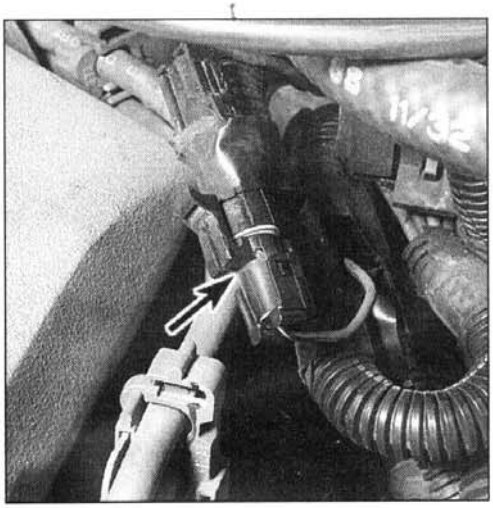
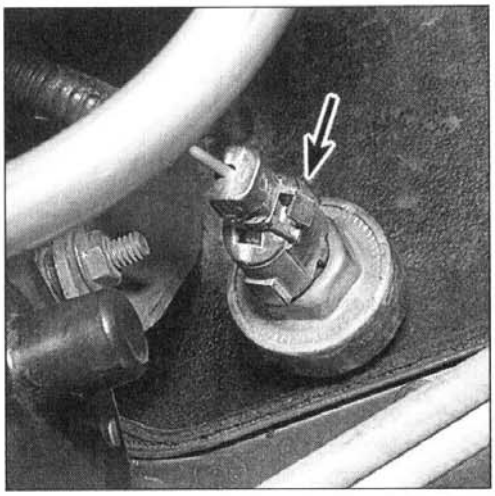
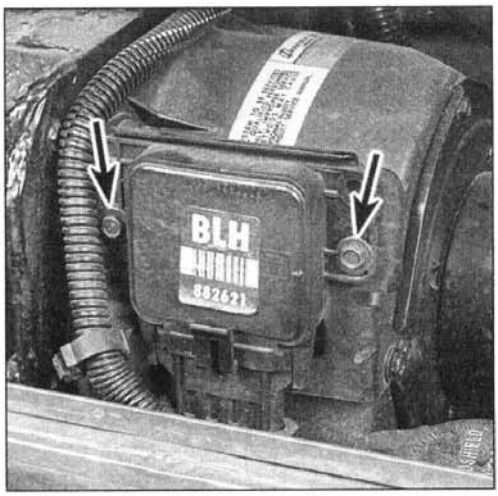


6.4 To set the initial base timing, disconnect the HEI/EST bypass connector (arrow) and set the timing as specified on the VECI label



7.8 The Electronic Spark Control (ESC) sensor is located in the lower right side of the block, just in front of the starter motor



7.13 The Electronic Spark Control (ESC) module is attached to the right side of the evaporator blower with two bolts (arrows)

7 Electronic Spark Control (ESC) system

Refer to illustrations 7.8 and 7.13

General description

1 Irregular octane levels in modern gasoline can cause detonation in a high performance engine. Detonation is sometimes referred to as "spark knock." This condition causes the pistons and rings to vibrate and rattle, producing a characteristic knocking or pinging sound.

2 The Electronic Spark Control (ESC) system is designed to retard spark timing up to 20-degrees to reduce spark knock in the engine. This allows the engine to use maximum spark advance to improve driveability and fuel economy.

3 The ESC knock sensor, which is located on the lower right side of the engine block (some models use two sensors, one on the right side of the block and one on the left side of the block, service procedures are the same for both sensors), sends a voltage signal of 8 to 10-volts to the ECM when no spark knock is occurring and the ECM provides normal advance. When the knock sensor detects abnormal vibration (spark knock), the ESC module turns off the circuit to the ECM. The ECM then retards the EST distributor until spark knock is eliminated.

4 Failure of the ESC knock sensor signal or loss of ground at the ESC module will cause the signal to the ECM to remain high. This condition will result in the ECM controlling the EST as if no spark knock is occurring. Therefore, no retard will occur and spark knock may become severe under heavy engine load conditions. At this point, the ECM will set a Code 43.

5 Loss of the ESC signal to the ECM will cause the ECM to constantly retard EST. This will result in sluggish performance and cause the ECM to set a Code 43.

