

# 1974-79 EXHAUST EMISSION SYSTEMS Mercedes-Benz Exhaust Gas Recirculation

## All Models

### DESCRIPTION

All models are equipped with an Exhaust Gas Recirculation (EGR) system. This system is designed to reduce the formation of oxides of nitrogen (NOx). This is accomplished by recirculating a small amount of exhaust gases back into the intake manifold where it mixes with the air/fuel mixture. By adding these gases to the air/fuel mixture, the combustion temperatures are lowered, thereby reducing NOx emissions. The 1977-79 EGR system consists of an EGR control valve, a thermo/vacuum valve, and an exhaust pressure transducer (if equipped).

### OPERATION

**1975-76 230 Models** - Under certain conditions the switchover valve allows a small amount of exhaust gas back into the intake manifold. The EGR valve is controlled by engine temperature, engine speed, and the switchover valve. If oil temperature is below 77°F (25°C) or engine speed is above 3600 RPM, EGR does not take place. When oil temperature is above 77°F (25°C) and engine speed below 3600 RPM, switchover valve is energized and EGR takes place.

**1975-76 280 Models** - When coolant temperature is above 149°F (65°C) and transmission is in Drive, the temperature switch is closed and the EGR switchover valve is de-energized. See Fig. 1. The EGR valve is then controlled by venturi vacuum through the vacuum booster. The EGR valve cannot be activated by the vacuum booster when transmission is in Park or Neutral, or when coolant temperature is below 149°F (65°C).

**1975-76 450 Models** - The EGR system works in 2 stages. The first stage permits a small amount of exhaust gas recirculation, while second stage permits full exhaust gas recirculation. Both stages are con-

