DAIHATSU

F300

[HD-Engine]

EMISSION CONTROL SYSTEM

[HD-C Engine]
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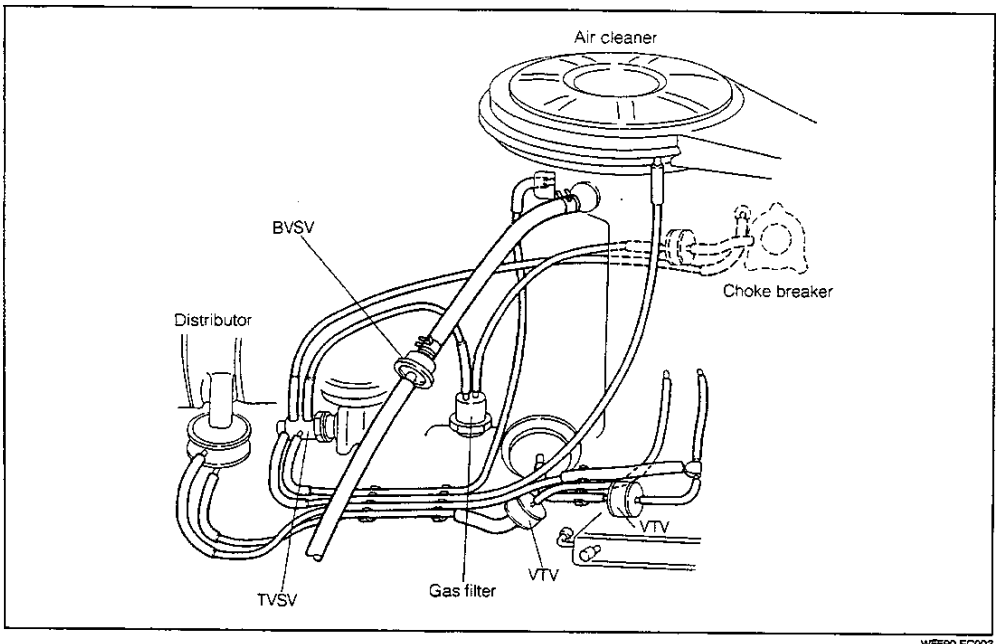
WFE90-EC001

[HD-C Engine]
PURPOSE OF SYSTEM

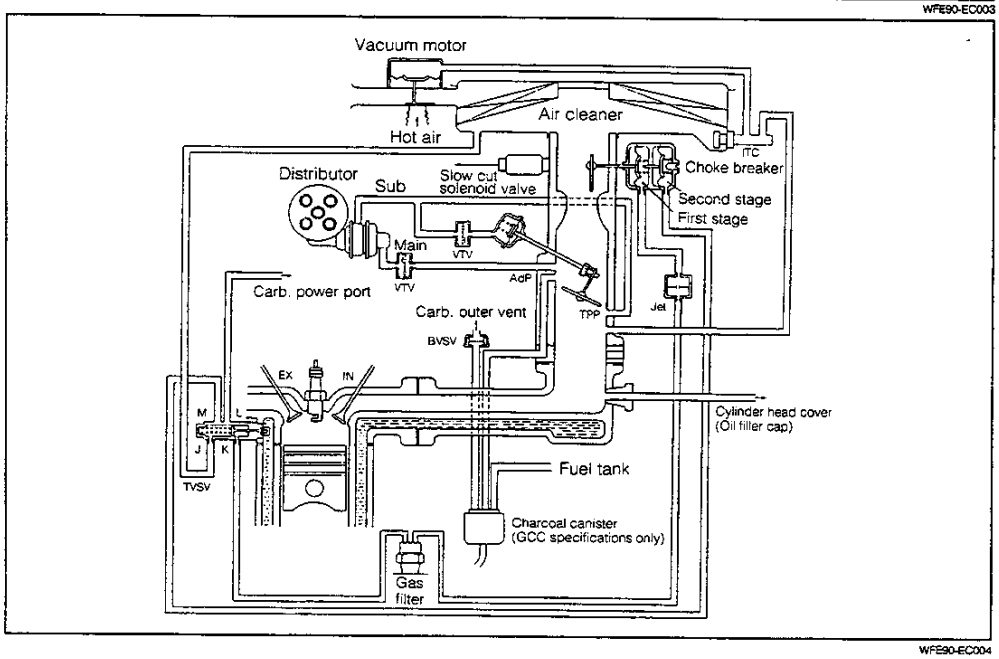
System	Abbreviation	PURPOSE
Positive crank case ventilation	PCV	Reduction of blow-by gas (HC emission)
Spark delay system	SD	Reduction of HC and NOx
Choke breaker system	C/B	Reduction of HC and CO
Throttle positioner system	TP	Reduction of HC and CO
Fuel evaporative emission control system	EVAP	Reduction of evaporative HC emission

WFE90-EC002

COMPONENT LAYOUT & SCHEMATIC DIAGRAM



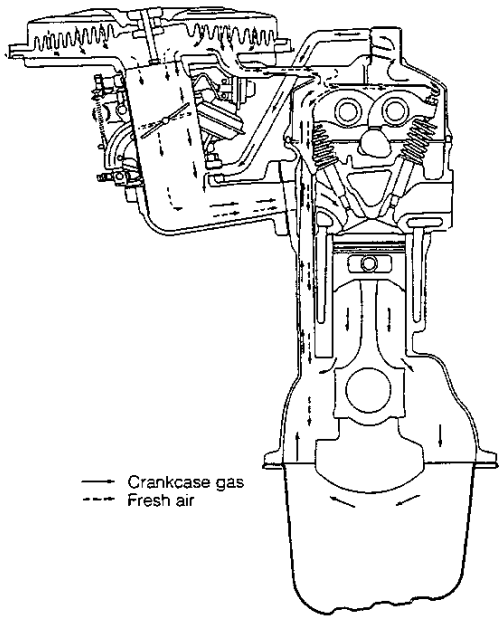
WFE90-EC003



WFE90-EC004

POSITIVE CRANKCASE VENTILATION (PCV)

To combat air-pollution problems, the engine is equipped with a sealed type positive crankcase ventilation system in order to prevent blow-by gases generated inside the crankcase from being released into the atmosphere.
The blow-by gases generated inside the crankcase flow into the cylinder head side through the gas passages of the cylinder block.
When the throttle valve opening degree is small, first the oil in the blow-by gas is separated by the oil separator provided at the cylinder head cover. Then, the blow-by gases flow from the carburetor heat insulator section to the intake manifold. Thus, the gases are sucked into the cylinder and burned again.
At this time, fresh air flows from the upstream of the throttle valve into the cylinder head cover. The air flow rate is restricted by a jet located at the cylinder head cover, thus stabilizing the engine idling.
When the throttle valve opening degree is great and/or a large amount of blow-by gases are generated, the blow-by gases flow through both the upstream and the downstream of the throttle valve and are sucked into the combustion chamber.



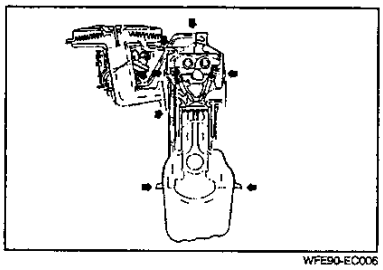
HD-C engine

WFE90-EC005

INSPECTION OF PCV HOSE & CONNECTION

Visual inspection of hoses and connection

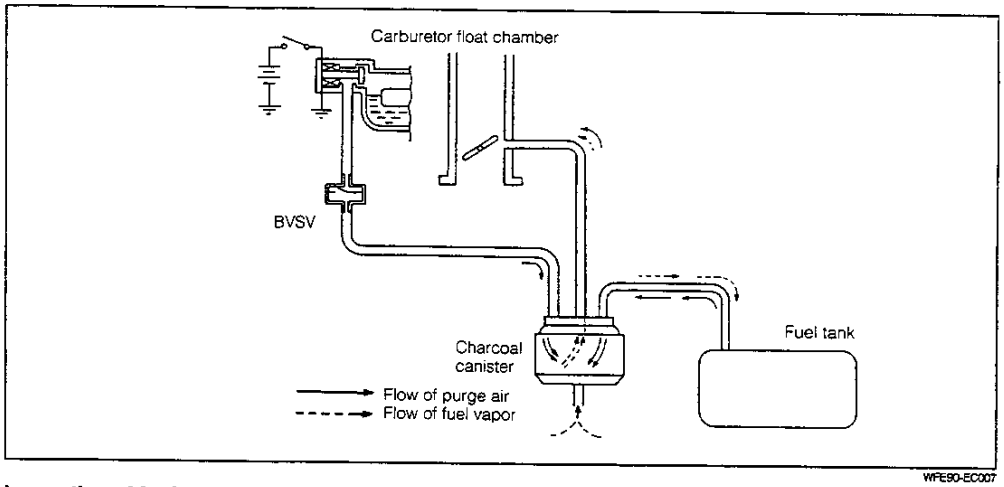
Check the hoses for improper connections, cracks, leak or damage.
Replace or repair any part which exhibits defects.



WFE90-EC006

FUEL EVAPORATIVE EMISSION CONTROL SYSTEM (GCC specifications only)

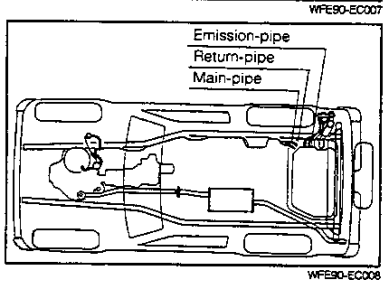
The fuel evaporative emission control system prevents the fuel evaporative emission generated inside the fuel tank or the float chamber of the carburetor from being discharged to the atmosphere.
As the temperature rises, the pressure of the fuel evaporative emission generated in the fuel tank increases while the engine is stopped. When this pressure rise exceeds a certain level, the check valve at the positive pressure side is raised and the evaporative emission is absorbed into the activated carbon in a charcoal canister.
When the engine starts running, the check valve at the negative pressure side opens so that any evaporative emission stored in the canister may be sent to the combustion chamber to be reburnt there.
On the other hand, the fuel evaporative emission generated in the float chamber of the carburetor is sent into the charcoal canister when the BVSV exceeds the set temperature (65°C).



