

Section C7

Exhaust Gas Recirculation (EGR) System

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General Description

Purpose

The Exhaust Gas Recirculation (EGR) system controls the formation of NO_x (Oxides of Nitrogen) emissions by recirculating the exhaust gases into the combustion chamber. This is done through the intake manifold.

Operation

The Exhaust Gas Recirculation (EGR) valve operation is controlled by the Engine Control Module (ECM). The ECM uses an EGR Solenoid Vacuum valve to control vacuum to the EGR pressure transducer, then to the EGR valve itself. The EGR Solenoid Vacuum valve is turned "ON" when the ECM senses various inputs from the engine sensors.

A diaphragm mounted in the EGR pressure transducer is operated by backpressure from the exhaust gas to open and close the valve. By this opening and closing action of the valve, the EGR pressure transducer controls the vacuum transmitted to the EGR valve.

Under a low load condition such as low speed driving, the exhaust pressure is low. In this state, the diaphragm in the EGR pressure transducer is pushed down by the spring force and the EGR pressure transducer valve opens to allow the air into the vacuum passage from the outside.

As a result, the vacuum transmitted to the EGR valve becomes smaller and so does the opening of the EGR valve. Thus, less amount of exhaust gas is recirculated to the intake manifold.

Under a high load condition such as high speed driving, the exhaust pressure is high. By the high exhaust pressure, the diaphragm in the EGR pressure transducer is pushed up and closes the valve. The air does not enter the vacuum passage in this state, the vacuum transmitted to the EGR valve grows larger and so does the opening of the EGR valve. Thus, larger amount of exhaust gas is recirculated to the intake manifold.

Under any one of the following conditions, the ECM closes the vacuum passage of the EGR Solenoid Vacuum valve. In this state, as the vacuum is not transmitted to the EGR valve, it remains closed.

- Engine Coolant Temperature (ECT) sensor is low.
- The throttle valve opening is less than what specification (determined by the ECM).
- When the vehicle is stopped.
- Engine is running at a high load.

Other than the above, the EGR valve opens and closes in accordance with the EGR pressure transducer operation.

Also, in order to check the EGR passage and its valve for a restrictions. The ECM turns the EGR Bypass valve "ON," allowing intake vacuum directly to the EGR valve, forcing the valve to open. In return, the ECM checks for variations in manifold pressure. The ECM can check whether the EGR passage or the valve have any restriction.

Diagnosis

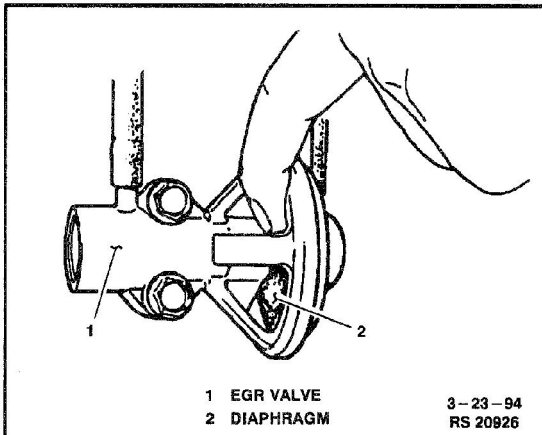
Exhaust Gas Recirculation (EGR) Valve Check

Figures C7-1 and C7-2

Caution: If the EGR valve is hot, it may be necessary to wear gloves to avoid burning fingers.

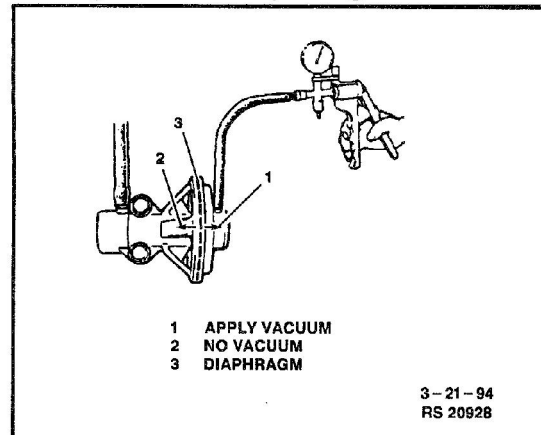
1. Start and run engine until normal operating temperature is attained.
2. Engine at normal operating temperature, place finger on Exhaust Gas Recirculation (EGR) valve diaphragm and accelerate engine; diaphragm should move (Figure C7-1).

Figure C7-1 - Checking EGR Valve Diaphragm



3. Disconnect vacuum hose from EGR valve.
4. Using a vacuum pump, apply 27 kPa (8 in. Hg) of vacuum to EGR valve with finger on diaphragm. The diaphragm should move and engine should run rough and may stall (Figure C7-2).
- Check for carbon in valve which may cause restriction. Restriction may be small enough so that the engine may not stall during Step 4, but large enough to cause a DTC to set. If the valve passes the above test, check the Exhaust Gas Recirculation (EGR) pressure transducer. If valve fails, replace the valve.

