

# EGR SYSTEM

## 1988 Toyota Celica

1988 EXHAUST EMISSION SYSTEMS  
Toyota EGR

### DESCRIPTION

The Exhaust Gas Recirculation (EGR) system is used for the reduction of NOx emissions by lowering combustion temperatures. Recycling metered amounts of exhaust gas back into the intake system lowers combustion temperatures.

Each system has a vacuum-operated EGR valve and a vacuum modulator. Temperature sensing devices control EGR operation.

Temperature sensing device used could be a Vacuum Switching Valve (VSV), a Bi-Metallic Vacuum Switching Valve (BVSV), a Thermostatic Vacuum Switching Valve (TVSV), Vacuum Control Valve (VCV) or a combination of these valves. A check valve, EGR cooler and computer may also be used on some models.

### OPERATION

When engine is below operating temperature, no exhaust gas recirculation is obtained. Increase in engine temperature allows control valves to regulate vacuum to EGR valve for gas recirculation.

Vacuum modulator is used to regulate exhaust backpressure, balance atmospheric pressure and vacuum to allow EGR operation at heavy throttle. The EGR cooler, used on the Cressida and Supra assists in reducing exhaust gas temperature before entering combustion chamber.

### TESTING

#### EGR TEST

- 1) Ensure modulator filter is clean and in good condition prior to performing test. Clean filter with compressed air if necessary. Disconnect vacuum hose from EGR valve.
- 2) Using a "T" connector, connect a vacuum gauge in EGR valve line. Check that engine starts and runs at idle. This ensures proper seating of EGR valve.
- 3) The BVSV, TVSV, VSV and EGR modulator can be checked with engine coolant below minimum temperature and specified engine RPM in accordance with application. See EGR SPECIFICATIONS table. Different valves are used depending on model. See Figs. 1 through 16.
- 4) Operate engine with engine coolant below minimum temperature and specified RPM. No vacuum reading should be obtained when operated with engine coolant below minimum temperature.
- 5) Operate engine at normal operating temperature and specified RPM. See EGR SPECIFICATIONS table for specified engine RPM. Low vacuum reading should be obtained.
- 6) Vacuum reading of 2.6 in. Hg should be obtained on Cressida and Supra models. On Cressida, Land Cruiser, Pickup and 4Runner (3.0L) and Supra non-turbo models, check that no vacuum is shown at idle. Also check Corolla models with EFI, Corolla FX-16 and the MR2 models at 5000 RPM. No vacuum should exist.
- 7) Disconnect hose from the "R" port of EGR vacuum modulator on all models except the Celica 4WD, Tercel Wagon, Pickup (turbo) and Supra (turbo) models. See Figs. 1 through 16.
- 8) Using additional hose, connect "R" port directly to intake manifold. High vacuum reading should be obtained at specified engine

RPM. See EGR SPECIFICATIONS table.

NOTE: Engine should misfire due to large amounts of exhaust gas being injected into intake manifold.

9) Disconnect vacuum gauge and install vacuum hoses. To check EGR valve, apply vacuum directly to EGR valve with engine idling. Engine should run rough. If system did not operate within specifications, each component should be tested. See COMPONENT TEST in this article.

EGR SPECIFICATIONS TABLE

Model	Minimum Temperature	Engine RPM
Camry		
2.0L .....	113°F (45°C)	(1) 2500
2.5L .....	104°F (40°C)	2500
Celica		
2WD .....	113°F (45°C)	2500
4WD .....	129°F (45°C)	2500
Corolla		
Carbureted .....	122°F (50°C)	2000
EFI .....	95°F (35°C)	3500
Corolla FX .....	122°F (50°C)	2000
Corolla FX-16 .....	95°F (35°C)	3500
Cressida .....	135°F (57°C)	2500
Land Cruiser .....	127°F (53°C)	2500
MR2 .....	95°F (35°C)	3500
Pickup		
2.4L		
Carbureted .....	113°F (45°C)	3000
EFI .....	86°F (30°C)	(2) 3500
3.0L .....	118°F (48°C)	3500
Supra .....	135°F (57°C)	2500
Tercel		
Sedan .....	104°F (40°C)	3000
Wagon .....	122°F (50°C)	3000
Van .....	104°F (40°C)	3500
4Runner		
2.4L .....	86°F (30°C)	(2) 3500
3.0L .....	118°F (48°C)	3500

(1) - Check at 3500 RPM with hose from EGR to manifold.

(2) - Check at 3000 RPM with hose from EGR to manifold.

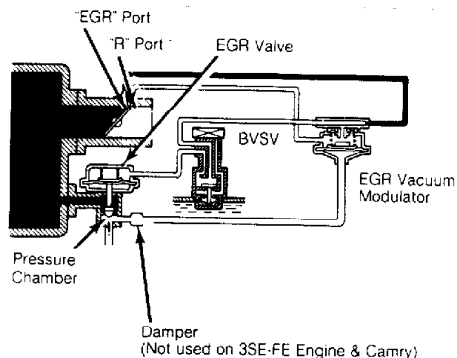


Fig. 1: Camry & Celica (2WD) EGR System  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

# EGR Vacuum Modulator EGR Valve

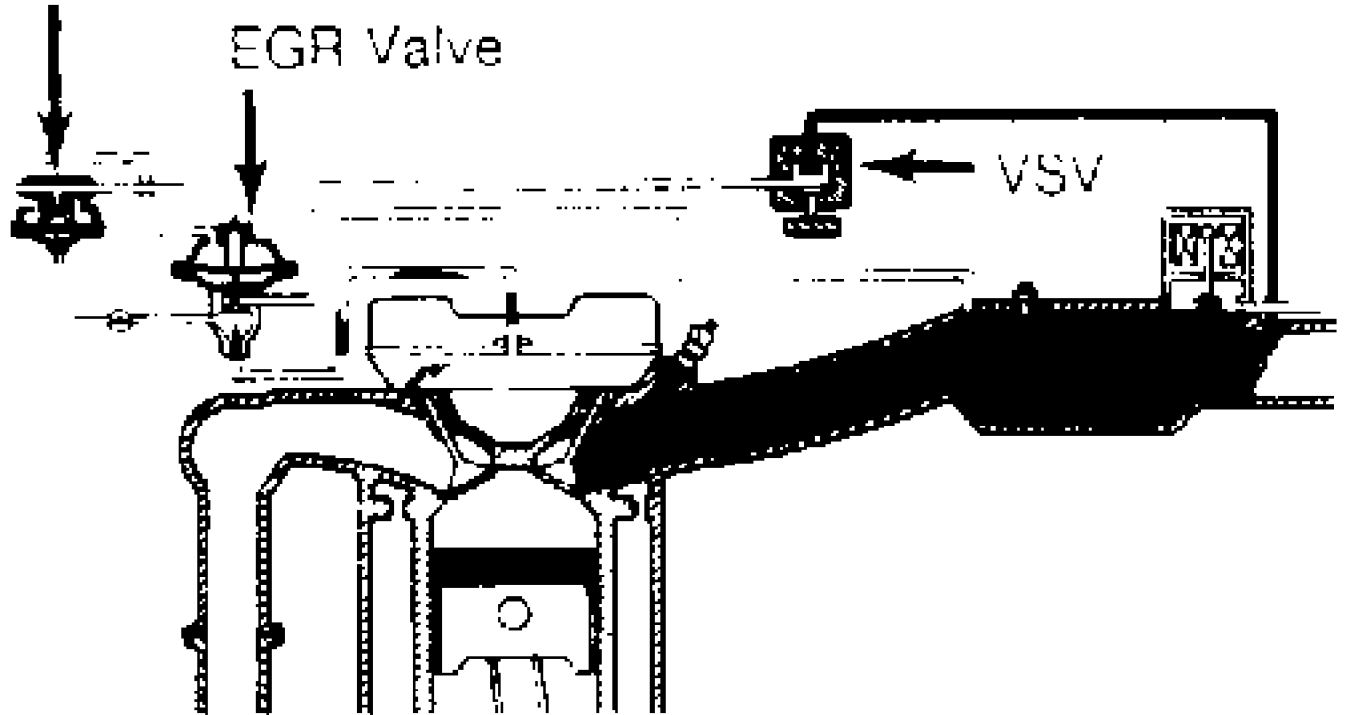


Fig. 2: Celica (4WD) EGR System  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

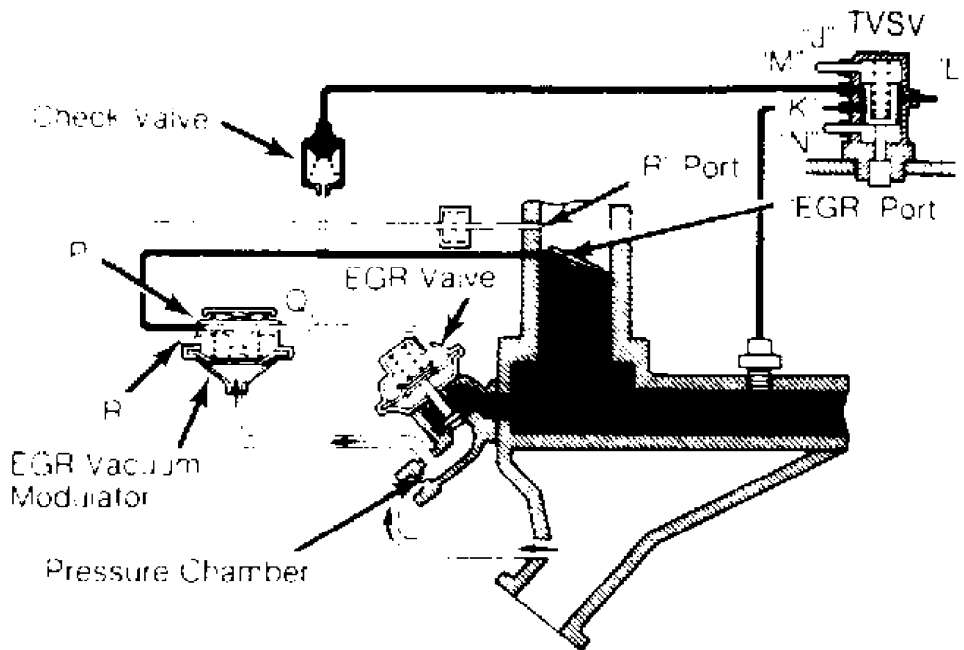


Fig. 3: Corolla FX EGR System  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

