EMISSION CONTROL SYSTEMS

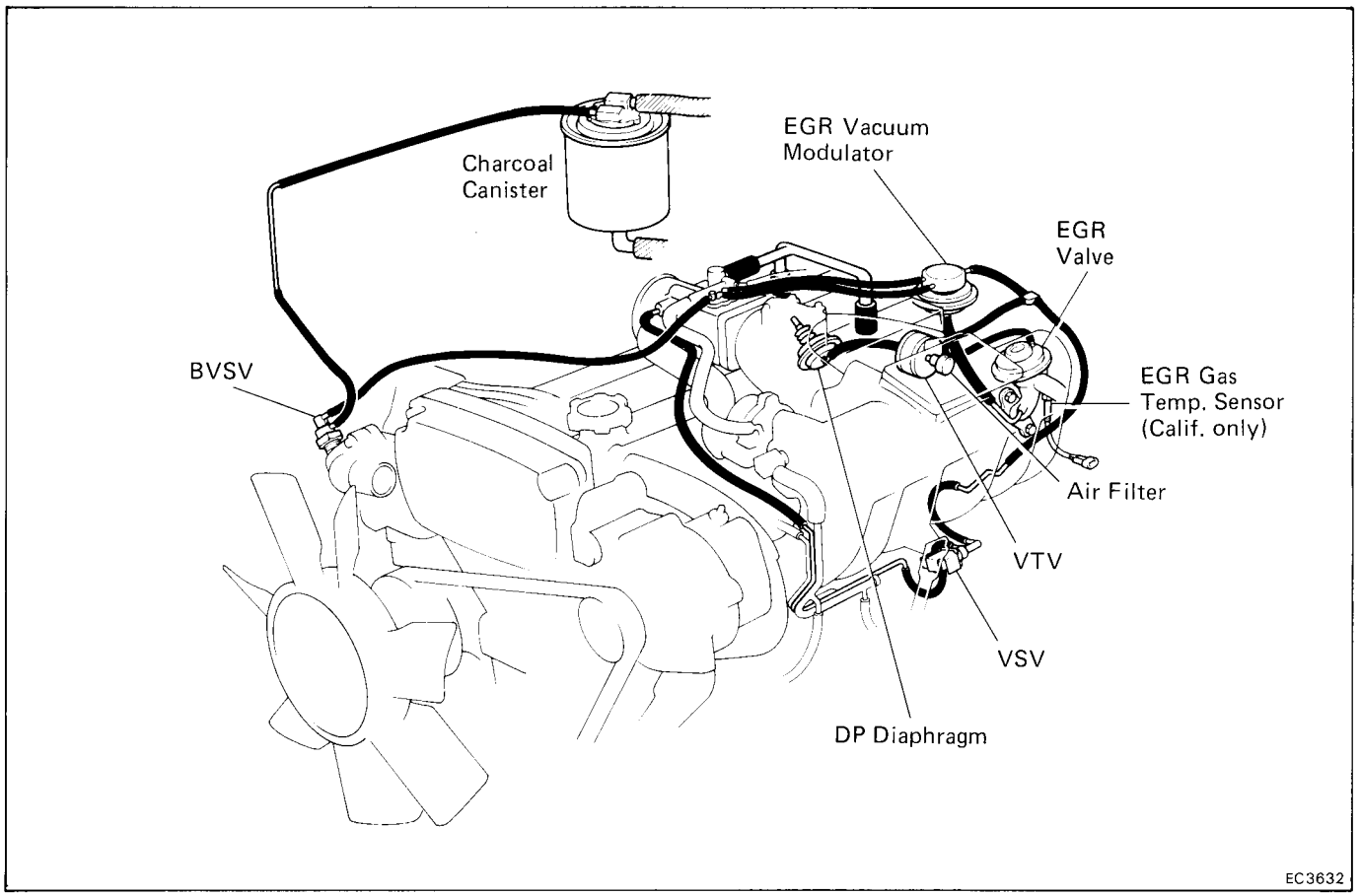
NOTE: TROUBLESHOOTING
(See pages EM-4 to 6)

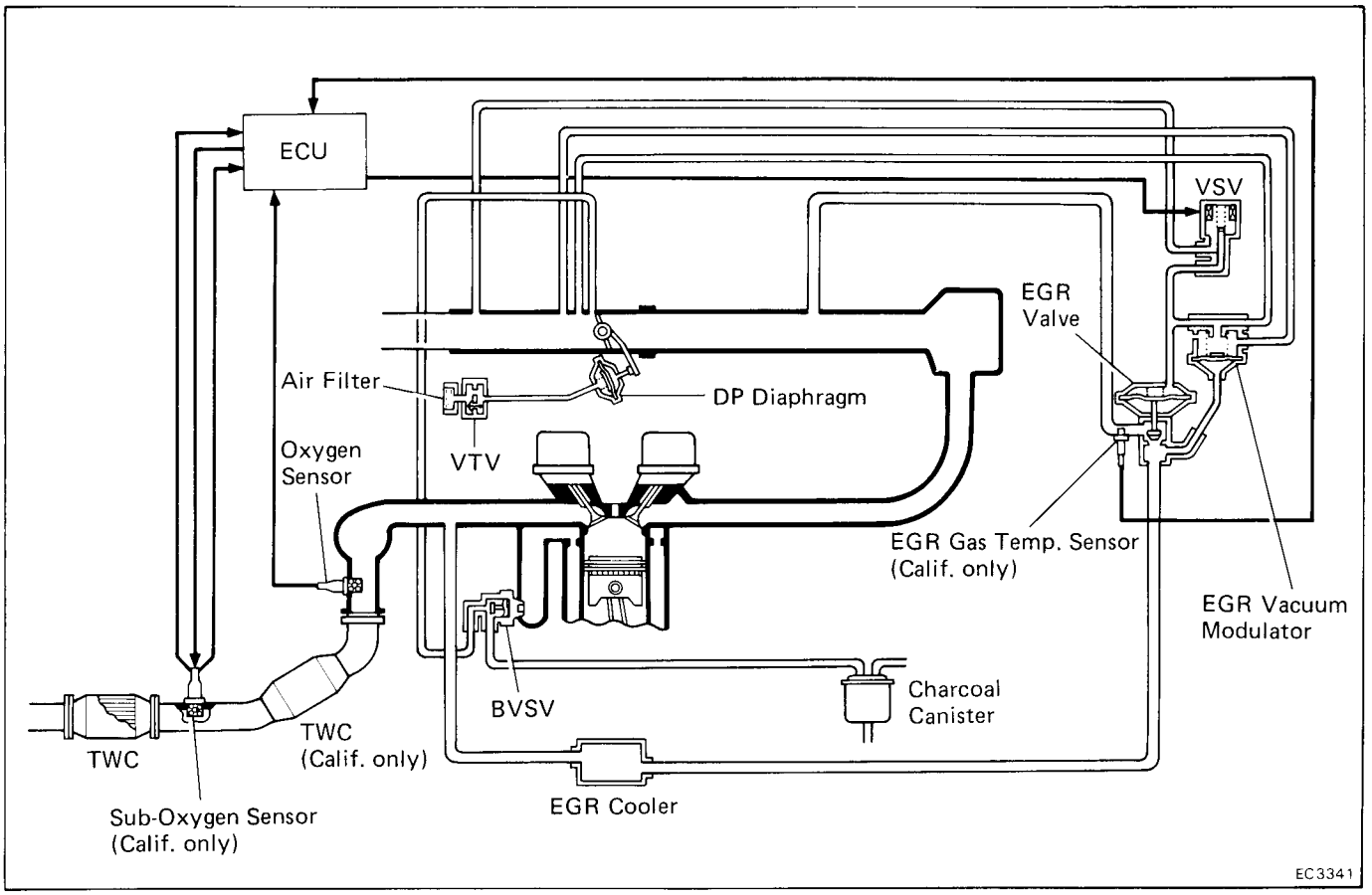
SYSTEM PURPOSE

System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduces blow-by gas (HC)
Fuel evaporative emission control	EVAP	Reduces evaporative HC
Dash pot	DP	Reduces HC and CO
Exhaust gas recirculation	EGR	Reduces NOx
Three-way catalyst	TWC	Reduces HC, CO and NOx
Electronic fuel injection *	EFI	Regulates all engine conditions for reduction of exhaust emissions.

