TOYOTA EXHAUST GAS RECIRCULATION

All Models

DESCRIPTION

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

Each system has a vacuum operated EGR valve and a coolant-sensitive bimetal vacuum switching valve (BVSV). A vacuum modulator is used on all models. An EGR cooler decreases exhaust gas temperatures. Vacuum control valves and vacuum switching valves are used on some models to control EGR operation. See *appropriate illustration for system layout and components.*

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 NOx formation.

TESTING

EGR SYSTEM

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

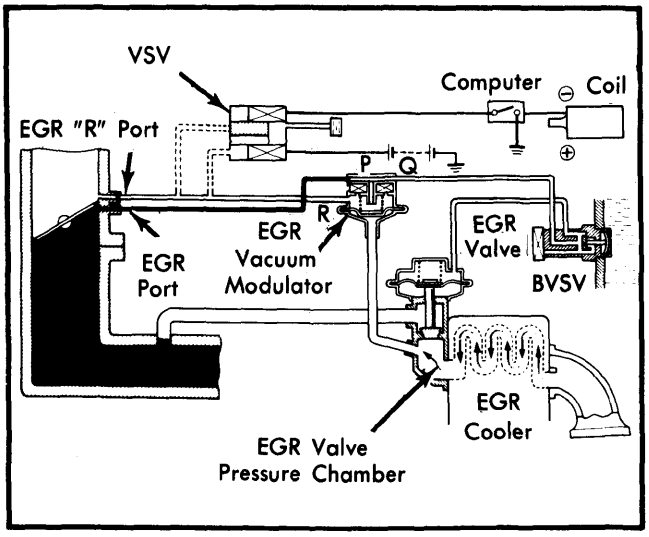

Fig. 1 Celica, Corona and Pickup EGR System

Celica, Corona and Pickup – 1) Disconnect the vacuum hose to the EGR valve and connect a vacuum gauge to the hose. Start engine and make sure it idles. 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) Apply intake manifold vacuum directly to ports "P" and "R" of vacuum modulator after unplugging existing hoses. Vacuum gauge should indicate high at idle. Pinch hose bringing manifold vacuum to port "R". Vacuum gauge should read lower than previous check.

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

4) On California vehicles (except Pickup with auto. trans.) and Cab and Chassis, disconnect vacuum hose from EGR port "R" and connect to intake manifold vacuum. Disconnect vacuum hose to VSV from EGR modulator and connect a vacuum gauge to VSV. Vacuum should read low at idle and high above 1700 RPM. Reconnect hoses.

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

Supra and Cressida – 1) Disconnect vacuum hose from the advancer port and connect to intake manifold vacuum. Disconnect hose from EGR valve "A" and connect a vacuum gauge to it. Disconnect vacuum hose from VCV (2) port "S" and plug hose.

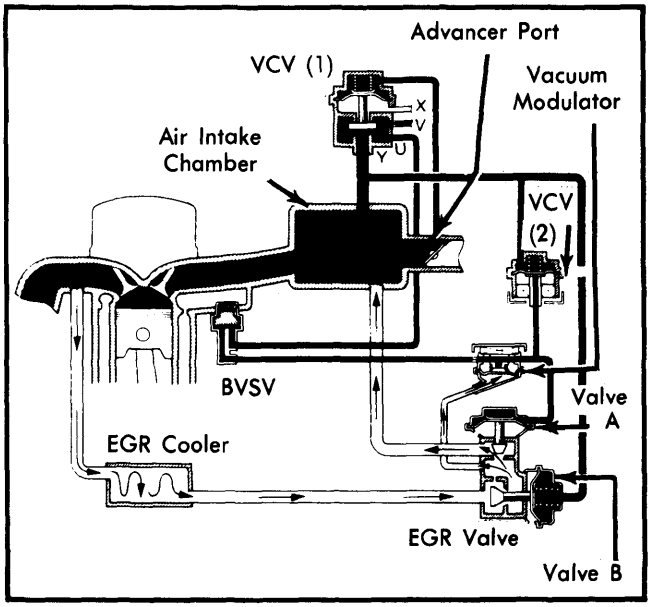

Fig. 2 Supra and Cressida EGR System

2) Start engine and run at idle. Vacuum gauge should read zero at 1500 RPM. As engine warms up, vacuum gauge should indicate manifold vacuum. If not, check BVSV and modulator.

