

1974-79 EXHAUST EMISSION SYSTEMS

Toyota Exhaust Gas Recirculation

3-429

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.

OPERATION

1974 EGR SYSTEMS

On 18R-C and F engines, the EGR system is on when all sensors are on. See 1974 EGR SYSTEM SENSOR OPERATING TEMPERATURES table. With all sensors on, the computer operates vacuum switching valve, which allows vacuum from carburetor to open EGR valve. When any sensor is off, the EGR system is shut off.

On 4M engine, the EGR system is in operation when speed sensor and engine coolant temperature sensors are on. With all sensors on, the computer operates vacuum switching valve, which allows vacuum to reach EGR vacuum control valve. The EGR vacuum control valve opens EGR valve and allows exhaust gases to enter intake manifold. When any sensor is off, the EGR system is shut off.

1974 EGR SYSTEM SENSOR OPERATING TEMPERATURES

Application	On	Off
Coolant Temp. Sensor		
18R-C	140°F (60°C)	217°F (103°C)
F	113°F (45°C)	217°F (103°C)
4M	77°F (25°C)
Speed Sensor		
18R-C	13-19 MPH	56-68 MPH
F	10-16 MPH	62-68 MPH
4M	13-19 MPH	62-68 MPH
EGR Valve Temp. Sensor		
18R-C	194°F (90°C)	260°F (127°C)
F	248°F (120°C)	320°F (160°C)

1975-76 EGR SYSTEMS

On 20R and 2F engines, a computer will turn vacuum solenoid valve on. This opens vacuum passage between EGR valve and EGR port, permitting exhaust gas recirculation to take place. If any sensor is off, the vacuum solenoid valve is turned off (closing off vacuum to EGR valve). With no vacuum applied to valve, exhaust gas recirculation flow stops.

On 4M engine, when all sensors are on, the computer will turn the vacuum solenoid valve on. This opens vacuum passage between EGR valve and EGR port. This causes EGR valve to open, permitting exhaust gases to flow from exhaust manifold, through cooler pipe, into intake manifold. If any sensor is off, the EGR system is shut off.

1977 EGR SYSTEMS

On 2T-C Federal and 3K-C engines, the Bimetallic Vacuum Switching Valve (BVSV) is open when coolant temperature is less than 122°F (50°). Atmospheric pressure from thermostatic valve on carburetor acts to close EGR valve. An orifice in 3-way connector maintains EGR ported vacuum at a high level. The 2T-C California and High Altitude engines, no thermostatic valve is used.

With coolant temperature below 122°F (50°C), the BVSV is open, and pressure from constant pressure chamber closes the EGR vacuum modulator. At this point, vacuum from EGR port can open EGR valve and the EGR system becomes operational.

On 20R engine, vacuum passage between EGR port and EGR valve is closed by Thermostatic Vacuum Switching Valve (TVSV) when coolant temperature is below 50°F (10°C). At this point, the EGR valve cannot operate and exhaust gas recirculation stops. As coolant temperature rises above 50°F (10°C), the TVSV opens and exhaust gas recirculation takes place.

On 2F engine, the Bimetallic Vacuum Switching Valve (BVSV) closes vacuum passage to EGR valve when coolant temperature is less than 122°F (50°) making the EGR system inoperative. As coolant temperature rises above 122°F (50°C), the BVSV opens vacuum passage and exhaust gas recirculation takes place.

1978-79 EGR SYSTEMS

Below a predetermined coolant temperature, 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, if equipped, reacts with exhaust backpressure and balances atmospheric pressure and vacuum pressure to allow or stop EGR. Vacuum control valve, if equipped, senses changes in intake manifold vacuum levels and will bleed off or allow vacuum to the EGR valve. The EGR cooler, if equipped, assists in reducing exhaust gas temperature before it is cycled into the combustion chamber.

TESTING

EGR SYSTEM

1975-77 Models - 1) See applicable EGR system diagnostic charts and perform EGR system test as outlined. See Figs. 1 through 8. A cold engine (1975-76 models only) means that either the coolant temperature is below 40°F (4.5°C) or thermo switch is grounded (simulating a cold engine).

2) On 2F engine, test steps 6 and 7 cannot be performed if EGR valve temperature rises above 320°F (160°C) as system will be off. If diagnostic flow charts indicate a failure, unplug thermo sensor connector at EGR valve and road test vehicle. If road test is satisfactory, EGR system is operating properly. If not check speed sensor.

NOTE: On 1978 models, if a step does not apply to vehicle being worked on (component not used), skip that step and continue with rest of procedure.

1978 Models - 1) Check, clean or replace filter in vacuum modulator (if equipped). Disconnect vacuum hose from EGR port and connect it to intake manifold vacuum source.

2) Detach vacuum hose from EGR valve and attach a vacuum gauge to hose. Pinch off hose between carburetor and vacuum control valve (if equipped). With engine cold, start engine.

3) With engine cold, vacuum gauge reading should be zero (0) at 2000 RPM. As engine warms up, low vacuum should be indicated. If not, check thermal vacuum switch and vacuum modulator.

4) Released pinched hose and check that gauge shows low vacuum at 2000 RPM. This confirms normal operation of vacuum control valve.