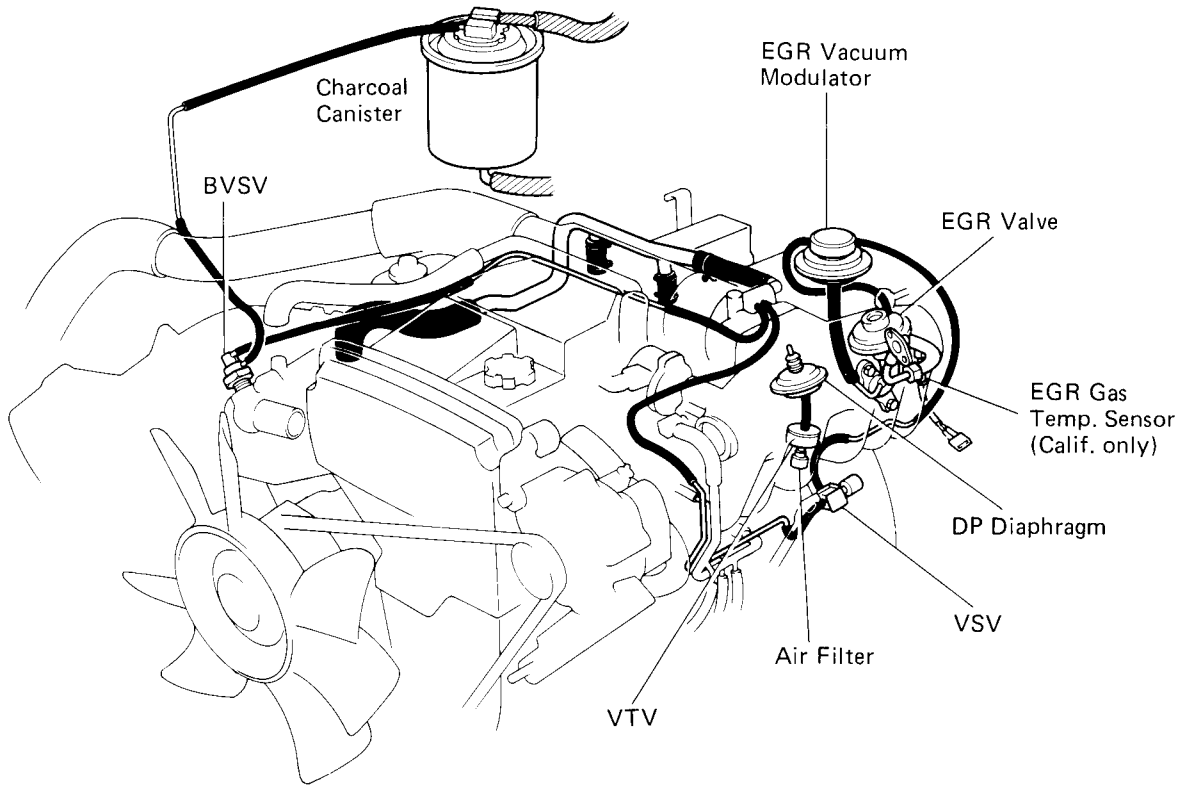
* For inspection and repair of the EFI system, refer to EFI Section.

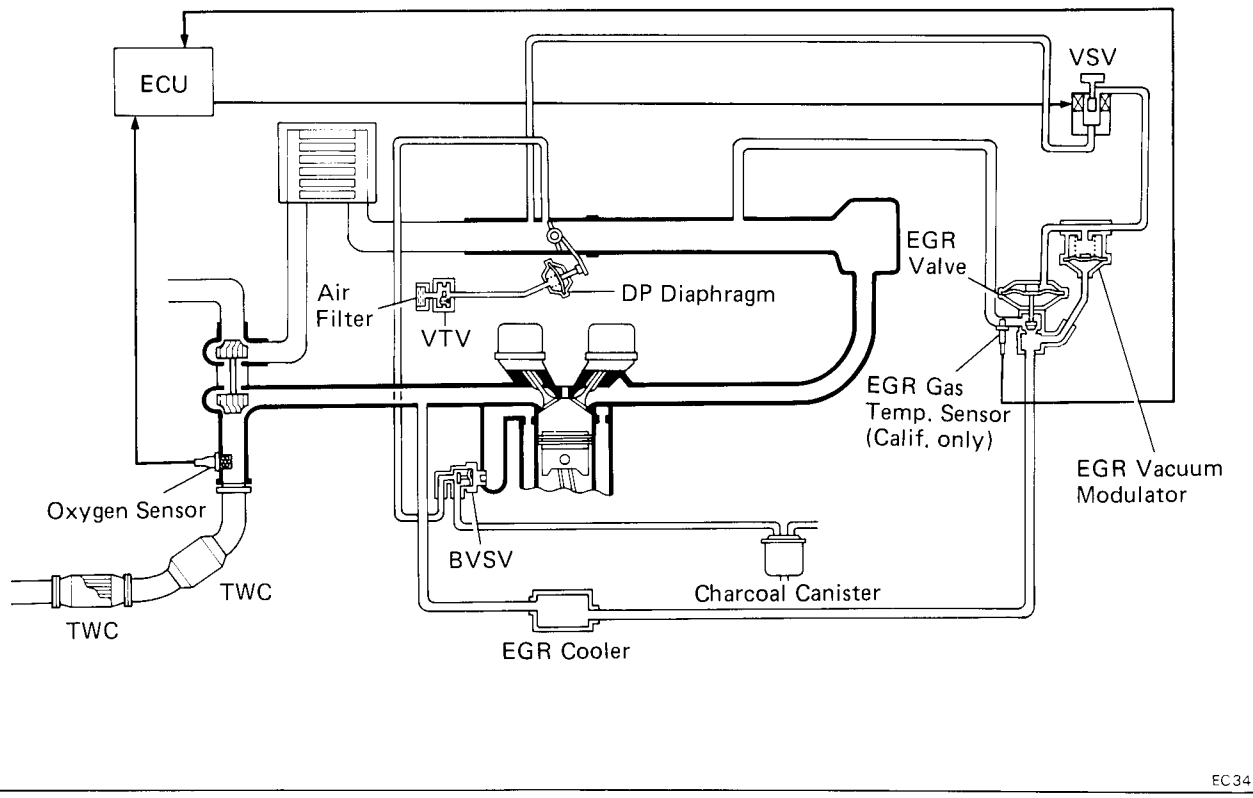
COMPONENT LAYOUT AND SCHEMATIC DRAWING (7M-GE)



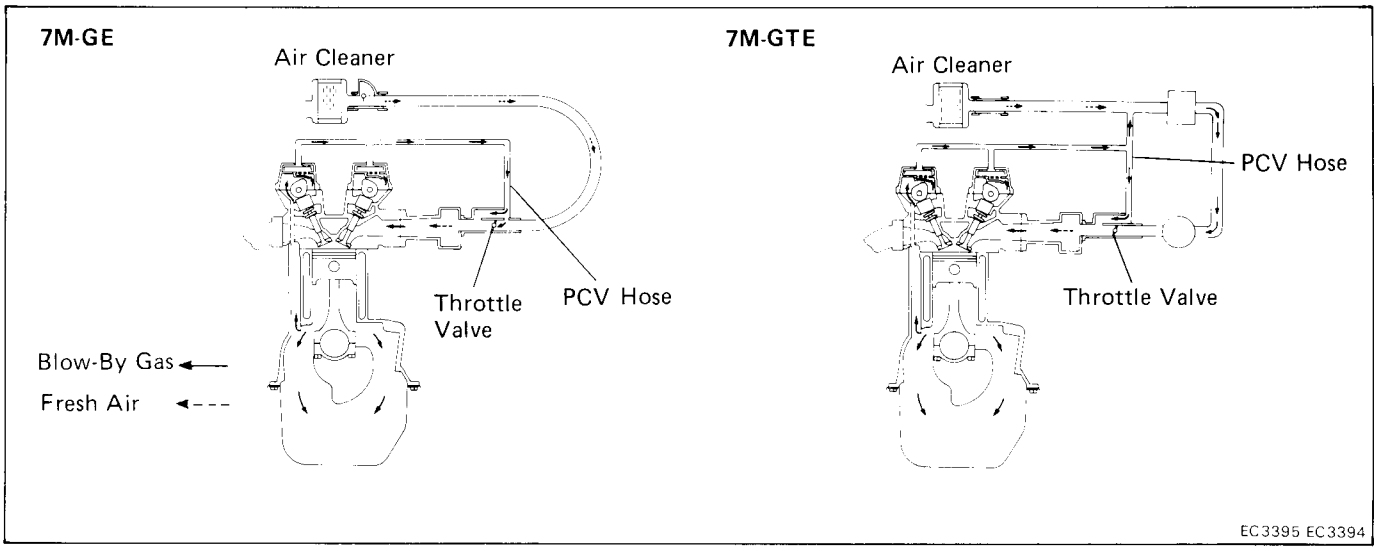


COMPONENT LAYOUT AND SCHEMATIC DRAWING (7M-GTE)

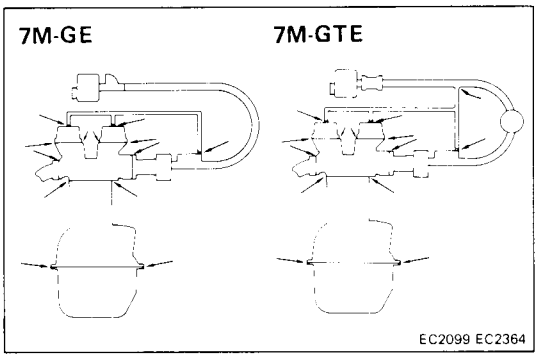




POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



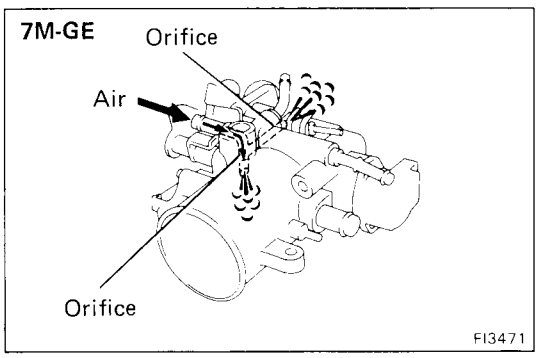
To reduce HC emissions, crankcase blow-by gas (HC) is routed to the intake manifold for combustion in the cylinders.



INSPECTION OF PCV HOSE AND CONNECTIONS

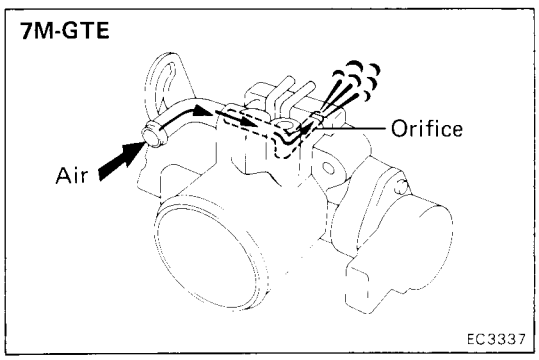
1. VISUALLY INSPECT HOSE AND CONNECTIONS

Check for cracks, leaks or damage.

