

G - TESTS W/CODES - TESTS (TURBO)

1998 Toyota Supra

1998 ENGINE PERFORMANCE
Toyota - Self-Diagnostics - Turbo

Supra

DIAGNOSTIC TESTS

* PLEASE READ FIRST *

NOTE: Before performing any diagnostic test, refer to SELF-DIAGNOSTICS - INTRODUCTION article for diagnostic system functions and system diagnostic procedures. For component location, see appropriate illustration in E - THEORY/OPERATION article. Manufacturer recommends using Check Harness "A" (SST 09990-01000) when using diagnostic tests to diagnose malfunctions. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article.

DTC P0100: MASS AIRFLOW (MAF) SENSOR CIRCUIT

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

MAF sensor uses a platinum hot wire maintained at a constant temperature. Airflow past sensor affects temperature and current flow through sensor. DTC is set when ECM detects an open or short in MAF sensor circuit with engine speed of 4000 RPM or less. ECM will operate in fail-safe mode if DTC P0100 is set. Possible causes are:

- * MAF open or short circuit.
- * MAF sensor.
- * ECM.

Diagnosis & Repair

1) Connect scan tool to DLC No. 3 connector. See Fig. 1.

Start vehicle engine and allow to idle. Using scan tool, monitor MAF flow rate. If scan tool reading is 0.0 gm/sec., go to next step. If reading is 359.0 gm/sec. or more, go to step 5).

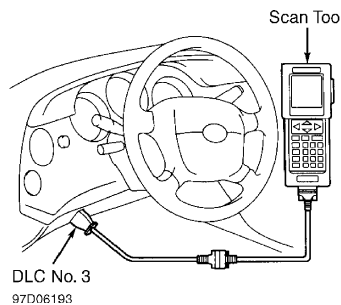


Fig. 1: Connecting Scan Tool To Data Link Connector (DLC) No. 3
Courtesy of Toyota Motor Sales, U.S.A., Inc.

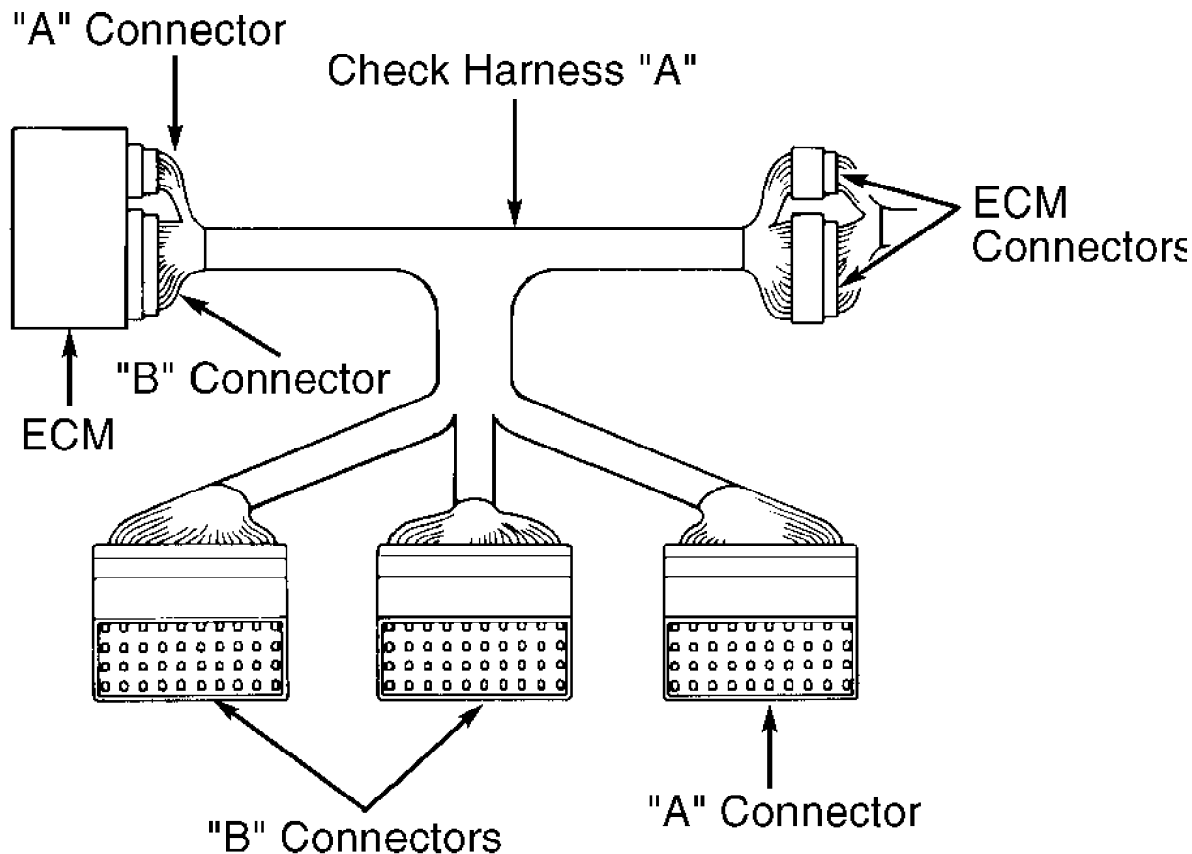
2) Disconnect MAF sensor connector. Ensure ignition is on. Using DVOM, measure voltage between terminal No. 1 (Black/Red wire)

and ground. If voltage is 9-14 volts, go to next step. If voltage is not 9-14 volts, check for open circuit in wiring harness between EFI main relay and MAF sensor. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary.

3) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Start engine. Measure voltage between ground and terminal No. 66 at Check Harness "B" connector. See Fig. 2. If voltage is 1.1-1.5 volts, replace ECM.

4) If voltage is not 1.1-1.5 volts, check for open or short circuit in wiring harness between MAF sensor and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace MAF sensor.

5) Access ECM below passenger's side of instrument panel, underneath carpet. Turn ignition off. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Using ohmmeter, check continuity between ground and terminal No. 28 at Check Harness "B" connector. See Fig. 2. If continuity does not exist, replace ECM. If continuity exists, check for open circuit in wiring harness between MAF sensor and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace MAF sensor.



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Fig. 2: Identifying Check Harness "A"
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC P0101: MASS AIRFLOW (MAF) SENSOR CIRCUIT
RANGE/PERFORMANCE PROBLEM

Condition

Following conditions continue with engine speed of 900 RPM or less:

- * Closed throttle position switch on.
- * MAF sensor output is 2.2 volts or more.

Following conditions continue for more than 10 seconds with engine speed of 1500 RPM or more:

- * VTA circuit signal is .72 volt or more.
- * MAF sensor output is less than one volt.

Diagnosis & Repair Procedure

If only DTC P0101 is displayed, replace MAF sensor. If other codes are displayed, diagnose and repair those codes first and retest.

DTC P0110: INTAKE AIR TEMPERATURE (IAT) SENSOR CIRCUIT

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

The IAT sensor is a thermistor built into the MAF sensor and is used to monitor temperature of air flowing through MAF sensor. DTC is set when ECM detects an open or short in IAT sensor circuit. ECM will operate in fail-safe mode if DTC P0110 is set. Possible causes are:

- * IAT sensor open or short circuit.
- * IAT sensor.
- * ECM.

NOTE: If DTCs P0110, P0115 and P0120 are output together, inspect ECM terminal E2 (ground) circuit. Repair as necessary. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

Diagnosis & Repair

1) Connect scan tool to DLC No. 3 connector. See Fig. 1. Turn ignition on. Using scan tool, monitor IAT sensor temperature. If temperature displayed is same as outside temperature, check component and ECM connections. Problem is intermittent.

2) If temperature displayed is 284°F (140°C) or more, go to step 5). If temperature displayed is -40°F (-40°C), turn ignition off. Disconnect MAF sensor connector. Using jumper wire, connect MAF connector terminals No. 3 (Pink/Blue wire) and No. 4 (White/Black wire). Turn ignition on. Using scan tool, monitor IAT sensor temperature.

3) If temperature displayed is 284°F (140°C) or more, replace MAF sensor. If temperature displayed is less than 284°F (140°C), turn ignition off. Remove jumper wire. Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Connect jumper wire between terminals No. 45 and 65 at Check Harness "B" connector. See Fig. 2.

4) If temperature displayed on scan tool is 284°F (140°C) or more, repair wiring harness between MAF sensor and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. If temperature displayed on scan tool is less than 284°F (140°C), replace

ECM.

5) Turn ignition off. Disconnect MAF sensor connector. Turn ignition on. If temperature displayed on scan tool is -40°F (-40°C), replace MAF sensor. If temperature displayed is not -40°F (-40°C), turn ignition off.

6) Access ECM below passenger's side of instrument panel, underneath carpet. Disconnect Check Harness "B" connector from ECM. See Fig. 2. Turn ignition on. If temperature displayed is -40°F (-40°C), locate and repair short circuit in wiring harness between MAF sensor and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. If temperature displayed by scan tool is not -40°F (-40°C), replace ECM.

DTC P0115: ENGINE COOLANT TEMPERATURE (ECT) SENSOR CIRCUIT

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

The ECT sensor is a thermistor sensor that monitors engine coolant temperature. DTC is set when ECM detects an open or short in ECT sensor circuit. Possible causes are:

- * Open or short in ECT sensor circuit.
- * ECT sensor.
- * ECM.

NOTE: If DTCs P0110, P0115 and P0120 are output together, inspect ECM terminal E2 (ground) circuit. Repair as necessary. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

Diagnosis & Repair

1) Connect scan tool to DLC No. 3 connector. See Fig. 1. Turn ignition on. Using scan tool, monitor ECT sensor temperature. If temperature displayed is same as actual coolant temperature, check component and ECM connections. Problem is intermittent.

2) If temperature displayed is 284°F (140°C) or more, go to step 5). If temperature displayed is -40°F (-40°C), turn ignition off. Disconnect ECT sensor connector. ECT is located at top left side of engine. Connect a jumper wire between ECT sensor wiring harness connector terminals. Turn ignition on. Using scan tool, monitor ECT sensor temperature.

3) If temperature displayed is 284°F (140°C) or more, replace ECT sensor. If temperature displayed is less than 284°F (140°C), turn ignition off. Remove jumper wire. Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Connect a jumper wire between terminals No. 44 and 65 at Check Harness "B" connector. See Fig. 2.

4) If temperature displayed on scan tool is 284°F (140°C) or more, locate and repair open circuit in wiring harness between ECT sensor and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. If temperature displayed on scan tool is less than 284°F (140°C), replace ECM.

5) Turn ignition off. Disconnect ECT sensor connector. Turn ignition on. If temperature displayed on scan tool is -40°F (-40°C), replace ECT sensor. If temperature displayed is not -40°F (-40°C), turn ignition off.

6) Access ECM below passenger's side of instrument panel, underneath carpet. Disconnect Check Harness "B" connector from ECM.

See Fig. 2. Turn ignition on. If temperature displayed is -40°F (-40°C), locate and repair short circuit in wiring harness between ECT sensor and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. If temperature displayed by scan tool is not -40°F (-40°C), replace ECM.

