

SECTION C7

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

GENERAL DESCRIPTION

PURPOSE

The EGR system is used to lower NO_x (oxides of nitrogen) emission levels caused by high combustion temperature. It does this by decreasing combustion temperature.

The main element of the system is the EGR valve operated by vacuum and mounted on the intake manifold.

The EGR valve feeds small amounts of exhaust gas back into the combustion chamber as shown in Figure C7-1.

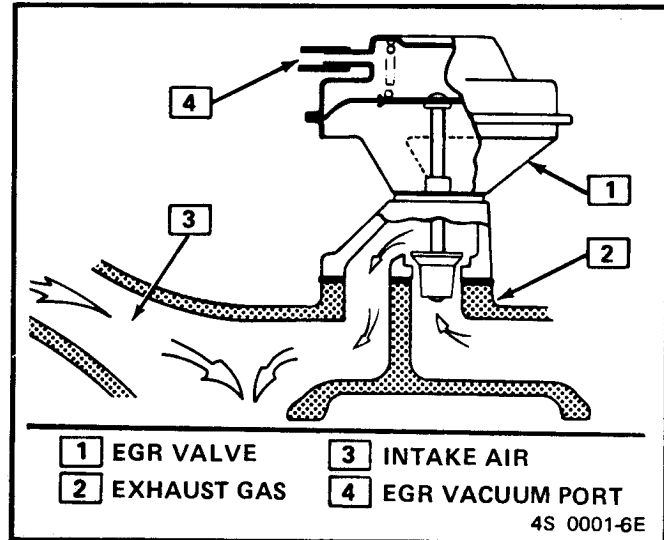


Figure C7-1 Exhaust Gas Recirculation

OPERATION

The EGR valve is opened by ported manifold vacuum to let exhaust gas flow into the intake manifold. The exhaust gas then moves with the air/fuel mixture into the combustion chamber. If too much exhaust gas enters, combustion will not occur. For this reason, very little exhaust gas is allowed to pass through the valve, especially at idle. The EGR valve is usually open under the following conditions:

- Warm engine operation
- Above idle speed

To more closely regulate EGR flow, an ECM controlled solenoid is used in the vacuum line. The ECM uses information from the following sensors to regulate the EGR solenoid:

- Coolant Temperature
- Throttle Position (TPS)
- Mass AIR Flow (MAF)
- P/N Switch

EGR VALVE IDENTIFICATION, (Figure C7-2)

- Positive backpressure EGR valves will have a "P" stamped on the top side of the valve after the part number.
- Negative backpressure EGR valves will have an "N" stamped on the top side of the valve after the part number.
- Port EGR valves have no identification stamped after the part number.

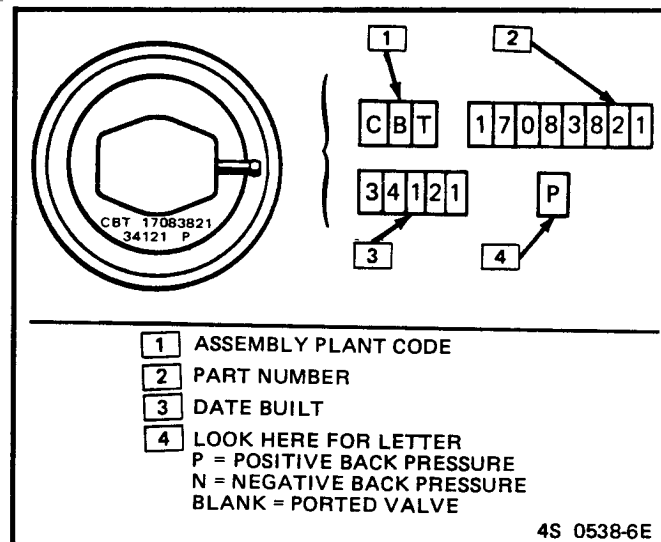


Figure C7-2 EGR Valve Identification

A diagnostic switch is part of the control and monitors vacuum to the EGR valve. This switch will trigger a "SERVICE ENGINE SOON" light, and set a Code 32 in the event of a circuit failure.