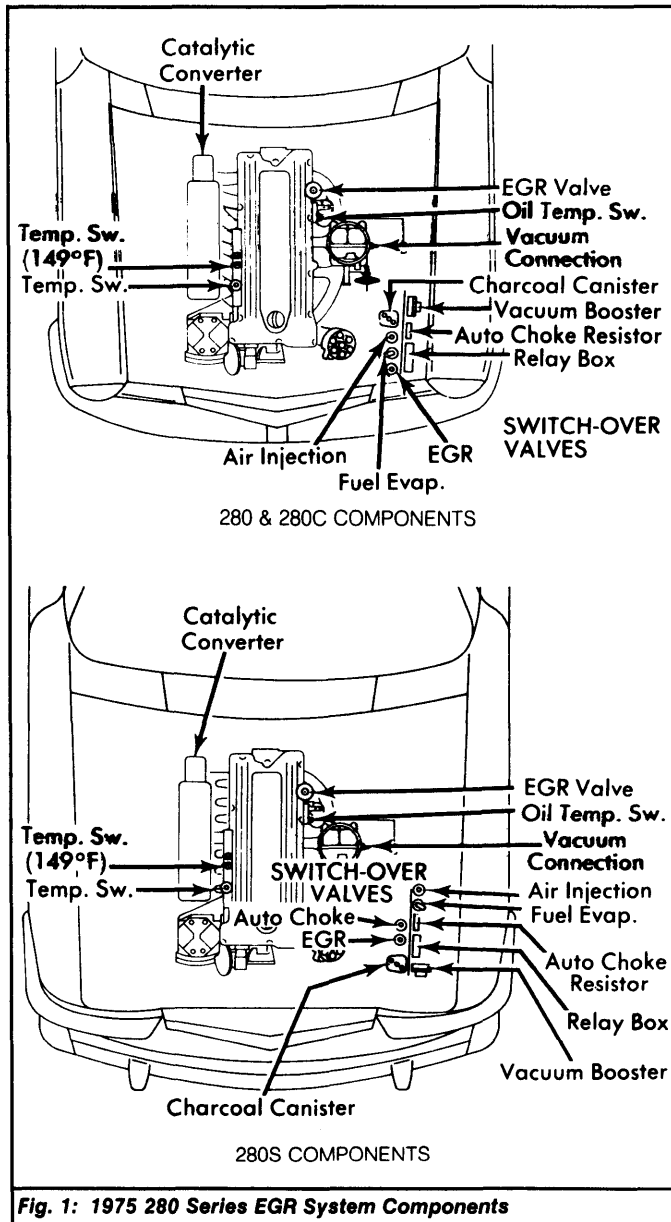


Fig. 1: 1975 280 Series EGR System Components

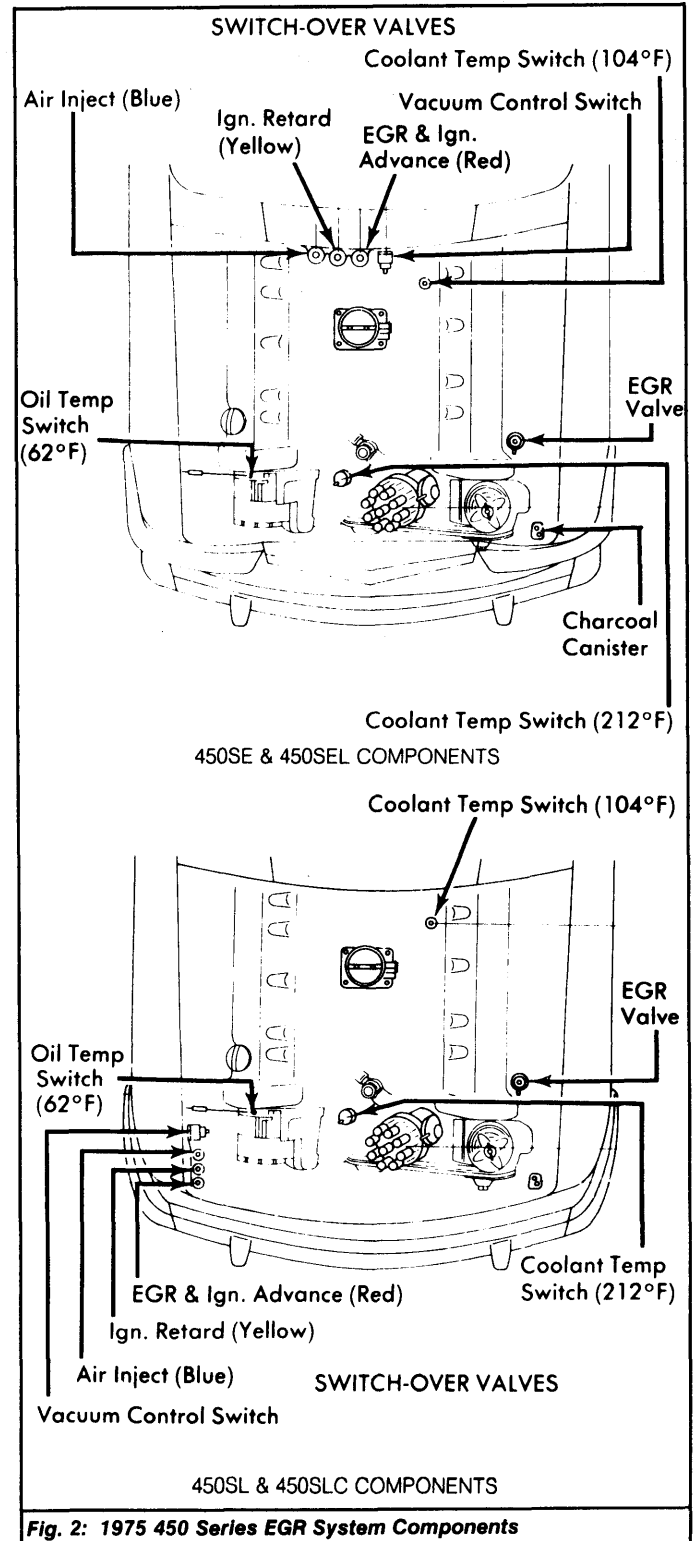


Fig. 2: 1975 450 Series EGR System Components

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trolled by coolant temperature, vacuum control switch, and throttle position.

First stage EGR takes place during driving operations with coolant temperatures above 104°F (40°C). The thermo/vacuum valve is open and vacuum from throttle valve is available at EGR valve. See Fig. 2. The EGR valve opens and exhaust gases are drawn into the intake manifold.

The second stage of the EGR valve operates during periods of acceleration when coolant temperature is above 104°F (40°C). During acceleration, vacuum drops and vacuum control switch directs vacuum to second stage of the EGR valve. The EGR valve opens completely. When vacuum rises above 8 in. Hg, the vacuum control switch will close off vacuum to second stage of EGR valve by venting vacuum to the atmosphere. At this point, the EGR valve operates in first stage.

**1977-79 Models** - Starting at a coolant temperature of 62°F (17°C) on 1978 230 models or 104°F (40°C) on all other models, a portion of the exhaust gases from the exhaust manifold is recirculated into the intake manifold during acceleration, part throttle operation and deceleration. The amount of EGR is dependent on the position of the throttle valve and the exhaust gas backpressure in the exhaust manifold.

### EXHAUST PRESSURE TRANSDUCER

**1977-79 Models** - The exhaust pressure transducer is divided into 3 chambers, by 2 spring loaded diaphragms. Both diaphragms are connected with each other by a diaphragm cup. The upper diaphragm is controlled by exhaust backpressure. The middle diaphragm chamber is continually vented via the intake air housing. The lower diaphragm is either vented or evacuated according to exhaust backpressure. Due to the various driving conditions, there are 3 positions for the exhaust pressure transducer.

**During Acceleration** - Exhaust gas backpressure increases and pushes the upper diaphragm, along with the diaphragm cup and lower diaphragm, downwards. The valve disc in the diaphragm cup closes the intake manifold vacuum line in lower diaphragm chamber. At the same time, the vent bore between middle and lower diaphragm chambers is opened by the valve disc. The EGR valve lower chamber is vented by the vacuum control line to lower chamber of transducer. The spring in the EGR valve depresses the working diaphragm downwards. This action opens the EGR valve completely and maximum EGR flow is obtained.

**During Deceleration** - Exhaust gas backpressure decreases during deceleration. The upper diaphragm with diaphragm cup and lower diaphragm in transducer slowly return to their initial positions. The valve disc opens the intake manifold vacuum line. This interrupts the venting of lower chamber. The intake manifold vacuum now present in lower chamber evacuates the lower diaphragm chamber of the EGR valve through the vacuum control line. Depending on the amount of vacuum, EGR valve is pulled in a closing direction against spring force and EGR flow is reduced.

