

SECTION 2 ENGINE

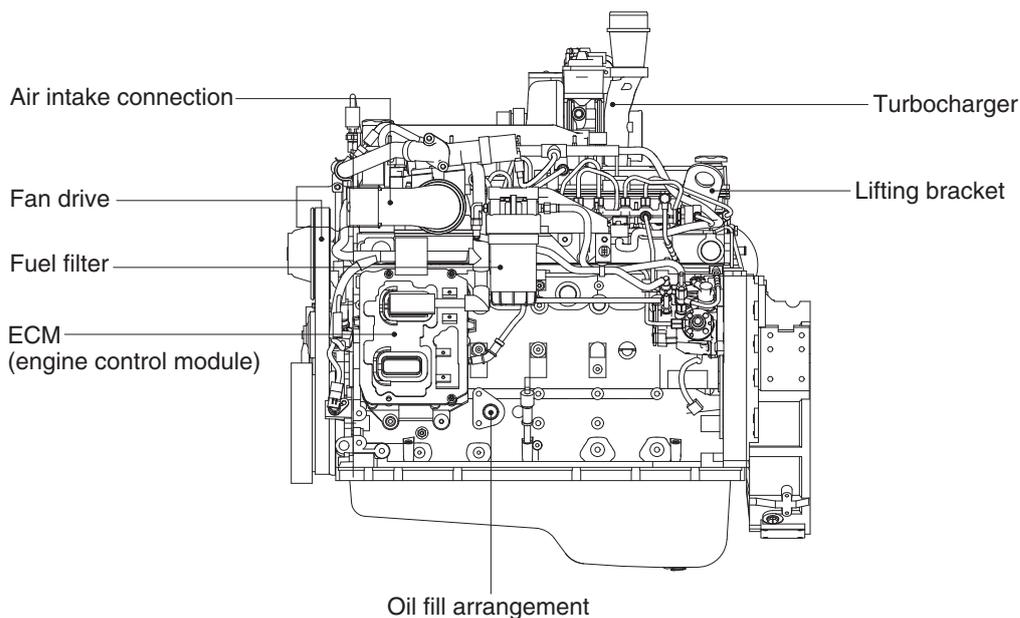
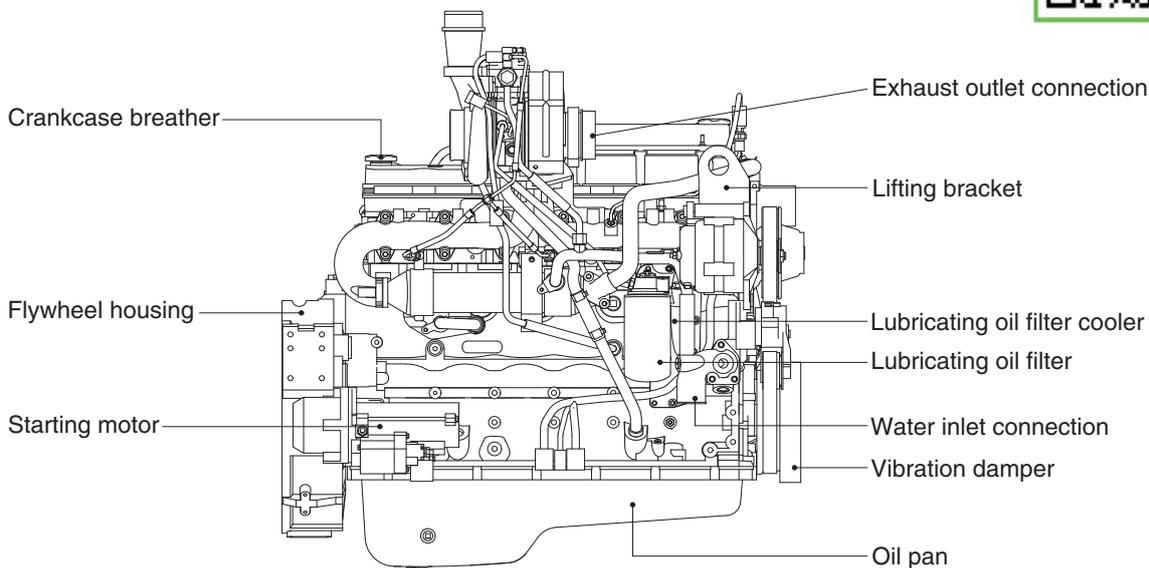
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SECTION 2 ENGINE