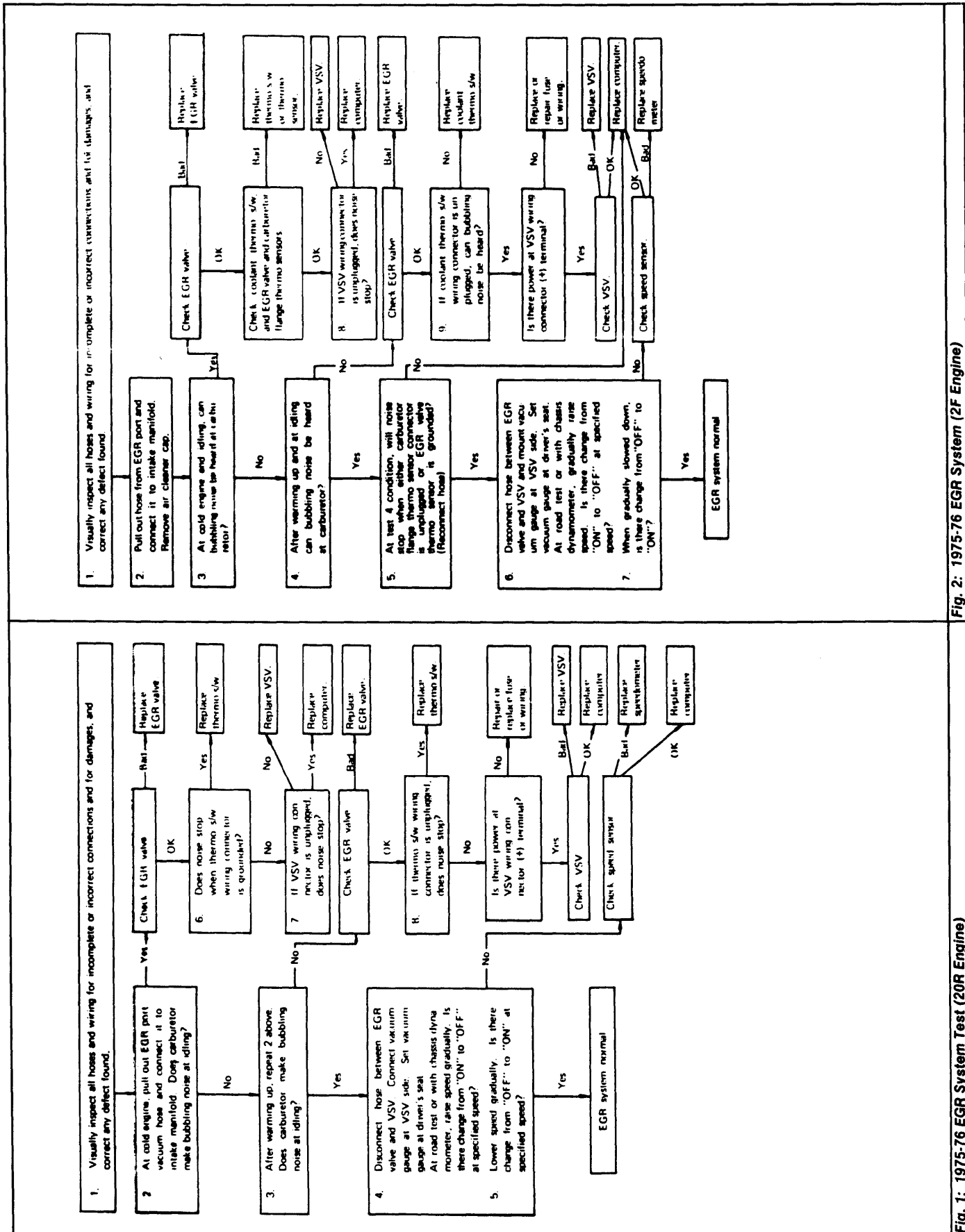
5) Now pinch off vacuum hose between vacuum control valve and carburetor. Detach vacuum gauge and apply vacuum directly to EGR valve with engine idling. Engine should run rough or stall.

6) Reconnect vacuum hoses to proper locations. Released pinched hose. If EGR system tests as described, system is operating properly. If not, check individual EGR components.

1979 Corolla (3K-C Engine) - Disconnect hose from EGR port and connect to an intake manifold nipple. See Fig. 9. Start cold engine and warm up. Engine should run rough or die when warm.

1974-79 EXHAUST EMISSION SYSTEMS

Toyota Exhaust Gas Recirculation (Cont.)



1974-79 EXHAUST EMISSION SYSTEMS

Toyota Exhaust Gas Recirculation (Cont.)