WFE90-EC007

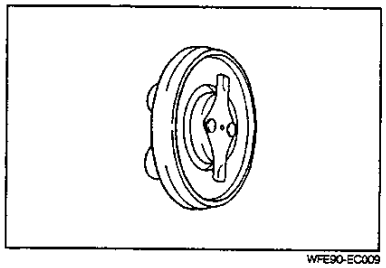
Inspection of fuel vapor lines, fuel tank & filler cap

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



WFE90-EC008

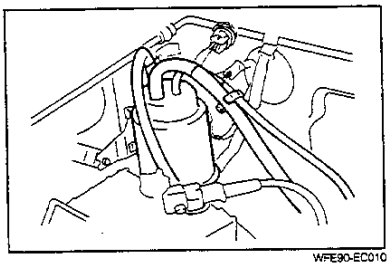
3. Visual inspection of fuel filler cap
   Check the cap and gasket for damage or deformation.
   Replace the cap, if necessary.



WFE90-EC009

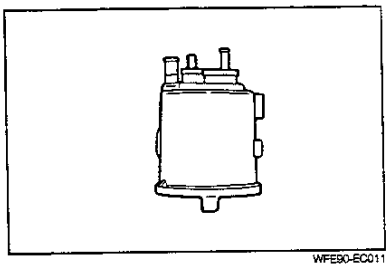
Inspection of charcoal canister (GCC specification only)

1. Disconnect the rubber hoses and remove the charcoal canister.
   NOTE:
   - Put a tag on each of the rubber hoses so that they may be reconnected correctly to the original positions.



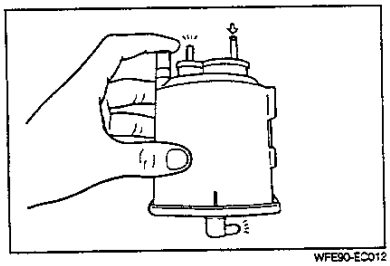
WFE90-EC010

2. Visual inspection of charcoal canister case
   Visually inspect the charcoal canister case for cracks or damage.



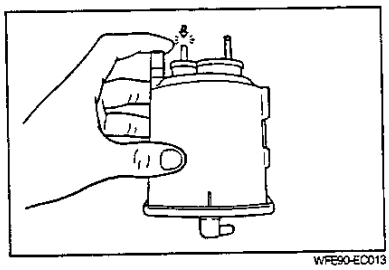
WFE90-EC011

3. Check of canister for restriction
   (1) With the pipe at the BVSV side plugged with your finger, apply compressed air from the pipe at the fuel tank side. Ensure that air leaks from the other pipe.



WFE90-EC012

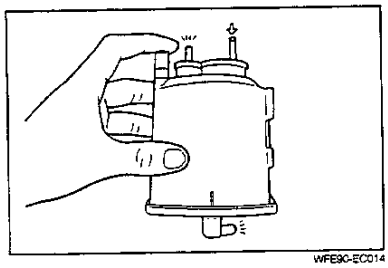
   (2) Apply compressed air from the purge side. Ensure that no air continuity exists.
   If the check results are unsatisfactory, replace the charcoal canister.



WFE90-EC013

4. Cleaning of filter in canister
   Clean the filter by blowing compressed air of 294 kPa (3 kgf/cm^2) into the tank pipe while holding the other upper canister pipe closed.
   NOTE:
   - Do not attempt to wash the canister.
   - No activated carbon should come out during the test.

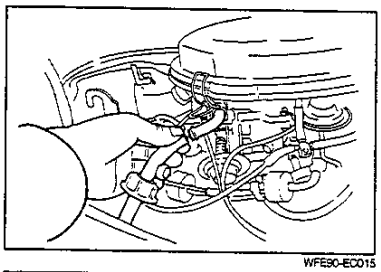
5. Install the charcoal canister and reconnect the rubber hose.



WFE90-EC014

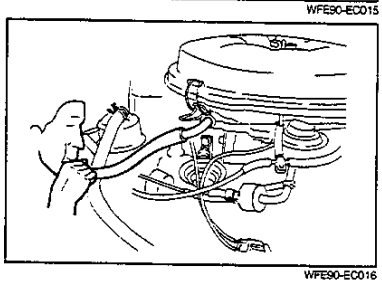
Inspection of outer vent valve

1. Disconnect the rubber hose at the BVSV side.



WFE90-EC015

2. With the ignition key switch turned ON, blow air into the outer vent valve. Ensure that no air continuity exists.
   If air continuity exists, check to see if any abnormality is present in the electric circuit of the outer vent valve. Then, replace the outer vent valve, as required.
   CAUTION:
   - Never inhale the air during the continuity inspection.



WFE90-EC016

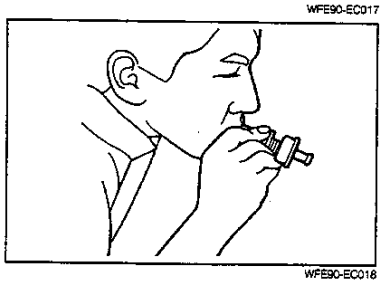
3. With the ignition key switch turned OFF, blow air into the outer vent valve. Ensure that air continuity exists.
   If no air continuity exists, check to see if any abnormality is present in the electric circuit of the outer vent valve. Then, replace the outer vent valve, as required.
   CAUTION:
   - Never inhale the air during the continuity inspection.

4. Connect the rubber hose to the BVSV. Attach the hose bands.

Inspection of BVSV

1. Remove the BVSV.
2. Check the air continuity of the BVSV under the following ambient air temperature conditions.
   Below 50°C ... No air continuity exists.
   Above 65°C ... Air continuity exists.
3. Install the BVSV on the carburetor.

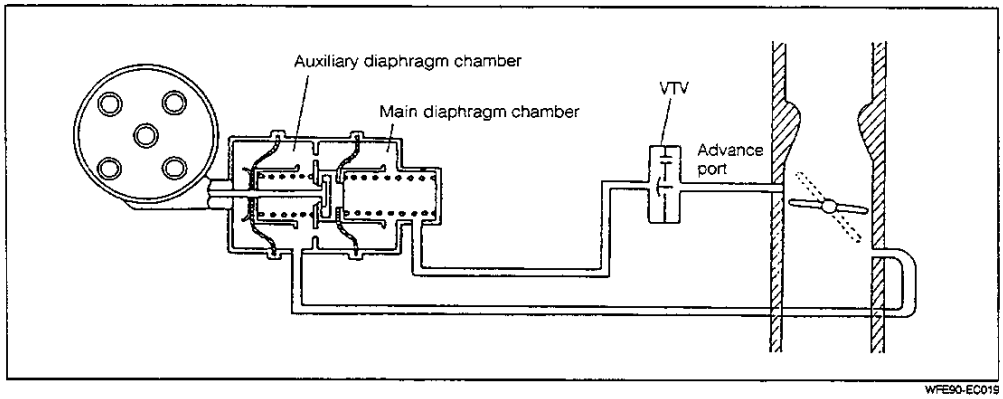
WFE90-EC017



WFE90-EC018

SPARK DELAY SYSTEM

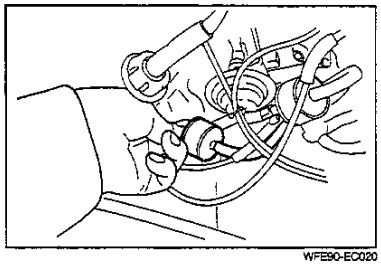
During an acceleration period, this system reduces the HC and NOx emissions generated during the transient period by retarding the ignition advance timing temporarily. This is accomplished by means of the VTV which retards the application of a negative pressure being applied to the main diaphragm of the distributor vacuum advancer through the carburetor advance port.



WFE90-EC019

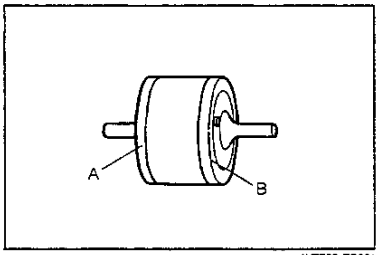
Unit inspection of spark delay system

1. Remove the VTV from engine.



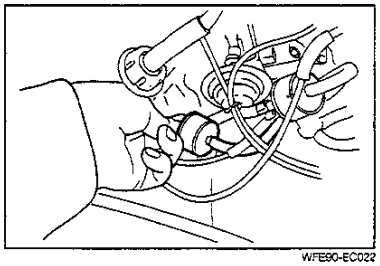
WFE90-EC020

2. Inspection of VTV
   (1) Blow your breath into the VTV carburetor side (side B). Ensure that the air passes through without restriction. If significant restriction exists, replace the VTV.
   (2) Blow your breath into the VTV distributor side (side A). Ensure that there is restriction. If no restriction exists, replace the VTV.



WFE90-EC021

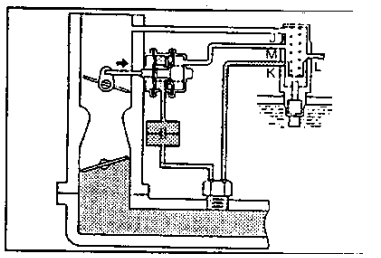
3. Install the VTV to the engine.