Negative Backpressure Valve

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 back pressure.

The diaphragm on this valve (shown in Figure C7-4) has an internal vacuum bleed hole which is held closed by a small spring when there is no exhaust backpressure. The amount of vacuum to the valve is controlled by the ECM controlling a solenoid.

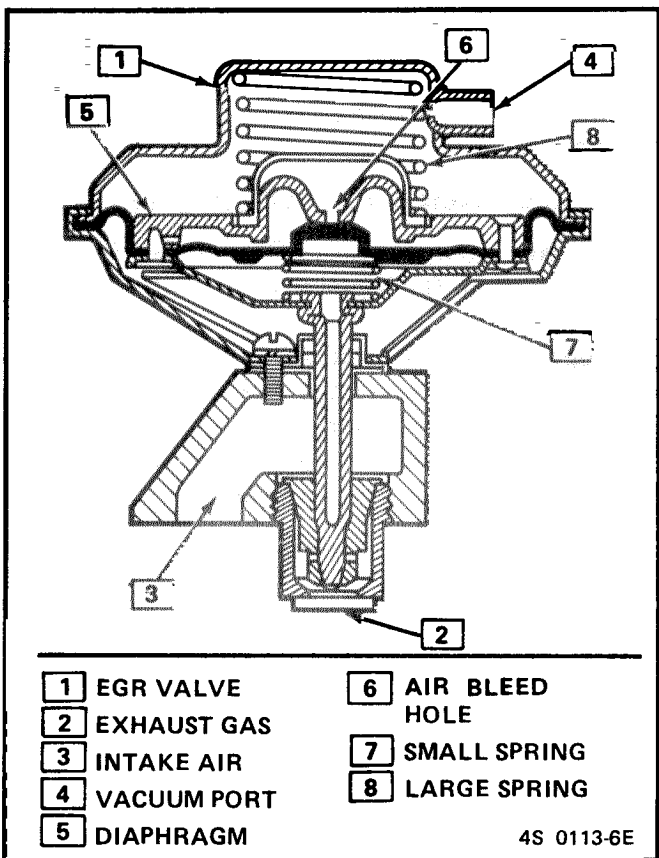


Figure C7-3 Negative Backpressure EGR Valve

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.

During cold operation and at idle, the solenoid circuit is grounded by the ECM. This blocks vacuum to the EGR valve.

When the solenoid circuit is not grounded by the ECM, vacuum is allowed to the EGR valve.

Grounding the ALCL diagnostic "test" terminal, with ignition "on" and engine not running, will energize the solenoid and block vacuum to the EGR valve.

Results of Incorrect EGR System Operation

Too much EGR flow tends to weaken combustion, causing the engine to run roughly or stop. With too much EGR flow at idle, cruise, or cold operation, any of the following conditions may happen:

- Engine stalls after start.
- Engine stops at idle after deceleration.
- Car surges during cruise.
- Rough idle.

If the EGR valve should stay open all off the time, the engine may not run.

Too little or no EGR flow allows combustion temperatures to get too high during acceleration and load conditions. This could cause:

- Spark knock (detonation).
- Engine overheating.
- Emission test failure.

DIAGNOSIS

Diagnosis of the EGR system is covered in CHART C-7 at the end of this section.

ON-CAR SERVICE

EGR VALVE

↔ Remove or Disconnect

1. Plenum (See Plenum R&R)
2. Vacuum line
3. Retaining bolts
4. Valve

↔ Install or Connect

1. Reinstall valve or replacement EGR valve on intake manifold using new gasket (15).
2. Bolts and tighten to 18 N.m (14 ft. lbs.).
3. Vacuum hose to valve.
4. Plenum.

🔍 Inspect

If EGR passages in the inlet manifold indicate excessive build-up of desposits, the passages 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.

Do not wash EGR valve in solvents or degreaser - permanent damage to valve diaphragm may result. Also, sand blasting of the valve is not recommended since this can affect the operation of the valve.

EGR MANIFOLD PASSAGE



Clean

1. With a wire wheel, buff the exhaust deposits from the mounting surface and around the valve.
2. Look for exhaust deposits in the valve outlet. Remove deposit build-up with a screwdriver.
3. Clean mounting surfaces of intake manifold and valve assembly.