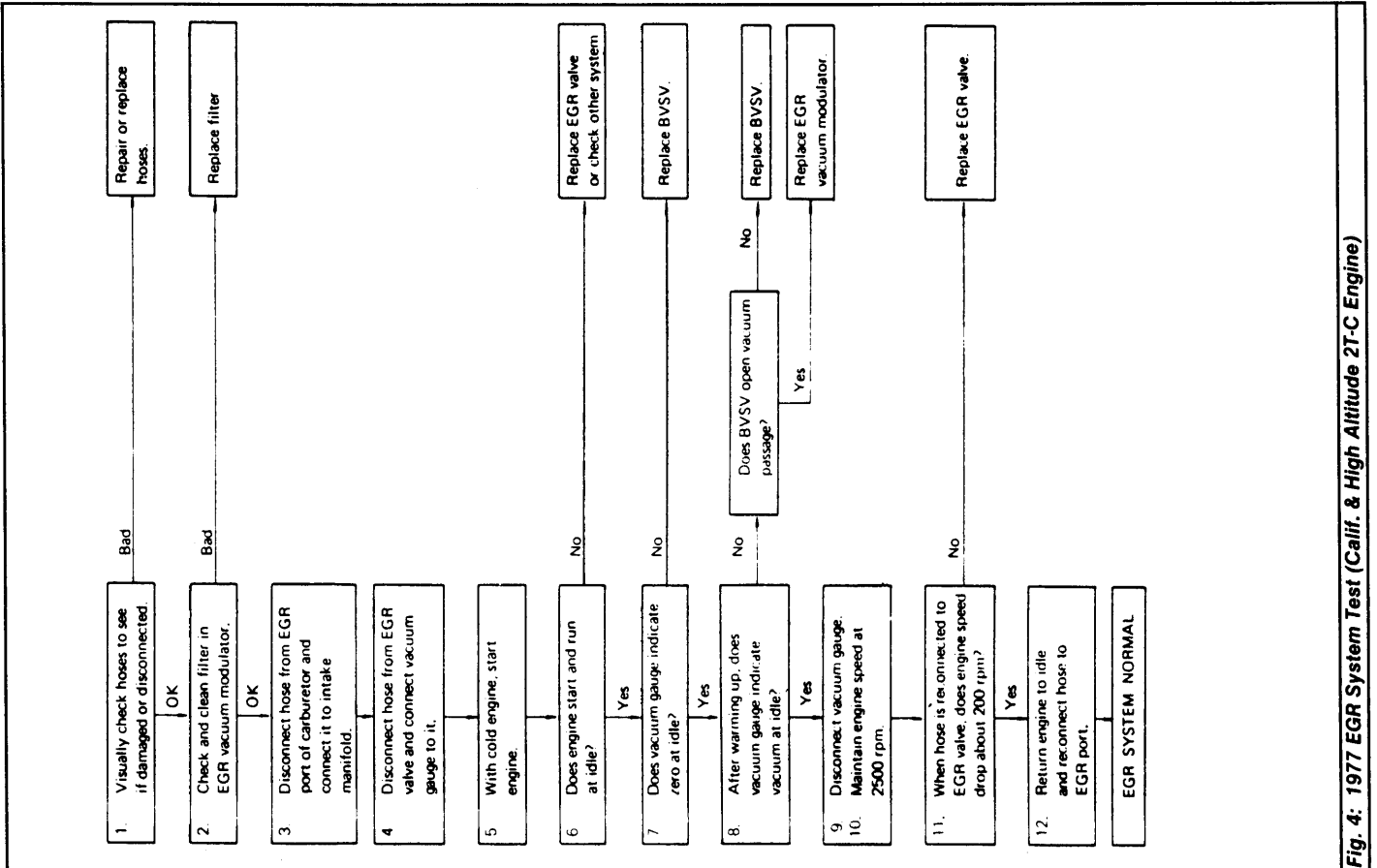


Fig. 4: 1977 EGR System Test (Calif. & High Altitude 2T-C Engine)

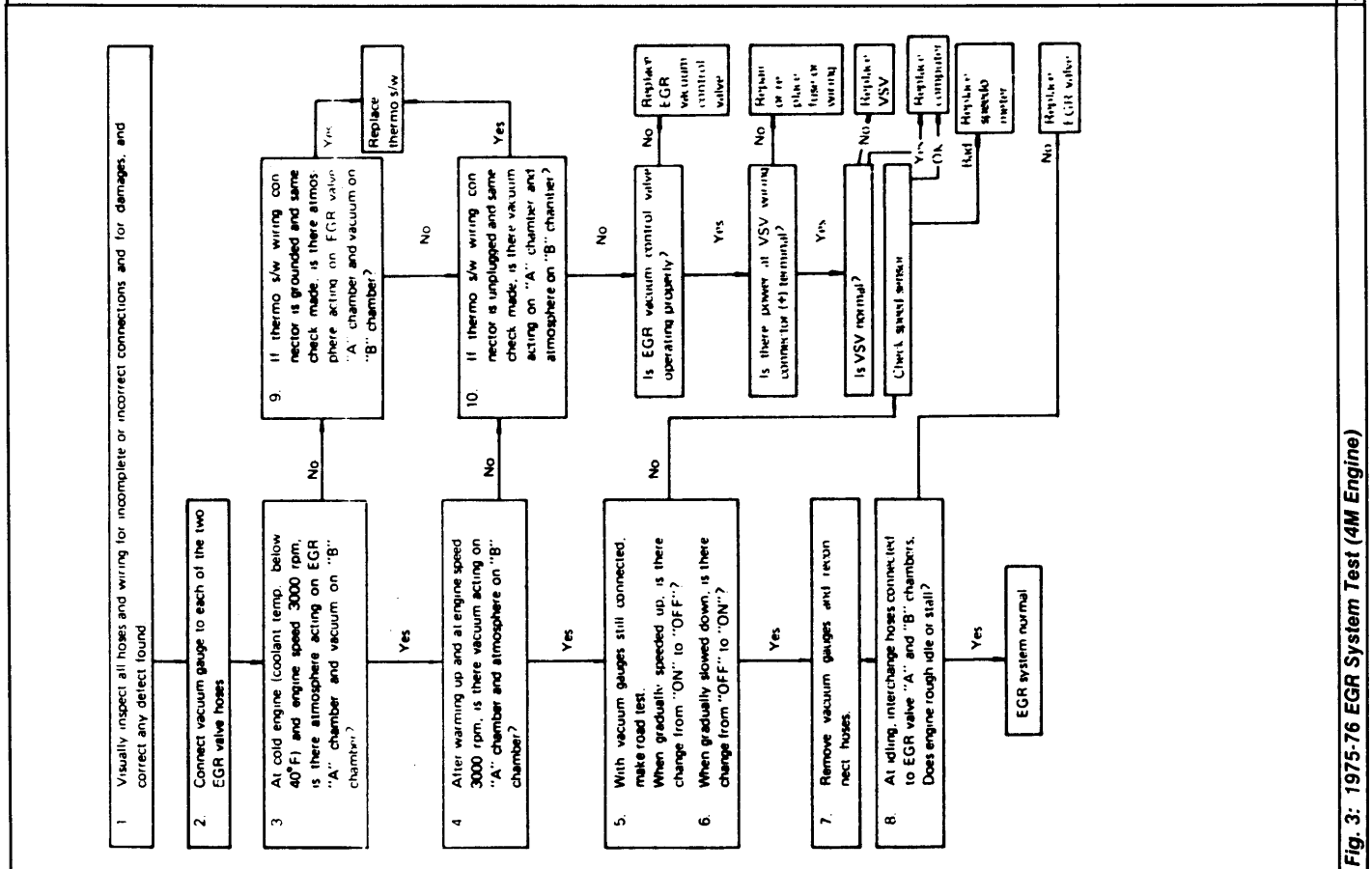


Fig. 3: 1975-76 EGR System Test (4M Engine)

1974-79 EXHAUST EMISSION SYSTEMS Toyota Exhaust Gas Recirculation (Cont.)