GROUP 1 STRUCTURE AND FUNCTION



1. STRUCTURE



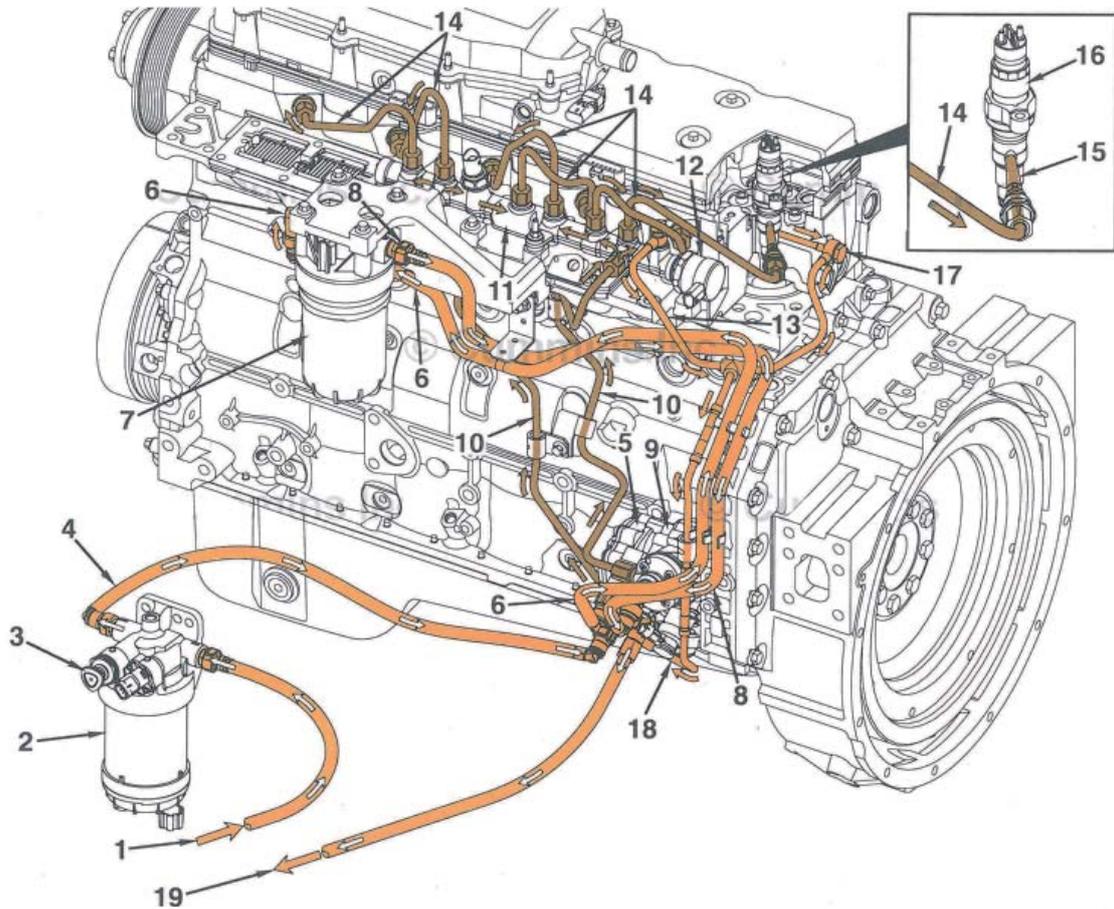
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- Direct 4-stroke, 6-cylinders, water-cooling and charge air cooled diesel engine in installed, cylinder block and cylinder head are made of case iron and turbocharger is attached.

2. SYSTEM DIAGRAMS

The following drawings show the flow through the engine systems.

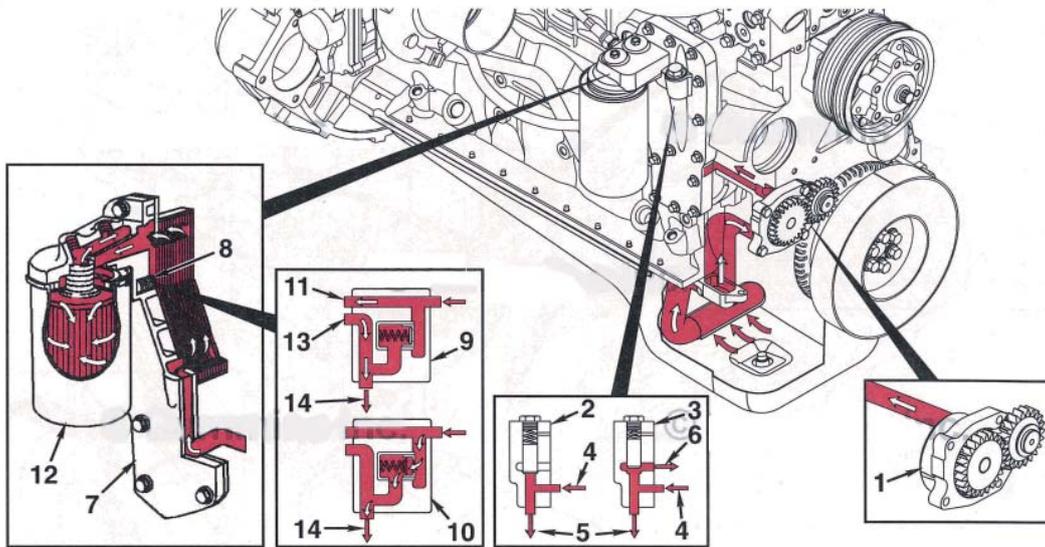
1) FUEL SYSTEM



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- | | | | |
|----|-------------------------------|----|-------------------------------------|
| 1 | Fuel from supply tank | 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 | | |