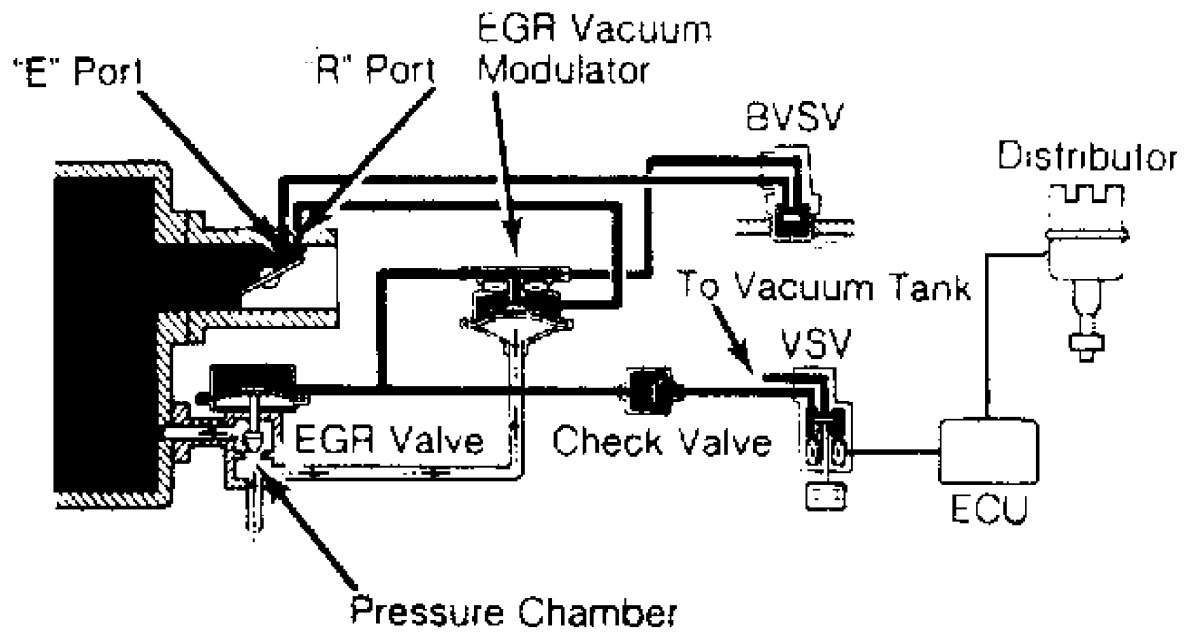


Fig. 4: Corolla (EFI), Corolla FX-16 & MR2 EGR System  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

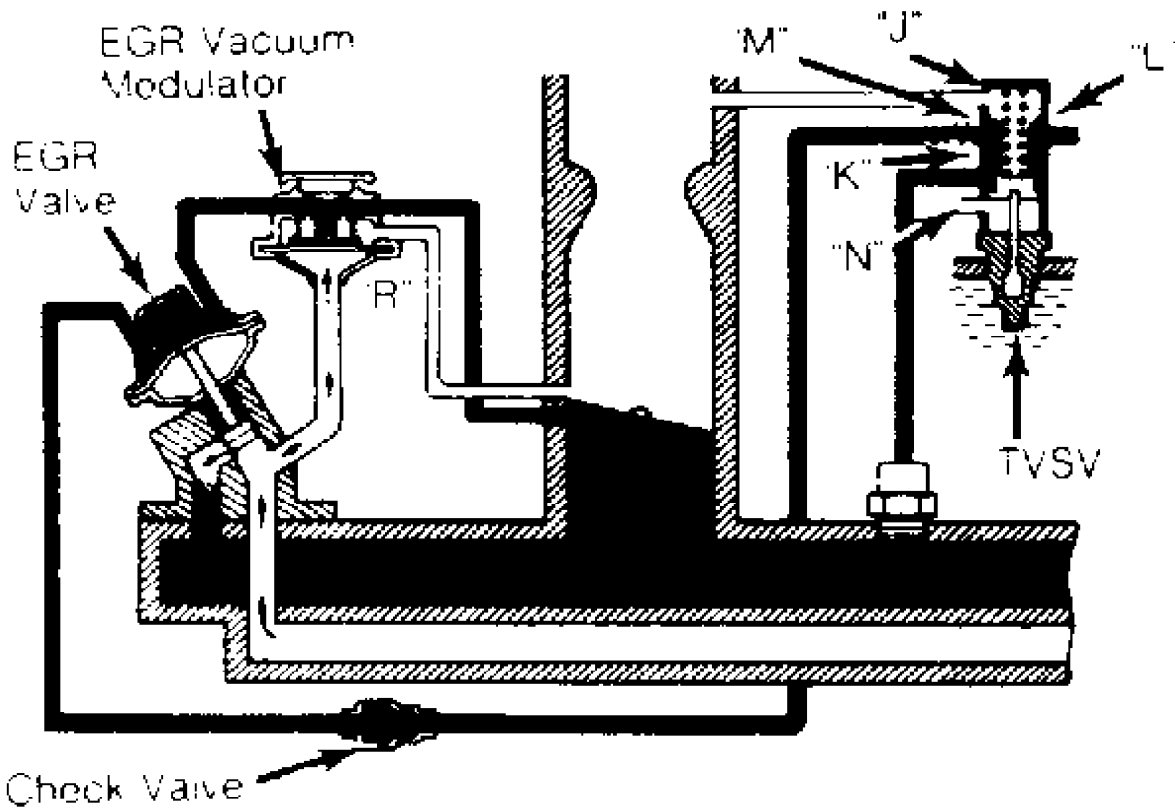


Fig. 5: Corolla EGR System (Carbureted)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

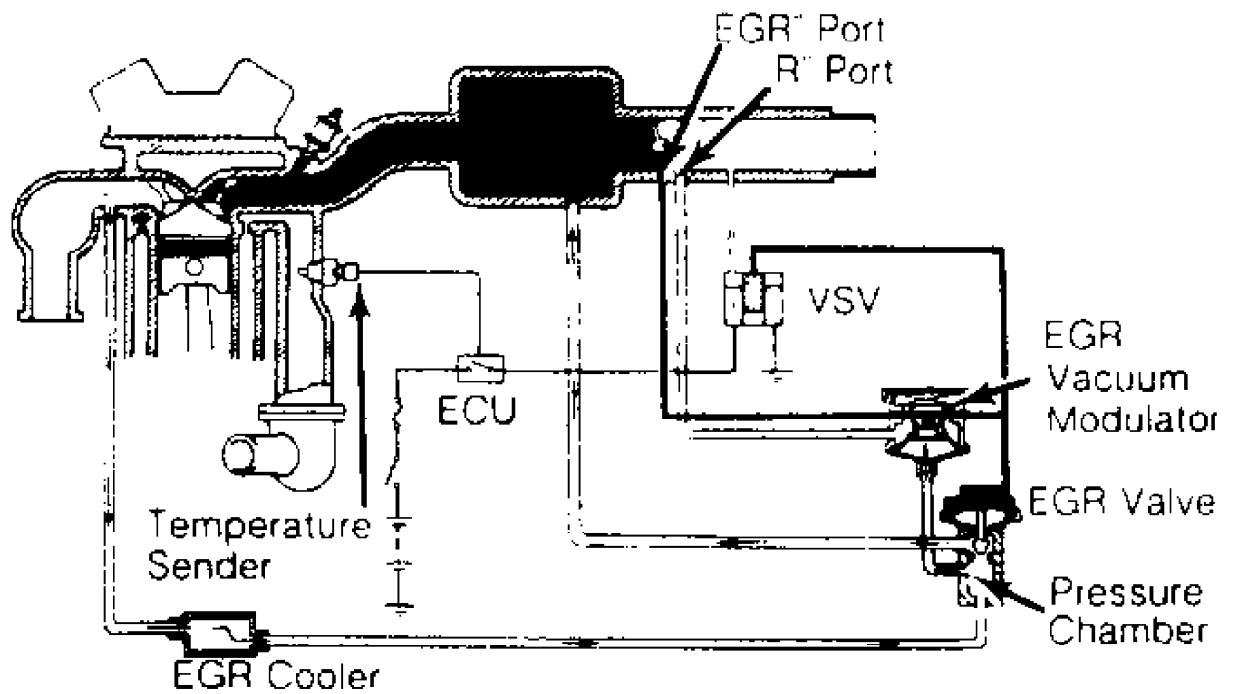


Fig. 6: Cressida EGR System  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