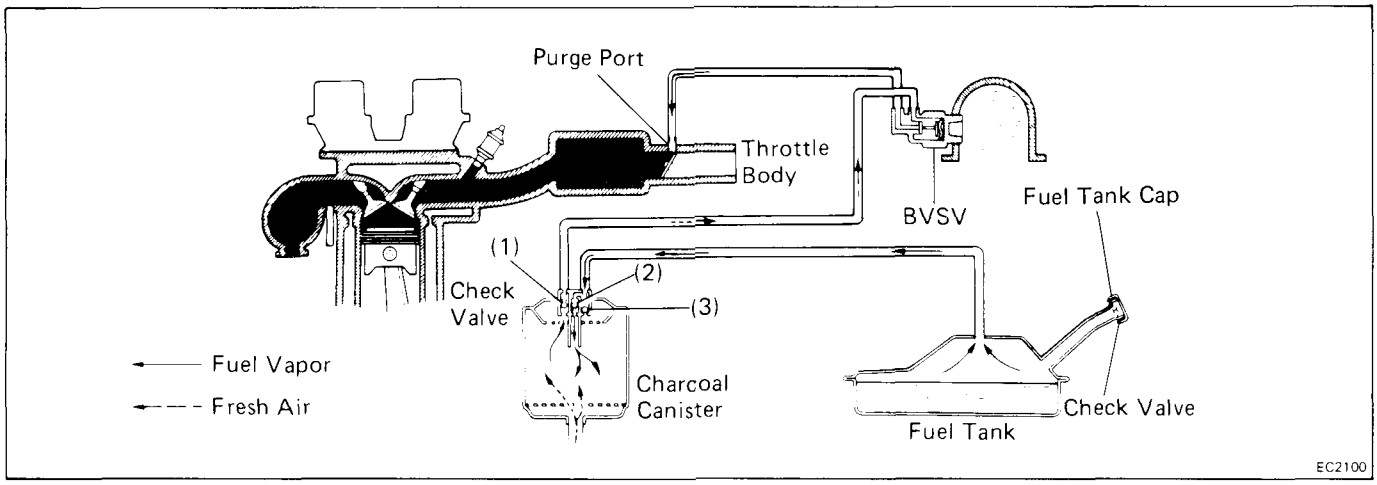


2. CLEAN ORIFICE(S)

Clean off any gum deposits in the orifice(s) with solvent and blow out with compressed air.

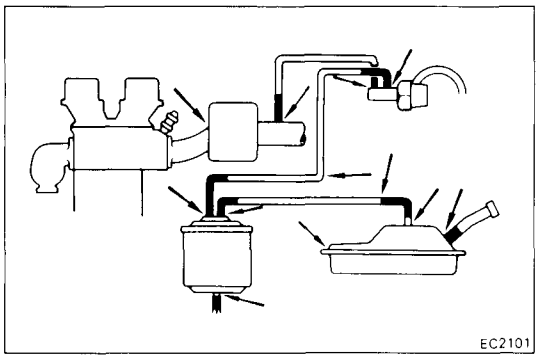


FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM



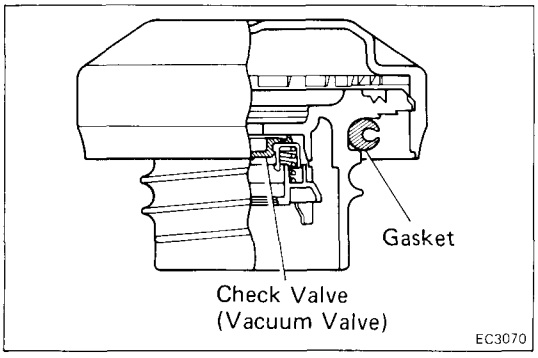
To reduce HC emissions, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

Coolant Temp.	BVSV	Throttle Valve Opening	Canister Check Valve			Check Valve in Cap	Evaporated Fuel (HC)
			(1)	(2)	(3)		
Below 35°C (95°F)	CLOSED	—	—	—	—	—	HC from tank is absorbed into the canister.
Above 54°C (129°F)	OPEN	Positioned below purge port	CLOSED	—	—	—	
		Positioned above purge port	OPEN	—	—	—	HC from canister is led into air intake chamber.
High pressure in tank	—	—	—	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister.
High vacuum in tank	—	—	—	CLOSED	OPEN	OPEN	Air is led into the fuel tank.

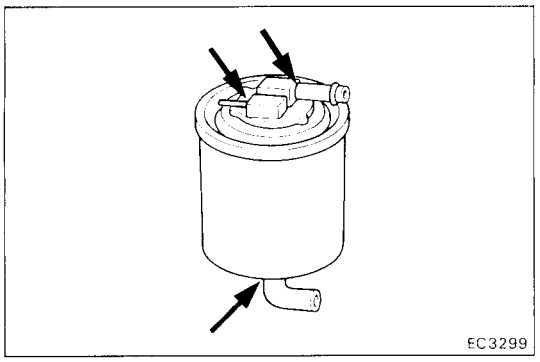


INSPECTION OF FUEL VAPOR LINES, FUEL TANK AND TANK CAP

1. **VISUALLY INSPECT LINES AND CONNECTIONS**
   Look for loose connections, kinks or damage.
2. **VISUALLY INSPECT FUEL TANK**
   Look for deformation, cracks or fuel leakage.



3. **VISUALLY INSPECT FUEL TANK CAP**
   Check if the cap and/or gasket are deformed or damaged.
   If necessary, repair or replace the cap.

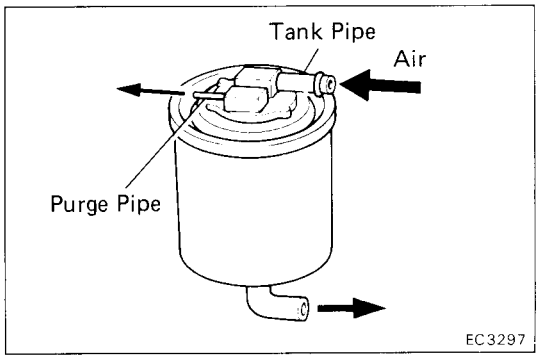


INSPECTION OF CHARCOAL CANISTER

1. REMOVE CHARCOAL CANISTER

2. VISUALLY INSPECT CHARCOAL CANISTER CASE

Look for cracks or damage.

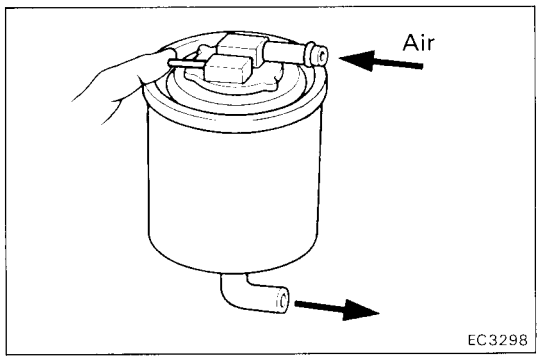


3. CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE

(a) Using low pressure compressed air, blow into the tank pipe and check that air flows without resistance from the other pipes.

(b) Blow into the purge pipe and check that air does not flow from the other pipes.

If a problem is found, replace the charcoal canister.



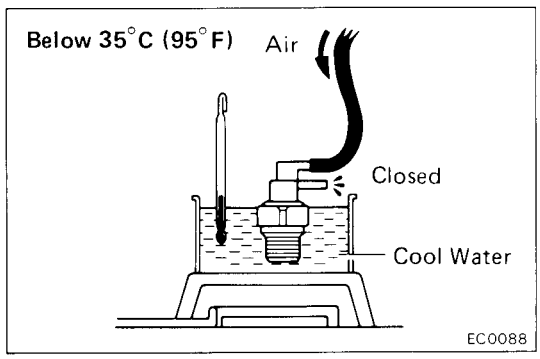
4. CLEAN FILTER IN CANISTER

Clean the filter by blowing 3 kg/cm²(43 psi, 294 kPa)of compressed air into the tank pipe while holding the other upper canister pipe closed.

HINT:

- Do not attempt to wash the canister.
- No activated carbon should come out.

5. INSTALL CHARCOAL CANISTER



INSPECTION OF BVSV

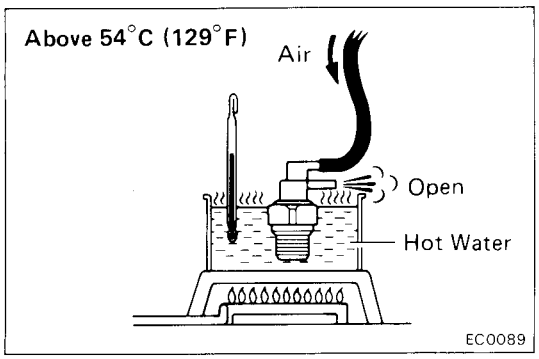
CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV.

(c) Cool the BVSV to below 35°C (95°F) with cool water.

(d) Blow air into a pipe and check that the BVSV is closed.



(e) Heat the BVSV to above 54°C (129°F) with hot water.

(f) Blow air into a pipe and check that the BVSV is open.

If a problem is found, replace the BVSV.

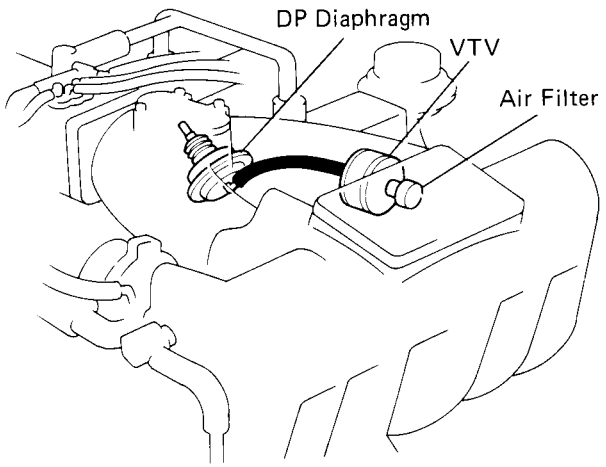
(g) Apply sealant to the threads of the BVSV and reinstall.