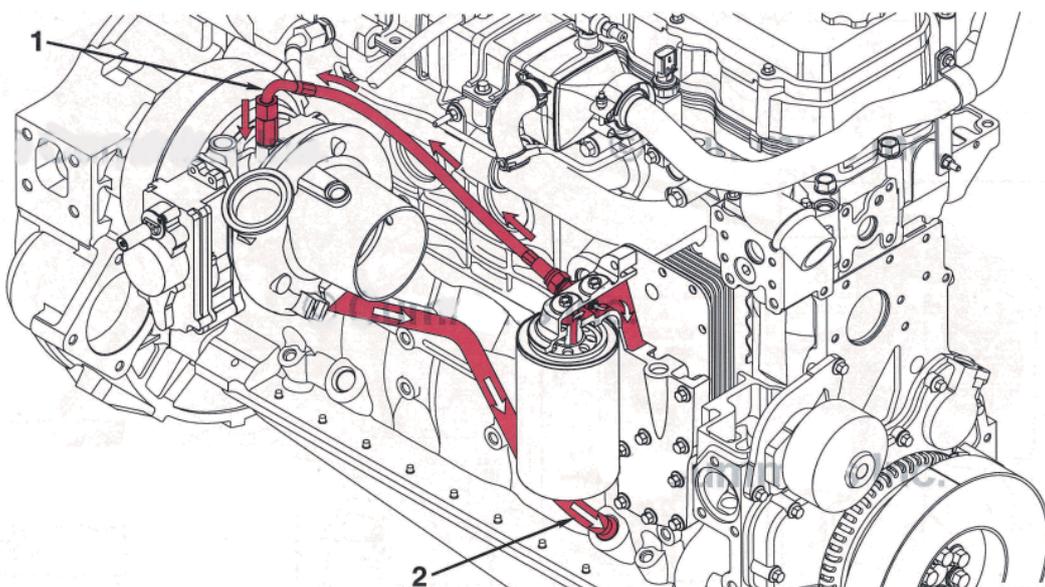
2) LUBRICATING OIL SYSTEM



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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) |

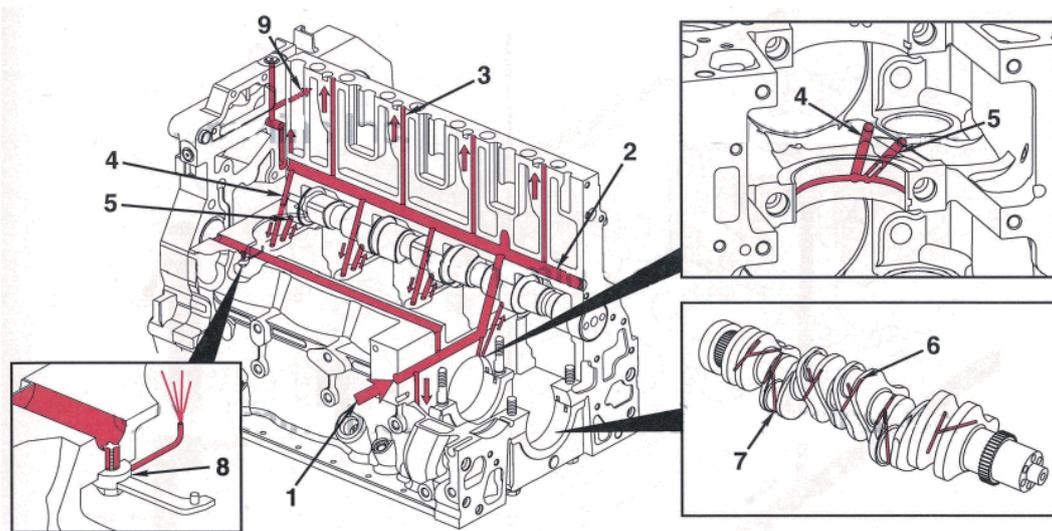
(1) Lubrication for the turbocharger



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

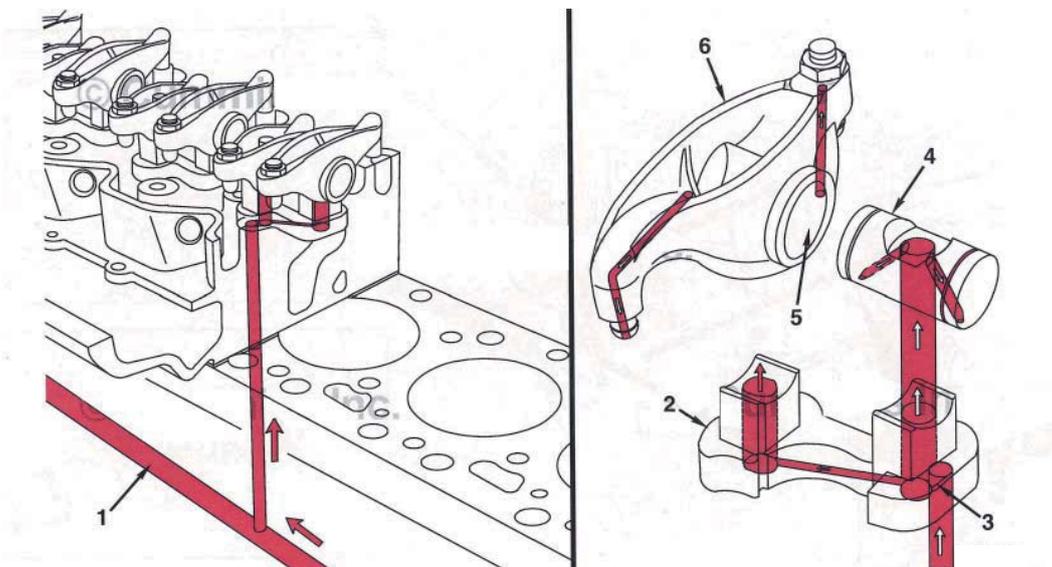
(2) Lubrication for the power components



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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 | | |

