

## SECTION 2 ENGINE

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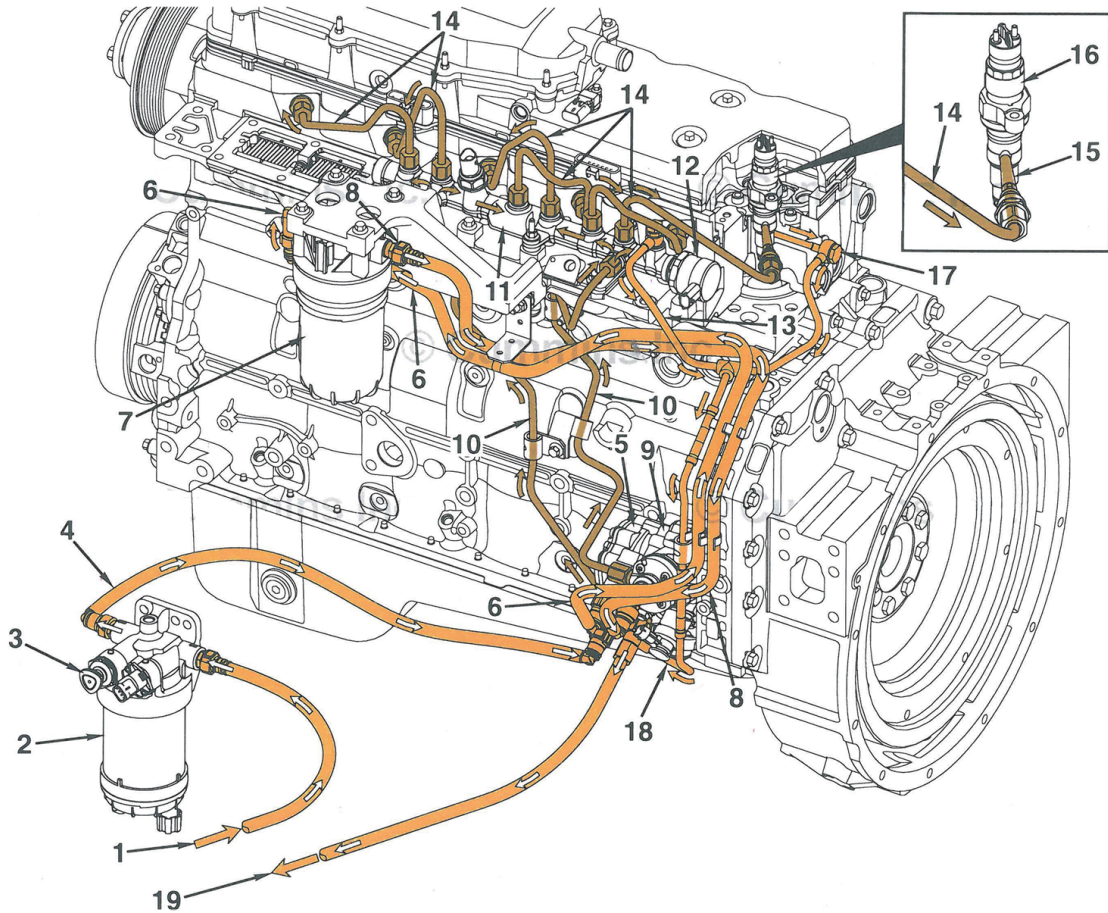
## SECTION 2 ENGINE

### GROUP 1 STRUCTURE AND FUNCTION

#### 1. SYSTEM DIAGRAMS

The following drawings show the flow through the engine systems.