Sealant: Part No.08833-00070, THREE BOND 1324 or equivalent

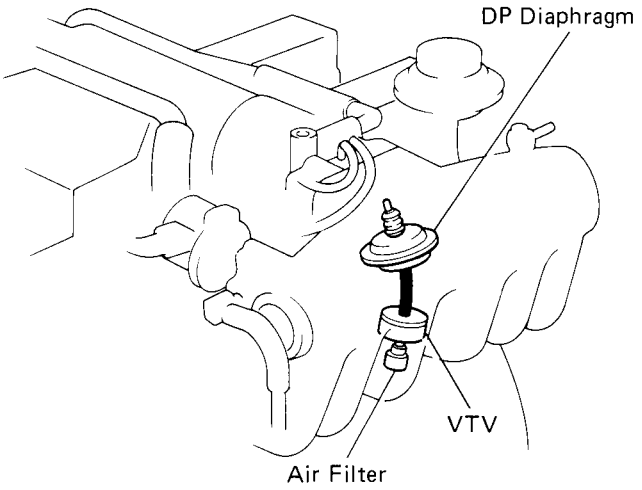
(h) Fill the radiator with coolant.

DASH POT (DP) SYSTEM

7M-GE

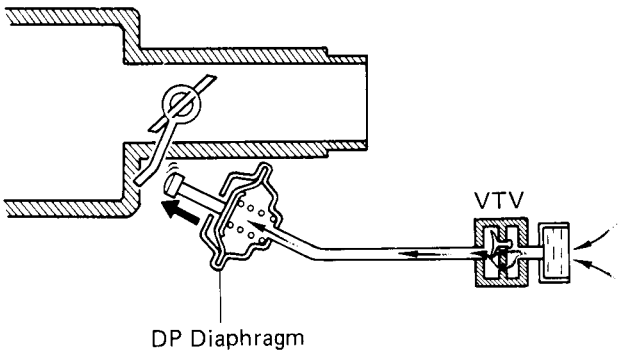


7M-GTE



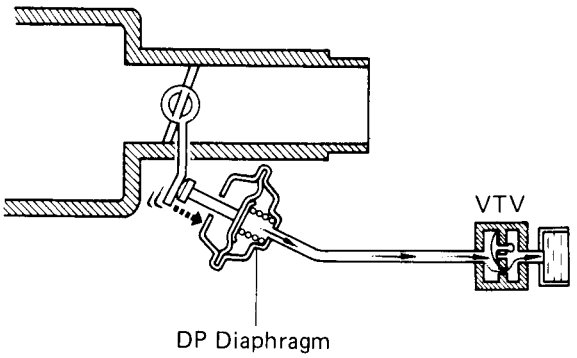
EC3317 EC3318

Normal Driving



EC3440

Deceleration



EC3439

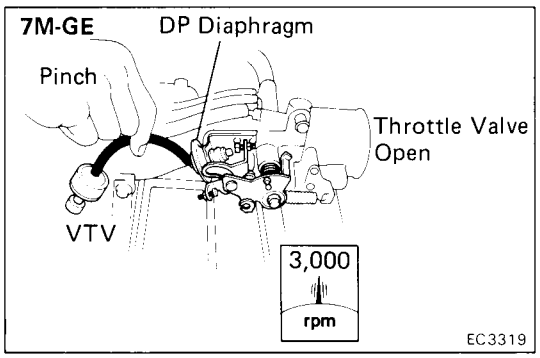
To reduce HC and Co emissions, when decelerating the dash pot opens the throttle valve slightly more than at idle. This causes the air-fuel mixture to burn completely.

Condition	Diaphragm	VTV	Throttle Valve
Idling	Pushed in by return force of throttle valve	CLOSED	Idle speed position
Normal driving	Pushed out by diaphragm spring	OPEN	High speed position
Deceleration	Pushed in by return force of throttle valve	CLOSED	Slightly opens and then slowly closes to idle position

INSPECTION OF DP SYSTEM

1. **WARM UP ENGINE**

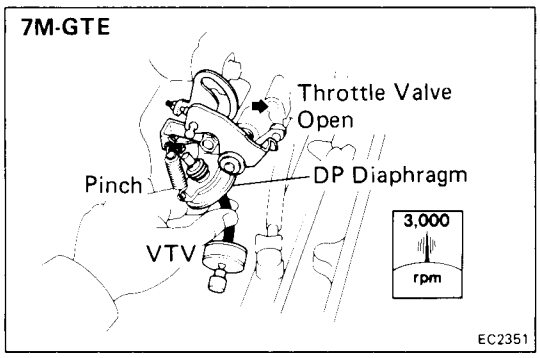
2. **CHECK IDLING SPEED**

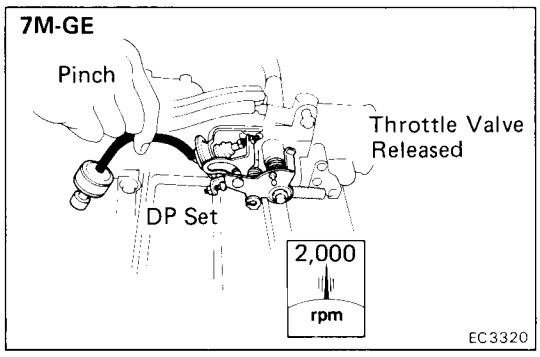


3. **CHECK DP SETTING SPEED**

(a) Maintain the engine speed at 3,000 rpm.

(b) Pinch the vacuum hose between the DP and VTV.

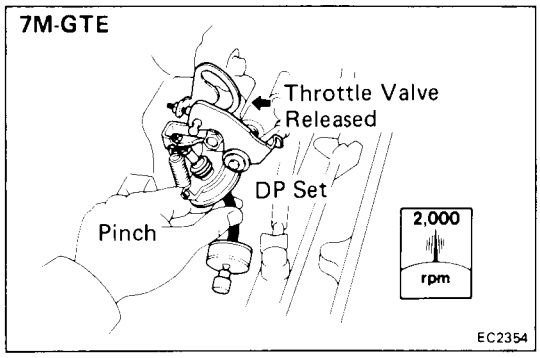


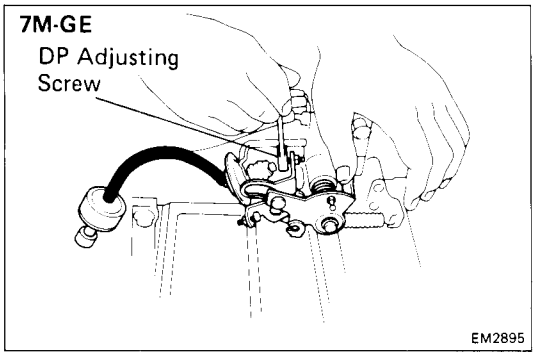


(c) Release the throttle valve.

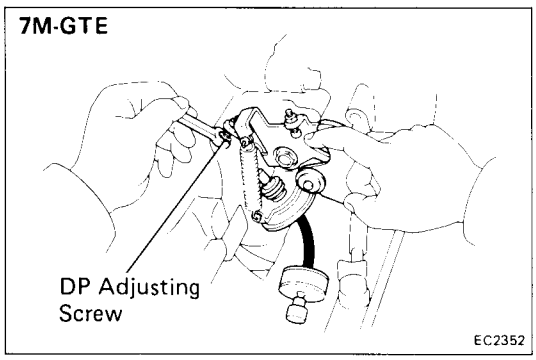
(d) Check that the DP is set.

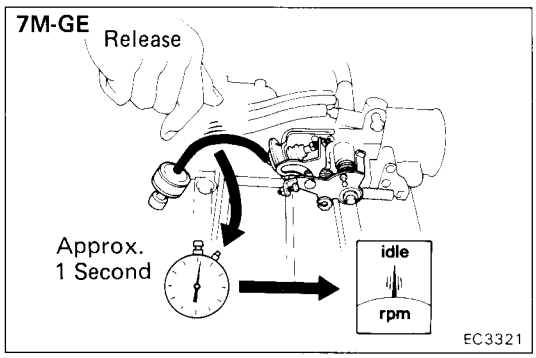
DP setting speed: 2,000 rpm





If not at the specified speed, adjust with the DP adjusting screw.

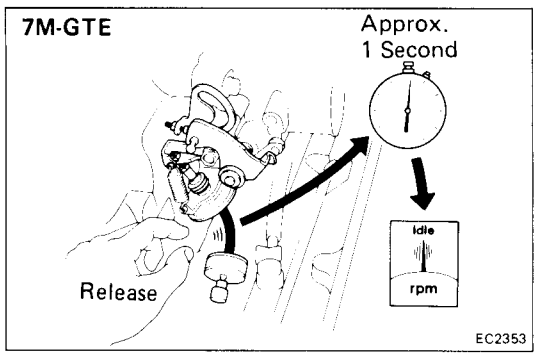




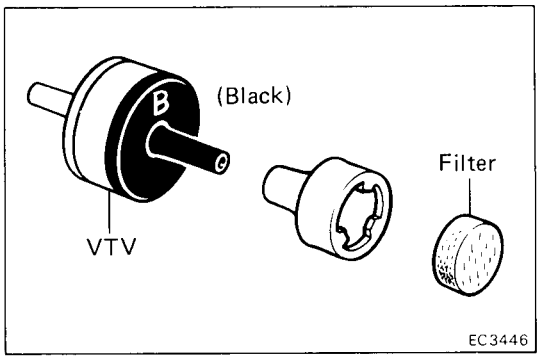
4. CHECK OPERATION OF VTV

(a) Set the DP speed in the same procedure as above; (a) to (c).