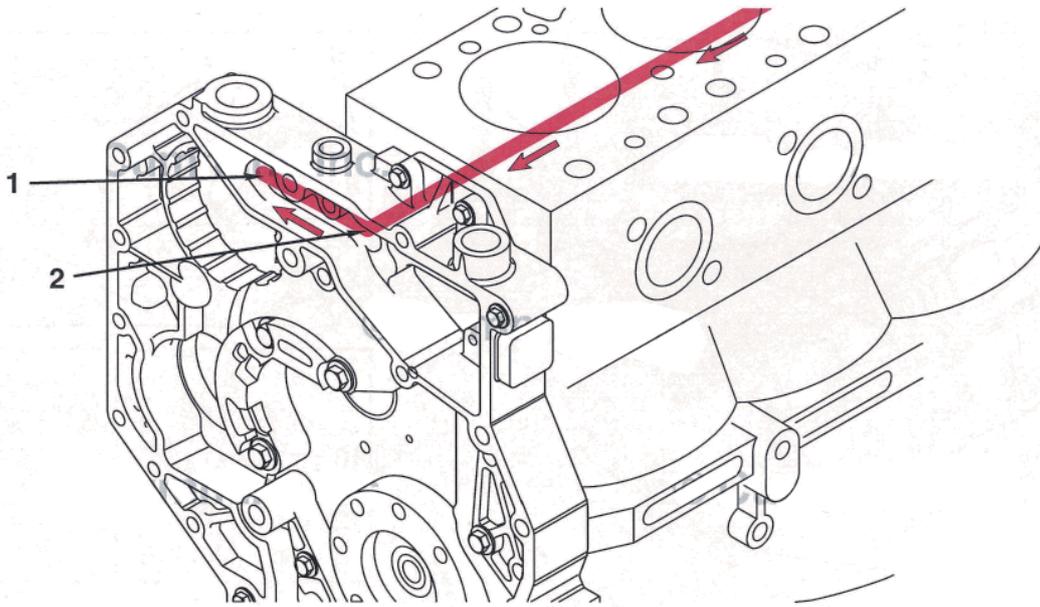
(3) Lubrication for the overhead components



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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



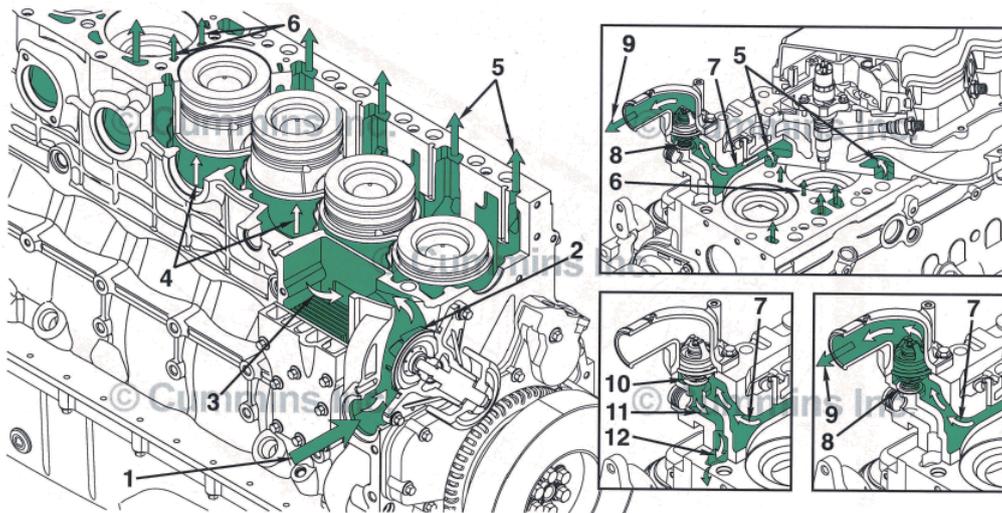
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1 Oil supply to accessory drive

2 Oil feed from block

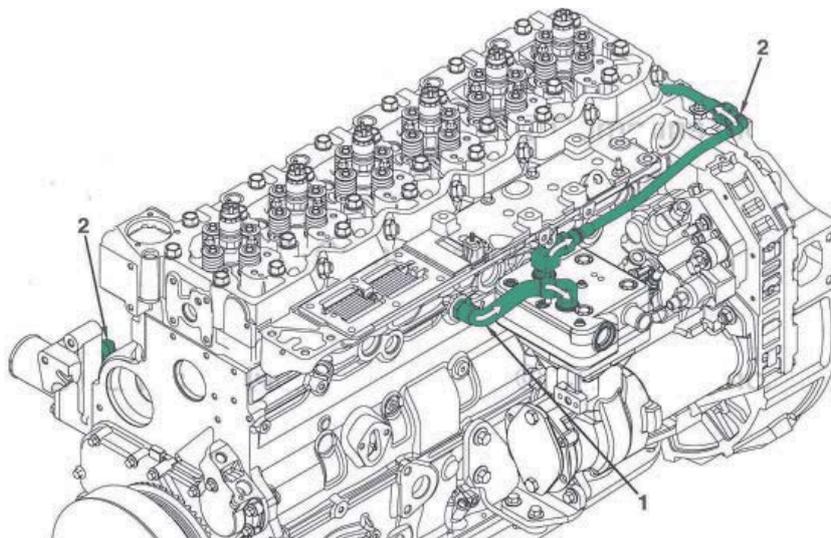
※ Oil returns to pan through the gear housing.