**During Part Throttle Operation** - During this phase, the pressure in the upper and lower diaphragm chambers is balanced. The EGR valve remains in its present position and EGR flow also remains constant.

### THERMO/VACUUM VALVE

**1977-79 Models** - The thermo/vacuum valve is screwed into the cylinder head or on intake manifold. Below a temperature of 62°F (17°C) on 1978 230 models or 104°F (40°C) on all other models, a bimetallic disc in the thermo/vacuum valve rests against "O" ring in valve and closes the valve connection to the vacuum source. Above this temperature, the bimetallic disc snaps downwards due to heating action. This opens the vacuum source connection and allows vacuum to the EGR valve.

### EGR CONTROL VALVE

**1977-79 Models** - The EGR control valve is constructed as a three-diaphragm valve to provide better proportioning of exhaust gas recirculation. Depending on the position of the throttle valve, the center diaphragm chamber of EGR valve will receive more or less vacuum via the thermo/vacuum valve.

In the upper diaphragm there is always atmospheric pressure present via a vent bore. Depending on vacuum, the shut-off diaphragm with connecting pin moves downward against spring tension and the EGR valve will open. See Fig. 3.

The opening and closing of the EGR valve is controlled by the exhaust pressure transducer which, depending on exhaust gas backpressure in the exhaust manifold, either vents or evacuates the diaphragm chamber above the working diaphragm.

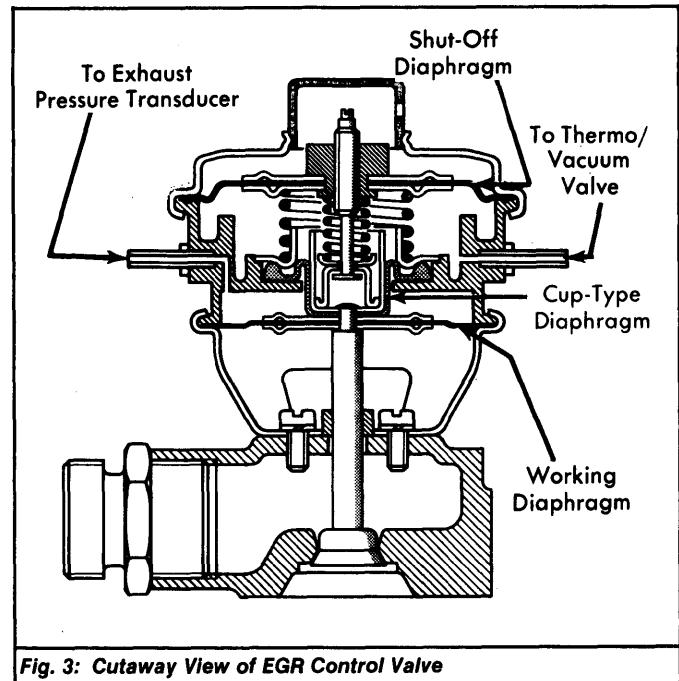


Fig. 3: Cutaway View of EGR Control Valve

### TESTING

**NOTE:** Exhaust gas recirculation testing information for 1974 280 and 450 models not available at time of publication.

### EGR SYSTEM

- 1975-76 230 Models** - 1) Disconnect Brown vacuum line at carburetor and Brown/Purple line at EGR valve. See Fig. 4. Blow into Brown vacuum line and simultaneously increase engine speed to 3600 RPM. At idle speed, air should pass through vacuum line. Above 3600 RPM, air should not pass through vacuum line.
- 2) If air can be blown through vacuum hose with engine speed above 3600 RPM, check the 3400-3600 RPM switch in RPM relay. If air cannot be blown through vacuum hose at idle, check vacuum hoses for damage and proper routing.
- 3) Brown vacuum hose from carburetor should be attached to center connection of Brown switchover valve. Brown/Purple vacuum hose to EGR valve should be attached to outer connection of switchover valve. If correct, check switchover valve.
- 4) Connect EGR valve to intake manifold vacuum. Disconnect Red vacuum line at carburetor and Brown/Purple vacuum line at EGR valve. Connect both vacuum lines. Engine should run rough or stall. If engine does not stall, check EGR valve.
- 5) Increase engine speed to 2500 RPM and release throttle lever slowly. At the same time, observe vacuum control on carburetor. Vacuum control should extend above 2000 RPM and retract below 1800 RPM. If not, check vacuum control (on throttle lift).
- 1975-76 280 Models** - 1) Remove Brown/Purple vacuum hose from EGR valve. Turn ignition on and blow air into hose. Place transmission in Drive, Park and Neutral position. In Park and Neutral, hose should be open. In Drive, hose should be closed. If not, check vacuum hose routing.
- 2) The Brown vacuum hose from vacuum booster should be attached to center connection of Brown switchover valve. The Brown/Purple

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vacuum hose to EGR valve should be on outer connection of switch-over valve. If vacuum hose routing is correct, check relay box.