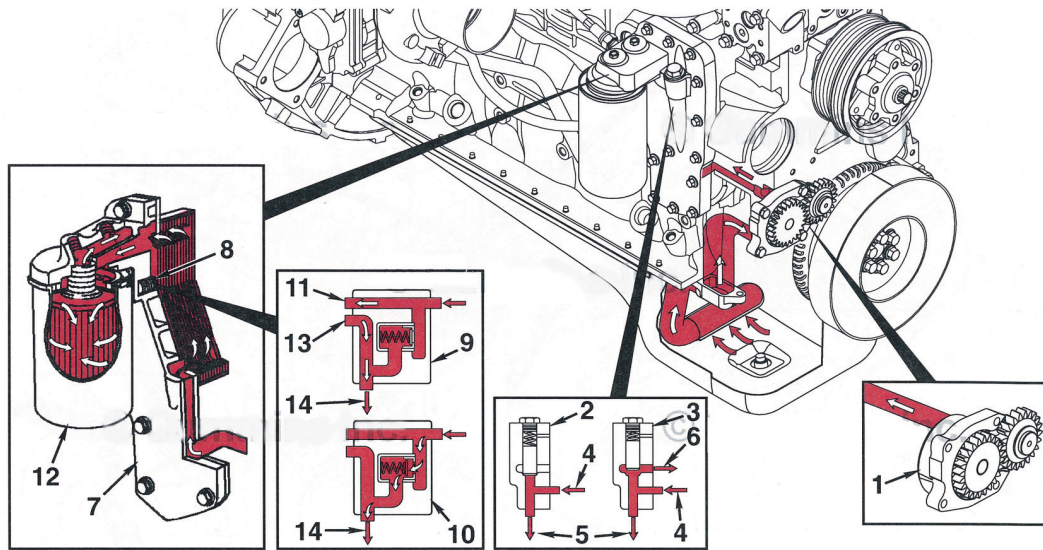
##### 1) FUEL SYSTEM



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- |    |                               |    |                                     |
|----|-------------------------------|----|-------------------------------------|
| 1  | Fuel from supply tank         | 11 | Fuel rail                           |
| 2  | Water/fuel separator filter   | 12 | Fuel rail pressure relief valve     |
| 3  | Priming pump                  | 13 | Common rail fuel return             |
| 4  | Fuel supply to fuel gear pump | 14 | High-pressure fuel line to injector |
| 5  | Fuel gear pump                | 15 | High-pressure connector             |
| 6  | To pressure side fuel filter  | 16 | Injector                            |
| 7  | Pressure side fuel filter     | 17 | Fuel return from injectors          |
| 8  | To high-pressure fuel pump    | 18 | Combined fuel return                |
| 9  | High-pressure fuel pump       | 19 | Fuel return to fuel supply tank     |
| 10 | To fuel rail                  |    |                                     |

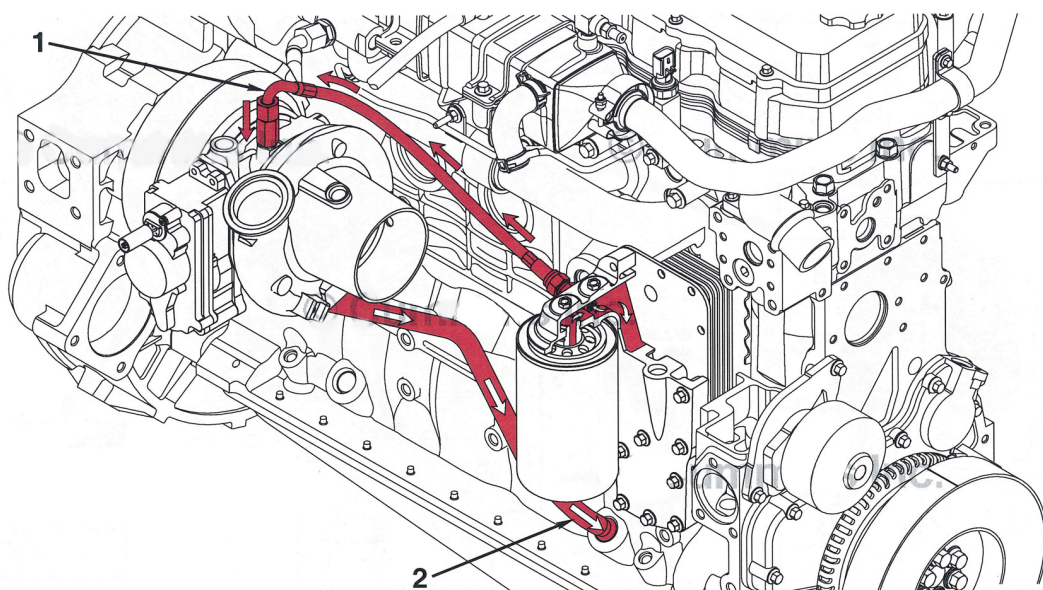
## 2) LUBRICATING OIL SYSTEM



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- |   |                                  |    |                                  |
|---|----------------------------------|----|----------------------------------|
| 1 | Lubricating oil pump             | 8  | Filter bypass valve              |
| 2 | Pressure regulating valve closed | 9  | Filter bypass valve closed       |
| 3 | Pressure regulating valve open   | 10 | Filter bypass valve open         |
| 4 | From lubricating oil pump        | 11 | To lubricating oil filter        |
| 5 | To lubricating oil cooler        | 12 | Full-flow lubricating oil filter |
| 6 | To lubricating oil pan           | 13 | From lubricating oil filter      |
| 7 | Lubricating oil cooler           | 14 | To main lubricating oil rifle(s) |

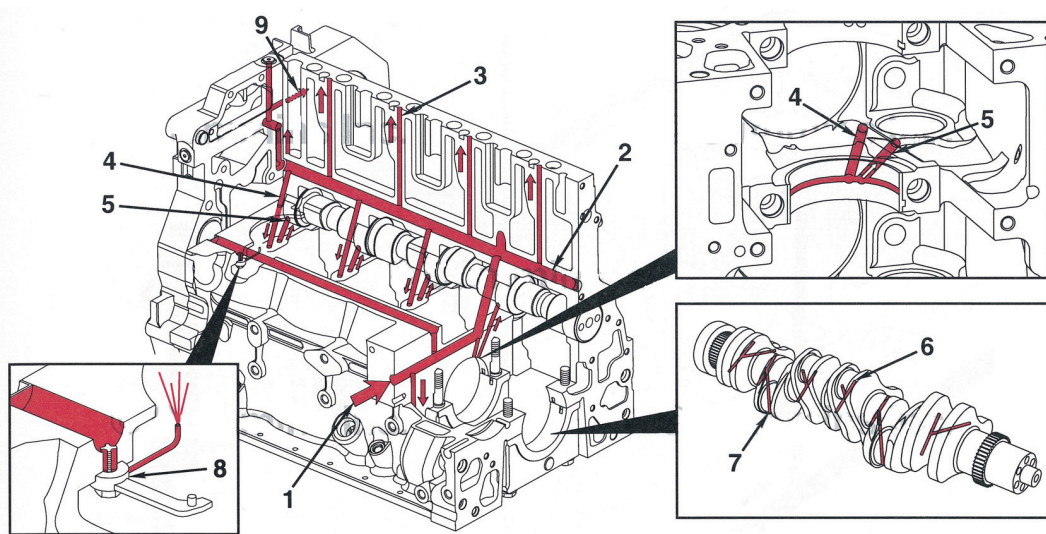
### (1) Lubrication for the turbocharger