(b) Release the pinched hose and check that the engine returns to idle speed in approx. 1 second.



IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

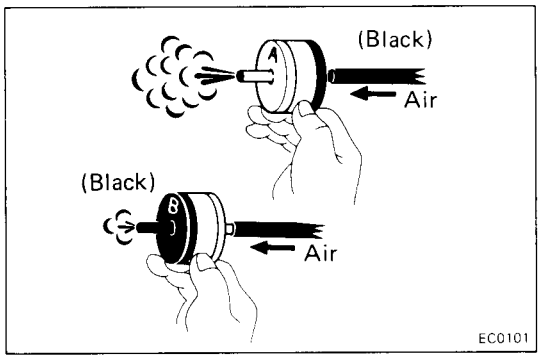


INSPECTION OF VTV

1. CHECK AND CLEAN FILTER ON VTV

(a) Check the filter for contamination or damage.

(b) Using compressed air, clean the filter.

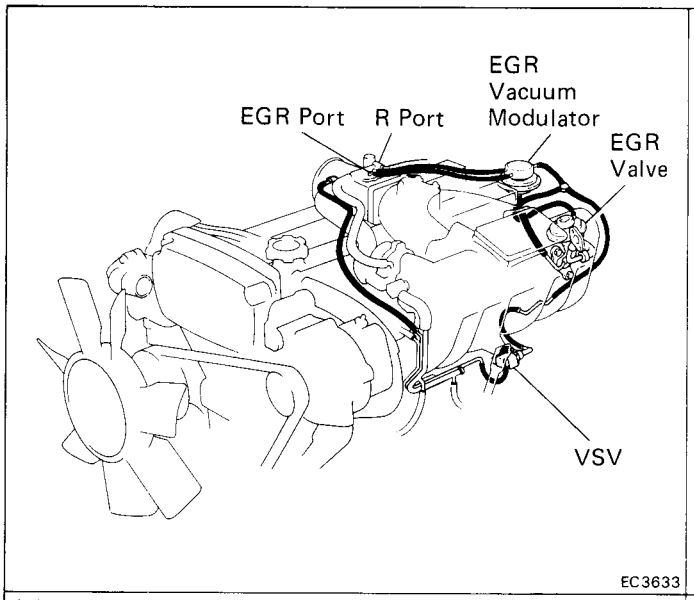


2. CHECK VTV BY BLOWING AIR INTO EACH SIDE

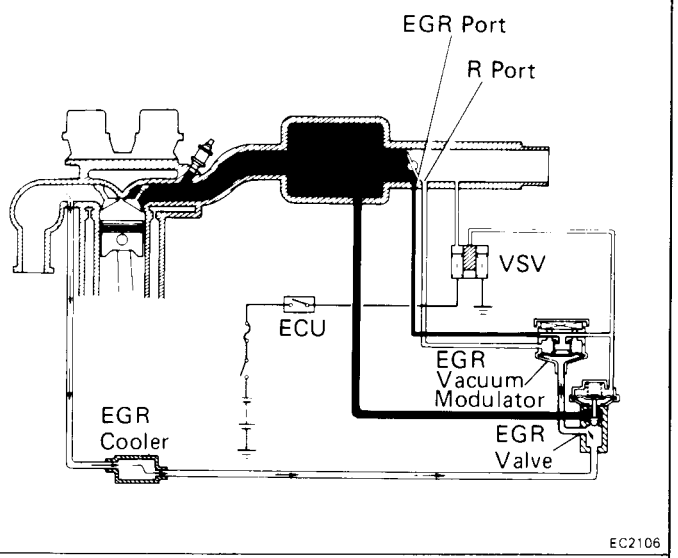
(a) Check that air flows without resistance from B to A.

(b) Check that air flows with difficulty from A to B.

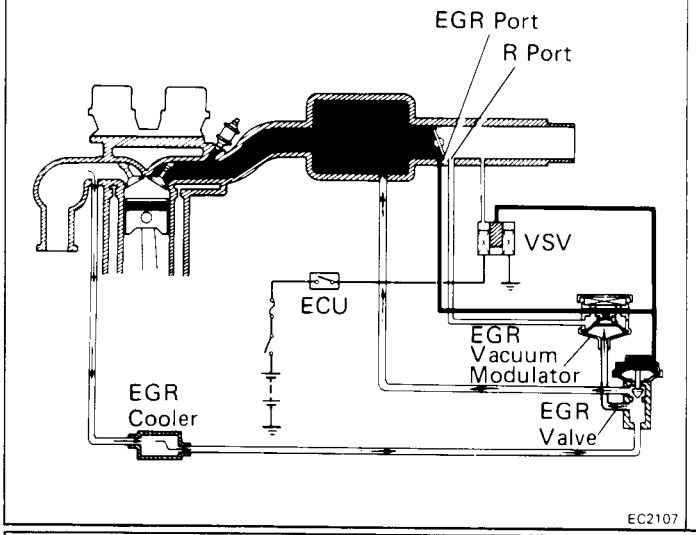
EXHAUST GAS RECIRCULATION (EGR) SYSTEM (7M-GE)



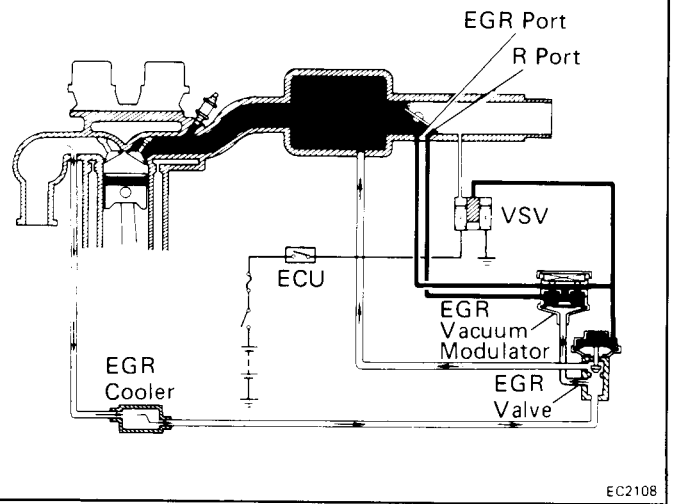
(1)



(2)



(3)



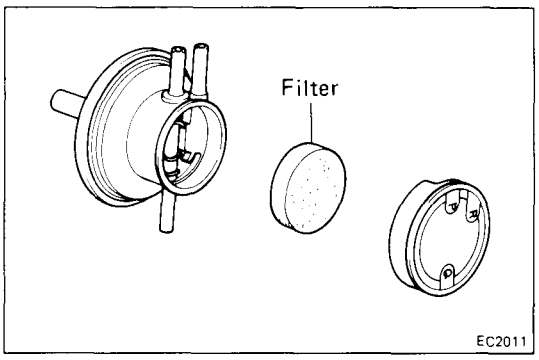
To reduce NOx emissions, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

Coolant Temp.	*Engine RPM	VSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 57°C (135°F)	–	OPEN	–	–		–	CLOSED	Not recirculated
Above 63°C (145°F)	Above 5,200 rpm	OPEN	–	–		–	CLOSED	Not recirculated
	Below 4,800 rpm	CLOSED	Positioned below EGR port	–		–	CLOSED	Not recirculated
			Positioned between EGR port and R port	(1) LOW	** Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
				(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated
			Positioned above R port	(3) HIGH	***	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

* Engine RPM control is for Calif. only.

** Pressure increase → Modulator closes → EGR valve opens → Pressure drops
→ EGR valve close → Modulator opens →

*** When the throttle valve is positioned above the R port, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.

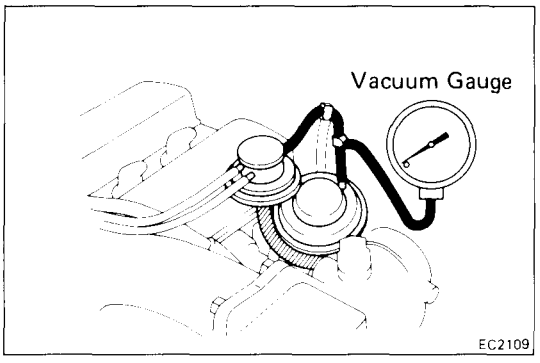


INSPECTION OF EGR SYSTEM

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.

(b) Using compressed air, clean the filter.

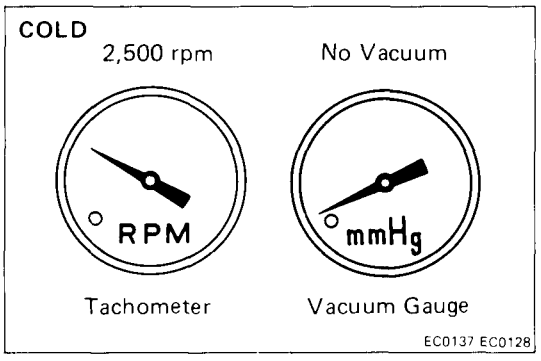


2. PREPARATION

Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and EGR vacuum modulator.

3. CHECK SEATING OF EGR VALVE

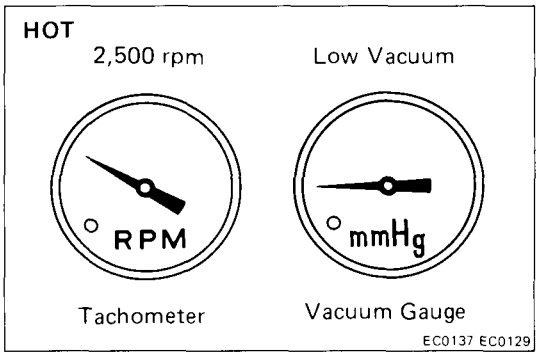
Start the engine and check that the engine starts and runs at idle.