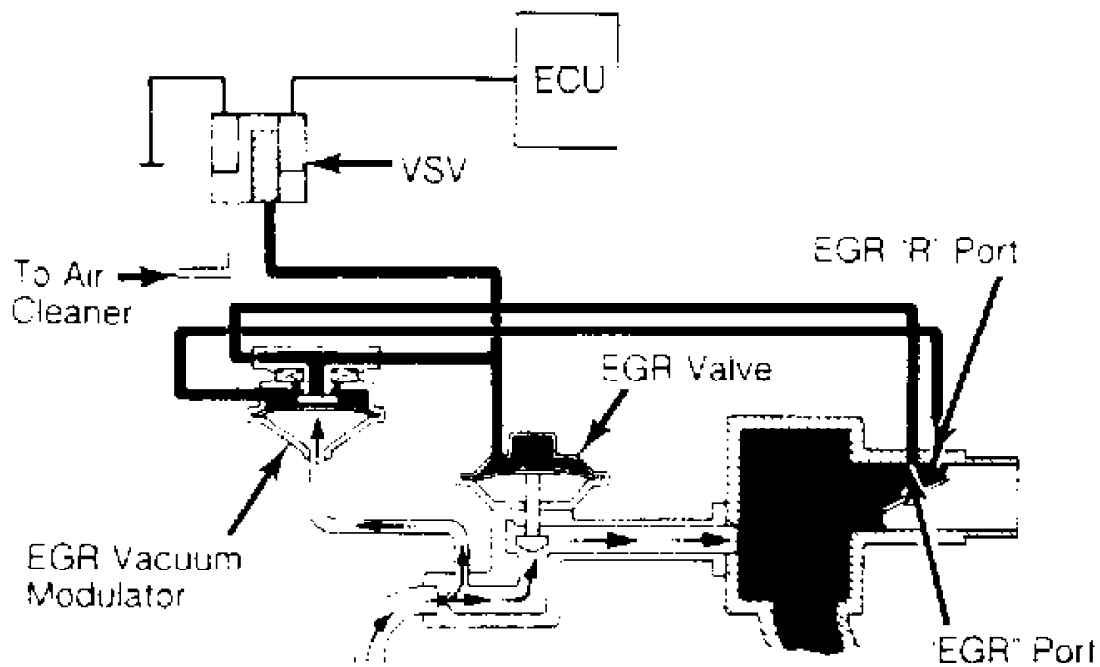


Fig. 7: Land Cruiser EGR System  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

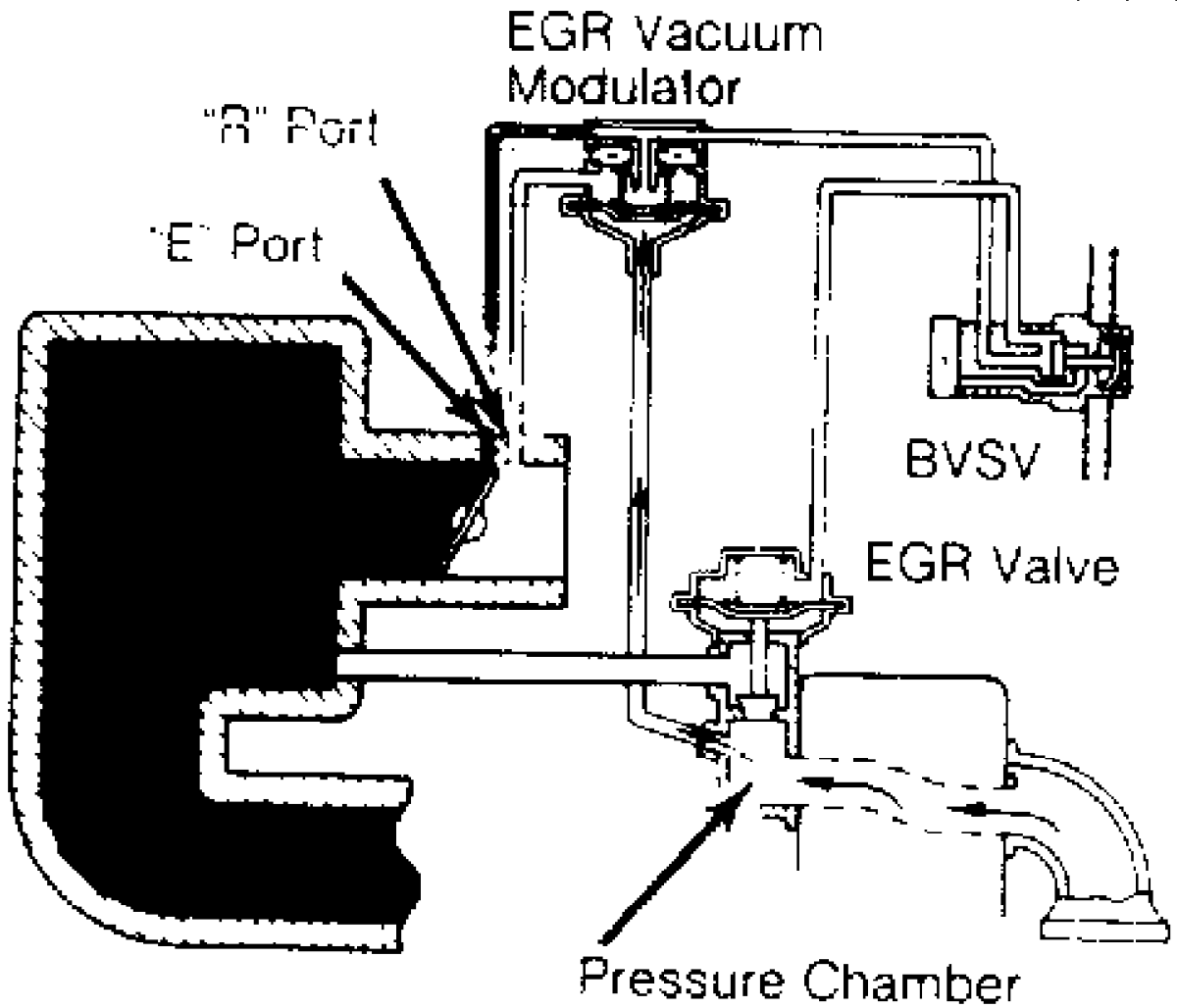


Fig. 8: Pickup & 4Runner EGR System (2.4L Non-Turbo)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

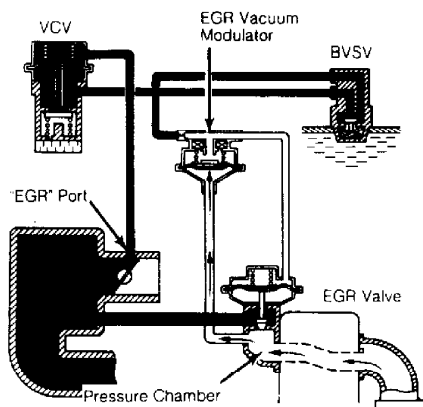


Fig. 9: Pickup EGR System (2.4L Turbo)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

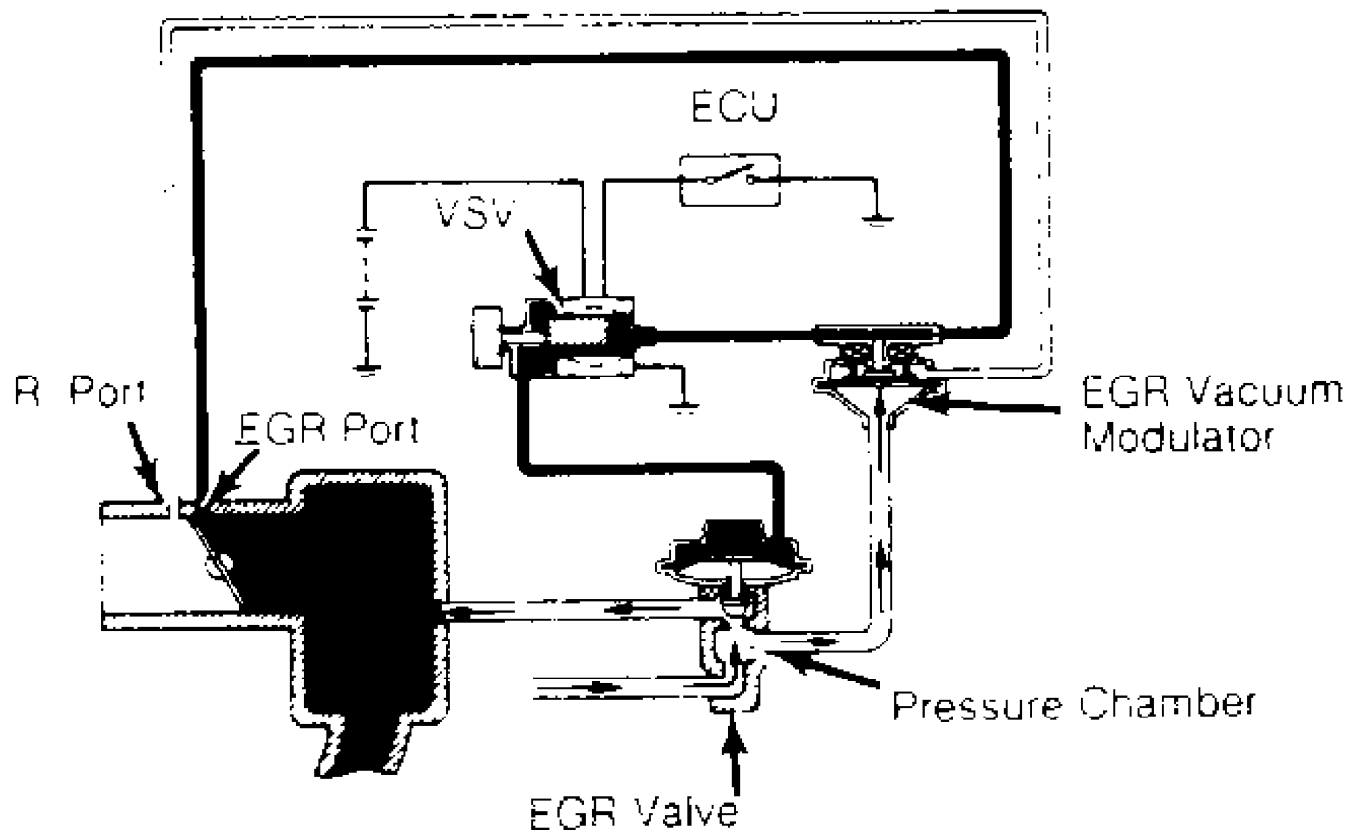


Fig. 10: Pickup & 4Runner EGR System (3.0L)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

