

TOYOTA EXHAUST GAS RECIRCULATION

Celica	Pickup
Corolla	Starlet
Corona	Supra
Cressida	Tercel
Land Cruiser	

DESCRIPTION

The exhaust gas recirculation (EGR) system is used to reduce the formation of NO_x emissions. This is accomplished by recycling metered amounts of exhaust gas back into the intake system. This reduces combustion temperature and results in fewer NO_x emissions.

Each system has a vacuum operated EGR valve and a vacuum modulator. Vacuum control valves (VCV), vacuum switching valves (VSV), bimetal vacuum switching valves (BVSV), vacuum transmitting valves (VTV) and thermostatic vacuum switching valves (TVSV) are used on some models to control EGR operation.

OPERATION

Below a predetermined temperature, when engine coolant is not warm, no exhaust gas recirculation will occur since the thermal vacuum switch is closed. Once coolant warms up, the thermal vacuum switch opens and exhaust gas recirculation is then controlled by the other components of the system.

Vacuum modulator reacts to exhaust back pressure and balances atmospheric pressure and vacuum pressure to allow or stop EGR. Vacuum control valve senses changes in intake manifold vacuum levels and will bleed off or allow vacuum to the EGR valve. The EGR cooler assists in reducing exhaust gas temperature before it is cycled into the combustion chamber. This helps further reduce the high temperatures which cause NO_x formation.

TESTING

EGR SYSTEM

NOTE — Before testing, clean or replace filter in vacuum modulator. All tests of EGR systems begin with cold engine.

Celica, Corona, Land Cruiser & Pickup — 1) Using a 3-way connector, connect a vacuum gauge to EGR vacuum hose. Start engine and run at idle speed. With coolant temperature below 86°F (30°C), vacuum gauge should indicate zero at 2000 RPM. When engine is warm, low vacuum should be present.

2) On Federal Pickup and Land Cruiser, disconnect vacuum hose from EGR vacuum modulator port "R". Using a jumper hose, connect port "R" to intake manifold vacuum. Vacuum gauge should indicate high vacuum at 2000 RPM.

NOTE — Engine will misfire slightly at this time, as a large amount of EGR gas enters.

3) Reconnect all hoses and remove vacuum gauge. Apply manifold vacuum directly to EGR valve with engine idling. Engine should run rough or die.

4) On Federal Pickup and Land Cruiser, disconnect vacuum hoses from pipe "E" and "F" of VSV. Run engine at idle speed. Blow air into pipe "F" checking that VSV closes. Increase engine speed to above 1700 RPM. Blow air into pipe "F" checking that VSV opens. Reconnect vacuum hoses.

5) If system performed as described, it is operating correctly. If not, test individual components and repair or replace as necessary.

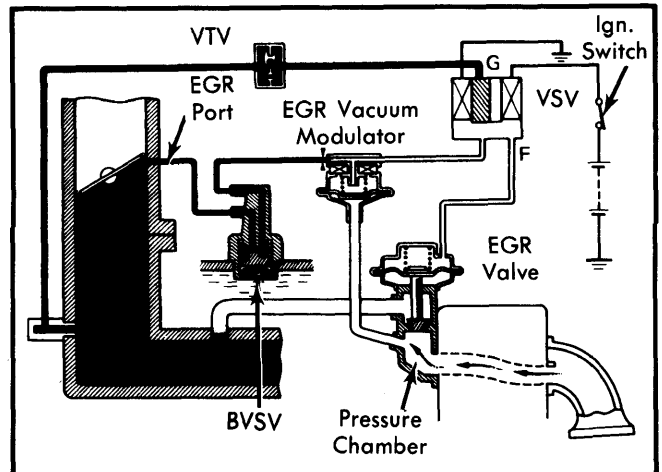


Fig. 1 EGR System
(Celica, Corona & Calif. Pickup)

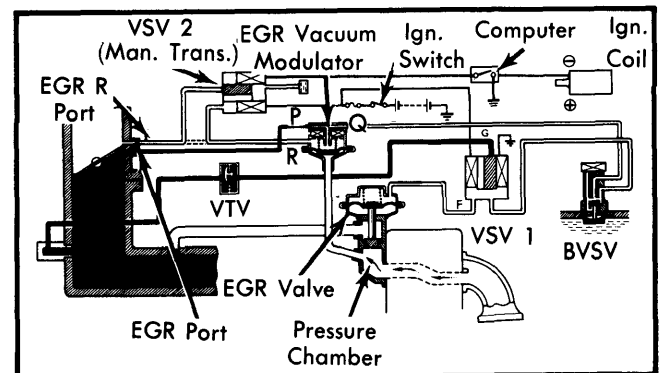


Fig. 2 EGR System
(Federal Pickup)

