

1974-79 EXHAUST EMISSION SYSTEMS

BMW Exhaust Gas Recirculation

All Models

DESCRIPTION

The Exhaust Gas Recirculation (EGR) system recirculates a small amount of exhaust gases during low engine loads, a larger amount during high engine loads and acceleration conditions, and provides no recirculation at idle or wide open throttle to assure maximum performance and a smooth idle. This complete modulation assures good engine performance at partial load coupled with effective NO_x reduction.

On 2002, 530i and 3.0Si, system components include a two stage EGR valve, vacuum control valve, temperature controlled vacuum solenoid, and exhaust gas filter. On 630CSi, 633CSi and 733i, main components include an EGR valve, pressure transmitter, EGR filter, switching valves or thermo valve.

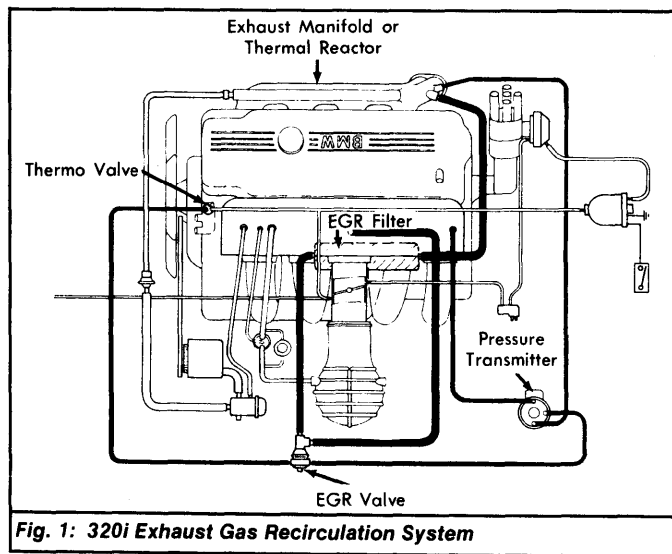


Fig. 1: 320i Exhaust Gas Recirculation System

OPERATION

EGR VALVE

On 2002, 530i and 3.0Si, a dual diaphragm valve operates in 2 stages. When vacuum is about 3. in Hg, vacuum is applied to upper diaphragm to partially lift EGR valve from seat allowing a small amount of exhaust gas flow. The second stage of EGR valve is controlled by a vacuum control valve which senses absolute pressure in intake manifold. When second stage is opened, EGR valve is lifted completely off its seat allowing full exhaust gas recirculation.

On 630CSi, 633CSi and 733i, the EGR valve is controlled by vacuum inputs from the pressure transmitter and the electromagnetic switching valve or thermo valve. The EGR valve consists of two diaphragms which allows precise control of the quantity of exhaust gas recirculation. The upper diaphragm is used to close the valve completely, thus stopping the flow of exhaust gas. The lower diaphragm determines the quantity of exhaust gas recirculation.

VACUUM CONTROL VALVE

When manifold vacuum is high, valve closes vacuum to EGR valve. During periods of low manifold vacuum, control valve opens to allow vacuum to operate second stage of EGR valve and allow full exhaust gas recirculation. Vacuum control valve is mounted on firewall to prevent damage caused by engine vibration.

TEMPERATURE & RPM CONTROLLED VACUUM SOLENOID

This solenoid is controlled by temperature sensor mounted in intake manifold coolant passage and by engine speed switch. When coolant

temperature is below 113°F (45°C) or if engine is above 3000 RPM, solenoid valve closes vacuum to vacuum control valve and to first stage of EGR valve. This prevents the EGR valve from operating when engine is cold and improves cold driveability and engine performance above 3000 RPM.

PRESSURE CONVERTER/TRANSMITTER

The pressure transmitter uses exhaust gas back-pressure and intake manifold vacuum inputs to determine a control vacuum which it supplies to the EGR valve lower diaphragm. The strength of this control vacuum determines the quantity of exhaust gas recirculation. For example, the exhaust gas back-pressure increases and intake manifold vacuum decreases as the throttle is opened. This will result in a decrease in control vacuum and an increase in the amount of exhaust gas recirculation.