Component replacement

ESC sensor

6 Disconnect the cable from the negative terminal of the battery.

7 Raise the vehicle and support it on jackstands. Refer to Chapter 1 and drain the cooling system.

8 Disconnect the wiring harness connector from the ESC sensor **(see illustration)**.

9 Remove the ESC sensor from the block. Coolant will flow out of the hole, so be careful not to get any in your eyes.

10 Apply thread sealant to the ESC sensor threads.

11 Installation is the reverse of the removal procedure. Be sure to refill the cooling system.

ESC module

12 Disconnect the cable from the negative terminal of the battery.

13 Disconnect the electrical connector from the module, which is located on the right side of the evaporator blower assembly **(see illustration)**.

14 Unscrew and remove the module.

15 Installation is the reverse of removal.

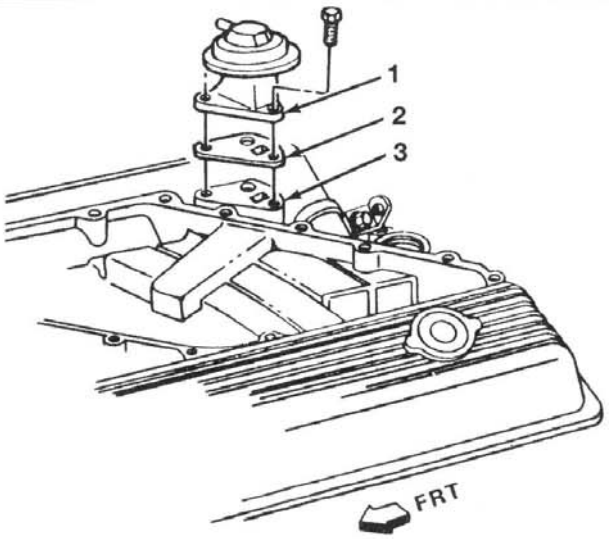
8 Exhaust Gas Recirculation (EGR) system

Refer to illustrations 8.1, 8.5a, 8.5b, 8.14 and 8.16

General description

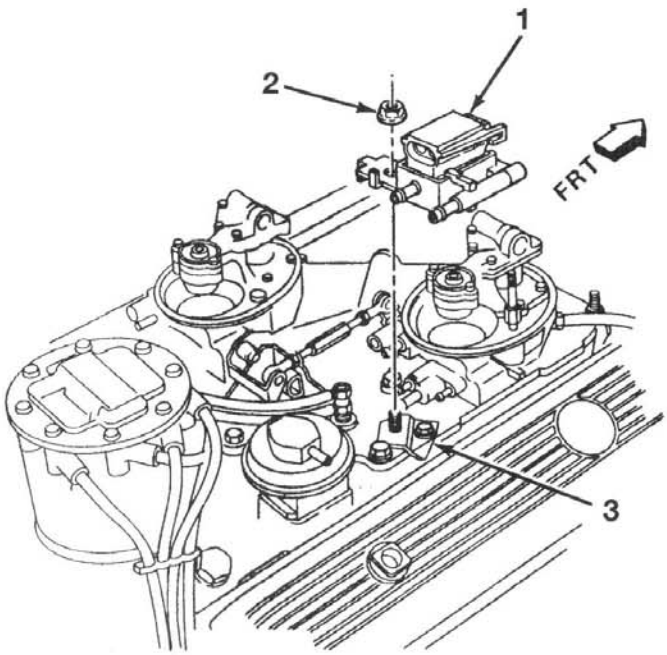
1 The Exhaust Gas Recirculation (EGR) system is used to lower NOx (oxides of nitrogen) emission levels by decreasing combustion temperature. The main element of the system is the EGR valve, mounted on the intake manifold **(see illustration)**, which feeds small amounts of exhaust gas back into the combustion chamber.

2 The EGR valve is opened by manifold vacuum to allow exhaust gases to flow into the intake manifold. The EGR valve is usually open during warm engine operation and anytime the engine is running above idle speed. The amount of gas recirculated is controlled by variations in vacuum and exhaust backpressure.



8.1 On 1984 vehicles, the EGR valve is mounted at the right rear corner of the intake manifold

1 EGR valve
2 Gasket
3 Mounting surface



8.5a On 1984 vehicles, the Exhaust Gas Recirculation (EGR) solenoid is located in front of the EGR valve, on the right side of the intake manifold

1 EGR solenoid
2 Mounting nut
3 Mounting bracket

3 The valve used on this engine is called a negative backpressure valve. It varies the amount of exhaust gas flow into the manifold depending on manifold vacuum and variations in exhaust backpressure.

4 The diaphragm on this valve has an internal vacuum bleed hole which is held closed by a small spring when there is no exhaust backpressure. Engine vacuum opens the EGR valve against the pressure of a large spring. When manifold vacuum combines with negative exhaust backpressure, the vacuum bleed hole opens and the EGR valve closes.