4. CHECK VSV WITH COLD ENGINE

(a) The coolant temperature should be below 57°C (135°F).

(b) Check that the vacuum gauge indicates is zero at 2,500 rpm.

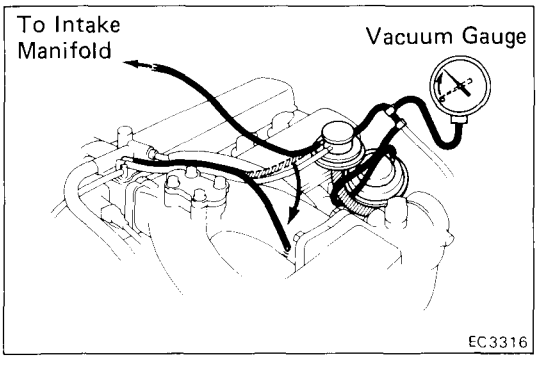


5. CHECK VSV AND EGR VACUUM MODULATOR WITH WARM ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indication is approx. 70 mmHg (2.76 in.Hg, 9.3 kPa) at 2,500 rpm.

(c) Check that the vacuum gauge indication is zero at idle.

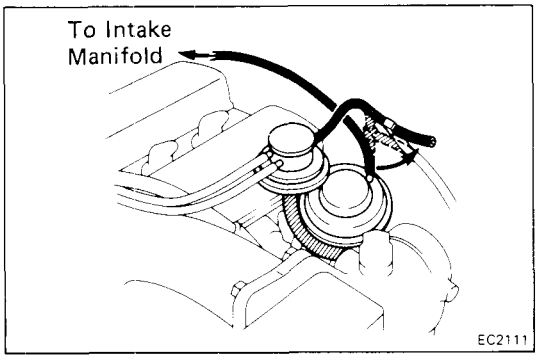


(d) Disconnect the vacuum hose from R port of the EGR vacuum modulator and connect R port directly to the intake manifold with another hose.

(e) Check that the vacuum gauge indicates high vacuum at 2,500 rpm.

HINT: As a large amount of EGR gas enters, the engine will misfire slightly.

(f) Disconnect the vacuum gauge and reconnect the vacuum hoses to the proper locations.



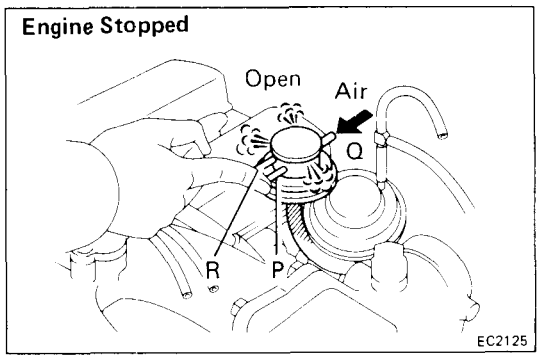
6. CHECK EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idling.

(b) Check that the engine runs rough or dies.

(c) Reconnect the vacuum hoses to the proper location.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



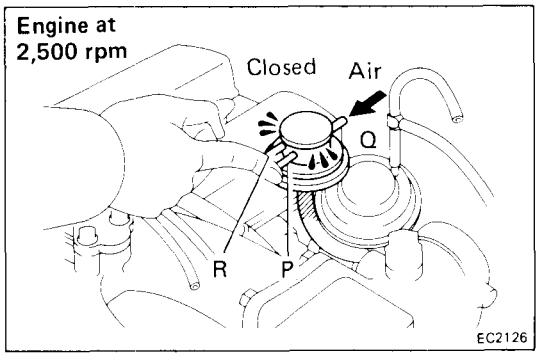
INSPECTION OF EGR VACUUM MODULATOR

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from ports P, Q and R of the EGR vacuum modulator.

(b) Block ports P and R with your finger.

(c) Blow air into port Q. Check that the air passes through to the air filter freely.

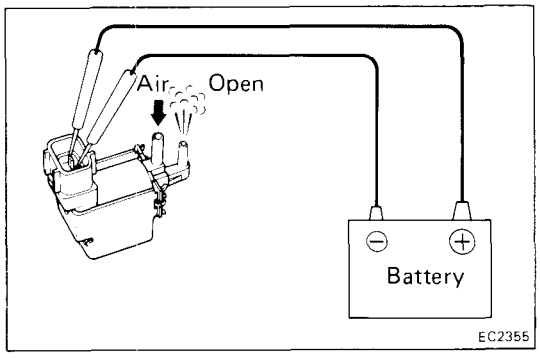


(d) Start the engine and maintain speed at 2,500 rpm.

(e) Repeat the above test. Check that there is a strong resistance to air flow.

If a problem is found, replace the EGR vacuum modulator.

(f) Reconnect the vacuum hoses to the proper locations.

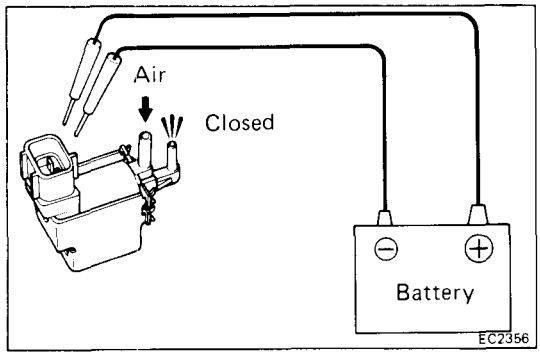


INSPECTION OF VSV

1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as illustrated.

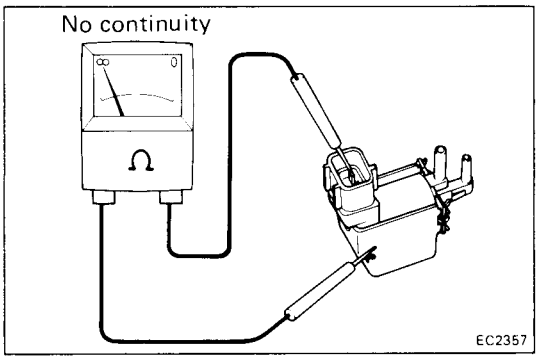
(b) Blow air into a pipe and check that the VSV is open.



(c) Disconnect the battery.

(d) Blow air into a pipe and check that the VSV is closed.

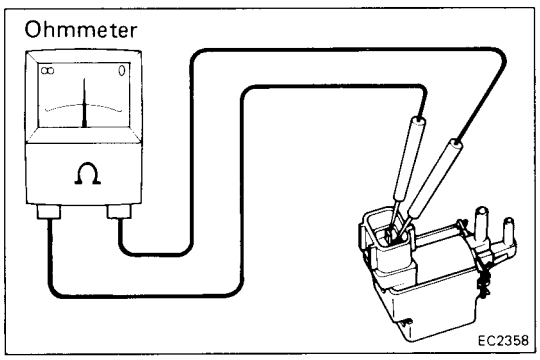
If a problem is found, replace the VSV.



2. **CHECK FOR SHORT CIRCUIT**

Using an ohmmeter, check that there is no continuity between the terminals and the VSV body.

If there is continuity, replace the VSV.



3. **CHECK FOR OPEN CIRCUIT**

Using an ohmmeter, measure the resistance between the terminals.

Specified resistance: 38 — 44 Ω at 20°C (68°F)

If the resistance is not within specification, replace the VSV.

INSPECTION OF EGR VALVE

1. **REMOVE EGR VALVE**

Check the valve for sticking and heavy carbon deposits.

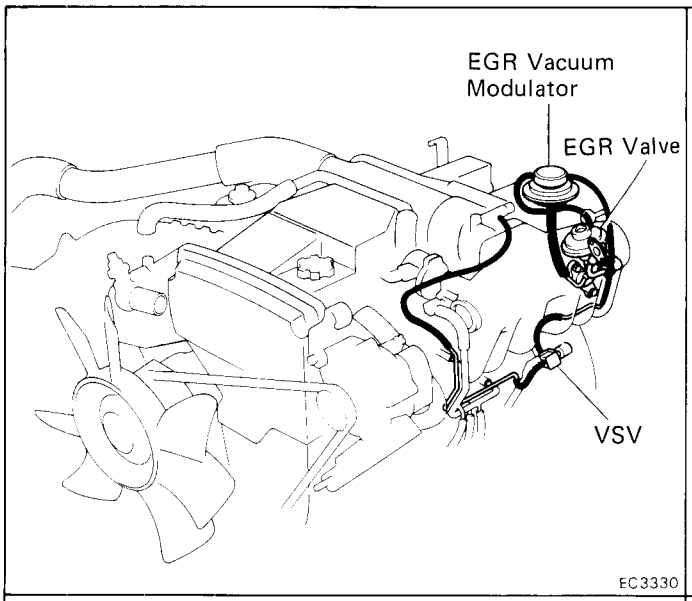
If a problem is found, replace it.