The vacuum inputs to the EGR valve from the pressure transmitter and the electromagnetic switching valve or thermo valve, result in a continuous balance condition between the upper and lower EGR valve diaphragms. This enables the EGR valve to provide a wide range of operating capability and quick response in engine operating conditions.

SWITCHING VALVE

The switching valve switches off the EGR valve at temperatures below 113°F (45°C) and at speeds above 3750 RPM. This switching valve is regulated by a temperature switch, a switching relay and a speed switch. The switching valve controlling the EGR valve can be identified by a Red cap.

THERMO VALVE

The thermo valve, which is located adjacent to the thermostat, prevents vacuum to the upper diaphragm of the EGR valve when the coolant temperature is below 113°F (45°C). This lack of vacuum results in upper diaphragm being closed by the return spring, thereby preventing any exhaust gas recirculation when the engine is cold. When the thermo valve is open and supplying vacuum, the lower diaphragm of EGR valve then controls normal EGR flow.

TESTING

EGR VALVE

2002, 530i & 3.0Si - 1) Connect first stage of EGR valve to manifold vacuum source with engine at idle. Idle speed should drop 150-300 RPM. If idle does not drop, blow into valve while holding finger over second stage connection. Any leakage indicates EGR valve metal housing is leaking. If test fails to disclose a leak or if valve still does not function, replace valve.

2) To test EGR valve second stage, remove and plug purge line from charcoal (fuel evaporation) canister (if equipped). Connect secondary crankcase vacuum control hose to second stage of EGR valve with engine running at idle. Idle speed should drop 200-300 RPM or engine stall. If idle does not drop, check EGR valve for leaks and replace if necessary.

3) Using finger, push up on EGR valve diaphragm. If valve only operates with extreme pressure, remove and clean valve. Before installing valve, check that valve moves .08" (2 mm) with vacuum applied to first stage and .118" (3 mm) with vacuum applied to second stage.

630CSi, 633CSi & 733i - 1) With engine idling at normal operating temperature, disconnect Blue hose from EGR valve. DO NOT plug hose or connection. Engine speed should not change.

2) If speed drops, either the EGR valve is defective, idle position of throttle is out of adjustment, or the Red vacuum hose from throttle housing is leaking or plugged.

3) Disconnect Blue hose from EGR valve. Pull White hose from connection on intake manifold. Pull Red hose from throttle housing and connect it to fitting from which White hose was removed.

4) Engine speed should drop considerably. If not, EGR valve is defective, temperature switch is defective, or the Red electromagnetic switching valve is defective.

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5) Reconnect Blue hose to EGR valve. Leave Red hose from throttle valve housing connected to intake manifold fitting from which White hose was removed. Engine speed should drop slightly. If there is a large drop in engine speed, there are faulty vacuum hoses, a defective EGR valve, or defective pressure transmitter.

320i - 1) With engine idling at normal operating temperature, disconnect Blue vacuum hose from EGR valve. DO NOT plug hose or connection. Engine speed should not change. If speed drops, either EGR valve is defective, throttle idle setting is out of adjustment, or Red vacuum hose from thermo valve is leaking or plugged.

2) With Blue hose still disconnected, pull Red hose from EGR valve. Disconnect Black hose from intake manifold and connect it to Red hose connection on EGR valve. Engine speed should now drop considerably. If speed does not drop, EGR valve is defective.

3) With Red hose disconnected from EGR valve and Black hose connected to EGR valve, reconnect Blue hose to EGR valve. Engine speed should not change. If speed drops, vacuum hoses are leaking or plugged, EGR valve is defective, or pressure transmitter is defective.

PRESSURE CONVERTER/TRANSMITTER

1) Start and run engine until normal operating temperature is reached. Ensure all vacuum hoses are connected properly.

2) Disconnect Red hose from pressure transmitter and check for exhaust gas back-pressure at end of hose. If no pressure is felt, back-pressure line or hose is leaking or plugged. Reconnect Red hose.