5 An ECM controlled solenoid **(see illustrations)** is used in the vacuum line in order to maintain finer control of EGR flow. The ECM uses information from the coolant temperature, throttle position and manifold pressure sensors to regulate the vacuum solenoid.

6 During cold operation and at idle, the solenoid circuit is grounded by the ECM to block vacuum to the EGR. When the solenoid circuit is not grounded by the ECM, vacuum is allowed to the EGR.

7 With the engine stopped, turning the ignition key to On will turn on the solenoid, allowing vacuum to the EGR valve. Grounding the ALCL diagnostic test terminal will remove power to the solenoid and allow vacuum to the EGR valve.

8 Too much EGR flow weakens combustion, causing the engine to run roughly or stall. During cold operation it may cause the engine to stop after a cold start. At idle, excessive EGR flow may cause the engine to run roughly or stop after decelerating. Too much EGR flow while cruising may cause the engine to surge.

9 Too little or no EGR flow allows combustion temperatures to get too high during acceleration and load conditions. The result can be spark knock (detonation), engine overheating and emission test failure.

1984 through 1991 models

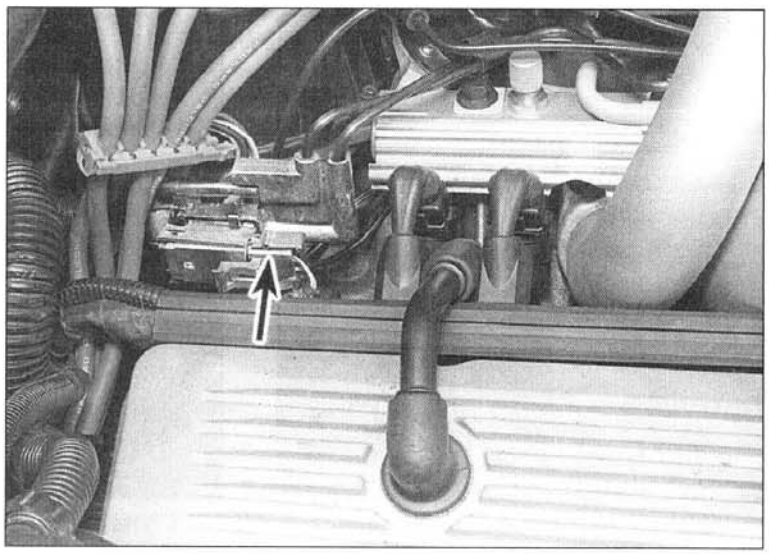
Check

1984 models only

10 Make a physical inspection of the hoses and electrical connections to ensure that nothing is loose.

11 With the ignition off, check the EGR valve to make sure it is closed by pushing up on the underside of the diaphragm.

12 If the valve is open, disconnect the vacuum hose at the EGR valve and recheck the diaphragm. If the diaphragm is still open, clean the EGR valve and passages as described in Steps 36 on. Replace the EGR valve if necessary. If the diaphragm is closed, connect a vacuum gauge in place of the EGR valve. Proceed to Step 16.



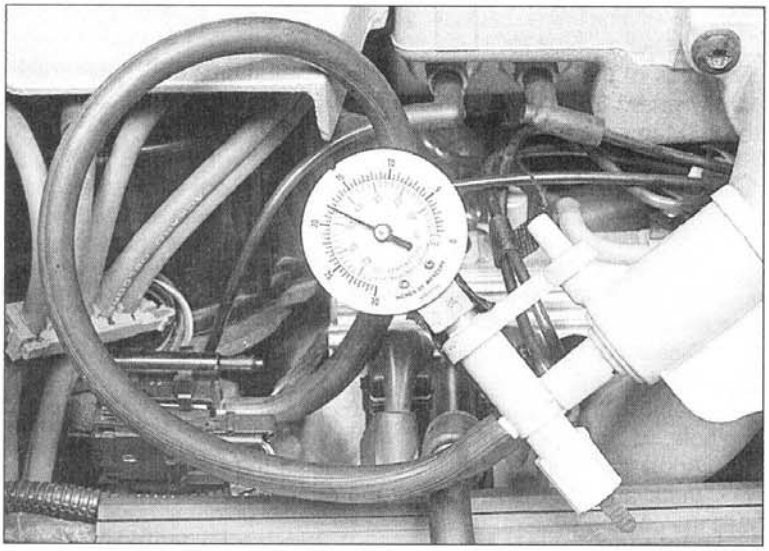
8.5b On 1985 and later vehicles, the EGR solenoid is located at the right rear corner of the intake manifold next to the distributor (arrow)

13 If the valve is closed, install a tachometer and bring the engine to normal operating temperature. Do not ground the Test terminal. With the engine idling, the rpm should drop as the EGR valve is opened by pushing up on the underside of the diaphragm. If there is no change in rpm, clean the EGR valve and passages. Replace the EGR valve if necessary.