Figure C7-2 - Inspecting EGR Valve



Exhaust Gas Recirculation (EGR) Manifold Passage

Inspect

If Exhaust Gas Recirculation (EGR) passages in the intake manifold indicate excessive buildup of deposits, 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.

Clean

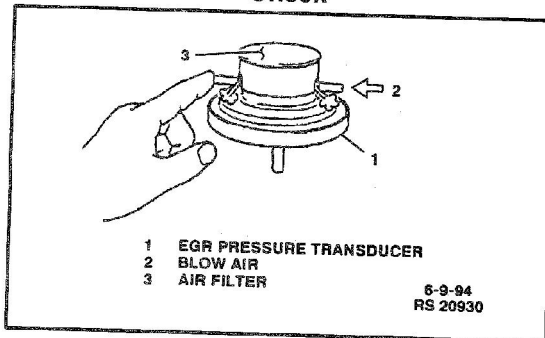
- With a wire wheel, buff the exhaust deposits from the mounting surface and around the valve.
- Look for exhaust deposits in the valve outlet. Remove deposit buildup with a screwdriver.
- Clean mounting surfaces of the intake manifold and EGR valve assembly.

Exhaust Gas Recirculation (EGR) Pressure Transducer Check

Figures C7-3 and C7-4

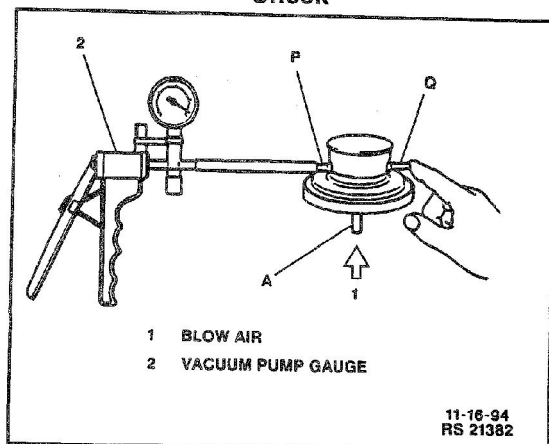
1. Check filter for contamination and damage. Use compressed air to clean filter.
2. Remove the three vacuum hoses from the Exhaust Gas Recirculation (EGR) pressure transducer.
3. Place finger over EGR pressure transducer tube and blow air into opposite tube. Air should pass through filter part of pressure transducer (Figure C7-3).

Figure C7-3 - EGR Pressure Transducer Check



4. Connect a vacuum pump to tube "P" and plug tube "Q" with your finger.
 5. Blow air into tube "A" while applying vacuum to tube "P" at the same time. You should be able to obtain vacuum on the vacuum pump gage (Figure C7-4).
 6. Stop blowing air into tube "A" and the vacuum pump gage should read zero.
- If EGR pressure transducer fails either test, replace the pressure transducer.

Figure C7-4 - EGR Pressure Transducer Check



Exhaust Gas Recirculation Solenoid Vacuum Valve Check

Figures C7-5 and C7-6

Tool Required

J 39200 Digital Multimeter

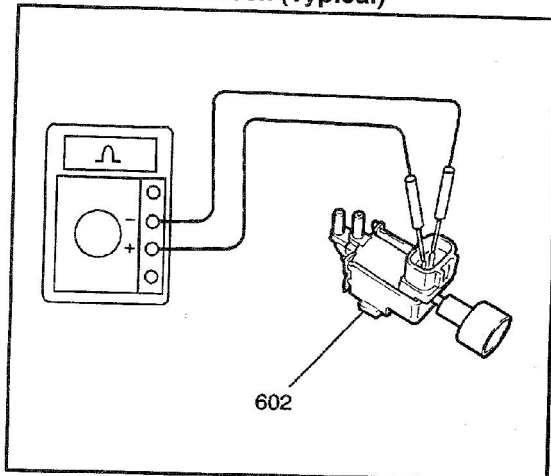
Remove or Disconnect

1. Two vacuum hoses from Exhaust Gas Recirculation (EGR) Solenoid Vacuum valve.
2. EGR Solenoid Vacuum valve electrical connector.

Measure

- Resistance of the EGR Solenoid Vacuum valve terminals (valve side). Resistance should be 28-36 ohms at 20°C (68°F). If resistance is not within specification, replace EGR Solenoid Vacuum valve (Figure C7-5).

