






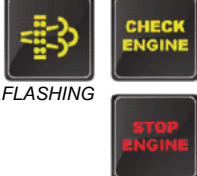



## 5-12. Cummins Regeneration

### 5-12.1 After Treatment Device Indicator Lights - Cummins Engines

Table 5-1: Cummins Instrument ATD Panel Lights

	The amber <b>Check Engine</b> , or Engine Warning, light indicates a non-critical system fault with the engine has occurred. The operator can drive the vehicle to the end of their shift and call service to remedy the problem.
	The red <b>Stop Engine</b> light indicates a serious engine fault that may result in engine damage has occurred and the vehicle should be shut down as soon as it is safe to do so. The engine should remain shut down until serviced by an authorized dealer.
	The <b>Malfunction Indicator (MIL)</b> light illuminates when a fault has occurred on an emission related component. The engine and after treatment system should be diagnosed and serviced at the next available opportunity.
	If the MIL and Stop Engine Lamp illuminate together, the vehicle should be stopped as soon as it is safe to do so. The vehicle should be serviced by an authorized dealer.
	The <b>Diesel Particulate Filter (DPF)</b> light will illuminate when a regeneration is necessary. There are progressive stages of need for regeneration indicated by this light:
 ON SOLID	1. On solid (low to medium levels of particulate build up). The vehicle requires regeneration but should be able to complete its mission before a regeneration is performed. <ul style="list-style-type: none"> <li>— Ensure the Regen Inhibit Switch is not activated.</li> <li>— Initiate a DPF regeneration by switching to a more challenging duty cycle (such as highway driving for at least 20 minutes or pumping)</li> <li>— OR perform a parked regeneration.</li> </ul>
 FLASHING	2. Flashing (medium to high levels of particulate build up). The vehicle requires a regeneration as soon as possible). <ul style="list-style-type: none"> <li>— Perform a regeneration by switching to a more challenging duty cycle or a parked regeneration.</li> </ul>
 FLASHING	3. Flashing with amber Check Engine light (high level of particulate build up). A DPF regeneration is required immediately. <ul style="list-style-type: none"> <li>— An automatic regeneration will not initiate. The operator must perform a parked regeneration.</li> </ul>
 FLASHING	4. If a parked regeneration is not performed the red Stop Engine lamp will illuminate. <ul style="list-style-type: none"> <li>— As soon as it is safe to do so, the vehicle should be <b>stopped</b> and remain shut down until serviced by an authorized dealer.</li> </ul>

	<p>The <b>High Exhaust System Temperature (HES)</b> light indicates an active regeneration has been initiated and exhaust system temperatures are elevated above normal levels. The HES light will remain on until exhaust temperatures have dropped below 977°F (525°C).</p> <p>If the HES light is ON and the vehicle speed has dropped below the threshold of 5 miles per hour, the light will remain ON until the vehicle speed increases ~3 mph back above the speed threshold and the regeneration process finishes.</p>
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## 5-12.2 Passive Regeneration

Passive regeneration can occur during normal engine operation, typically at higher engine speeds (i.e. highway driving) and/or high loads, when exhaust temperatures naturally get high enough to oxidize the soot in the DPF. No engine ECU or operator intervention is required, and the operator will not see a difference in vehicle performance during the process.

- No extra fuel is used, and excessive exhaust temperatures do not occur during passive regeneration.
- The DPF light may temporarily illuminate and extinguish if soot levels reach moderately high levels, but because conditions allow, the passive regeneration process reduces the soot load naturally.

## 5-12.3 Active Regeneration

Active regeneration is controlled by the engine ECU. The active regeneration process removes collected soot in the DPF by injecting a small amount of diesel fuel into the exhaust stream. This raises the exhaust temperature to provide the heat needed to burn off the accumulated soot and regenerate the DPF.

Active Regeneration can happen while the truck is being driven, when in stationary truck operations, or during pumping operations.