WFE90-EC022

CHOKE BREAKER SYSTEM

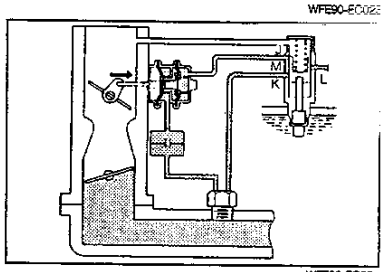
This system opens the choke valve during a period immediately after starting so as to reduce the HC and CO emissions.



WFE90-EC023

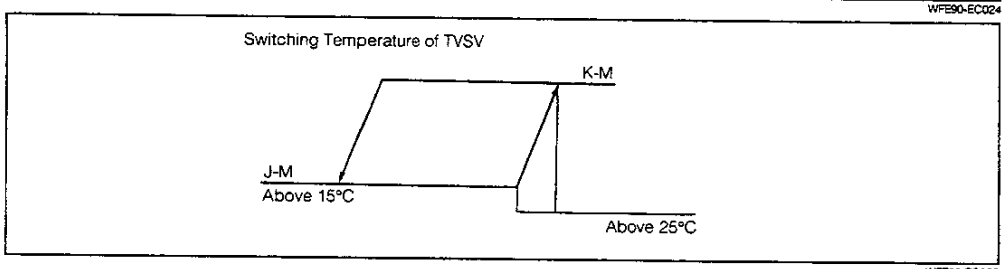
Operation

During a period immediately after starting, negative pressure is applied gradually to the first stage of the choke breaker diaphragm. Consequently, the choke valve is opened slightly. When the water temperature is low, the atmosphere is applied to the second stage of the choke breaker diaphragm via the TVSV. Thus, the second diaphragm remains inoperative.



WFE90-EC024

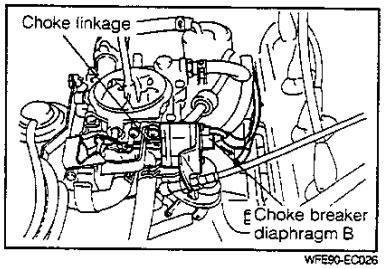
When the temperature reaches a certain level as the cooling water temperature rises, the negative pressure of the intake manifold starts to be applied to the second stage of the choke breaker diaphragm via the TVSV.
As a result, the choke valve opens further, thereby preventing the air-to- fuel ratio from becoming too rich.



WFE90-EC025

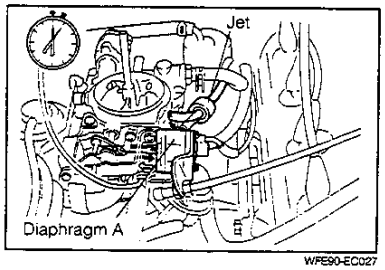
Inspection of choke breaker system

1. Inspection of TVSV with cold engine
   (1) Start the engine.
   (2) With the coolant temperature below 15°C, disconnect the vacuum hose from choke breaker diaphragm B and check that the choke linkage does not move.
   (3) Reconnect the vacuum hose to diaphragm B.



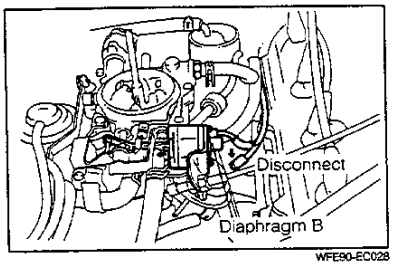
WFE90-EC026

2. Inspection of jet and diaphragm A
   (1) Disconnect the vacuum hose from the choke breaker diaphragm A and check linkage moves.
   (2) Reconnect the vacuum hose to diaphragm A and check that the choke linkage moves within the specified time after reconnecting the hose.
   Specified Time: 1 - 5 seconds



WFE90-EC027

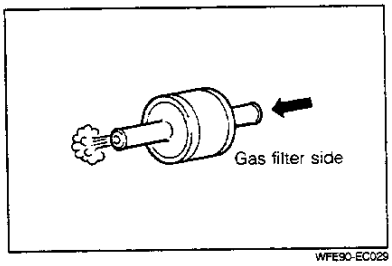
3. Inspection of TVSV and diaphragm B with warm engine
   (1) After warming up the engine, disconnect the vacuum hose from diaphragm B and check that the choke linkage returns.
   (2) Reconnect the vacuum hose to diaphragm B.
   If no problem is found with this inspection, the system is okay; otherwise inspect each part.



WFE90-EC028

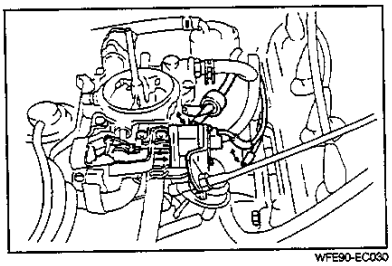
Unit inspection of choke breaker

1. Inspection of jet
   (1) Check the jet by blowing air from each side.
   (2) Ensure that there is no restriction if the air blows form the gas filter side.

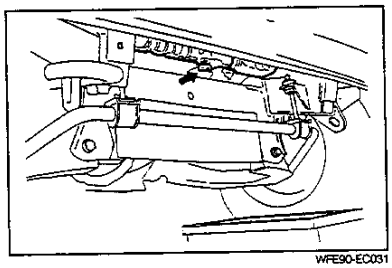


WFE90-EC029

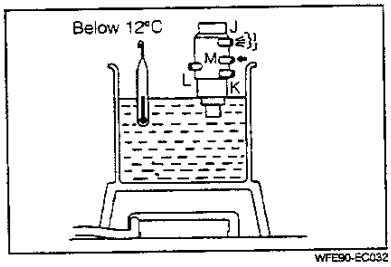
2. Inspection of choke breaker diaphragms
   (1) Check that choke linkage moves in accordance with applied vacuum.


WFE90-EC030

3. Inspection of TVSV
   (1) Drain the cooling water from radiator into a suitable container.
   (2) Disconnect the vacuum hose from the TVSV, and remove the TVSV.
   NOTE:
   - **Be very careful not to damage the TVSV by hitting it to the by-pass pipe.**

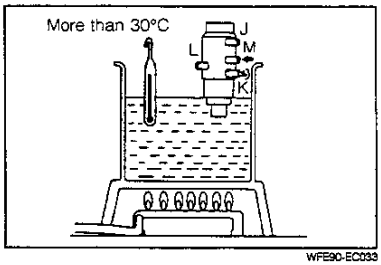

WFE90-EC031

   (3) Cool the TVSV thermo sensing section to below 12°C, and check that air flows from pipe M to pipe J.



WFE90-EC032

(4) Heat the TVSV more than 30°C, and check that air flows from pipe M to pipe K.

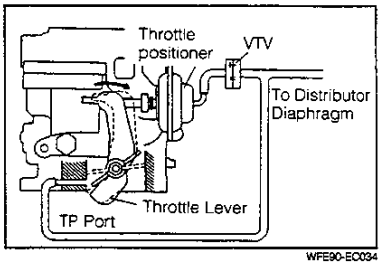


WFE90-EC033

THROTTLE POSITIONER (TP) SYSTEM

Operation

For the purpose of reducing the CO and HC emissions, the throttle positioner prevents the throttle valve from being closed suddenly during the engine braking period, utilizing a negative pressure generated in the intake manifold.

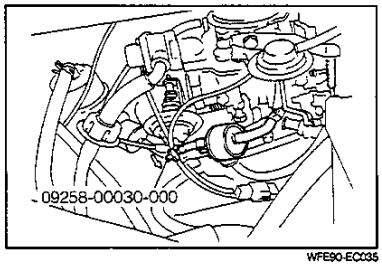


WFE90-EC034

Inspection of throttle positioner system

1. Warm up the engine.
2. Disconnect the vacuum hose from the throttle positioner. Plug the hole, using the following SST.
   SST: 09258-00030-000

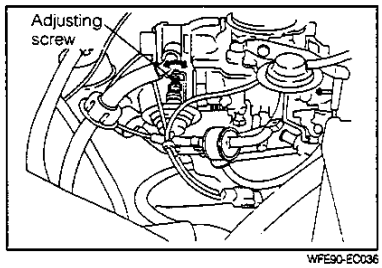
   NOTE:
   - At this time, be sure that the throttle positioner shaft is stretched fully.



WFE90-EC035

3. Check that touch revolution speed is set.
   Touch Revolution Speed: 1500 ± 50 rpm

4. It not at specified speed adjust with throttle positioner adjusting screw.



WFE90-EC036

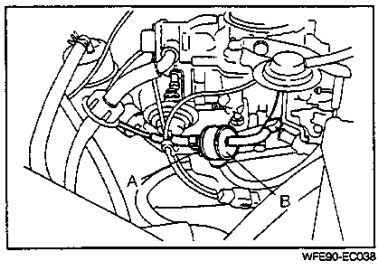
5. Hold the engine revolution speed at about 2500 rpm at least five seconds by opening the throttle valve. Then, release the throttle lever. Check that the time required for the engine revolution speed to drop from 1500 to 1200 rpm conforms to the specified value.
   Specified Time: 0.5 - 5 seconds

   If the time will not conform to the specification, check the direction of the VTV. Then, proceed to check the VTV.

WFE90-EC037

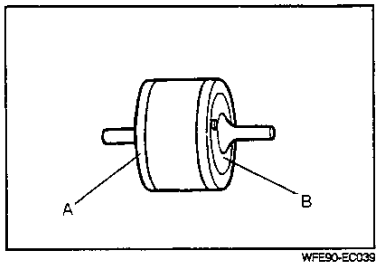
Inspection of VTV

1. Remove the VTV. Blow your breath into the VTV from the carburetor side (side B). Ensure that the air passes through without restriction.
   If significant restriction exists, replace the VTV.