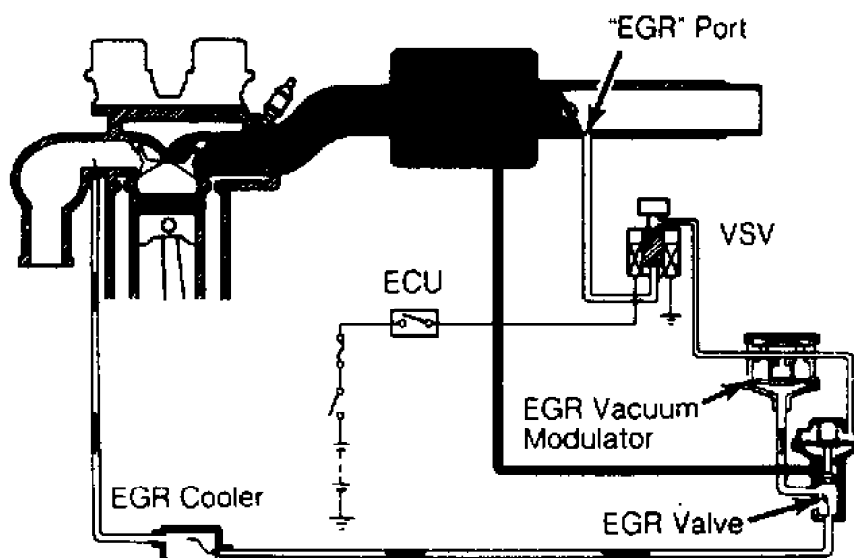


Fig. 11: Pickup EGR System (2.4L Carbureted)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

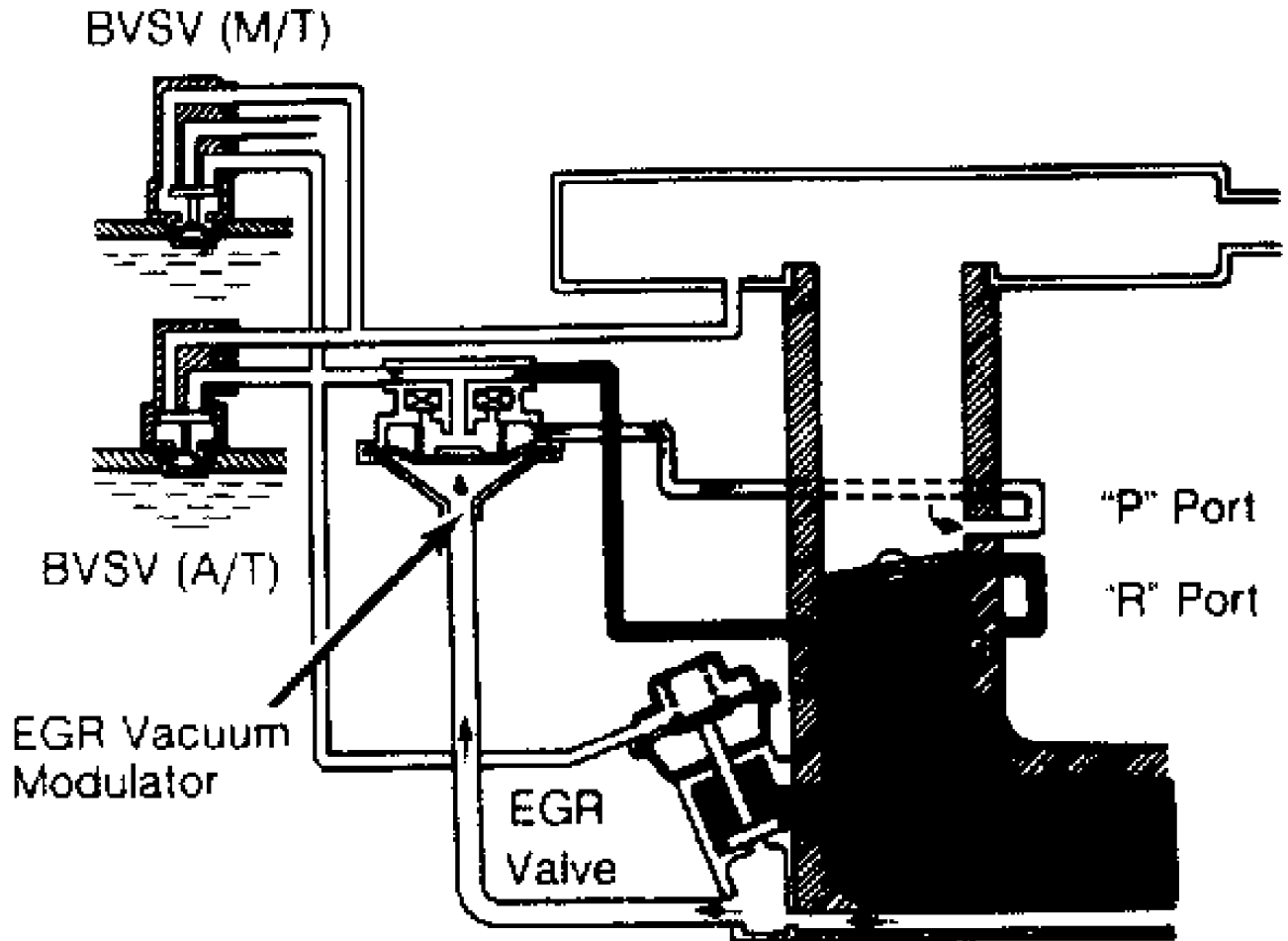


Fig. 12: Supra EGR System (Non-Turbo)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

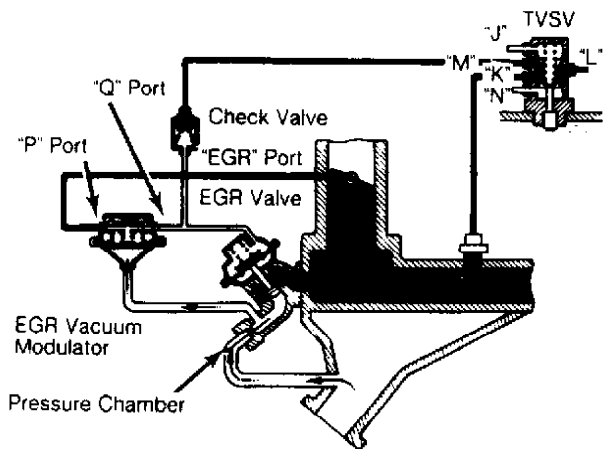


Fig. 13: Supra EGR System (Turbo)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



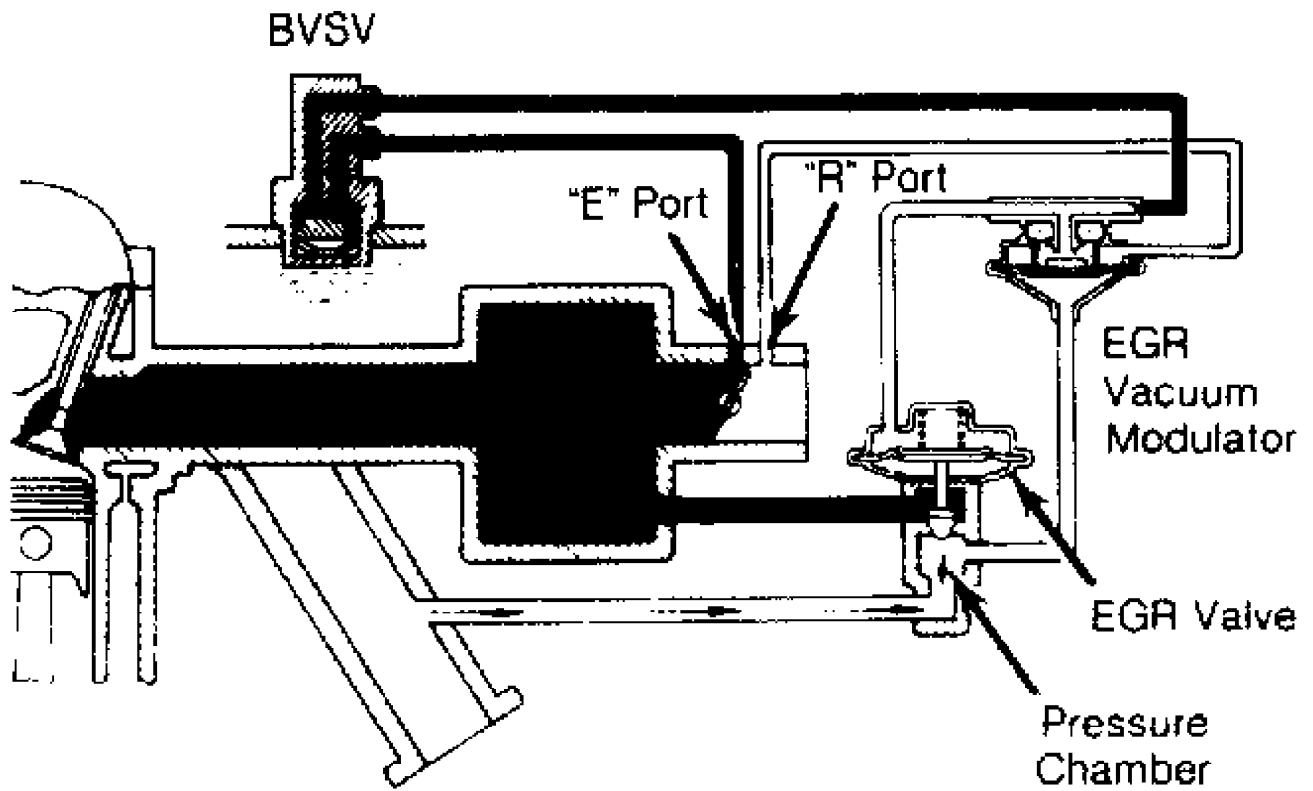


Fig. 14: Tercel Sedan EGR System  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