3) COOLING SYSTEM



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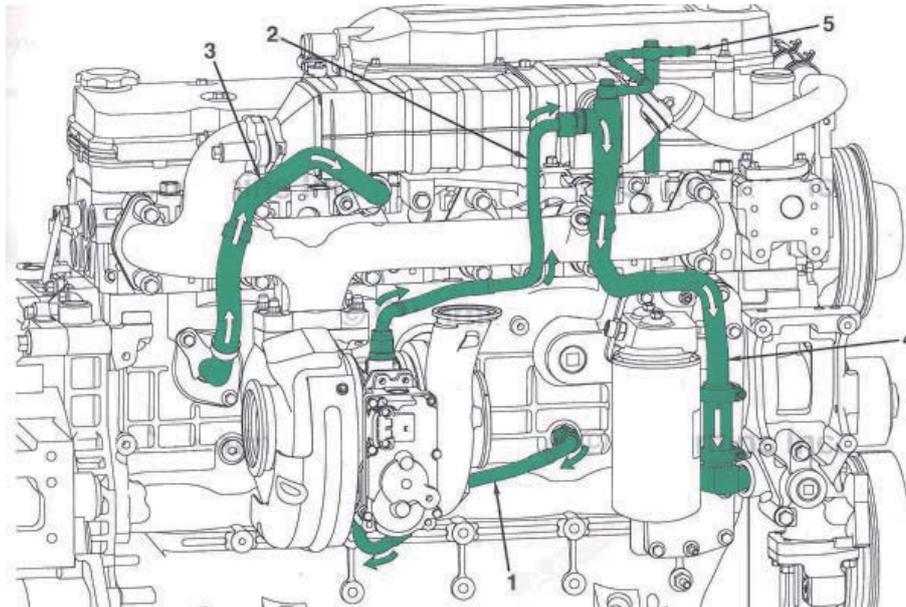
- | | | | |
|---|---|----|---|
| 1 | Coolant inlet from radiator and aftertreatment diesel exhaust fluid (DEF) dosing valve and DEF tank | 7 | Coolant flow to thermostat housing |
| 2 | Water pump Impeller | 8 | Thermostat open - bypass passage closed |
| 3 | Coolant flow past lubricating oil cooler | 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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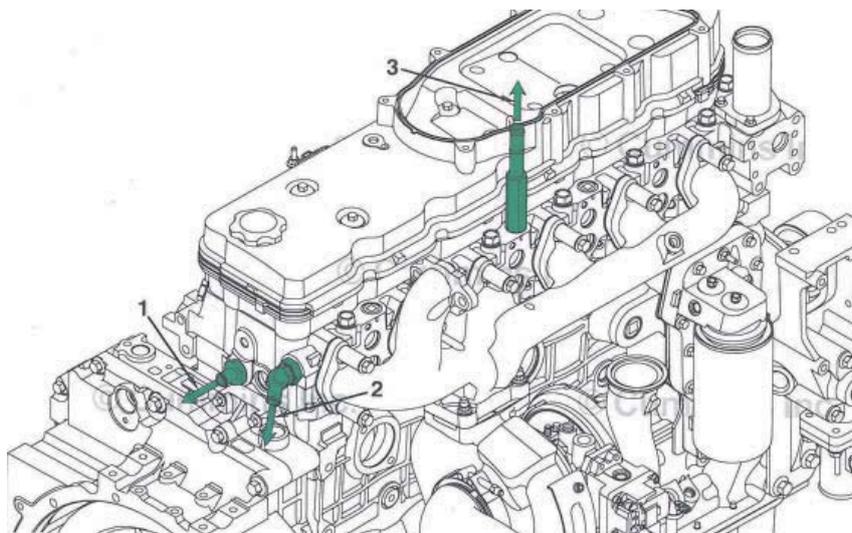
- 1 Air compressor coolant supply line
- 2 Air compressor coolant return to coolant inlet connection

COOLING SYSTEM



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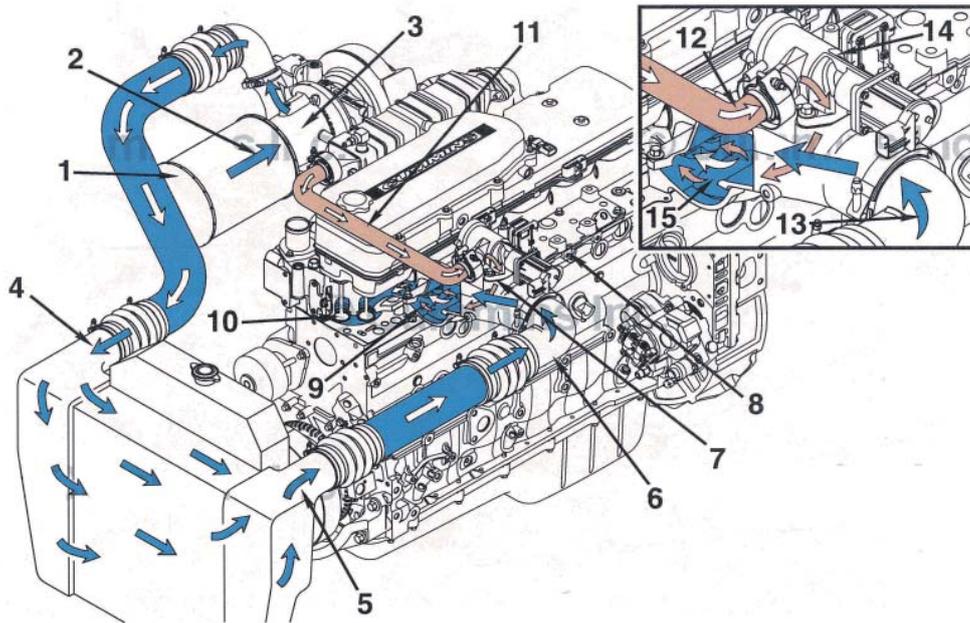
- 1 Coolant supply to variable geometry turbocharger from the cylinder block
- 2 Variable geometry turbocharger coolant return to the EGR cooler outlet tube
- 3 Coolant supply to the EGR cooler from the rear of the cylinder block
- 4 EGR cooler coolant return to the coolant inlet connection
- 5 De-aeration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