WFE90-EC038

2. Blow your breath into the VTV from the throttle positioner side (side A). Ensure that there is restriction.
   If no restriction exists, replace the VTV.



WFE90-EC039

[HD-E Engine]
PURPOSE OF SYSTEMS

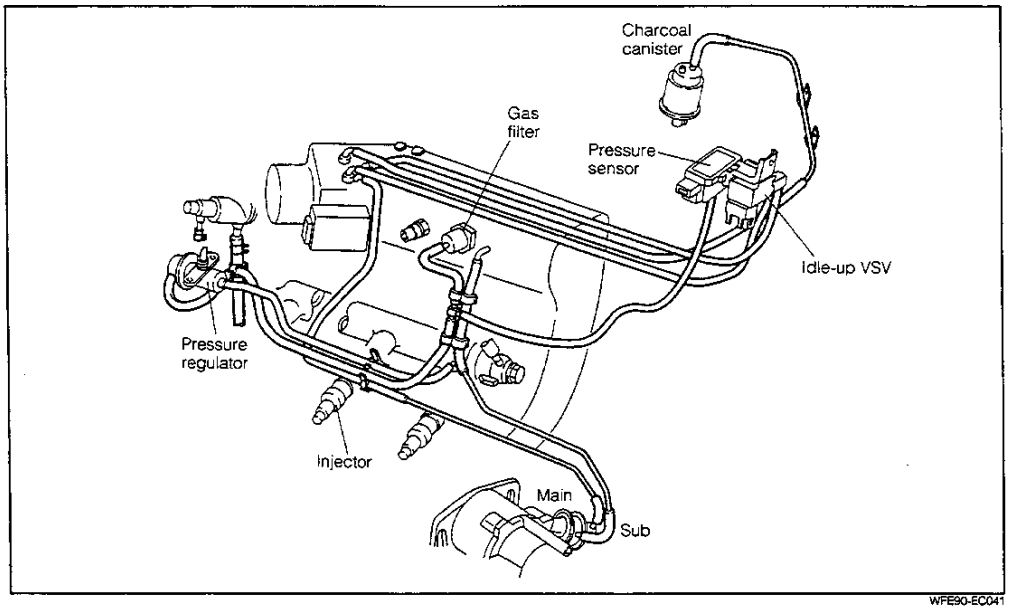
System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduction of blow-by gas (HC emission)
Fuel evaporative emission control	EVAP	Reduction of evaporative HC emission
Throttle positioner	TP	Reduction of HC and CO emissions
Exhaust gas recirculation	EGR	Reduction of NOx emission
Three-way catalyst (Catalyst provided at under floor.)	TWC	Reduction of HC, CO and NOx emissions
Electronic fuel injection*	EFI	Regulation of all engine conditions for reduction of exhaust emissions

* For inspection and repairs of the EFI system, refer to the EFI section.

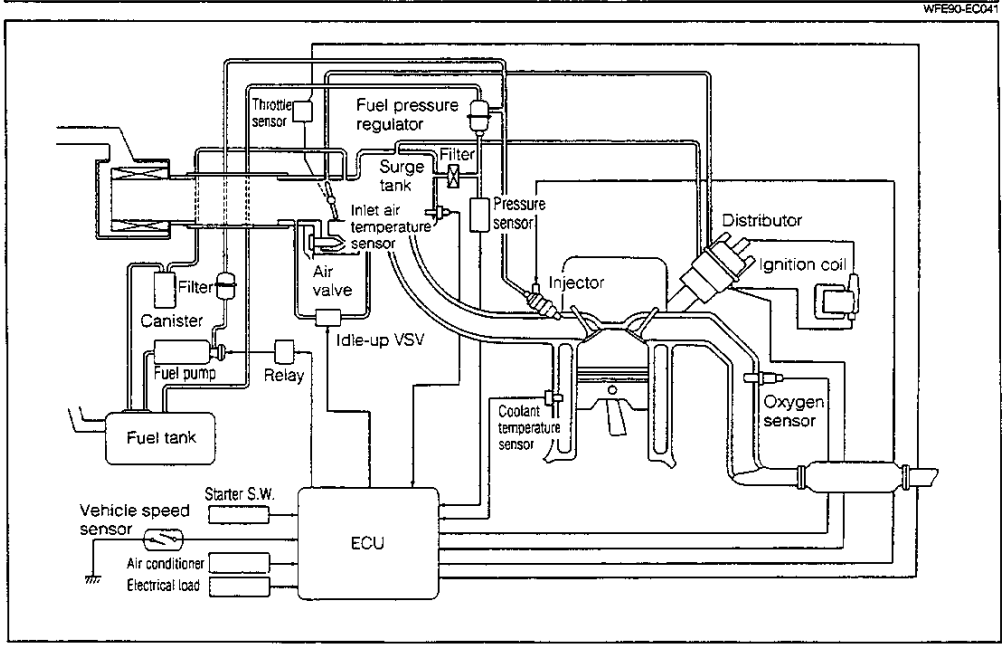
WFE90-EC040

COMPONENT LAYOUT & SCHEMATIC DIAGRAM

(General Specification)

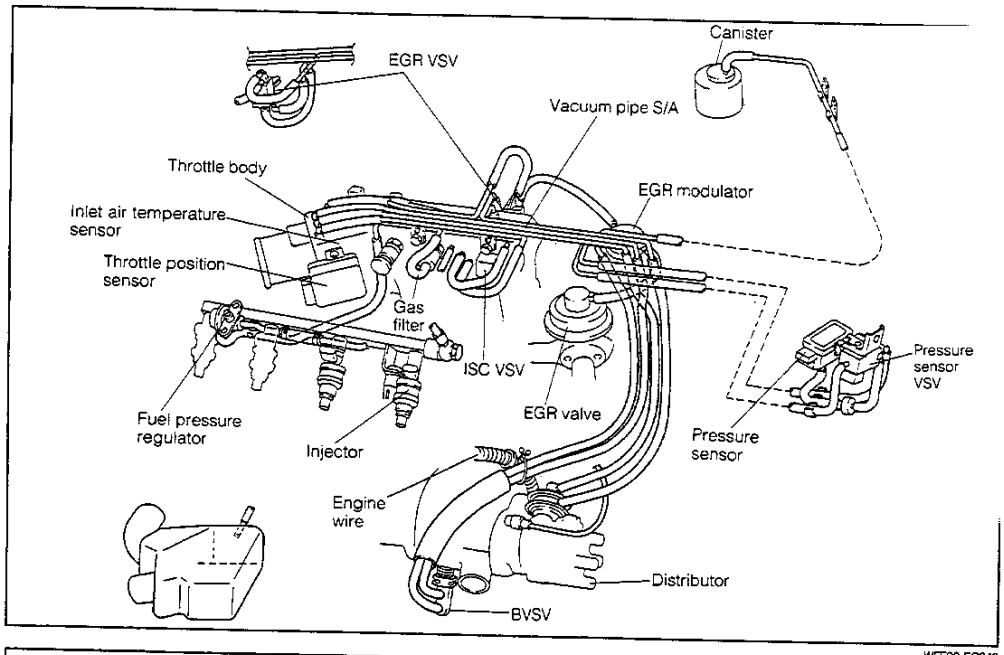


WFE90-EC041

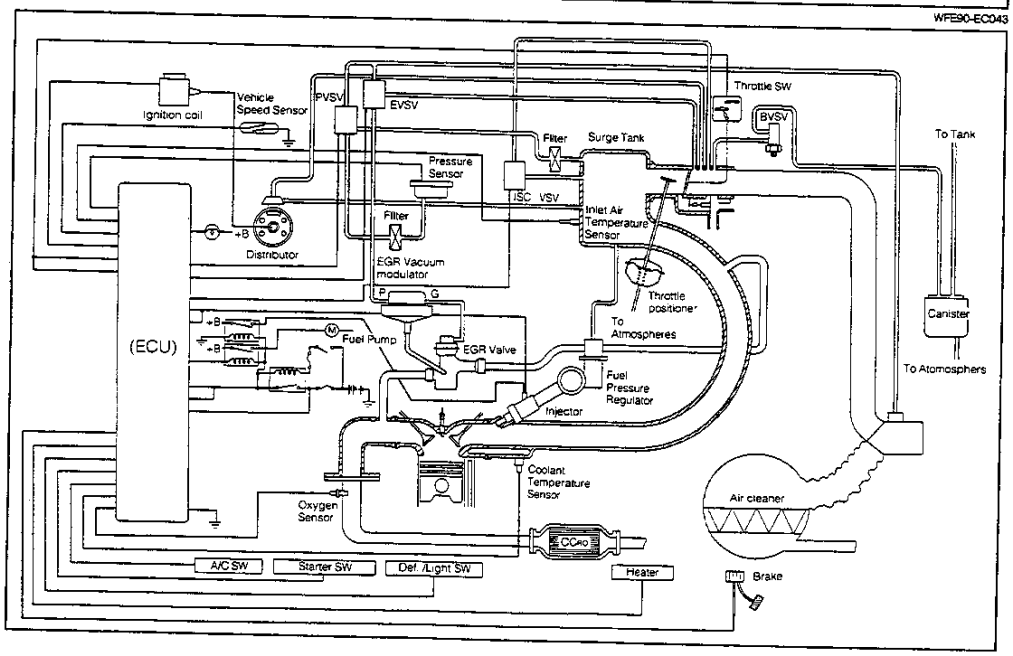


WFE90-EC042

(US Specification)