EGR CONTROL SOLENOID



Remove or Disconnect

1. Negative battery cable.
2. Electrical connector at solenoid
3. Vacuum hoses.
4. Nut and solenoid.



Install or Connect

1. Solenoid and bracket. Tighten nut to 24 N·m (17 ft. lbs.).
2. Vacuum hoses.
3. Electrical connector.
4. Negative battery cable.

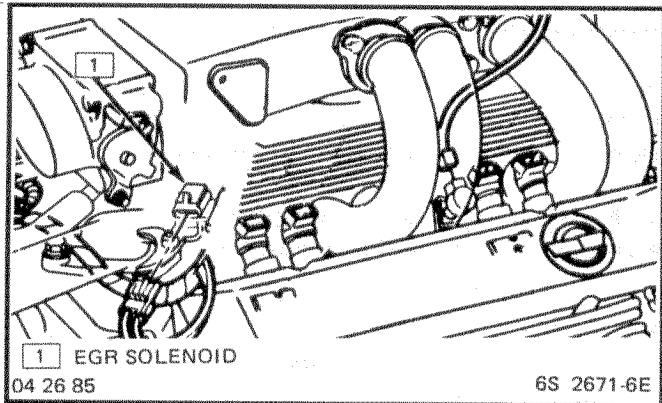


Figure C7-4 EGR Control Solenoid

EGR VALVE IDENTIFICATION

When replacing an EGR valve, always check for correct part number in the parts catalog or supplemental bulletin.

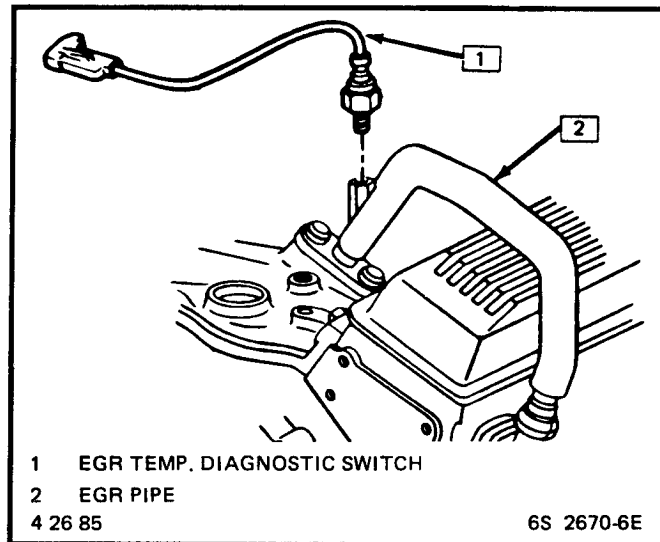


Figure C7-5 EGR Diagnostic Switch

PARTS INFORMATION

PARTS NAME	GROUP
Valve, EGR (1)	3.670
Solenoid, EGR cont VLV RLY (14)	3.670
Gasket, EGR Valve (15)	3.680