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- |   |                                     |   |                                    |
|---|-------------------------------------|---|------------------------------------|
| 1 | Turbocharger lubricating oil supply | 2 | Turbocharger lubricating oil drain |
|---|-------------------------------------|---|------------------------------------|

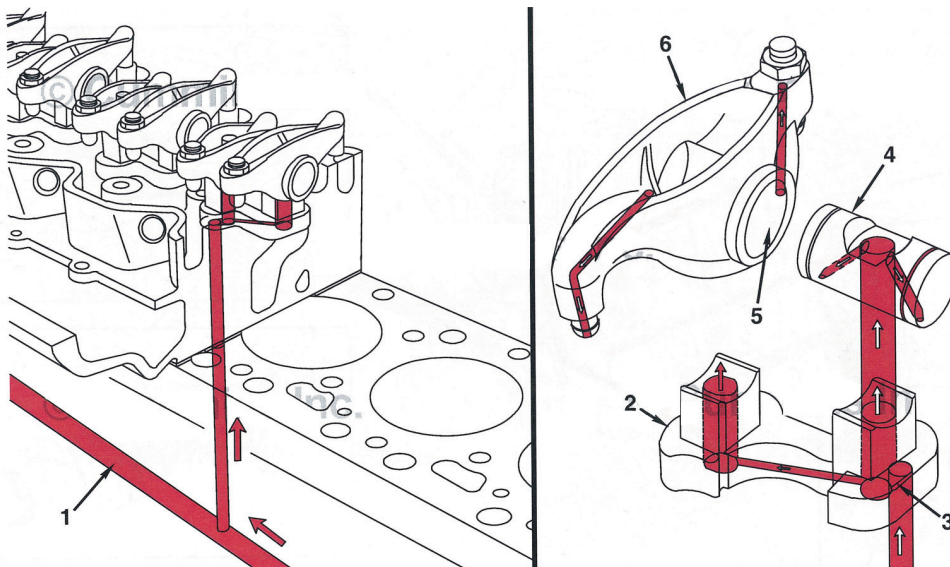
## (2) Lubrication for the power components



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- |   |                             |   |   |
|---|-----------------------------|---|---|
| 1 | From lubricating oil cooler | 6 | Oil supply to rod bearings                              |
| 2 | Main lubricating oil rifle  | 7 | Crankshaft cross drilling from the main bearing journal |
| 3 | To overhead components      | 8 | J-jet piston-cooling nozzle                             |
| 4 | To upper main bearing       | 9 | To accessory drive oil feed                             |
| 5 | To camshaft journal         |   |   |

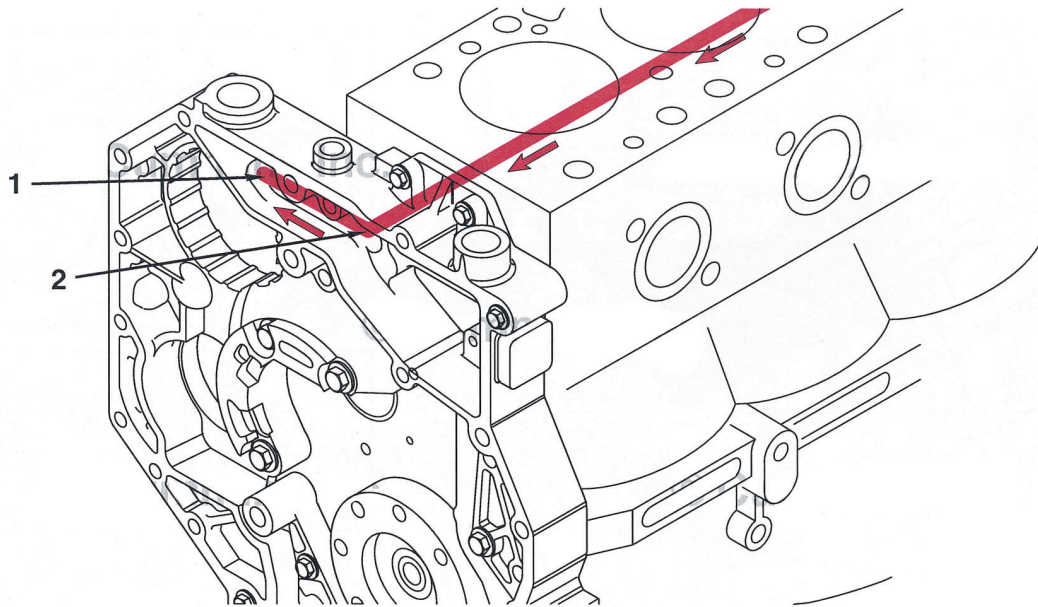
## (3) Lubrication for the overhead components