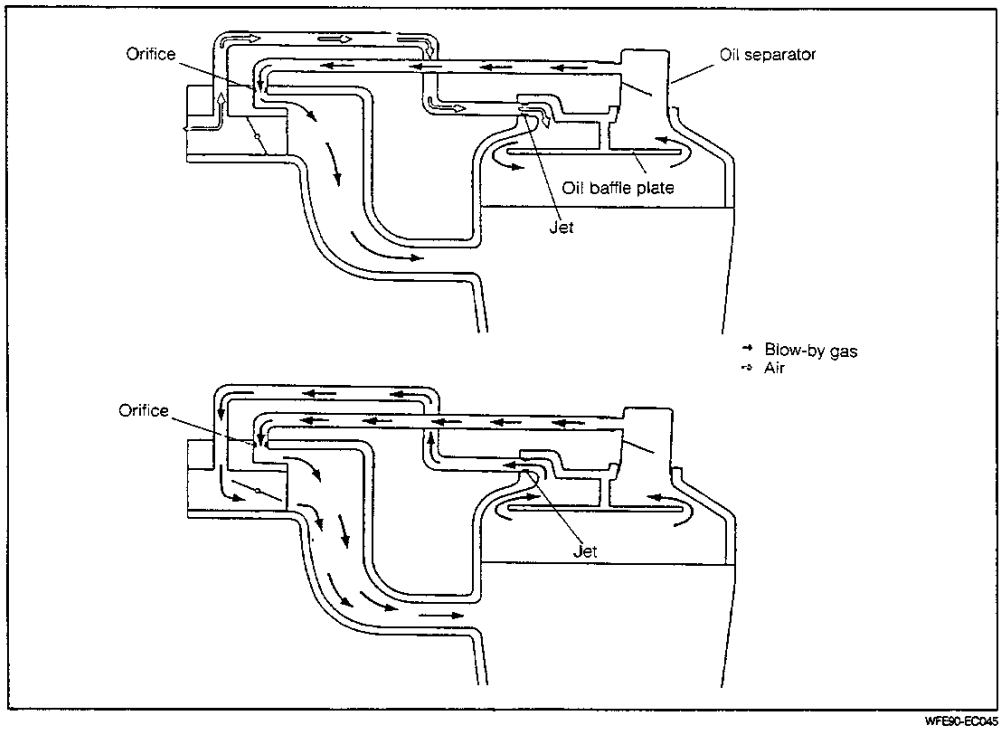
WFE90-EC043



WFE90-EC044

POSITIVE CRANKCASE VENTILATION SYSTEM (PCV)

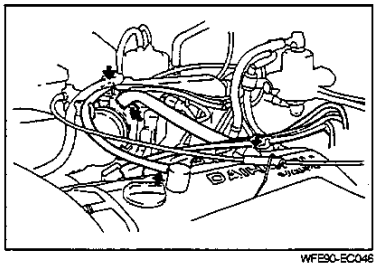
To combat air-pollution problems, the engine is equipped with a sealed type positive crankcase ventilation system in order to prevent blow-by gases generated inside the crankcase from being released into the atmosphere.
The blow-by gases generated inside the crankcase flow into the cylinder side through the gas path of the cylinder block. When the opening degree of the throttle valve is small, oil in the blow-by gases is separated by the oil separator provided at the cylinder head cover. Then, the blow-by gases are sucked into the cylinders from the throttle body to be burnt again.
Fresh air enters the cylinder head cover from the upstream path of the throttle valve. At this time, the air flow rate is regulated by a jet provided at the cylinder head cover, thus stabilizing the engine idling. When the opening degree of the throttle valve is large and/or when a large amount of blow-by gases are generated, the blow-by gases are sucked into the combustion chambers both through the upstream path and the downstream path of the throttle valve.



WFE9C-EC045

INSPECTION OF PCV HOSE & CONNECTION

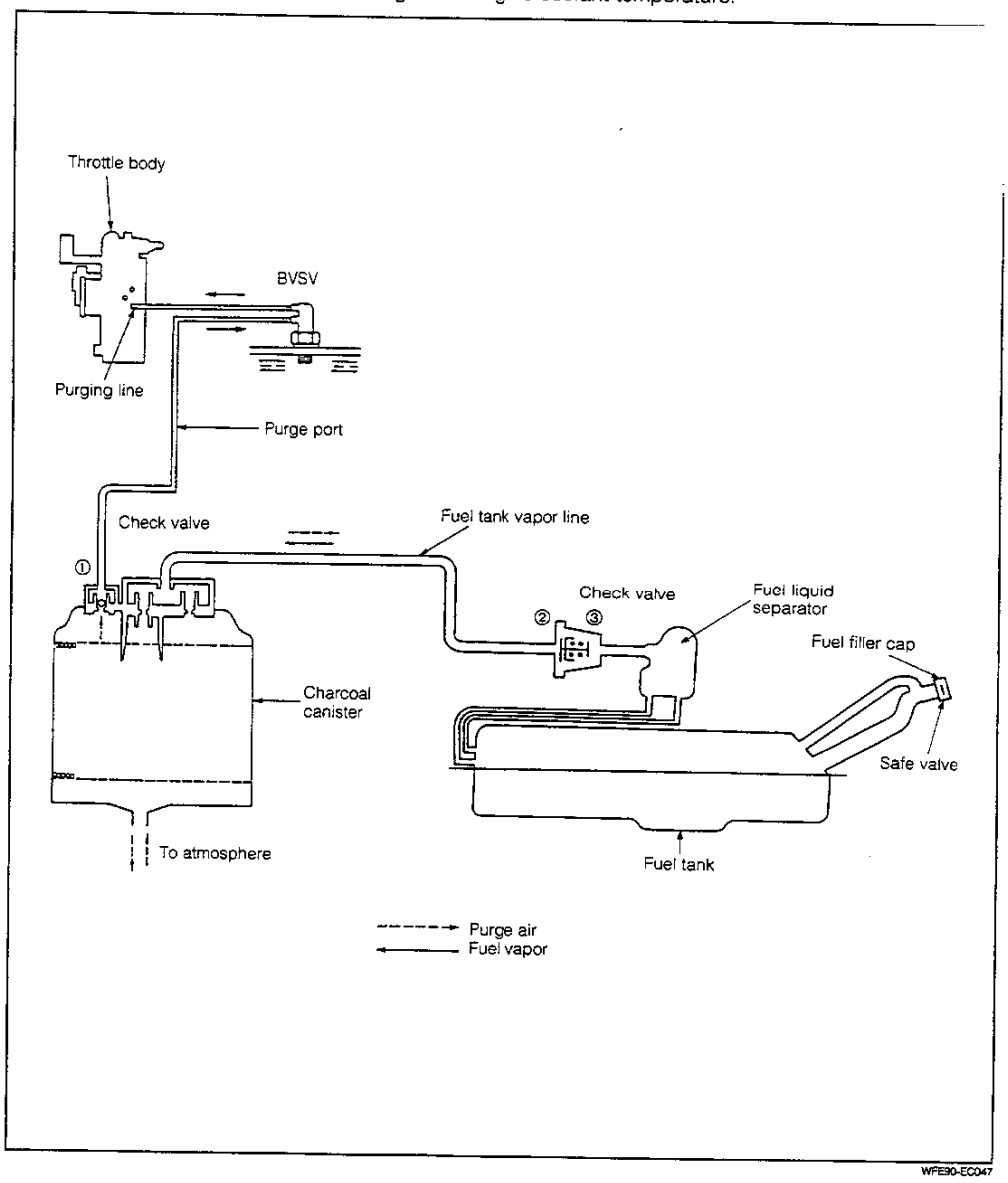
Visual inspection of hoses and connections check the hoses and connections for cracks, leakage or damage.
If any parts exhibit fault, replace or repair them, as required.



WFE9C-EC046

FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM

The fuel evaporative emission control system employs the charcoal canister type. Pressure created by evaporating fuel drives the vapors into the charcoal canister which uses activated carbon to absorb HC emission.
The separated HC emission is drawn into the throttle body to be burnt together with mixture in the combustion chamber when the BVSV opens according to the engine coolant temperature.



WFE90-EC047

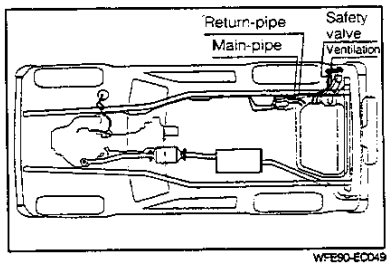
Coolant temp. or tank pressure	BVSV	Throttle valve opening position	*Check valve			Fuel filler cap check valve	Evaporated fuel (HC)
			(1)	(2)	(3)		
Below 45°C	CLOSED	—	—	—	—	—	HC from fuel tank is absorbed by canister
Above 66°C	OPEN	Positioned below purge port	CLOSED	—	—	—	
		Positioned above purge port	OPEN	—	—	—	HC from canister is sucked into engine
High pressure in fuel tank	—	—	—	OPEN	CLOSED	CLOSED	HC from fuel tank is absorbed by canister
High vacuum in fuel tank	—	—	—	CLOSED	OPEN	CLOSED (OPEN when excessive high vacuum)	(Air is led into fuel tank)

*: (1)...Charcoal canister, (2)...Safety valve positive side, (3)...Safety valve negative side

WFE90-EC048

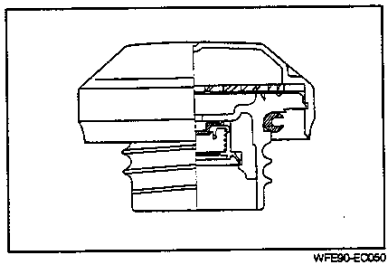
INSPECTION OF FUEL VAPOR LINES, FUEL TANK, FILLER CAP & SAFETY VALVE

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.



