exhaust heat from causing damage to the road surface or the ground.
2. The driver **MUST** stay with the vehicle throughout the regeneration process. The procedure will take 20 to 40 minutes.
3. Locate the regeneration request switch located in the cab within reach of the driver. This is a momentary style switch.
4. Cycle the park brake OFF to ON – once an ignition cycle (parking brake must be ON).
5. Engine speed should be at idle.
6. Cycle the transmission from Drive to Neutral. The transmission must be in neutral (confirmed by looking at the Allison transmission shift selector and seeing current gear and selected gear are neutral "N").
7. Vehicle speed must be 0 mph.
8. Hold the regeneration switch to the ON position for five (5) seconds and release.

When the request is accepted, the DPF Lamp will turn on for one (1) second and then go off for the rest of the parked regeneration. The engine speed will increase to 1600 rpm during a parked regeneration.

The HEST lamp will not illuminate until exhaust temperatures exceed the temperature threshold. Breaking any of the required conditions will stop the parked regeneration and engine speed will return to idle.

Upon completion of parked regeneration, the following should occur:

1. The HEST lamp will remain illuminated until the exhaust outlet temperature is below the temperature threshold or the vehicle speed exceeds 5 mph.
2. The DPF lamp will turn off along with all other associated warning lamps. If the Check Engine lamp, Stop Engine lamp or MIL are still illuminated a fault condition exists that should be diagnosed by a Detroit Diesel service representative.

To cancel the parked regeneration, the driver can toggle the regeneration switch to ON for five seconds. The DPF lamp will flash on for one second to show acceptance of the cancellation request and then return to idle. If a parked regeneration is interrupted the DPF lamp will illuminate, indicating the need for further regeneration. The DPF lamp will remain illuminated until the regeneration is completed through either automatic regeneration (by driving or pumping), or by resuming a parked regeneration.

Parked regeneration is not allowed when the DPF lamp is not illuminated.

Regeneration Activation Switch

Activating the Regeneration process requires the operator to press the regeneration switch under the previous described conditions. The location of the regeneration switch is outlined below.

- Quantum® – located next to the engine diagnostic connector and diagnostic switch below the dash panel.
- Velocity™ and Impel™ – located next to the engine diagnostic connector and diagnostic switch below the dash panel.
- Arrow XT™ – located on the switch panel right of the dash panel.

Diagnostic Software

2007 model year Detroit Diesel engines will require Detroit Diesel Diagnostic Link software version 7.0 for diagnostic support. Dealers can purchase the DDDL 6.3/7.0 package and be able to support both 2007 model year and older engines. Contact a Detroit Diesel service location to obtain a copy of DDDL.

General Notes For All 2007 Engines

No modification of the exhaust between the engine and DPF is allowed per the EPA. Only tailpipes after the DPF are allowed to be changed.

Pierce custom chassis will be outfitted with diffuser exhaust tips. These devices lower exhaust gas temperatures as they exit the tailpipe. Customers should not remove any diffuser items from their apparatus. Consult your Pierce dealer for exhaust extraction systems that are compatible with the Pierce diffuser tips.

Pierce custom chassis will be configured with the fan locked on during stationary operations. All 2007 engines are configured to engage the fan clutch during “parking brake and neutral” or “parking brake and pump in gear” situations. This is done to prevent overheating of steering systems, air conditioning systems and exhaust components, particularly when trucks are operating at elevated high idles for extended periods of time.

Any customer installed hardware needs to be kept a minimum of 6 inches away from any exhaust pipe and After Treatment Device housing. Installation of aftermarket components shall follow this to prevent heat related damage.