3) Pull White hose from pressure transmitter and check for vacuum at end of hose. There should be vacuum. If not, check White hose and connections for leaks. Reconnect White hose.

4) To check for control pressure on 630CSi, 633CSi and 733i, pull Red and Blue hoses from pressure transmitter. Vacuum should be felt at Blue hose fitting on transmitter. If not, replace pressure transmitter.

5) To check for control pressure on 320i, disconnect Blue hose from pressure transmitter and check for vacuum at hose connection on transmitter. Vacuum should be felt. If not, replace pressure transmitter.

RED SWITCHING VALVE

630CSi, 633CSi & 733i - With engine off and coolant temperature above 113°F (45°C), disconnect Red hose from Red switching valve and blow air into hose. Valve is good if air flows with ignition off and does not flow with ignition on.

BLACK SWITCHING VALVE

630CSi, 633CSi & 733i - With engine off and ignition on, disconnect Black switching valve. Connect a test lamp to connector terminals. Push in clutch and place transmission in 4th gear. Test lamp should come on. If not, switch on transmission is defective, or electrical circuit is defective.

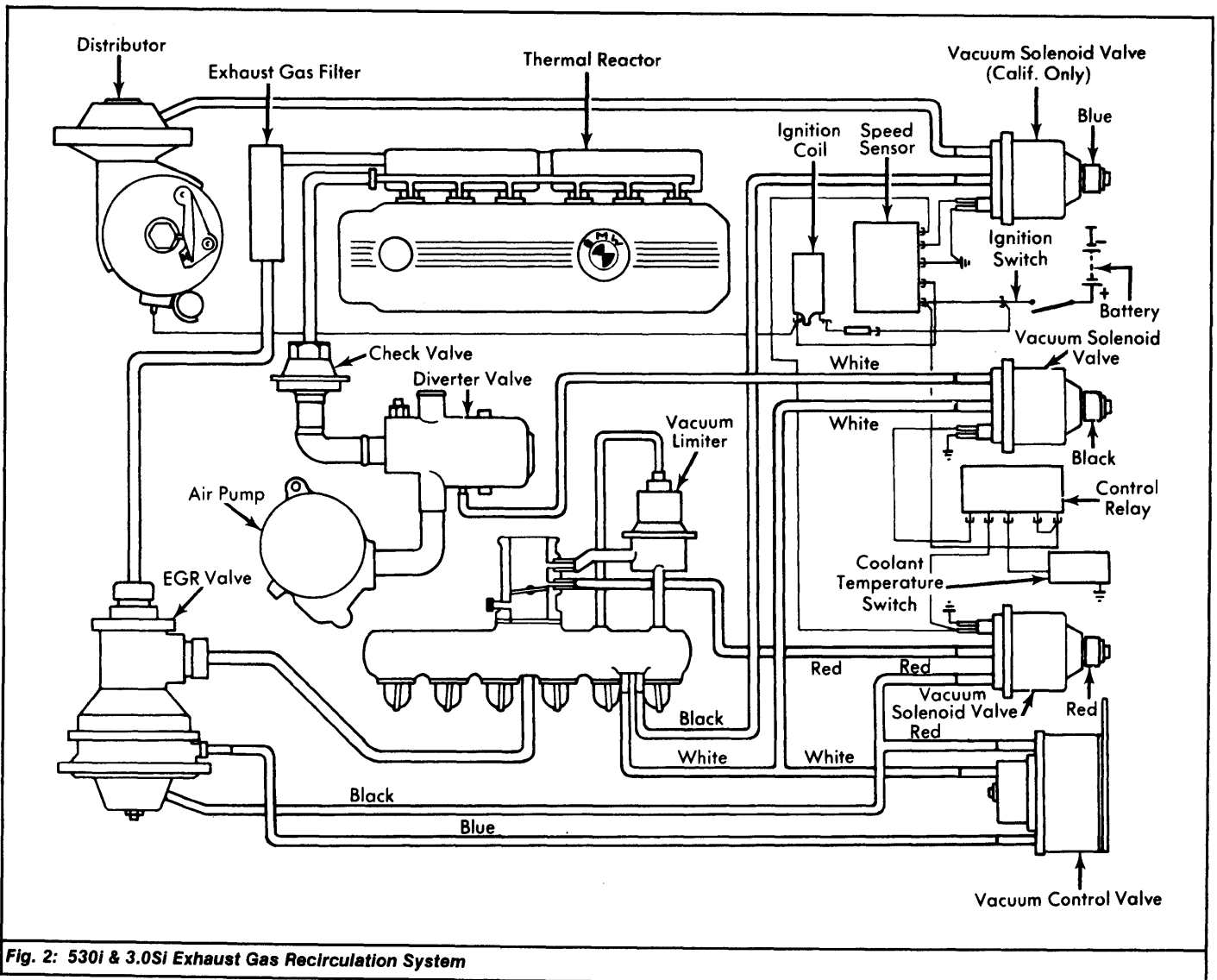


Fig. 2: 530i & 3.0Si Exhaust Gas Recirculation System

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BMW Exhaust Gas Recirculation (Cont.)

VACUUM CONTROL VALVE

2002, 530i & 3.0Si - 1) Ensure all vacuum hose connections are correct. See Fig. 2. Remove Red vacuum hose from carburetor (throttle housing) and connect to vacuum source. Pull off and plug vacuum hose from first stage of EGR valve. Engine speed should NOT decrease.

2) Disconnect Blue vacuum hose from second stage of EGR valve and feel for vacuum. If vacuum is present, valve is defective. With engine at idle, blow through Blue hose. Air should flow freely.

3) Reconnect vacuum hoses and disconnect White vacuum hose from dashpot (if equipped). Turn dashpot until plunger is free of throttle lever and reconnect vacuum hose. Remove White vacuum hose from carburetor and connect to secondary venting hose and plug loose end of secondary vent hose.

4) Start engine and detach White hose from intake manifold. A considerable speed drop must occur and Blue hose connected to EGR valve must be under vacuum. If not, replace vacuum control valve.