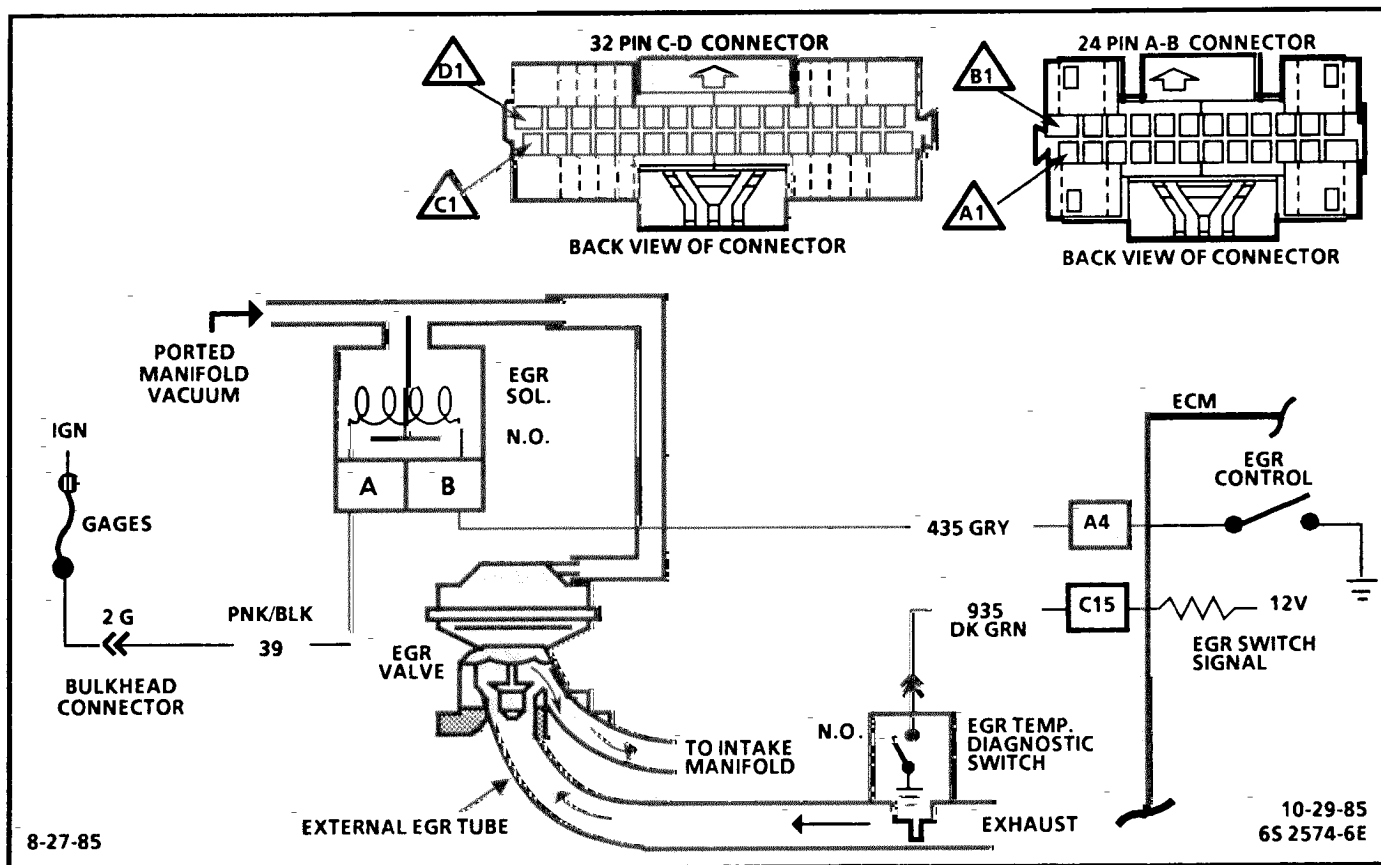


CHART C-7B

EXHAUST GAS RECIRCULATION

5.7L "Y" SERIES

FUEL INJECTION (PORT)

The Exhaust Gas Recirculation (EGR) valve is controlled by a normally open, pulse width modulated (PWM) solenoid. The ECM turns the solenoid "off" to allow vacuum to pass to the EGR and turns the solenoid "on" to prohibit EGR operation. When EGR is commanded, the solenoid is turned on and off many times a second (duty cycle).

The duty cycle is calculated by the ECM based on information from the coolant, MAT, TPS, and MAF sensors. Also, engine RPM's and the P/N switch input affect EGR. There should be no EGR when in park or neutral, TPS below a calibrated value or TPS indicating WOT.

With the ignition on and engine stopped, the EGR solenoid is de-energized. The solenoid, however, should be energized if the diagnostic terminal is grounded with the ignition on and engine not running.

- This will test the solenoid valve to determine if it is capable of closing off the manifold vacuum from the EGR valve. The vacuum may bleed off slowly but this should not be considered a fault.
- As soon as back pressure is available at the EGR valve, the bleed portion in the valve should open and cause the valve to go to its heated position.
- To check P/N switch:
 - Connect a test light between EGR solenoid harness terminals.
 - Engine at normal operating temperature.
 - Accelerate engine to about 1500 RPM's in park (observe light, it should stay on).
 - Repeat test in drive and the test light should go dim or out.
 - If both conditions are met then the P/N switch is ok, otherwise see Chart C-1A.