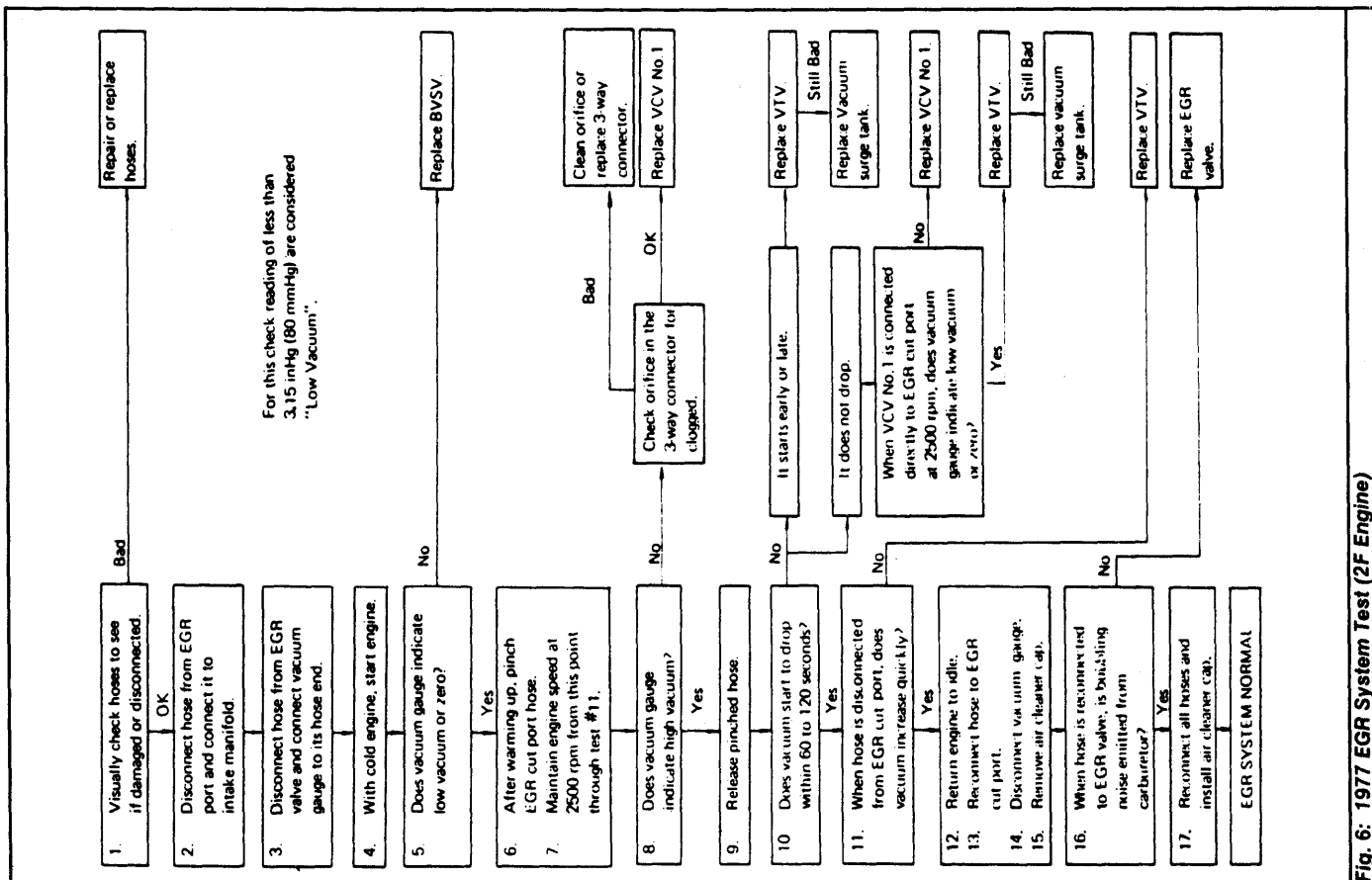


Fig. 6: 1977 EGR System Test (2F Engine)