2. **INSTALL EGR VALVE WITH NEW GASKET**

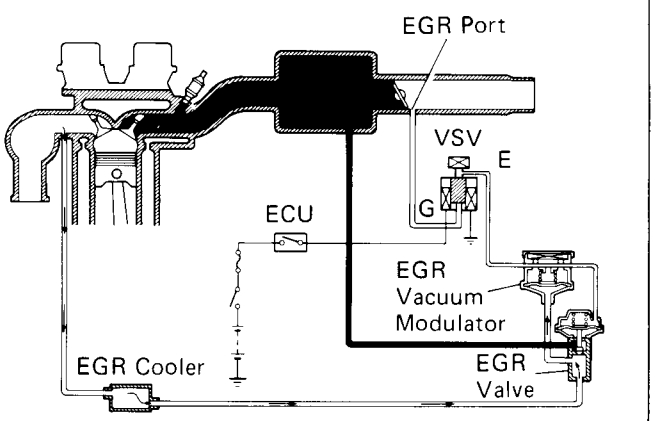
INSPECTION OF WATER TEMP. SENSOR

(See page FI-113)

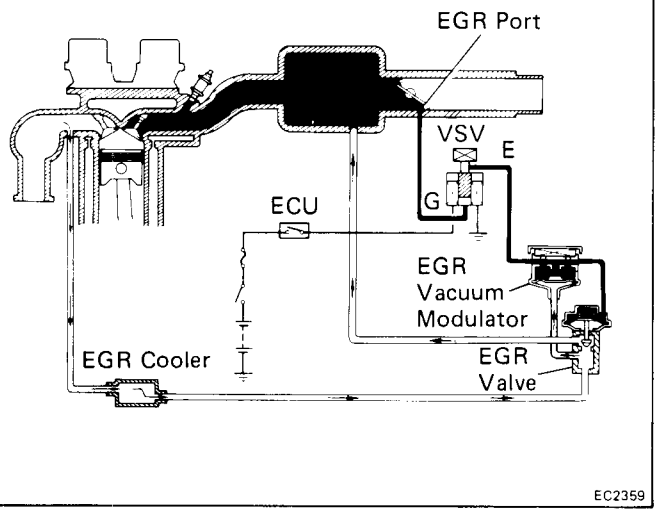
EXHAUST GAS RECIRCULATION (EGR) SYSTEM (7M-GTE)



(1)



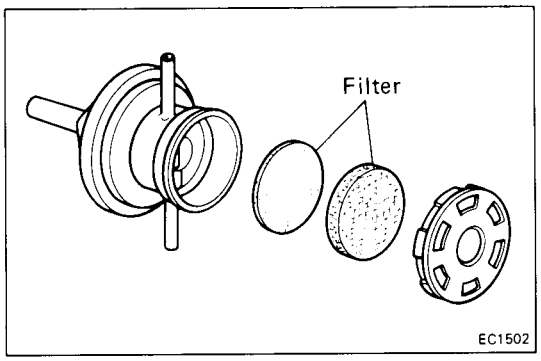
(2)



To reduce NOx emissions, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

Coolant Temp.	VSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 57°C (135°F)	CLOSED (E–G)	–	–		–	CLOSED	Not recirculated
Above 63°C (145°F)	OPEN (E–G)	Positioned below EGR port	(1)	–	–	CLOSED	Not recirculated
		Positioned above EGR port	(2)	*	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

* When the throttle valve is positioned above the EGR port, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.

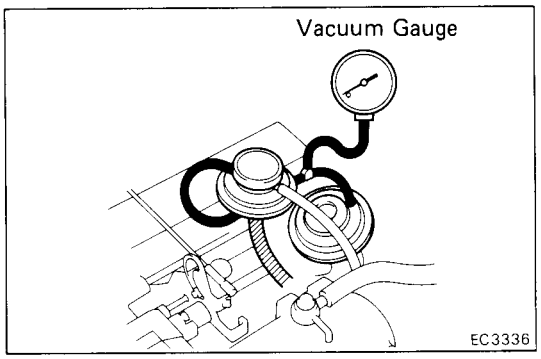


INSPECTION OF EGR SYSTEM

1. CHECK AND CLEAN FILTERS IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.

(b) Using compressed air, clean the filter.

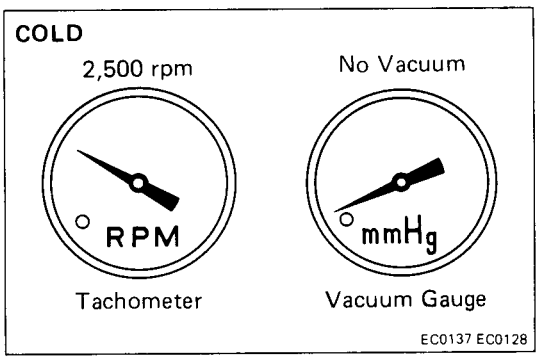


2. PREPARATION

Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and EGR vacuum modulator.

3. CHECK SEATING OF EGR VALVE

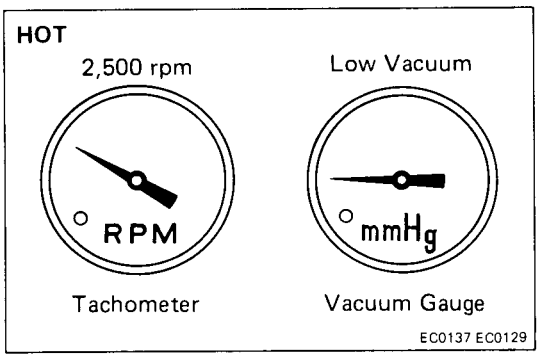
Start the engine and check that the engine starts and runs at idle.



4. CHECK VSV WITH COLD ENGINE

(a) The coolant temperature should be below 57°C (135°F).

(b) Check that the vacuum gauge indication is zero at 2,500 rpm.

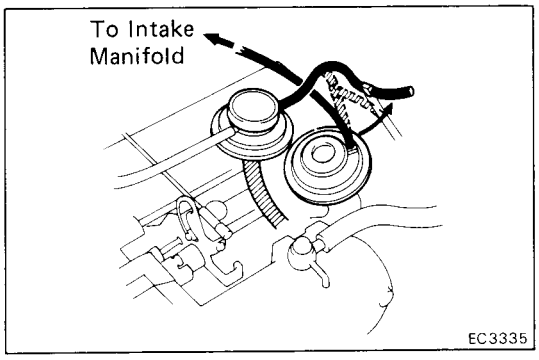


5. CHECK VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indication is approx. 70 mmHg (2.76 in.Hg, 9.3 kPa) at 2,500 rpm.

(c) Disconnect the vacuum gauge and reconnect the vacuum hose to the proper location.



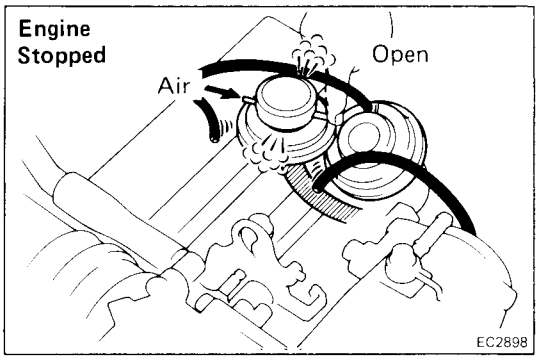
6. CHECK EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idling.

(b) Check that the engine runs rough or dies.

(c) Reconnect the vacuum hoses to the proper location.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



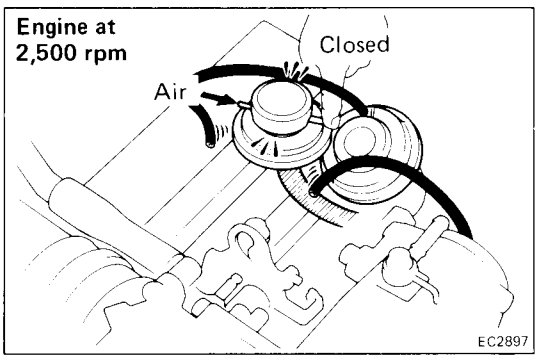
INSPECTION OF EGR VACUUM MODULATOR

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from the EGR vacuum modulator.

(b) Block port P with your finger.

(c) Blow air into the other pipe. Check that the air passes through to the air filter freely.

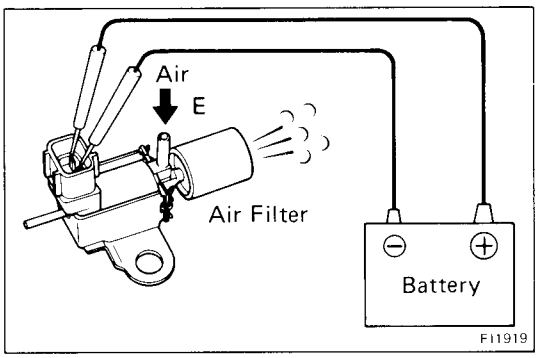


(d) Start the engine and maintain speed at 2,500 rpm.

(e) Repeat the above test. Check that there is a strong resistance to air flow.

If a problem is found, replace the EGR vacuum modulator.

(f) Reconnect the vacuum hoses to the proper locations.

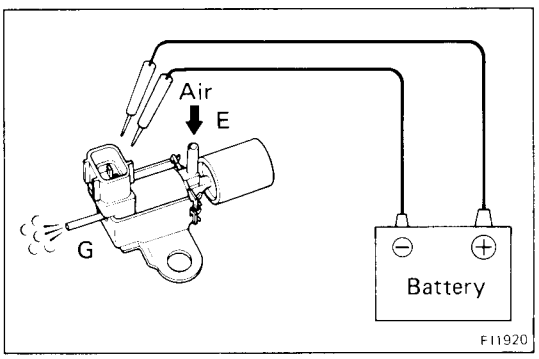


INSPECTION OF VSV

1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as illustrated.

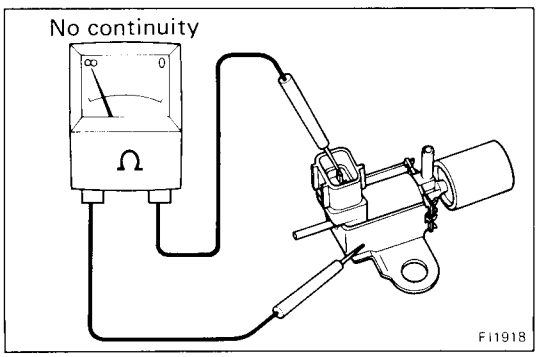
(b) Blow into pipe E and check that air comes out of the air filter.



(c) Disconnect the battery.

(d) Blow into pipe E and check that air comes out of pipe G.