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- |   |                            |   |                    |
|---|----------------------------|---|--------------------|
| 1 | Main lubricating oil rifle | 4 | Rocker lever shaft |
| 2 | Rocker lever support       | 5 | Rocker lever bore  |
| 3 | Transfer slot              | 6 | Rocker lever       |

#### (4) Lubrication for the accessory drive



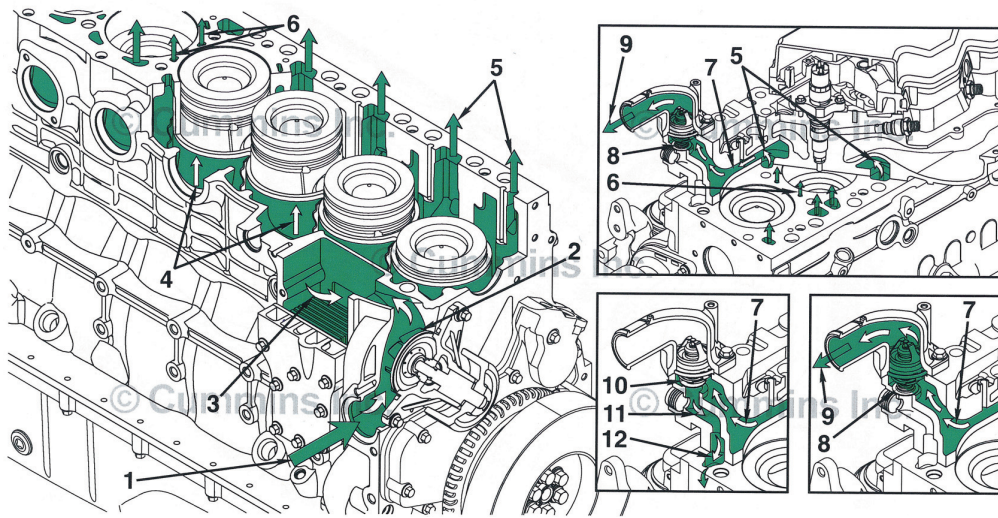
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1 Oil supply to accessory drive

2 Oil feed from block

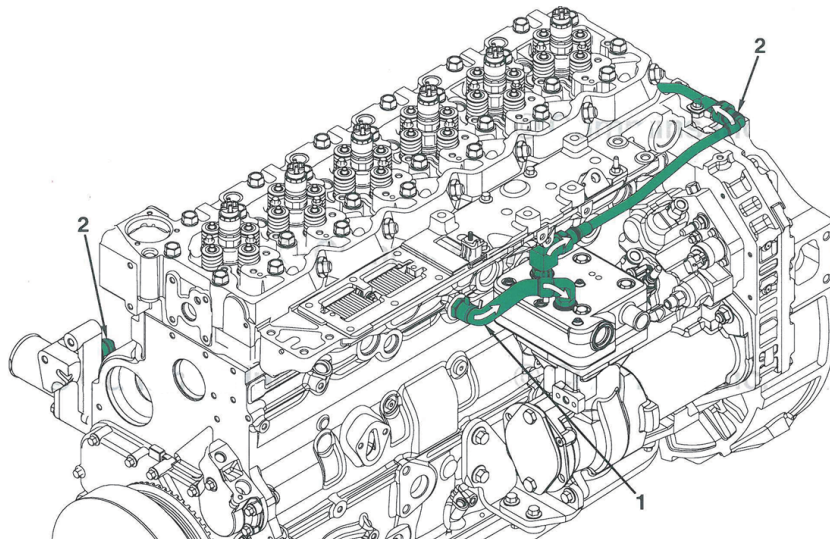
※ Oil returns to pan through the gear housing.

### 3) COOLING SYSTEM



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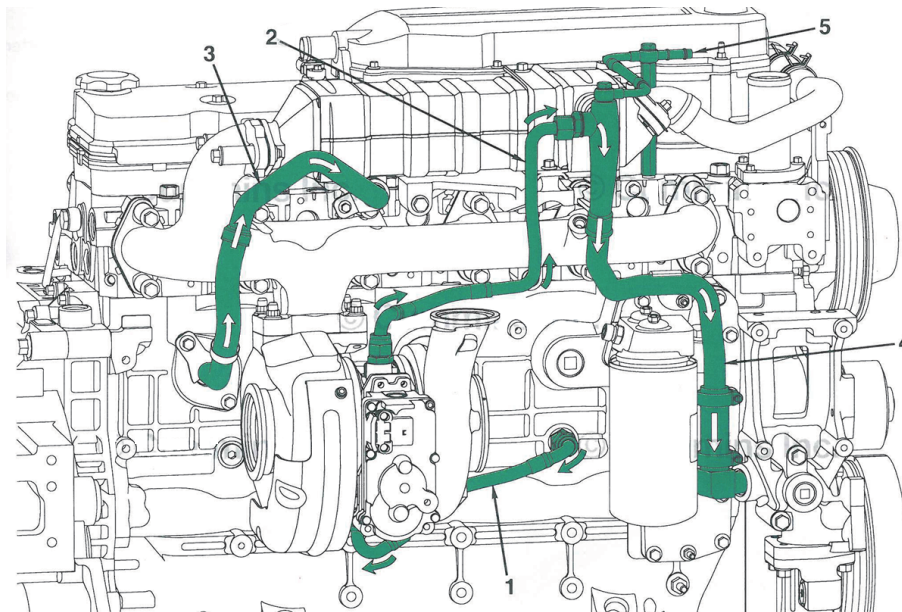
- |   |   |    |   |
|---|---|----|---|
| 1 | Coolant inlet from radiator and aftertreatment diesel exhaust fluid (DEF) dosing valve and DEF tank | 7  | Coolant flow to thermostat housing      |
| 2 | Water pump Impeller   | 8  | Thermostat open - bypass passage closed |
| 3 | Coolant flow past lubricating oil cooler  | 9  | Coolant flow back to radiator           |
| 4 | Coolant flow past cylinders   | 10 | Thermostat closed - bypass passage open |
| 5 | Coolant flow from cylinder block to cylinder head   | 11 | Coolant bypass passage in cylinder head |
| 6 | Coolant flow between cylinders  | 12 | Coolant flow to water pump inlet        |