TEMPERATURE SWITCH

2002, 530i & 3.0Si - With engine cold, turn ignition on. Disconnect plug at solenoid valve and connect test lamp. Lamp should light. Start and warm engine to over 113°F (45°C), test lamp should go out. If test lamp does not perform as indicated, temperature switch or relay are defective.

630CSi, 633CSi & 733i - With engine cold, turn ignition on. Disconnect Red switching valve and connect a test lamp to connector terminals. Temperature switch is good if test lamp does NOT come on. If test lamp comes on, either coolant temperature is above 113°F (45°C), temperature switch is defective, or speed switch is defective.

SPEED SWITCH

2002, 530i & 3.0Si - Start and run engine until normal operating temperature is reached. Connect test lamp to disconnected plug on sole-

noid valve. Test lamp should light when engine speed is over 3000 RPM. If not, speed switch is defective.

630CSi, 633CSi & 733i - 1) Start and run engine until normal operating temperature is reached. Disconnect electrical connector from Blue switching valve. See Fig. 3. Connect test lamp between connector terminals. Test lamp should NOT light. If test light is on, speed switch is defective.

2) Increase engine speed and note RPM at which test lamp comes on. It should come on at approximately 3750 RPM. If test lamp does not come on (above 3750 RPM), speed switch is defective.

THERMO VALVE

320i - 1) Disconnect thermo valve vacuum hose at EGR valve. Disconnect the other vacuum hose from thermo valve. Blow air into hose connected to thermo valve.

2) Thermo valve should be closed with coolant temperature below 91°F (33°C) and fully open with temperature above 109°F (43°C). If not, thermo valve is defective.

MAINTENANCE

EGR SYSTEM

1) After 25,000 miles an EGR service warning light will light up, to indicate that the filter of the EGR system should be replaced and the thermal reactor(s) should be inspected for cracks or other damage. After replacing filter and checking thermal reactor(s), the mileage interval switch must be reset.

2) The switch is connected to speedometer cable, on left side engine carrier. Two contacts are located in the switch, one is marked "REAC" (reactor) and the other "EGR". The appropriate contact must be pushed inwards to extinguish the warning lamp and reset the mileage recorder to zero.