Figure C7-5 - EGR Solenoid Vacuum Valve Check (Typical)



Legend

602 EGR Solenoid Vacuum Valve

Inspect

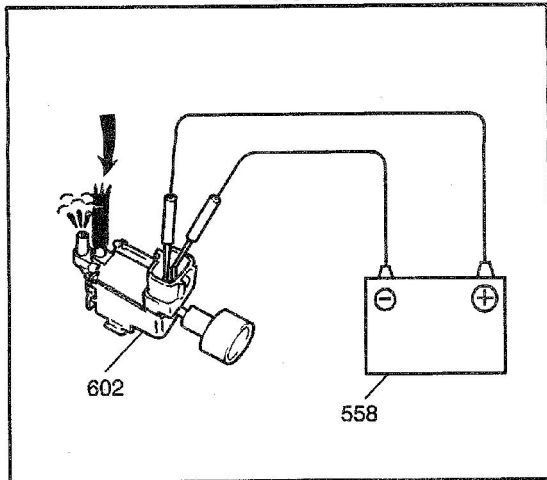
1. Blow air into tube "A." Air should exhaust through filter, and not through tube "B."
2. Connect battery voltage to the EGR Solenoid Vacuum valve and blow air into tube "A." Air should exhaust from tube "B" and not from filter (Figure C7-6).

If EGR Solenoid Vacuum valve does not perform satisfactorily, replace EGR Solenoid Vacuum valve.

Install or Connect

1. EGR Solenoid Vacuum valve electrical connector.
2. Two vacuum hoses to EGR Solenoid Vacuum valve.

Figure C7-6 - EGR Solenoid Vacuum Valve Check (Typical)



Legend

558 Battery

602 EGR Solenoid Vacuum Valve

Exhaust Gas Recirculation (EGR) Bypass Valve Check

Tool Required

J 39200 Digital Multimeter

Remove or Disconnect

1. Three vacuum hoses from Exhaust Gas Recirculation (EGR) Bypass valve.
2. EGR Bypass valve electrical connector.

Measure

- Resistance of the EGR Bypass valve terminals (valve side). Resistance should be 33-39 ohms at 20°C (68°F). If resistance is not within specification, replace EGR Bypass valve.
- Resistance between terminal (valve side) and body. DVM should read 1M ohm or higher. If resistance is not within specification, replace EGR Bypass valve.

Install or Connect

1. EGR Bypass valve electrical connector.
2. Three vacuum hoses to EGR Bypass valve.

On-Vehicle Service

Exhaust Gas Recirculation (EGR) Valve Replacement

Remove or Disconnect

1. Negative (-) battery cable.
2. Two vacuum hoses from Exhaust Gas Recirculation (EGR) valve.
3. Two bolts, gasket and EGR valve from intake manifold.

Install or Connect

1. EGR valve and gasket to intake manifold; secure with two bolts.

Tighten

- EGR valve bolts to 20 N•m (15 lb. ft.)
- 2. Two vacuum hoses to EGR valve.
- 3. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative battery terminal retainer to 15 N•m (11 lb. ft.)

Exhaust Gas Recirculation (EGR) Pressure Transducer Replacement

Remove or Disconnect

1. Negative (-) battery cable.
2. Three vacuum hoses from Exhaust Gas Recirculation (EGR) pressure transducer.
3. EGR pressure transducer from mounting bracket.

Install or Connect

1. EGR pressure transducer to mounting bracket.
2. Three vacuum hoses to EGR pressure transducer.
3. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N•m (11 lb. ft.)

Exhaust Gas Recirculation Solenoid Vacuum Valve Replacement

Remove or Disconnect

1. Negative (-) battery cable.
2. Exhaust Gas Recirculation Solenoid Vacuum valve electrical connector.
3. Two vacuum hoses from EGR Solenoid Vacuum valve.
4. Two screws and EGR Solenoid Vacuum valve from bracket.

Install or Connect

1. EGR Solenoid Vacuum valve to bracket; secure with two screws.
2. Two vacuum hoses to Solenoid Vacuum valve.
3. EGR Solenoid Vacuum valve electrical connector.
4. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N•m (11 lb. ft.).

Exhaust Gas Recirculation (EGR) Bypass Valve Replacement

Remove or Disconnect

1. Negative (-) battery cable.
2. Exhaust Gas Recirculation (EGR) Bypass valve electrical connector.
3. Three vacuum hoses from EGR Bypass valve.
4. Two screws and EGR Bypass valve from bracket.

Install or Connect

1. EGR Bypass valve to bracket; secure with two screws.
2. Three vacuum hoses to EGR Bypass valve.
3. EGR Solenoid Vacuum valve electrical connector.
4. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N•m (11 lb. ft.).

Specifications

Engine Fastener Tightening Specifications

Application	N•m	Lb Ft	Lb In
EGR Valve Bolts	20	15	—
Negative (-) Battery Cable-to- Negative (-) Battery Terminal Retainer	15	11	—

BLANK