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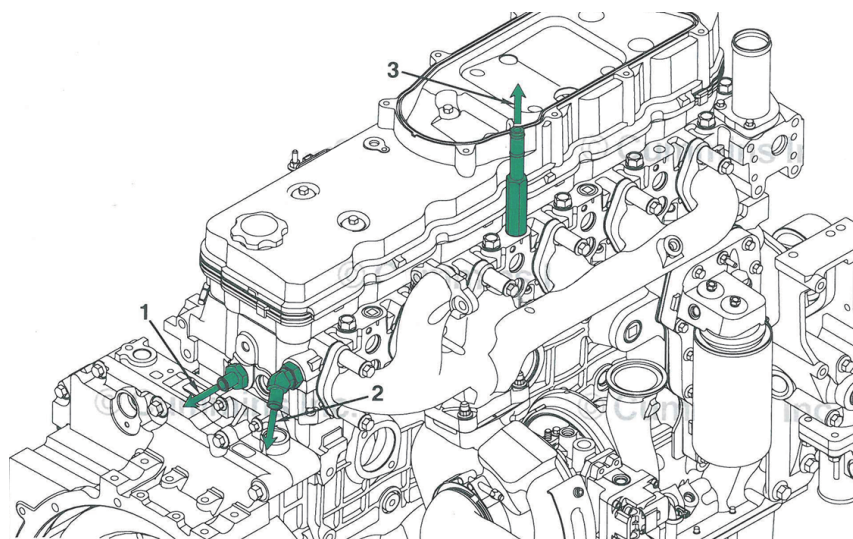
- |   |   |
|---|---|
| 1 | Air compressor coolant supply line                        |
| 2 | Air compressor coolant return to coolant inlet connection |

## COOLING SYSTEM



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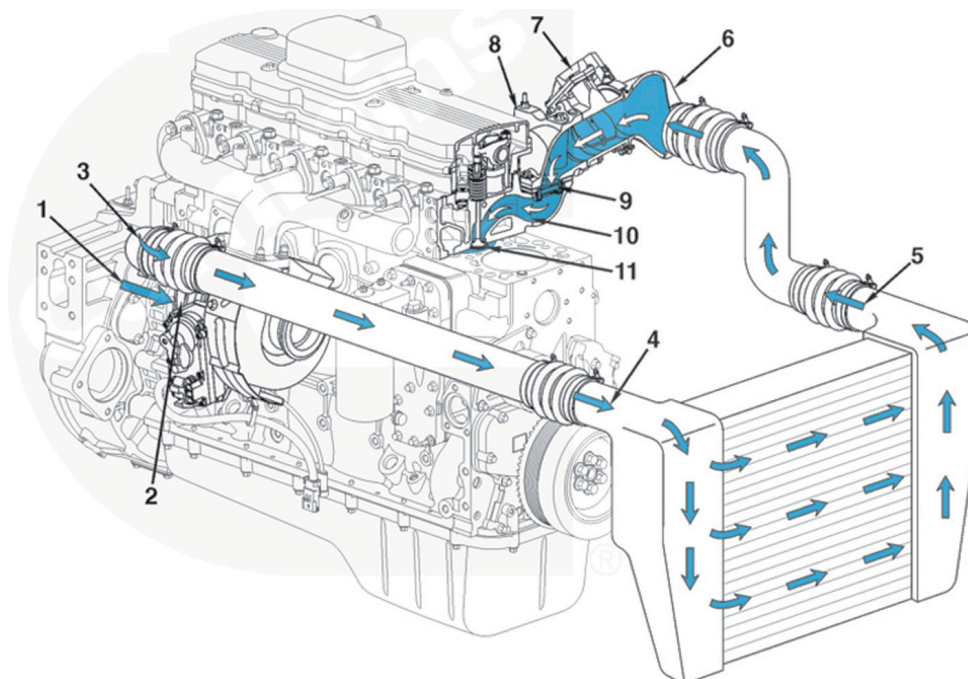
- 1 Coolant supply to variable geometry turbocharger from the cylinder block
- 2 Variable geometry turbocharger coolant return to the EGR cooler outlet tube
- 3 Coolant supply to the EGR cooler from the rear of the cylinder block
- 4 EGR cooler coolant return to the coolant inlet connection
- 5 De-aeration port (to coolant top tank)