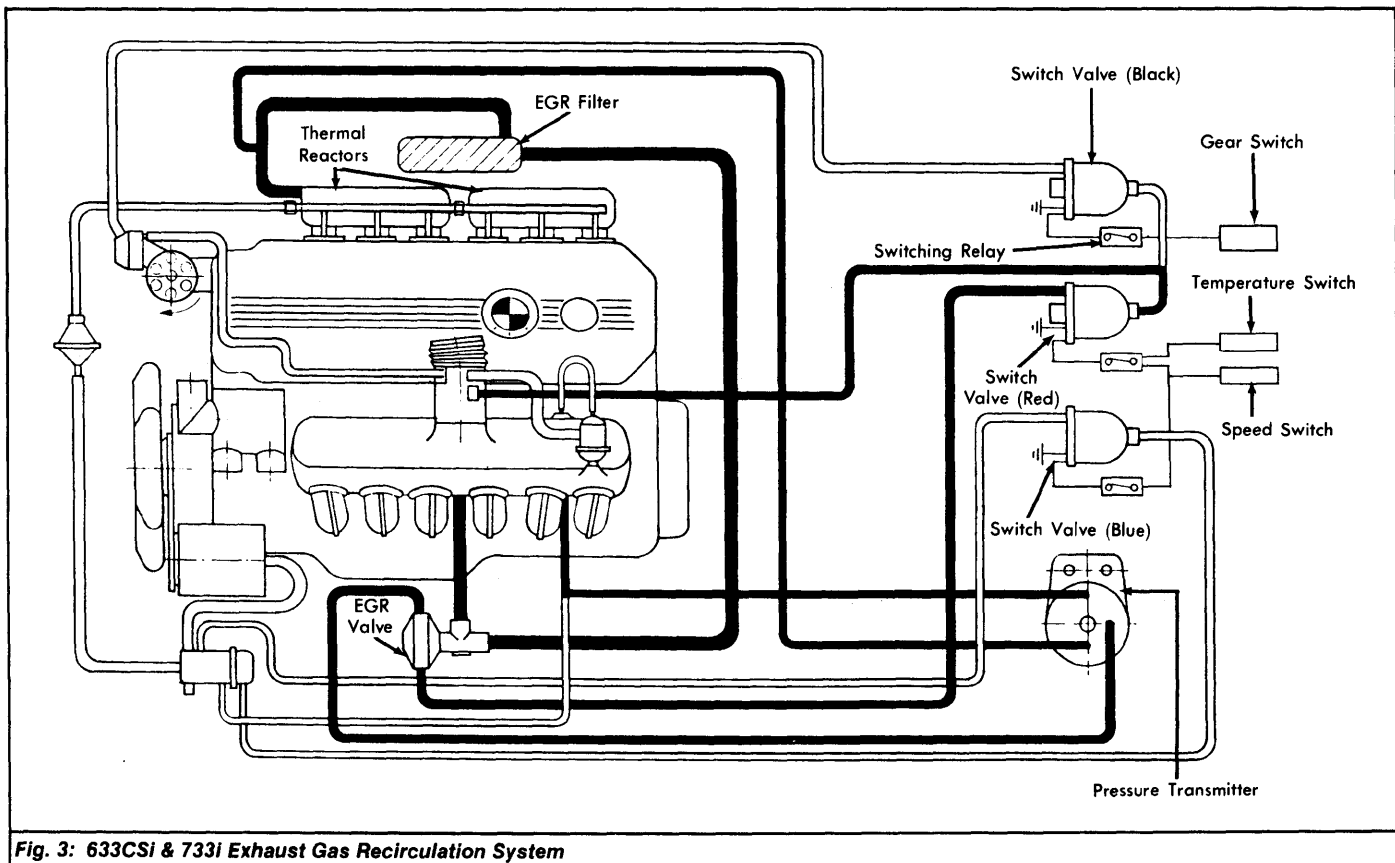


Fig. 3: 633CSi & 733i Exhaust Gas Recirculation System