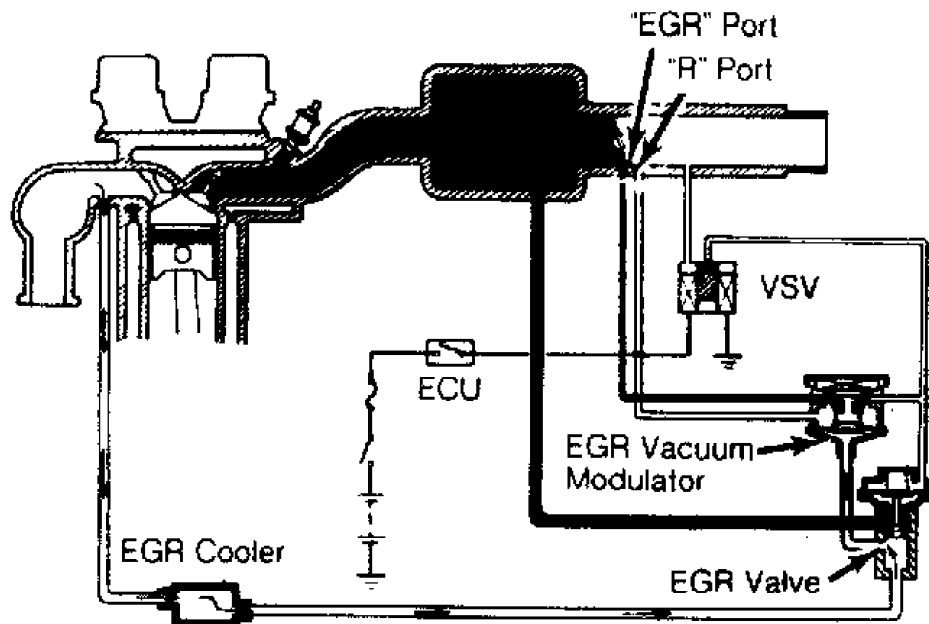


Fig. 15: Tercel Wagon EGR System  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

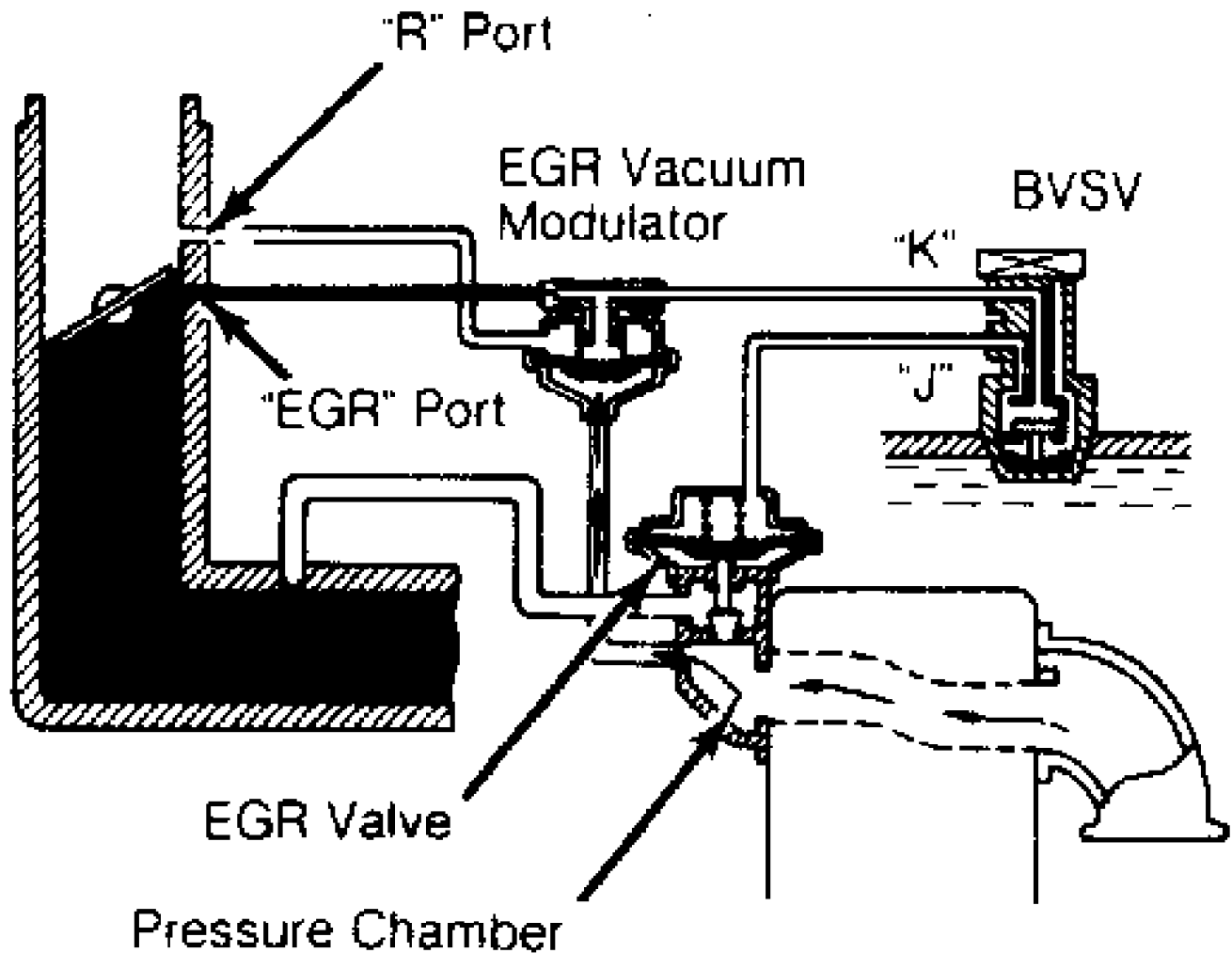


Fig. 16: Van EGR System  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

## COMPONENT TEST

### EGR VACUUM MODULATOR

- 1) EGR vacuum modulator may be a 2 port or 3 port depending on application. On 2 port models, disconnect hoses from vacuum modulator. Plug one end of hose connection on EGR vacuum modulator.
- 2) Apply air pressure through remaining port. Air should pass freely through air filter side. On 3 port models, disconnect all hoses. Block "P" and "R" ports. Apply air pressure to "Q" port. See Fig. 17. Air should pass through the air filter side freely.