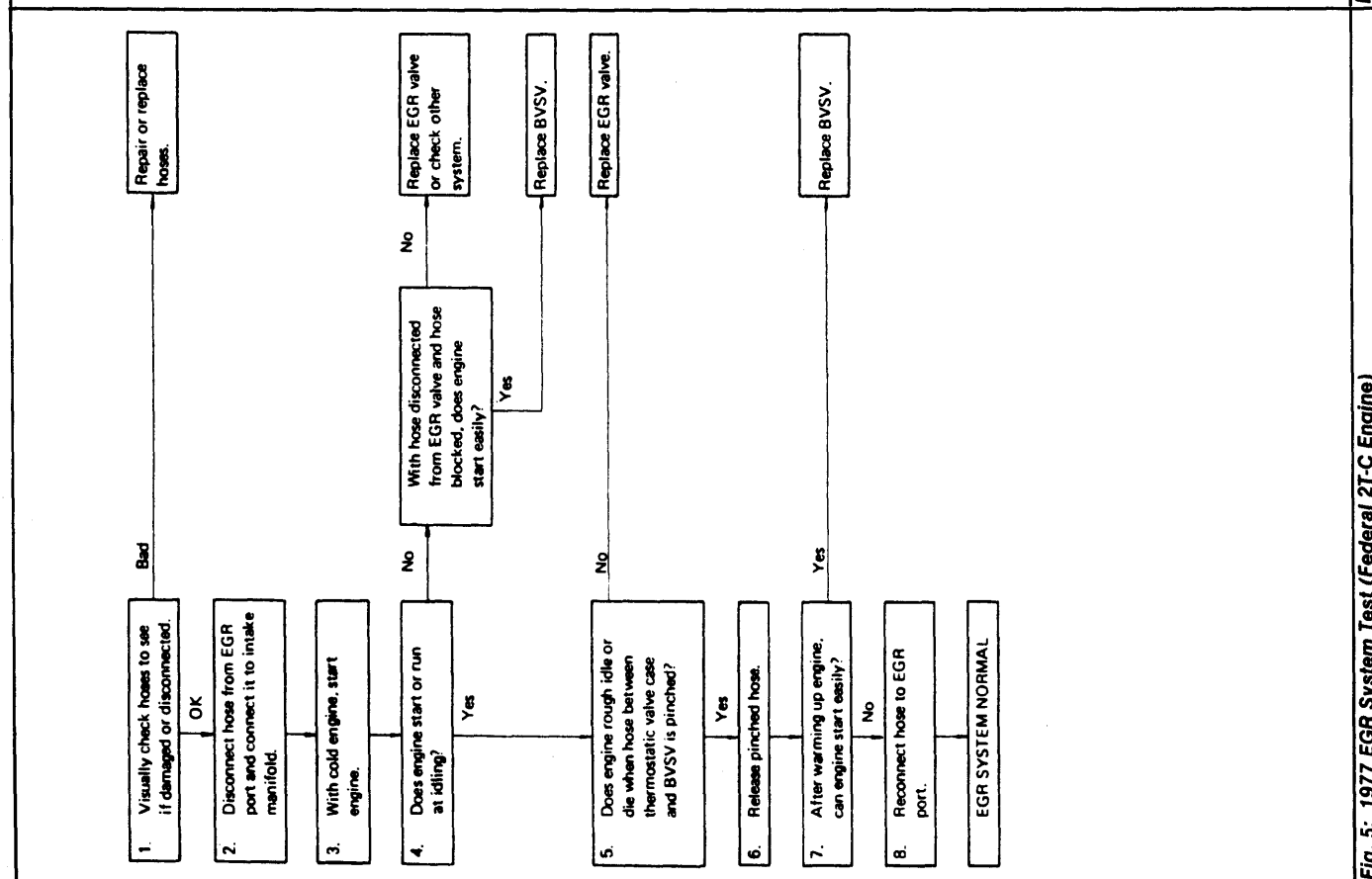


Fig. 5: 1977 EGR System Test (Federal 2T-C Engine)

1974-79 EXHAUST EMISSION SYSTEMS

Toyota Exhaust Gas Recirculation (Cont.)

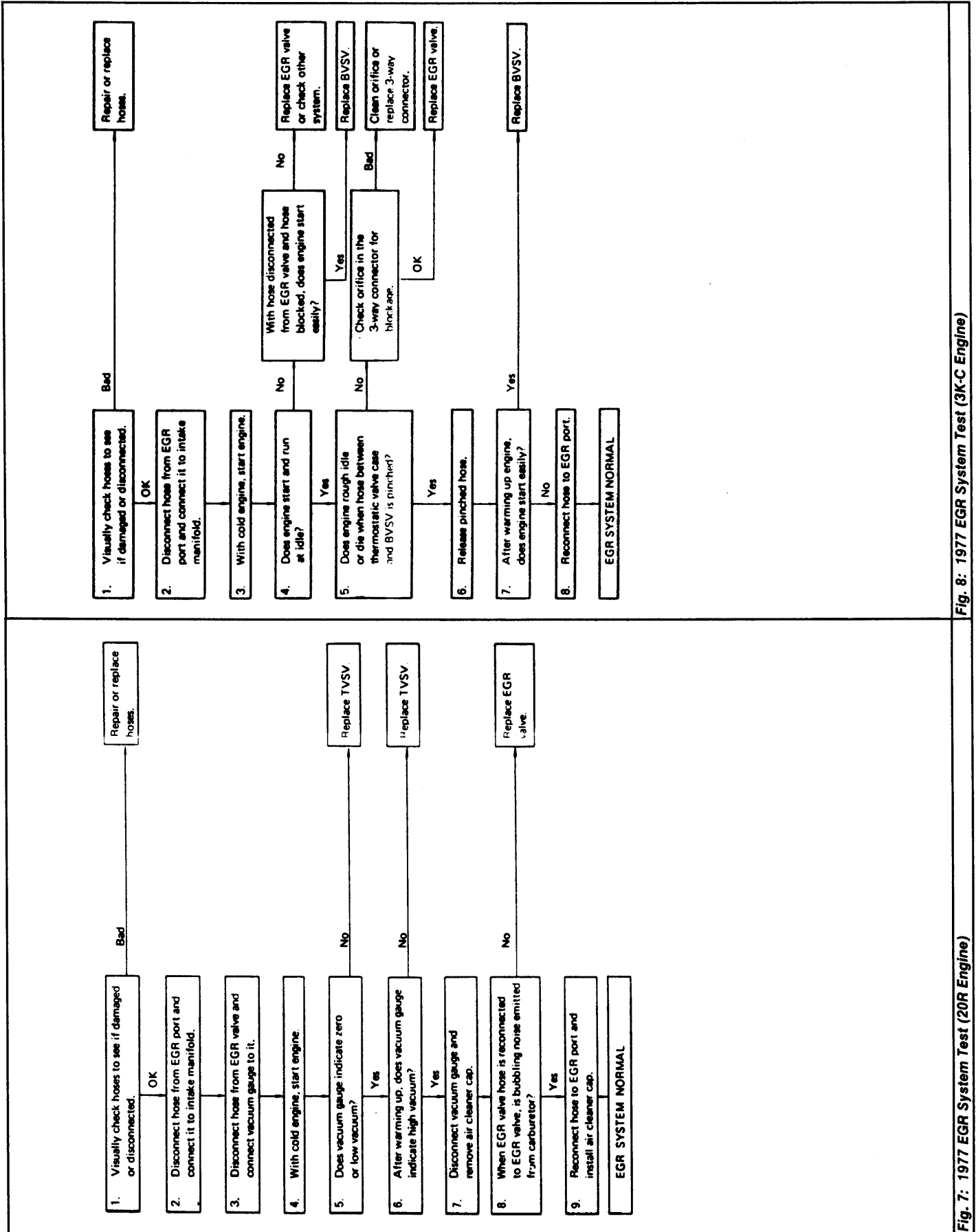


Fig. 8: 1977 EGR System Test (3K-C Engine)

Fig. 7: 1977 EGR System Test (20R Engine)

1974-79 EXHAUST EMISSION SYSTEMS

Toyota Exhaust Gas Recirculation (Cont.)