3) Remove Green vacuum hose and Brown vacuum hose (at connection D) from carburetor. See Fig. 5. Connect Brown vacuum hose in place of Green vacuum hose on carburetor.

4) Start engine and place transmission in Park, Neutral, and Drive. With transmission in Park or Neutral, engine should run smoothly. With transmission in Drive, engine should run rough or stall.

5) If engine does not run as specified, check vacuum hoses on vacuum booster for damage and proper routing. Also check EGR valve. Remove Brown/Purple vacuum hose at Brown switchover valve.

6) Start engine and remove Green vacuum hose from Green switchover valve. Connect Brown/Purple hose with Green hose. Engine should run rough or stall. If not, replace EGR valve. If engine runs rough or stalls, replace vacuum booster.

**1975-76 450 Models** - 1) Remove Red/Purple vacuum hose at EGR valve. Connect a vacuum gauge to Red/Purple hose and to Red connection of EGR valve. See Fig. 6. Start and run engine at idle. Increase engine speed to 2500 RPM. At idle, vacuum gauge should indicate no vacuum. At higher speeds, vacuum should be present.

2) If no vacuum is present, check vacuum hoses for damage and proper routing. Red vacuum hose from Red port on throttle housing should

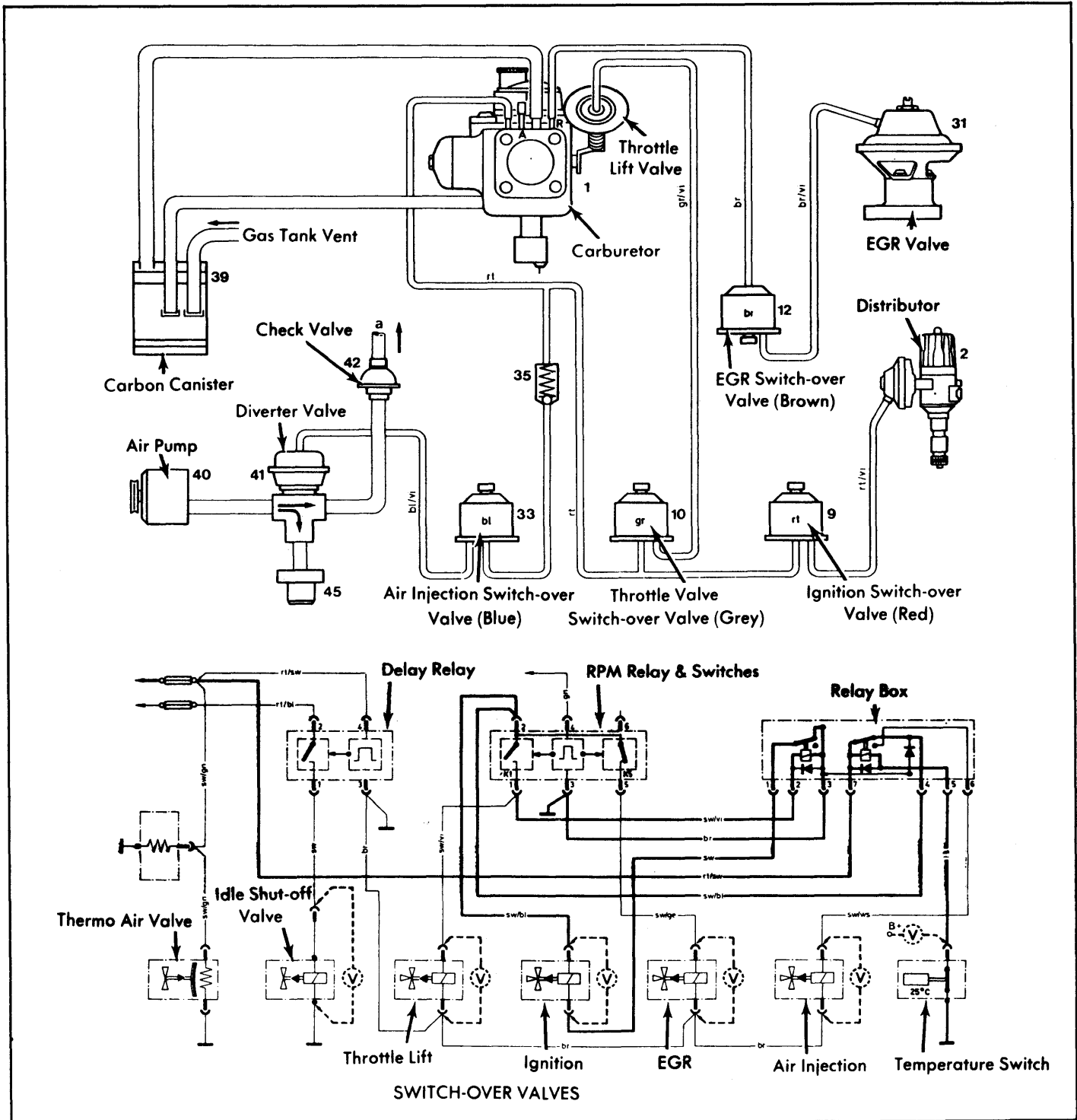


Fig. 4: 1975-76 230 Series EGR System Vacuum/Wiring Schematics

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be routed to center port of switchover valve (angular port of Black thermo/vacuum valve on 1976 models).