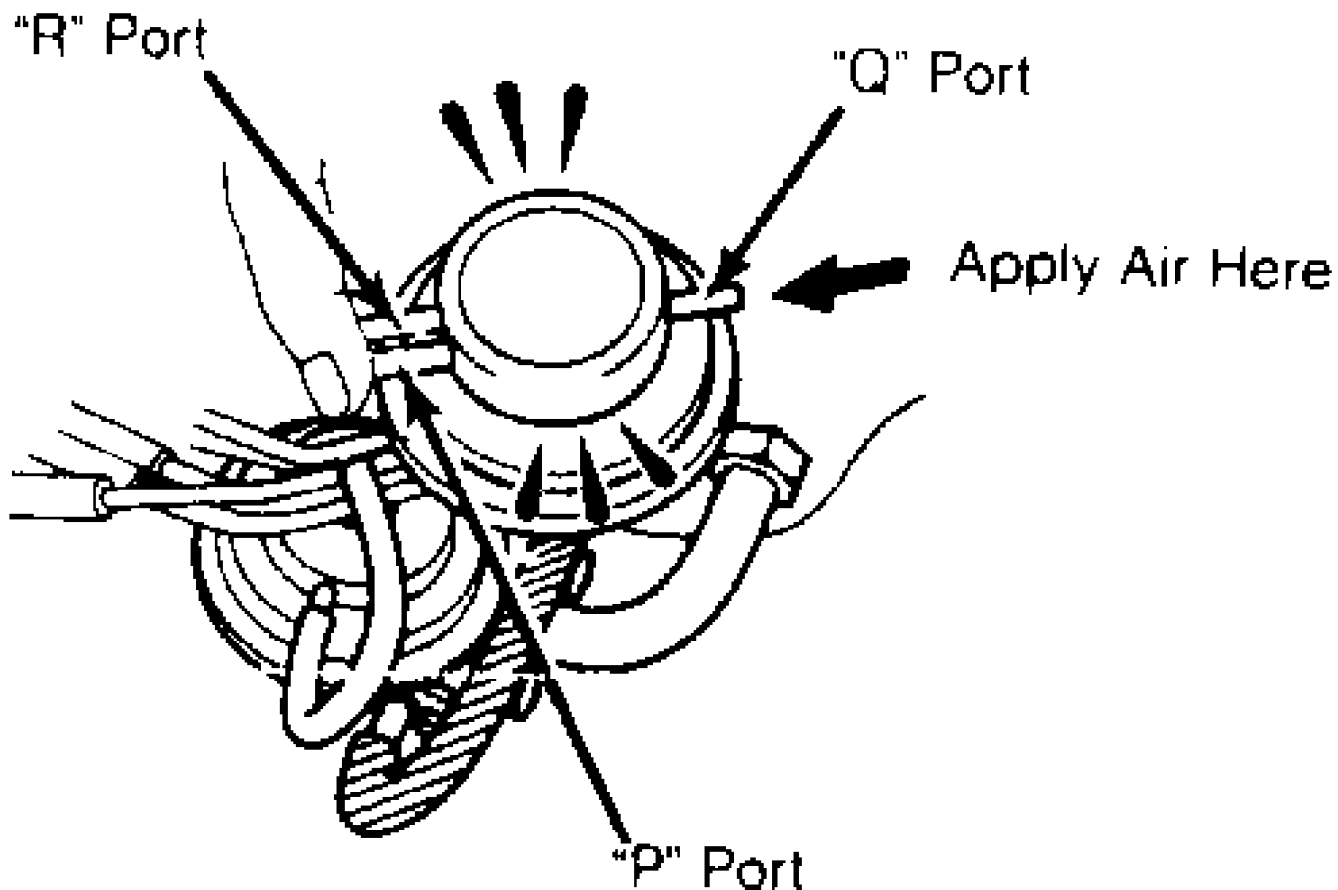


Fig. 17: Testing 3-Port Vacuum Modulator  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

3) On all models, operate engine at specified RPM. See EGR VACUUM MODULATOR SPECIFICATIONS table. Repeat previous test procedure. Strong resistance of airflow should be felt. Replace EGR vacuum modulator if resistance is not felt.

EGR VACUUM MODULATOR SPECIFICATIONS TABLE

Application	Engine RPM
2-Port Type	
Celica 4WD .....	2500
Pickup	
Turbo .....	3500
Supra	
Turbo .....	2500
Tercel Wagon .....	3000
3-Port Type	
Camry	
2.0L .....	2500
2.5L .....	3500
Celica 2WD .....	2500
Corolla	
Carbureted .....	2000
EFI .....	3500

Corolla FX .....	2000
Corolla FX-16 .....	3500
Cressida .....	2500
Land Cruiser .....	2500
MR2 .....	3500
Pickup	
2.4L Carbureted .....	3000
2.4L Non-Turbo .....	3500
3.0L .....	2500
4Runner	
2.4L .....	3500
3.0L .....	2500
Supra	
Non-Turbo .....	2500
Tercel Sedan .....	3000
Van .....	3500

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### BI-METALLIC VACUUM SWITCHING VALVE (BVSV)

Camry (2.5L), Corolla (EFI), Corolla FX-16, MR2, Pickup (Turbo), Tercel Sedan & Van

1) Drain cooling system and remove BVSV. Using cool water, cool BVSV to below minimum temperature according to application. See BVSV SPECIFICATIONS table.

2) On all models except Tercel Sedan, apply air through top port of valve. Air should not exhaust through bottom port. Heat BVSV valve to above maximum temperature according to application. See BVSV SPECIFICATIONS table. Apply air in top port. Air should exhaust through lower port. Replace assembly if defective.

3) On Tercel Sedan with M/T, a 3 port BVSV is used while a 2 port is used on A/T applications. On both applications, cool BVSV to below minimum temperature. See BVSV SPECIFICATIONS table.

4) On A/T models, apply air to top port of valve. Air should exhaust from lower port. On M/T models, apply air to the center port. Air should exhaust from the upper and lower ports.

5) Heat BVSV valve to above maximum temperature. See BVSV SPECIFICATIONS table. On A/T models, apply air to top port. Air should not exhaust through lower port. On M/T models, apply air to the center port. Air should not exhaust through any port. Replace assembly if defective.

Camry (2.0L), Pickup (2.4L Carbureted & Non-Turbo), 4Runner (2.4L EFI) & Celica (2WD)

1) Drain cooling system and remove BVSV. Cool BVSV to minimum temperature according to application using cool water. See BVSV SPECIFICATIONS table.

2) Apply air to the lower port. Air should escape from air filter located on top of valve assembly. Heat BVSV valve to maximum temperature according to application. See BVSV SPECIFICATIONS table.

3) Apply air to the lower port. Air should exhaust from the upper port but not through the air filter. Replace assembly if defective.

#### BVSV SPECIFICATIONS TABLE

Application	Minimum Temperature	Maximum Temperature
Camry		
2.0L .....	113°F (45°C)	151°F (66°C)
2.5L .....	104°F (40°C)	129°F (54°C)
Celica 2WD .....	113°F (45°C)	151°F (66°C)

Corolla (EFI) .....	95°F (35°C) .....	129°F (54°C)
Corolla FX-16 .....	95°F (35°C) .....	129°F (54°C)
Pickup		
2.4L Carbureted .....	113°F (45°C) .....	(1)
2.4L EFI & Turbo .....	86°F (30°C) .....	111°F (44°C)
MR2 .....	95°F (35°C) .....	129°F (54°C)
Tercel Sedan .....	104°F (40°C) .....	129°F (54°C)
Van 2.4L .....	104°F (40°C) .....	129°F (54°C)
4Runner 2.4L EFI .....	86°F (30°C) .....	111°F (44°C)

(1) - California models is 147°F (64°C) and 151°F (66°C) on Federal models.

### THERMOSTATIC VACUUM SWITCHING VALVE (TVSV)

Corolla (Carbureted), Corolla FX-16 & Tercel Wagon

1) Drain cooling system and remove TVSV. Cool TVSV to 45°F (7°C). Apply air pressure to port "J". See Fig. 20. Air should escape from ports "M" and "L".

2) Apply air pressure to port "K". Air should escape from port "N." Heat TVSV to 63-122°F (17-50°C). Apply air pressure to port "K". Air should escape from ports "N" and "L". Apply air pressure to port "J". Air should escape from port "M".

3) Heat TVSV to 154°F (68°C). Apply air pressure to port "K". Air should escape from ports "M" and "L". Apply air pressure to port "J". Air should not escape from any ports. Replace assembly if defective.

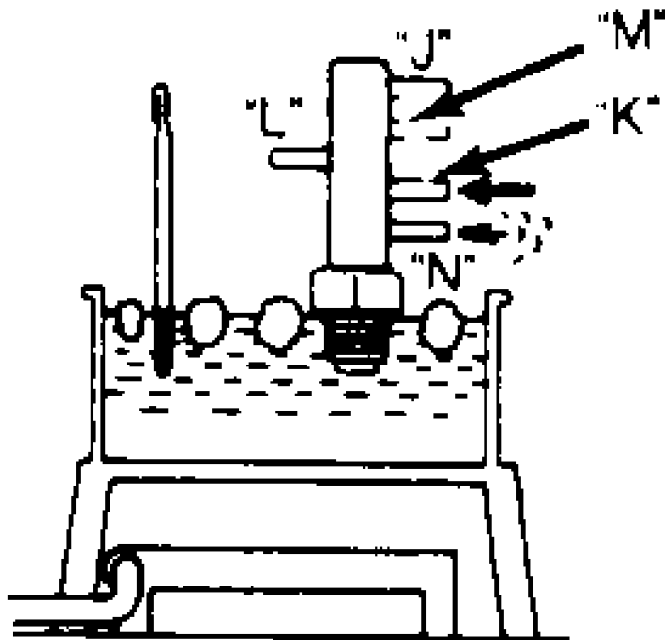


Fig. 18: Checking TVSV Operation  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

### VACUUM SWITCHING VALVE (VSV)

Corolla (EFI), Corolla FX-16, MR2 & Supra (Turbo)

1) Connect battery to VSV terminals. See Figs. 19-23. Apply air pressure to port "E". Air should escape from port "F". Disconnect battery terminals.

2) Apply air pressure to port "E". Air should now escape from air filter. Using ohmmeter, check for continuity between terminals and VSV body. Replace unit if incorrect airflow or continuity exists.

3) Using ohmmeter, measure resistance between both terminals of valve assembly. Resistance should be 38-44 ohms at 68°F (20°C) for Supra models or 33-39 ohms at 68°F (20°C) for all others. Replace valve if resistance is not within specification.