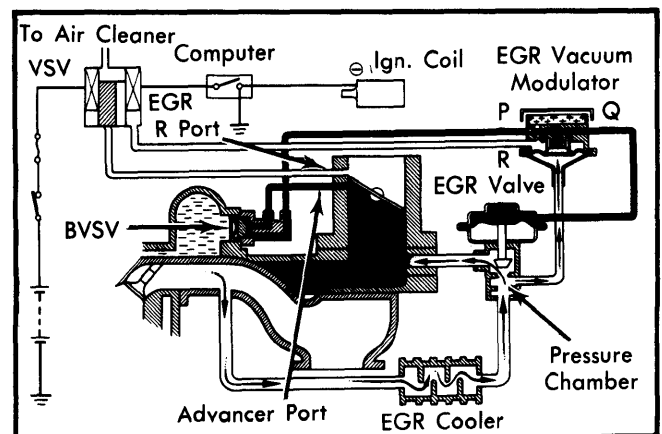


Fig. 3 EGR System
(Land Cruiser)

TOYOTA EXHAUST GAS RECIRCULATION (Cont.)

Corolla - 1) Using a 3-way connector, connect a vacuum gauge to vacuum hose between EGR valve and EGR vacuum modulator. Start engine and run at idle speed. With coolant temperature below 104°F (40°C), increase engine speed to 3000 RPM. Vacuum gauge should indicate zero.

2) Warm up engine to normal operating temperature. Vacuum gauge should indicate low vacuum at 3000 RPM. Apply manifold vacuum directly to EGR valve with engine idling. Engine should run rough or die.

3) Remove gauge and reconnect hose. If system performed as described, it is operating correctly. If not, test individual components and repair or replace as necessary.

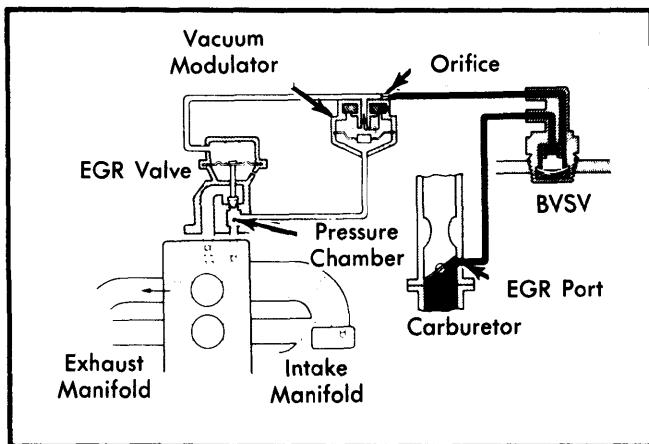


Fig. 4 EGR System (Corolla)

Cressida & Supra - 1) Disconnect vacuum hose from EGR valve "A" and connect a vacuum gauge to it. Disconnect and plug vacuum hose from VCV port "S".

2) Start engine and run at idle. With coolant temperature below 122°F (50°C), vacuum gauge should indicate zero at 2000 RPM. As engine warms up, vacuum gauge should indicate high vacuum. If not, check BVSV and modulator.

3) Maintain engine speed at 2000 RPM. Reconnect hose to VCV port "S". Check that vacuum gauge indicates zero for 25-40 seconds. If not, check VCV. Remove gauge and reconnect hoses.

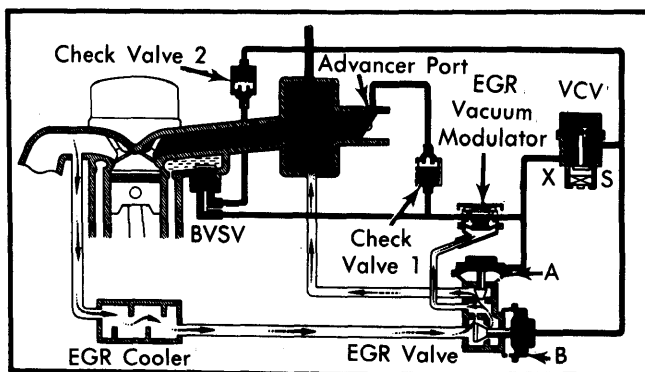


Fig. 5 EGR System (Cressida & Supra)

4) Stop engine and remove EGR modulator. Plug the gas hose from EGR valve to modulator. Start engine and race it once, then apply vacuum directly to EGR valve with engine idling. Engine should idle rough or die. If not, check EGR valve or passage.