3) The Red/Purple vacuum hose should be connected to outer port of switchover valve (vertical port of Black thermo/vacuum valve, then be connected to Red port of vacuum control valve and EGR valve on 1976 models). Also check Red switchover valve (Black thermo/vacuum valve on 1976 models).

4) Remove Brown/Purple vacuum hose from EGR valve. Connect vacuum gauge between Brown/Purple vacuum hose and bottom of EGR valve. Start and slowly increase engine speed to 2500 RPM. At idle, vacuum gauge should indicate no vacuum. During acceleration, vacuum should be present for a brief period until engine speed stabilizes at 2500 RPM. If no vacuum is present, check vacuum hoses for damage and proper routing.

5) On 1975 models, Black vacuum hose from Black port of throttle valve housing should be connected to purge valve through "Y" fitting. From "Y" fitting, a White vacuum hose should be attached to White port of vacuum control switch. The Brown/Purple hose goes to Brown port on vacuum control switch and EGR valve.

6) On 1976 models, Red/Purple vacuum hose must be attached to Red port on vacuum control switch. White vacuum hose should be routed to center port and Brown/Purple hose to Brown port of vacuum control switch. If hose routing is correct and vacuum is not available, replace vacuum control switch.

7) Remove Yellow/Purple vacuum hose from vacuum control diaphragm on distributor. Disconnect both vacuum hoses at EGR valve. With known good vacuum hose, connect the Yellow/Purple hose with the upper and then the lower ports of EGR valve. Engine should run rough or stall in both instances. If not, replace EGR valve.

**1977-78 230 Models** - 1) Disconnect Brown vacuum line at carburetor and Gray vacuum line at intake manifold. Connect Brown vacuum line to intake manifold connection. Engine should run rough or stall. If not, ensure that all EGR system vacuum lines are properly connected.

2) The carburetor Brown vacuum line MUST be connected to angular port of thermo/vacuum valve. The Brown/Purple vacuum line MUST be connected to vertical port of thermo/vacuum valve.

3) If vacuum lines are properly connected, check all vacuum lines for leaks. Clean the carburetor vacuum pick-up connection with compressed air. If engine still does not run rough or stall, test individual components of the EGR system.

**1977-79 All Other Models** - 1) Disconnect Brown vacuum line at EGR valve. Slowly increase engine speed. Above approximately 1200 RPM, engine should begin to run rough and/or stall. If not, ensure that all EGR system vacuum lines are properly connected to exhaust pressure transducer and intake manifold.

2) Ensure that connections on exhaust pressure transducer are properly connected. The vacuum line connections of the transducer have color coded rings. The vacuum lines attached to transducer must have the same color code.

3) The Red vacuum line MUST be connected to the angular port of thermo/vacuum valve and the Red/Purple line to the vertical port of thermo/vacuum valve. Check all vacuum lines for leaks and clean the vacuum pick-up connection with compressed air. If engine still does not run rough or stall, test individual components of the EGR system.

### THERMO/VACUUM VALVE

**1976 450 Models** - To check Black thermo/vacuum valve, check that valve is open if coolant temperature is over 104°F (40°C) and closed when temperature is below 86°F (30°C).

**1977-78 230 Models** - Disconnect Brown/Purple vacuum line from thermo/vacuum valve. Start engine and accelerate briefly. Vacuum valve should be present at open connection of thermo/vacuum valve. If not, carburetor vacuum port is not blocked, replace thermo/vacuum valve.

**1977-79 All Other Models** - Disconnect vacuum line at the vertical connection of thermo/vacuum valve. Start engine and accelerate briefly. Vacuum must be present at vertical port of thermo/vacuum valve. If not, and vacuum source connection is not blocked, replace thermo/vacuum valve.

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**NOTE:** When removing or installing the thermo/vacuum valve, ensure that connecting tubes are not damaged.

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### EXHAUST PRESSURE TRANSDUCER

**1977-79 Models** - Run engine at idle speed. Disconnect Brown vacuum line at EGR valve. Connect a vacuum gauge to vacuum line or close line with finger. Vacuum must be present at idle speed. If no vacuum is present, replace exhaust pressure transducer.

### EGR CONTROL VALVE

**1975-76 230 Models** - 1) Remove EGR valve. Connect Red vacuum line to the removed valve. The EGR valve stem must lift off its seat. If not, check vacuum source. If vacuum is present, check valve stem and diaphragm for damage.

2) If necessary clean EGR bores in intake manifold with a .40" (10 mm) drill, remove exhaust deposits from distribution tube and clean out with compressed air. Replace EGR valve if necessary.

**1977-78 230 Models** - Remove EGR valve. Connect Brown/Purple vacuum line to the removed valve. Run engine at idle speed, then slowly increase engine speed while covering openings in intake manifold. The EGR valve stem must lift off its seat. If not, replace EGR valve.

**1977-79 All Other Models** - Run engine at idle speed. Disconnect both vacuum lines from EGR valve. Connect Brown vacuum line to connection of Red/Purple vacuum line on EGR valve. Engine should run rough or stall. If engine does not run rough or stall, replace EGR valve.