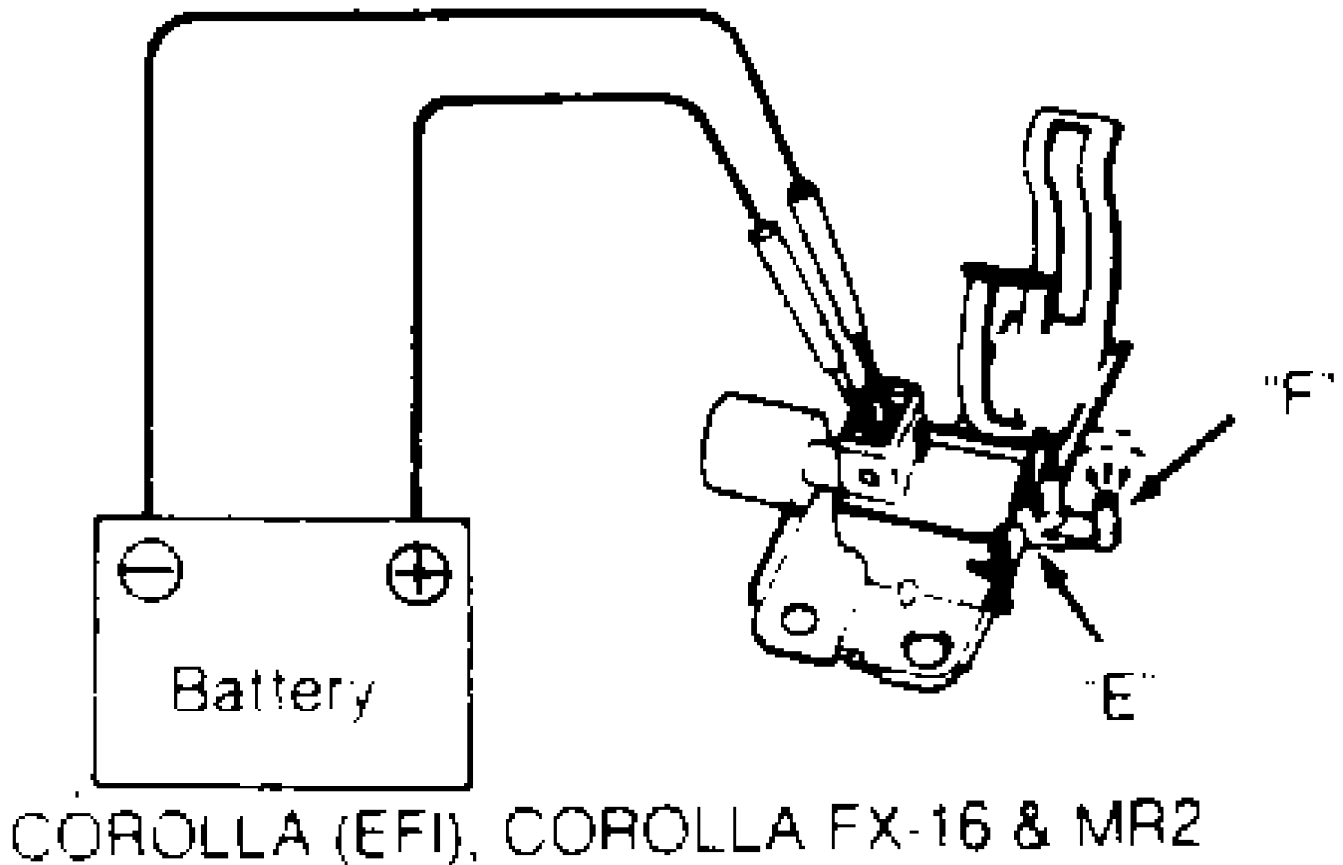


Fig. 19: Testing VSV Operation (Corolla EFI, Corolla FX-16, & MR2)  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

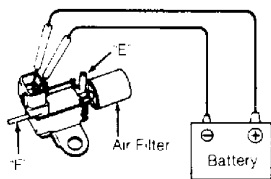
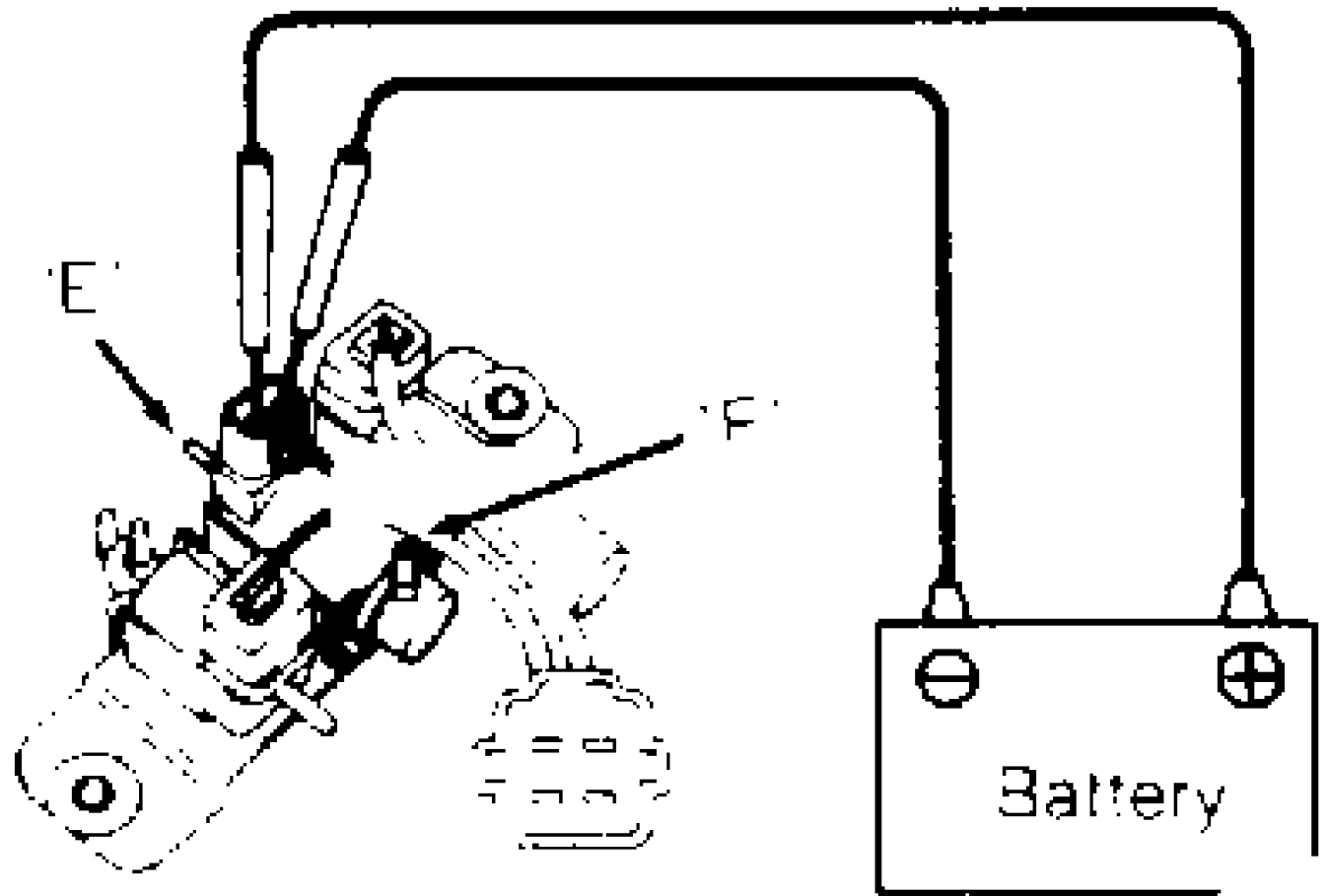
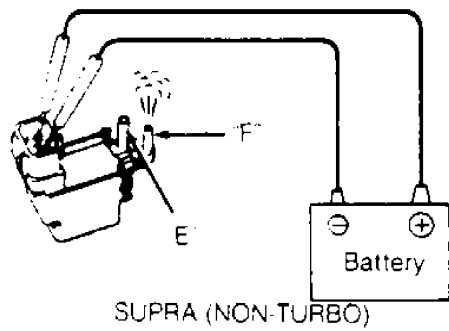


Fig. 20: Testing VSV Oper (Celica 4WD, Supra Turbo, Pickup & 4Runner 3.0L.)  
Courtesy of Toyota Motor Sales, U.S.A., Inc.



## LAND CRUISER

Fig. 21: Testing VSV Operation (Land Cruiser)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



SUPRA (NON-TURBO)

Fig. 22: Testing VSV Operation (Supra Non-Turbo)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

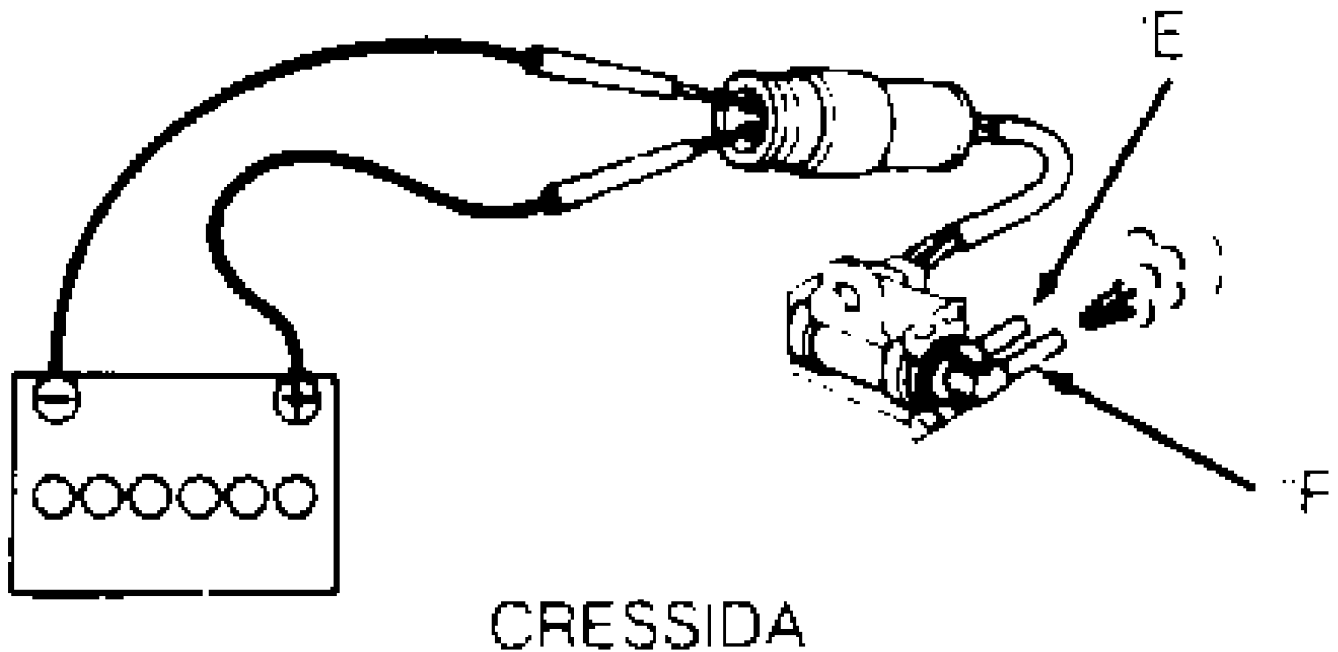


Fig. 23: Testing VSV Operation (Cressida)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

Pickup & 4Runner (3.0L)

1) Connect battery to VSV terminals. See Fig. 19. Apply air pressure to port "E". Air should escape from air filter. Disconnect battery terminals.