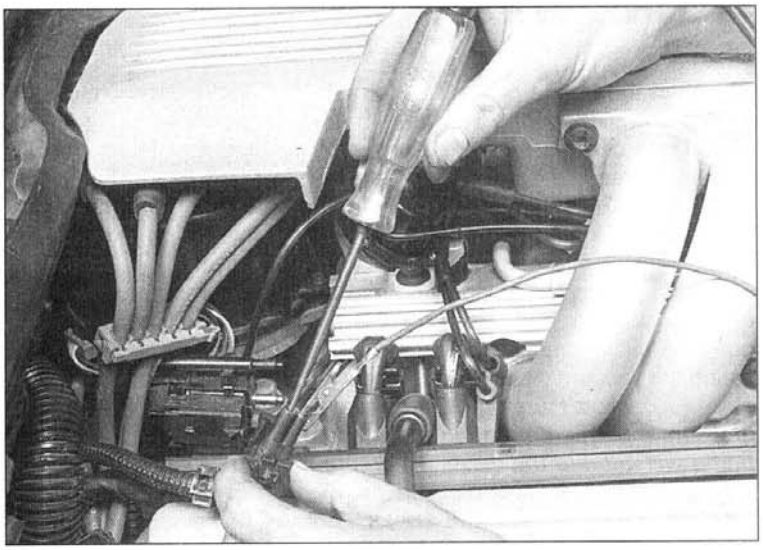
14 If the rpm drops, disconnect the EGR control solenoid, then check for movement of the diaphragm as the rpm is increased to 1200 rpm and returned to idle. If there is no movement, check vacuum at the engine side of the EGR solenoid **(see illustration)**. It should have at least ten inches of vacuum. If it doesn't, repair the cause of poor vacuum to the solenoid. If it has ten inches of vacuum, check to make sure that it has at least ten inches of vacuum on the EGR valve side of the solenoid. If it does, check for a restricted hose between the EGR valve and the solenoid. If the hose is okay, the EGR valve is faulty. If it does not have at least ten inches of vacuum on the EGR valve side of the solenoid, the EGR solenoid is faulty.

15 If there is movement, connect a vacuum gauge in place of the EGR valve. There should be at least ten inches of vacuum. If not, perform the sequence of tests outlined in Step 14.

16 If there are at least ten inches of vacuum, leave the vacuum gauge connected, turn the ignition on and, with the engine stopped,



8.14 The engine side of the EGR solenoid should have at least ten inches of vacuum



8.16 Connect a test light across the EGR solenoid wire harness terminals after checking the solenoid for vacuum - the light should come on

connect a test light across the solenoid harness connector terminals **(see illustration)**. The light should go on.

17 If the light does not come on, probe both harness connector terminals with a test light connected to ground. If there is no voltage at either terminal, repair the open ignition circuit to the solenoid. If the light goes on at one terminal, check for an open in circuit 435 (see the wiring diagrams at the end of Chapter 12). If there is no open in circuit 435, either the ECM connector terminal is faulty or the ECM itself is faulty. **Note:** *Before replacing the ECM, use an ohmmeter and check the resistance between the solenoid terminals of the TCC and the EGR. Refer to the ECM wiring diagrams (at the end of Chapter 12) for coil terminal identification for both the solenoid(s) and relay(s) to be checked. Replace any solenoid where the resistance measures less than 20 ohms.*

18 If the light does come on, ground the diagnostic test terminal and note whether the light comes on. If the light comes on, check for a short to ground in circuit 435. If it's okay, the ECM is faulty. **Note:** *Before replacing the ECM, use an ohmmeter to check the resistance between the solenoid terminals of the TCC and the EGR. Refer to the ECM wiring diagrams (at the end of Chapter 12) for coil terminal identification for both the solenoid(s) and relay(s) to be checked. Replace any solenoid where the resistance measures less than 20 ohms.* If the light does not come on, reconnect the solenoid, start the engine and note the vacuum gauge reading while the engine is idling. If there is vacuum, replace the EGR control solenoid. If there is no vacuum, the EGR control solenoid is okay. Check the valve for binding, leakage and loose mounting bolts.