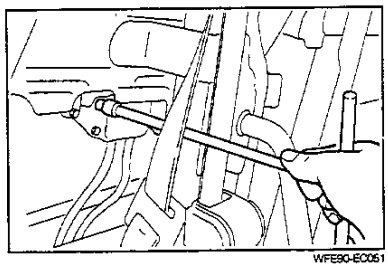
WFE90-EC049

3. Visual inspection of fuel filler cap
   Check the cap and gasket for damage or deformation.
   Repair or replace the gasket and/or cap, if necessary.



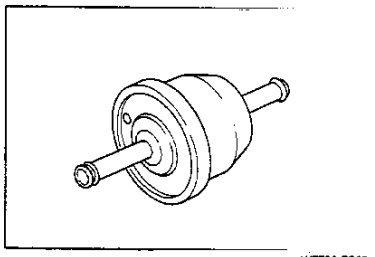
WFE90-EC050

4. Inspection of safety valve
   (1) Remove the quarter trim RH by detaching the eleven clips.
   (2) Detach the safety valve together with fuel separator.
   (3) Disconnect the hoses from the safety valve.



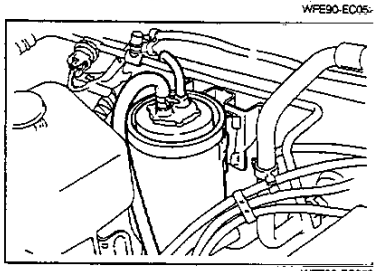
WFE90-EC051

(4) Ensure that there exists resistance when you blow your breath lightly form the side A. Also, ensure that the resistance no longer exists when you blow your breath strongly.
(5) Ensure that there exists resistance when you suck air lightly from the side B. Also, ensure that the resistance no longer exists when you suck air strongly.

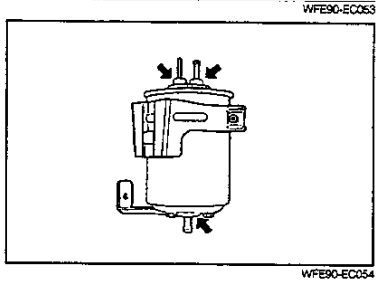

WFE90-EC052

INSPECTION OF CHARCOAL CANISTER

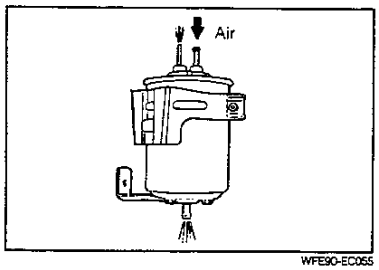
1. Disconnect the rubber hoses and remove the charcoal canister


WFE90-EC053

2. Visual inspection of charcoal canister case
   Visually inspect the charcoal canister case for cracks or damage.

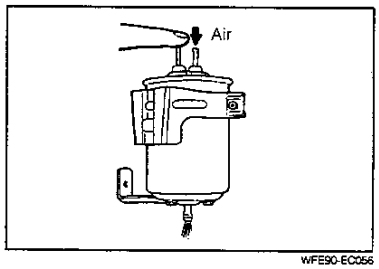

WFE90-EC054

3. Check of filter for restriction
   (1) Blow low pressure compressed air into the tank pipe. Ensure that air flows without resistance from the other pipe.
   (2) Blow air into the purge pipe. Ensure that no air flows from the other pipe.
   Replace the charcoal canister, if it exhibits any defect.



WFE90-EC055

4. Cleaning of filter in canister
   Clean the filter by blowing compressed air of 294 kPa (3 kgf/cm^2) into the tank pipe while holding the other upper canister pipe closed.
   NOTE:
   - Do not attempt to wash the canister.
   - No activated carbon should come out during the test.



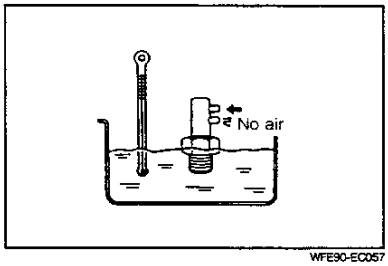
WFE90-EC056

5. Install the charcoal canister and reconnect the rubber hose.

INSPECTION OF BVSV

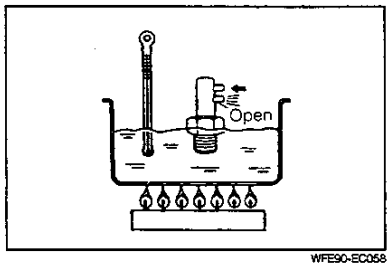
Checking of BVSV by blowing air into pipe

1. Drain the coolant from the radiator into a suitable container.
2. Remove the BVSV.
3. Cool the BVSV to below 45°C
4. Ensure that no air continuity exists. If air continuity exists, replace the BVSV.



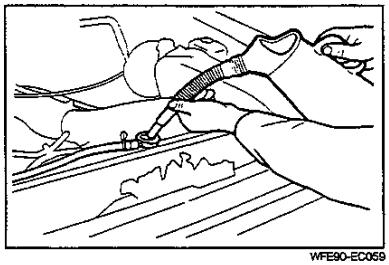
WFE90-EC057

5. Heat the BVSV to above 66°C, using hot water.
6. Ensure that air continuity exists.
   If no air continuity exists, replace the BVSV.
7. Apply liquid sealer to the threaded portion of the BVSV. Reinstall the BVSV.
   Tightening Torque: 24.5 - 34.3 N·m (2.5 - 3.5 kgf-m)



WFE90-EC058

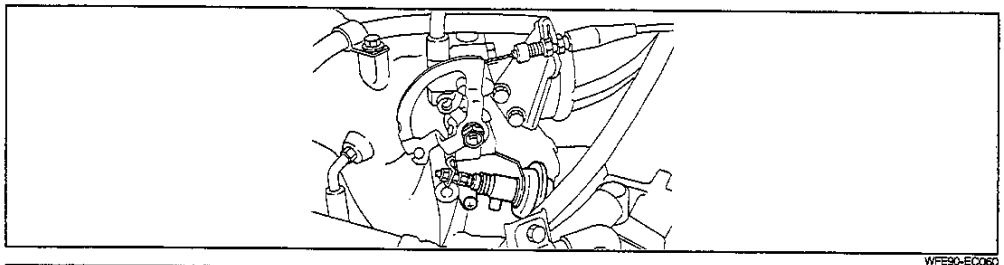
8. Fill the coolant to the radiator.
   (See page CO–12.)
9. Start the engine. Check the coolant level.
   If the coolant level is low, add the coolant.
10. Check the water leakage and/or air leakage.



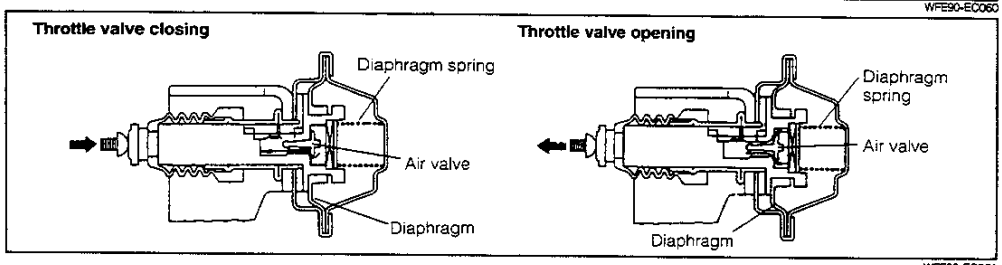
WFE90-EC059

THROTTLE POSITIONER (TP) SYSTEM

This system prevents the throttle valve from suddenly closing, thus reducing the CO and HC emissions.



WFE90-EC060



WFE90-EC061

Conditions	TP diaphragm	Throttle valve
Idling	Pushed in by return force of throttle valve	Idle speed position
Normal driving	Pushed out by diaphragm spring	Opened position
Deceleration	* Pushed in by return force of throttle valve	Slightly opens and then slowly closes to the idle position.

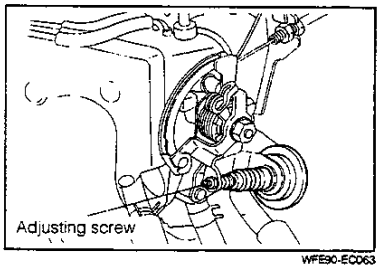
* At this point, the function of the air valve provided inside the throttle positioner diaphragm prevents the throttle valve from being closed suddenly.

INSPECTION OF THROTTLE POSITIONER (TP) SYSTEM

1. Warm up the engine.
2. Check the idle speed. Adjust the speed, if necessary.
3. Check of TP setting speed
   (1) Raise the engine speed to approximately 3000 rpm.
   (2) Close the throttle valve slowly.
   (3) Observe the engine speed at a time when the dashpot lever comes in contact with the throttle lever.
   Engine Speed:
   General Spc: 1800 ± 100 rpm
   US Spc: 1600 ± 100 rpm

   If the engine speed does not conform to the specification, perform adjustment by turning the TP adjusting screw.

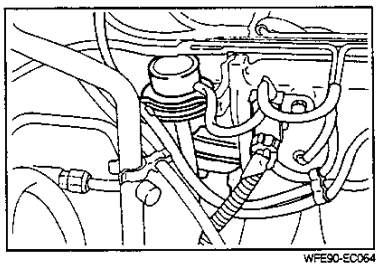
WFE90-EC062



WFE90-EC063

EXHAUST GAS RECIRCULATION (EGR) SYSTEM (US Specification Only)

The EGR system recirculates the exhaust gas into the intake manifold in an optimum amount according to driving conditions and coolant temperature.
Thus, this system retards the combustion, resulting in reduced amount of NOx emission.