2) Apply air pressure to port "E". Air should now escape from port "F". Using ohmmeter, check for continuity between terminals and VSV body. Replace unit if incorrect airflow or continuity exists.

3) Using ohmmeter, measure resistance between both terminals of valve assembly. Resistance should be 30-50 ohms at 68°F (20°C). Replace valve if resistance is not within specification.

Celica (4WD) & Land Cruiser

1) Apply air pressure to port "E". Air should escape from port "F". See Fig. 19. Connect battery to VSV terminals. Apply air pressure to port "E".

2) On Celica models, air should escape from air filter. On Land Cruiser models no air should escape from port "F".

3) On Celica models, using ohmmeter, check for continuity between terminals and VSV body. Replace unit if continuity exists. Using ohmmeter, measure resistance between both terminals of valve assembly. Resistance should be 33-39 ohms. Replace valve if resistance is not within specification.

Cressida



1) Connect battery to VSV terminals. See Fig. 19. Apply air pressure to port "E". Air should escape from port "F". Disconnect battery terminals.

2) Apply air pressure to port "E". Air should not flow from port "F". Using ohmmeter, check for continuity between terminals and VSV body. Replace unit if incorrect airflow or continuity exists.

3) Using ohmmeter, measure resistance between both terminals of valve assembly. Resistance should be 38-44 ohms at 68°F (20°C). Replace valve if resistance is not within specification.

#### Supra (Non-Turbo)

1) Connect battery to VSV terminals. See Fig. 19. Apply air pressure to port "E". Air should escape from port "F". Disconnect battery terminals.

2) Apply air pressure to port "E". Air should not escape from port "F". Using ohmmeter, check for continuity between terminals and VSV body. Replace unit if incorrect airflow or continuity exists.

3) Using ohmmeter, measure resistance between both terminals of valve assembly. Resistance should be 38-44 ohms at 68°F (20°C). Replace valve if resistance is not within specification.

### VACUUM CONTROL VALVE (VCV)

#### Pickup (Turbo)

1) Using vacuum pump, apply 1.18 in. Hg to port "S". See Fig. 21. With vacuum applied air should be drawn in at port "Z". Remove vacuum supply.

2) Apply air pressure at port "Z". Air should escape through air filter. Replace valve assembly if defective.

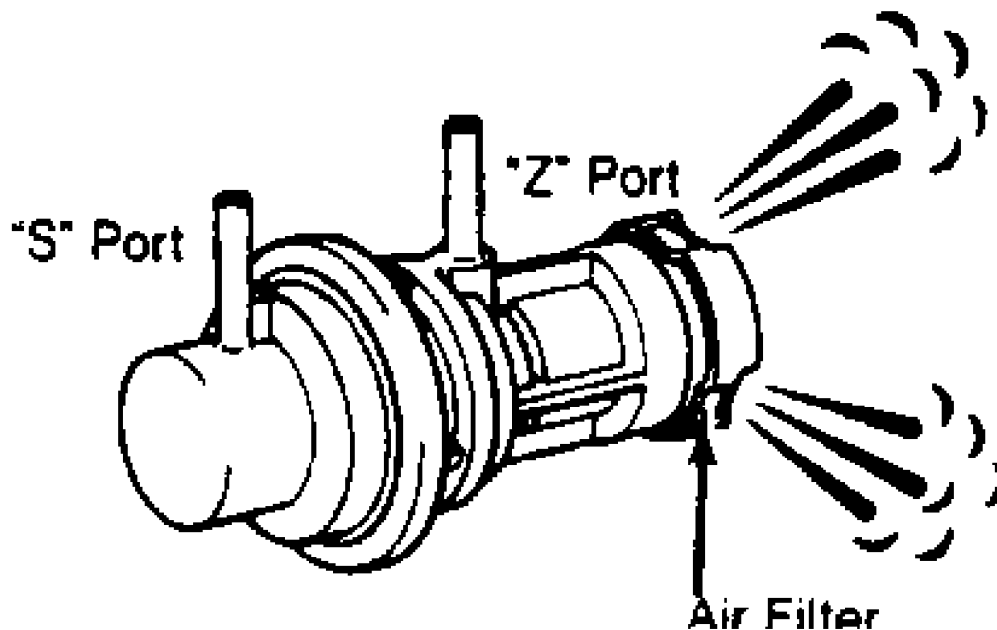


Fig. 24: Testing VCV Operation  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

### VACUUM CHECK VALVE

Apply air pressure to one side of check valve. Air pressure should flow easily in one direction and should not flow through valve when air pressure is reversed.

### COOLANT TEMPERATURE SENSOR

Cressida, MR2, Supra, Pickup & 4Runner (3.0L)

Disconnect coolant temperature sensor. Using ohmmeter, measure resistance in accordance with coolant temperature. See Fig. 25. Replace sensor if not within specification.

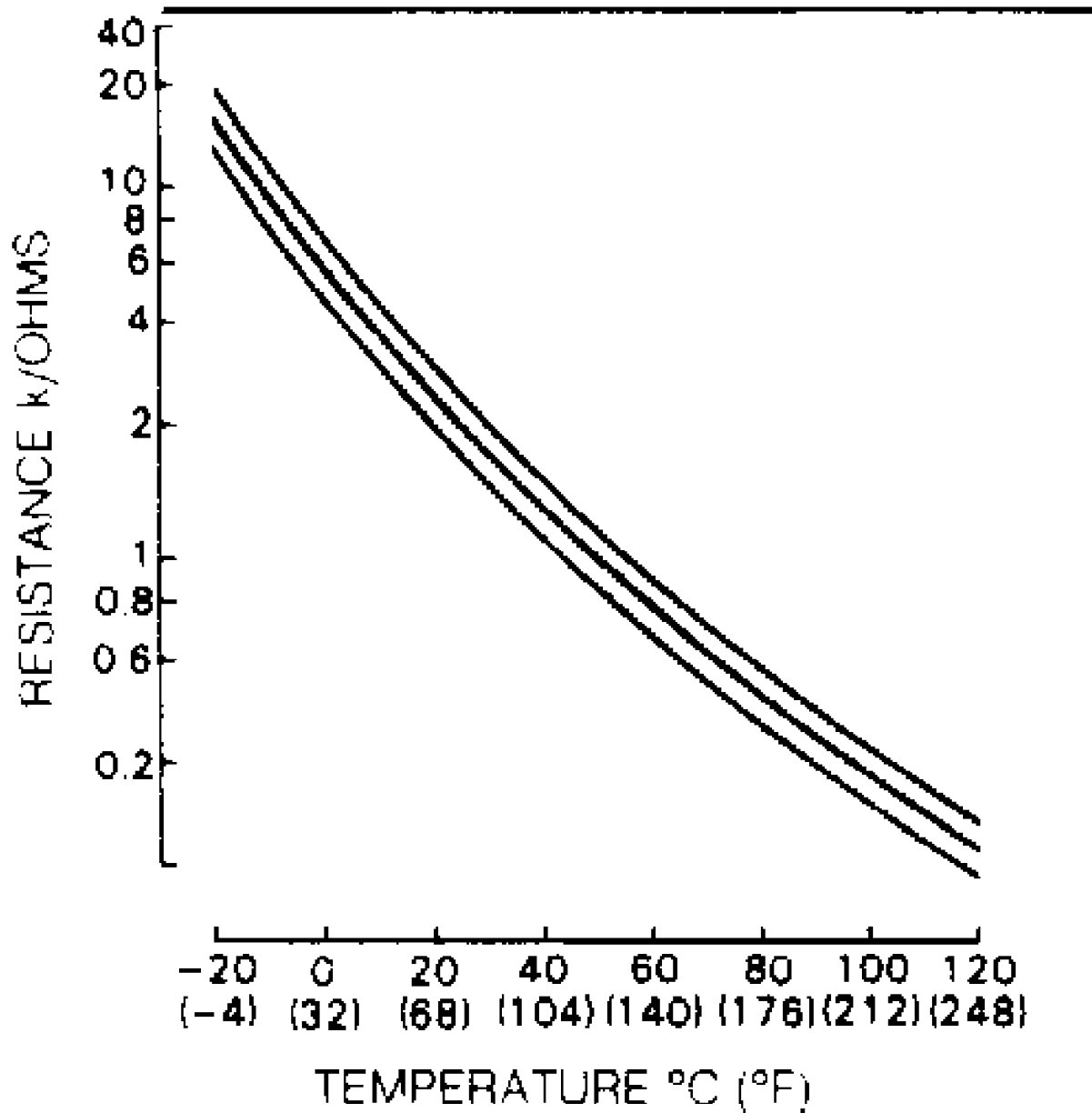


Fig. 25: Checking Coolant Temperature Sensor Resistance  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Blow through jet. Replace jet if airflow is restricted.