### RELAY BOX

**1975-76 280 Models** - 1) Disconnect EGR switchover valve and connect voltmeter to wiring harness connector. Disconnect coolant temperature switch (65°C) and ground wire. See Fig. 5.

2) When ignition is turned on, voltage should read battery voltage. If voltage does not exist, replace relay box. If relay box is functional, check EGR switchover valve.

### SWITCHOVER VALVE

**1974 230 Models** - Start and slowly increase engine speed to 2500 RPM. At about 2000 RPM, listen or feel for valve to operate.

**1975-76 230 Models** - Disconnect relay box and RPM relay. Connect terminal No. 5 of RPM relay harness connector to terminal No. 7 of relay box harness connector. Turn ignition on. The Brown switchover valve should click. If switchover valve DOES click, replace relay box. If switchover valve DOES NOT click, replace switchover valve.

**1975-76 280 Models** - 1) Disconnect relay box and connect terminals No. 3 and 4 with jumper wire. Turn ignition on. The EGR switchover valve should click. If EGR switchover valve is functional, check starter lockout and back-up light switch.

2) Disconnect relay box and connect a voltmeter between terminals No. 2 and 5. Turn ignition on. With transmission in Park or Neutral, voltmeter should read battery voltage. If voltage does not exist, replace relay box.

**1975 450 Models** - 1) To test Red switchover valve, turn engine off. Turn ignition on and disconnect 104°F (40°C) coolant temperature switch. The Red switchover valve should click. If not, repeat test with a known good switchover valve. If replacement valve does not click, replace EGR relay.

### OIL TEMPERATURE SWITCH

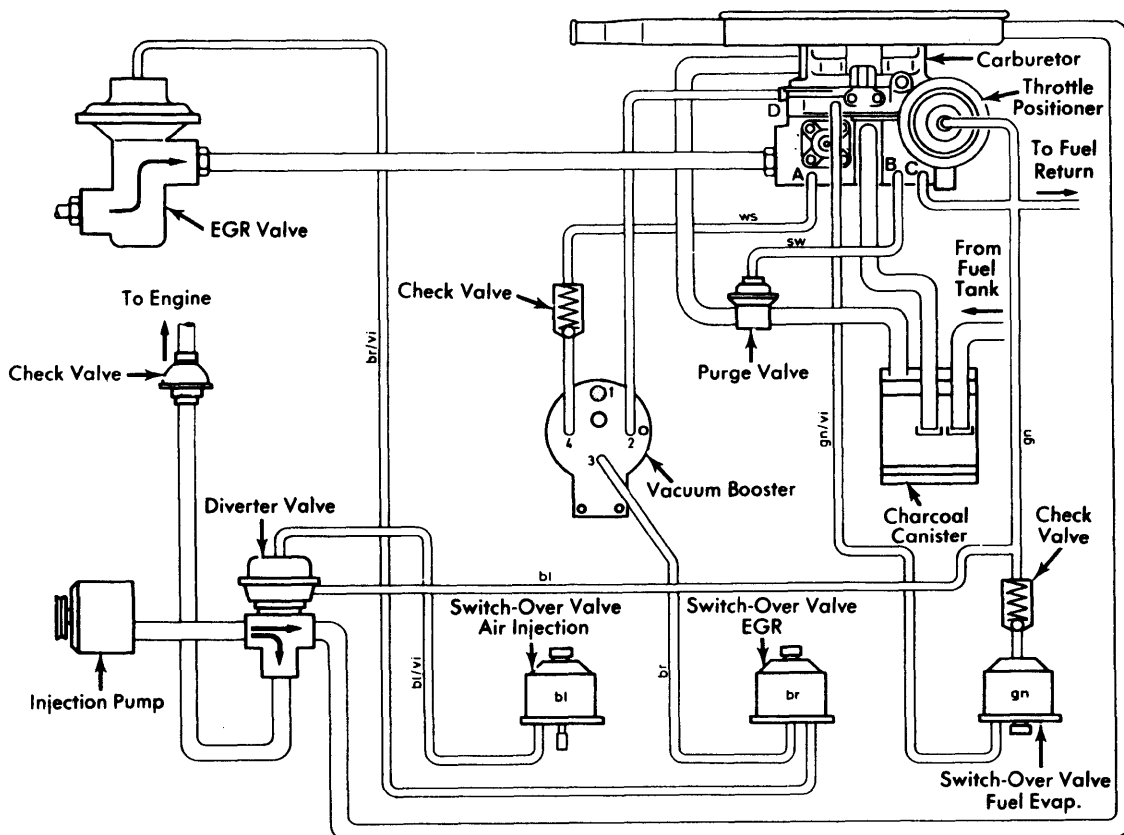
**1975-76 230 Models** - Disconnect relay box. Connect a test light between harness terminals No. 5 and 7 and turn ignition on. Test light should NOT come on when oil temperature is above 77°F (25°). If it does, replace oil temperature switch.