CHART C - 7B

EGR SYSTEM CHECK

5.7L "Y" SERIES FUEL INJECTION (PORT)

BEFORE USING THIS CHART, CHECK FOR PORTED VACUUM TO EGR SOLENOID, ALSO CHECK HOSES FOR LEAKS OR RESTRICTIONS. SHOULD BE AT LEAST 7" HG VACUUM AT 2000 RPM. THIS CHART ASSUMES THERE IS NO CODE 32.

- 1
- IGNITION "ON" ENGINE STOPPED.
 - GROUND DIAGNOSTIC TERMINAL.
 - DISCONNECT EGR SOLENOID VACUUM HARNESS.
 - APPLY 10" VACUUM TO MANIFOLD SIDE OF SOLENOID.
 - SHOULD BE ABLE TO HOLD VACUUM.

OK

NOT OK

- UNGROUND DIAGNOSTIC TERMINAL
- VACUUM SHOULD DROP

- DISCONNECT EGR SOLENOID ELECTRICAL CONNECTOR.
- CONNECT A TEST LIGHT BETWEEN HARNESS TERMINALS

DROPS

NO DROP

- IGN. 'OFF'
- CONNECT A VACUUM PUMP TO EGR VALVE.
- USING A MIRROR OBSERVE EGR DIAPHRAGM WHILE APPLYING VACUUM
- DIAPHRAGM SHOULD MOVE FREELY AND HOLD VACUUM FOR AT LEAST 20 SECONDS.

- DISCONNECT SOLENOID ELECTRICAL CONNECTOR
- NOTE VACUUM

LIGHT 'ON'

LIGHT 'OFF'

REPLACE SOLENOID.

PROBE EACH HARNESS CONNECTOR TERMINAL WITH A TEST LIGHT CONNECTED TO GROUND.

NO DROP

DROPS

REPLACE SOLENOID

REPAIR SHORT TO GROUND IN CKT 435. IF NOT SHORTED TO GROUND IT IS A FAULTY ECM. 

NO LIGHT

LIGHT ON 'ONE' (CKT 39)

LIGHT ON BOTH

REPAIR OPEN CKT 39.

CHECK FOR OPEN CKT 435.

REPAIR SHORT TO VOLTAGE IN CKT 435 AND REPLACE ECM.

IF OK

CHECK SOL. RESISTANCE SHOULD BE MORE THAN 20 OHMS.

OK

NOT OK

FAULTY ECM CONNECTION OR ECM. 

REPLACE SOLENOID AND ECM. 

OK NOT OK
REPLACE EGR VALVE.

- APPLY VACUUM TO EGR VALVE.
- START ENGINE AND IMMEDIATELY OBSERVE VACUUM
- VALVE IS GOOD IF VALVE MOVES TO SEATED POSITION (VALVE CLOSED) AND VACUUM DROPPED WHILE STARTING ENGINE.

3 OK

NOT OK

A/T CHECK P/N SWITCH

IF OK THERE IS NO TROUBLE FOUND.

- REMOVE EGR VALVE CHECK PASSAGES FOR BEING PLUGGED.
- IF NOT PLUGGED REPLACE EGR VALVE.



BEFORE REPLACING ECM USE AN OHMMETER AND CHECK RESISTANCE OF EACH ECM CONTROLLED RELAY AND SOLENOID COIL. SEE ECM WIRING DIAGRAM FOR COIL TERMINAL IDENTIFICATION FOR SOLENOID(S) AND RELAY(S) TO BE CHECKED. REPLACE ANY RELAY OR SOLENOID IF THE COIL RESISTANCE MEASURES LESS THAN 20 OHMS.

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CLEAR CODES AND CONFIRM "CLOSED LOOP" OPERATION AND NO "SERVICE ENGINE SOON" LIGHT. * 55 1592-6E