Starlet & Tercel - 1) Using a 3-way connector, connect a vacuum gauge to EGR vacuum hose. Start engine and run at idle speed. With coolant temperature below 106°F (41°C) on Starlet or 122°F (50°C) on Tercel, vacuum gauge should indicate zero at 2000 RPM on Starlet or 2500 RPM on Tercel. When engine is warm, low vacuum should be present.

2) Disconnect vacuum hose from EGR vacuum modulator port "R". Using a jumper hose, connect port "R" to intake manifold vacuum. Vacuum gauge should indicate high vacuum at 2000 RPM on Starlet or 2500 RPM on Tercel.

NOTE - Engine will misfire slightly at this time, as a large amount of EGR gas enters.

3) On Tercel, disconnect and plug vacuum hose from port "S" of EGR vacuum modulator. Using a jumper hose, connect port "S" to intake manifold vacuum. Vacuum gauge should indicate low vacuum at 2500 RPM.

4) Remove gauge and reconnect hoses. If system performed as described, it is operating correctly. If not, test individual components and repair or replace as necessary.

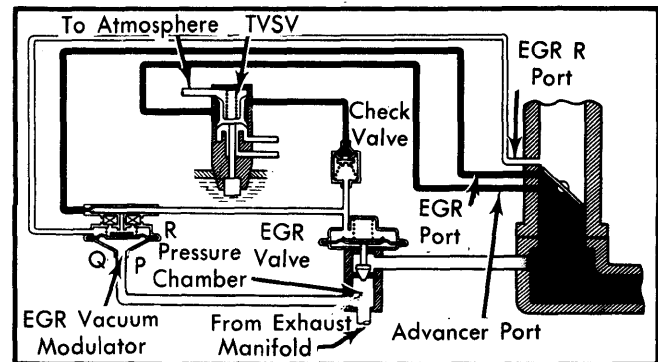


Fig. 6 EGR System (Starlet)

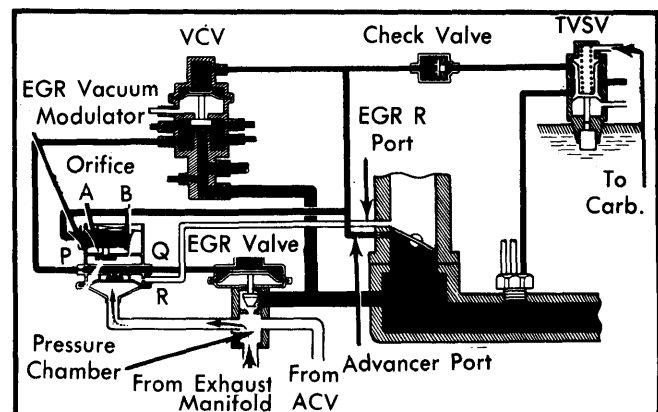


Fig. 7 EGR System (Calif. Tercel)

TOYOTA EXHAUST GAS RECIRCULATION (Cont.)

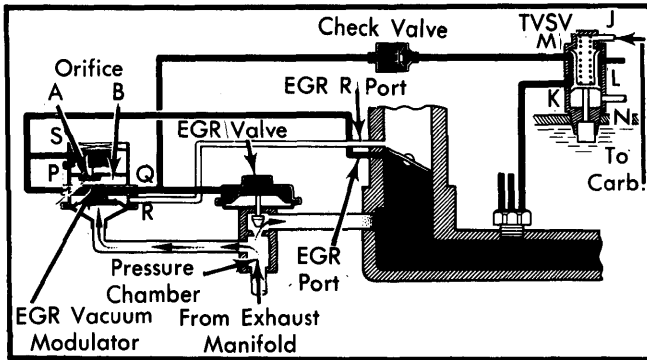


Fig. 8 EGR System (Federal Tercel)

VACUUM MODULATOR

Calif. Pickup, Celica, Corolla, Corona, Cressida & Supra –
 1) Disconnect vacuum hoses from top 2 ports of vacuum modulator. Plug one port and blow through the other. Air should escape freely from filter on top of modulator.

2) Start engine and raise speed to 2000-2500 RPM. Blow through port "Q" again; there should be resistance to air flow. If not, replace vacuum modulator.