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- 1 Coolant supply to aftertreatment DEF dosing valve and DEF tank
- 2 Coolant supply to cab heater
- 3 De-aeration port (to coolant top tank)

#### 4) AIR INTAKE SYSTEM

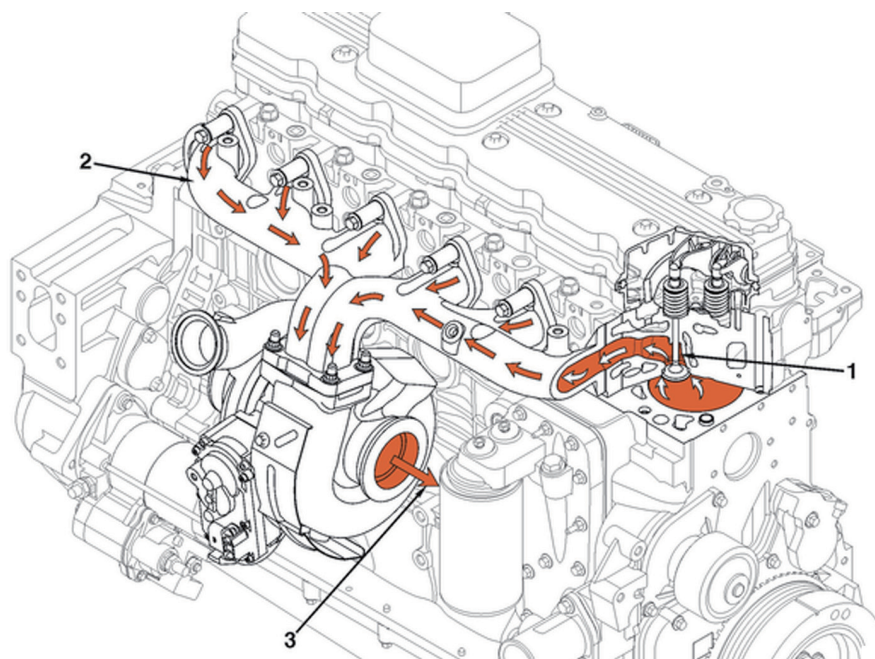


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- |   |                                |    |                       |
|---|--------------------------------|----|-----------------------|
| 1 | Air cleaner                    | 7  | Intake air throttle   |
| 2 | Turbocharger compressor inlet  | 8  | Air intake connection |
| 3 | Turbocharger compressor outlet | 9  | Intake manifold       |
| 4 | Charge air cooler inlet        | 10 | Intake port           |
| 5 | Charge air cooler outlet       | 11 | Intake valves         |
| 6 | Air intake connection adapter  |    |                       |



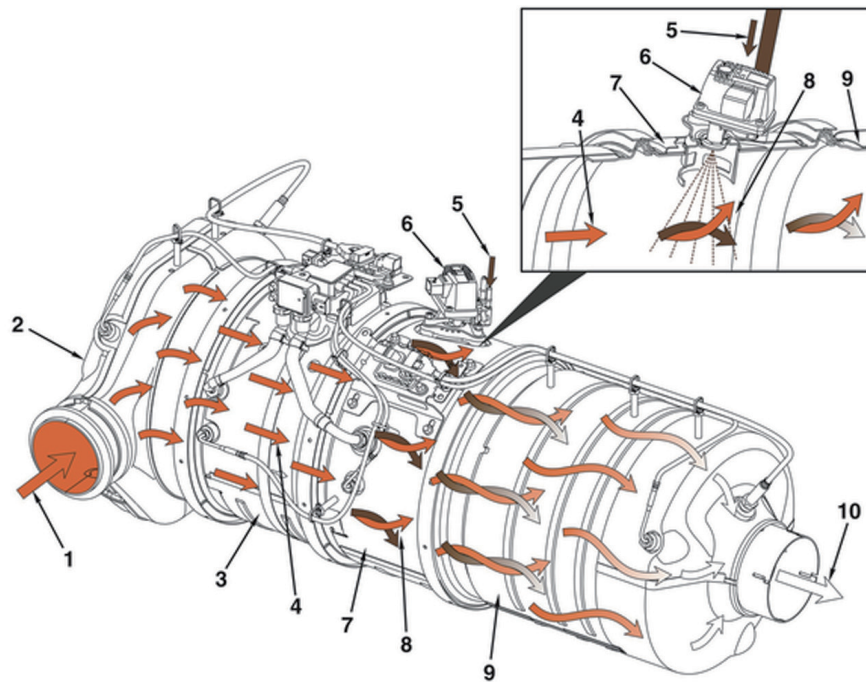
## 5) EXHAUST SYSTEM



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- 1 Exhaust valve port
- 2 Exhaust manifold
- 3 Exhaust gas to aftertreatment system