1985 through 1991 models

19 Before performing the following sequence of test procedures, check for ported vacuum to the EGR solenoid and check the hoses for leaks and restrictions. There should be at least seven inches of vacuum at 2000 rpm. **Note:** *The following test sequence assumes there is no Code 32.*

20 With the ignition on and the engine stopped, ground the diagnostic terminal, disconnect the EGR solenoid vacuum harness and apply ten inches of vacuum to the manifold side of the solenoid. It should be able to hold this vacuum. If it can, proceed to Step 24.

21 If it cannot hold vacuum, disconnect the EGR solenoid electrical connector and connect a test light between the harness terminals.

22 If the light comes on, replace the solenoid.

23 If the light does not come on, probe each harness connector terminal with a test light connected to ground. If there is no light, repair the open in circuit 39 (see the wiring diagrams at the end of Chapter 12). If the light comes on at one terminal, check for an open in circuit 435. If the circuit has no open, check the resistance of the solenoid - it should have more than 20 ohms. If it doesn't, replace the solenoid and the ECM. If it does, either the ECM connection or the ECM itself is faulty. **Note:** *Before replacing the ECM, check the resistance of each ECM controlled relay and solenoid coil with an ohmmeter. Refer to the ECM wiring diagrams (at the end of Chapter 12) for coil terminal identification for both the solenoid(s) and relay(s) to be checked. Replace any relay or solenoid if the coil resistance measures less than 20 ohms.*

24 If the solenoid can hold vacuum, unground the diagnostic terminal - the vacuum should drop.

25 If there is no drop in vacuum, disconnect the solenoid electrical connector and note the vacuum reading. If the vacuum reading drops, repair the short to ground in circuit 435. If there is no short to ground in circuit 435, the ECM is faulty. **Note:** *Before replacing the ECM, check the resistance of each ECM controlled relay and solenoid coil with an ohmmeter. Refer to the ECM wiring diagrams (at the end of Chapter 12) for coil terminal identification for both the solenoid(s) and relay(s) to be checked. Replace any relay or solenoid if the coil resistance measures less than 20 ohms.* If there is no drop in vacuum reading, replace the EGR solenoid.

26 If there is a drop in vacuum, turn the ignition off, connect a vacuum pump to the EGR valve and use a mirror to watch the valve diaphragm while applying vacuum. The diaphragm should move freely and hold vacuum for at least 20 seconds. If it doesn't, replace the EGR valve.

27 If the diaphragm does hold vacuum for at least 20 seconds, apply vacuum to the EGR valve, start the engine and immediately note the vacuum reading. The valve is good if it moves to its seated position (valve closed) and if the vacuum reading drops while starting the engine. If the valve does not move to its seated position and/or vacuum doesn't drop while starting the engine, remove the EGR valve and check for plugged passages. If the passages are not plugged, replace the EGR valve. If the valve moves to its seated position and the vacuum reading drops while starting the engine, check the Park/Neutral switch on the automatic transmission (if equipped) by connecting a test light between the EGR solenoid harness terminals, and, with the engine at normal operating temperature, accelerate the engine to about 1500 rpm in Park (observe the light, it should stay on). Repeat this test in Drive- the test light should dim or go out. If both conditions are met, then the switch is okay.

Component replacement

EGR valve

28 If your vehicle is a 1984 model, remove the air cleaner. If your vehicle is a 1985 or later model, remove the plenum (Chapter 4).

29 Disconnect the EGR valve vacuum line from the valve.

30 Remove the EGR valve mounting bolts.

31 Remove the EGR valve from the manifold.

32 If the EGR passages in the manifold have deposits built-up in them they should be cleaned. Care should be taken to ensure that all loose particles are completely removed to prevent them from clogging the EGR valve or from being ingested into the engine. **Caution:** *Do not wash the EGR valve in solvents or degreaser - permanent damage to the valve diaphragm may result. Sand blasting of the valve is also not recommended since it can affect the operation of the valve.*

33 Buff the exhaust deposits from the mounting surface and around the valve with a wire brush.

34 Look for exhaust deposits in the valve outlet. Remove deposit buildup with a screwdriver.

35 Clean the mounting surfaces of the intake manifold and the valve assembly.

36 If the valve itself is operating correctly, it can be reused after it has been cleaned and checked for deposits. Hold the valve in your hand. Tap on the end of the round pintle using a light snapping action with a soft-face hammer. This will remove the exhaust deposits from the valve seat. Remove all loose particles.

37 Clean the mounting surface of the valve and the pintle with a wire brush.

38 Depress the valve diaphragm and check the seating area for cleanliness and signs of rubbing by looking through the valve outlet. If the pintle or the seat are not completely clean, repeat the procedure in Step 36.