WFE90-EC064

Coolant temperature	EVSV	Throttle valve opening angle	EGR vacuum modulator	EGR valve	Exhaust gas
Below 39°C	Closed	—	—	Closed	Not recirculated
Above 40°C	Closed	Positioned below EGR port	Opens passage to atmosphere	Closed	Not recirculated
		* Positioned between EGR port	Opens passage to atmosphere	Closed	Not recirculated
			Closed passage to atmosphere	Open	Recirculated
		** Positioned above EGR port	Closed passage to atmosphere	Open	Recirculate volume increase

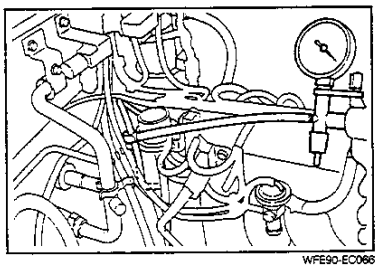
REMARKS:
* At this stage, the EGR valve repeats its opening/closing as described below, depending upon the throttle valve opening and exhaust gas pressure.
  Exhaust gas pressure drops. → Modulator opens. → EGR valve closes.
  ↑ ↓
  EGR valve opens. ← Modulator opens. ← Exhaust gas pressure increases.

** At this stage, the EGR valve remains open because of a negative pressure being applied to the EGR port, even when the modulator opens to the atmosphere.

WFE90-EC065

INSPECTION OF EGR SYSTEM

1. Preparation
   Using a three-way connector, connect a vacuum gauge to the hose between the EGR valve and the EGR vacuum modulator.

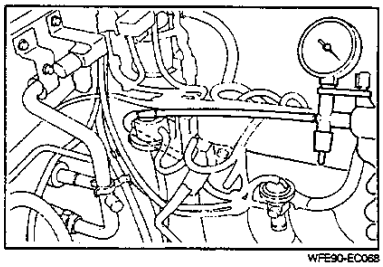


WFE90-EC066

2. Check of EGR valve seating
   Start the engine. Ensure that the engine starts and runs smoothly at the idle speed.
   If the engine will not idle smoothly, perform the unit inspection of the EGR valve.
3. Check of EGR VSV with engine in cold state
   Ensure that no vacuum is applied to the vacuum gauge even if the engine is raced when the coolant temperature is below 39°C.
   If a negative pressure is applied to the vacuum gauge, check the EGR VSV and/or the water temperature sensor.
4. Check of EGR VSV with engine in hot state
   (1) Warm up the engine.
   (2) Run the engine at a speed of about 3000 rpm. Ensure that a negative pressure is applied to the vacuum gauge.

WFE90-EC067

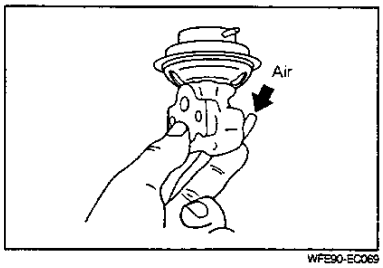
5. Check of EGR valve
   (1) Connect a MityVac directly to the EGR valve.
   (2) Apply a negative pressure to the EGR valve while the engine is idling. Ensure that the engine runs roughly or stalls.
   (3) Reconnect the vacuum hoses to original location.
   If no problem is found during this inspection, the system is functioning properly. If any problem is found, check and remedy the part concerned.



WFE90-EC068

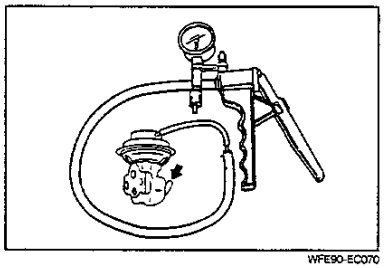
INSPECTION OF EGR VALVE

1. Remove the EGR valve.
2. Check of EGR valve
   (1) Blow air into the EGR valve through its pipe section with the bypass hole of the EGR valve plugged by your finger, as indicated in the right figure. Under this state, ensure that no air continuity is present.
   If air continuity exists, replace the EGR valve.



WFE90-EC069

   (2) Apply a negative pressure of 20.0 kPa (150 mmHg) to the EGR valve.
   Under this setting, blow air into the EGR valve through its pipe section with the bypass hole of the EGR valve plugged by your finger, as indicated in the right figure. Ensure that air continuity exists.
   If no air continuity exists, replace the EGR valve.

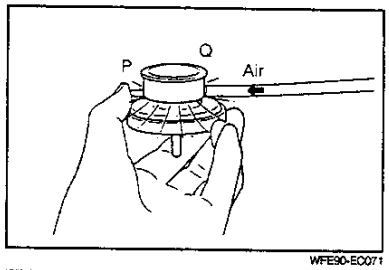


WFE90-EC070

3. Install the EGR valve on the intake manifold with a new gasket interposed. Connect the rubber hose.

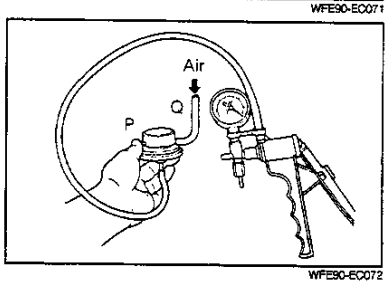
INSPECTION OF EGR VACUUM MODULATOR

1. Remove the EGR vacuum modulator.
2. Plug the port P with your finger. Blow air into the port Q. Ensure that air continuity exists.
   If no air continuity exists, replace the modulator.



WFE90-EC071

3. Apply a pressure 49.0 kPa (0.2 kgf/cm^2) to the pressure discharge port of the modulator, using a MityVac.
   Under this setting, blow air into the modulator through the port Q with the port P plugged by your finger. Ensure that no air continuity exists.
   If air continuity exists, replace the modulator.



WFE90-EC072

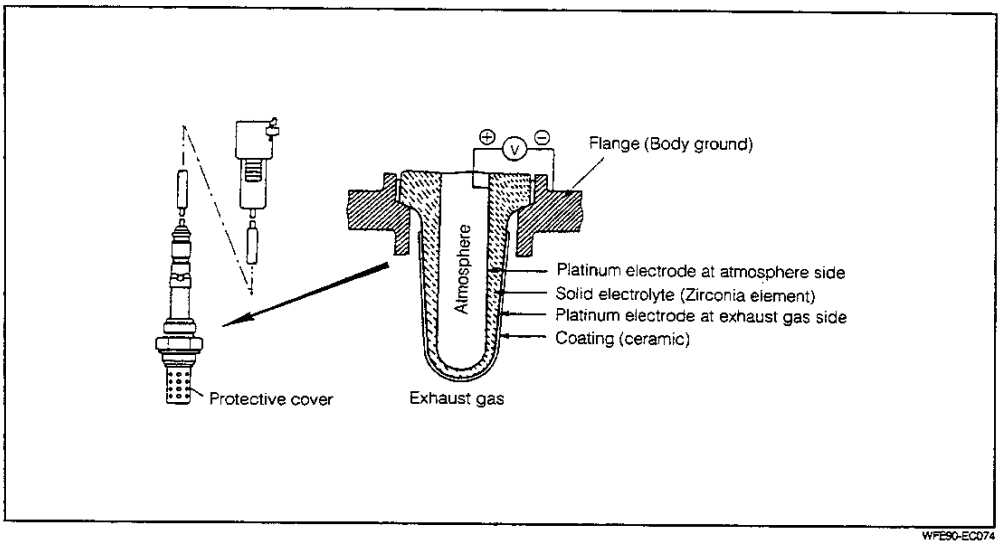
INSPECTION OF EGR VSV

(See page EF–181.)

WFE90-EC073

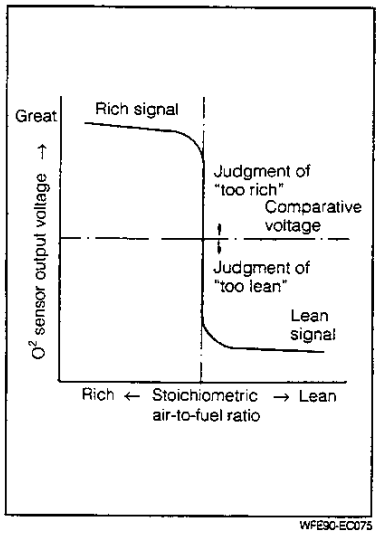
OXYGEN SENSOR

The oxygen sensor is a compact sensor installed at the exhaust pipe or exhaust manifold, which detects the oxygen concentration (air-to-fuel ratio). When the air-to-fuel ratio is greater (leaner) than the stoichiometric air-to-fuel ratio, there exists excessive amount of air compared with the amount of air required for the fuel to be burnt. Hence, oxygen remains in the exhaust gas. Conversely, when the air-to-fuel ratio is smaller (richer) than the stoichiometric air-to-fuel ratio, no oxygen remains in the exhaust gas. It is, therefore, possible to know whether the actual air-to-fuel ratio is richer or leaner than the stoichiometric air-to-fuel ratio by detecting the oxygen concentration in the exhaust gas.
The oxygen sensor is so constructed that both sides of a measuring-tube-shaped solid electrolyte (Zirconia element) are coated with thin films of platinum.