3) Connect a check valve between vacuum pipe and Tee leading to VCV (2) and EGR valve. White side of check valve must be toward Tee. Reconnect hose to port "S", then start

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engine and raise RPM once. Gauge should then indicate zero at idle. If not, check VCV (2).

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.

Corolla and Tercel – **1)** Disconnect hose from carburetor EGR port and connect directly to intake manifold vacuum. Disconnect vacuum hose to EGR valve and connect a vacuum gauge to it. Start engine and check that it idles properly. Vacuum gauge should indicate zero at 2000 RPM.

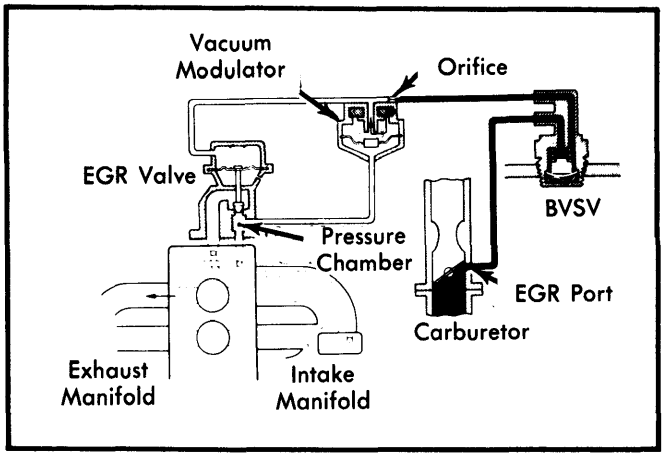

Fig. 3 Corolla EGR System

2) After engine is warm, vacuum gauge should indicate zero at idle and manifold vacuum at 2000 RPM. On Tercel, disconnect vacuum hose from port "S" on VCV. Vacuum should drop to zero at 2000 RPM. Reconnect all vacuum lines.

3) Apply intake manifold vacuum directly to EGR valve with engine idling. Engine should die. If system works as described, testing is complete. If not, test individual components.

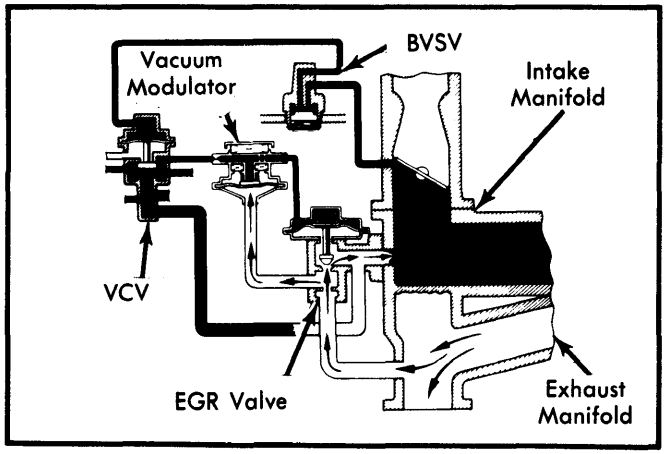

Fig. 4 Tercel EGR System

Land Cruiser (Federal) – Disconnect hose from EGR port and connect to an intake manifold nipple. Disconnect vacuum hose from EGR valve and connect a vacuum gauge to it. Start cold engine and warm up. Vacuum with cold engine at 3000 RPM should be zero. Intake manifold vacuum should be present with warm engine. Disconnect vacuum gauge and apply engine vacuum directly to EGR valve. Engine should die.

