

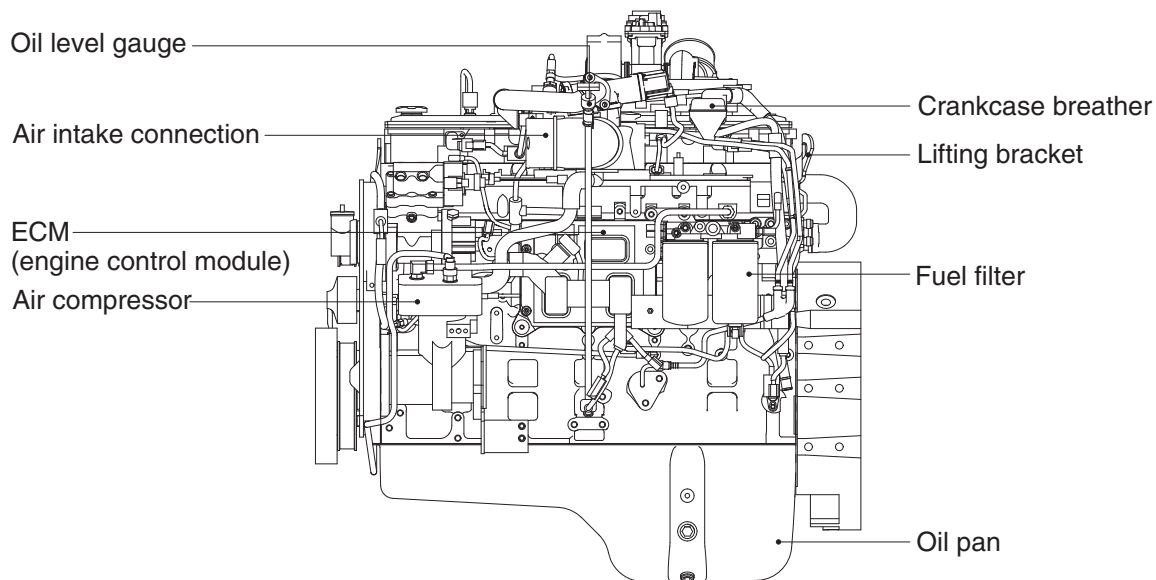
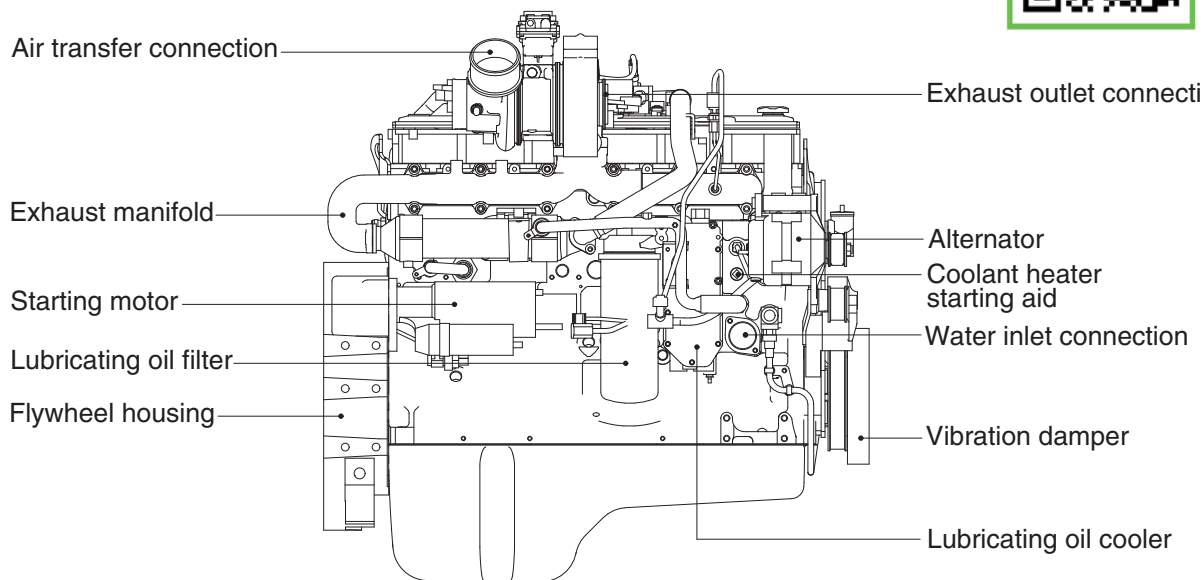
## SECTION 2 ENGINE