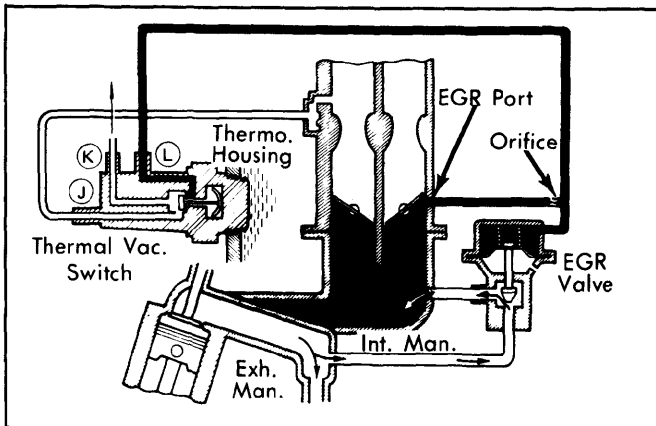


Fig. 9: 1979 Corolla (3K-C Engine) EGR System

1979 Corolla (2T-C Engine) – 1) Disconnect hose from EGR port and connect to an intake manifold nipple. See Fig. 10. Disconnect vacuum hose from EGR valve and connect vacuum gauge to it. Start cold engine and warm up. Vacuum with cold engine at 2000 RPM should be zero.

2) Intake manifold vacuum should be present with warm engine at 2000 RPM. Disconnect vacuum gauge and apply engine vacuum directly to EGR valve. Engine should run rough or stall.

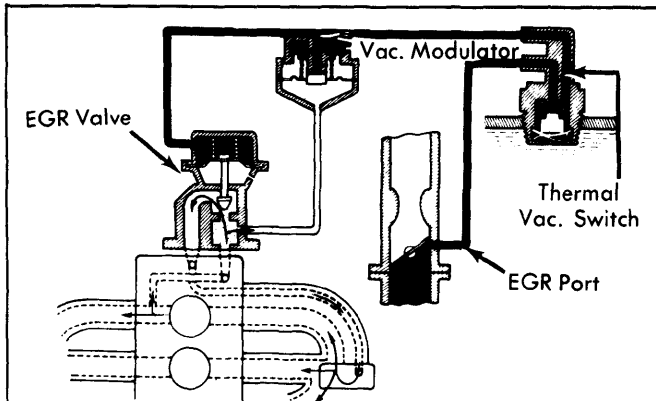


Fig. 10: 1978-79 Corolla (2T-C Engine) EGR System

1979 Celica, Corona & Pickup – 1) Disconnect hose from EGR port and connect to an intake manifold nipple. See Fig. 11. Disconnect vacuum hose from EGR valve and connect vacuum gauge to it. On manual transmission equipped Celica and Corona, pinch hose between vacuum control valve and carburetor.

2) Start cold engine. Vacuum with cold engine should be zero. Low vacuum should be present with warm engine. Release pinched hose and see that vacuum drops to zero. Disconnect vacuum gauge and apply engine vacuum directly to EGR valve. Engine should die.

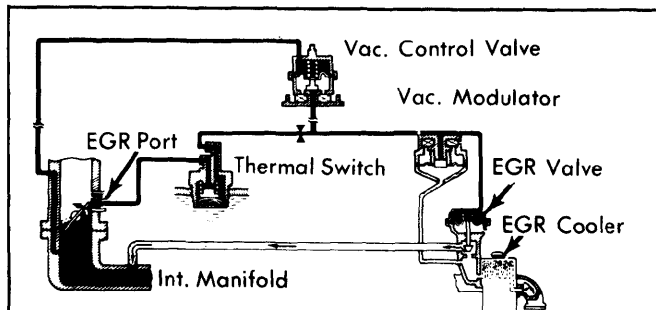


Fig. 11: 1978-79 Celica, Corona & Pickup (20R Engine) EGR System

1979 Cressida – Disconnect vacuum hose from pipe "S" of vacuum control valve and connect to intake manifold. Disconnect vacuum hose from EGR valve and connect vacuum gauge to it. Start cold engine. With cold engine, vacuum should be zero at 2000 RPM. With hot engine, intake manifold vacuum should be present. Disconnect vacuum gauge and connect engine vacuum directly to EGR valve. Engine should die.

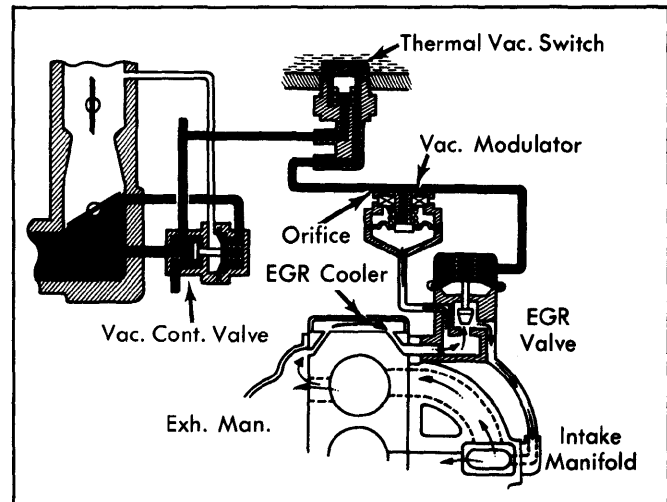


Fig. 12: 1978-79 Cressida (4M Engine) EGR System

1979 Supra – 1) Disconnect vacuum hose from advance port and connect to gas filter on air intake chamber. See Fig. 13. Disconnect vacuum hose from EGR valve and connect a vacuum gauge to it. Start cold engine and warm up. Vacuum at 1500 RPM with cold engine should be zero. Intake manifold vacuum should be present with warm engine at 1500 RPM.