WPE90-EC074

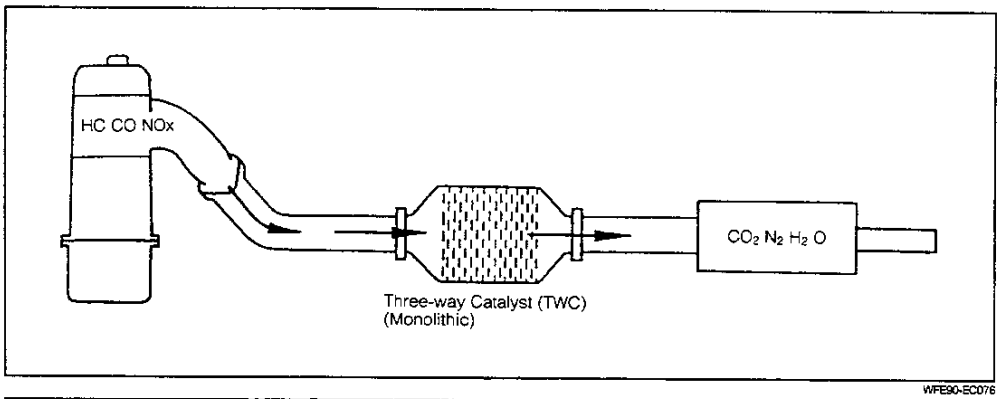
The Zirconia element has such characteristics that an electromotive force is generated when the oxygen concentration differs between both sides of the element. Furthermore, when the temperature of the oxygen sensor is high, its electromotive force changes suddenly in the neighborhood of the stoichiometric air-to-fuel ratio due to platinum catalysis. (See the right figure.)
The exterior of the oxygen sensor is exposed to the exhaust gas, whereas the interior is introduced with the atmosphere. Utilizing the aforesaid characteristics, the oxygen sensor accurately detects whether the oxygen concentration, i.e. the air-to-fuel ratio, is richer or leaner than the stoichiometric air-to-fuel ratio. When the air-to-fuel ratio is richer than the stoichiometric air-to-fuel ratio, the electromotive force of the oxygen sensor becomes high, thus sending a rich signal to the computer. Conversely, when the air-to-fuel ratio is leaner than the stoichiometric air-to-fuel ratio, the electromotive force of the oxygen sensor becomes low, thus sending a lean signal to the computer.
The oxygen sensor begins its operation when the temperature rises above about 400°C.



WPE90-EC075

THREE-WAY CATALYST (TWC) SYSTEM

If this three-way catalyst, the oxidation of carbon monoxide (CO) and the reduction of nitrogen oxides (NOx) contained in exhaust gas can take place simultaneously. Thus, the three-way catalyst purifies the exhaust gas by converting its harmful components gas into harmless carbon dioxide (CO_2), water vapor (H_2O) and nitrogen (N_2).



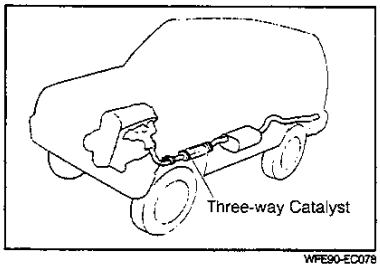
WFE90-EC076

Exhaust gas component	TWC	Exhaust gas
HC, CO and NOx	Oxidation and reduction	CO_2, H_2O and N_2

WFE90-EC077

INSPECTION OF EXHAUST PIPE ASSEMBLY

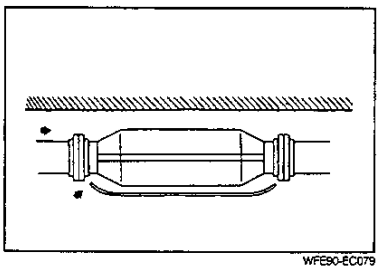
1. Check the connections for looseness or damage.
2. Check the clamps for weakness, bend or damage.



WFE90-EC078

INSPECTION OF HEAT INSULATOR

1. Check heat insulator for damage.
2. Check for adequate clearance between the three-way catalyst and heat insulator.

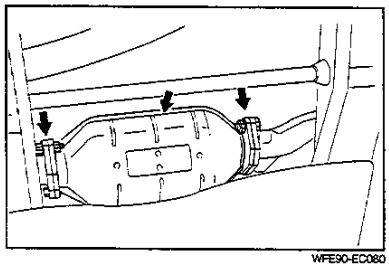


WFE90-EC079

THREE-WAY CATALYST

INSPECTION

1. Check the connections for looseness or damage.
2. Check the three-way catalyst for dents or damage.



WFE90-EC080

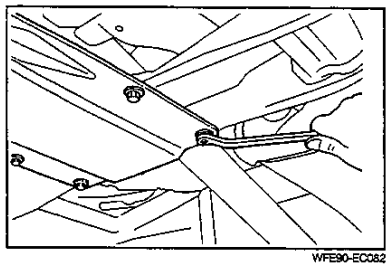
REMOVAL

WARNING:
- Do not perform any operation while the exhaust pipe is still hot.

1. Jack up the vehicle and support it with safety stands.

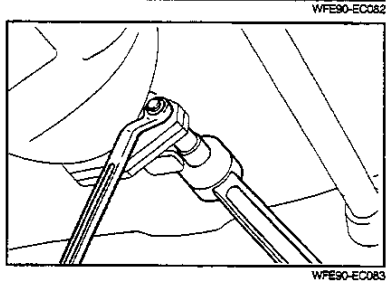
WFE90-EC081

2. Remove the transmission undercover, by removing the eight attaching bolts.



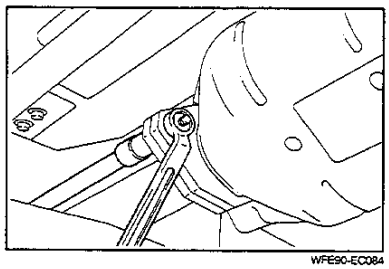
WFE90-EC082

3. Separate the tail pipe assembly from the three-way catalyst assembly by removing the two bolts and nuts.



WFE90-EC083

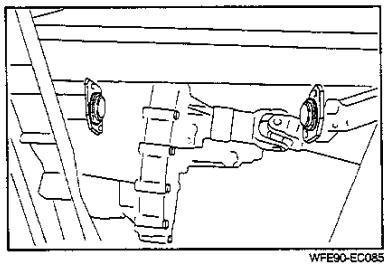
4. Separate the three-way catalyst assembly from the front exhaust pipe assembly by removing the two bolts and nuts.
5. Remove the three-way catalyst while pushing the tail pipe assembly rearward.



WFE90-EC084

INSTALLATION

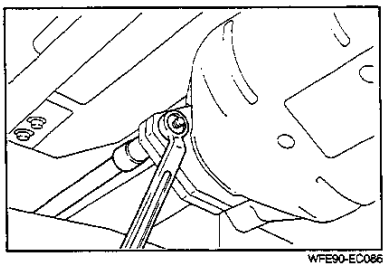
1. Install a new gasket to the front exhaust pipe and tail pipe.



WFE90-EC085

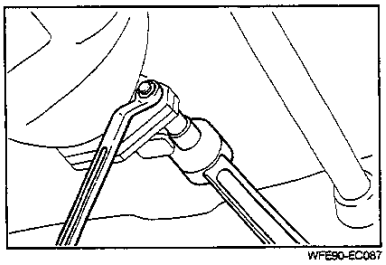
2. Install the three-way catalyst assembly to the front exhaust pipe assembly.
   Tightening Torque:
   36.3 - 51.0 N·m (3.7 - 5.2 kgf-m)

   NOTE:
   - Make sure that the front mark is located at front side.



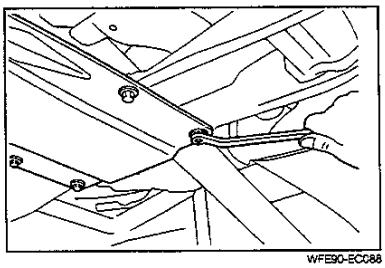
WFE90-EC086

3. Tighten the attaching bolts and nuts for the three-way catalyst at the tail pipe side.
   Tightening Torque:
   36.3 - 51.0 N·m (3.7 - 5.2 kgf-m)



WFE90-EC087

4. Install the transmission under cover by attaching the eight bolts.



WFE90-EC088

SST (Special Service Tools)

Shape	Part No. and Name	Purpose	Remarks
	*4 09991-87703-000 Tacho pulse pick-up wire	Connecting engine tachometer	
	09258-00030-000 Plug set	Plugging rubber hoses.	

WFE90-EC089

TIGHTENING TORQUES

Tightening component	Tightening torque			
	N·m	kgf-m	ft-lb	Remark
Cylinder head × TVSV (HD-C engine only)	24.5 - 34.3	2.5 - 3.5	18.1 - 25.3	Dry
Cylinder head × Exhaust manifold	29.4 - 44.1	3.0 - 4.5	21.7 - 32.5	Dry
Exhaust manifold × Exhaust pipe	34.3 - 49.0	3.5 - 5.0	25.3 - 36.2	Dry
Exhaust manifold clamp	29.4 - 44.1	3.0 - 4.5	21.7 - 32.5	Dry
Exhaust pipe front × Exhaust pipe rear	36.3 - 51.0	3.7 - 5.2	26.8 - 37.6	Dry
Exhaust pipe support	9.8 - 15.7	1.0 - 1.6	7.2 - 11.6	Dry

WFE90-EC090

SERVICE SPECIFICATION

Ignition timing	HD-C HD-E (General) HD-E (US. spc)	B.T.D.C. 3 ± 2°/850 ± 50 rpm 〃 / 〃 〃 /1000 rpm or less (However, engine revolution must be stable.)
Idle speed		

Engine type	HD-C	HD-E
Idle speed	850 ± 50 rpm	850 ± 50 rpm

Fast idle speed adjustment (HD-C)	Full position	1300 - 2000 rpm
Throttle positioner touch revolution		

HD-C	HD-E
1500 ± 50 rpm	1800 ± 100 rpm (General spc.) 1600 ± 100 rpm (US spc.)

Throttle positioner operating time	HD-C	0.5 - 5.0 seconds
	HD-E	0.5 - 5.0 seconds
Compression pressure at 300 rpm	Standard	1373 kPa (14.0 kgf/cm^2)
	Minimum	1030 kPa (10.5 kgf/cm^2)
	Difference between cylinders	147 kPa (1.5 kgf/cm^2)

WFE90-EC091