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# SECTION 2 ENGINE

## GROUP 1 STRUCTURE AND FUNCTION

### 1. STRUCTURE



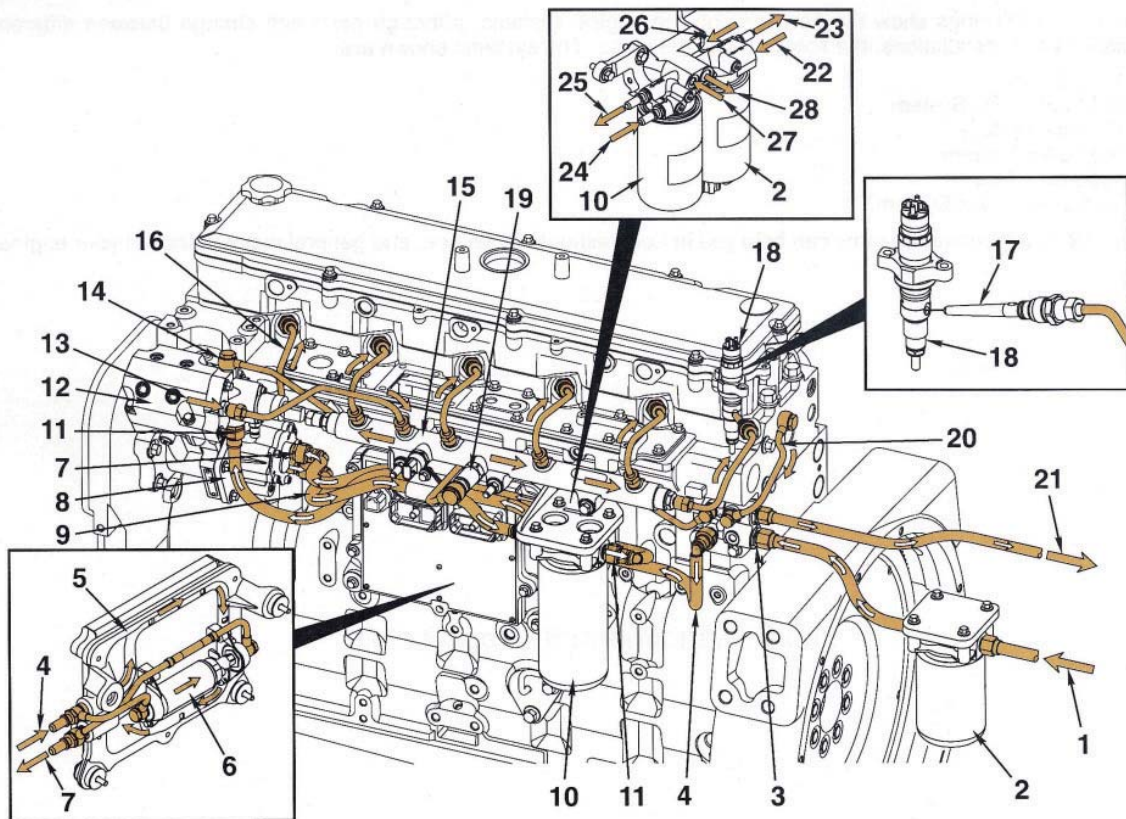
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- Direct 4-stroke, 6-cylinders, water-cooling and charge air cooled diesel engine in installed, cylinder block and cylinder head are made of case iron and turbocharger is attached.

## 2. SYSTEM DIAGRAMS

The following drawings show the flow through the engine systems.