2) Remove vacuum modulator and plug exhaust gas hose. Connect a check valve between vacuum hose and EGR valve "B" (white side toward EGR valve). Apply engine vacuum directly to EGR valve "A". Engine should run smoothly. Disconnect hose to "B" at check valve and plug. Engine should die. Replace all hoses and vacuum modulator.

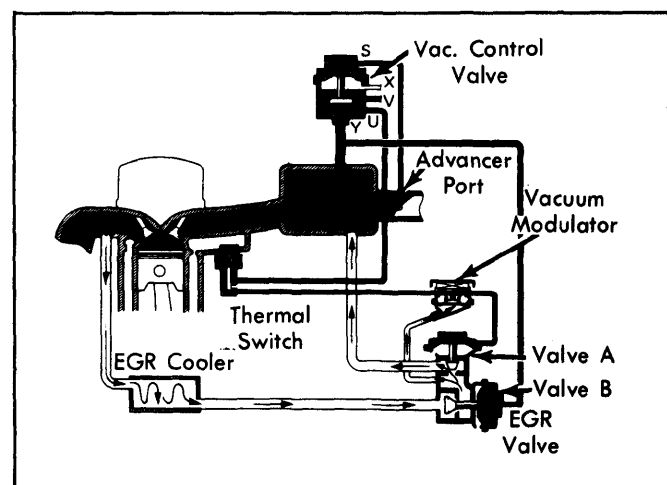


Fig. 13: 1979 Supra EGR System

1979 Land Cruiser (Federal) – 1) Disconnect hose from EGR port and connect to an intake manifold nipple. See Fig. 14. Disconnect vacuum hose from EGR valve and connect a vacuum gauge to it.

2) Start cold engine and warm to normal operating temperature. 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.

1974-79 EXHAUST EMISSION SYSTEMS Toyota Exhaust Gas Recirculation (Cont.)

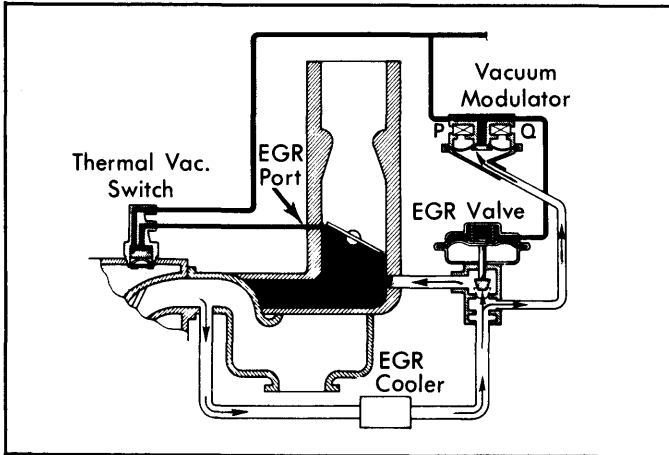


Fig. 14: 1979 Land Cruiser EGR System (Federal)

1979 Land Cruiser (Calif.) - 1) Disconnect vacuum hose from port "R" of EGR vacuum modulator. See Fig. 15. 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.

2) 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.

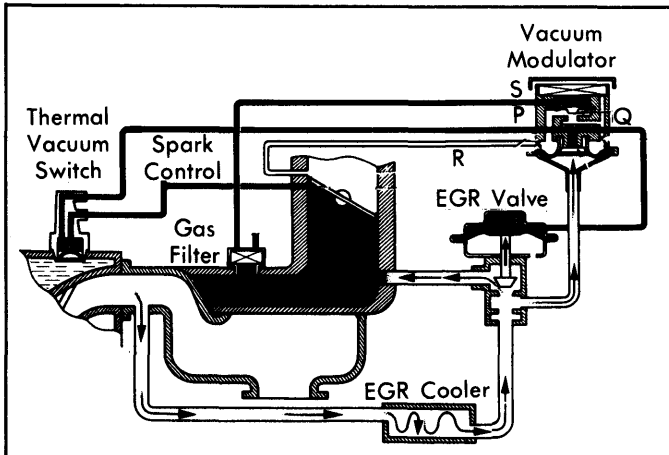


Fig. 15: 1979 Land Cruiser EGR System (Calif.)

EGR VALVE

1976 20R & 2F Engines - With engine idling at normal operating temperature, remove air cleaner cover. Connect EGR valve directly to intake manifold. This should cause carburetor to produce a bubbling noise which should disappear when vacuum is disconnected.

1976 4M Engine - With engine idling at normal operating temperature, interchange upper and lower vacuum hoses at EGR valve. If EGR valve is working properly, engine should run rough or stall.

BIMETALLIC VACUUM SWITCHING VALVE (BVS)

1977 Models - 1) Place BVS sensing portion in cold water. Check whether valve is closed or open. Heat water and repeat test. With BVS heated to engine operating temperature, whether valve is closed or open. See BVS OPERATING TEMP. SPECIFICATIONS table.

2) Notches on hexagon part of BVS indicate whether valve is open or closed when hot. Valves with NO notches are closed when hot. Valves with notches are open when hot. See Fig. 16.