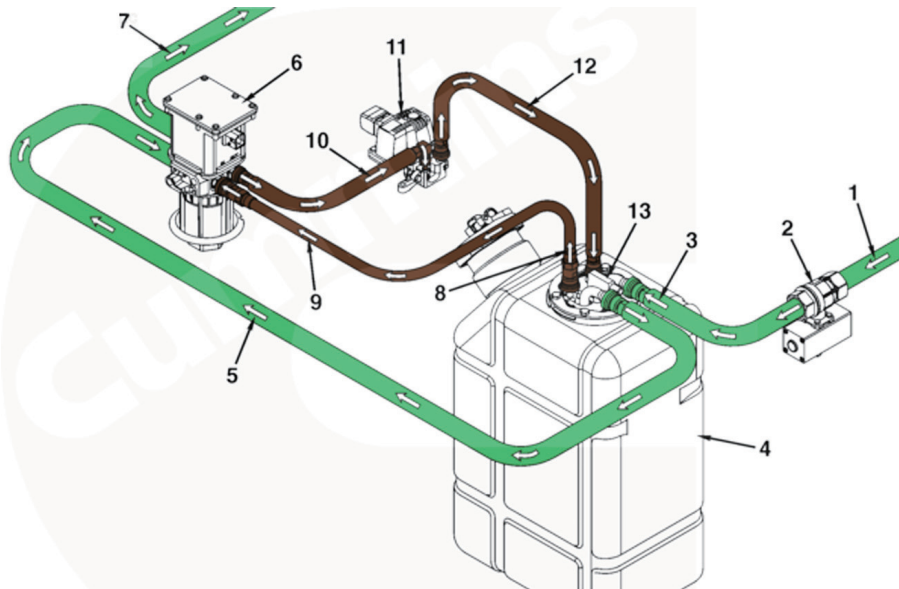
## EXHAUST SYSTEM



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- 1 Exhaust flow from turbocharger
- 2 Aftertreatment DOC
- 3 Aftertreatment DPF
- 4 Exhaust gas flow from the DPF
- 5 DEF supply to the aftertreatment DEF dosing valve
- 6 Aftertreatment DEF dosing valve
- 7 Decomposition reactor
- 8 Exhaust and DEF mixture
- 9 Aftertreatment SCR catalyst
- 10 Exhaust flow exiting aftertreatment system

## EXHAUST SYSTEM



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- 1 Coolant flow from engine to aftertreatment DEF tank heater control valve
- 2 Aftertreatment DEF tank heater coolant valve
- 3 Coolant flow to aftertreatment DEF tank
- 4 Aftertreatment DEF tank
- 5 Coolant flow to aftertreatment DEF dosing unit
- 6 Aftertreatment DEF dosing unit
- 7 Coolant return to engine
- 8 Aftertreatment DEF supply from aftertreatment DEF tank
- 9 Aftertreatment DEF flow to aftertreatment DEF dosing unit
- 10 Aftertreatment DEF flow to aftertreatment DEF dosing valve
- 11 Aftertreatment DEF dosing valve
- 12 Aftertreatment DEF return to the aftertreatment DEF tank
- 13 Aftertreatment DEF quality temperature, level, and sensor(s).

## 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 6-53.

### 2. SPECIFICATION

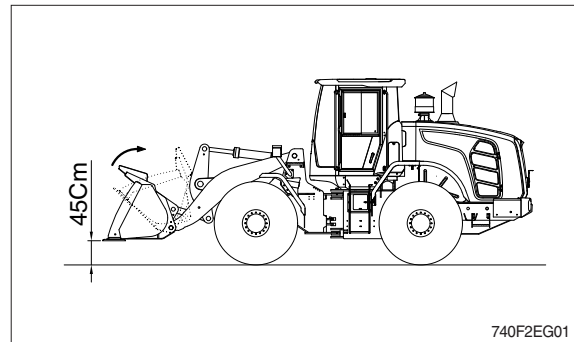
Engine speed, rpm (P mode)						Remark
Low idle	High idle	Pump stall	Converter stall	Full stall	Fan motor	
800±25	2230±50	2220±70	1900±70	1860±100	950±50	

### 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 6-51.

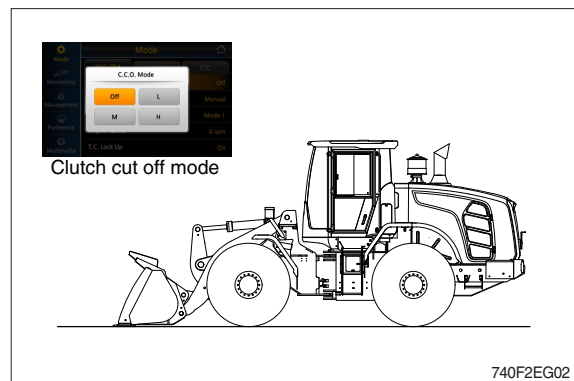
#### 1) Pump stall rpm

- 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.



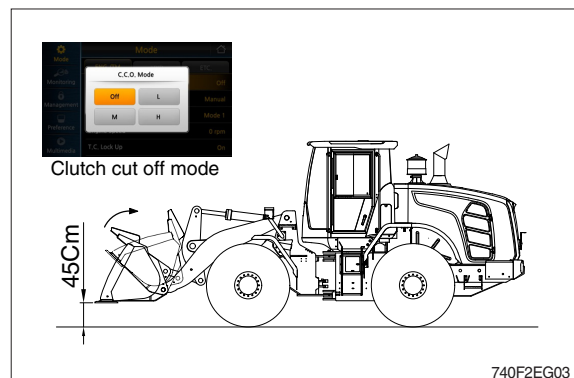
#### 2) Converter stall rpm

- 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.