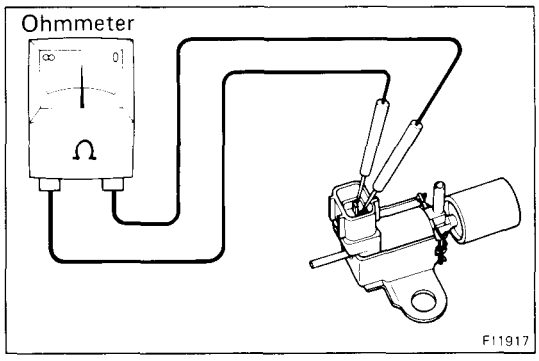
If a problem is found, replace the VSV.



2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the terminals and the VSV body.

If there is continuity, replace the VSV.



3. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between the terminals.

Specified resistance: 38 — 44 Ω at 20°C (68°F)

If the resistance is not within specification, replace the VSV.

INSPECTION OF EGR VALVE

1. REMOVE EGR VALVE

Check the valve for sticking and heavy carbon deposits. if a problem is found, replace it.

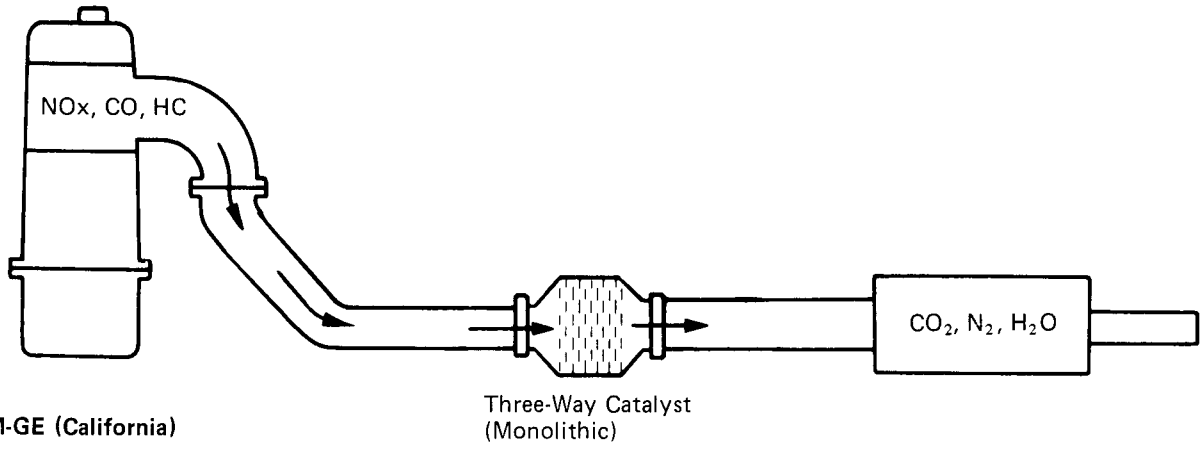
2. INSTALL EGR VALVE WITH NEW GASKET

INSPECTION OF WATER TEMP. SENSOR

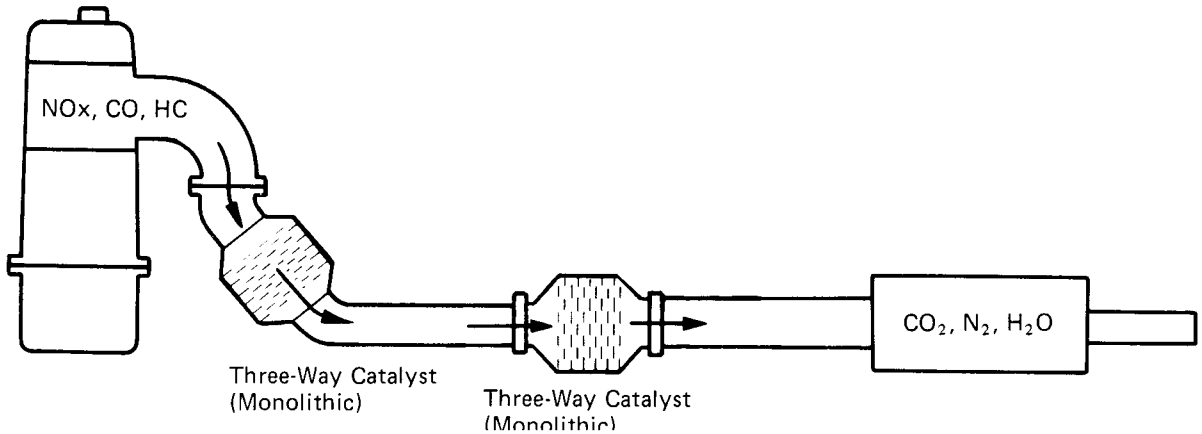
(See page FI-113)

THREE-WAY CATALYST (TWC) SYSTEM

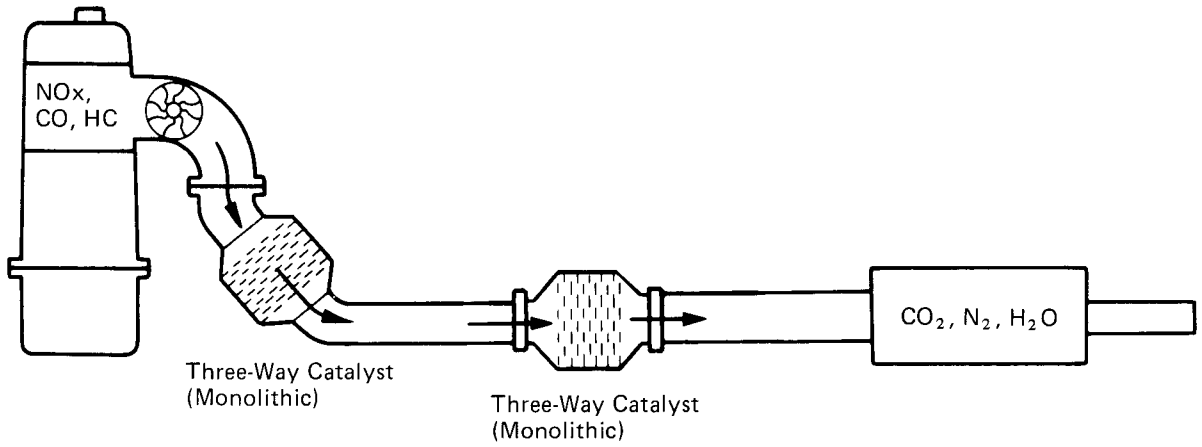
7M-GE (Federal and Canada)



7M-GE (California)



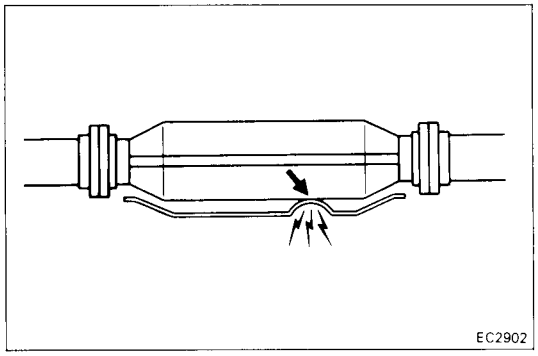
7M-GTE



EC3427
EC3340
EC2907

To reduce HC, CO and NOx emissions, they are oxidized, reduced and converted to nitrogen (N_2), carbon dioxide (CO_2) and water (H_2O) by the catalyst.

Exhaust Port		TWC		Exhaust Gas
HC, CO, AND NOx	⇒	OXIDATION AND REDUCTION	⇒	CO_2 H_2O N_2


EC2902

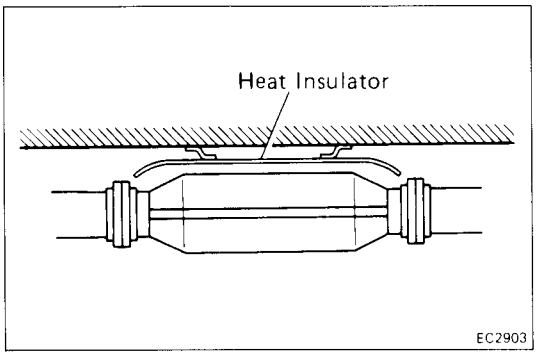
INSPECTION OF EXHAUST PIPE ASSEMBLY

1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE
2. CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE

INSPECTION OF CATALYTIC CONVERTER

CHECK FOR DENTS OR DAMAGE

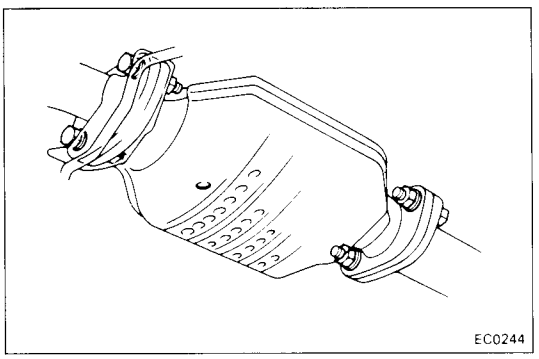
If any part of the protector is damaged or dented to the extent that it touches the catalyst, repair or replace it.



EC2903

INSPECTION OF HEAT INSULATOR

1. CHECK HEAT INSULATOR FOR DAMAGE
2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR


EC0244

REPLACEMENT OF CATALYTIC CONVERTER

1. REMOVE CONVERTER
   (a) Jack up the vehicle.
   (b) Check that the converter is cool.
   (c) Remove the bolts at the front and rear of the converter.
   (d) Remove the converter and gaskets.

2. INSTALL CONVERTER
   (a) Place new gaskets on the converter front and rear pipes, and connect the converter to the exhaust pipes.
   (b) Tighten the bolts.

   Torque: Catalyst-Exhaust pipe
   440 kg-cm (32 ft-lb, 43 N·m)