Federal Pickup, Land Cruiser, Starlet & Tercel – 1) Disconnect vacuum hoses from ports "P", "Q" and "R" of vacuum modulator. Plug port "P" and "R", and blow air into port "Q". Air should escape through air filter of modulator.

2) Start engine and run at 3000 RPM on Corolla or 2000 RPM on all other models. Repeat blowing test. There should be strong resistance to air flow through modulator. If not, replace it.

VACUUM CONTROL VALVE (VCV)

Cressida & Supra – Check VCV filter for damage. Using compressed air, clean filter. Apply 2 in. Hg to port "S". Blow air into port "X" checking that VCV opens for about 2 seconds. If not, replace it.

BIMETAL VACUUM SWITCHING VALVE (BVSV)

1) Drain coolant and remove BVSV. Place sensing portion in cool water (do not allow water into valve). Air should not pass through valve when water is below switching point.

2) Heat water and repeat test. Air should pass through valve when above switching temperature. If not, replace valve.

BVSV Test Temperatures		
Application	Closed Below ° F (° C)	Open Above ° F (° C)
Celica, Corona, Land Cruiser, Pickup	86 (30)	111 (44)
Corona	104 (40)	129 (54)
Cressida, Supra	122 (50)	147 (64)

VACUUM SWITCHING VALVE (VSV)

Celica, Corona, Land Cruiser & Pickup – 1) Connect battery voltage to VSV terminals as shown in Fig. 9. Blow air into pipe "E" checking that air comes out pipe "F". Disconnect battery and repeat test. Air should come out pipe "G".

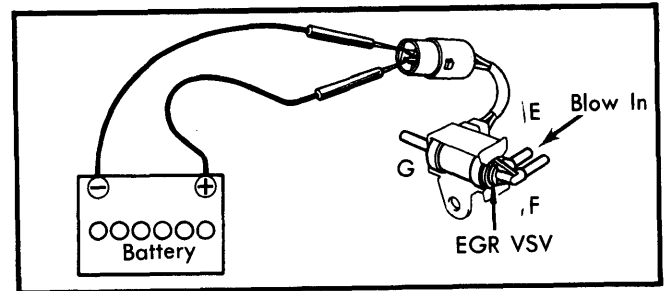


Fig. 9 VSV Test Connections

2) Using an ohmmeter, check that there is no continuity between positive terminal and body of VSV. Resistance between terminals where voltage was applied should measure 38-43 ohms at room temperature.

THERMOSTATIC VACUUM SWITCHING VALVE (TVSV)

Starlet – 1) Drain coolant from radiator and remove TVSV. Place threaded end of valve in container of water with thermometer. With temperature below 106°F (41°C), check that air flows from pipe "J" to pipe "N" and does not flow from pipe "L" to pipe "M". See Fig. 10.

2) Heat water to above 131°F (55°C). Check that air flows from pipe "J" to pipe "K" and from pipe "L" to pipe "M". If TVSV does not operate as described, replace it.

Tercel – 1) Drain coolant from radiator and remove TVSV. Place threaded end of valve in container of ice water with thermometer. With temperature below 45°F (7°C), check that air flows from pipe "J" to pipe "M" and "L" and from pipe "K" to pipe "N". See Fig. 10.

2) Heat water to 63-122°F (17-50°C). Check that air flows from pipe "K" to pipe "N" and "L" and from pipe "J" to pipe "M". Continue heating water to above 154°F (68°C). Check that air flows from pipe "K" to pipe "M" and "L" and does not flow from pipe "J" to any other pipe. If TVSV does not operate as described, replace it.

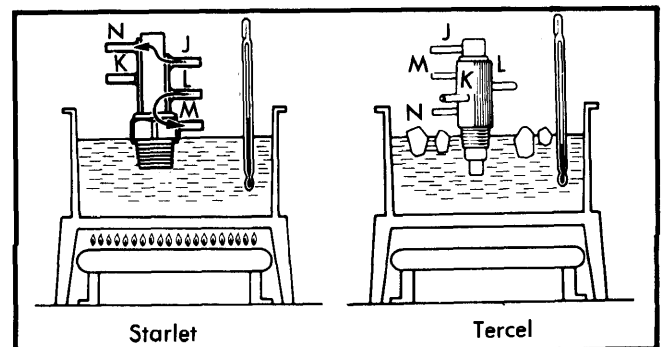


Fig. 10 Testing TVSV