### RPM RELAY/SWITCH

**1974 230 Models** - Disconnect EGR switchover valve, connect test harness, and reconnect valve. Connect voltmeter to test harness (par-

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- Color Code**
- bl = blue
  - br = brown
  - ge = yellow
  - gn = green
  - rs = pink
  - rt = red
  - sw = black
  - vi = purple
  - ws = white

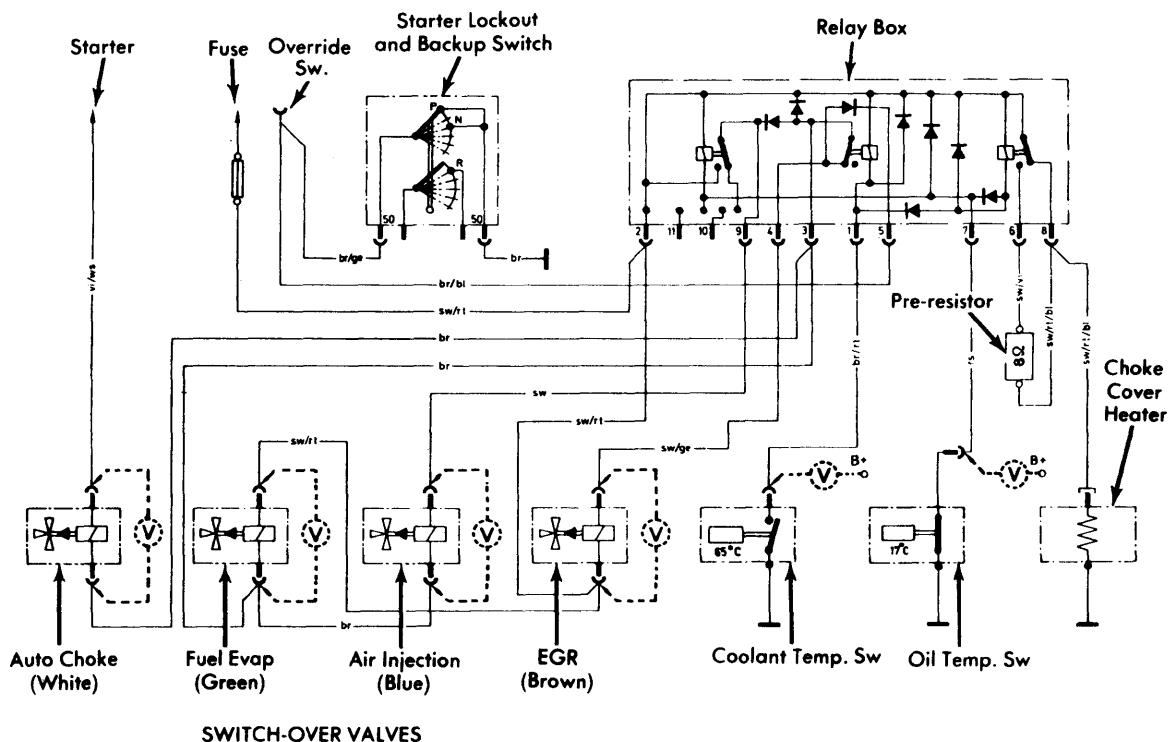


Fig. 5: 1975-76 230 Series EGR System Vacuum/Wiring Schematics

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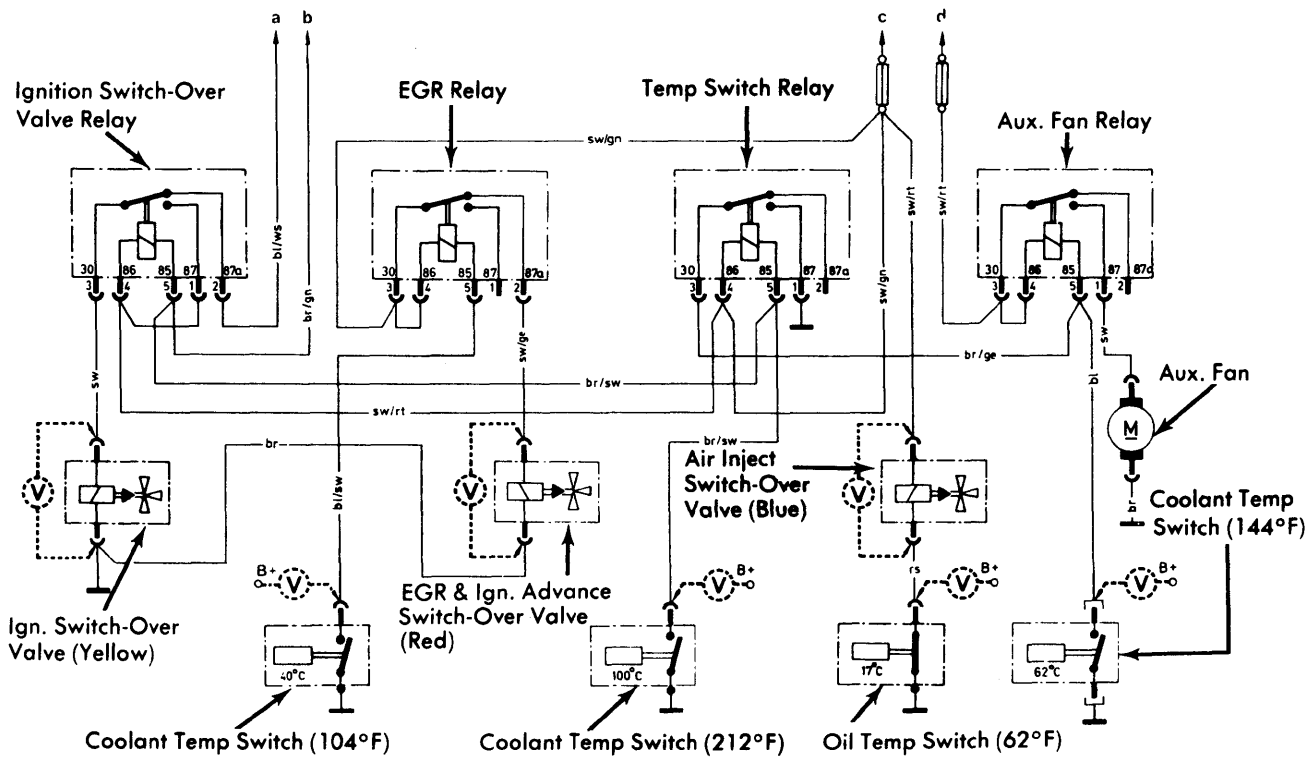
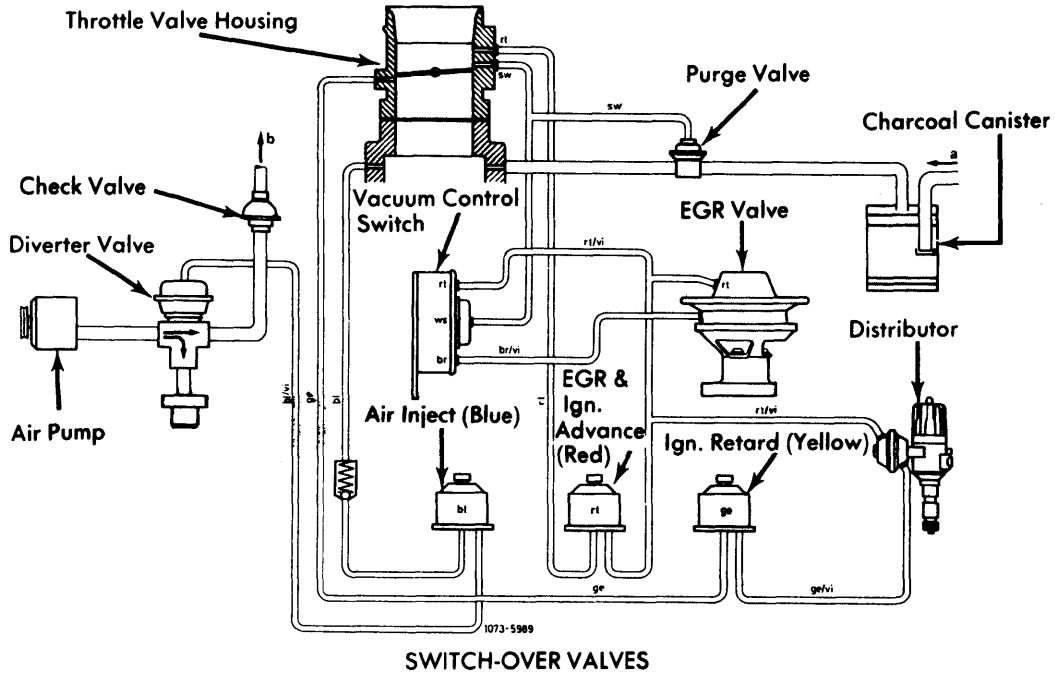


Fig. 6: 1975-76 450SL & 450SLC Series EGR System Vacuum/Wiring Schematics

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allel tap). Start engine and increase engine speed. Above 3600 RPM, voltmeter reading should drop to zero (0) volts. If correct voltage reading is not obtained, replace RPM relay.

**1975-76 230 Models** – Disconnect Brown switchover valve, connect test harness, and reconnect valve. Connect voltmeter to test harness (parallel tap). Start and increase engine speed. Below 3600 RPM, voltmeter reading should drop to zero (0) volts. If correct voltage reading is not obtained, replace RPM relay.

### VACUUM CONTROL/THROTTLE LIFT

**1974 230 Models** – 1) Connect tachometer to engine. Start engine and slowly increase speed to 2500 RPM. Release accelerator and observe vacuum governor on carburetor.

2) Above 2000 RPM, adjustment screw should contact operating lever on carburetor. Below 1800 RPM, diaphragm should be retracted and adjustment screw should not touch lever.

3) If throttle valve lift does not work as indicated, check vacuum hoses for damage and proper routing. Also check RPM switch and EGR switchover valve.

**1975-76 230 Models** – 1) Check vacuum hose for damage and proper routing. Red vacuum hose should be attached to center connection of Grey switchover valve. The Gray/Purple vacuum hose should be connected between vacuum control and outer connection of switchover valve.

2) To check switchover valve, disconnect relay box. Connect harness terminals No. 2 and 7 and turn ignition on. The Gray switchover valve should click. If vacuum hose and switchover valve are in good working order, replace relay box.