### 1) FUEL SYSTEM

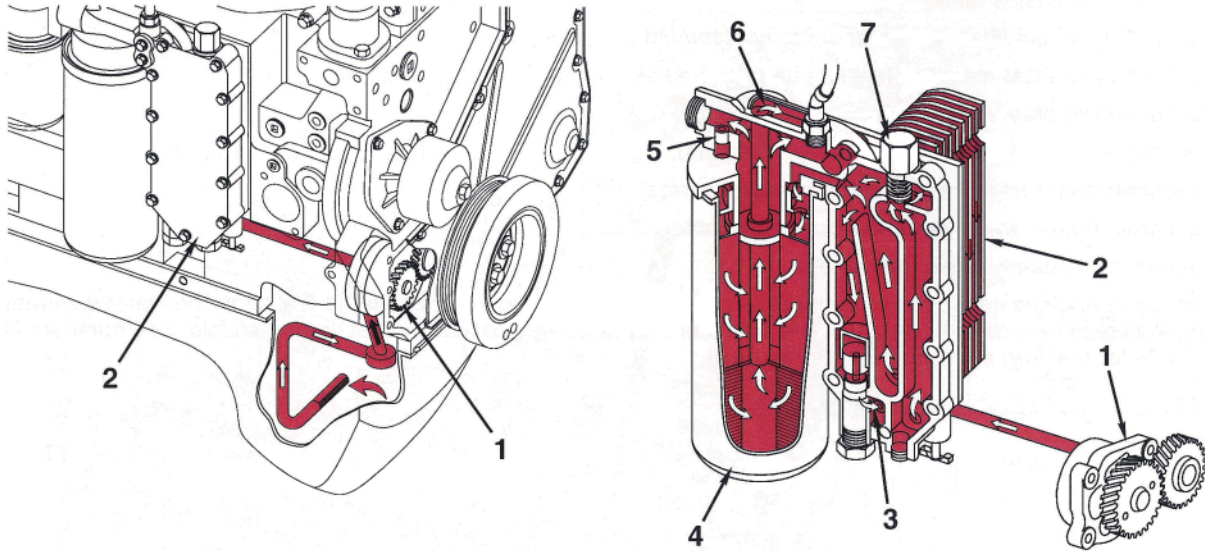


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- |    |   |    |  |
|----|---|----|--|
| 1  | Fuel from supply tank   | 15 | Fuel rail                                      |
| 2  | Fuel filter and water separator                               | 16 | High-pressure injector supply lines            |
| 3  | Fuel supply connection  | 17 | High-pressure fuel connector                   |
| 4  | Fuel supply to ECM mounted fuel lift pump                     | 18 | Fuel injector                                  |
| 5  | ECM cooling plate   | 19 | Fuel pressure relief valve                     |
| 6  | ECM mounted fuel lift pump                                    | 20 | Fuel injector drain flow line                  |
| 7  | Fuel outlet from ECM mounted fuel lift pump/fuel to gear pump | 21 | Fuel return to supply tanks                    |
| 8  | Fuel gear pump  | 22 | Fuel supply to fuel filter and water separator |
| 9  | Fuel from gear pump to fuel filter                            | 23 | Fuel supply to ECM mounted fuel lift pump      |
| 10 | Pressure-side fuel filter                                     | 24 | Fuel supply to pressure-side fuel filter       |
| 11 | Fuel to fuel pump actuator                                    | 25 | Fuel supply to high-pressure fuel pump         |
| 12 | High-pressure fuel pump                                       | 26 | Fuel drain from fuel rail and injector drains  |
| 13 | Fuel outlet from high-pressure pump                           | 27 | Fuel drain from high-pressure fuel pump        |
| 14 | High-pressure pump drain flow connection                      | 28 | Fuel return to supply tanks                    |

## 2) LUBRICATING OIL SYSTEM

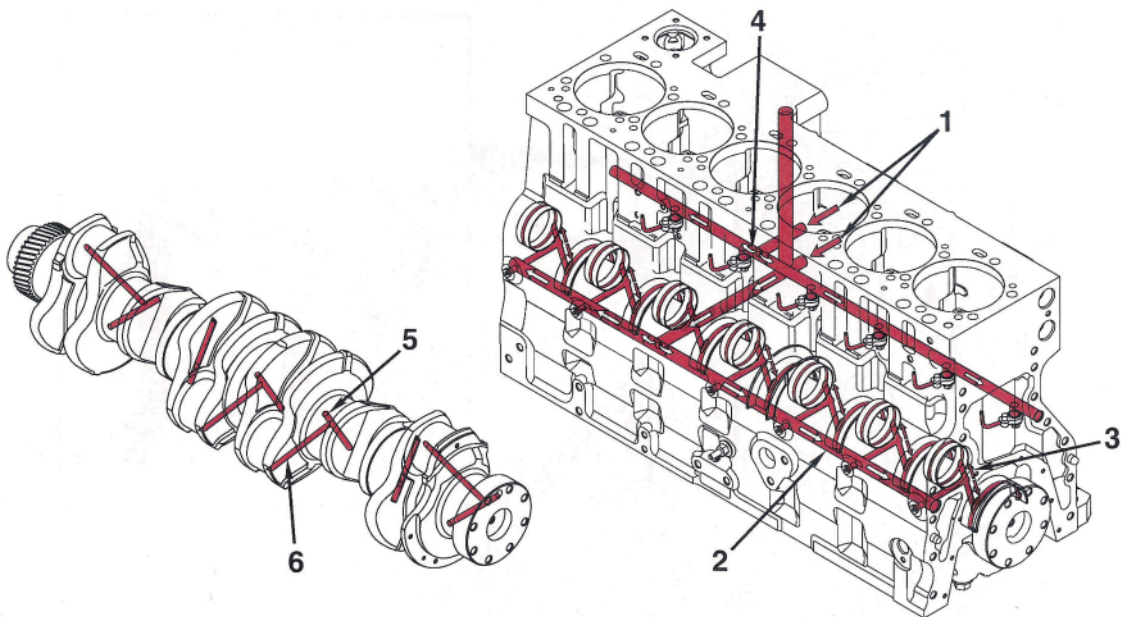
### (1) Lubricating oil cooler flow



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- |                                     |   |
|-------------------------------------|---|
| 1 Gerotor lubricating oil pump      | 5 Filter bypass valve                           |
| 2 Lubricating oil cooler            | 6 From lubricating oil filter to main oil rifle |
| 3 Bypass oil to lubricating oil pan | 7 Oil thermostat                                |
| 4 Full flow lubricating oil filter  |   |

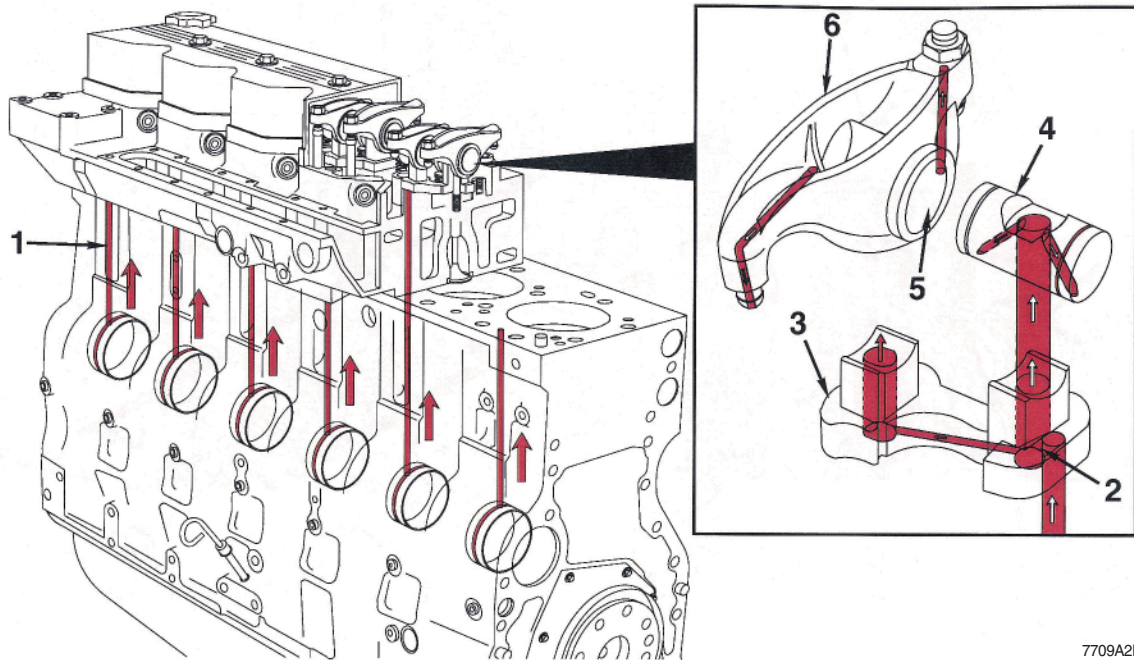
### (2) Lubrication for power components



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- |                               |                                   |
|-------------------------------|-----------------------------------|
| 1 From lubricating oil filter | 4 To piston cooling nozzle        |
| 2 Main lubricating oil rifle  | 5 From main lubricating oil rifle |
| 3 To camshaft                 | 6 To connecting rod bearing       |

### (3) Lubrication for the overhead

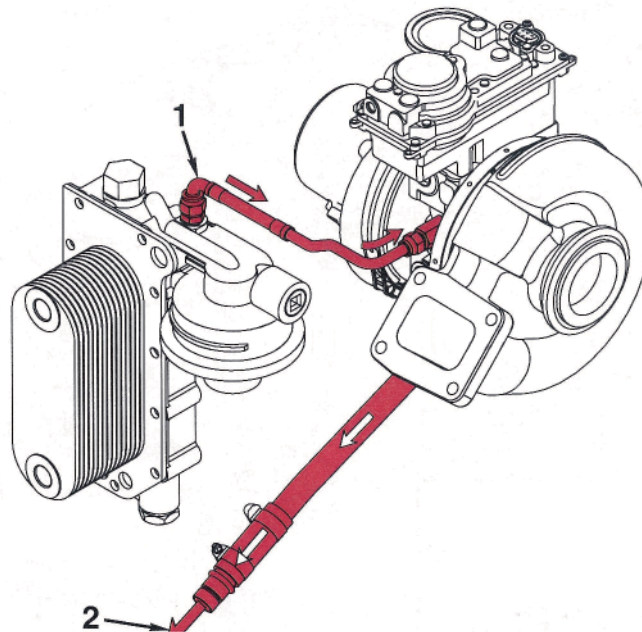


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- 1 From cam bushings
- 2 Transfer slot
- 3 Rocker lever support

- 4 Rocker lever shaft
- 5 Rocker lever bore
- 6 Rocker lever

### (4) Turbocharger oil flow

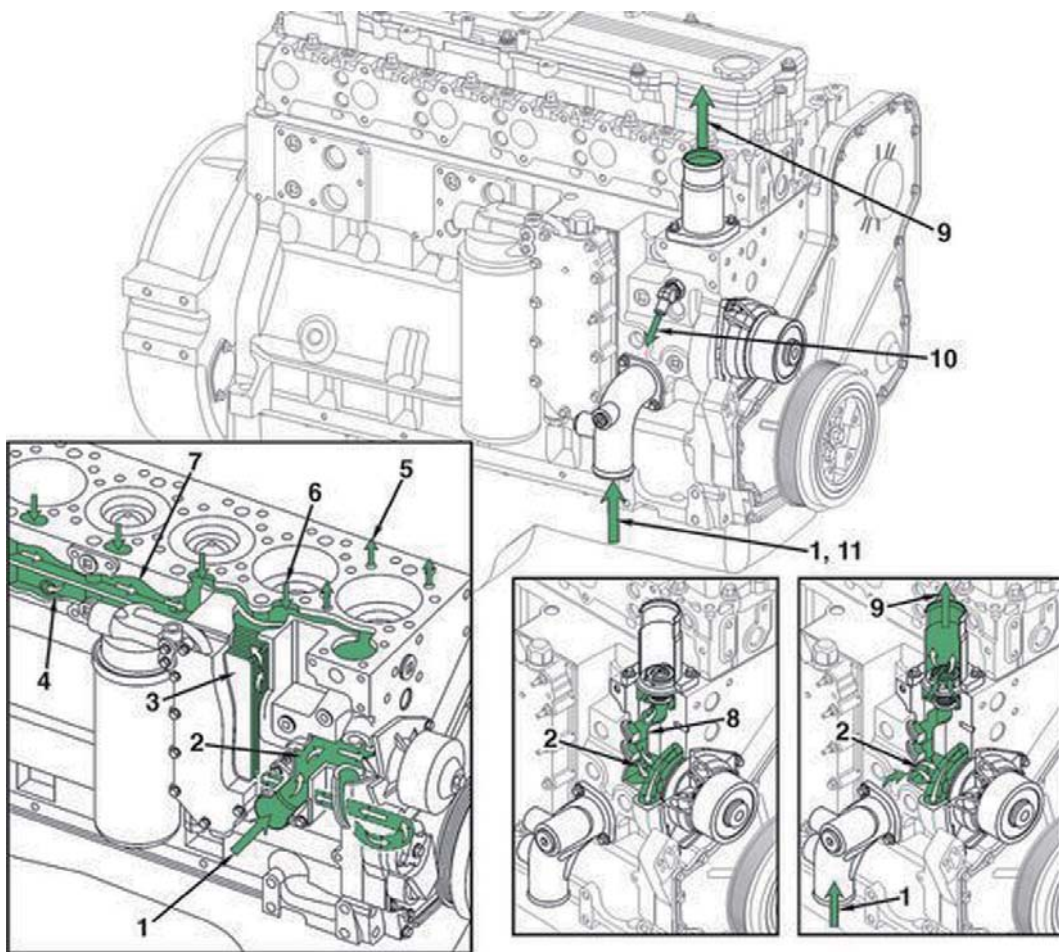


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- 1 Turbocharger oil supply from oil filter head

- 2 Turbocharger oil drain to cylinder block

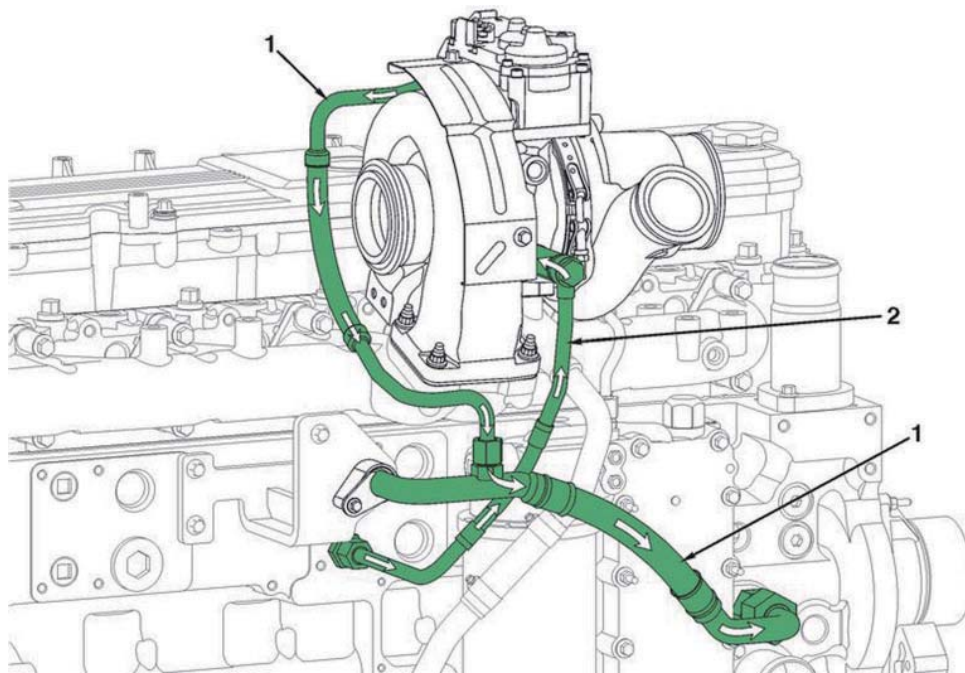
### 3) COOLING SYSTEM



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- 1 Water/coolant inlet from radiator
- 2 Water pump suction
- 3 Coolant flow through lubricating oil cooler
- 4 Block lower water manifold (to cylinders)
- 5 Coolant supply to cylinder head
- 6 Coolant return from cylinder head
- 7 Block upper water manifold
- 8 Thermostat bypass
- 9 Coolant return to radiator
- 10 Optional torque converter coolant supply from cylinder block with thermostat closed
- 11 Optional torque converter coolant return to water/coolant inlet connection

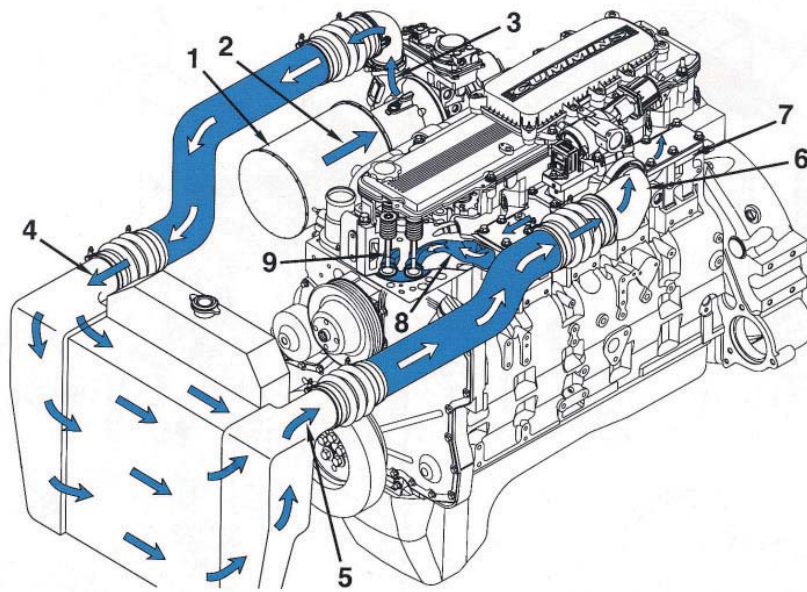
## COOLING SYSTEM



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- 1 Coolant drain to the water pump inlet from the variable geometry turbocharger (VGT) actuator
- 2 Coolant vent line to variable geometry turbocharger from the cylinder block

#### 4) AIR INTAKE SYSTEM

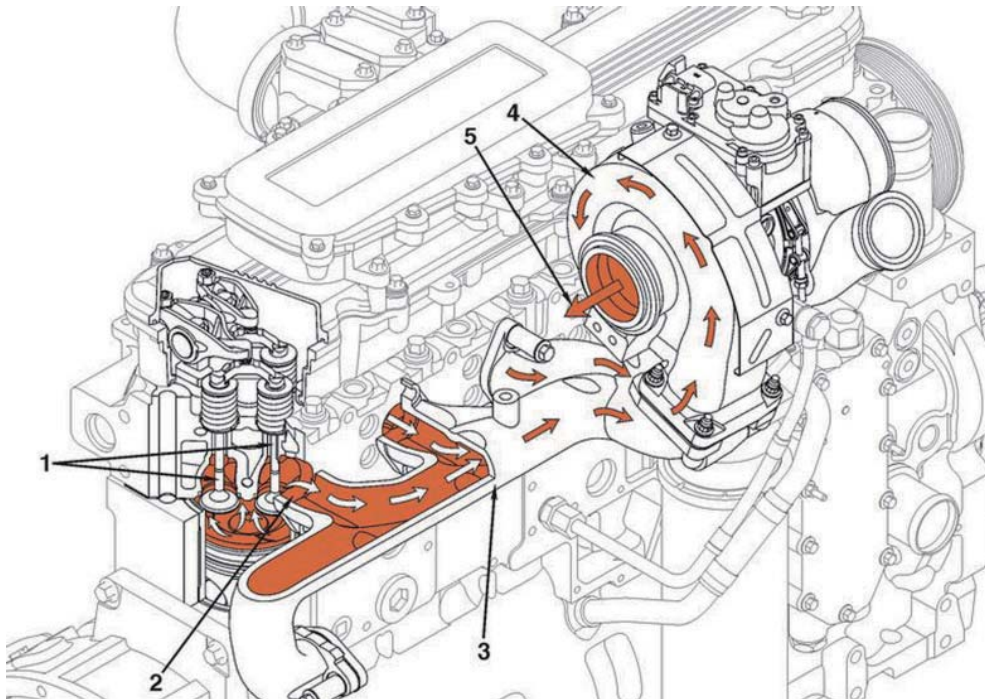


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- |   |                                |   |   |
|---|--------------------------------|---|---|
| 1 | Air cleaner                    | 6 | Air intake connection                                   |
| 2 | Turbocharger compressor inlet  | 7 | Intake manifold<br>(Integral part of the cylinder head) |
| 3 | Turbocharger compressor outlet | 8 | Intake port   |
| 4 | Charge air cooler inlet        | 9 | Intake valve  |
| 5 | Charge air cooler outlet       |   |   |



## 5) EXHAUST SYSTEM



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- |   |                  |   |                                      |
|---|------------------|---|--------------------------------------|
| 1 | Exhaust valves   | 4 | Turbocharger                         |
| 2 | Exhaust port     | 5 | Turbocharger exhaust outlet          |
| 3 | Exhaust manifold | 6 | Exhaust restrictor plate (not shown) |

## GROUP 2 ENGINE SPEED & STALL RPM

### 1. TEST CONDITION

1) Normal temperature of the whole system

- Coolant : Approx 80°C (176°F)
- Hydraulic oil : 45 ± 5°C (113 ± 10°F)
- Transmission oil : 75 ± 5°C (167 ± 10°F)

2) Normal operating pressure : See page 6-57.

### 2. SPECIFICATION

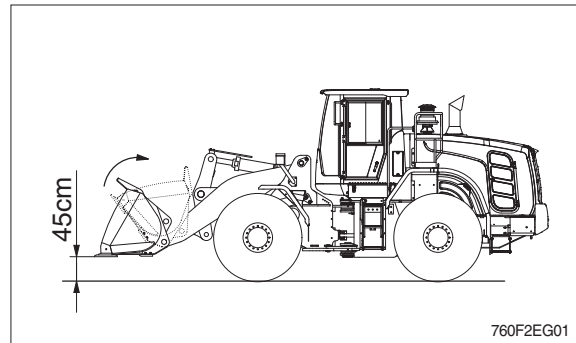
Engine speed, rpm (P mode)						Remark
Low idle	High idle	Pump stall	Converter stall	Full stall	Fan motor	
800 ± 25	2130 ± 50	2130 ± 70	1880 ± 70 (4-speed) 1740 ± 100 (5-speed)	1840 ± 100 (4-speed) 1740 ± 100 (5-speed)	950 ± 50	

### 3. ENGINE RPM CHECK

Remark : If the checked data is not normal, it indicates that the related system is not working properly. Therefore, it is required to check the related system pressure : See page 6-57.

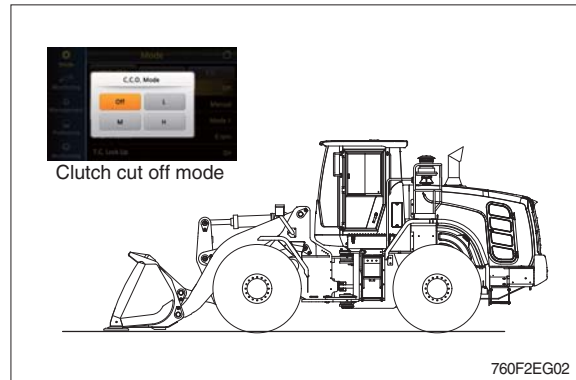
#### 1) Pump stall rpm

- Start the engine and raise the bucket approx 45 cm (1.5 ft) as the figure.
- Press the accelerator pedal fully and operate the bucket control lever to the retract position fully.
- Check the engine rpm at the above condition.



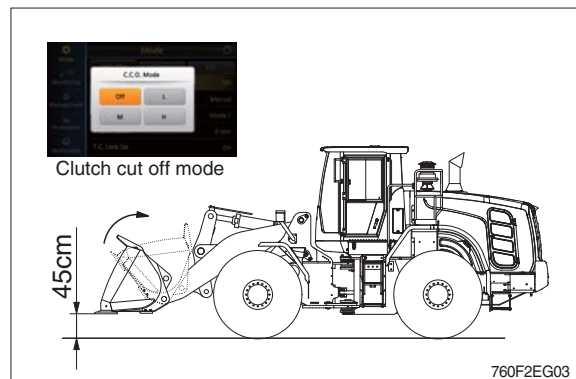
#### 2) Converter stall rpm

- Start the engine and lower the bucket on the ground as the figure.
- Set the clutch cut off mode at the OFF position.
- Press the brake pedal and accelerator pedal fully.
- Shift the transmission lever to the 4th forward position.
- Check the engine rpm at the above condition.



#### 3) Full stall rpm

- Start the engine and raise the bucket approx 45 cm (1.5 ft) as the figure.
- Set the clutch cut off mode at the OFF position.
- Press the brake pedal and accelerator pedal fully.
- Shift the transmission lever to the 4th forward position and operate the bucket lever to the retract position fully.
- Check the engine rpm at the above condition.



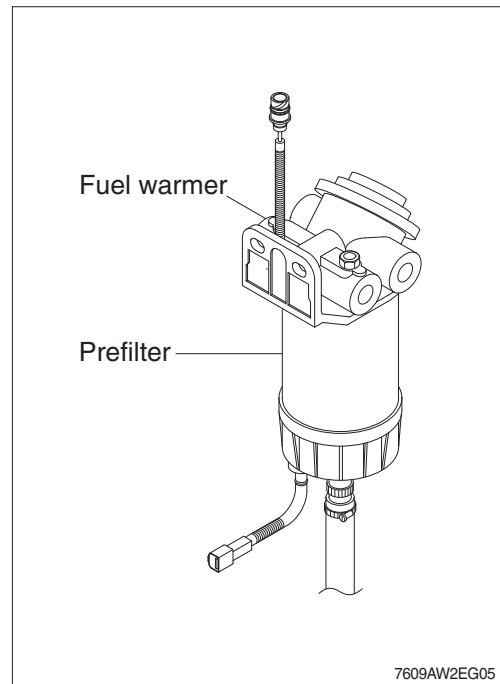
## GROUP 3 FUEL WARMER SYSTEM

### 1. SPECIFICATION

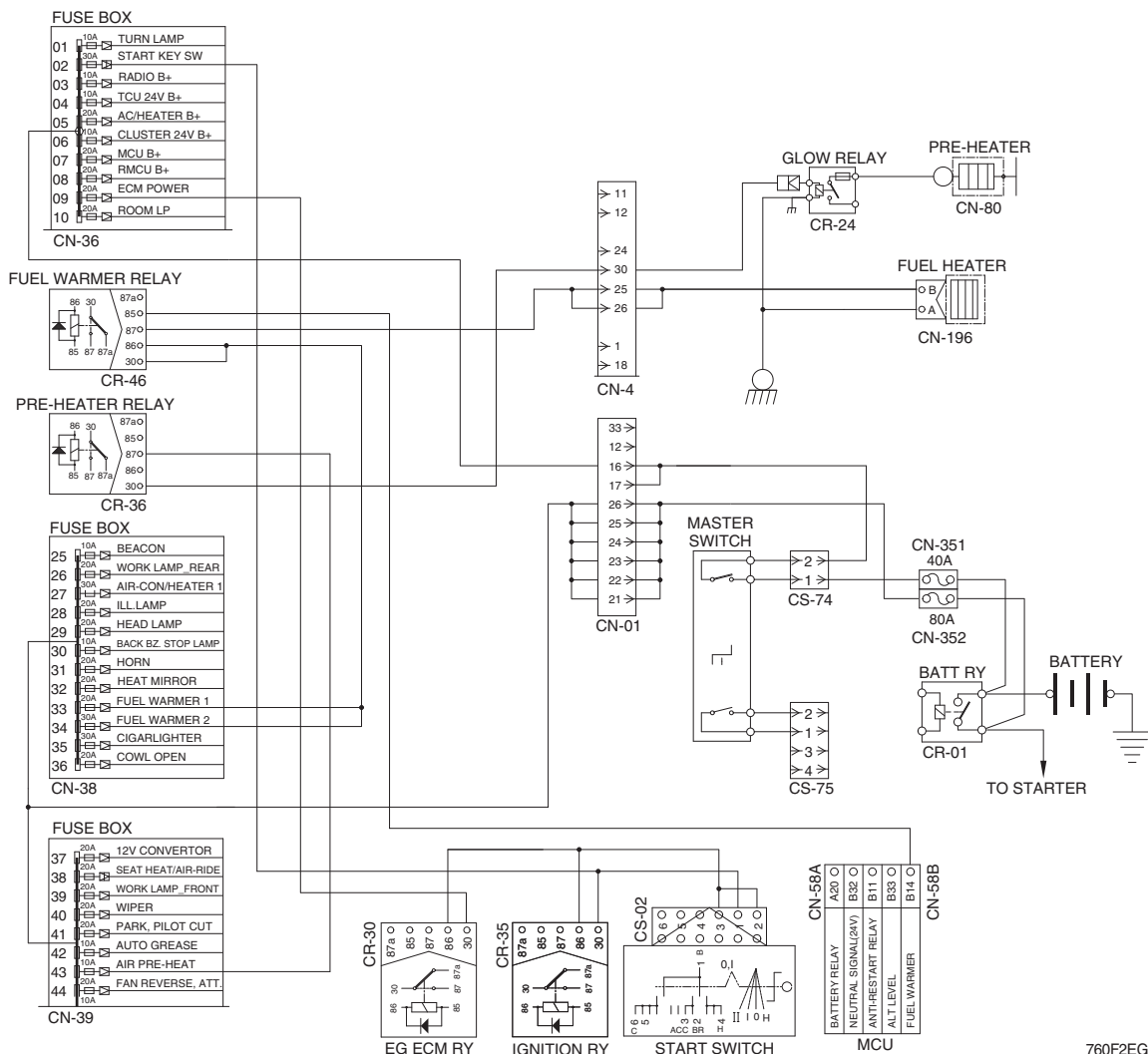
- 1) Operating voltage :  $24 \pm 4V$
- 2) Power :  $350 \pm 50W$
- 3) Current : 15A

### 2. OPERATION

- 1) The current of fuel warmer system is automatically controlled without thermostat according to fuel temperature.
- 2) At the first state, the 15A current flows to the fuel warmer and engine may be started in 1~2 minutes.
- 3) If the fuel starts to flow, ceramic-disk in the fuel warmer heater senses the fuel temperature to reduce the current as low as 1.5A.  
So, fuel is protected from overheating by this mechanism.



### 3. ELECTRIC CIRCUIT



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