- The need for active regeneration occurs more frequently within low speed, low load, or stop and go conditions.
- The DPF lamp illuminates when regeneration is needed. When the DPF light turns on, the operator can:
  - Provide assistance to the engine by either changing the duty cycle to allow the engine ECU to initiate the regeneration (Automatic Active Regeneration), or:
  - Manually initiate a parked regeneration using the regeneration switch, which is located in the cab within reach of the driver (Parked / Stationary Regeneration).

### 5-12.3a Automatic Active Regeneration During Driving or Pumping Conditions

The engine ECU will automatically activate a regeneration when the following vehicle conditions are satisfied:

- DPF light illuminates (soot is accumulated in the DPF filter) and the ECU looks for opportunities to regenerate.
- Sufficient exhaust flow and temperature conditions (engine fully warm and under load; typical pumping or highway driving conditions should be adequate).
- Speedometer showing 5 mph or higher vehicle speed, or in pumping mode.

When the ECU initiates the regeneration, exhaust system temperatures will rise, and the HES lamp will illuminate with temperatures above 977°F (525°C). Breaking any of the required conditions will stop the regeneration process. If excessive soot build up remains after the process, the dash lights will indicate the appropriate indication stage for further regeneration. No engine speed or load changes will occur during regeneration in pumping or driving modes.

Automatic active regeneration can be temporarily suspended using the regeneration inhibit switch. See [“Regeneration Inhibit”](#) on [page 5-26](#).

5-12.4 Parked Regeneration

**⚠ WARNING**

- Parked Regeneration causes high exhaust gas temperatures at zero vehicle speed. Keep personnel away from exhaust outlet to avoid serious burns and injury.
- Do not perform parked regeneration in an enclosed area (i.e. indoors). All internal combustion engines give off hazardous fumes and gasses while running. Inhalation of exhaust fumes can cause death.
- Do not sit in a parked vehicle for any extended amount of time with the engine running. Exhaust fumes could leak into the cab area and death can result.

**CAUTION**

- Do not perform parked regeneration while connected to an exhaust extraction system. Damage to the exhaust extraction system may result.

Parked regeneration, also known as stationary or manual regeneration, is an active regeneration that is performed by the operator while the vehicle is parked. Follow this procedure to safely perform a parked regeneration.








**IMPORTANT:** If a parked regeneration is attempted, and the engine speed does not increase, contact your engine dealer for assistance.


Table 5-3: Cummins Parked Regeneration Engine Speeds

ENGINE TYPE	ISM	ISL/ISC	ISX 11.9	ISX 15
PARKED REGEN RPM	1400	1000	960	900

**NOTE:** The apparatus does not need to be taken out of service to complete a parked regeneration. See [“Canceling Stationary Regeneration”](#) on [page 5-25](#).

