

I - SYSTEM/COMPONENT TESTS

1993 Toyota Celica

1993 ENGINE PERFORMANCE
Toyota System & Component Testing
Celica

INTRODUCTION

Before testing separate components or systems, perform procedures in F - BASIC TESTING article. Since many computer-controlled and monitored components set a trouble code if they malfunction, also perform procedures in G - TESTS W/CODES article.

NOTE: Testing individual components does not isolate shorts or opens. Perform all voltage tests with a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance, unless stated otherwise in test procedure. Use ohmmeter to isolate wiring harness shorts or opens.

NOTE: When testing some systems, tachometer may be required. Tachometer must be connected to proper terminals. For tachometer connections, see IDLE SPEED & MIXTURE in D - ADJUSTMENTS article.

AIR INDUCTION SYSTEMS

TURBOCHARGERS (CELICA & MR2)

Initial Checks

1) Check air intake system for cracks or restrictions.
Inspect exhaust system for leaks or restrictions.
2) Check air intake system and exhaust system for signs of oil leaks from turbocharger. Oil leaks can be caused by worn oil seals in turbocharger.

Wastegate Actuator

1) Disconnect hose from wastegate actuator. Using Pressure Gauge/Pump (SST 09992-00241), apply approximately 9.4 psi (.66 kg/cm²) of pressure to wastegate actuator. See Fig. 1. Ensure wastegate actuator rod moves.
2) Replace turbocharger assembly if wastegate actuator rod does not move. Remove pressure gauge/pump and reconnect hose.

CAUTION: DO NOT apply more than 11.4 psi (.8 kg/cm²) pressure to wastegate actuator.

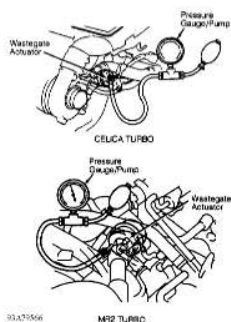


Fig. 1: Checking Wastegate Actuator (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

NOTE: Turbo pressure may be referred to as boost pressure. Tachometer is required when checking turbo pressure. If installing tachometer, ensure it is connected to proper terminals. For tachometer connections, see IDLE SPEED & MIXTURE in D - ADJUSTMENTS article.

Turbo Pressure Check

1) Ensure intake air hoses are connected. Install hose, "T" fitting and pressure gauge between intake manifold and turbocharging pressure sensor. See Fig. 2.

2) Drive vehicle with engine at 2800 RPM or more with throttle fully open and transaxle in 2nd gear (Celica) or 3rd gear (MR2), and note turbo pressure. Turbo pressure should be 7.1-11.8 psi (.50-.83kg/cm²).

3) If turbo pressure is less than specified, check intake air and exhaust systems for leaks. If no leaks exist, replace turbocharger. If turbo pressure exceeds specification, check wastegate actuator hose for leaks or cracks. If no leaks or cracks exist, replace turbocharger. Remove test equipment.

NOTE: Ensure turbocharging pressure sensor and vacuum switching valve are okay. For testing procedures, see ENGINE SENSORS & SWITCHES.

Impeller Wheel Rotation

Disconnect air cleaner hose. Rotate impeller wheel in air intake side of turbocharger and verify smooth rotation. Replace turbocharger if impeller wheel binds, drags or does not rotate smoothly.

Turbine Shaft End Play & Radial Play

1) Disconnect intake and exhaust hoses and pipes from turbocharger. Disconnect oil drain tube from turbocharger.

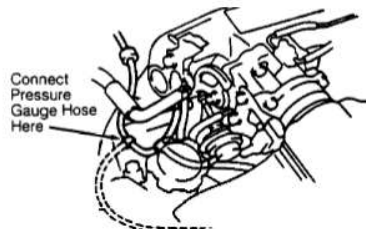
2) Install dial indicator with stem resting against end of shaft on impeller wheel (intake side). Push turbine wheel (exhaust) side of shaft toward dial indicator and zero dial indicator. Push impeller wheel (intake side) away from dial indicator, and note end play reading on dial indicator.

3) Remove dial indicator and reinstall with stem extending into oil drain tube hole and against center of turbine shaft. Pull impeller wheel (intake side) and turbine wheel upward toward dial indicator and zero dial indicator.

4) Push impeller wheel and turbine wheel downward and note radial play reading on dial indicator. Replace turbocharger if end play or radial play exceeds specification. See TURBOCHARGER SPECIFICATIONS table. Reinstall oil drain tube, intake and exhaust hoses, and pipes.

TURBOCHARGER SPECIFICATIONS TABLE

Measurement	In. (mm)
End Play	.0051 (.130)
Radial Play	.0071 (.180)



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CELICA TURBO

Fig. 2: Checking Turbo Pressure (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

VARIABLE INDUCTION SYSTEMS

NOTE: Tachometer may need to be installed when checking variable induction system. Ensure tachometer is connected to proper terminals. For tachometer connections, see IDLE SPEED & MIXTURE in D - ADJUSTMENTS article.

System Operation

1) Warm engine to normal operating temperature. Shut engine off. Using vacuum "T", install vacuum gauge in vacuum line between variable induction Vacuum Switching Valve (VSV) and variable induction vacuum actuator. Variable induction VSV is located below intake manifold, near cylinder block. See Fig. 3.

NOTE: Variable induction VSV may also be referred to as the T-VIS VSV.

2) Start engine. Vacuum gauge should indicate high vacuum at idle. Note that variable induction vacuum actuator rod moves inward so valves on variable induction system close.

3) Increase engine speed to greater than 4200 RPM. No vacuum should be indicated on vacuum gauge. Variable induction vacuum actuator rod should move outward so valves are open. If system operates correctly, all components are okay. If vacuum reading was obtained at idle, but variable induction vacuum actuator does not operate, check variable induction vacuum actuator.

4) If no vacuum reading was obtained at idle, check vacuum supply to vacuum tank. Vacuum tank is located below intake manifold. See Fig. 3.

5) If no vacuum supply exists, check vacuum hoses and circuit. If vacuum supply is okay, check vacuum tank, variable induction VSV and all hoses. If components are okay, check wiring circuit for variable induction VSV. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

6) On Celica Turbo, Engine Control Module (ECM) controls variable induction VSV ground circuit on Blue/Green wire. ECM is located at bottom center of dash, in front of console. Power is supplied to VSV through EFI main relay.

8) If necessary to check EFI main relay, see EFI MAIN RELAY under RELAYS. Repair as necessary and recheck system operation.

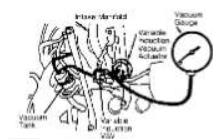
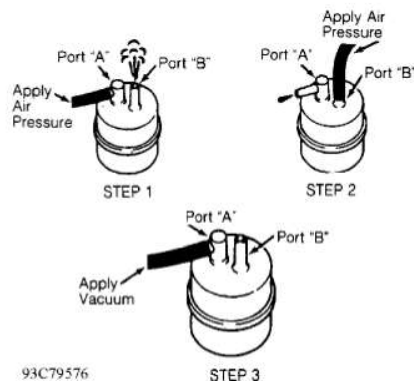


Fig. 3: Component ID & Checking Variable Induction System (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Vacuum Tank

1) Disconnect vacuum hoses from vacuum tank, located below intake manifold. See Fig. 3. Apply air pressure to port "A" on vacuum tank. Ensure air passes out port "B". Perform STEP 1. See Fig. 4. Apply air pressure to port "B". Ensure air does not pass out port "A". Perform STEP 2. See Fig. 4.

2) Using vacuum pump, apply approximately 20 in. Hg of vacuum to port "A". Perform STEP 3. See Fig. 4. Ensure vacuum reading will hold for at least one minute. Replace vacuum tank if defective. Remove vacuum pump. Reconnect vacuum hoses.



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Fig. 4: Checking Vacuum Tank (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

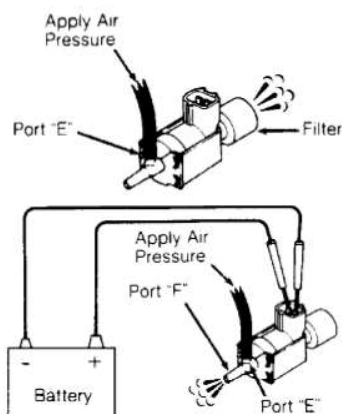
NOTE: Variable induction VSV may also be referred to as T-VIS VSV.

Variable Induction Vacuum Switching Valve (VSV)

1) Disconnect electrical connector variable induction VSV, located below intake manifold, near cylinder block. See Fig. 3.

2) Using ohmmeter, ensure continuity exists between electrical terminals on VSV and resistance is 33-39 ohms. Check that no continuity exists between each electrical terminal and body of VSV.

3) Apply air pressure to port "E" and ensure air passes out filter. See Fig. 5. Connect battery voltage and ground to VSV terminals. Apply air pressure to port "E". Ensure air passes out port "F". See Fig. 5. Replace VSV if defective.



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Fig. 5: Checking Variable Induction VSV (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Variable Induction Vacuum Actuator

1) Disconnect vacuum hose at variable induction vacuum

actuator. See Fig. 3. Using vacuum pump, apply about 16 in. Hg of vacuum to variable induction vacuum actuator. Ensure vacuum actuator rod pulls inward and valves move to closed position.

2) Release vacuum and note that variable induction vacuum actuator rod moves quickly outward so valves are open. Replace variable induction vacuum actuator if defective. Remove vacuum pump. Reconnect vacuum hose.

ENGINE SENSORS & SWITCHES

NOTE: Airflow meter may be referred to as Volume Airflow (VAF) meter or Mass Airflow (MAF) meter.

 Airflow Meter (Except 1.6L 4A-FE & 2.2L 5S-FE)

1) Turn ignition off. Disconnect electrical connector from airflow meter. Note airflow meter terminal identification. See Fig. 6.

2) Using ohmmeter, measure resistance between specified terminals. See AIRFLOW METER RESISTANCE SPECIFICATIONS table. Replace airflow meter if resistance is not within specification.

3) On Supra Turbo models, check airflow meter operation. Ensure electrical connector is installed on airflow meter.

4) Connect voltmeter leads to proper terminals on airflow meter with electrical connector installed. Apply air into airflow meter and note voltage reading.

5) While air is being applied, voltage reading should fluctuate. Replace airflow meter if voltage reading was not obtained. Remove voltmeter.

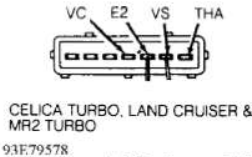


Fig. 6: Identifying Airflow Meter Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

AIRFLOW METER RESISTANCE SPECIFICATIONS TABLE

Application & Terminals	Ohms
Turbo	
E2-VC	200-400
E2-THA	
-4°F (20°C)	10,000-20,000
32°F (0°C)	4000-7000
68°F (20°C)	2000-3000
104°F (40°C)	900-1300
140°F (60°C)	400-700
E2-VS	
Measuring Plate Fully Closed	200-600
Measuring Plate Fully Opened	20-1200

NOTE: Air temperature sensor may be referred to as intake air temperature sensor.

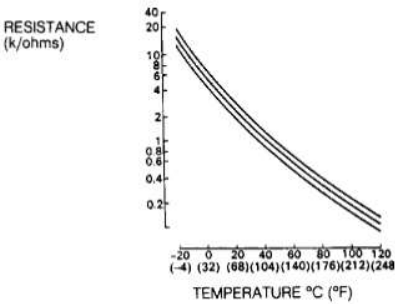
 Air Temperature Sensor (1.6L 4A-FE & 2.2L 5S-FE)

1) Ensure ignition is off. Disconnect electrical connector from air temperature sensor. Air temperature sensor is located in air intake, near air filter.

2) Remove air temperature sensor. Place threaded end of air temperature sensor and thermometer in container of water. Attach

ohmmeter between air temperature sensor electrical terminals.

3) Heat water and note that resistance is within specification in relation to temperature. See Fig. 7. Replace air temperature sensor if defective.



CAMRY 2.2L, CELICA 1.6L 4A-FE & 2.2L 5S-FE,
PASEO & TERCEL 931379583

Fig. 7: Testing Air Temperature Sensor
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Cold Start Injector Time Switch (Turbo)

- 1) Ensure ignition is off. Disconnect electrical connector from cold start injector time switch.
- 2) Cold start injector time switch is located in engine coolant passage near cylinder head or thermostat housing. To verify wire colors for proper identification, see appropriate wiring diagram in L - WIRING DIAGRAMS article.

NOTE: Cold start injector time switch may also be identified using appropriate illustration in E - THEORY/OPERATION article.

3) Note cold start injector time switch terminal identification. See Fig. 8. Using ohmmeter, measure resistance at designated switch terminals at specified temperature. See COLD START INJECTOR TIME SWITCH RESISTANCE SPECIFICATIONS table. Replace cold start injector time switch if resistance is not within specification.

COLD START INJECTOR TIME SWITCH RESISTANCE SPECIFICATIONS TABLE

Application & Terminals	Temperature °F (°C)	Ohms
Turbo		
STA-STJ	Less Than 50 (10)	30-50
	Greater Than 77 (25)	70-90
STA-Ground		30-90

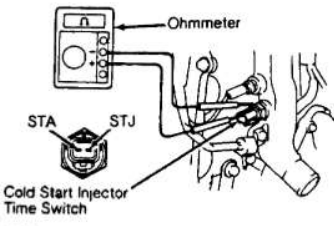


Fig. 8: Testing Typical Cold Start Injector Time Switch
Courtesy of Toyota Motor Sales, U.S.A., Inc.

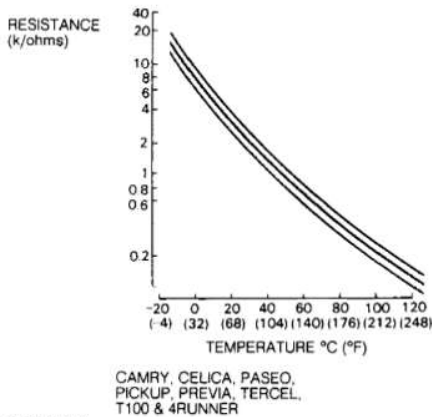
NOTE: Coolant temperature sensor may also be referred to as Engine Coolant Temperature (ECT) sensor.

Coolant Temperature Sensor (CTS)

1) Ensure ignition is off. Disconnect electrical connector from CTS. CTS is located in engine coolant passage near cylinder head or thermostat housing. To verify wire colors for proper identification, see appropriate wiring diagram in L - WIRING DIAGRAMS article.

NOTE: The CTS may be also identified using appropriate illustration in E - THEORY/OPERATION article.

2) Using ohmmeter, check resistance between CTS electrical terminals. Resistance should be within specification at designated temperature. See Fig. 9. Replace CTS if resistance is not within specification.



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Fig. 9: Checking Coolant Temperature Sensor
Courtesy of Toyota Motor Sales, U.S.A., Inc.

EGR Gas Temperature Sensor

1) Remove EGR gas temperature sensor from side of EGR valve. Place threaded end of sensor and thermometer in container of water.

2) Attach ohmmeter to electrical terminals. Heat water and note resistance at specified temperature. See EGR GAS TEMPERATURE SENSOR SPECIFICATIONS table. Replace EGR gas temperature sensor if resistance is not within specification.

EGR GAS TEMPERATURE SENSOR SPECIFICATIONS TABLE

Temperature °F (°C)	k/ohms
122 (50)	69-89
212 (100)	11-15
302 (150)	2-4

Intake Air Temperature Sensor (1.6L 4A-FE & 2.2L 5S-FE)
See AIR TEMPERATURE SENSOR under ENGINE SENSORS & SWITCHES.

Knock Sensor (2.0L Turbo & 2.2L 5S-FE)
Information for testing of knock sensor is not available from manufacturer. Use diagnosis in trouble Code 52 and 53 charts. Some models only have trouble Code 52. For trouble code charts, see G - TESTS W/CODES article.

Manifold Absolute Pressure (MAP) Sensor
See VACUUM SENSOR under ENGINE SENSORS & SWITCHES.

Park/Neutral Switch

Disconnect electrical connector from park/neutral switch at transmission or transaxle. Note terminal identification. See Figs. 10 and 11. Using ohmmeter, check for continuity at specified terminals with gearshift in proper positions. See PARK/NEUTRAL SWITCH SPECIFICATIONS table. Replace switch if defective.

PARK/NEUTRAL SWITCH SPECIFICATIONS TABLE

Application & Gearshift Position	Terminal Continuity
2.2L 5S-FE	
Park	2 & 3, 1 & 6
Reverse	5 & 6
Neutral	2 & 3, 6 & 7
Drive	6 & 8
2	6 & 9
Low	4 & 6
1.6L 4A-FE	
Park	"B" & "N"
Reverse	RB & RL
Neutral	"B" & "N"

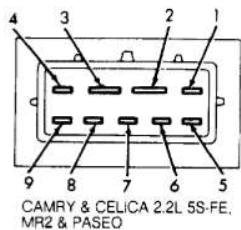


Fig. 10: Park/Neutral Switch Terminal ID (2.2L 5S-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



Fig. 11: Park/Neutral Switch Terminal ID (1.6L 4A-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Oxygen Sensor Feedback Voltage Test

1) Warm engine to normal operating temperature. Connect analog voltmeter to terminals VF1 and E1 of Data Link Connector No. 1 (DLC1). See Fig. 12. Perform test procedures listed. See Figs. 13 & 14.

2) Depending on model application, some vehicles may be equipped with a main oxygen sensor, sub-oxygen sensor and a sensor heater. See OXYGEN SENSOR APPLICATION table.

NOTE: Diagnostic trouble Codes 21, 25, 26, 27 and 28 (some models) are oxygen sensor circuit codes. For trouble code charts, see G - TESTS W/CODES article.

OXYGEN SENSOR APPLICATION TABLE

Application	Main Oxygen Sensor	Sub-Oxygen Sensor	Sensor Heater
1.6L 4A-FE	X		(2) X
2.0L Turbo	X		(3) X
2.2L 5S-FE	X	(1) X	

(1) - Applies to California models.
(2) - Heater used on all except California models.
(3) - Heater used on main oxygen sensor.

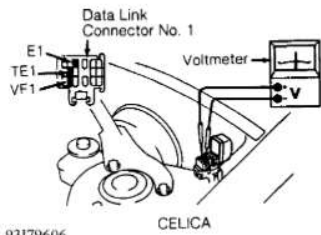


Fig. 12: Using Voltmeter For Testing Oxygen Sensor Feedback Voltage
Courtesy of Toyota Motor Sales, U.S.A., Inc.

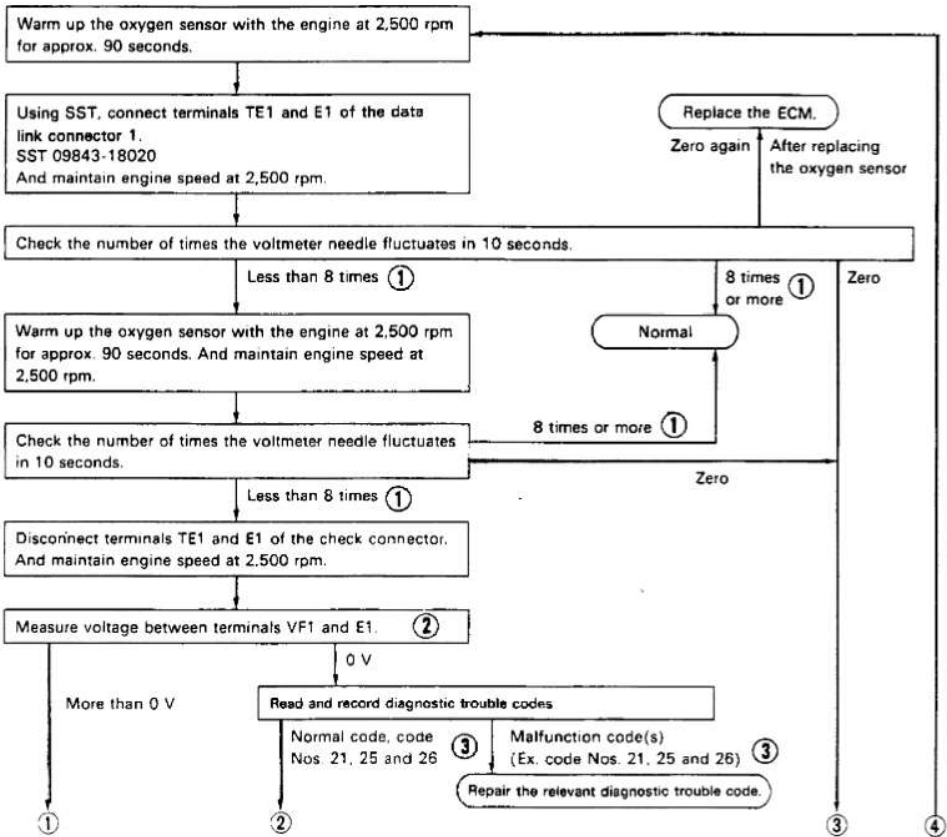


Fig. 13: Performing Oxygen Sensor Feedback Voltage Test (1 Of 2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

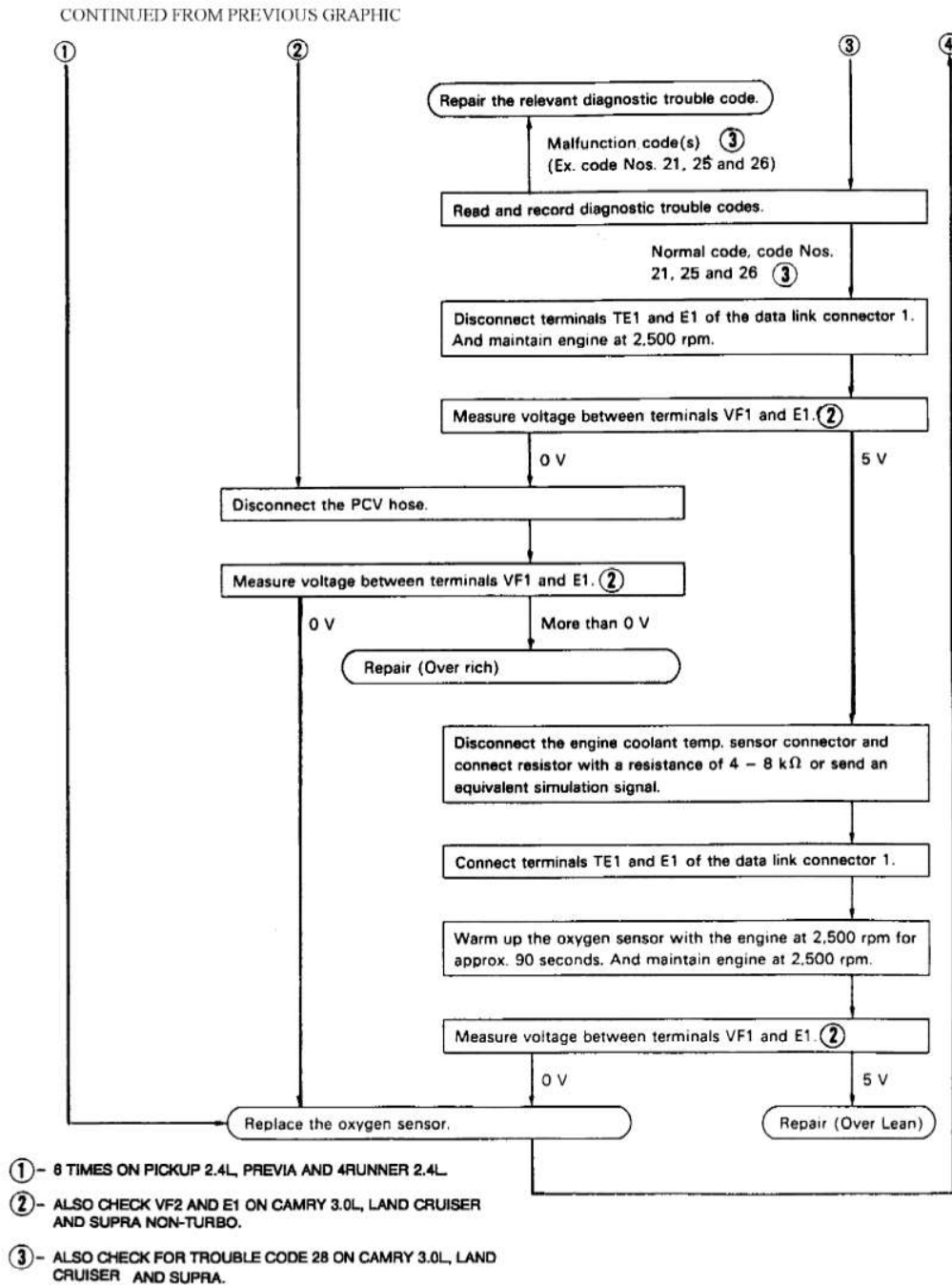


Fig. 14: Performing Oxygen Sensor Feedback Voltage Test (2 Of 2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

NOTE: Sub-oxygen sensor may be used only on California applications on some models. See OXYGEN SENSOR APPLICATION table.

Sub-Oxygen Sensor (2.2L 5S-FE)

1) Warm engine to normal operating temperature. Check Engine Control Module (ECM) for stored diagnostic trouble code(s). See

RETRIEVING TROUBLE CODES in G – TESTS W/CODES article. If sub-oxygen sensor or circuit fails, a trouble Code 27 will set in ECM memory. Clear codes if present. See CLEARING TROUBLE CODES in G – TESTS W/CODES article.

2) Drive vehicle between 50 and 62 MPH for at least 5 minutes in 4th or 5th gear (M/T) or Drive (A/T).

CAUTION: DO NOT drive vehicle at speeds exceeding 62 MPH, or trouble code will be cancelled.

3) On all other models, drive vehicle at speeds less than 50 MPH for at least 5 minutes in 4th or 5th gear (M/T) or Drive (A/T). On all models, fully depress accelerator pedal for at least 2 seconds.

4) Stop engine and turn ignition off. Repeat steps and note if trouble Code 27 exists again. If trouble Code 27 exists again, check sub-oxygen sensor circuit for continuity, shorts or grounds. Replace sub-oxygen sensor if circuit is okay.

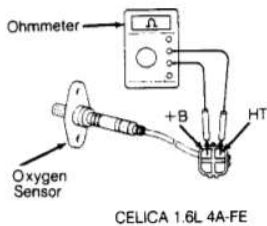
NOTE: Oxygen sensor heater may be used only on California applications on some models. See OXYGEN SENSOR APPLICATION table.

Oxygen Sensor Heater (1.6L 4A-FE Except Calif. & Turbo)

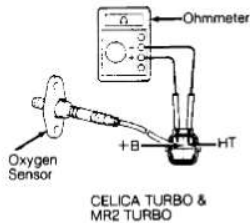
1) Disconnect electrical connector from oxygen sensor. Using ohmmeter, measure resistance between sensor terminals +B and HT. See Figs. 15 and 16.

2) Replace oxygen sensor if resistance is not within specification. See OXYGEN SENSOR HEATER RESISTANCE SPECIFICATIONS table.

OXYGEN SENSOR HEATER RESISTANCE SPECIFICATIONS TABLE	
Application	Ohms
Celica	5.1-6.3 @ 68 °F (20 °C)



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Fig. 15: Testing Oxygen Sensor Heater (1.6L 4A-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



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Fig. 16: Testing Oxygen Sensor Heater (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Pick-Up Coils
See PICK-UP COIL AIR GAP and PICK-UP COIL RESISTANCE under

IGNITION CHECKS in F – BASIC TESTING article.

Throttle Position Sensor (TPS)

- 1) Turn ignition off. Disconnect electrical connector from TPS on throttle body. Note terminal identification. See Figs. 29 and 30.
- 2) Insert specified thickness feeler gauge between throttle stop screw and throttle lever and check resistance or continuity. See appropriate TPS RESISTANCE SPECIFICATIONS table. Replace or adjust TPS if not within specification.

NOTE: Some models require that vacuum be applied to throttle opener before checking TPS. See appropriate TPS RESISTANCE SPECIFICATIONS table.

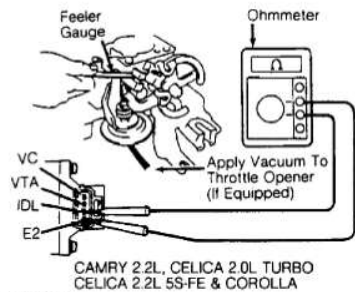


Fig. 17: Checking Throttle Position Sensor (2.0L Turbo & 2.2L 5S-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

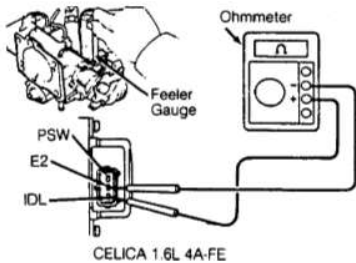


Fig. 18: Checking Throttle Position Sensor (1.6L 4A-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

TPS RESISTANCE SPECIFICATIONS TABLE

Application	Clearance In. (mm)	Terminal	Ohmmeter Reading
1.6L 4A-FE	.024 (.61)	IDL & E2	Continuity
		PSW-E2	No Continuity
	.031 (.79)	IDL-E2	No Continuity
		PSW-E2	No Continuity
	Fully Open	IDL-E2	No Continuity
2.0L Turbo (1)	0 (0)	PSW-E2	Continuity
	.020 (.51)	VTA & E2	470-6100
	.028 (.71)	IDL & E2	2300 Or Less
	Fully Open	IDL & E2	No Continuity
		VTA & E2	3100-12,100
2.2L 5S-FE (1)	0 (0)	VC & E2	3900-9000
	.020 (.51)	VTA & E2	200-5700
	.028 (.71)	IDL & E2	2300 Or Less
	Fully Open	IDL & E2	No Continuity
		VTA & E2	2000-10,200

VC & E2 2500-5900

(1) - Apply vacuum to throttle opener before checking TPS.

Turbocharging Pressure Sensor (Turbo)

1) Ensure ignition is off. To check turbocharging pressure sensor supply voltage, disconnect electrical connector from turbocharging pressure sensor.

2) Sensor is mounted near firewall, close to brake booster.

NOTE: Turbocharging pressure sensor has a vacuum hose connected to it and may be identified by wire colors. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Turbocharging pressure sensor may also be identified using appropriate illustration in E - THEORY/OPERATION article.

3) Turn ignition on. Using voltmeter, measure voltage between terminals VC and E2 of wiring harness side of electrical connector. See Fig. 19. Voltage should be 4.5-5.5 volts.

4) If voltage is not within specification, check wiring circuit. See appropriate wiring diagram in L - WIRING DIAGRAMS article. If voltage is correct, turn ignition off. Reinstall electrical connector on turbocharging pressure sensor.

5) To check turbocharging pressure sensor output voltage, turn ignition on. Disconnect turbocharging pressure sensor vacuum hose from intake manifold. Connect voltmeter to terminals PIM and E2 of Engine Control Module (ECM). See Fig. 20. See ECM LOCATION table.

ECM LOCATION TABLE

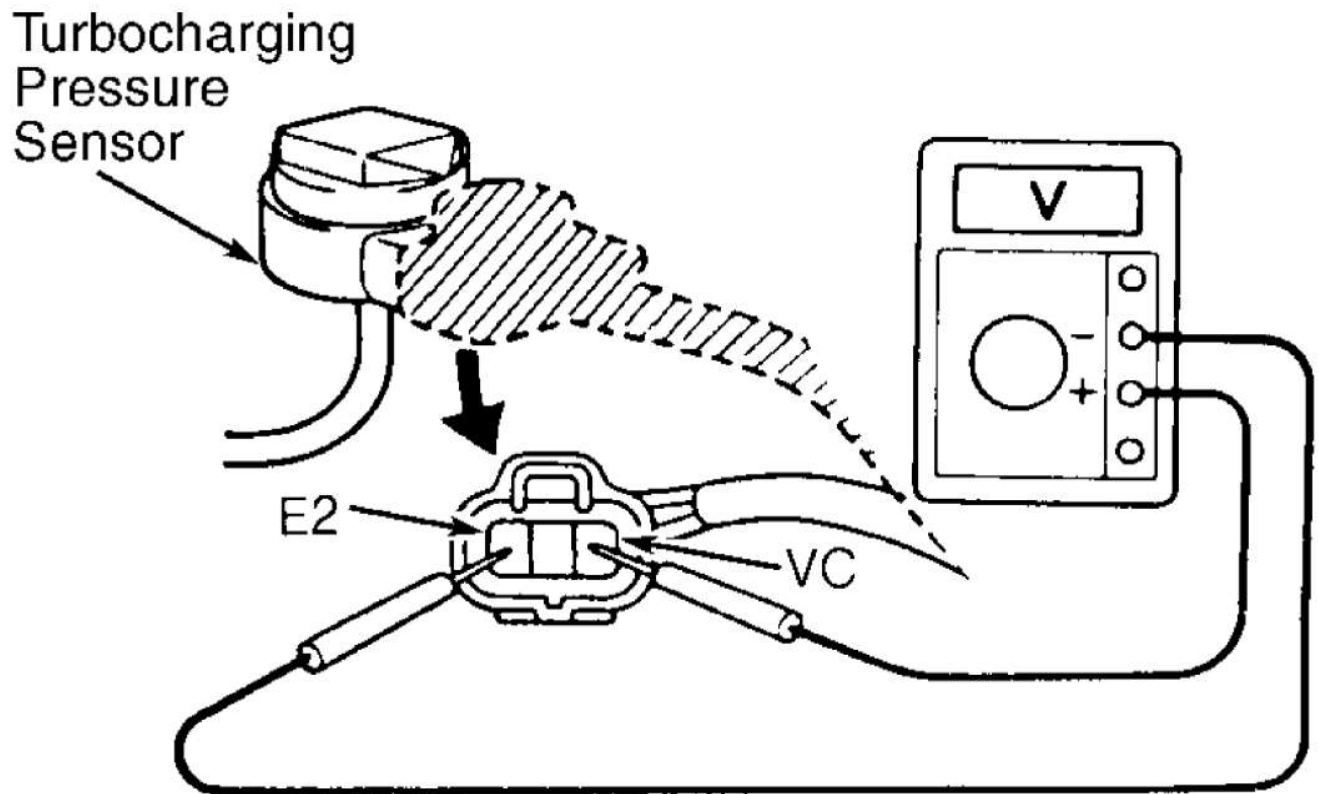
Application	Location
Turbo	Bottom Center Of Dash, In Front Of Console

6) Measure and record output voltage under ambient atmospheric pressure. Attach vacuum pump to turbocharging pressure sensor.

7) Apply vacuum in specified increments and measure output voltage drop at each increment. See TURBOCHARGING PRESSURE SENSOR OUTPUT VOLTAGE SPECIFICATIONS table. Replace turbocharging pressure sensor if output voltage drop is not within specification. Reinstall vacuum hose.

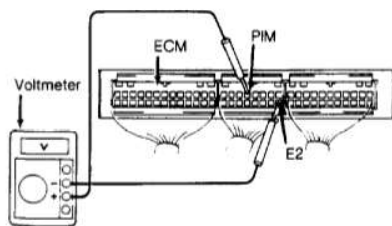
TURBOCHARGING PRESSURE SENSOR OUTPUT VOLTAGE SPECIFICATIONS TABLE

Applied Vacuum In. Hg	Output Voltage Drop
3.94	.15-.35
7.87	.40-.60
11.81	.65-.85
15.75	.90-1.10
19.69	1.15-1.35



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Fig. 19: Measuring Turbocharging Pressure Sensor Supply Voltage
Courtesy of Toyota Motor Sales, U.S.A., Inc.

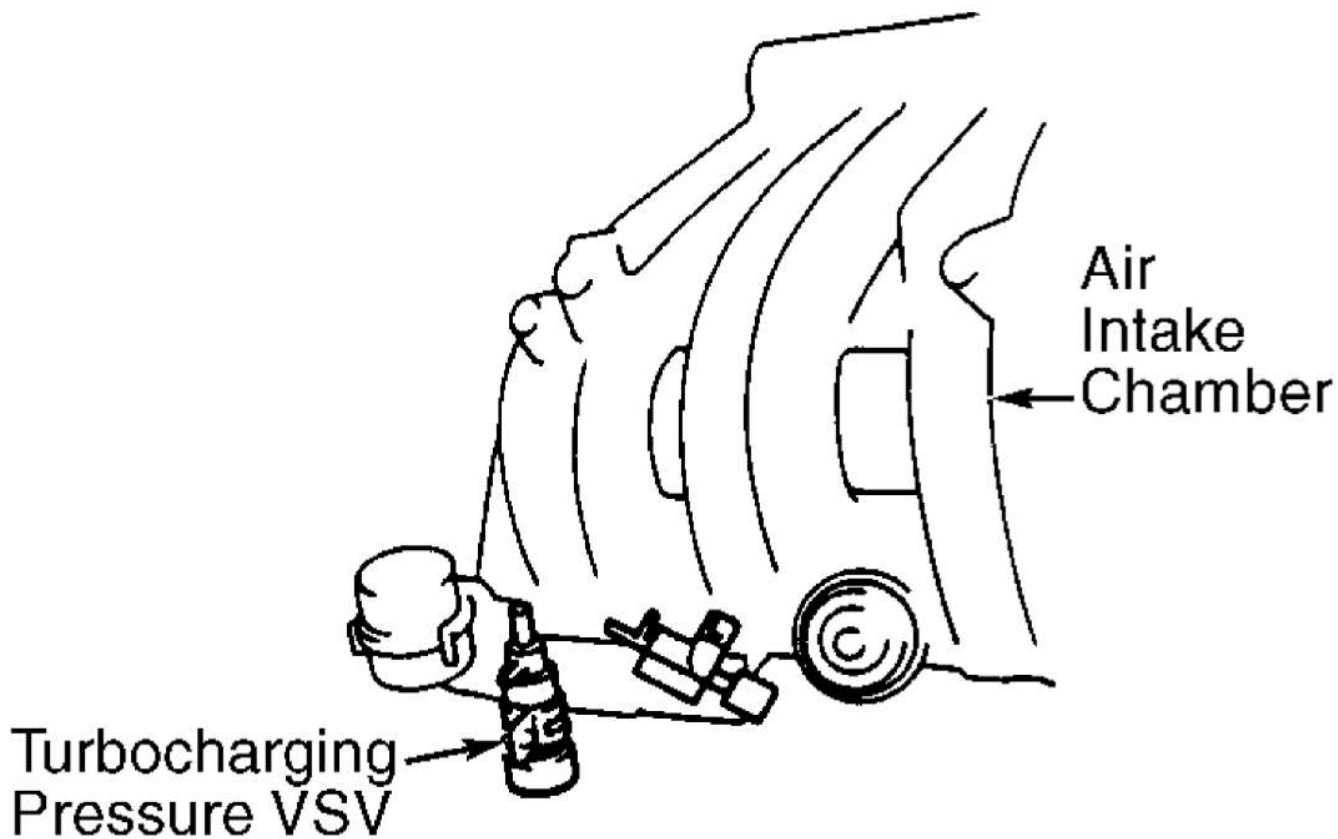


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Fig. 20: Measuring Turbocharging Pressure Sensor Output Voltage
Courtesy of Toyota Motor Sales, U.S.A., Inc.

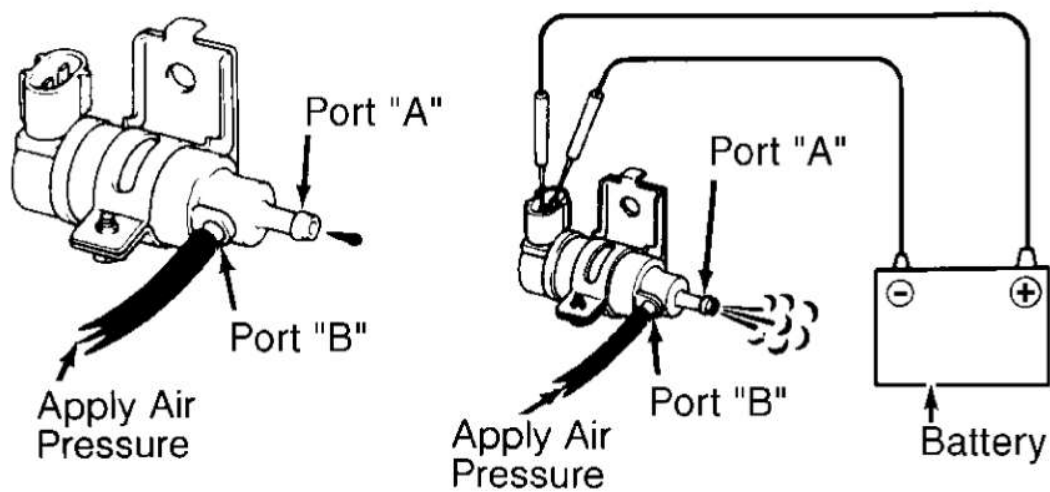
Turbocharging Pressure Vacuum Switching Valve (Turbo)

- 1) Disconnect electrical connector and hoses from turbocharging pressure Vacuum Switching Valve (VSV), located on lower area of air intake chamber. See Fig. 21.
- 2) Using ohmmeter, check resistance between turbocharging VSV electrical terminals. Replace VSV if resistance is not 24-30 ohms.
- 3) Check that no continuity exists between each electrical terminal and VSV body. Apply air pressure to port "B". Ensure no air passes from port "A". See Fig. 22.
- 4) Connect battery voltage to VSV terminals. Apply air pressure to port "B". Ensure air passes from port "A". See Fig. 22. Replace VSV if defective.



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Fig. 21: Identifying Turbocharging Pressure VSV (Turbo)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



92C27393

Fig. 22: Checking Turbocharging Pressure VSV (Turbo)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

Vacuum Sensor (1.6L 4A-FE & 2.2L 5S-FE)

1) Ensure ignition is off. To check vacuum sensor supply

voltage, disconnect electrical connector from vacuum sensor. See VACUUM SENSOR LOCATIONS table.

NOTE: Vacuum sensor may also be identified using appropriate illustration in E - THEORY/OPERATION article. Vacuum sensor has a vacuum hose connected to it and may be identified by wire colors. See appropriate wiring diagram in WIRING DIAGRAMS article.

VACUUM SENSOR LOCATIONS TABLE

Application	Location
Celica	Center Of Firewall In Engine Compartment

2) Turn ignition on. Using voltmeter, measure voltage between terminals VCC and E2 of electrical connector on wiring harness. See Fig. 23. The VCC and E2 terminals are the 2 outer terminals on all models. Voltage should be within specification. See VACUUM SENSOR SUPPLY VOLTAGE SPECIFICATIONS table.

VACUUM SENSOR SUPPLY VOLTAGE SPECIFICATIONS TABLE

Application	Voltage
1.6L 4A-FE & 2.2L 5S-FE	4.50-5.50

3) If supply voltage is not within specification, check wiring circuit. See appropriate wiring diagram in L - WIRING DIAGRAMS article. If supply voltage is correct, turn ignition off. Reinstall electrical connector on vacuum sensor.

4) To check vacuum sensor output voltage, turn ignition on. Disconnect vacuum sensor vacuum hose from intake manifold. Connect voltmeter to terminals PIM and E2 of Engine Control Module (ECM). See Figs. 24-26. See ECM LOCATION table.

ECM LOCATION TABLE

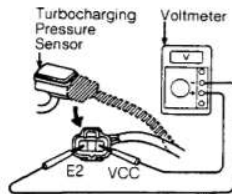
Application	Location
Celica	Bottom Center Of Dash, In Front Of Console

5) Measure and record output voltage under ambient atmospheric pressure. Attach vacuum pump to vacuum sensor.

6) Apply vacuum in specified increments and measure output voltage drop at each increment. See VACUUM SENSOR OUTPUT VOLTAGE DROP SPECIFICATIONS table. Replace vacuum sensor if output voltage drop is not within specification.

VACUUM SENSOR OUTPUT VOLTAGE DROP SPECIFICATIONS TABLE

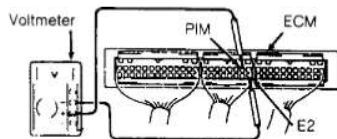
Applied Vacuum In. Hg	Output Voltage Drop
3.94	.3-.5
7.87	.7-.9
11.81	1.1-1.3
15.75	1.5-1.7
19.69	1.9-2.1



93179892

Fig. 23: Measuring Vacuum Sensor Supply Voltage (Camry 2.2L Shown; Others Similar)

Courtesy of Toyota Motor Sales, U.S.A., Inc.

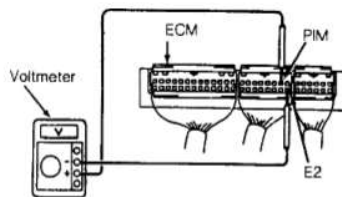


CAMRY 2.2L WITH ELECTRONIC TRANSAXLE,
CELICA 2.2L 5S-FE WITH A/T,
COROLLA 1.8L 7A-FE WITH A/T,
MR2 WITH A/T &
PASEO WITH ELECTRONIC TRANSAXLE

93179893

Fig. 24: Measuring Vacuum Sensor Output Voltage (2.2L 5S-FE With A/T)

Courtesy of Toyota Motor Sales, U.S.A., Inc.

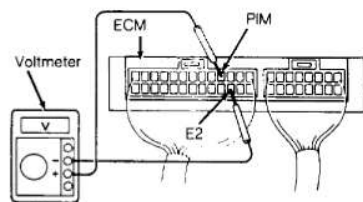


CAMRY 2.2L WITHOUT ELECTRONIC TRANSAXLE,
CELICA 2.2L 5S-FE WITH M/T,
COROLLA EXCEPT 1.8L 7A-FE WITH A/T &
MR2 WITH M/T

931179894

Fig. 25: Measuring Vacuum Sensor Output Voltage (2.2L 5S-FE With M/T)

Courtesy of Toyota Motor Sales, U.S.A., Inc.



CELICA 1.6L 4A-FE,
PASEO WITHOUT ELECTRONIC TRANSAXLE
& TERCEL

93179895

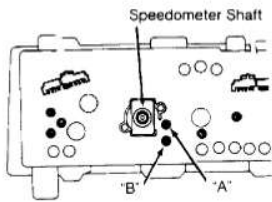
Fig. 26: Measuring Vacuum Sensor Output Voltage (1.6L 4A-FE With A/T)

Courtesy of Toyota Motor Sales, U.S.A., Inc.

Vehicle Speed Sensor

1) Vehicle speed sensor is located on rear of combination meter in instrument cluster. Connect ohmmeter between terminals "A" and "B". Terminals are located near vehicle speed sensor. See Fig. 27.

2) Rotate speedometer cable shaft and note reading. Ohmmeter should deflect from continuity to no continuity 4 times per speedometer cable shaft revolution. Replace vehicle speed sensor or speedometer if reading does not deflect as specified.



93J79904
CELICA
Fig. 27: Identifying Vehicle Speed Sensor Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

CONTROL UNITS

FUEL PUMP ELECTRONIC CONTROL UNIT

See FUEL CONTROL under FUEL SYSTEM.

RELAYS

CIRCUIT OPENING RELAY

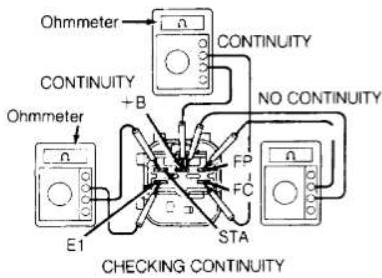
Circuit Opening Relay

- 1) Ensure ignition is off. Remove circuit opening relay. See CIRCUIT OPENING RELAY LOCATION table. Using ohmmeter, check continuity between specified terminals. See Figs. 45-49.
- 2) Check circuit opening relay operation by applying battery voltage and ground and checking continuity between specified terminals. See Figs. 45-49. Replace circuit opening relay if defective.

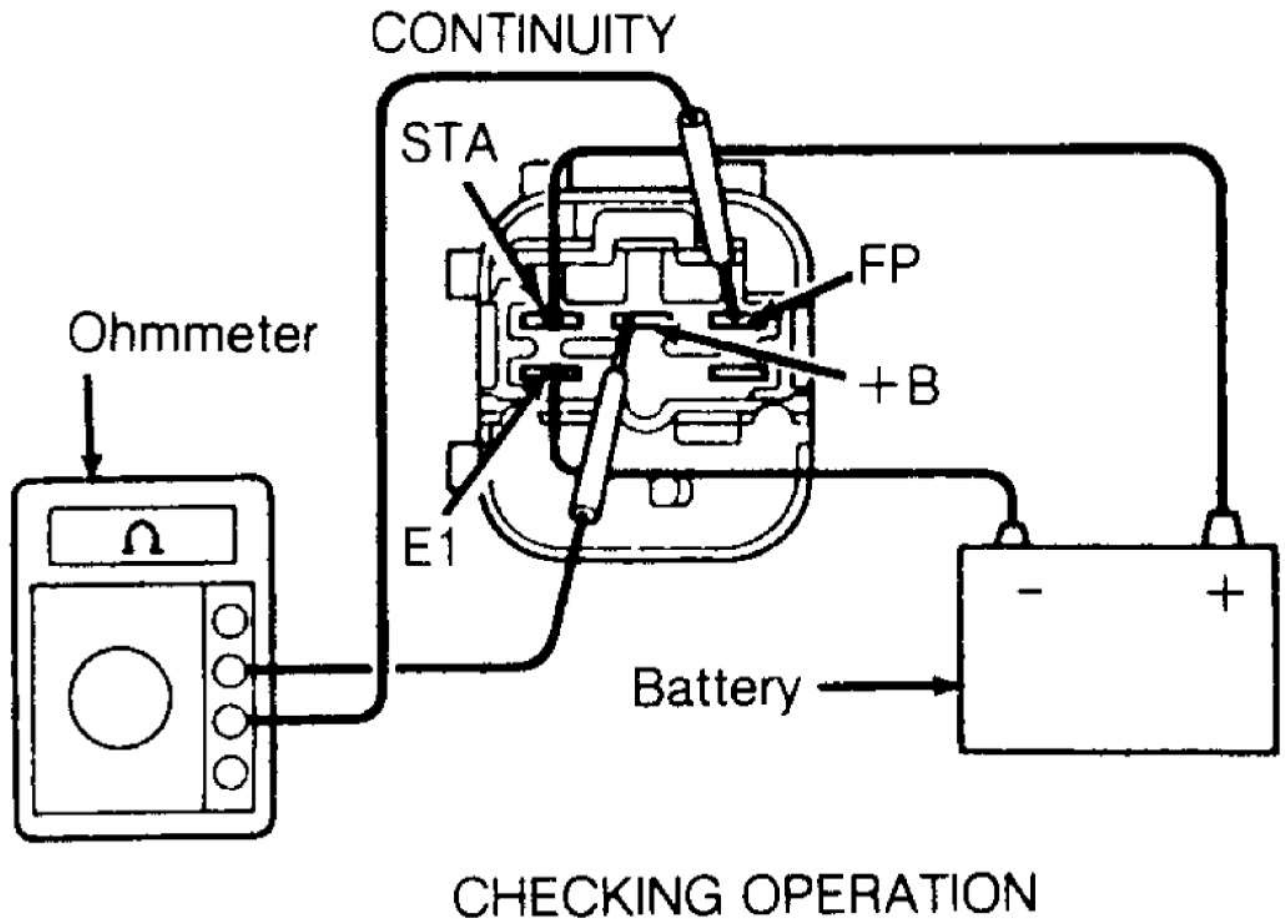
NOTE: Circuit opening relay may also be identified using appropriate illustration in E - THEORY/OPERATION article or wire color. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

CIRCUIT OPENING RELAY LOCATION TABLE

Application	Location
Celica	Bottom Center Of Dash, In Front Of Console, Attached To ECM



92F27404
Fig. 28: Testing Circuit Opening Relay - Checking Continuity (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



92G27405

Fig. 29: Testing Circuit Opening Relay - Checking Operation (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

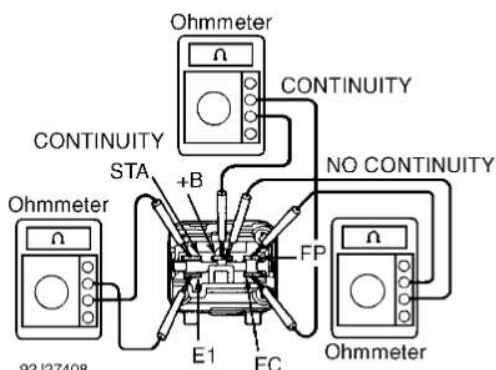
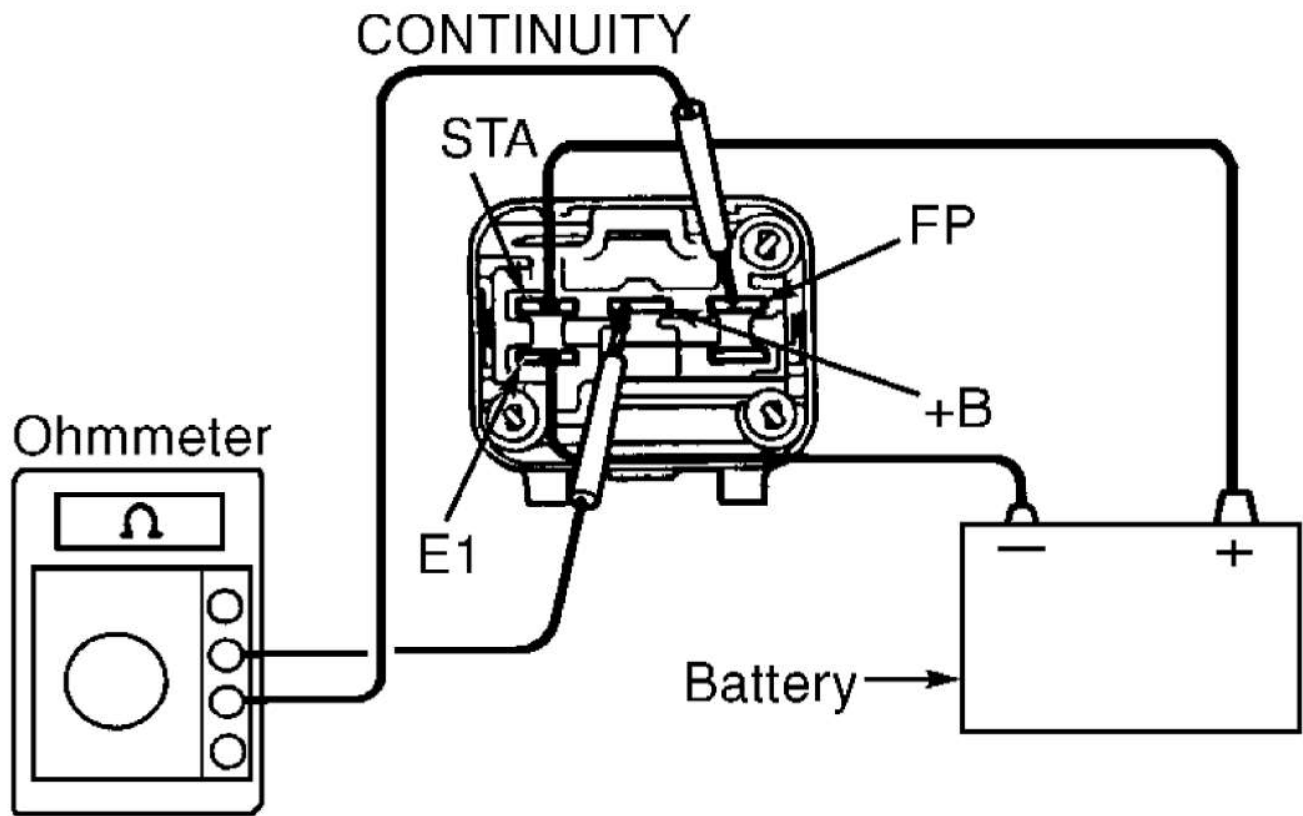


Fig. 30: Testing Circuit Opening Relay - Checking Continuity (1.6L & 2.2L)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



92A27409

CHECKING OPERATION

Fig. 31: Testing Circuit Opening Relay - Checking Operation (1.6L & 2.2L)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

EFI MAIN RELAY

NOTE: The EFI main relay may also be referred to as MFI main relay, SFI main relay or MPI main relay.

- 1) Ensure ignition is off. Remove EFI main relay. See EFI MAIN RELAY LOCATION table. Using ohmmeter, check continuity between specified terminals. See Figs. 32 and 33.
- 2) Check EFI main relay operation by applying battery voltage and ground and checking continuity between specified terminals. See Figs. 32 and 33. Replace EFI main relay if defective.

NOTE: The EFI main relay may also be identified using appropriate illustration in E - THEORY/OPERATION article or wire color. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

EFI MAIN RELAY LOCATION TABLE

Application	Location
Celica	Relay Box Near Air Filter In Left Corner Of Engine Compartment

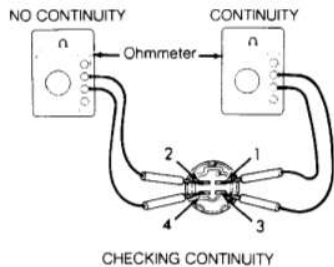


Fig. 32: Testing EFI Main Relay - Checking Continuity
Courtesy of Toyota Motor Sales, U.S.A., Inc.

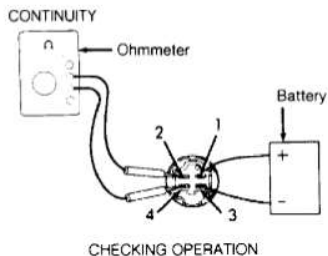


Fig. 33: Testing EFI Main Relay - Checking Operation
Courtesy of Toyota Motor Sales, U.S.A., Inc.

FUEL PUMP RELAY

Fuel Pump Relay (Turbo)

- 1) Ensure ignition is off. Remove fuel pump relay. See FUEL PUMP RELAY LOCATION table. Using ohmmeter, check continuity between specified terminals. See Figs. 34 and 35.
- 2) Check fuel pump relay operation by applying battery voltage and ground and checking continuity between specified terminals. See Fig. 34 and 35. Replace fuel pump relay if defective.

NOTE: Fuel pump relay may also be identified using appropriate illustration in E - THEORY/OPERATION article or wire color. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

FUEL PUMP RELAY LOCATION TABLE

Application	Location
Celica Turbo	Relay Box Near Radiator In Passenger's Front Corner Of Engine Compartment

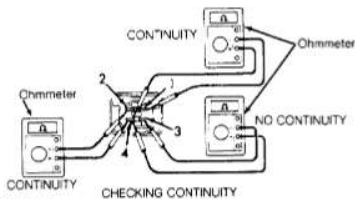


Fig. 34: Testing Fuel Pump Relay - Checking Continuity (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

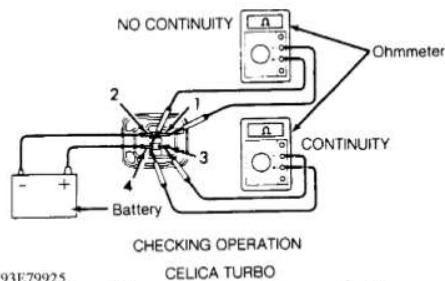


Fig. 35: Testing Fuel Pump Relay - Checking Operation (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

IGNITION MAIN RELAY

See IGNITION MAIN RELAY under IGNITION SYSTEM.

FUEL SYSTEM

FUEL DELIVERY

NOTE: For fuel system pressure testing, see F - BASIC TESTING article.

Circuit Opening Relay
See CIRCUIT OPENING RELAY under RELAYS.

EFI Main Relay
See EFI MAIN RELAY under RELAYS.

Fuel Pump Relay
See FUEL PUMP RELAY under RELAYS.

Fuel Pump Resistor
1) Ensure ignition is off. Disconnect fuel pump resistor electrical connector. See FUEL PUMP RESISTOR LOCATION table.

NOTE: Fuel pump resistor may also be identified using appropriate illustration in E - THEORY/OPERATION article. On Celica Turbo, ensure proper resistor is checked, as fuel injector solenoid resistor is located near fuel pump resistor.

2) Using ohmmeter, measure resistance between fuel pump resistor electrical terminals. See Fig. 36. Replace fuel pump resistor if resistance is not about .73 ohm.

FUEL PUMP RESISTOR LOCATION TABLE

Application		Location
Celica Turbo		Driver's Side Front Corner Of Engine Compartment & Contains 2-Wire Connector

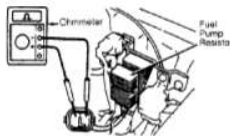


Fig. 36: Testing Fuel Pump Resistor (MR2 Shown; Others Are Similar)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

FUEL CONTROL

NOTE: Fuel injector solenoid resistor may also be referred to as EFI resistor, SFI resistor or solenoid resistor.

Fuel Injector Solenoid Resistor (Turbo)

1) Ensure ignition is off. Disconnect fuel injector solenoid resistor electrical connector. See FUEL INJECTOR SOLENOID RESISTOR LOCATION table.

NOTE: Fuel injector solenoid resistor may also be identified using appropriate illustration in E - THEORY/OPERATION article. On Celica Turbo, ensure proper resistor is checked, as fuel pump resistor is located near fuel injector solenoid resistor.

2) Using ohmmeter, measure resistance between terminal +B and other fuel injector solenoid resistor electrical terminals. See Fig. 37. Replace fuel injector solenoid resistor if resistance is not within specification. See FUEL INJECTOR SOLENOID RESISTOR SPECIFICATIONS table.

FUEL INJECTOR SOLENOID RESISTOR LOCATION TABLE

Application	Location
Celica Turbo	Driver's Side Front Corner Of Engine Compartment & Contains 5-Wire Connector

FUEL INJECTOR SOLENOID RESISTOR SPECIFICATIONS TABLE

Application	Ohms
Celica Turbo	4-6

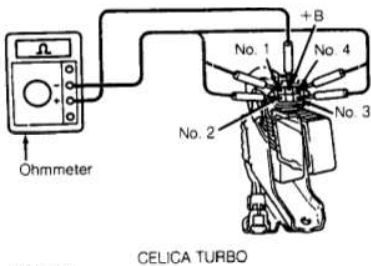


Fig. 37: Testing Fuel Injector Solenoid Resistor (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Fuel Injectors

1) Ensure ignition is off. Disconnect electrical connector at fuel injector. Using ohmmeter, measure resistance between fuel injector electrical terminals. Replace fuel injector if resistance is not within specification. See FUEL INJECTOR RESISTANCE SPECIFICATIONS table.

2) To check fuel injector spray pattern and volume, remove fuel injector. See N - REMOVE/INSTALL/OHAUL article. Disconnect fuel hose from fuel filter outlet. Use Delivery Hose (09268-41045) to install fuel injector between fuel filter and fuel pressure regulator. See Figs. 38 and 39.

3) Place fuel injector into a clean graduated container.

Place vinyl tube on end of fuel injector to prevent fuel spillage. Install Jumper Wire (SST 09843-18020) between +B and FP terminals of data link connector No. 1. Turn ignition on, with engine off to pressurize fuel system.

- NOTE: For proper location of data link connector No. 1 and terminal identification, see F - BASIC TESTING article. Jumper wire is installed in data link connector No. 1 when checking fuel pump operation and fuel pressure.
- 4) Connect fuel injector tester to fuel injector for 15 seconds. Use Fuel Injector Tester (09842-30060) for Turbo.
- 5) Measure fuel injector volume and check spray pattern. Test each fuel injector 2-3 times. Replace fuel injector if volume is not as specified. See FUEL INJECTOR VOLUME SPECIFICATIONS table.

NOTE: Ensure difference between fuel injector volume on all fuel injectors is within specification. See FUEL INJECTOR VOLUME SPECIFICATIONS table.

6) Disconnect fuel injector tester. Ensure fuel leakage from end of fuel injector is one drop or less in specified time. See FUEL INJECTOR LEAKAGE SPECIFICATIONS table. Replace fuel injector if leakage exceeds specified amount. Turn ignition off and remove test equipment.

FUEL INJECTOR RESISTANCE SPECIFICATIONS TABLE

Application	Ohms
1.6L 4A-FE & 2.2L 5S-FE	13.8
2.0L Turbo	2.0-4.0

FUEL INJECTOR VOLUME SPECIFICATIONS TABLE

Application	Cu. In. (cc)
1.6L 4A-FE	2.4-3.1 (40-50)
2.0L Turbo	5.8-7.3 (95-120)
2.2L 5S-FE	3.0-3.6 (49-59)
Maximum Difference Between Each Fuel Injector	
All	.3 (5)

FUEL INJECTOR LEAKAGE SPECIFICATIONS TABLE

Application	Leakage Time
All	1 Minute

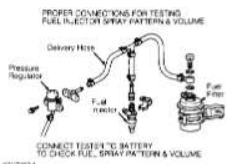
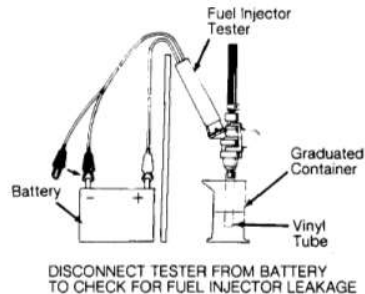


Fig. 38: Testing Fuel Injector Spray Pattern & Volume
Courtesy of Toyota Motor Sales, U.S.A., Inc.



93G79935

Fig. 39: Testing Fuel Injector For Leakage
Courtesy of Toyota Motor Sales, U.S.A., Inc.

NOTE: Fuel pressure control system may also be referred to as fuel pressure-up system.

Fuel Cut System (1.6L 4A-FE)

1) Install tachometer. Ensure tachometer is connected to proper terminals. See IDLE SPEED & MIXTURE in D - ADJUSTMENTS article.

CAUTION: Some tachometers may not be compatible with ignition system. Consult tachometer manufacturer before connecting tachometer to system. To avoid possible damage to ignitor and/or coil, DO NOT allow tachometer terminal to become grounded.

2) Disconnect electrical connector from throttle position sensor. Install jumper wire between IDL and E2 terminals on wiring harness side. See Fig. 40.

3) Start engine and warm to normal operating temperature. Ensure all accessories are off. Gradually increase engine RPM. Note fluctuation in tachometer reading to indicate fuel cut RPM and fuel return RPM. See Fig. 41.

4) Ensure fuel cut and fuel return RPM are within specification. See FUEL CUT SYSTEM SPECIFICATIONS table. Shut engine off. Disconnect tachometer. Reinstall electrical connector on throttle position sensor.



CELICA 1.6L 4A-FE

93H79936

Fig. 40: Throttle Position Sensor Connector Terminal ID (1.6L 4A-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

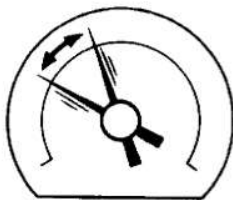


Fig. 41: Needle Fluctuations For Fuel Cut System RPM Test (1.6L 4A-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Fuel Cut System (Except 1.6L 4A-FE)

1) Install tachometer. Tachometer must be connected to proper terminals. See IDLE SPEED & MIXTURE in D - ADJUSTMENTS article.

CAUTION: Some tachometers may not be compatible with ignition system. Consult tachometer manufacturer before connecting tachometer to system. To avoid possible damage to ignitor and/or coil, DO NOT allow tachometer terminal to become grounded.

2) Start engine and warm to normal operating temperature. Ensure all accessories are off. Gradually increase engine RPM to maintain at least specified engine speed. See FUEL CUT SYSTEM TESTING SPECIFICATION table.

FUEL CUT SYSTEM TESTING SPECIFICATION TABLE

Application	Engine RPM
Except 1.6L 4A-FE	2500

3) Using stethoscope, check for fuel injector operating sound. Ensure when throttle lever is released, fuel injector stops operating momentarily (fuel cut RPM) and then resumes operating (fuel return RPM).

4) Ensure fuel cut RPM (if available) and fuel return RPM are within specification. See FUEL CUT SYSTEM SPECIFICATIONS table. Shut engine off. Disconnect tachometer.

FUEL CUT SYSTEM SPECIFICATIONS TABLE

Application	Fuel Cut RPM	Fuel Return RPM
1.6L 4A-FE	2300	1700
2.0L Turbo	(1)	1600
2.2L 5S-FE	(1)	1500

(1) - Fuel cut specification is not available from manufacturer.

Cold Start Injector (Turbo)

1) Disconnect negative battery cable. Disconnect cold start injector wiring harness connector.

2) Using ohmmeter, measure resistance between electrical terminals of cold start injector. Replace cold start injector if resistance is not 2-4 ohms. Remove cold start injector. See N - REMOVE/INSTALL/OHAUL article.

3) Install Union Adapters (SST 09268-41045) with NEW gaskets on cold start injector and delivery pipe. Connect delivery hose to union adapters. See Figs. 42 and 43.

4) Reconnect negative battery cable. Connect Jumper Wire (SST 09843-18020) between terminals FP and +B of data link connector No. 1. Turn ignition on, with engine off to pressurize fuel system.

NOTE: For proper location of data link connector No. 1 and terminal identification, see F - BASIC TESTING article. Jumper wire is installed in data link connector No. 1 when checking fuel pump operation and fuel pressure.

5) Place tip of cold start injector in a container. Connect cold start injector tester to cold start injector. Use Cold Start

Injector Tester (SST 09842-30050).

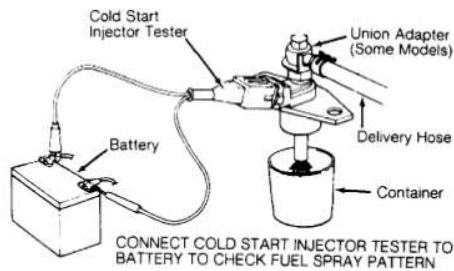
CAUTION: Perform cold start injector test in shortest possible time to check fuel spray pattern.

6) Connect cold start injector tester to battery. See Figs. 42 and 43. Ensure fuel spray pattern is an even cone shape. Disconnect cold start injector tester from battery.

7) Check for fuel leakage from cold start injector. Maximum leakage should be one drop per minute with fuel pressure applied. Replace cold start injector if defective. Disconnect negative battery cable and test equipment.

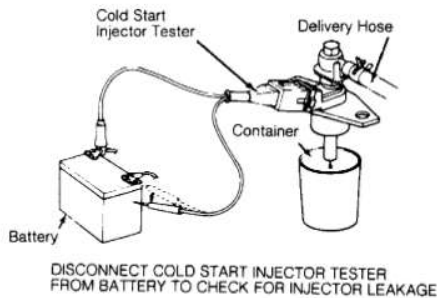
NOTE: Cold start injector is controlled by cold start injector time switch when ignition is turned on.

Cold Start Injector Time Switch
For test procedures, see ENGINE SENSORS & SWITCHES.



93J79937

Fig. 42: Testing Cold Start Injector - Fuel Spray Pattern
Courtesy of Toyota Motor Sales, U.S.A., Inc.



93J79938

Fig. 43: Testing Cold Start Injector - For Leakage
Courtesy of Toyota Motor Sales, U.S.A., Inc.

IDLE CONTROL SYSTEM

AIR CONTROL VALVE

1.6L 4A-FE

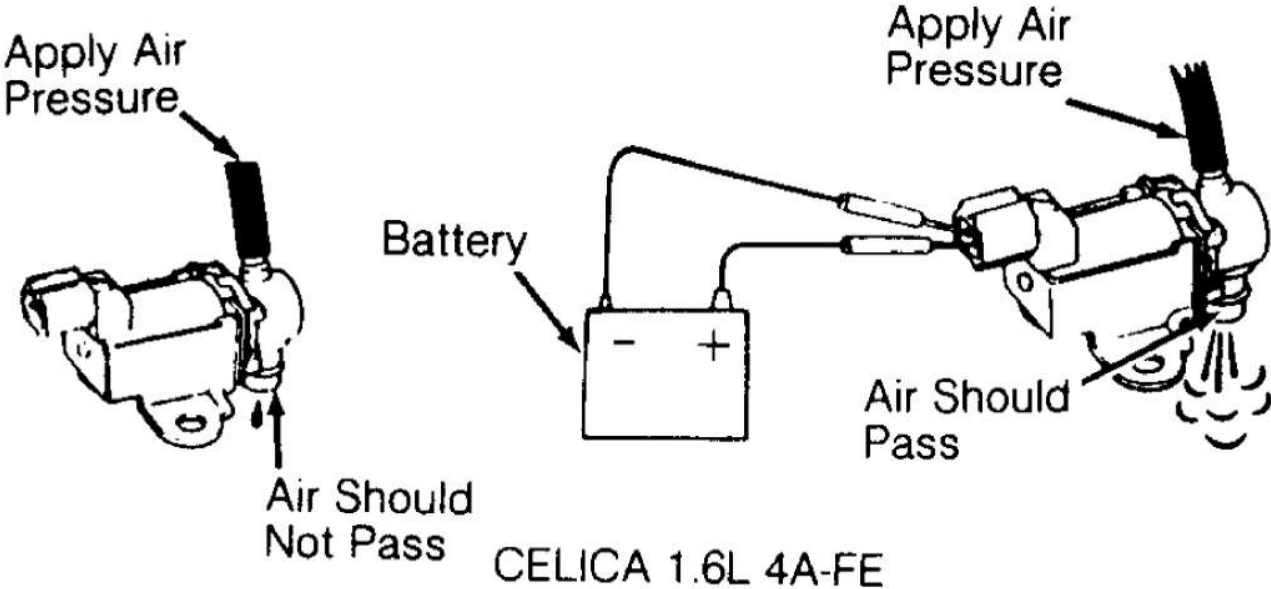
1) Remove air control valve, located on end of air intake chamber on passenger's side. Air control valve may also be identified using appropriate illustration in E - THEORY/OPERATION article or wire color. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

2) Using ohmmeter, check resistance and for continuity between air control valve electrical terminals. Replace air control valve if resistance is not within specification or continuity does not exist. See AIR CONTROL VALVE RESISTANCE SPECIFICATIONS table.

AIR CONTROL VALVE RESISTANCE SPECIFICATIONS TABLE

Application	Ohms
1.6L 4A-FE	27-33

3) Ensure no continuity exists between each electrical terminal and air control valve body. Test air control valve by applying air pressure to designated area and checking air passage, and then applying battery voltage and ground and retesting. See Fig. 44. Replace air control valve if defective or continuity exists between electrical terminals and air control valve body.



92D27428

Fig. 44: Testing Air Control Valve (1.6L 4A-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

AUXILIARY AIR VALVE SYSTEM

NOTE: Install tachometer when checking auxiliary air valve system. Ensure tachometer is connected to proper terminals. See IDLE SPEED & MIXTURE in D - ADJUSTMENTS article for tachometer connections.

CAUTION: Some tachometers may not be compatible with ignition system. Consult tachometer manufacturer before connecting tachometer to system. To avoid possible damage to ignitor and/or coil, DO NOT allow tachometer terminal to become grounded.

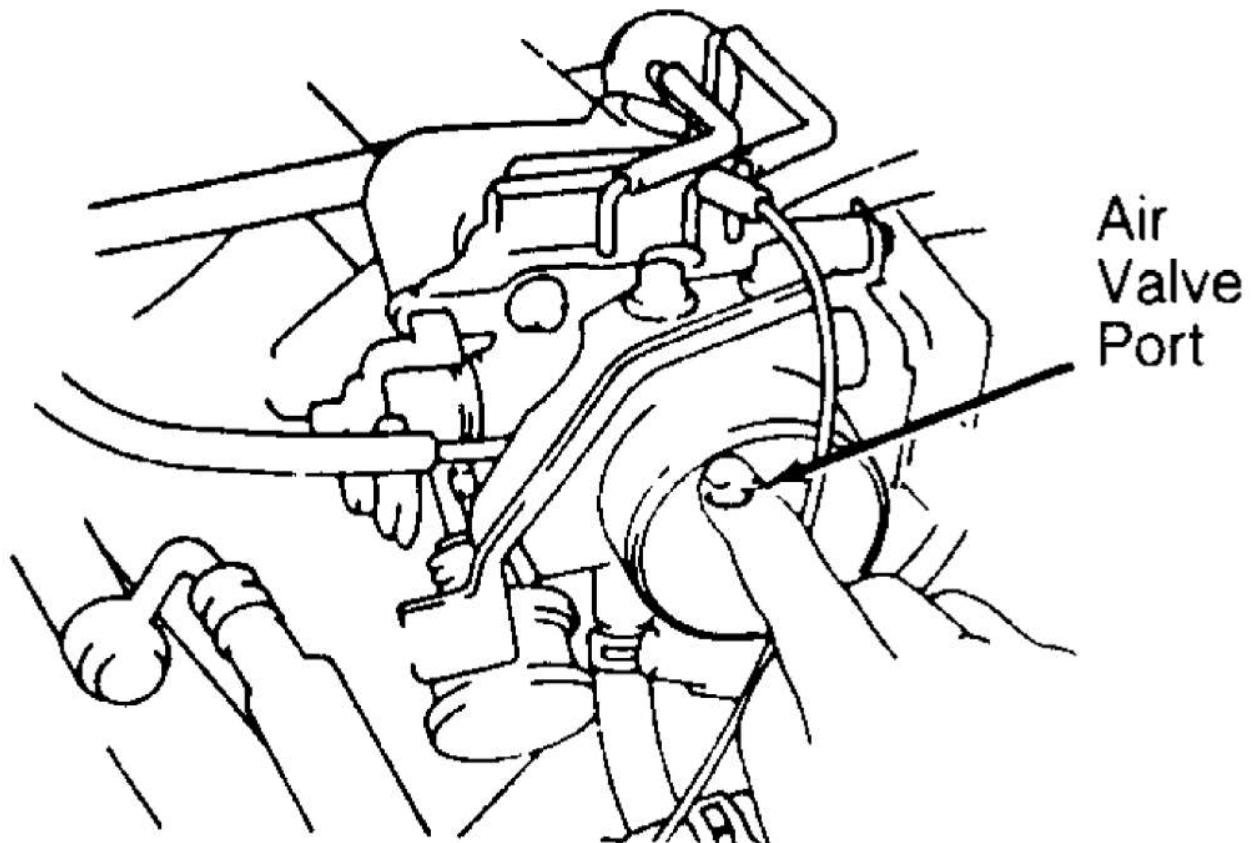
1.6L 4A-FE

- 1) Install tachometer. With engine coolant less than 176°F (80°C), remove air intake hose from throttle body.
- 2) Start engine. Place finger over air valve port to block airflow. See Fig. 45. Engine speed should decrease noticeably. Remove

finger from air valve port.

3) Allow engine to warm to normal operating temperature. Place finger over air valve port to block airflow. Engine speed should not decrease more than 100 RPM for Tercel or 50 RPM for all others.

4) If engine RPM does not respond as indicated, check for vacuum leaks or restricted chamber in auxiliary air valve circuit. If no defects are found, replace auxiliary air valve.



92H27430

Fig. 45: Checking Auxiliary Air Valve (1.6L 4A-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

A/C IDLE-UP SYSTEM

2.2L 5S-FE

1) Remove A/C idle-up system Vacuum Switching Valve (VSV).

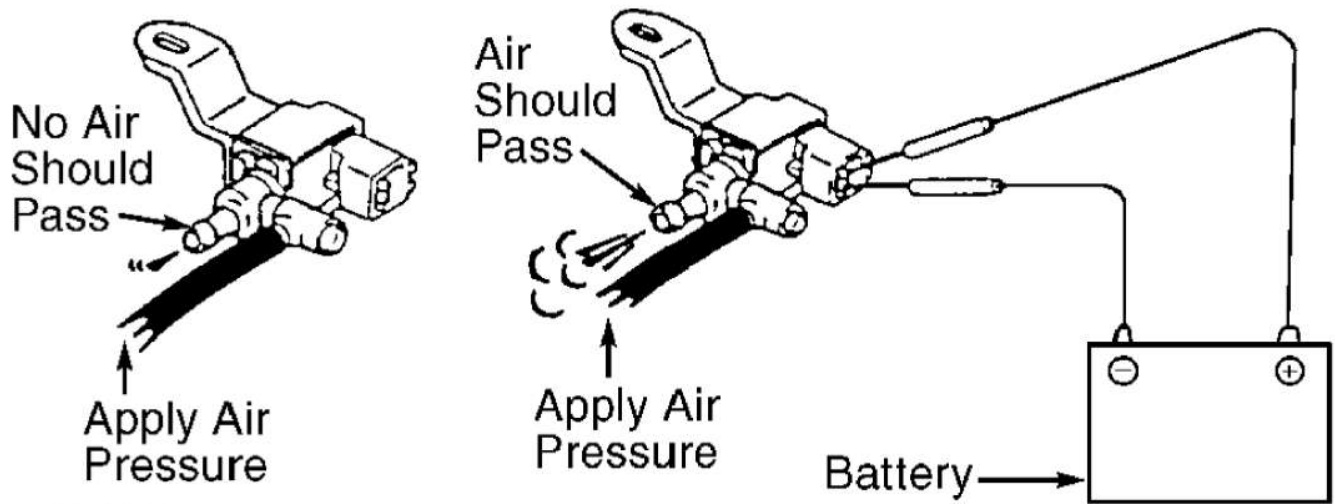
See A/C IDLE-UP VSV LOCATIONS table.

NOTE: The A/C idle-up VSV may also be identified using appropriate illustration in E - THEORY/OPERATION article or wire color. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

A/C IDLE-UP VSV LOCATIONS TABLE

Application	Location
2.2L 5S-FE	End Of Air Intake Chamber, Near Front Of Valve Cover

- 2) Using ohmmeter, check resistance between A/C idle-up VSV electrical terminals. Replace A/C idle-up VSV if resistance is not 30-34 ohms.
- 3) Ensure no continuity exists between each electrical terminal and A/C idle-up VSV body. Test A/C idle-up VSV by applying air pressure to designated area and checking air passage, and then applying battery voltage and ground and retesting. See Fig. 46. Replace A/C idle-up VSV if defective.



93H80124
Fig. 46: Testing A/C Idle-Up VSV (2.2L 5S-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

IDLE AIR CONTROL (IAC) VALVE

- NOTE: IAC valve may also be referred to as Idle Speed Control (ISC) valve.
- 2.2L 5S-FE
- 1) Warm engine to normal operating temperature. Ensure idle speed is correct. See D - ADJUSTMENTS article.
- 2) Apply parking brake and place transmission/transaxle in Neutral. Install Jumper Wire (SST 09843-18020) between terminals TE1 and E1 of data link connector No. 1. See Fig. 47. Start engine and note engine RPM.
- NOTE: Data link connector No. 1 is located in engine compartment on all models except Previa. On Previa, data link connector No. 1 is located under below driver's seat.
- 3) On Previa, engine RPM should increase to specified engine RPM for 5 seconds and then decrease approximately 200 RPM. See IAC VALVE ENGINE SPEED TESTING SPECIFICATIONS table.
- 4) On all other models, engine RPM should increase to specified engine RPM for 5 seconds, and then return to idle. See IAC VALVE ENGINE SPEED TESTING SPECIFICATIONS table.

IAC VALVE ENGINE SPEED TESTING SPECIFICATIONS TABLE

Application	Engine RPM
All	900-1300

5) If engine RPM is not as specified, check IAC valve resistance and operation. If engine RPM is within specification, remove jumper wire. Turn ignition off.

6) To check IAC valve resistance, ensure ignition is off. Disconnect electrical connector from IAC valve located on lower area of throttle body. Using ohmmeter, measure resistance between terminal B+ and each remaining terminal. See Figs. 48 and 49.

7) Replace IAC valve if resistance is not within specification. See IAC VALVE RESISTANCE SPECIFICATIONS table.

NOTE: Information is not available from manufacturer for checking IAC valve operation for Previa.

8) Remove IAC valve from throttle body. See appropriate N - REMOVE/INSTALL/OHAUL article. Connect battery voltage and ground to proper terminals and ensure valve opens and closes. See Figs. 50 and 51. Replace IAC valve if defective.

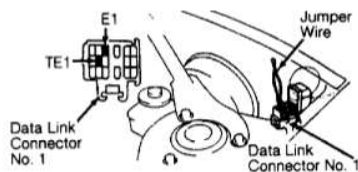
9) If IAC valve resistance is correct and operates correctly, check wiring circuit between Engine Control Module (ECM) and IAC valve. See ECM LOCATION table. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

IAC VALVE RESISTANCE SPECIFICATIONS TABLE

Application	Ohms
Turbo & 2.2L 5S-FE	19.3-22.3

ECM LOCATION TABLE

Model	Location
Celica	Bottom Center Of Dash, In Front Of Console



93A80127 CELICA 1.6L 4A-FE & 2.2L 5S-FE

Fig. 47: Using Jumper Wire In Data Link Connector No. 1 (1.6L 4A-FE & 2.2L 5S-FE)

Courtesy of Toyota Motor Sales, U.S.A., Inc.

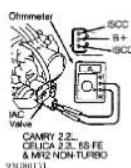


Fig. 48: Checking IAC Valve Resistance (2.2L 5S-FE)

Courtesy of Toyota Motor Sales, U.S.A., Inc.

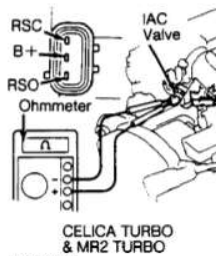


Fig. 49: Checking IAC Valve Resistance (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

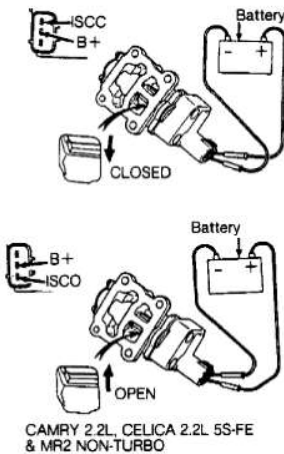


Fig. 50: Checking IAC Valve Operation (2.2L 5S-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

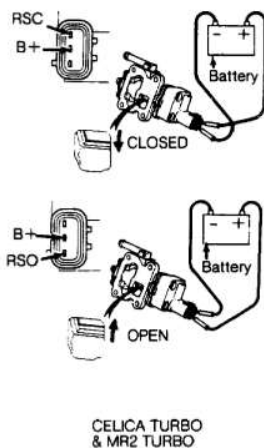


Fig. 51: Checking IAC Valve Operation (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Turbo

1) Warm engine to normal operating temperature. Ensure idle speed is correct. See D - ADJUSTMENTS article. Apply parking brake and place transaxle in Neutral.

2) With engine idling, disconnect electrical connector from IAC valve located on lower area of throttle body. Engine RPM should increase to at least 1000 RPM. Reinstall electrical connector on IAC

valve.

3) Ensure engine returns to idle speed of 750–850 RPM. If engine does not return to proper idle speed, check IAC valve resistance and operation.

4) To check IAC valve resistance, ensure ignition is off. Disconnect electrical connector from IAC valve. Using ohmmeter, measure resistance between terminal B+ and each remaining terminal. See Figs. 48 and 49.

5) Replace IAC valve if resistance is not within specification. See IAC VALVE RESISTANCE SPECIFICATIONS (EXCEPT CAMRY 3.0L, LAND CRUISER & SUPRA) table.

6) To check IAC valve operation, remove IAC valve from throttle body. See N – REMOVE/INSTALL/OHAUL article. Connect battery voltage and ground to proper terminals and ensure valve opens and closes. See Fig. 50 and 51. Replace IAC valve if defective.

7) If IAC valve resistance is correct and operates correctly, check wiring circuit between Engine Control Module (ECM) and IAC valve. See ECM LOCATION table. See appropriate wiring diagram in L – WIRING DIAGRAMS article.

4) To check IAC valve operation, remove IAC valve. See N – REMOVE/INSTALL/OHAUL article. Note IAC valve terminal identification.

5) Apply battery voltage to terminals B1 and B2. Repeatedly ground terminals in sequence and ensure IAC valve closes and opens. See IAC VALVE GROUNDING SEQUENCE table. Replace IAC valve if defective.

6) If IAC valve resistance is correct and operates correctly, check wiring between Engine Control Module (ECM) and IAC valve. See ECM LOCATION table. See appropriate wiring diagram in L – WIRING DIAGRAMS article.

IGNITION SYSTEM

NOTE: For basic ignition checks, see F – BASIC TESTING article.

TIMING CONTROL SYSTEMS

Knock Sensor

See KNOCK SENSOR under ENGINE SENSORS & SWITCHES.

EMISSION SYSTEMS & SUB-SYSTEMS

EXHAUST GAS RECIRCULATION (EGR)

NOTE: EGR systems contain different components and have different operating parameters depending on application. See Figs. 55–63. When testing EGR system and components, use proper illustration to determine component location.

EGR System Test (2.2L 5S-FE)

1) Ensure EGR vacuum modulator filter is clean and in good condition. Clean filter with compressed air (if necessary).

2) Using "T" connector, install vacuum gauge in vacuum line to EGR valve. Start engine. Ensure engine runs idles smoothly to ensure proper seating of EGR valve.

3) Install Jumper Wire (SST 09843–18020) between terminals TE1 and E1 of data link connector No. 1, located in engine compartment. See Fig. 47.

NOTE: The EGR system components can be checked with engine coolant

temperature less than minimum temperature and engine at specified engine RPM.

4) Operate engine with engine coolant temperature less than minimum temperature and at specified RPM. See EGR TESTING SPECIFICATIONS table. No vacuum reading should be obtained.

5) Warm engine to normal operating temperature. Operate engine at specified engine RPM again. See EGR TESTING SPECIFICATIONS table. Ensure a low vacuum reading is now obtained.

6) Disconnect vacuum hose from port "R" of EGR vacuum modulator. See Fig. 52. Using additional hose, connect port "R" of EGR vacuum modulator directly to intake manifold. High vacuum reading should be obtained at specified engine RPM. See EGR TESTING SPECIFICATIONS table.

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

7) Remove vacuum hose and reconnect original vacuum hose to EGR vacuum modulator. To check EGR valve operation, remove vacuum hose from EGR valve.

8) Using vacuum pump, apply vacuum directly to EGR valve with engine idling. Engine should run rough or stall. If EGR system does not operate as described, each individual component should be tested. Shut engine off. Remove jumper wire from data link connector No. 1.

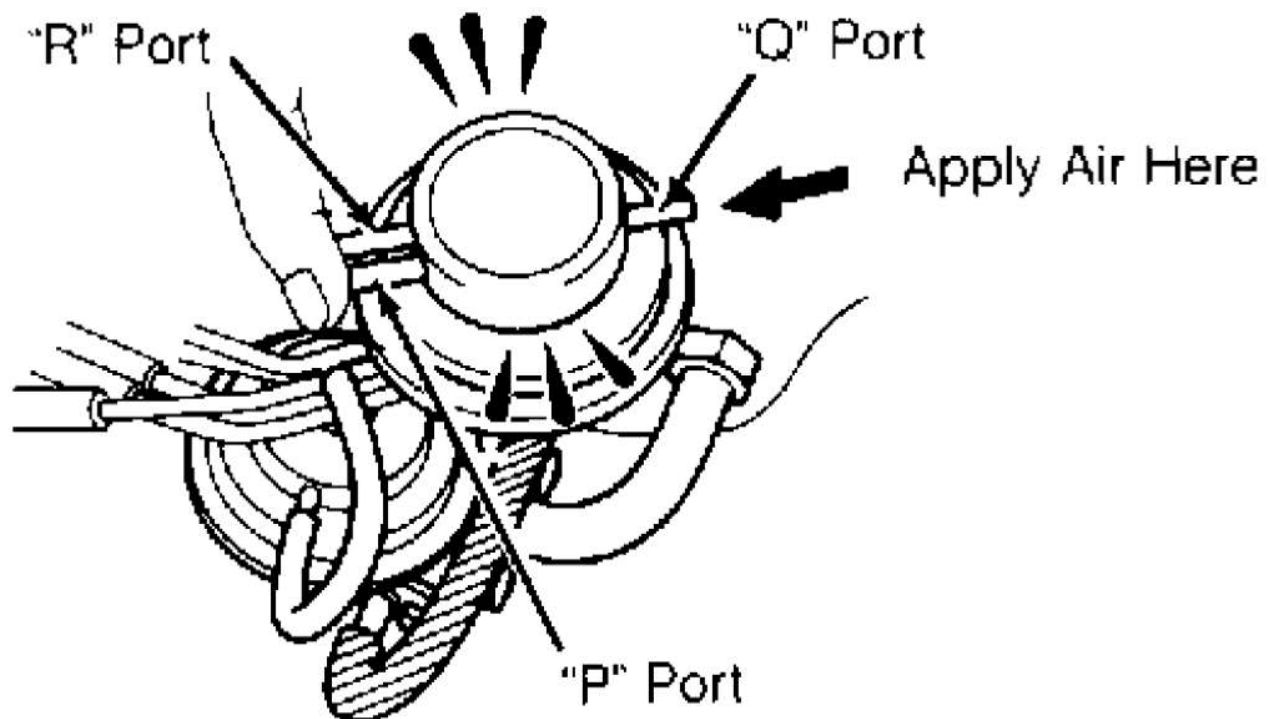


Fig. 52: Identifying Ports & Testing EGR Vacuum Modulator
Courtesy of Toyota Motor Sales, U.S.A., Inc.

EGR System Test (1.6L 4A-FE)

1) Ensure EGR vacuum modulator filter is clean and in good condition. Clean filter with compressed air (if necessary).

2) Using "T" connector, install vacuum gauge in vacuum line to EGR valve. Start engine. Ensure engine runs idles smoothly to ensure proper seating of EGR valve.

3) Install Jumper Wire (SST 09843-18020) between terminals TE1 and E1 of data link connector No. 1, located in engine compartment. See Fig. 47.

NOTE: The EGR system components can be checked with engine coolant temperature less than minimum temperature and engine at specified engine RPM.

4) Operate engine with engine coolant temperature less than minimum temperature and at specified RPM. See EGR TESTING SPECIFICATIONS table. No vacuum reading should be obtained.

5) Warm engine to normal operating temperature. Operate engine at specified engine RPM again. See EGR TESTING SPECIFICATIONS table. Ensure a low vacuum reading is now obtained.

6) To check EGR valve operation, remove vacuum hose from EGR valve. Using vacuum pump, apply vacuum directly to EGR valve with engine idling. Engine should run rough or stall.

7) If EGR system does not operate as described, each individual component should be tested. Shut engine off. Remove jumper wire from data link connector No. 1.

EGR System Test (All Others)

1) Ensure EGR vacuum modulator filter(s) are clean and in good condition. Clean filter(s) with compressed air (if necessary).

2) Using "T" connector, install vacuum gauge in vacuum line to EGR valve. Start engine. Ensure engine runs idles smoothly to ensure proper seating of EGR valve.

NOTE: The EGR system components can be checked with engine coolant temperature less than minimum temperature and engine at specified engine RPM.

3) Operate engine with engine coolant temperature less than minimum temperature and at specified RPM. See EGR TESTING SPECIFICATIONS table. No vacuum reading should be obtained.

4) Warm engine to normal operating temperature. Operate engine at specified engine RPM again. See EGR TESTING SPECIFICATIONS table. Ensure a low vacuum reading is now obtained.

5) On all models except Turbo, disconnect vacuum hose from port "R" of EGR vacuum modulator. See Fig. 52.

6) Using additional hose, connect port "R" of EGR vacuum modulator directly to intake manifold. High vacuum reading should be obtained at specified engine RPM. See EGR TESTING SPECIFICATIONS table.

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

7) Remove vacuum hose and reconnect original vacuum hose to EGR vacuum modulator.

8) To check EGR valve operation, remove vacuum hose from EGR valve. Using vacuum pump, apply vacuum directly to EGR valve with engine idling. Engine should run rough or stall. If EGR system does not operate as described, each individual component should be tested.

EGR TESTING SPECIFICATIONS TABLE

Application	Minimum Temperature	Engine RPM
1.6L 4A-FE	117°F (47°C)	2500
2.0L Turbo	129°F (54°C)	2500
2.2L 5S-FE	131°F (55°C)	2500

EGR Vacuum Modulator (Turbo)

1) Disconnect vacuum hoses from EGR vacuum modulator. Plug one end of vacuum hose connection on EGR vacuum modulator.

2) Apply air pressure through remaining port. Air should pass freely through air filter side of EGR vacuum modulator.

3) Start and operate engine at specified RPM. See EGR VACUUM MODULATOR TESTING SPECIFICATIONS table. Repeat test procedures in steps 1) and 2). Strong resistance of airflow should be felt. Replace EGR vacuum modulator if resistance is not felt. Reconnect vacuum hoses to proper locations.

EGR Vacuum Modulator (All Others)

1) Disconnect vacuum hoses from EGR vacuum modulator. Block ports "P" and "R" of EGR vacuum modulator. See Fig. 52.

NOTE: Ports "P" and "R" are the double ports on side of EGR vacuum modulator. Port "Q" is the single port on side of EGR vacuum modulator.

2) Apply air pressure to port "Q". See Fig. 52. Air should pass freely through air filter side of EGR vacuum modulator.

3) Start and operate engine at specified RPM. See EGR VACUUM MODULATOR TESTING SPECIFICATIONS table. Repeat test procedures in steps 1) and 2). Strong resistance of airflow should be felt. Replace EGR vacuum modulator if resistance is not felt. Reconnect vacuum hoses to proper locations.

EGR VACUUM MODULATOR TESTING SPECIFICATIONS TABLE

Application	Engine RPM
All	2500

NOTE: Bimetallic Vacuum Switching Valve (BVSF) may be referred to as a Thermal Vacuum Valve (TVF). When testing BVSF, use proper illustration to determine component location. See Figs. 55-63.

EGR Vacuum Switching Valve (VSF) (Turbo & 2.2L 5S-FE)

1) Disconnect electrical connector from EGR VSF. Using ohmmeter, check resistance between EGR VSF electrical terminals.

2) Replace EGR VSF if resistance is not within specification. See EGR VSF RESISTANCE SPECIFICATIONS table. Ensure no continuity exists between each electrical terminal and EGR VSF body. Replace EGR VSF if continuity exists between any electrical terminal and VSF body.

3) Apply air pressure to port "E" (without battery connected). See Figs. 53 and 54. Air pressure should flow from port "G". Connect battery to EGR VSF electrical terminals. See Figs. 53 and 54. Apply air pressure to port "E". Air pressure should flow through the air filter. Replace EGR VSF if defective.

EGR Vacuum Switching Valve (VSF) (1.6L 4A-FE)

1) Disconnect electrical connector from EGR VSF. Using ohmmeter, check resistance between EGR VSF electrical terminals.

2) Replace EGR VSF if resistance is not within specification. See EGR VSF RESISTANCE SPECIFICATIONS table. Ensure no continuity exists between each electrical terminal and EGR VSF body. Replace EGR VSF if continuity exists between any electrical terminal and VSF body.

3) Apply air pressure to port "E" (without battery connected). See Figs. 53 and 54. Air pressure should flow through the

air filter. Connect battery to EGR VSV electrical terminals. See Fig. 54. Apply air pressure to port "E". Air pressure should not flow through the air filter. Replace EGR VSV if defective.

EGR VSV RESISTANCE SPECIFICATIONS TABLE

Application	(1) Ohms
1.6L 4A-FE	37-44
2.0L Turbo & 2.2L 5S-FE	33-39

(1) - Specification listed when measured at 68°F (20°C).

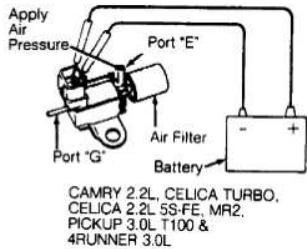


Fig. 53: Testing EGR VSV Operation (Turbo & 2.2L 5S-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

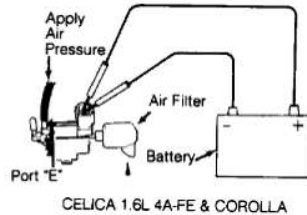


Fig. 54: Testing EGR VSV Operation (1.6L 4A-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

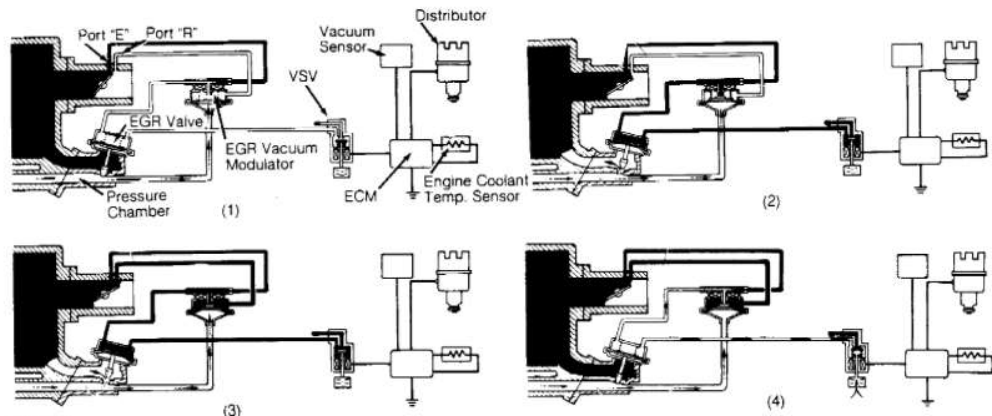


Fig. 55: Identifying EGR System Operation (1.6L 4A-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

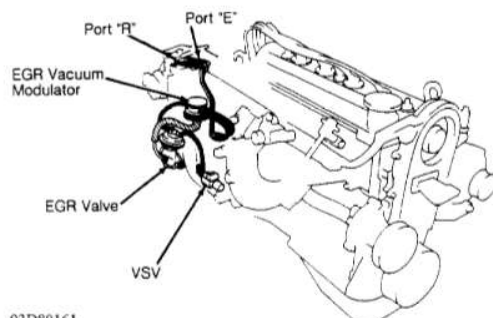
Engine Coolant Temp.	ENGINE rpm	VSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber	EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 47°C (117°F)		**** OFF	-	-	-	CLOSED	Not recirculated
Above 53°C (127°F)	Above 1,100 rpm (Federal) & Below 4,000 rpm	*** ON	Positioned below port E	-	-	CLOSED	Not recirculated
			Positioned between port P and port R	(1) LOW (2) HIGH	* Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED Not recirculated
			Positioned above port R	(3) HIGH	**	CLOSES passage to atmosphere	OPEN Recirculated
	Below 1,000 rpm (Federal) & Above 4,400 rpm	(4) OFF	-	-	-	CLOSED	Recirculated (increase) Not recirculated

Remarks:

- * Pressure increase → Modulator closes → EGR valve opens → Pressure drops → EGR valve closes → Modulator opens
- ** When the throttle valve is positioned above port R, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the exhaust gas, even if the exhaust pressure is insufficiently low.
- *** VSV switched ON when product of engine rpm multiplied by vacuum sensor value exceeds a specified value.
- **** If terminals TE1 and ET of data link connector 1 are connected, the VSV switches ON.

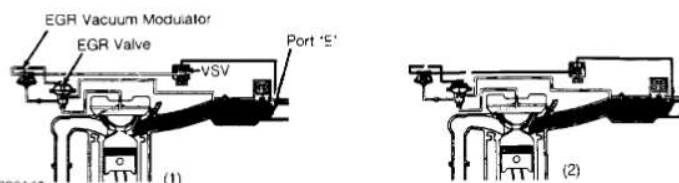
93C80160

Fig. 56: Identifying EGR System Operating Parameters (1.6L 4A-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



93D80161

Fig. 57: Identifying EGR System Components (1.6L 4A-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



93F80162

Fig. 58: Identifying EGR System Operation (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

To reduce NOx emissions, part of the exhaust gases is recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.						
Coolant temp.	VSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber	EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 54°F (129°F)	CLOSED	-	-	-	CLOSED	Not recirculated
Above 80°F (140°F)	OPEN	Positioned above port E	(1)	-	-	Not recirculated
		Positioned below port E	(2)	+	CLOSED passage to atmosphere	OPEN
Remarks: * When the throttle valve is positioned above the port E, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is indifferently low.						

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Fig. 59: Identifying EGR System Operating Parameters (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

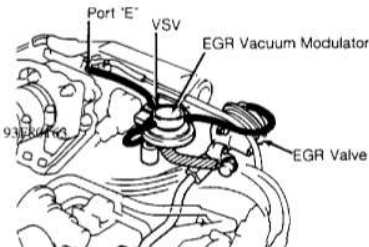


Fig. 60: Identifying EGR System Components (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

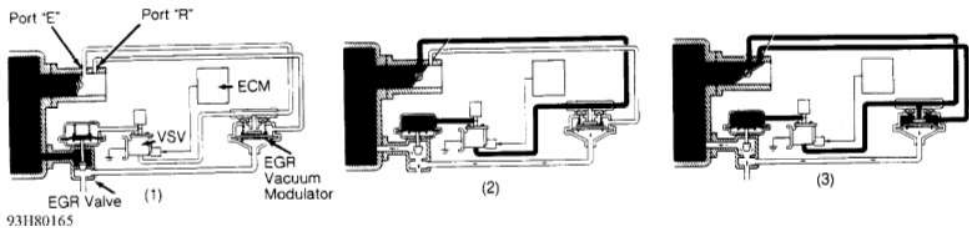


Fig. 61: Identifying EGR System Operation (2.2L 5S-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Engine Coolant Temp.	Engine RPM	ECM	VSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber	EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 55°C (131°F)	-	-	CLOSED	-	-	-	CLOSED	Not recirculated
Above 60°C (140°F)	Below 4,000 rpm	OFF	CLOSED	Positioned below port E	-	-	CLOSED	Not recirculated
		...	CLOSED	Positioned below port E	(1)	-	CLOSED	Not recirculated
		ON	OPEN	Positioned between port E and port R	(2) HIGH	CLOSES passage to atmosphere	OPEN	Recirculated
	Above 4,000 rpm	OFF	CLOSED	Positioned above port R	(3) HIGH	CLOSES passage to atmosphere	OPEN	Recirculated (increase)
							CLOSED	Not Recirculated

* Pressure increases → Modulator closes → EGR valve opens → Pressure drops
→ EGR valve closes → Modulator opens →
** When the throttle valve is positioned above port R, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the exhaust gas, even if the exhaust pressure is insufficiently low.
*** If terminals TE1 and E1 of data link connector 1 are connected, the VSV switches ON.

Fig. 62: Identifying EGR System Operating Parameters (2.2L 5S-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

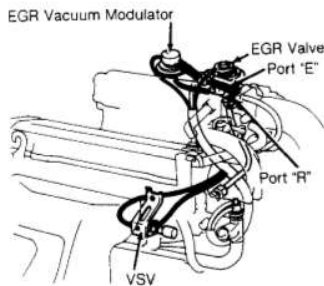


Fig. 63: Identifying EGR System Components (2.2L 5S-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

FUEL EVAPORATION

NOTE: Fuel evaporation systems contain different components and have different operating parameters depending on application. See Figs. 64-66.

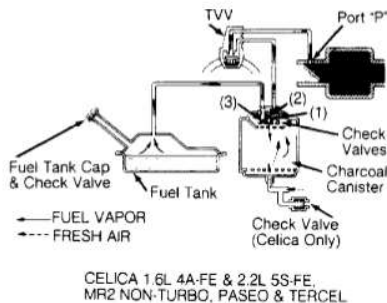


Fig. 64: Fuel Evaporation System Operation ID (1.6L 4A-FE & 2.2L 5S-FE)
Courtesy Of Toyota Motor Sales, U.S.A., Inc.

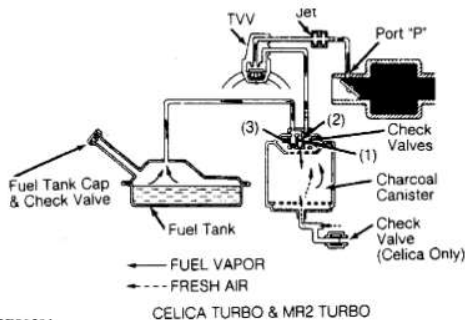


Fig. 65: Fuel Evaporation System Operation ID (Turbo)
Courtesy Of Toyota Motor Sales, U.S.A., Inc.

PICKUP 3.0L & 4RUNNER 3.0L

Engine Coolant Temp.	TVV	Throttle Valve Opening	Canister Check Valve			Check Valve in Cap	Evaporated Fuel (HC)
			(1)	(2)	(3)		
Below 35°C (95°F)	CLOSED	-	-	-	-	-	HC from tank is absorbed into the canister
Above 54°C (129°F)	OPEN	Positioned below port P	CLOSED	-	-	-	
		Positioned above port P	OPEN	-	-	-	HC from canister is led into air intake chamber.
High pressure in tank	-	-	-	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister.
High vacuum in take	-	-	-	CLOSED	OPEN	OPEN	Air is led into the fuel tank.

Fig. 66: Fuel Evaporation System Operating Parameters
Courtesy Of Toyota Motor Sales, U.S.A., Inc.

NOTE: The Bimetallic Vacuum Switching Valve (BVSV) may be referred to as a Thermal Vacuum Valve (TVV).

Bimetallic Vacuum Switching Valve

- 1) Drain cooling system. Remove Bimetallic Vacuum Switching Valve (BVSV). BVSV is located in coolant passage and contains 2 vacuum hoses which go to the charcoal canister and throttle body.
- 2) Use cool water to cool threaded end of BVSV to less than 95°F (35°C). Apply air pressure to top port on BVSV. Ensure BVSV is closed and no air will pass through lower port.
- 3) Heat water to greater than 129°F (54°C). Apply air pressure to top port on BVSV. Ensure BVSV is open and air passes through lower port. Replace BVSV if defective. Apply thread sealant to threads of BVSV and reinstall. Fill cooling system.

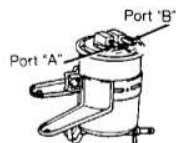
Charcoal Canister

- 1) Disconnect hoses from charcoal canister. Check for clogged

filter and/or stuck check valve by applying low air pressure to port "A". See Fig. 67. Ensure air flows freely from other ports on charcoal canister.

2) Apply low air pressure to port "B". See Fig. 67. Ensure no air flows from any other ports on charcoal canister. Replace charcoal canister if defective.

3) To clean charcoal canister filter, apply 43 psi (3 kg/cm²) air pressure to port "A" while holding port "B" closed. Ensure no activated carbon comes out of charcoal canister. DO NOT attempt to wash out charcoal canister.



CELICA & COROLLA

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Fig. 67: Identifying Charcoal Canister Ports
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Check Valve

1) Remove check valve from lower hose on charcoal canister. Apply air pressure to Yellow side of check valve. Air should pass through check valve.

2) Apply air pressure to Black side of check valve. Air should not pass through check valve. Replace check valve if defective.

Jet (Turbo)

Remove jet from hose between throttle body and BVS. Blow air through both sides and ensure no blockage exists. Replace jet if blockage exists in either direction.

POSITIVE CRANKCASE VENTILATION (PCV)

Turbo

Visually inspect hose and connections for cracks, leaks or other damage. Clean deposits from orifice with solvent and blow out with compressed air.

All Others

1) Remove PCV valve. Attach hose to PCV valve. Blow air from cylinder head side of PCV valve. Ensure air passes easily through PCV valve.

2) Blow air from intake manifold side of PCV valve. Ensure air passes through PCV valve with some restriction. Replace PCV valve if valve does not function as described.

THROTTLE CONTROLS

NOTE: When testing throttle control systems, tachometer may be required. Ensure tachometer is connected to proper terminals. For tachometer connections, see IDLE SPEED & MIXTURE in D - ADJUSTMENTS article.

Dashpot Control System (1.6L 4A-FE)

1) Warm engine to normal operating temperature. Ensure idle speed is correct. See IDLE SPEED & MIXTURE in D - ADJUSTMENTS article.

2) Remove cover, cap, filter and separator from dashpot. See Fig. 68. Install Jumper Wire (SST 09843-18020) between terminals TE1 and E1 of data link connector No. 1. See Fig. 47. Disconnect electrical connector from EGR Vacuum Switching Valve (VSV), located below EGR valve.

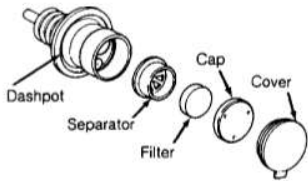
3) Start engine. Maintain engine speed at specified testing RPM. See DASHPOT TESTING SPECIFICATIONS table.

4) Plug Vacuum Transmitting Valve (VTV) hole. See Fig. 69. Release throttle. Dashpot should be extended and dashpot setting RPM should be as specified. See DASHPOT TESTING SPECIFICATIONS table.

5) If dashpot setting RPM is incorrect, rotate dashpot adjusting screw to obtain correct RPM. See Fig. 70. Repeat steps 3) and 4) and ensure proper adjustment is obtained.

6) Reinstall electrical connector on EGR VSV. Remove jumper wire from data link connector No. 1. Install separator, filter, cap and cover. Install filter with coarse surface facing outward (away from dashpot).

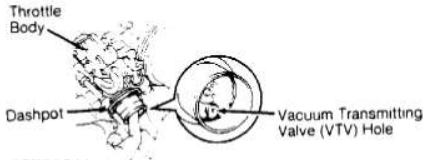
7) To check VTV operation, operate engine at dashpot testing RPM for a few seconds. Release throttle. Ensure engine returns to idle in a few seconds.



CELICA 1.6L 4A-FE

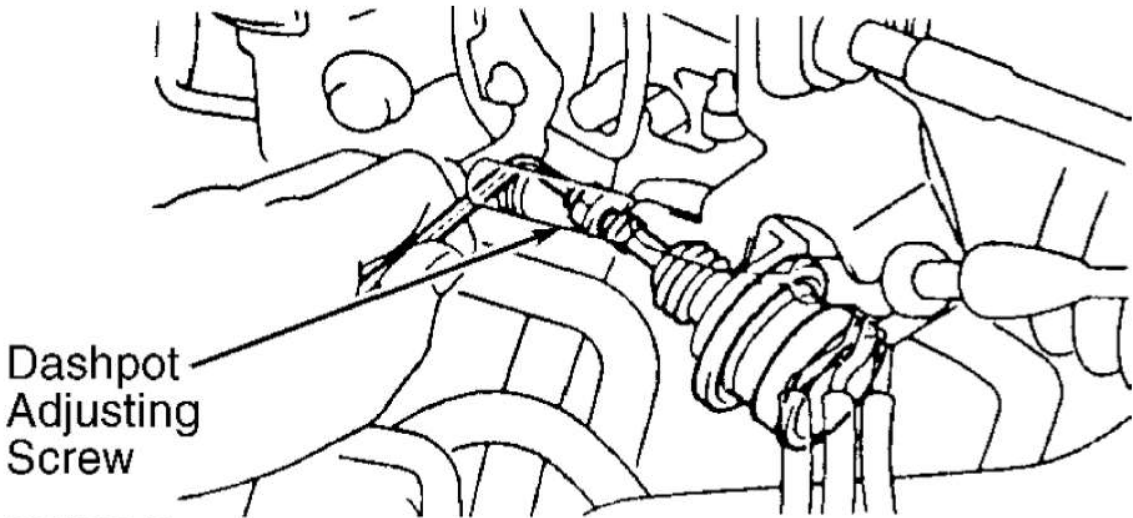
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Fig. 68: Identifying Dashpot (1.6L 4A-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



93F80544

Fig. 69: Identifying Vacuum Transmitting Valve (1.6L 4A-FE)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



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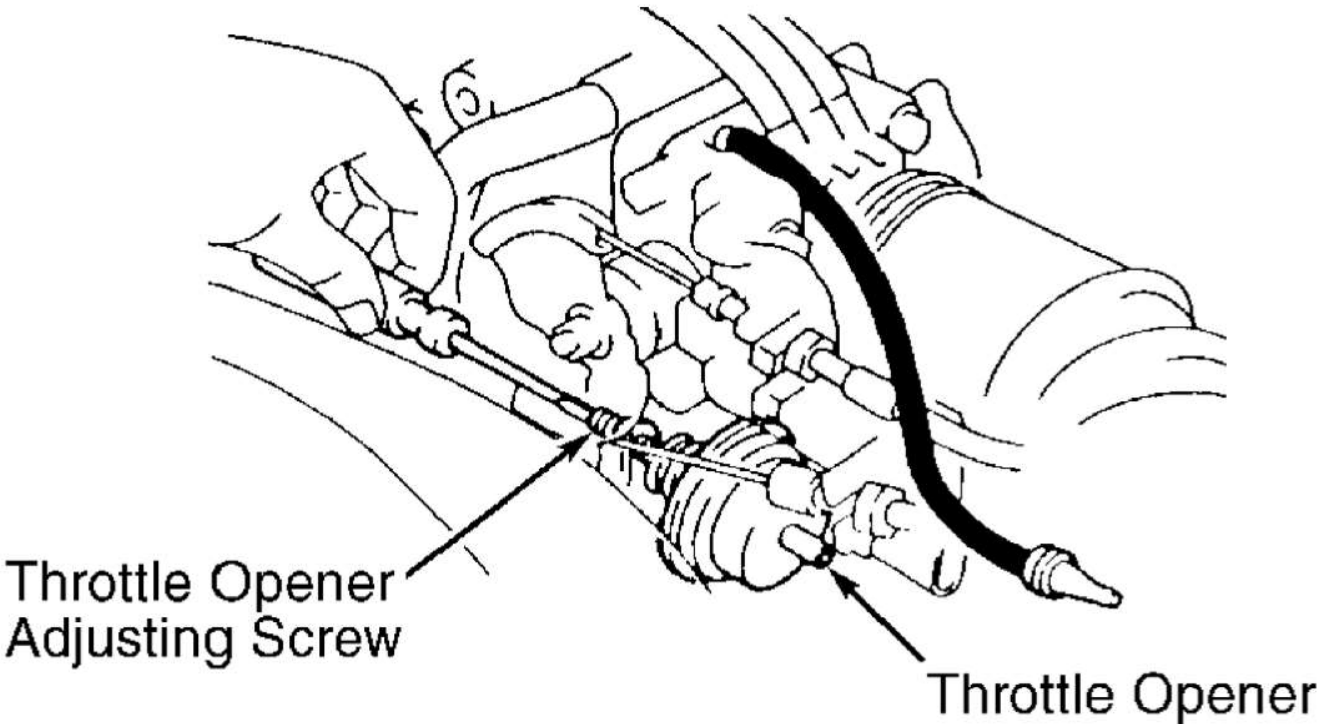
Fig. 70: Adjusting Dashpot
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DASHPOT TESTING SPECIFICATIONS TABLE

Application	Testing RPM	(1) Dashpot Setting RPM
1.6L 4A-FE		
A/T	3000	2200
M/T	3000	1800

(1) - With electric cooling fan off (if equipped).

- Throttle Opener (2.2L 5S-FE)
- 1) Warm engine to normal operating temperature. Ensure idle speed is correct. See IDLE SPEED & MIXTURE in D - ADJUSTMENTS article.
 - 2) Disconnect and plug vacuum hose at throttle opener, located on side of throttle body. Start engine. Maintain engine speed at 2500 RPM. Release throttle and note engine speed. Engine speed should be within specification. See THROTTLE OPENER SPECIFICATIONS table.
 - 3) If engine speed is not within specification, rotate throttle opener adjusting screw until correct engine speed is obtained. See Fig. 71. Reinstall vacuum hose on throttle opener.



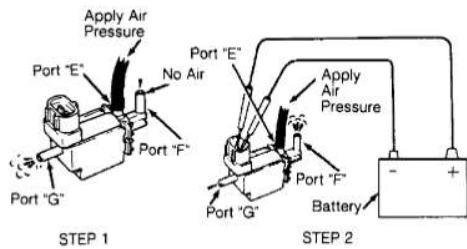
93180547
Fig. 71: Adjusting Throttle Opener (Camry 2.2L Shown; Others Similar)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

- Throttle Opener (Turbo)
- 1) Warm engine to normal operating temperature. Ensure idle speed is correct. See IDLE SPEED & MIXTURE in D - ADJUSTMENTS article.
 - 2) Disconnect and plug vacuum hose at throttle opener, located on side of throttle body. Start engine and note engine speed. Engine speed should be within specification. See THROTTLE OPENER SPECIFICATIONS table.
 - 3) Replace throttle body if engine speed is not within specification. Shut engine off. Reinstall vacuum hose on throttle opener. Start engine and ensure engine returns to correct idle speed.

THROTTLE OPENER SPECIFICATIONS TABLE

Application	(1) Engine RPM
2.0L Turbo	900-1900
2.2L 5S-FE	1300-1500

(1) - With electric cooling fan turned off (if equipped).



93J80548
Fig. 72: Checking Throttle Opener Vacuum Switching Valve (VSV)
Courtesy of Toyota Motor Sales, U.S.A., Inc.