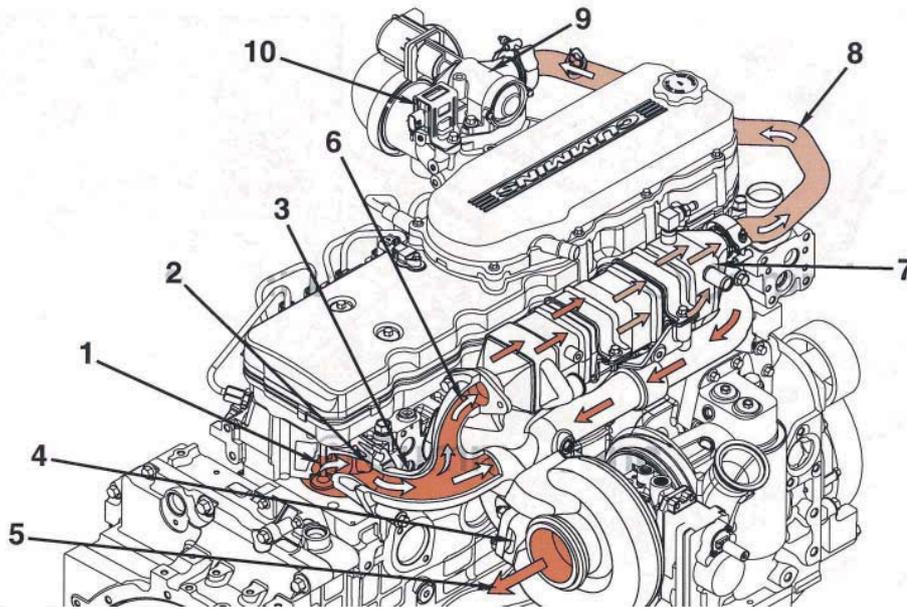
4) AIR INTAKE SYSTEM



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- | | | | |
|---|--------------------------------|----|------------------------------------|
| 1 | Air cleaner | 9 | Intake port |
| 2 | Turbocharger compressor inlet | 10 | Intake valves |
| 3 | Turbocharger compressor outlet | 11 | EGR connection tube |
| 4 | Charge air cooler inlet | 12 | EGR cooled exhaust gases |
| 5 | Charge air cooler outlet | 13 | Charge air cooled intake air |
| 6 | Air intake connection adapter | 14 | EGR valve |
| 7 | Air intake connection | 15 | Air mixture to combustion cylinder |
| 8 | Intake manifold | | |

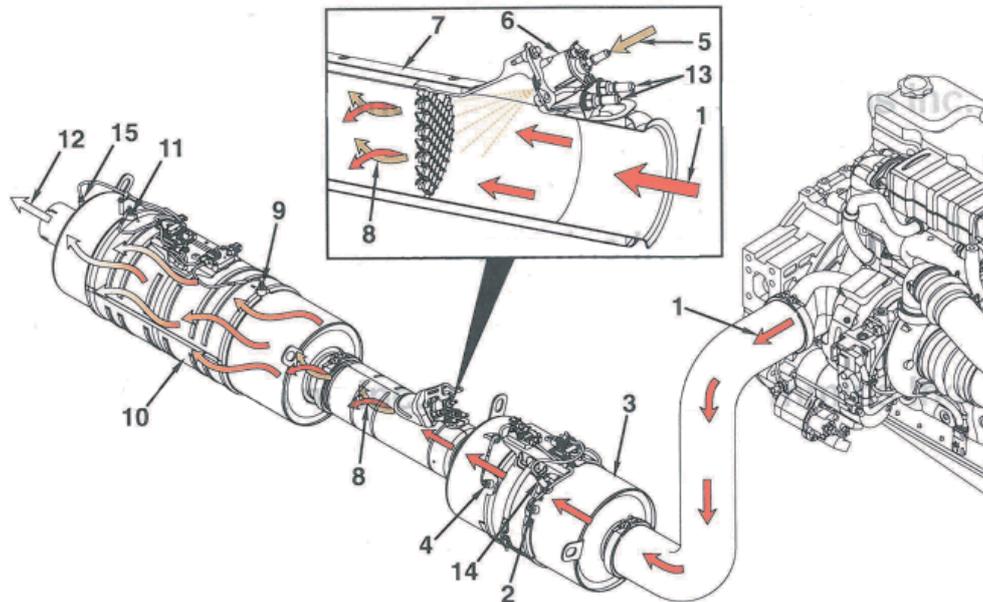
5) EXHAUST SYSTEM



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- | | | | |
|---|-----------------------------|----|--|
| 1 | Exhaust valves | 6 | Exhaust inlet to EGR cooler |
| 2 | Exhaust port | 7 | EGR cooler |
| 3 | Exhaust manifold | 8 | Cooled exhaust outlet to EGR valve |
| 4 | Turbocharger | 9 | EGR valve |
| 5 | Turbocharger exhaust outlet | 10 | EGR valve differential pressure sensor |