BVS OPERATING TEMP. SPECIFICATIONS

BVS Color	Operating Temp. °F (°C)
Gray	86 (30)
Blue	122 (50)
Black	140 (60)

Color	Vacuum Passage Temp.	Engine	System	Location
Silver/Gray	86 ± 7.2°F (30 ± 4°C) CLOSE → OPEN ← CLOSE OPEN min. 88°F (20°C)	2T C (Cold Weather 4x4)	Double Vacuum Advance Distributor	on Tube (at water outlet housing)
Gold/Blue	122 ± 7.2°F (50 ± 4°C) OPEN → CLOSE ← OPEN CLOSE min. 104°F (40°C)	3K C 2T C (Ex Calif and High Altitude)	EGR	Water Outlet Housing Intake Manifold
Silver/Black	140 ± 7.2°F (60 ± 4°C) OPEN → CLOSE ← OPEN CLOSE min. 122°F (50°C)	2T C (Ex Calif and High Altitude)	AAP	Intake Manifold
Silver/Blue	122 ± 7.2°F (50 ± 4°C) CLOSE → OPEN ← CLOSE OPEN min. 104°F (40°C)	2T C (for Calif and High Altitude) 2F	EGR SC, EGH	Intake Manifold Water outlet Housing

Fig. 16: Testing Bimetallic Vacuum Switching Valve

SPEED SENSOR

1974 Models - 1) Disconnect speedometer cable at transmission. Disconnect connector harness from computer. Using a 10 ohm resistor, connect positive lead of ohmmeter to computer connector speed sensor terminal. Connect negative ohmmeter lead to a known good ground.

2) Have an assistant turn speedometer cable by hand and count number of needle sweeps at ohmmeter. Four needle sweeps should occur for every one revolution of speedometer cable.

1975-77 Models - 1) Check sensor terminals at back of speedometer for proper connections. Block front wheels and jack up one rear wheel off ground. Release parking brake and place transmission in Neutral.

2) Unplug wiring connector from computer. Using a 10 ohm resistor, connect positive lead of ohmmeter to computer connector speed sensor terminal. Connect negative ohmmeter lead to a known good ground.

3) Have an assistant turn rear wheel slowly and observe voltmeter. Ohmmeter should fluctuate near infinity mark. If not, replace speedometer assembly if wiring is not defective.

THERMAL VACUUM SWITCH (TVS)

1978-79 Models - Drain coolant and remove TVS from intake manifold. Place TVS sensing portion in cold water. With hose attached to upper nipple, blow into TVS. No air should pass. Heat water and repeat test. With TVS heated to engine operating temperature, air should pass. If valve does not respond as described, replace it.

THERMOSTATIC VACUUM SWITCHING VALVE (TVSV)

1977 Models - 1) Drain coolant and remove TVSV from intake manifold or cylinder head. Place TVSV sensing portion in cold water. With hose attached to TVSV, blow into TVSV. Air should flow as shown in illustration. See Fig. 17. With TVSV heated to engine operating temperature, air should flow as shown in illustration.

1974-79 EXHAUST EMISSION SYSTEMS

Toyota Exhaust Gas Recirculation (Cont.)


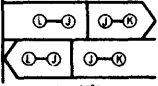

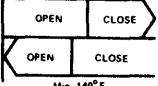

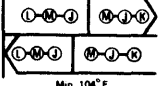

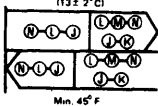
TVSV	Passage Temp.	Vehicle Model	System	Location
	$140 \pm 9^\circ\text{F}$ $(80 \pm 5^\circ\text{C})$  Min. 95°F (35°C)	TL (Calif. and High Altitude)	Choke Opener, AAP	Intake Manifold
	$158 \pm 9^\circ\text{F}$ $(70 \pm 5^\circ\text{C})$  Min. 140°F (60°C)	HA RT RN	AAP	Cylinder Head
	$122 \pm 9^\circ\text{F}$ $(50 \pm 5^\circ\text{C})$  Min. 104°F (40°C)	RA RT	SC	Water Outlet Housing (Intake Manifold)
	$55 \pm 3.6^\circ\text{F}$ $(13 \pm 2^\circ\text{C})$  Min. 45°F (7°C)	RA RT HN	EGR AI (Choke Breaker) (RA, RT)	Water Outlet

Fig. 17: Testing Thermostatic Vacuum Switching Valve

VACUUM MODULATOR

1978-79 Models - 1) Disconnect 2 tap vacuum hoses from vacuum modulator. Plug one nipple with finger and blow into other nipple. Air should come out of filter area.

2) Start engine and set at 2000 RPM. Repeat blowing test. There should be strong resistance to air flow. If valve does not respond as described, it must be replaced.

VACUUM CONTROL VALVE (VCV)

1976 4M Engine - 1) Connect carburetor advance port and EGR vacuum control valve together (by-passing vacuum solenoid valve.) Disconnect hoses from EGR valve and connect a vacuum gauge to each hose. When engine is accelerated, vacuum gauge for upper hose should indicate venturi vacuum and lower gauge should indicate zero.

2) With engine idling, disconnect hose from carburetor advance port. Vacuum gauge to upper hose should now read close to zero and lower gauge should read intake manifold vacuum.

1978 Models - Tee a vacuum gauge in line between carburetor and VCV. Disconnect hose from VCV filter side. VCV should be closed when vacuum is less than 14.9 in. Hg (below 11.8 in. Hg on high altitude models).

1979 Celica, Corona & Pickup - Tee a vacuum gauge in line between carburetor and VCV. Disconnect hose from VCV filter side. VCV should be closed when vacuum is less than 14.2 in. Hg; open when vacuum is more than 15.8 in. Hg.

1979 Cressida - Remove VCV. Apply vacuum to port "S" and blow air into port "Y". VCV should be open. Without vacuum applied, VCV should be closed.