Table 5-4: Performing A Parked Regeneration

						
DPF LAMP MUST BE ON OR FLASHING	STOP IN SAFE LOCATION	SET PARKING BRAKE	SET SAFE ZONE AROUND EXHAUST	FOOT OFF THROTTLE, BRAKE	HOLD REGEN SWITCH 5 SECONDS	MONITOR AREA STOP ENGINE FOR UNSAFE CONDITIONS!!
<b>PRESSING BRAKE, THROTTLE, REGEN INHIBIT SWITCH WILL STOP REGENERATION PROCESS</b>						
<ol style="list-style-type: none"> <li>Stop vehicle completely, transmission in N (neutral), and set the parking brake. <ul style="list-style-type: none"> <li>Park on a clean surface that will not melt or burn (clean concrete or gravel, not grass or asphalt).</li> <li>Engine control should be from accelerator pedal (not PTO, remote PTO, cruise, etc) PTO and running at normal idle (high idle should be OFF).</li> <li>Clear exhaust outlet area 5 ft of any items, gasses, vapors that can melt, burn or explode.</li> <li>If indoors, exhaust discharge pipe must be rated at least 1500°F (816°C).</li> </ul> </li> <li>Keep foot off the throttle pedal and the brake pedal.</li> </ol>						
<div style="background-color: yellow; border: 1px solid black; padding: 2px; display: inline-block;"><b>CAUTION</b></div> <p><b>STAY with the vehicle. Monitor the area during the operation. if any unsafe conditions occur, shut off engine immediately!</b></p> <p><b>NOTE:</b> Diesel Particulate Filter (DPF) lamp must be ON in order to start a stationary regeneration.</p> <ol style="list-style-type: none"> <li>With the engine running, press and hold the vehicle's regeneration switch for several seconds. <ul style="list-style-type: none"> <li>Engine speed increases. The turbocharger may make a different sound during the event.</li> <li>DEF lamp turns OFF. As hydrocarbons are added, temperature goes up. HEST lamp illuminates when exhaust temperature reaches 977°F (525°C).</li> <li>Regeneration may take 20-40 minutes or more, depending on soot level.</li> <li>Exhaust temps stay high at least 3-5 minutes after completion.</li> </ul> </li> <li>To stop a regeneration before completion, depress throttle pedal, release parking brake, press the regeneration inhibit switch, or turn off the engine.</li> <li>When the regeneration is complete, the engine returns to normal idle speed and operation. <ul style="list-style-type: none"> <li>If excessive soot remains in the filter, the DPF light(s) will return to the appropriate stage until another regeneration occurs. Repeat parked regeneration. If the DPF light still remains on, call for service.</li> </ul> </li> </ol>						

After completion of regeneration, the HEST light will remain illuminated until the exhaust outlet temperature is below 977°F (525°C) or the vehicle speed exceeds 5 mph.

#### 5-12.4a Canceling Stationary Regeneration

If it is necessary to interrupt a stationary/parked regeneration before completion (such as in order to respond to an emergency call) the operation may be canceled by depressing the throttle, releasing the parking brake, or pressing the Regen Inhibit Switch. If the DPF lamp is still illuminated after the call, the operator can re-initiate the stationary regeneration process as normal. If the DPF lamp has extinguished in the meantime, the vehicle was able to complete the regen process on its own.

### 5-12.5 Regeneration Inhibit

#### **WARNING**

Inhibiting or suspending regeneration too frequently can result in exhaust restriction, higher fuel consumption, and engine performance loss due to soot build-up in the DPF.

If the DPF has reached system limits (DPF light flashes with Check Engine Light) the operator needs to take action such as removing the truck from a high-load mission, and initiating an active regeneration or a parked regeneration.

The Regeneration Inhibit Switch can be used to temporarily suspend an in-process active regeneration. This may be done when the regeneration is going to occur in a location or situation that is not ideal and must be postponed. An indicator will appear on the dash panel when this mode is activated.

- The regen inhibit switch should not be used for normal operation. It should only be used for hazardous environments.
- Overuse of the regeneration inhibit feature **will** lead to more frequent need of parked/stationary regeneration, or the need for servicing and/or replacing the Diesel Particulate Filter (DPF).

#### 5-12.5a Regeneration Inhibit While Pumping

A common misconception is that regeneration will negatively affect pumping operations. Any time the engine detects a need for regeneration, it is looking for conditions (such as engine speed and temperature) to start an active regeneration. If the pump is engaged, the regeneration process should not affect the engine speed.

### 5-12.6 Maintenance

Regeneration removes soot from the DPF, but accumulated ash remains in the filter. Over time the DPF must be removed, disassembled, and cleaned in a special machine to remove the ash build-up.

- CEL will illuminate and a fault code will be set when ash removal is necessary.
- The Cummins maintenance interval is 200,000-400,000 miles, or up to 6,750 hours, which is dependent on duty cycle, type of oil used, and oil consumption rate.
- Using CES20081/API CJ-4 oil will maximize the DPF maintenance interval.