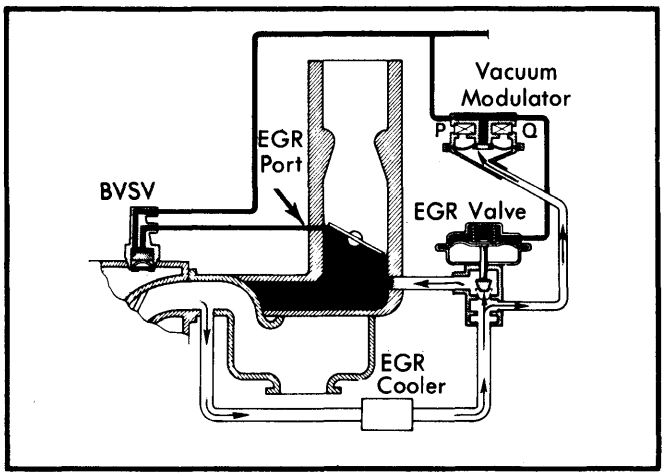

Fig. 5 Land Cruiser (Federal) EGR System

Land Cruiser (Calif.) – Disconnect vacuum hose from port "R" of EGR vacuum modulator. Disconnect vacuum hose from EGR valve and connect vacuum gauge to it. Start cold engine and warm up. Vacuum with cold engine should be zero at 2500 RPM. Low vacuum should be present with warm engine. Disconnect vacuum hose from port "S" of vacuum modulator and plug hose. Apply vacuum to ports "P" and "R". Vacuum gauge should read high at idle. Pinch hose at port "R". Vacuum gauge should drop to zero. Reconnect vacuum hose to port "S". Vacuum gauge should read low at idle. Replace all hoses.

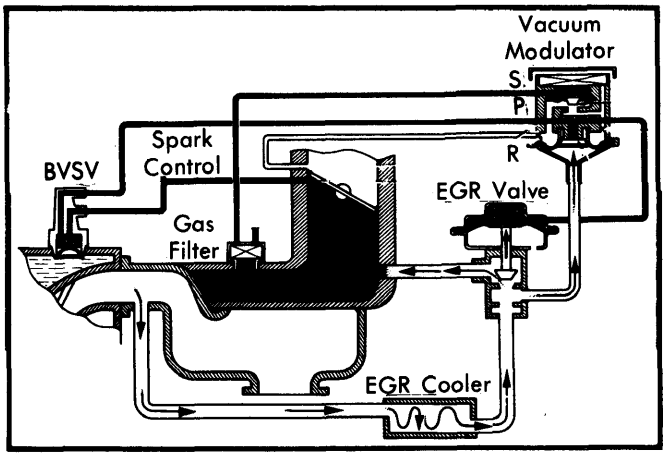

Fig. 6 Land Cruiser (Calif.) EGR System

VACUUM MODULATOR

Celica, Corona, Pickup and Calif. Land Cruiser – **1)** Disconnect vacuum hoses from ports "P", "Q" and "R" of vacuum modulator. Plug "P" and "R", and blow air into port "Q". Air should escape through air filter 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.

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Corolla, Cressida, Supra, Tercel and Fed. Land Cruiser – 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 run at 2000 RPM. Repeat blowing test. There should be strong resistance to air flow through modulator. If not, replace it.

VACUUM CONTROL VALVE (VCV)

Celica Supra, Cressida – 1) To test VCV (1), apply more than 3.5 in. (90 mm) Hg vacuum to port "S". Air should pass freely from port "Y" to "V" and "U". With no vacuum applied, air should not pass.

2) To test VCV (2), clean air filter in VCV. Apply more than 18 in. (465 mm) Hg vacuum to port "S". VCV should be open and allow air to pass. With no vacuum applied, air should not pass.

Tercel – Apply more than 3.5 in. (90 mm) Hg vacuum to port "S" of VCV. Blow air into "T" while closing "R" and "Y". Air should pass freely and come out "U", "W" and "Z". With no vacuum applied, air should not pass.

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, Pickup	86 (30)	111 (44)
Land Cruiser, Corolla	104 (40)	129 (54)
Supra, Cressida, Tercel	122 (50)	147 (64)

VACUUM SWITCHING VALVE (VSV)

1) Connect battery voltage to VSV terminals as shown. Blow into pipe "E" and check that air comes out "F". Disconnect battery and repeat test. Air should come out air filter at bottom of valve.

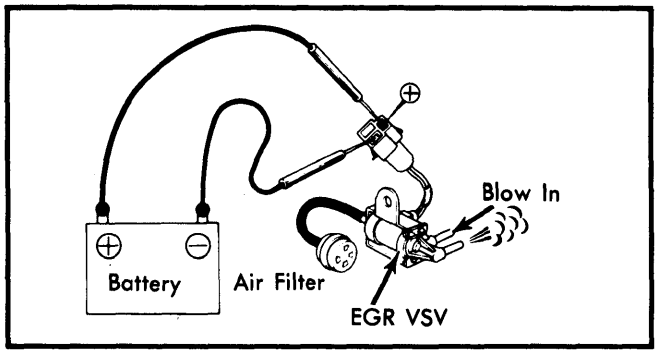

Fig. 7 VSV Test Connections

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.