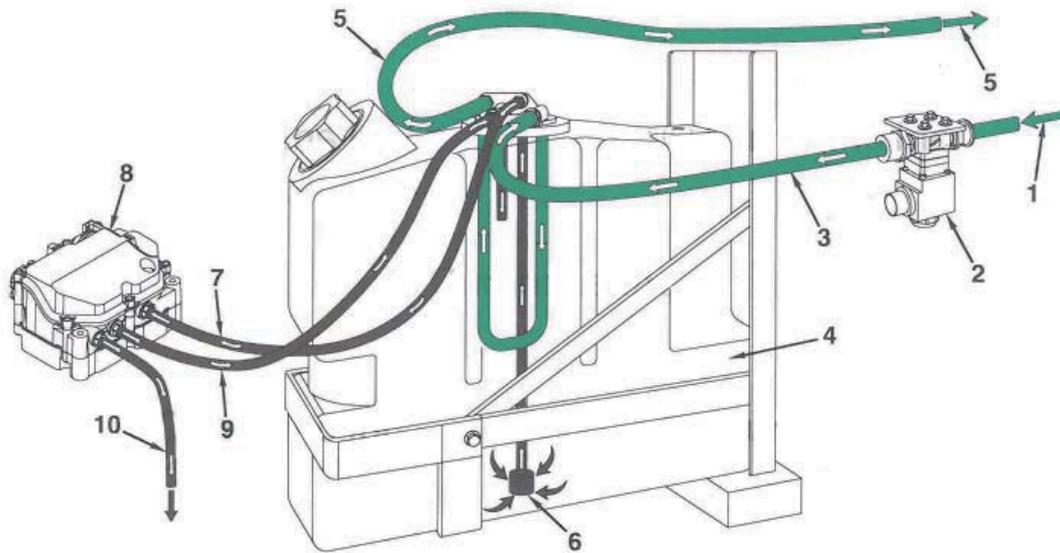
EXHAUST SYSTEM



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- 1 Exhaust from turbocharger
- 2 Aftertreatment diesel oxidation catalyst (DOC) intake temperature sensor probe
- 3 Aftertreatment DOC
- 4 Aftertreatment DOC outlet temperature sensor probe
- 5 Diesel exhaust fluid (DEF) supply to aftertreatment DEF dosing valve
- 6 Aftertreatment DEF dosing valve
- 7 Decomposition reactor
- 8 Exhaust DEF mixture
- 9 Aftertreatment selective catalyst reduction (SCR) intake temperature sensor probe
- 10 Aftertreatment SCR catalyst
- 11 Aftertreatment SCR outlet temperature sensor probe
- 12 Exhaust flow exiting aftertreatment system
- 13 Aftertreatment DEF dosing valve coolant fittings
- 14 Aftertreatment inlet mono-nitrogen oxides (NO_x) sensor probe
- 15 Aftertreatment outlet NO_x sensor probe

EXHAUST SYSTEM



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- 1 Coolant flow from engine to aftertreatment DEF
- 2 Aftertreatment DEF tank coolant valve
- 3 Coolant flow to aftertreatment DEF tank
(only when aftertreatment DEF tank coolant valve is open)
- 4 Aftertreatment DEF tank
- 5 Coolant return to engine
- 6 Aftertreatment DEF supply from aftertreatment DEF tank
- 7 Aftertreatment DEF flow to aftertreatment DEF dosing unit
- 8 Aftertreatment DEF dosing unit
- 9 Aftertreatment DEF return to aftertreatment DEF tank
- 10 Aftertreatment DEF flow to aftertreatment DEF dosing valve

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

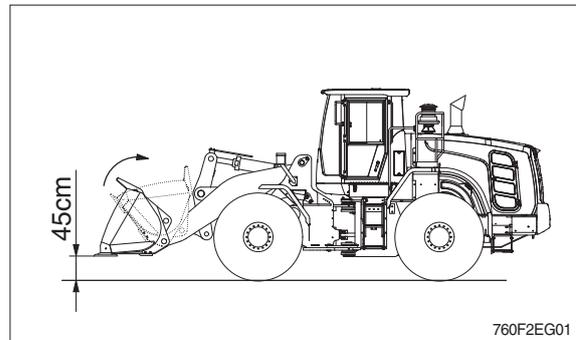
Engine speed, rpm (P mode)						Remark
Low idle	High idle	Pump stall	Converter stall	Full stall	Fan motor	
800±25	2230±50	2220±70	2000±70	1940±100	950±50	

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 6-57.

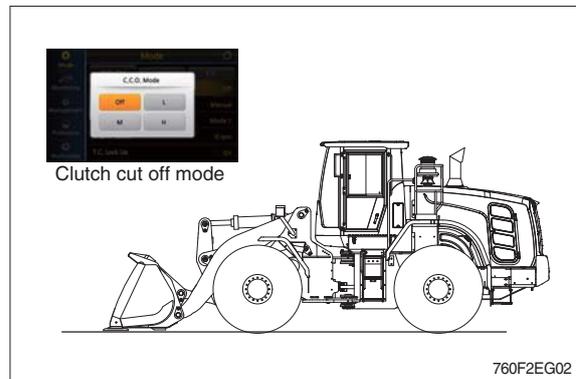
1) Pump stall rpm

- 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.



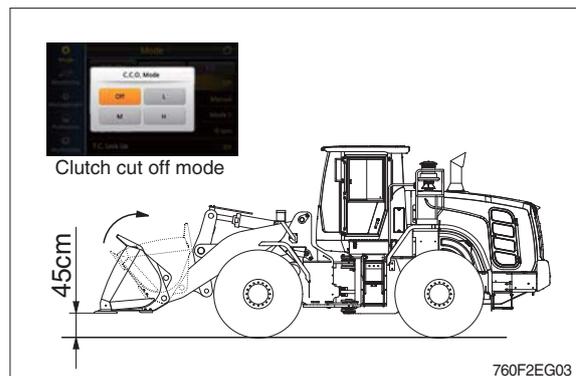
2) Converter stall rpm

- 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.



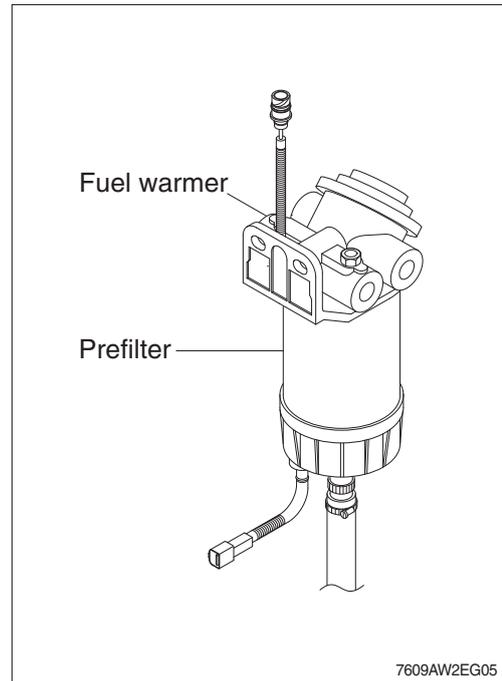
GROUP 3 FUEL WARMER SYSTEM

1. SPECIFICATION

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

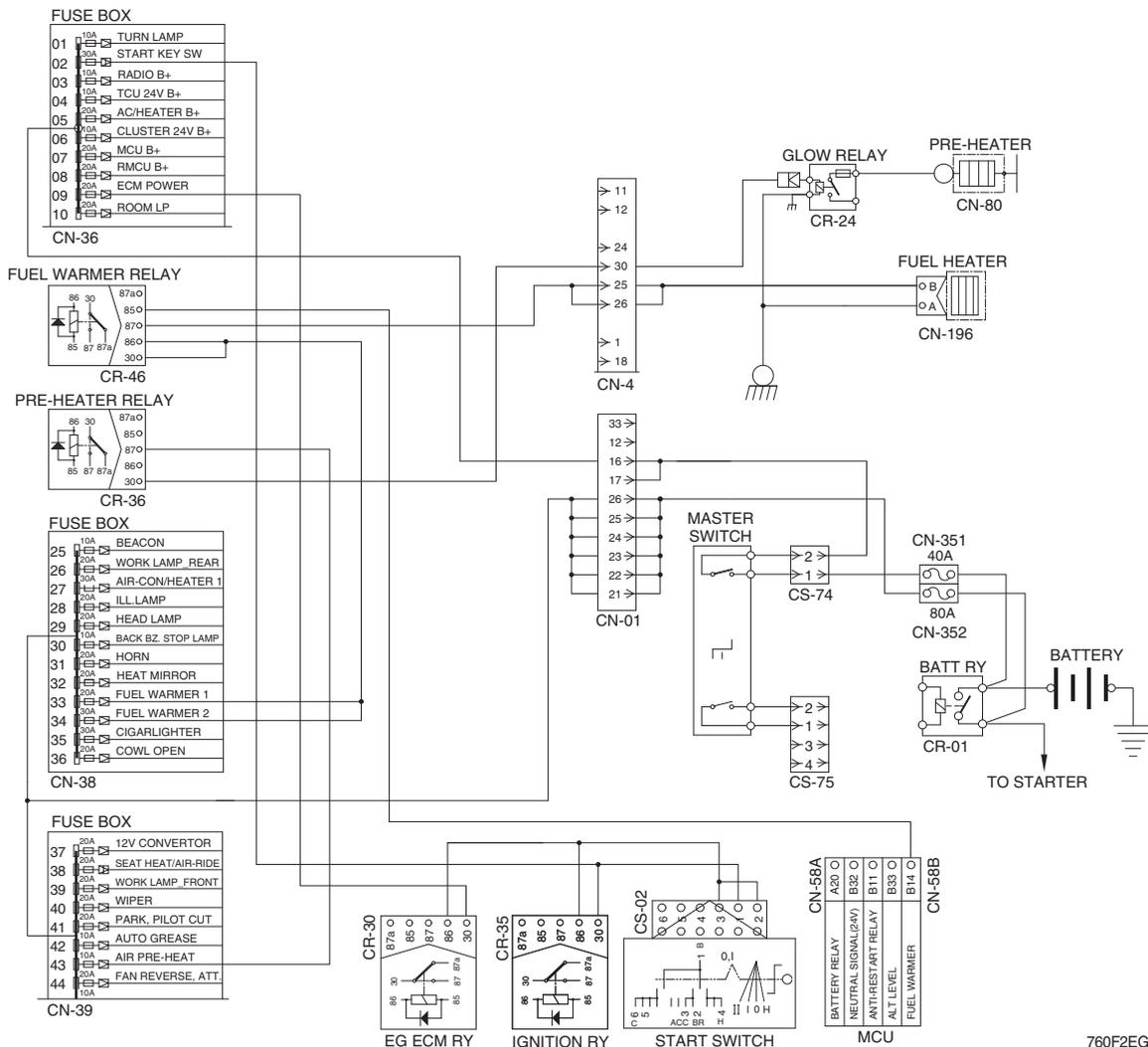
2. OPERATION

- 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.



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3. ELECTRIC CIRCUIT



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