DTC P0116: ENGINE COOLANT TEMPERATURE (ECT) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM

Condition

DTC is set when ECT sensor temperature is 86°F (30°C) or less during engine operation. Possible causes are:

- * ECT sensor.
- * Cooling system.

Diagnosis & Repair

If any other codes are displayed, diagnose and repair those codes first and retest. If only DTC P0116 is displayed, remove and inspect cooling system thermostat. Replace thermostat as necessary. If thermostat is okay, replace ECT sensor.

DTC P0120: THROTTLE POSITION (TP) SENSOR CIRCUIT MALFUNCTION

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

The TP sensor is a variable resistor that monitors throttle opening. The ECM determines vehicle driving condition and adjusts air/fuel mixture accordingly. DTC is set when ECM consistently detects less than .3 volt from VTA1 circuit and closed throttle position switch is off. DTC can also be set if ECM consistently detects more than 4.9 volts on VTA1 circuit. DTC P0120 will not set if there is an open in IDL1 circuit. Possible causes are:

- * Open or short in TP sensor circuit.
- * TP sensor.
- * ECM.

NOTE: If DTCs P0110, P0115 and P0120 are output together, inspect ECM terminal E2 (ground) circuit. Repair as necessary. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

Diagnosis & Repair

1) Connect scan tool to DLC No. 3 connector. See Fig. 1. Turn ignition on. Using scan tool, monitor throttle valve opening percentage. Opening percentage should be approximately 10 percent with fully closed throttle.

2) Depress accelerator pedal to floor (WOT). Opening percentage should be approximately 70 percent. If percentages are as specified, check all connections. Problem may be intermittent.

3) If percentages are not as specified, turn ignition off. Disconnect TP sensor connector. Turn ignition on. Using DVOM, measure voltage between ground and terminal No. 1 (Blue/Red wire) at TP sensor wiring harness connector. If voltage is 4.5-5.5 volts, go to next step. If voltage is not 4.5-5.5 volts, go to step 7).

4) Check Throttle Position (TP) sensor. See ENGINE SENSORS & SWITCHES in appropriate I - SYSTEM/COMPONENT TESTS article. Replace TP sensor as necessary. If TP sensor is okay, go to next step.

5) Access ECM below passenger's side of instrument panel,

underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Turn ignition on. Measure voltage between terminals No. 43 and 65 at Check Harness "B" connector. See Fig. 2. Voltage should be .3-.8 volt with throttle fully closed, and 3.2-4.9 volts with throttle fully open (WOT).

6) If voltage is as specified, replace ECM. If voltage is not as specified, check for an open or short in Yellow wire between TP sensor and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary.

7) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Turn ignition on. Measure voltage between terminals No. 41 and 65 at Check Harness "B" connector. See Fig. 2. If voltage is 4.5-5.5 volts, check wiring harness for an open in Blue/Red wire between TP sensor and ECM. If voltage is not 4.5-5.5 volts, replace ECM.

DTC P0121: THROTTLE POSITION (TP) SENSOR CIRCUIT

RANGE/PERFORMANCE FAULT

Condition

Vehicle speed must have exceeded 19 MPH at least once. DTC is set when TP sensor output voltage is out of range while vehicle speed is 0-19 MPH. Possible cause is:

- * Throttle Position (TP) sensor.

Diagnosis & Repair

If only DTC P0121 is displayed, replace TP sensor. If other codes are displayed, diagnose and repair those codes first and retest.

DTC P0125: INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP

FUEL CONTROL

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

NOTE: Sensor No. 1 refers to sensor closest to engine block. Sensor No. 2 refers to sensor located in front of rear catalytic converter.

Circuit Description

The oxygen sensor monitors exhaust gas oxygen content and delivers an input signal to ECM. The ECM uses input signal to determine fuel injection system operation. Sensors include heater. DTC is set when sensor does not output a rich condition once engine is at normal operating temperature, engine speed of 1500 RPM or more, and vehicle speed is 25-62 MPH for at least 2 minutes. Possible causes are:

- * Open or short in heated oxygen sensor circuit.
- * Heated oxygen sensor.

Diagnosis & Repair

1) Connect scan tool to DLC No. 3 connector. See Fig. 1. Start vehicle and warm engine to normal operating temperature. Using scan tool, monitor sensor No. 1 output voltage. Snap accelerate engine to about 4000 RPM 3 times. Sensor should indicate a rich signal (.45 volt or more) at least once.

2) If a rich signal is indicated at least once, replace ECM. If sensor does not display a rich signal at least once, check for open or short in wiring harness between ECM and oxygen sensor. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace oxygen sensor.

DTC P0130: HEATED OXYGEN SENSOR CIRCUIT (SENSOR NO. 1)

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

NOTE: Sensor No. 1 refers to sensor closest to engine block. Sensor No. 2 refers to sensor located in front of rear catalytic converter.

Condition

DTC P0130 is set when oxygen sensor No. 1 voltage remains at .4 volt or more, or .6 volt or less during idle, once engine is at normal operating temperature. Possible causes are:

- * Heated oxygen sensor.
- * Fuel trim.

Test Drive Confirmation

1) If using OBD-II scan tool, go to next step. If using Toyota scan tool, connect scan tool. See Fig. 1. Switch scan tool to CHECK mode. Start and warm engine to normal operating temperature. Drive vehicle at 31-40 MPH for 1-3 minutes. Stop vehicle and allow to idle for one minute. If malfunction exists, MIL will illuminate.

2) If using OBD-II scan tool, start and warm engine to normal operating temperature. Drive vehicle at 31-40 MPH for 1-3 minutes. Stop vehicle and allow to idle for one minute. Turn vehicle off. Repeat driving and idle part of test. If malfunction exists, MIL will illuminate.

Diagnosis & Repair Procedure

1) Check for open or short circuit in wiring harness between ECM and oxygen sensor. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, connect scan tool. See Fig. 1.

2) Start engine and warm to normal operating temperature. Monitor heated oxygen sensor output voltage and short-term fuel trim. If scan tool indicates a lean condition (.6 volt or less, +20 trim) or rich condition (.4 volt or more, -20 trim), see DTC P0171: SYSTEM TOO LEAN (FUEL TRIM), DTC P0172: SYSTEM TOO RICH (FUEL TRIM) test.

3) If scan tool indicates other than reading in step 2), operate engine at 2500 RPM for 90 seconds. Monitor oxygen sensor voltage. If voltage constantly fluctuates from less than .4 volt to more than .6 volt, perform TEST DRIVE CONFIRMATION. If voltage does not fluctuate as specified, replace sensor.

DTC P0133: HEATED OXYGEN SENSOR (NO. 1) CIRCUIT SLOW RESPONSE

NOTE: Sensor No. 1 refers to sensor closest to engine block.

Condition

DTC is set when ECM detects a response time of one second or more from sensor to change from rich to lean, or lean to rich. Possible cause is:

- * Heated oxygen sensor.

Diagnosis & Repair

If only DTC P0133 is displayed, replace oxygen sensor. If other codes are displayed, diagnose and repair those codes first and retest.

DTC P0135: HEATED OXYGEN SENSOR CIRCUIT (SENSOR NO. 1) DTC

P0141: HEATED OXYGEN SENSOR CIRCUIT (SENSOR NO. 2)

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

NOTE: Sensor No. 1 refers to sensor closest to engine block. Sensor No. 2 refers to sensor located in front of rear catalytic converter.

Condition

DTC is set when either of the following conditions is present:

- * Sensor heater current draw exceeds 2 amps.
- * Sensor heater current draw is .25 amp or less.

Possible causes are:

- * Heated oxygen sensor open or short circuit.
- * Heated oxygen sensor heater.
- * ECM.

Diagnosis & Repair

1) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Turn ignition on. If DTC P0135 is set, measure voltage between ground and terminal No. 71 at Check Harness "B" connector. If DTC P0141 is set, measure voltage between ground and terminal No. 72 at Check Harness "B" connector. See Fig. 2. Voltage for each circuit should be 9-14 volts.

2) If voltage is as specified, replace ECM. If voltage is not as specified, turn ignition off. Disconnect appropriate oxygen sensor connector. Using ohmmeter, measure resistance between terminals No. 1 and 2 at oxygen sensor connector. See IDENTIFYING OXYGEN SENSOR HEATER TERMINALS table.

IDENTIFYING OXYGEN SENSOR HEATER TERMINALS TABLE

| Application | Terminal No. 1 | Terminal No. 2 |
|--------------------|------------------------|----------------|
| Sensor No. 1 | Black/Blue Wire | Black/Red Wire |
| Sensor No. 2 | Brown/White Wire | Black/Red Wire |

3) If resistance is 11-16 ohms at 68°F (20°C), check circuits between ECM and sensor. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If resistance is not 11-16 ohms at 68°F (20°C), replace sensor.

DTC P0136: HEATED OXYGEN SENSOR CIRCUIT (SENSOR NO. 2)

NOTE: Sensor No. 1 refers to sensor closest to engine block. Sensor No. 2 refers to sensor located in front of rear

catalytic converter.

Condition

DTC is set when oxygen sensor No. 2 voltage remains at .4 volt or more, or .6 volt or less during vehicle operation (25 MPH or more), once engine is at normal operating temperature. Possible cause is:

- * Heated oxygen sensor.

Diagnosis & Repair

1) If any codes are displayed other than DTC P0136, diagnose and repair those codes first. If only DTC P0136 is displayed, check for open or short circuit in wiring harness between ECM and oxygen sensor. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary.

2) If wiring harness is okay, connect scan tool. See Fig. 1. Start and warm engine to normal operating temperature. Monitor oxygen sensor No. 2 output voltage. Snap accelerate engine to about 4000 RPM 3 times. Voltage should fluctuate from less than .4 volt to more than .6 volt.

3) If voltage fluctuates as specified, check sensor wiring harness connector. Problem may be intermittent. If voltage does not fluctuate as specified, replace sensor.

DTC P0171: SYSTEM TOO LEAN (FUEL TRIM) DTC P0172: SYSTEM TOO RICH (FUEL TRIM)

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

NOTE: Sensor No. 1 refers to sensor closest to engine block. Sensor No. 2 refers to sensor located in front of rear catalytic converter.

Circuit Description

Fuel trim refers to feedback compensation value compared against basic injection time. Fuel trim includes short-term and long-term fuel trim. DTC P0171 is set when fuel trim is rich beyond a certain value. Possible causes are:

- * Air intake hose loose.
- * Fuel line pressure.
- * Injector blockage.
- * Heated oxygen sensor.
- * Mass Airflow (MAF) sensor.
- * Engine Coolant Temperature (ECT) sensor.

DTC P0172 is set when fuel trim is lean beyond a certain value. Possible causes are:

- * Fuel line pressure.
- * Injector blockage or leak.
- * Heated oxygen sensor.
- * Mass Airflow (MAF) sensor.
- * Engine Coolant Temperature (ECT) sensor.

Diagnosis & Repair

1) Check all air induction components. Repair as necessary. If air induction components are okay, connect scan tool. See Fig. 1. Start engine and warm to normal operating temperature. Monitor heated

oxygen sensor output voltage and short-term fuel trim.

2) If scan tool indicates a lean condition (.6 volt or less, +20 trim) or rich condition (.4 volt or more, -20 trim), go to next step. If results are other than shown, see DTC P0130: HEATED OXYGEN SENSOR CIRCUIT (SENSOR NO. 1) test.

3) Check fuel pressure. See appropriate F - BASIC TESTING article. Repair fuel pressure as necessary. If fuel pressure is okay, check fuel injectors. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace injectors as necessary.

4) If all injectors are okay, check Mass Airflow (MAF) sensor and Engine Coolant Temperature (ECT) sensor. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace MAF and/or ECT sensor as necessary. If both components are okay, check ignition system. See IGNITION CHECKS in appropriate F - BASIC TESTING article. Repair ignition system as necessary. If ignition system is okay, replace ECM.

DTC P0300: RANDOM MISFIRE DETECTED

Circuit Description

A misfire is determined by the ECM. The ECM uses signals provided by the crankshaft and camshaft position sensors. If the engine speed rate has changed enough to equal a preset number, a misfire is detected and the MIL is illuminated. If the misfire rate is high enough, and driving conditions will cause catalytic converter damage or overheating, the MIL blinks when a misfire is occurring.

DTC is set when misfiring of random cylinders is detected during any particular 200 or 1000 revolutions. Possible causes are:

- * Ignition system.
- * Injector(s).
- * Fuel pressure.
- * EGR system.
- * Engine compression.
- * Valve clearance.
- * Valve timing.
- * Mass Airflow (MAF) sensor.
- * Engine Coolant Temperature (ECT) sensor.

Test Drive Confirmation

1) Connect Toyota or OBD-II scan tool. See Fig. 1. Record any DTCs and freeze frame data. Switch scan tool to CHECK mode (Toyota scan tool only). Drive vehicle several times with engine speed, load and its surrounding range shown with ENGINE SPD, CALC LOAD in freeze frame data or MISFIRE RPM and MISFIRE LOAD in scan tool data list.

2) Drive vehicle at specified engine speeds. See DRIVING PATTERN table. If using OBD-II scan tool, turn ignition off after symptom is simulated the first time, then repeat test drive again. If a misfire is detected, a DTC will set and misfire will be indicated in freeze frame data. Turn ignition off and wait a minimum of 5 seconds.

DRIVING PATTERN TABLE

| RPM | (1) Minutes |
|--------|-------------|
| Idling | 3 1/2 |
| 1000 | 3 |
| 2000 | 1 1/2 |
| 3000 | 1 |

(1) - Minimum specification given.

Diagnosis & Repair

1) Check vacuum hoses for leaks, blockage and proper routing. Also, check wiring harness and wiring harness connectors for damage or poor connections. Repair as necessary and perform TEST DRIVE CONFIRMATION. If vacuum hoses and wiring harness connectors are okay, go to next step.

2) Inspect spark plug and check for spark at misfiring cylinder. See appropriate F - BASIC TESTING article. Repair as necessary. If spark plug is okay and spark is present, go to next step.

3) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Turn ignition on. Measure voltage between ground and injector terminals at Check Harness "B" connector. See IDENTIFYING INJECTOR TERMINALS table. See Fig. 2. If voltage is 9-14 volts for each circuit, go to step 5). If voltage is not 9-14 volts, go to next step.

IDENTIFYING INJECTOR TERMINALS TABLE

| Injector No. | (1) Terminal No. | Wire Color |
|--------------|------------------|------------|
| 1 | 20 | Red/Blue |
| 2 | 19 | Red/Yellow |
| 3 | 18 | Red/Green |
| 4 | 17 | Red/White |
| 5 | 16 | Red |
| 6 | 15 | Red/Black |

(1) - Terminals are located at Check Harness "B" connector.

4) Disconnect injector of misfiring cylinder. Using ohmmeter, measure resistance between injector terminals. If resistance is about 1.95 ohms, check for open or short circuit in wiring harness between ECM and injector. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If resistance is not about 1.95 ohms, replace injector.

5) Check fuel pressure. See appropriate F - BASIC TESTING article. Repair fuel pressure as necessary. If fuel pressure is okay, check fuel injector performance. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace fuel injectors as necessary.

6) If all injectors are okay, check EGR system. See appropriate I - SYSTEM/COMPONENT TESTS article. Repair EGR system as necessary. If EGR system is okay, check MAF sensor and ECT sensor. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace MAF and/or ECT sensor as necessary. If both components are okay, also check engine compression, valve clearance and valve timing. See appropriate F - BASIC TESTING article.

DTCS P0301-P0306: CYLINDERS NO. 1-6 MISFIRE DETECTED

NOTE: When 2 or more codes for a misfiring cylinder are recorded repeatedly, but DTC P0300 is not recorded, it indicates that misfires were detected and stored into ECM memory at different times.

Circuit Description

See DTC P0300: RANDOM MISFIRE DETECTED test.

Condition

Two conditions can cause code to set. These are:

- * During any particular 200 revolutions of engine, misfiring is detected which can cause catalytic converter overheating and/or damage.
- * During any particular 1000 revolutions of engine, misfiring is detected which can cause a deterioration in emission levels.

For possible causes, see DTC P0300: RANDOM MISFIRE DETECTED test.

Diagnosis & Repair
See DTC P0300: RANDOM MISFIRE DETECTED test.

DTC P0325: KNOCK SENSOR NO. 1 CIRCUIT DTC P0330: KNOCK SENSOR NO. 2 CIRCUIT

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

Knock sensors are located on front and rear left side of cylinder block. Sensor generates voltage when engine block vibrates due to knocking. DTC P0325 is for front sensor. DTC P0330 is for rear sensor. DTC is set when there is no knock sensor signal to ECM with engine speed of 1600 RPM or more. Possible causes are:

- * Open or short in knock sensor circuit.
- * Knock sensor (loose).
- * ECM.

Diagnosis & Repair

1) Connect scan tool. See Fig. 1. Connect Check Harness "A" (SST 09990-01000) to ECM connectors, leaving ECM disconnected. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. If DTC P0325 is present, measure resistance between ground and terminal No. 50 at Check Harness "B" connector. If DTC P0330 is present, measure resistance between ground and terminal No. 49 at Check Harness "B" connector. See Fig. 2. If resistance is infinite, go to step 3). If resistance is not infinite, go to next step.

2) Check knock sensor. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace sensor as necessary. If sensor is okay, go to next step.

3) Check for open or short circuit in wiring harness between ECM and knock sensor. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, go to next step.

4) Substitute knock sensor with known-good sensor. Clear and then retrieve codes. See SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. If code is still present, replace ECM. If code is no longer present, replace sensor.

DTC P0335 OR P1335: CRANKSHAFT POSITION (CKP) SENSOR CIRCUIT

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

The CKP sensor is a pick-up coil mounted next to crankshaft pulley. A 34-tooth signal plate is mounted to crankshaft. DTC P0335 is set if no cranking signal is received by ECM from sensor. DTC P1335 is set if no engine running signal is received by ECM from sensor. Possible causes are:

- * CKP sensor open or short circuit.
- * CKP sensor.
- * Starter.
- * ECM.

Diagnosis & Repair

1) Disconnect CKP sensor connector. Using ohmmeter, measure resistance between CKP sensor connector terminals. Resistance should be 1630-2740 ohms (cold sensor) or 2065-3225 ohms (hot sensor). Replace CKP sensor as necessary. If CKP sensor is okay, go to next step.

2) Check for open or short circuit in wiring harness between ECM and CKP sensor. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, remove and inspect CKP sensor. Also inspect signal plate. Replace CKP sensor and/or signal plate as necessary. If both components are okay, replace ECM.

DTC P0340: CAMSHAFT POSITION (CMP) SENSOR CIRCUIT

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

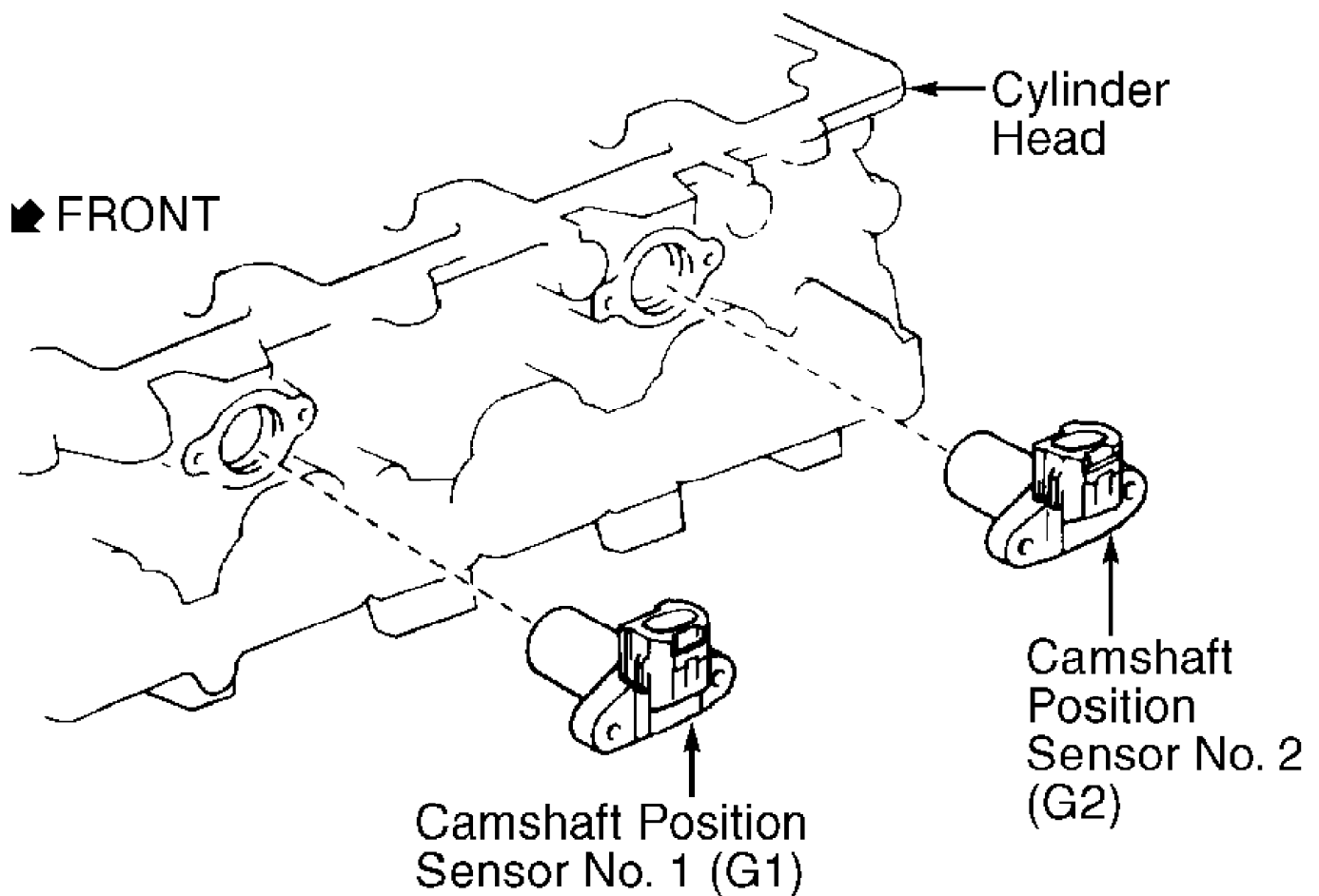
The CMP sensors (G1 and G2 signals) consist of a signal plate and a pick-up coil. Sensors are located on intake side of cylinder head. See Fig. 3. DTC is set when either no cranking or engine running signal is received by ECM from sensor. Possible causes are:

- * Open or short in CMP sensor circuit.
- * CMP sensor.
- * ECM.

Diagnosis & Repair

1) Disconnect CMP sensor connector. Using ohmmeter, measure resistance between CMP sensor connector terminals. Resistance should be 835-1400 ohms (cold sensor) or 1060-1645 ohms (hot sensor). If resistance is not as specified, replace CMP sensor. If resistance is as specified, go to next step.

2) Check for open or short circuit in wiring harness between ECM and CMP sensor. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, remove and inspect CMP sensors. Replace CMP sensors as necessary. If CMP sensors are okay, replace ECM.



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Fig. 3: Identifying Camshaft Position Sensors
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC P0401: INSUFFICIENT EXHAUST GAS RECIRCULATION (EGR) FLOW DETECTED

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

The EGR system recirculates exhaust gas through intake system to reduce combustion temperature and NOx emissions. The amount of EGR valve opening is regulated by the EGR vacuum modulator according to engine load. Vacuum source to valve is controlled by the Vacuum Switching Valve (VSV), which is controlled by ECM.

The EGR valve is closed (VSV on) under the following conditions:

- * Engine is not warmed up.
- * Vehicle under deceleration.
- * Light engine load.
- * Engine racing.

DTC is set when EGR temperature sensor value does not exceed

ambient air temperature by more than 112°F (45°C) after vehicle is operated for 3-5 minutes (50 MPH or more). Possible causes are:

- * EGR valve stuck closed.
- * VSV short circuit.
- * EGR temperature sensor open circuit.
- * EGR vacuum hose disconnected.
- * ECM.

Test Drive Confirmation

1) Connect scan tool. See Fig. 1. Start and warm engine to normal operating temperature. Operate vehicle at 43-56 MPH for 3 minutes or more. Stop vehicle and allow to idle for about 2 minutes. Turn ignition off.

2) Start engine and allow to idle. Operate vehicle at 43-56 MPH for 3 minutes or more. Stop vehicle and allow to idle for about 2 minutes.

3) Using scan tool, check READINESS TESTS. If COMPL is displayed on scan tool and MIL is not illuminated, system is normal. If INCMPL is displayed and MIL is not illuminated, repeat test drive procedure.

Diagnosis & Repair (Using Toyota Scan Tool)

1) Connect scan tool. See Fig. 1. Turn ignition on. Read EGR gas temperature. If temperature is 50°F (10°C), go to step 6). If temperature is not 50°F (10°C), go to next step.

NOTE: If EGR gas temperature is 37.6°F (3.1°C), an open exists in EGR temperature sensor circuit.

2) Disconnect EGR temperature sensor connector. EGR temperature sensor is mounted to EGR valve assembly. Connect a jumper wire between EGR temperature sensor connector terminals.

3) If EGR temperature displayed is not 318.7°F (159.3°C), go to next step. If temperature displayed is 318.7°F (159.3°C), check sensor connectors and terminals. Repair as necessary. If connectors are okay, replace sensor.

4) Remove jumper wire. Turn ignition off. Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Connect a jumper wire between terminals No. 46 and 65 at Check Harness "B" connector. See Fig. 2. Turn ignition on.

5) If EGR temperature displayed is 318.7°F (159.3°C), locate and repair open circuit in wiring harness between ECM and EGR temperature sensor. If temperature displayed is not 318.7°F (159.3°C), replace ECM.

6) Check vacuum hoses. See appropriate illustration in M - VACUUM DIAGRAMS article. Replace vacuum hoses as necessary. If all hoses are okay, check EGR VSV. Using scan tool, select ACTIVE TEST mode. Check operation of EGR VSV when activated by scan tool. EGR VSV is located near intake manifold at left rear of engine.

7) Apply air pressure to EGR VSV port "E". With EGR system off, air from port "E" should not flow from port "F". See Fig. 4. With EGR system on, air from port "E" should flow from port "F". If VSV operates as specified, go to step 11). If VSV does not operate as specified, go to next step.

8) Remove EGR VSV. Using ohmmeter, measure resistance between EGR VSV terminals. Resistance should be 39-45 ohms at 68°F (20°C). Measure resistance between each terminal and body of EGR VSV. Resistance should be infinite. If resistance is not as specified, replace EGR VSV. If resistance is as specified, go to next step.

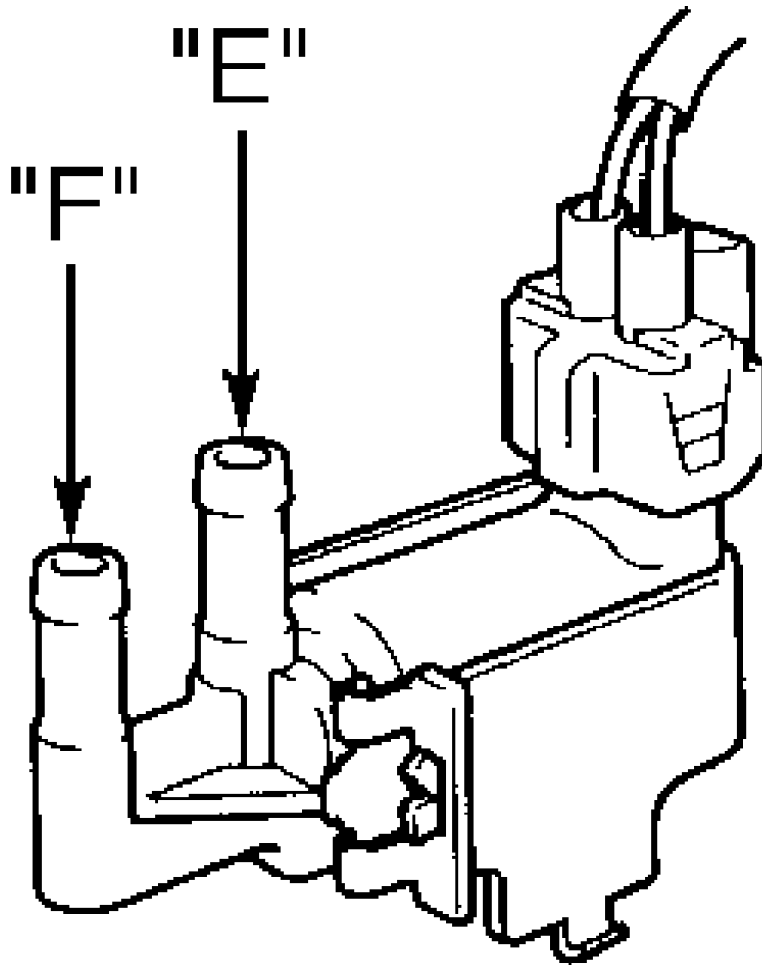
9) Check EGR VSV operation. Apply battery voltage to EGR VSV

terminals. Apply air pressure to VSV port "E". Air from port "E" should flow from port "F". See Fig. 4. Remove battery voltage from VSV terminals. Air from port "E" should not flow from port "F". Replace VSV as necessary.

10) If VSV meets all specifications in steps 8) and 9), check circuits between EGR VSV and ECM. See appropriate wiring diagram in I - WIRING DIAGRAMS article. Repair wiring as necessary.

11) Check EGR vacuum modulator. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace as necessary. If EGR vacuum modulator is okay, check EGR valve. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace EGR valve as necessary. If components are okay, go to next step.

12) Ensure all components are connected. Start and run engine. Using scan tool, select ACTIVE TEST mode (EGR system ON). Run engine at 4000 RPM for 3 minutes. Monitor EGR gas temperature. If temperature is 248°F (120°C) or more, replace ECM. If temperature is less than 248°F (120°C), replace EGR temperature sensor.



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Fig. 4: Identifying Vacuum Switching Valve (Typical)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Diagnosis & Repair (Using OBD-II Scan Tool)

1) Disconnect EGR temperature sensor. EGR sensor is located

on EGR valve assembly. Using ohmmeter, measure resistance between sensor terminals. If resistance is 600,000 ohms or less, go to next step. If resistance is more than 600,000 ohms, check sensor. See appropriate I - SYSTEM/COMPONENT TESTS. Replace as necessary.

2) Turn ignition on. Using DVOM, measure voltage between sensor wiring harness connector terminals. If voltage is 4.5-5.5 volts, go to step 4). If voltage is not 4.4-5.5 volts, go to next step.

3) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Measure voltage between terminals No. 46 and 65 at Check Harness "B" connector. See Fig. 2. If voltage is 4.5-5.5 volts, check for open circuit in wiring harness between EGR temperature sensor and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If voltage is not 4.4-5.5 volts, replace ECM.

4) Check all EGR system vacuum hoses. Replace vacuum hoses as necessary. Access ECM below passenger's side of instrument panel, underneath carpet. Ensure ignition is off. Disconnect Check Harness "B" connector from ECM. Turn ignition on. Connect a jumper wire between ground and terminal No. 75 at Check Harness "B" connector.

5) With jumper wire connected, EGR Vacuum Switching Valve (VSV) is on. EGR VSV is located near intake manifold at left rear of engine. Apply air pressure to EGR VSV port "E". Air from port "E" should flow from port "F". See Fig. 4. Disconnect jumper wire. Air from port "E" should not flow from port "F". If EGR VSV operates as specified, go to step 9). If EGR VSV does not operate as specified, go to next step.

6) Remove EGR VSV. Using ohmmeter, measure resistance between EGR VSV terminals. Resistance should be 39-45 ohms at 68°F (20°C). Measure resistance between each terminal and body of EGR VSV. Resistance should be infinite. If resistance is not as specified, replace EGR VSV. If resistance is as specified, go to next step.

7) Check EGR VSV operation. Apply battery voltage to EGR VSV terminals. Apply air pressure to EGR VSV port "E". Air from port "E" should flow from port "F". See Fig. 4. Remove battery voltage from EGR VSV terminals. Air from port "E" should not flow from port "F". Replace EGR VSV as necessary.

8) If EGR VSV meets all specifications in steps 6) and 7), check circuits between EGR VSV and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary.

9) Check EGR vacuum modulator. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace as necessary. If EGR vacuum modulator is okay, check EGR valve. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace EGR valve as necessary.

10) Disconnect EGR temperature sensor connector. Start engine. Ensure engine is at normal operating temperature. Disconnect EGR VSV. