

DAIHATSU

L500, L501

EC

EMISSION CONTROL SYSTEMS

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NOTE:
The contents described in the service manual have been explained in the EM section. Please refer to the EM section, as required.

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NO. 9198-LE

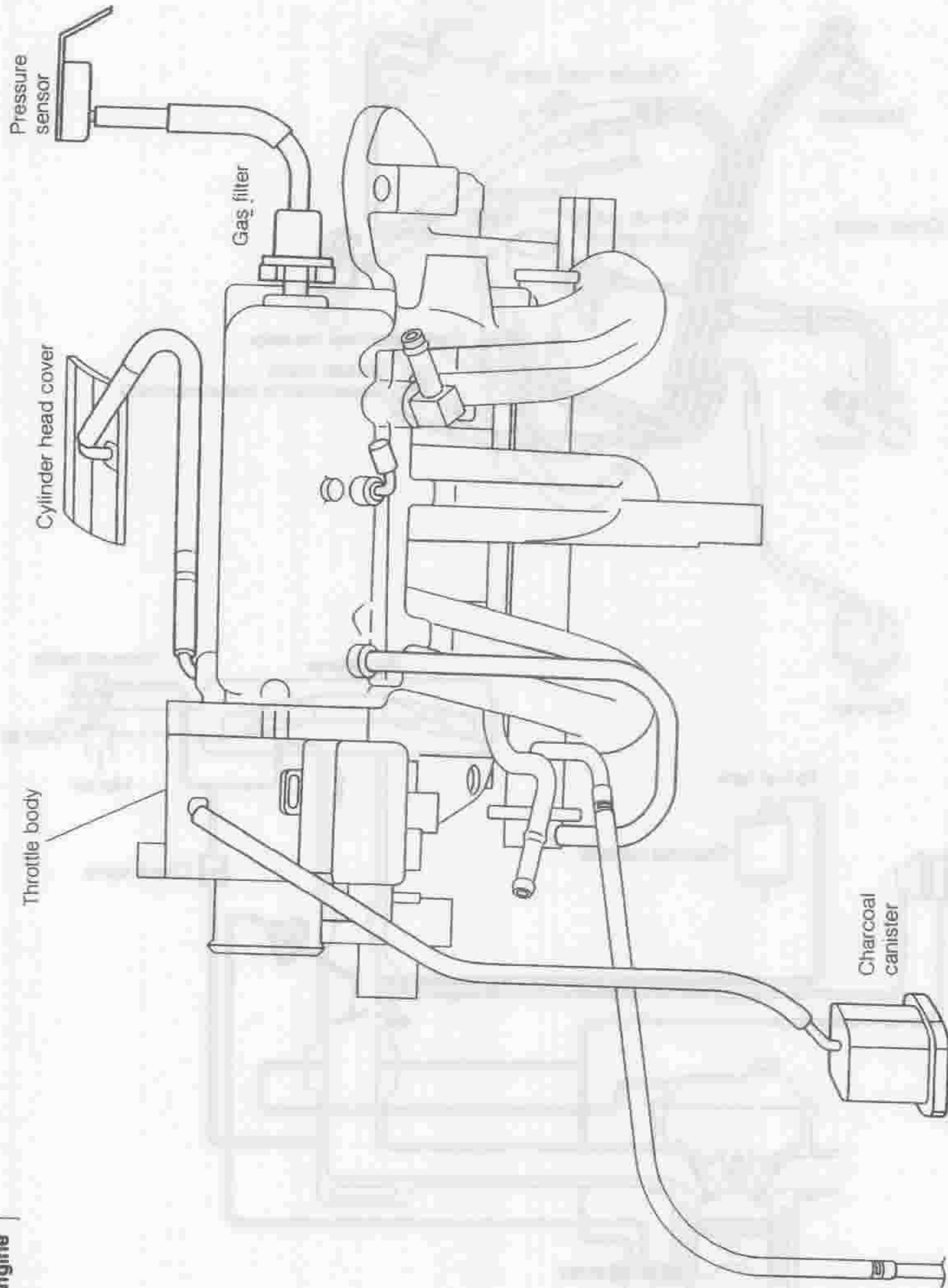
OUTLINE OF EMISSION CONTROL SYSTEM

PURPOSE OF SYSTEMS

	Engine type			Pollutants to be controlled			Purpose and function
	EF-EL	ED-10	ED-20	HC	CO	NOx	
Specifications	Aus., Hongkong Singapore	General	EC				
Blow-by gas recirculating	○	○	○	○	○		A system whereby the blow-by gas generated inside the engine is introduced to the intake manifold, instead of releasing it to the atmosphere, in order that it may be burnt again in the combustion chamber.
Choke warning	—	○	—	○	○		A telltale system which turns ON the warning lamp so as to tell the driver that he has failed to return the choke lever to its original position. Thus, this prevents increase of HC and CO emissions.
Three-way catalyst	○	—	○	○	○	○	A device whereby HC and CO contained in the exhaust gas are oxidized and NOx is deoxidized by the monolithic type catalytic converter, thereby reducing those emissions of HC, CO and NOx to be-released to the atmosphere.
Fuel evaporative emission control	○	○	○	○			A system whereby HC emitted from the carburetor and the fuel tank is absorbed to a charcoal canister, thereby preventing HC from being released to the atmosphere.
Feedback control	○	—	○	○	○	○	The feedback control system ensures a proper air-to-fuel ratio required by the engine. Also, it ensures an optimum amount of oxygen to be contained in the exhaust gas so as to obtain high purification rate of the three- way catalyst.

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EL-EL Engine
ED-20 Engine

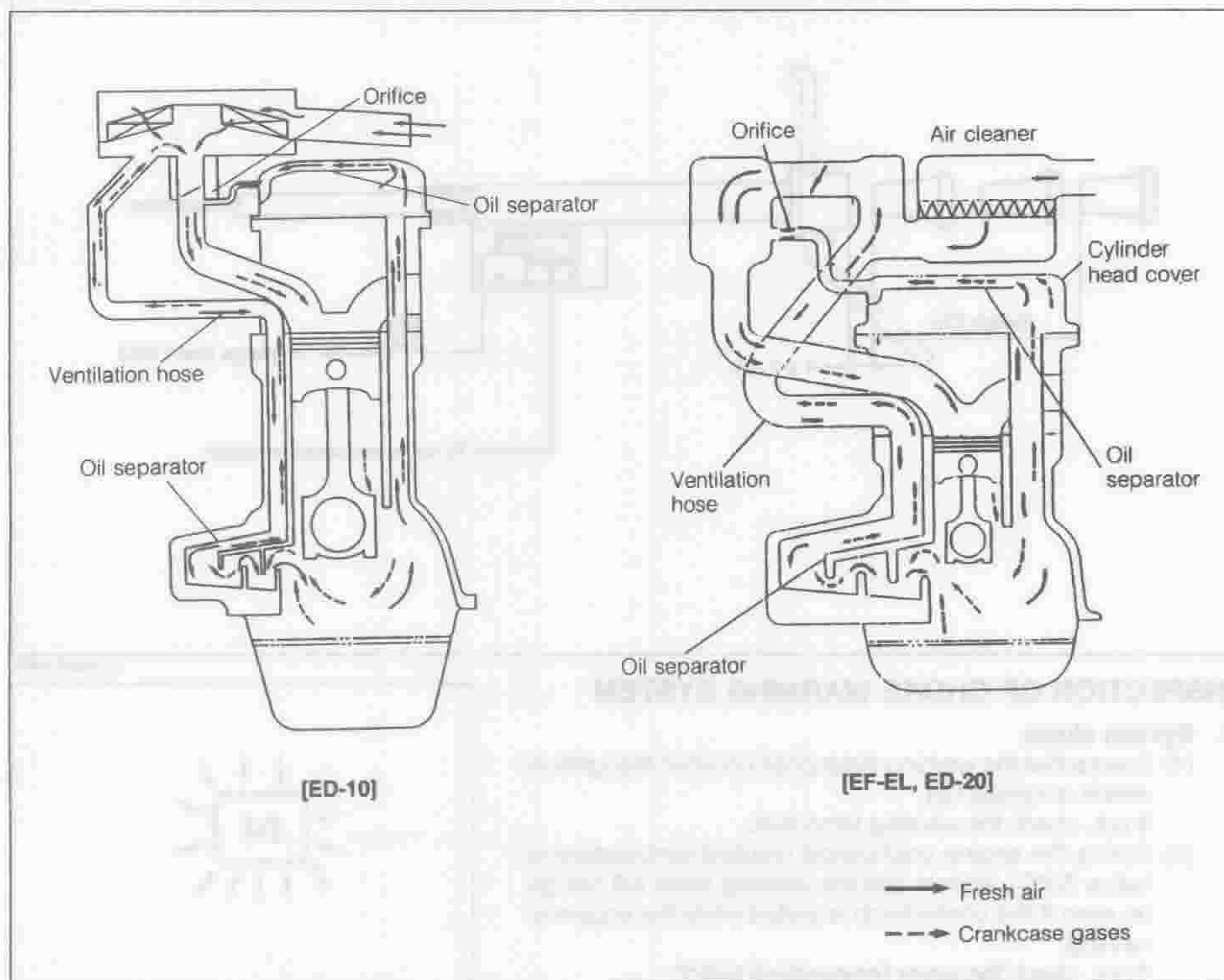


BLOW-BY GAS RECIRCULATING SYSTEM

To combat with air-pollution problems, the engine is equipped with a sealed type positive crankcase ventilation system in order to prevent blow-by gas generated inside the crankcase from being released into the atmosphere.

When the amount of generated blow-by gas is small, the blow-by gas generated inside the crankcase will be introduced to the cylinder head side through the oil return hole. Then, the gas passes through the oil separator and is sucked into the intake manifold from the heat insulator section. At this time, fresh air is introduced into the crankcase from the air cleaner through the ventilation hose.

When the amount of generated blow-by gas is large, the blow-by gas will be sucked into the intake manifold through the oil separators of both the cylinder head cover and cylinder block.



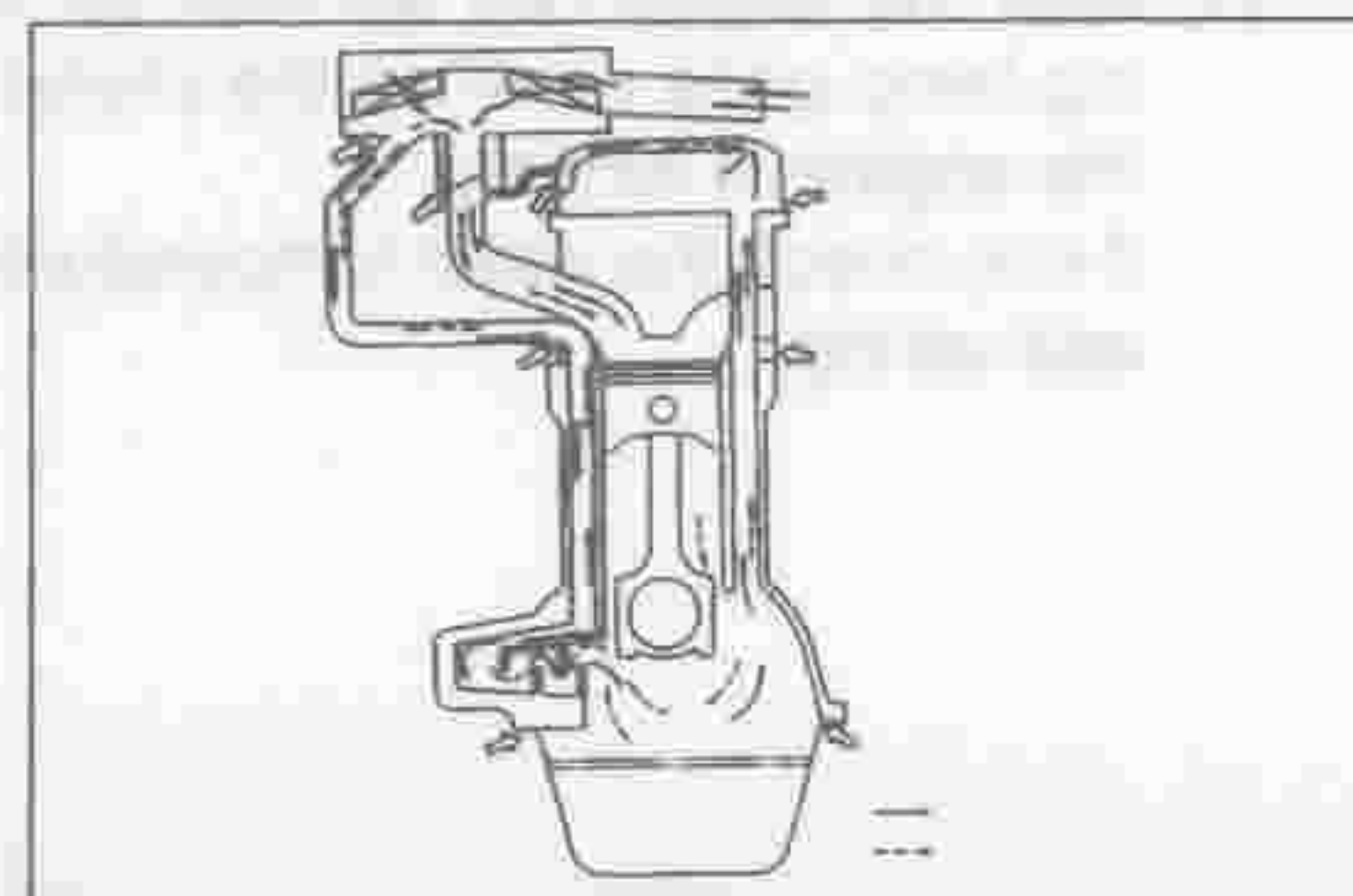
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INSPECTION OF PCV HOSE & CONNECTION

Visual inspection of hoses and connection

Check the hoses for improper connections, cracks, leak or damage.

Replace or repair any part which exhibits defects.



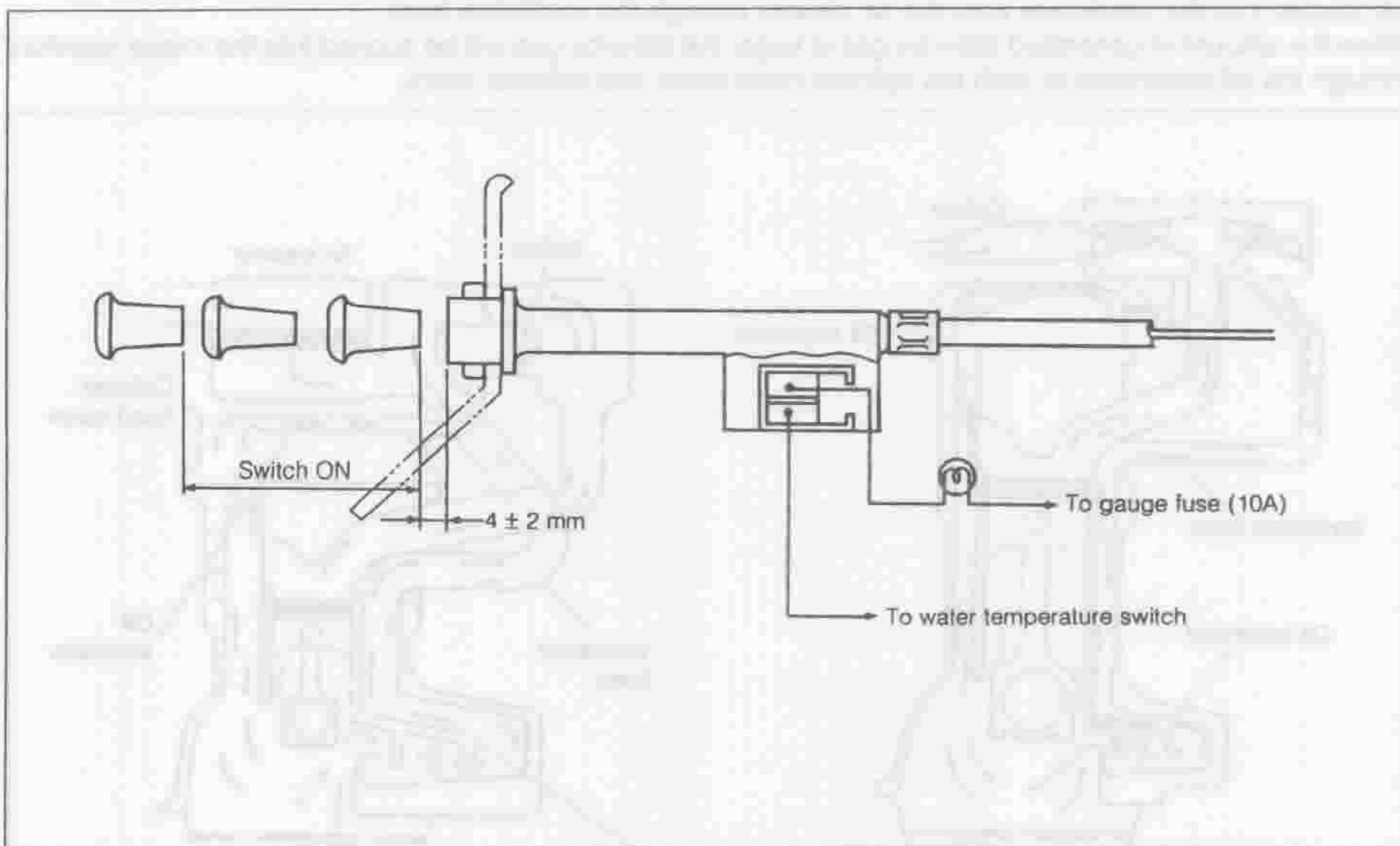
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CHOKE WARNING SYSTE

This choke warning system is provided to prevent the increase of fuel consumption and unburnt gas emissions due to the driver's failure to return the choke button to the original position.

In the event that the choke button remains in its pulled state even after the engine has been warmed-up, the warning lamps goes on by detecting the warmed-up state by means of the water thermo switch which functions at 62°C.

This system intends to reduce those emissions of CO and HC.

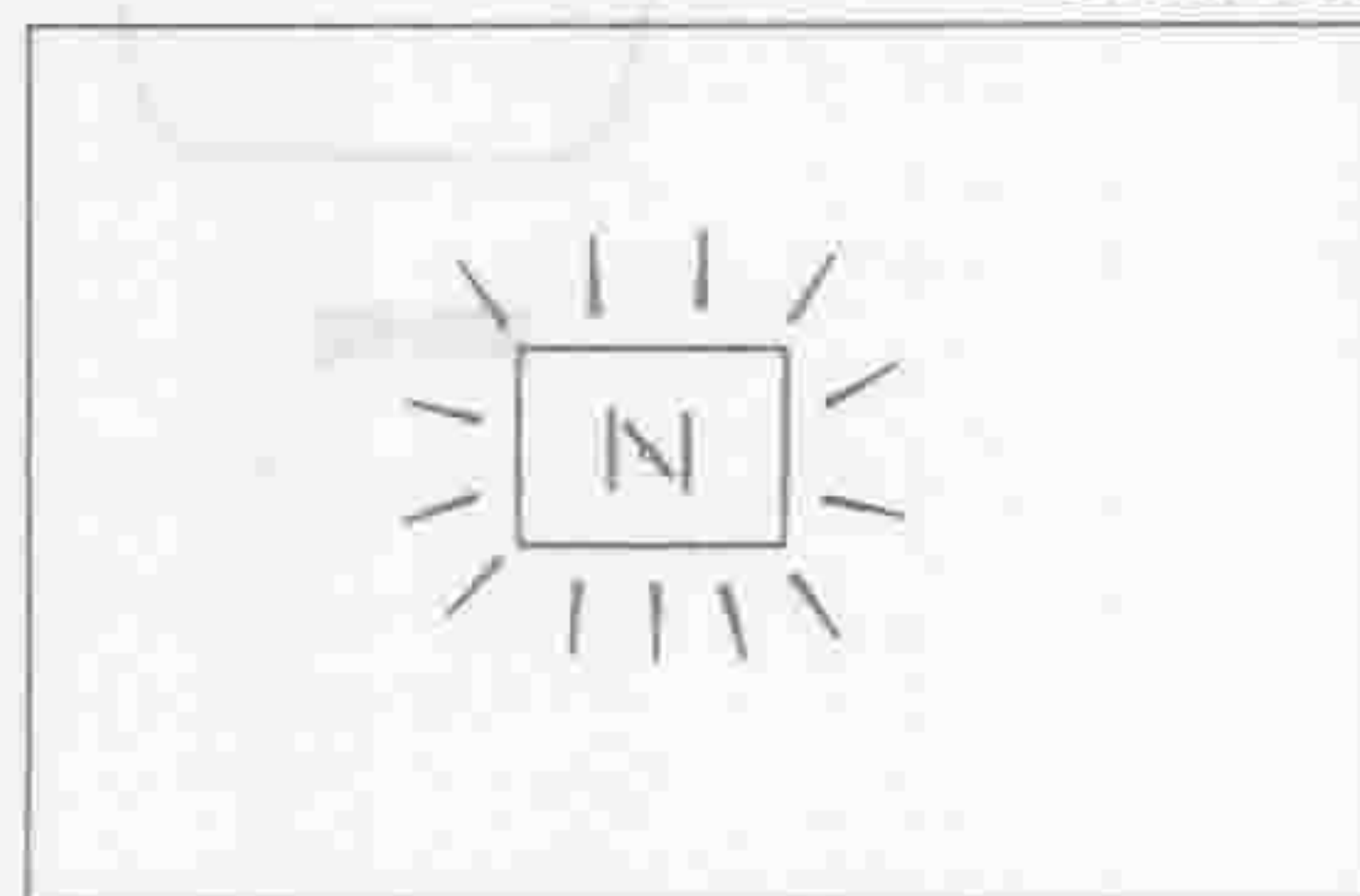


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INSPECTION OF CHOKE WARNING SYSTEM

1. System check

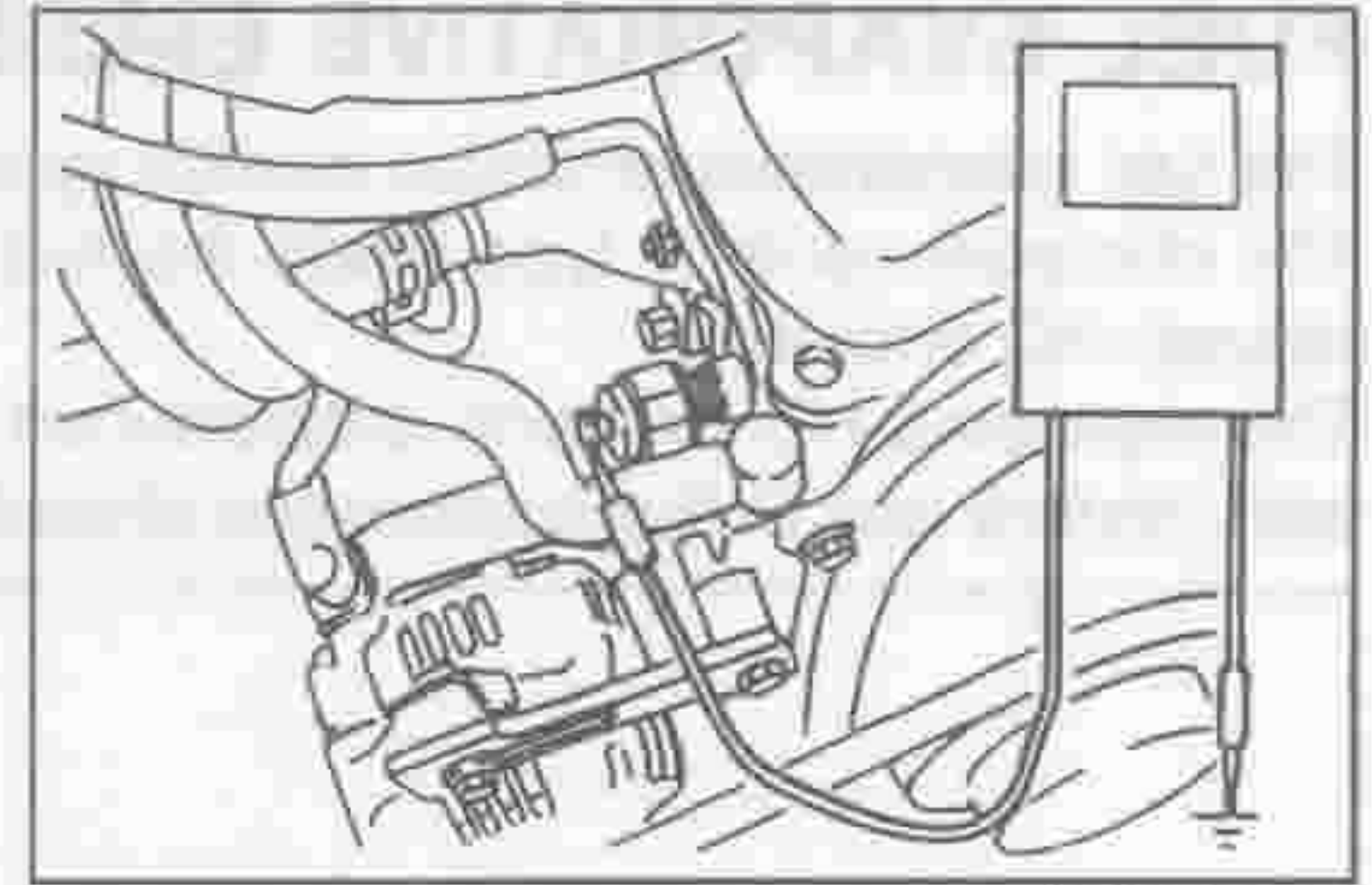
- (1) Ensure that the warning lamp goes on when the ignition switch is turned ON.
If not, check the warning lamp bulb.
- (2) During the engine cold period (coolant temperature is below 53°C), ensure that the warning lamp will not go on even if the choke knob is pulled while the engine is running.
If not, check the water temperature switch.
- (3) After the engine has warmed up, ensure that the warning lamp goes on when the choke knob is pulled while the engine is running.
If not, check the water temperature switch, choke cable and wiring.



LEC00008-00006

2. Check of water temperature switch

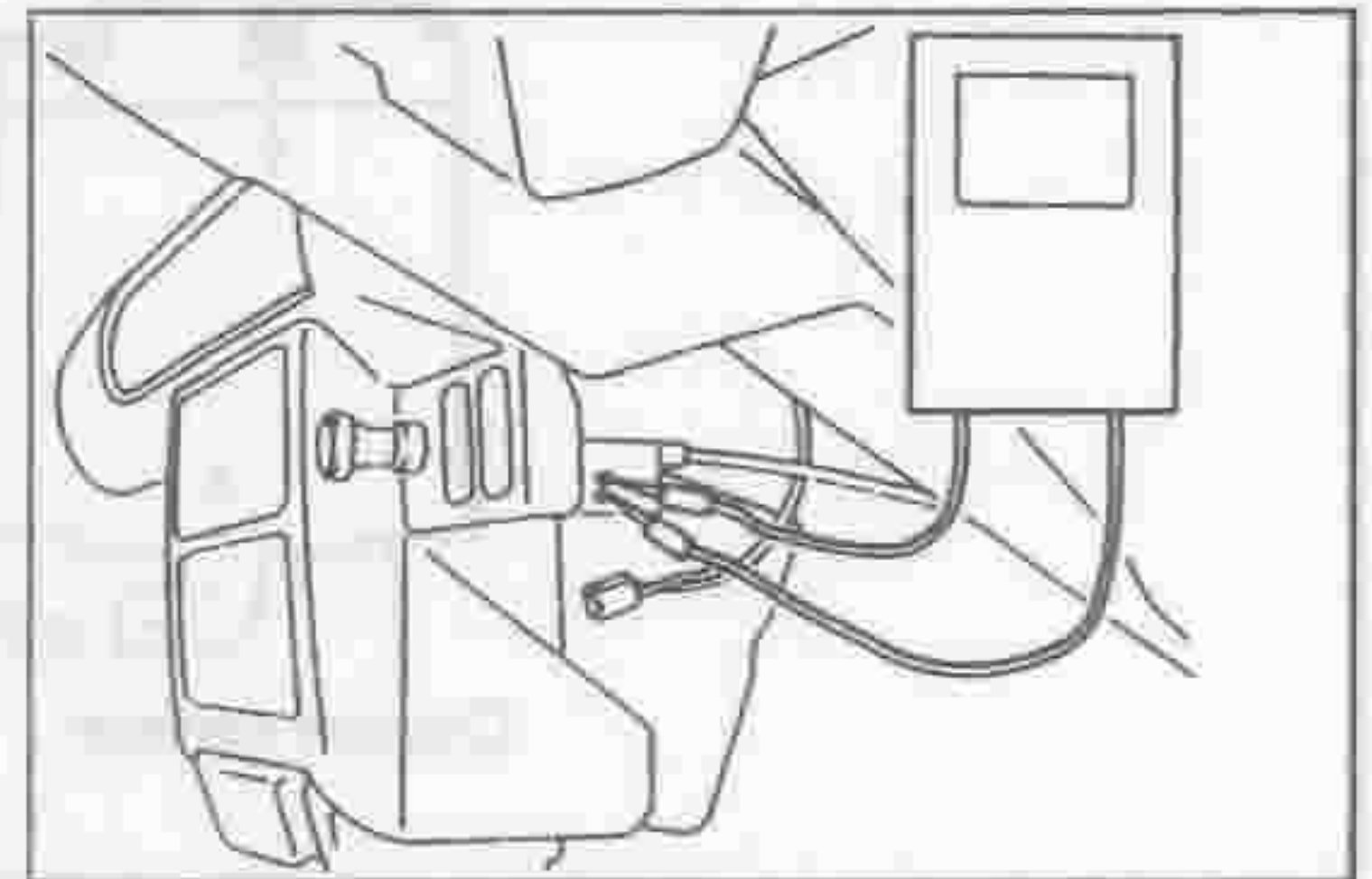
- (1) During the engine cold period (coolant temperature is below 53°C):
 - ① Disconnect the connector from the water temperature switch.
 - ② Ensure that no continuity exists between the water temperature switch connector and the engine ground.
If not, replace the water temperature switch.
- (2) After the engine has warmed up (coolant temperature is above 62°C):
 - ① Disconnect the water temperature switch connector.
 - ② Ensure that continuity exists between the water temperature switch connector and the engine ground.
If not, replace the water temperature switch.



LEC00009-00007

3. Check of choke cable

- (1) Disconnect the connector of the choke cable.
- (2) Ensure that no continuity exists between the terminals at the choke cable side when the choke knob is returned to its original position.
If not, replace the choke cable.
- (3) Ensure that continuity exists between the terminals at the choke cable side when the choke knob is pulled.



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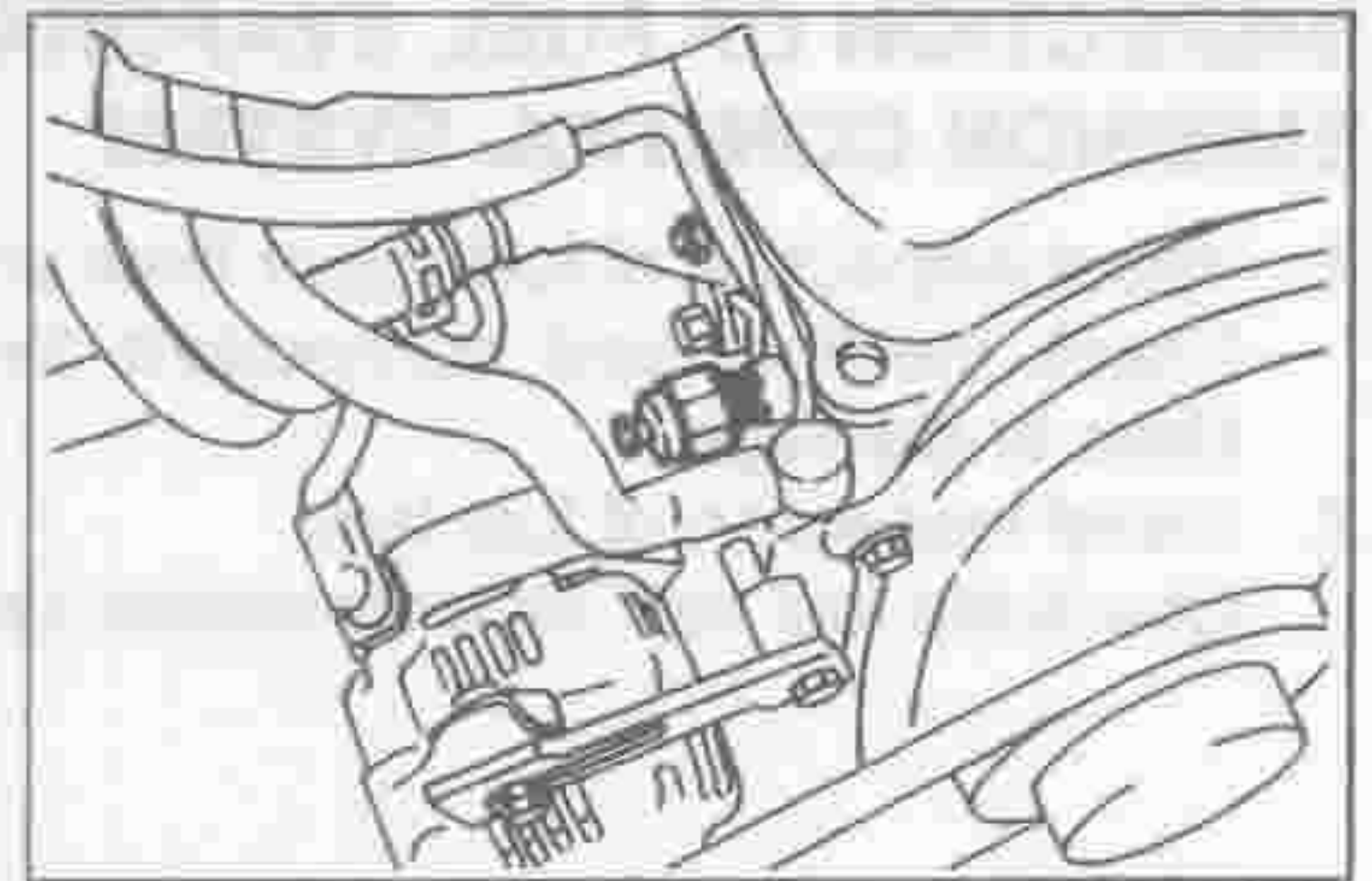
4. Replacement of water temperature switch

- (1) Disconnect the ground cable terminal from the battery ground terminal.
- (2) Drain the coolant. (Refer to the CO section.)
- (3) Disconnect the connector from the water temperature switch.
- (4) Remove the water temperature switch.
- (5) Clean the water temperature switch attaching hole of the cylinder block.
- (6) Clean the threaded portion of the water temperature switch. Wind seal tape around the threaded portion.
- (7) Install the water temperature switch to the cylinder block.

Tightening Torque:

$29.4 \pm 4.9 \text{ N}\cdot\text{m}$ ($3.00 \pm 0.50 \text{ kgf}\cdot\text{m}$)

- (8) Connect the connector to the water temperature switch.
- (9) Fill coolant. (Refer to the CO section.)
- (10) Connect the ground cable terminal to the negative terminal of the battery.
- (11) Start the engine. Ensure that no water leakage is present.



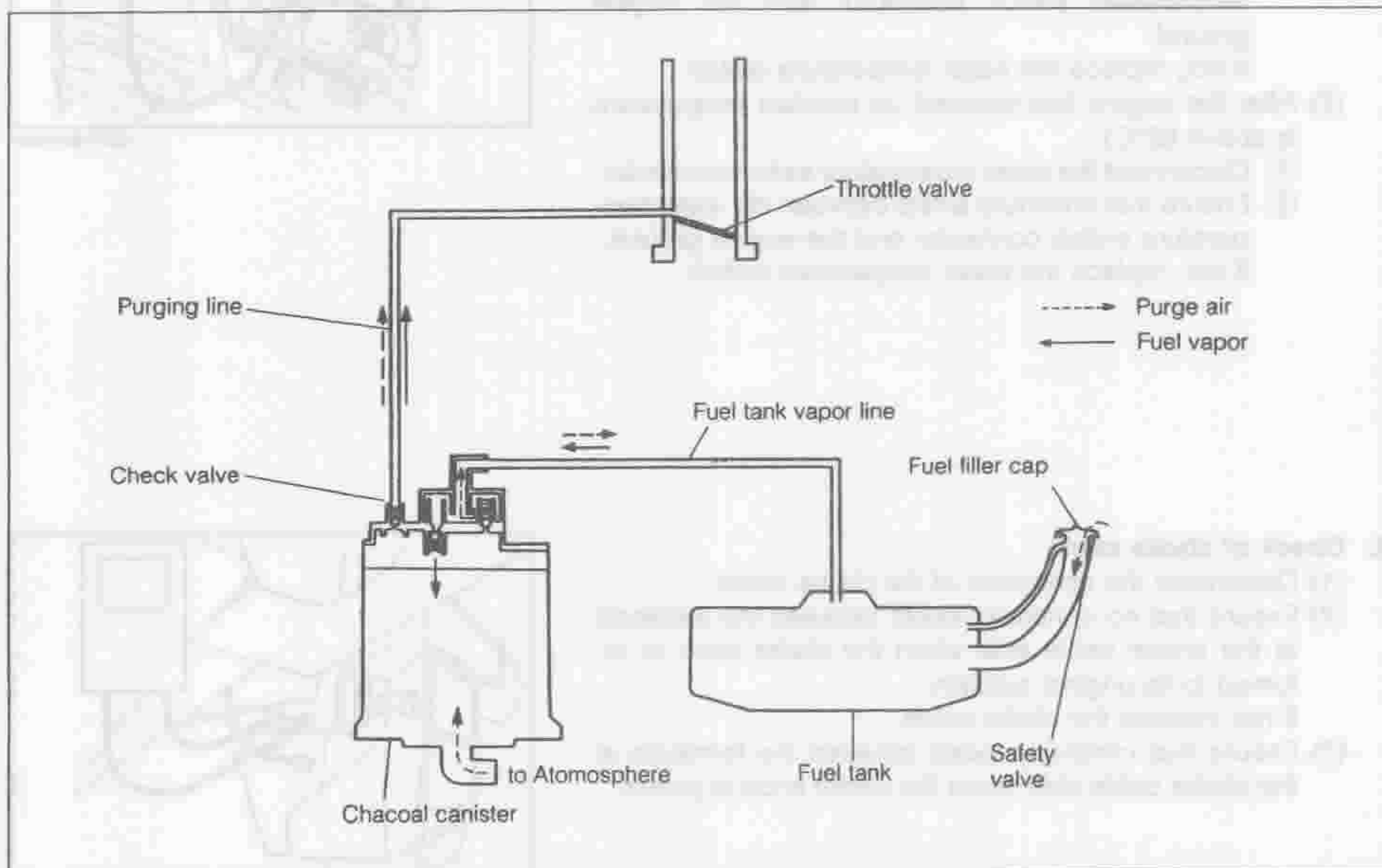
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FUEL EVAPORATIVE EMISSION CONTROL SYSTEM

The fuel evaporative emission control system employs a charcoal canister type.

The charcoal canister type leads the fuel vapor into the charcoal canister which uses activated carbon to absorb HC emission.

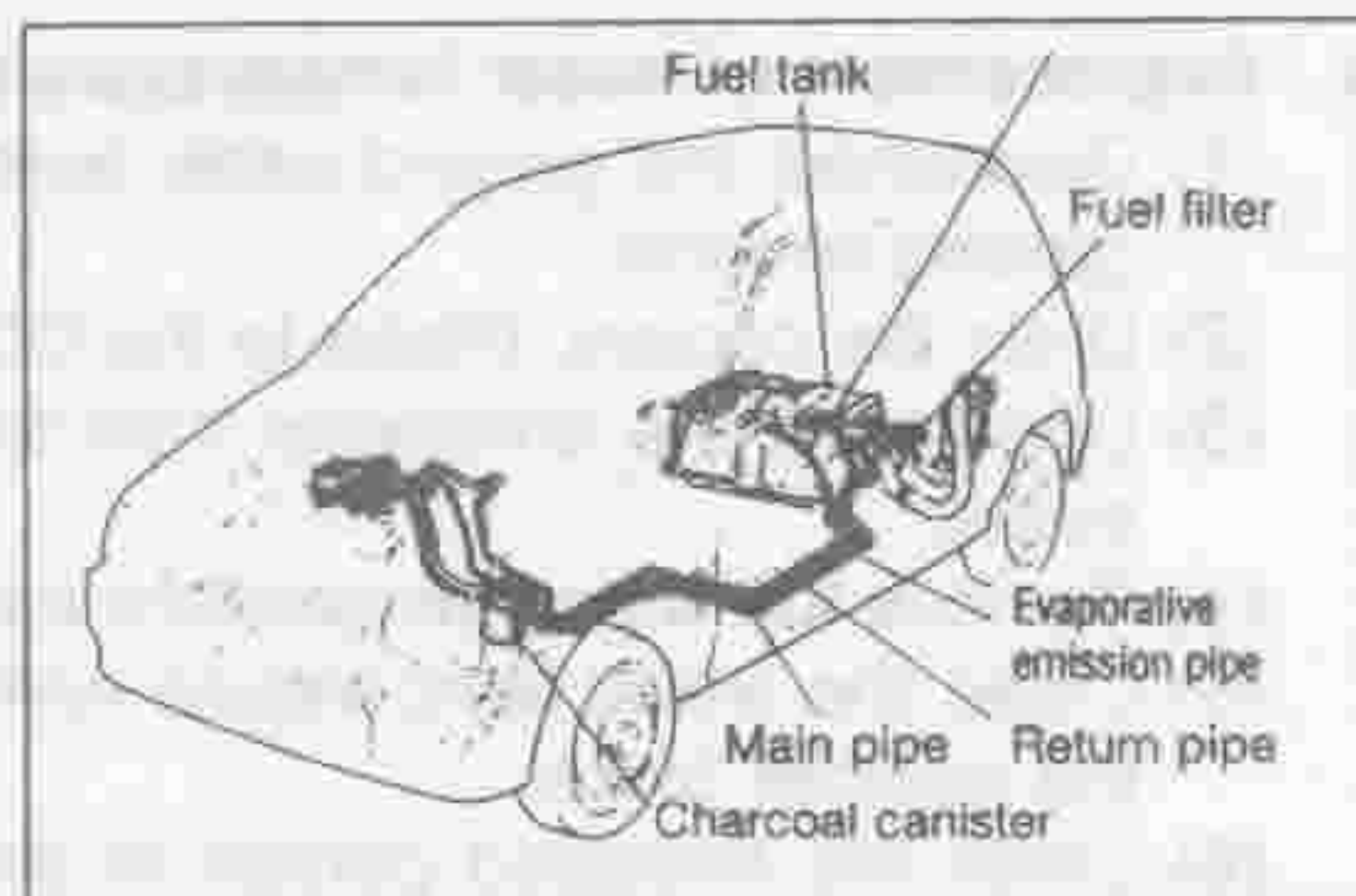
The separated HC emission is introduced into the carburetor from the charcoal canister to be burnt together with mixture gas in the combustion chamber.



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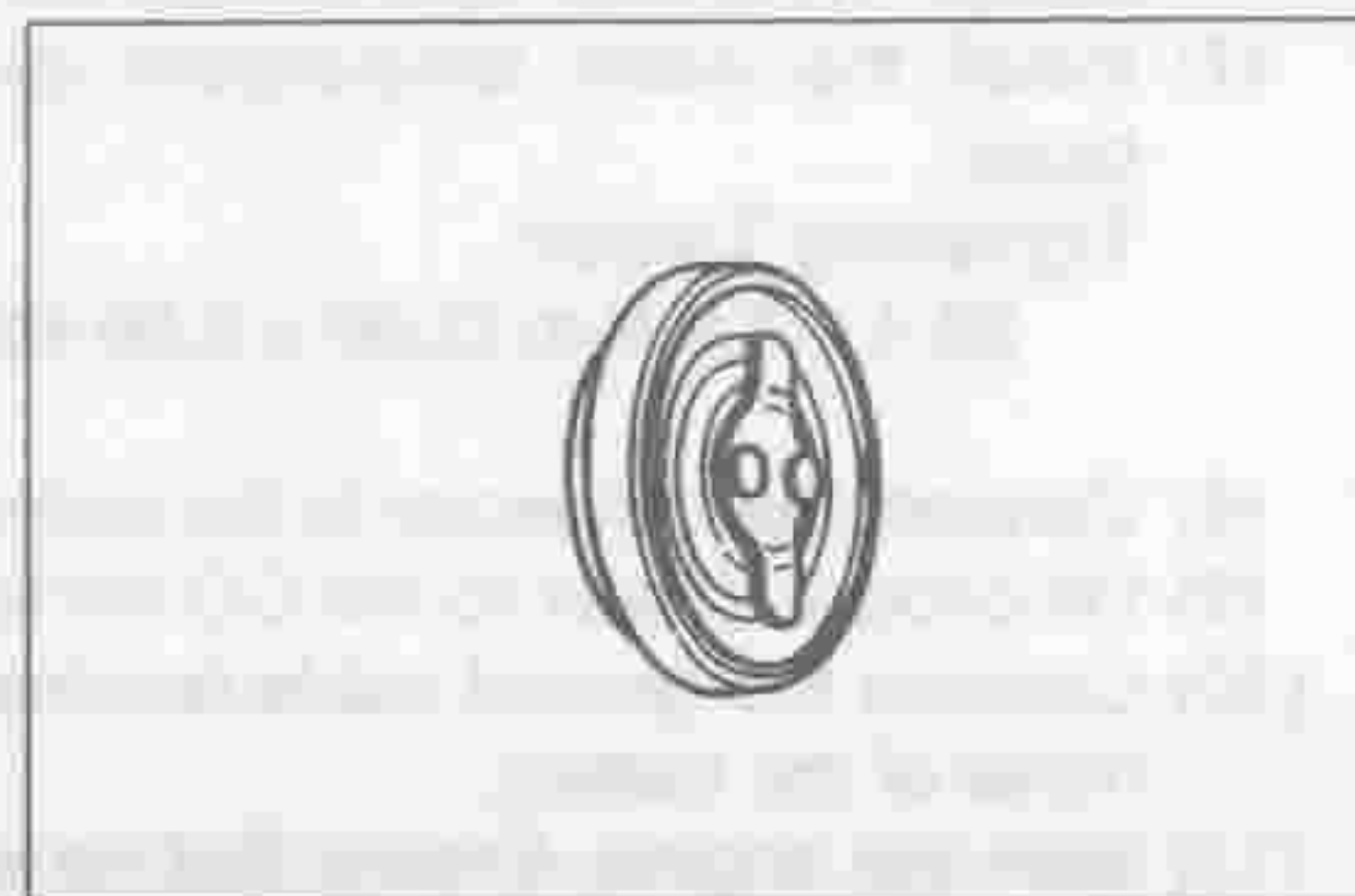
INSPECTION OF FUEL EVAPORATIVE EMISSION CONTROL SYSTEM

1. Visual inspection of fuel vapor lines and connections
Check the lines and connections for loose connections, kinks or damage.
2. Visual inspection of fuel tank
Check the fuel tank for deformation, cracks or fuel leakage.



LEC00013-00011

3. Visual inspection of fuel filler cap
Check the cap the gasket for damage or deformation
Replace the cap and/or gasket, if necessary.
4. Inspection of charcoal canister
(Refer to the EM section.)



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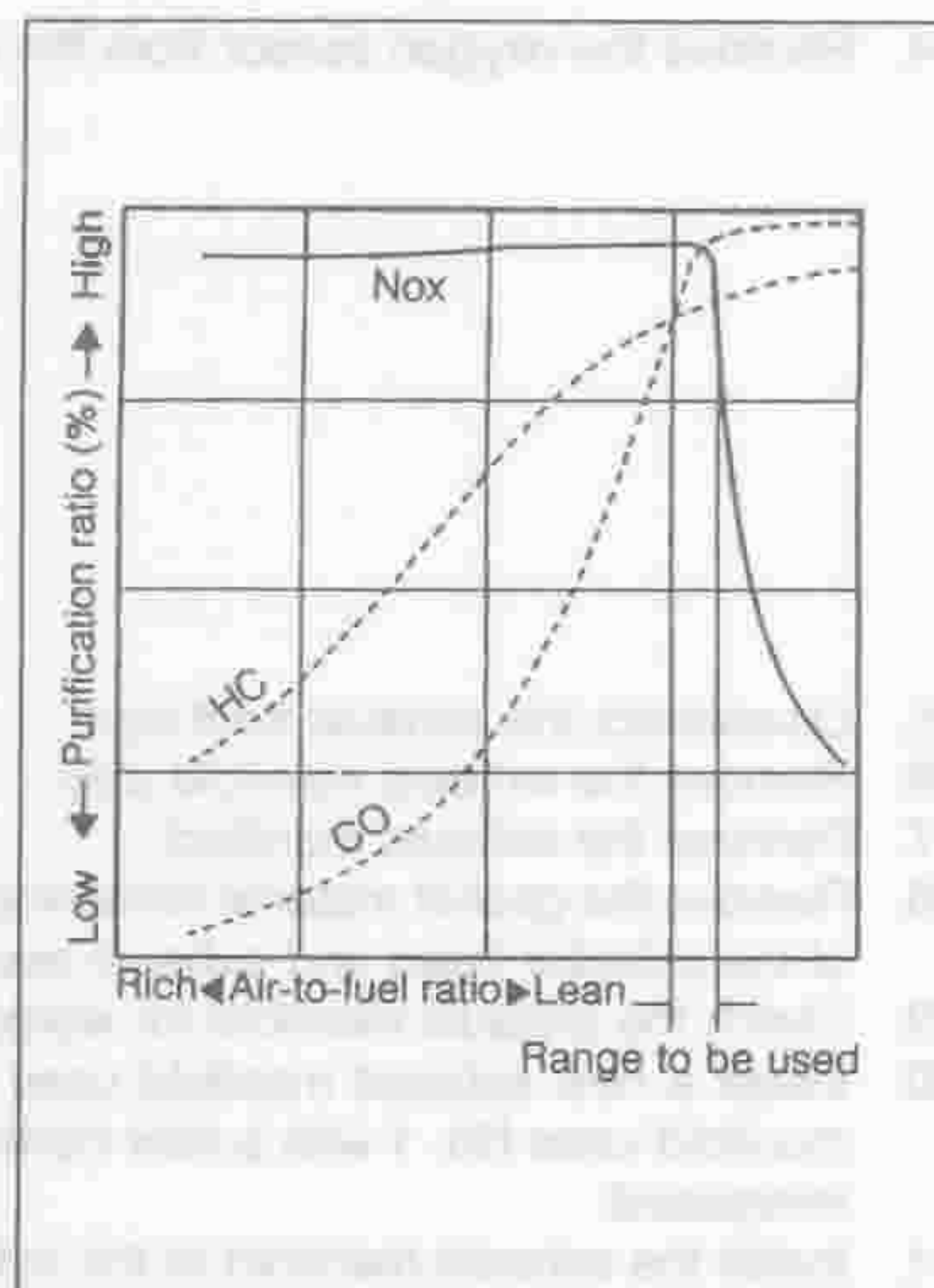
THREE-WAY CATALYST

A cylindrical monolith type three-way catalyst is provided inside the exhaust manifold.

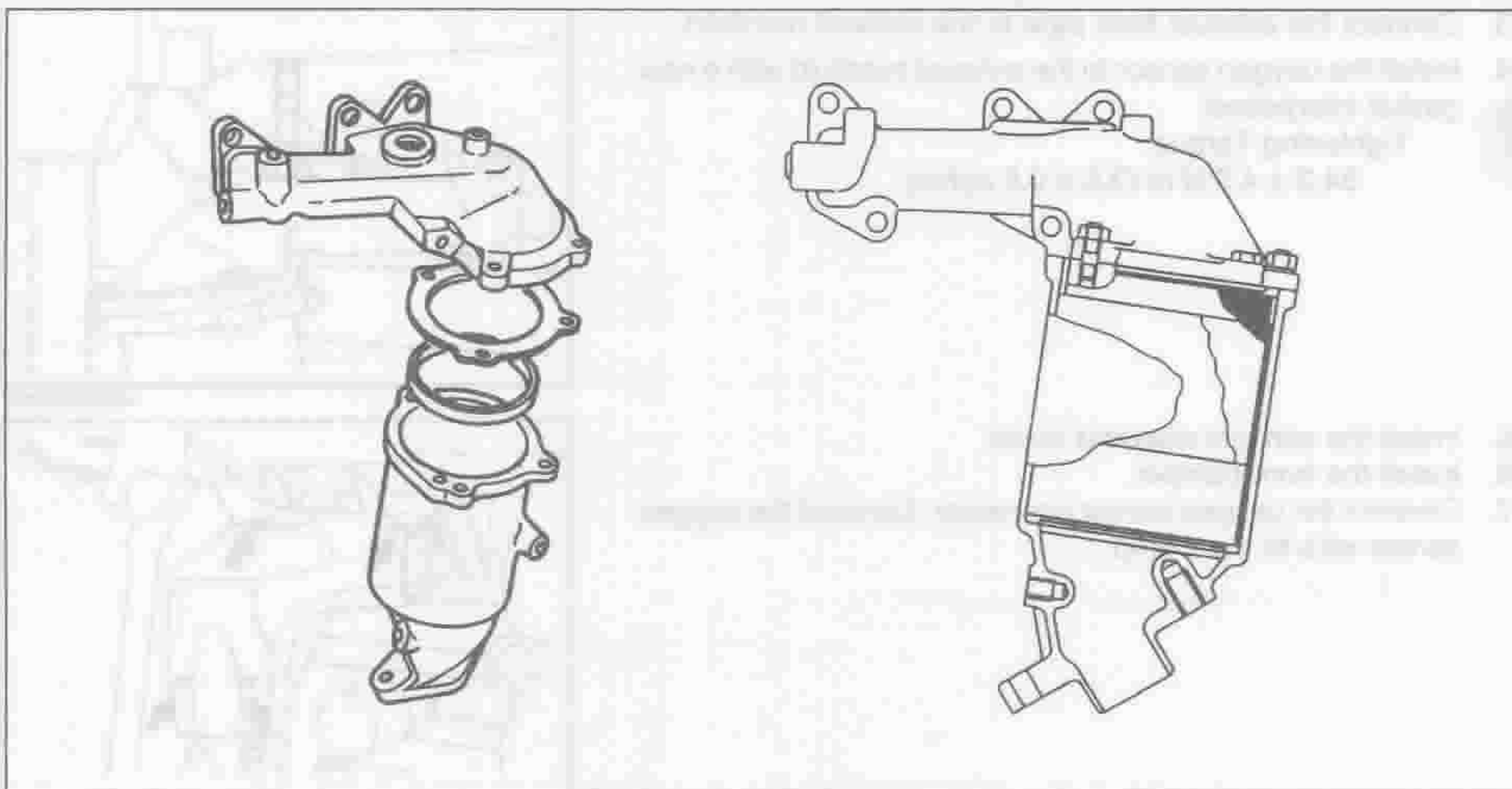
The three-way catalyst is a catalyst capable of processing simultaneously three components of CO, HC and NOx in a single unit.

When the exhaust emissions are purified by the three-way catalyst, the purification characteristics greatly depends upon the air-to-fuel ratio of the engine. Namely, when the air-to-fuel ratio is too lean, the oxygen amount after combustion becomes great. As a result, the oxidation becomes active, whereas the reduction becomes inactive. Conversely, when the air-to-fuel ratio is too rich, the oxidation becomes inactive, whereas the reduction becomes active.

It is, therefore, imperative to keep the air-to-fuel ratio in the neighborhood of the stoichiometric air-to-fuel ratio all the time. This is accomplished by the air-to-fuel ratio automatic control.



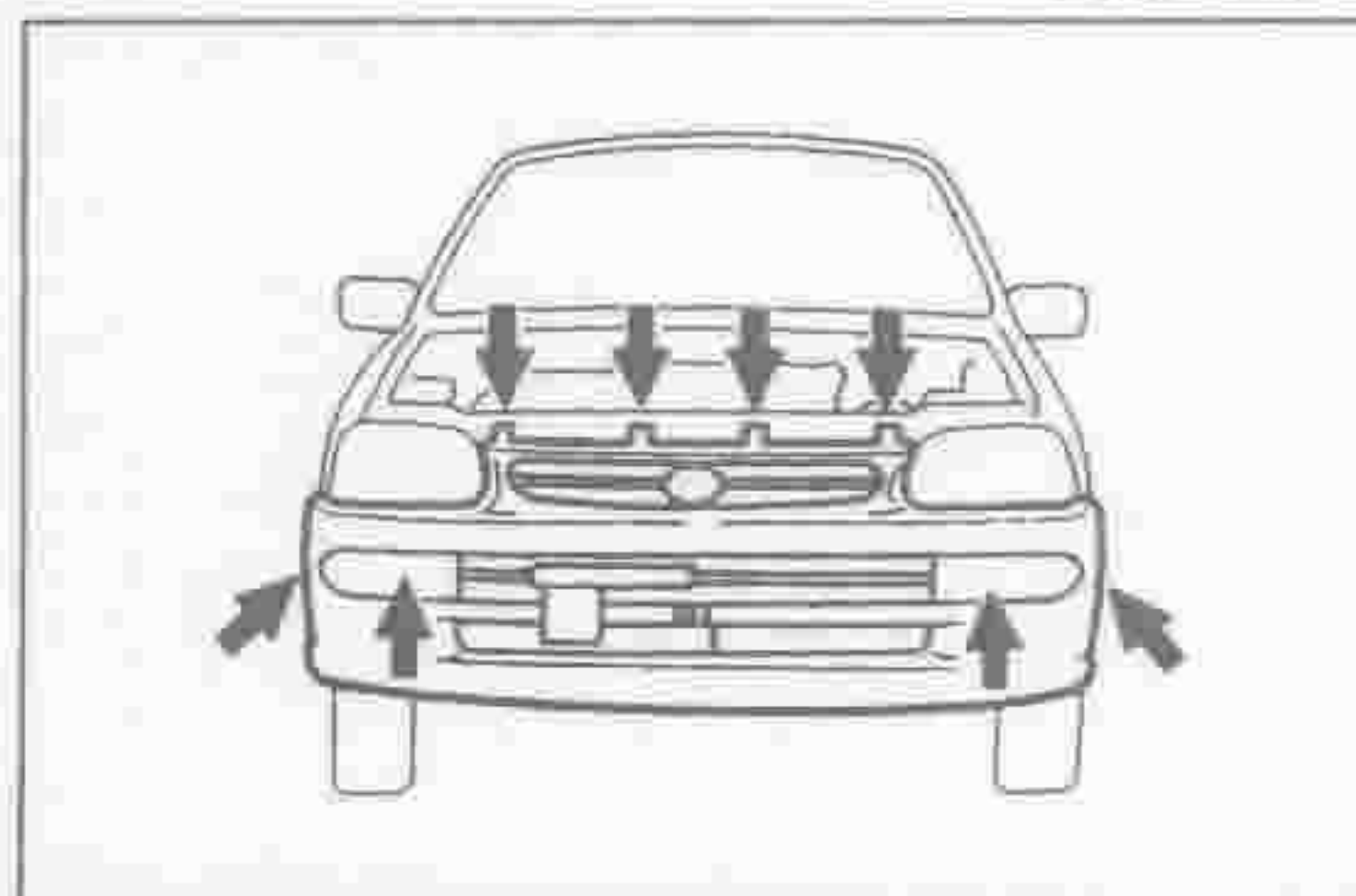
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LEC00016-00014

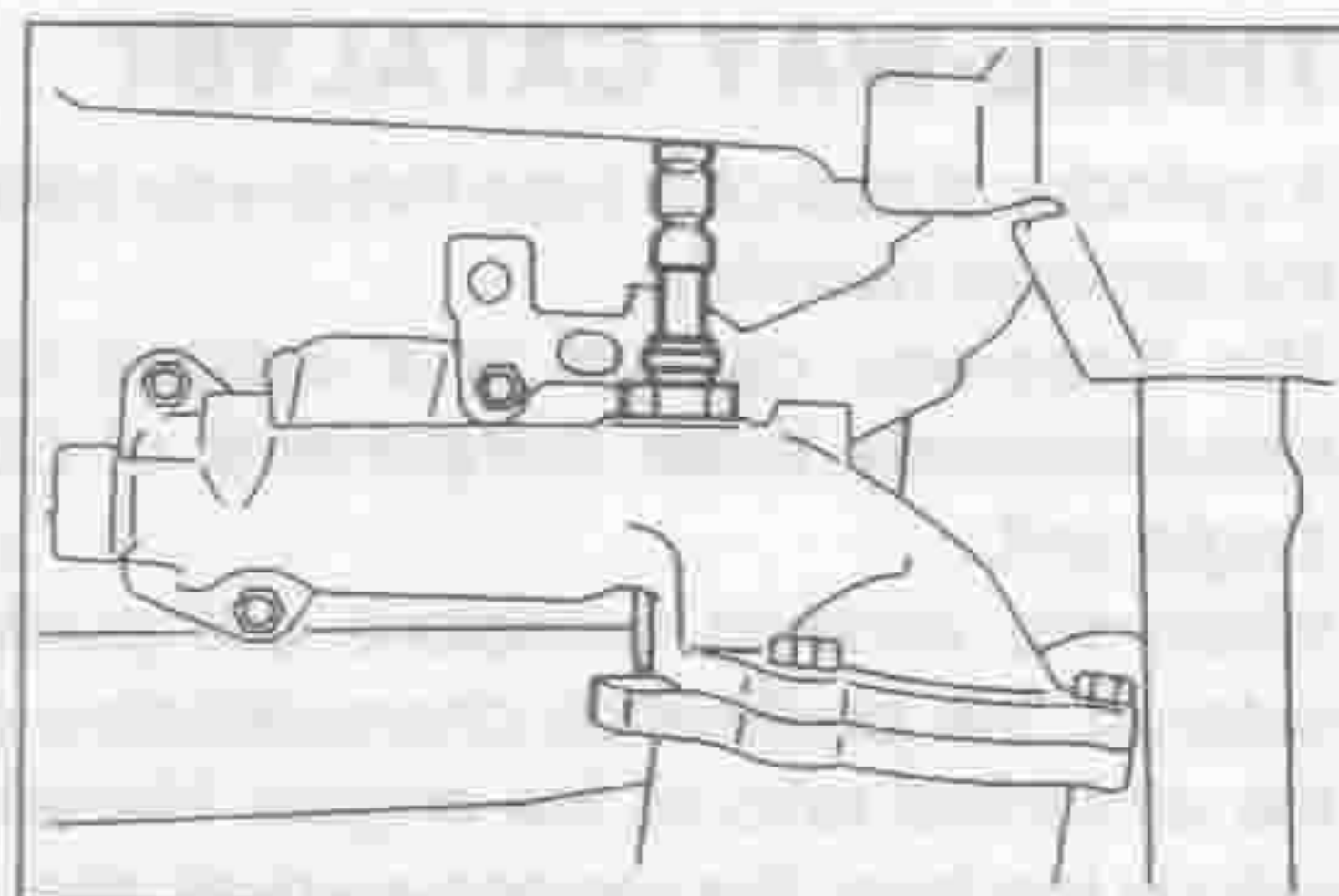
REPLACEMENT OF CATALYST

1. Remove the front bumper.
(Refer to the BO section.)
2. Remove the exhaust manifold cover.
3. Disconnect the oxygen sensor connector. Disconnect the wire of the oxygen sensor from the clamp.



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4. Remove the oxygen sensor from the exhaust manifold.

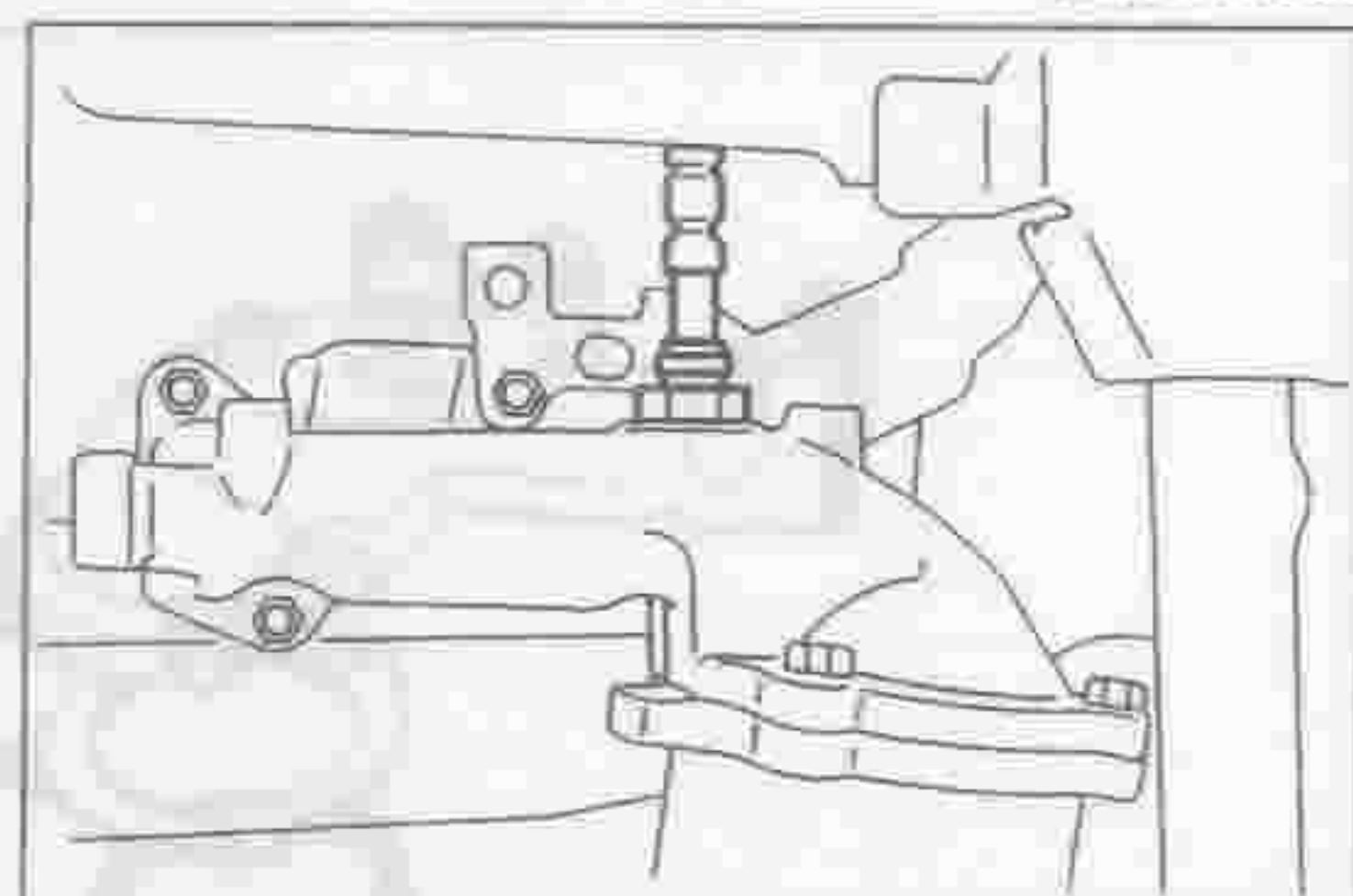


LEC00018-00016

5. Disconnect the exhaust front pipe.
6. Remove the exhaust manifold stay.
7. Remove the exhaust manifold.
8. Remove the gasket material remaining on the both surfaces of the cylinder head and exhaust manifold.
9. Check the exhaust manifold for warpage.
10. Install a new exhaust manifold case No. 2 to the exhaust manifold case No. 1 with a new cushion and a new gasket interposed.
11. Install the exhaust manifold to the cylinder head.
12. Install the exhaust manifold stay.
13. Connect the exhaust front pipe to the exhaust manifold.
14. Install the oxygen sensor to the exhaust manifold with a new gasket interposed.

Tightening Torque:

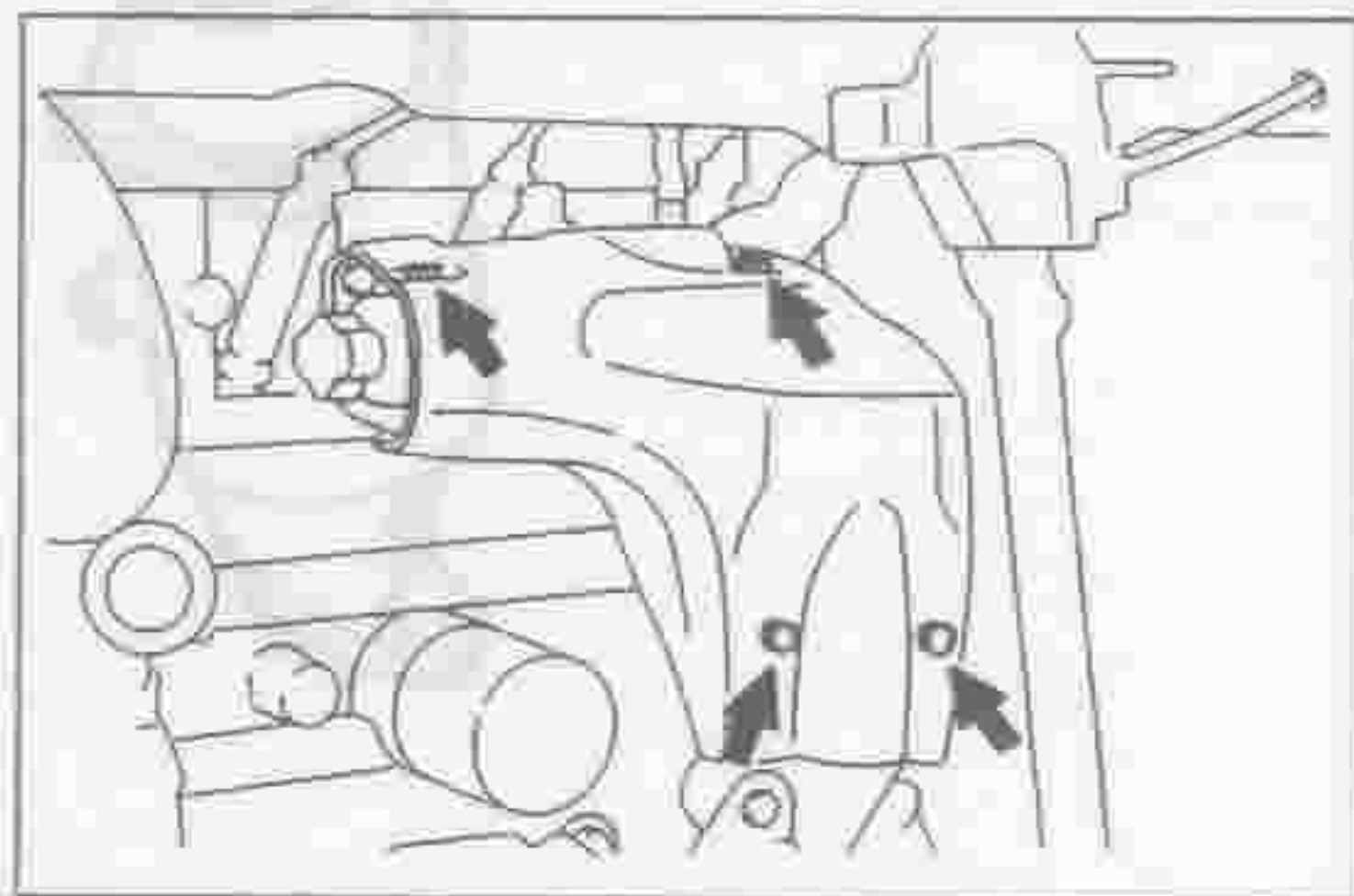
$34.3 \pm 4.9 \text{ N}\cdot\text{m}$ ($3.5 \pm 0.5 \text{ kgf}\cdot\text{m}$)



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LEC00020-00017

15. Install the exhaust manifold cover.
16. Install the front bumper.
17. Connect the oxygen sensor connector. Connect the oxygen sensor wire to the clamp.



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FEEDBACK CONTROL

Type EF-EL Engine and Type ED-20 engine have been equipped with an EFI system. This feedback control is one of functions of the EFI system.

This feedback control is a system which controls the air-to-fuel ratio by judging whether the air-to-fuel ratio of the intake mixture is richer or leaner than the stoichiometric air-to-fuel ratio. This judgment is made by measuring the residual oxygen concentration in the exhaust gas by means of the oxygen sensor.

Upon receiving signals from the oxygen sensor, evaluation is made as to whether the air-to-fuel ratio is richer or leaner than the stoichiometric air-to-fuel ratio. If the ratio is richer, the fuel injection amount (time) is reduced. Conversely, if the ratio is leaner, the fuel injection amount is increased, thus compensating the mixture so that it may have the stoichiometric air-to fuel ratio.

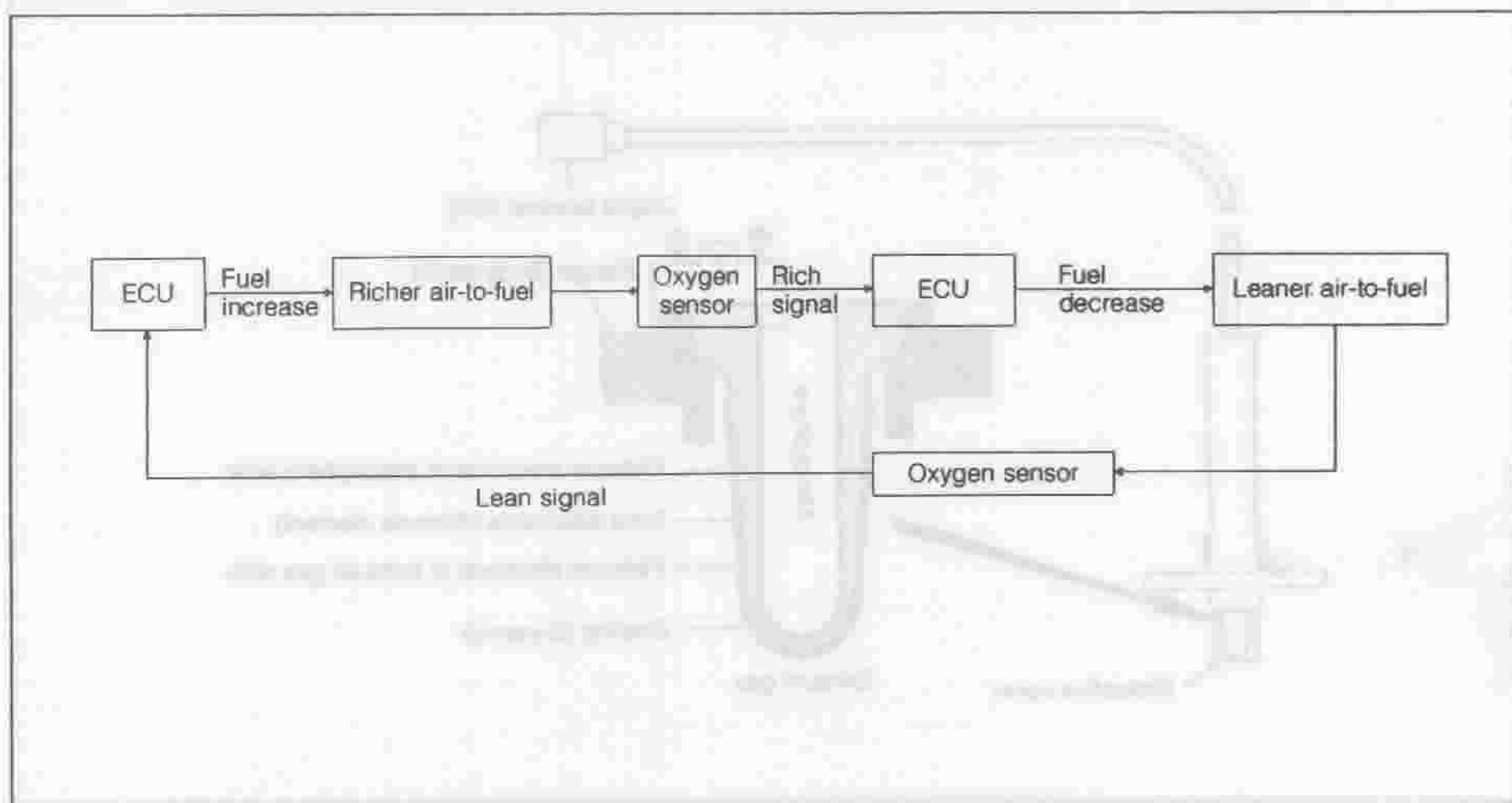


Fig. 2-12

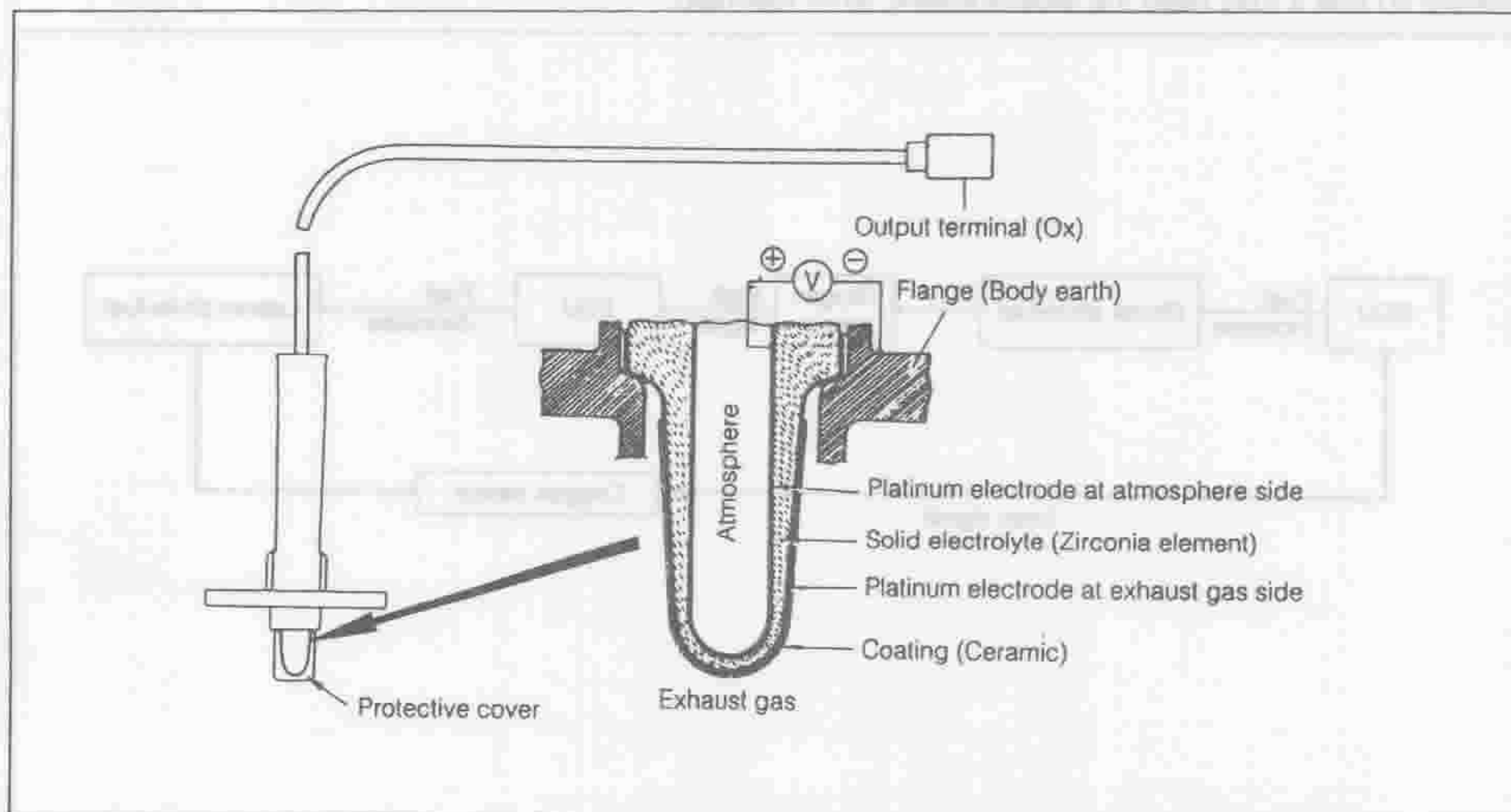
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The oxygen sensor has such characteristics that the electromotive force becomes higher when the air-to-fuel ratio is rich, whereas it becomes lower when the air-to-fuel ratio is lean.

A reference voltage is set based on the output (electromotive force) of the oxygen sensor that is produced when the mixture has the stoichiometric air-to-fuel ratio. Utilizing the aforesaid characteristics of the oxygen sensor, the ECU judges that the mixture is richer when the oxygen sensor output is higher than the reference voltage. Conversely, the ECU judges that the mixture is leaner when the output is smaller than the reference voltage. Thus, the ECU compensates the mixture so that it may have the stoichiometric air-to-fuel ratio by providing compensation rates.

Oxygen Sensor

The oxygen sensor is a compact sensor installed at the exhaust manifold, which detects the oxygen concentration (air-to-fuel ratio) in the exhaust gas. In cases where the fuel is burnt completely, if the air-to-fuel ratio is larger than the stoichiometric ratio (too lean), the exhaust gas still contains oxygen. This is because air was excessive against the air required for the fuel combustion. Conversely, if the air-to-fuel ratio is smaller than the stoichiometric ratio (too rich), the exhaust gas contains no oxygen. Hence, evaluation can be made as to whether the actual air-to-fuel ratio is richer or leaner compared with the stoichiometric air-to-fuel ratio by detecting the oxygen concentration in the exhaust gas. The oxygen sensor has been so constructed that both sides of a measuring-tube-shaped solid electrolyte (Zirconia element) are coated with a thin film of platinum.

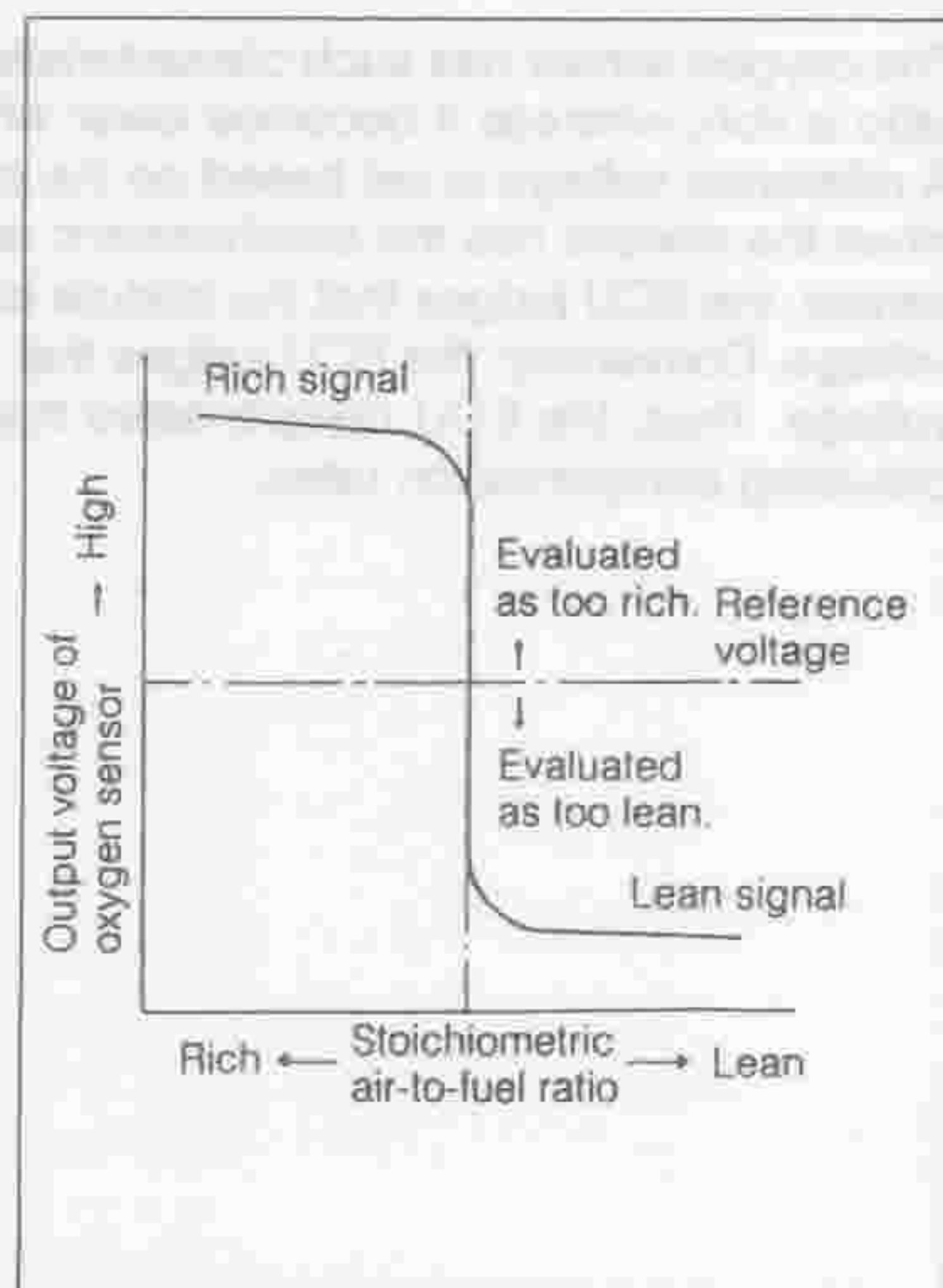


LEC00023-00020

The Zirconia element has such characteristics that an electromotive force is generated if the oxygen concentration differs between both sides of the element. Moreover, when the temperature of the oxygen sensor becomes high, the oxygen sensor has such characteristics that the electromotive force changes suddenly in the neighborhood of the stoichiometric air-to-fuel ratio owing to the platinum catalysis.

(See the right figure.)

The outside of the oxygen sensor is exposed to the exhaust gas, whereas the atmosphere is introduced into the inside of the sensor. Utilizing the characteristics above, correct evaluation can be performed as to whether the oxygen concentration in the exhaust gas, i.e. the air-to-fuel ratio, is too rich or too lean. When the air-to-fuel ratio is richer than the stoichiometric ratio, the electromotive force of the oxygen sensor is high, sending a rich signal to the ECU. Conversely, when the air-to-fuel ratio is leaner than the stoichiometric ratio, the electromotive force of the oxygen sensor is low, sending a lean signal to the ECU. The oxygen sensor starts its operation at about 300°C.



LEC00024-00021

TIGHTENING TORQUES FOR MAIN COMPONENTS

NOTE:

- As regards the tightening torques for the general bolts, refer to the section under "TIGHTENING TORQUES FOR MAIN COMPONENTS" in the EM section.

EMISSION CONTROL SYSTEM

Tightening component	Tightening torque			Remarks
	N·m	kgf·m	ft·lb	
Water temperature switch	29.4 ± 4.9	3.00 ± 0.50	21.7 ± 3.6	
Exhaust manifold No. 1 × No. 2	24.5 ± 4.9	2.50 ± 0.50	18.1 ± 3.6	
Exhaust manifold No. 1 × cylinder head	25.0 ± 5.0	2.55 ± 0.51	18.4 ± 3.7	
Exhaust manifold stay	19.0 ± 3.8	1.95 ± 0.39	14.1 ± 2.8	
Oxygen sensor	34.3 ± 4.9	3.5 ± 0.5	25.3 ± 3.6	
Exhaust pipe × exhaust manifold	39.2 - 53.9	4.00 - 5.50	28.9 - 39.8	

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SERVICE SPECIFICATIONS

EMISSION CONTROL SYSTEM

Water temperature switch	Operating temperature	ON	62°C or above
		OFF	53°C or below
BVS	Continuity between ports (J) and (K)	ON	64°C or above
		OFF	45°C or below
Exhaust manifold No. 1	Warpage		
	Cylinder head side		0.1 mm
	Exhaust manifold No. 2 side		0.1 mm

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