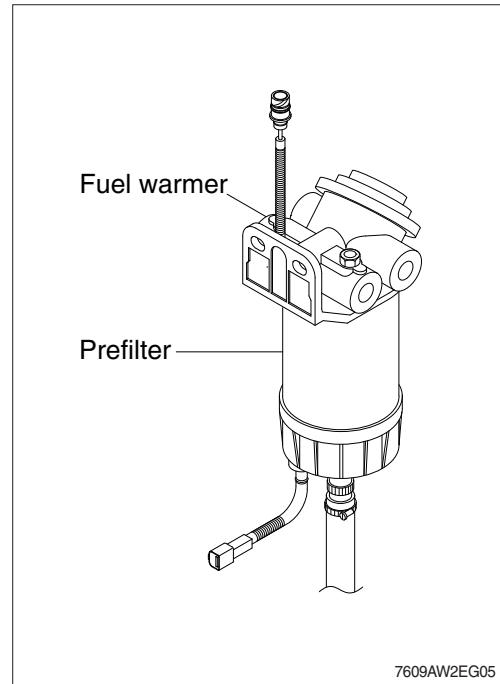
# GROUP 3 FUEL WARMER SYSTEM

## 1. SPECIFICATION

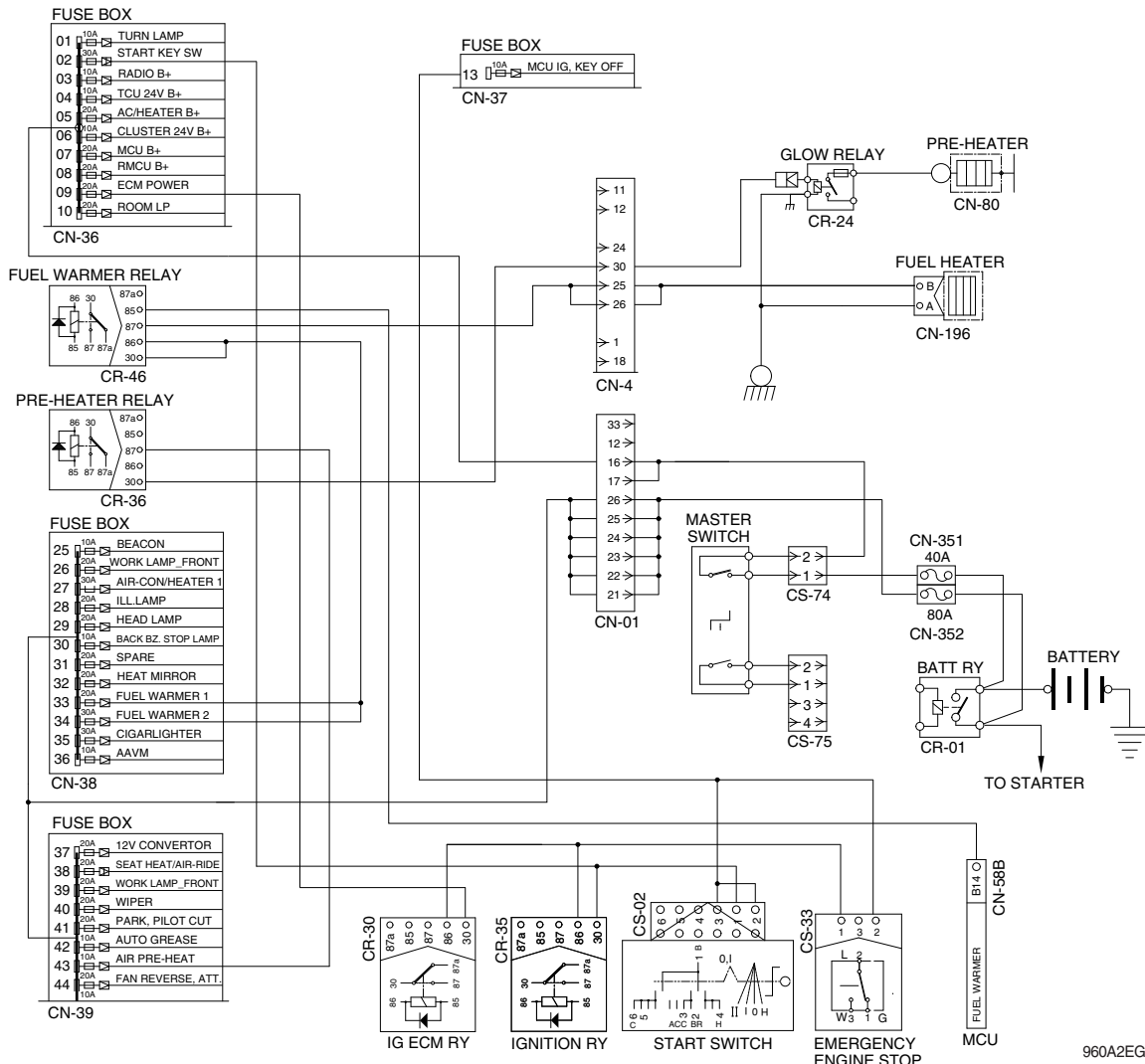
- 1) Operating voltage :  $24 \pm 4V$
- 2) Power :  $350 \pm 50W$
- 3) Current : 15A

## 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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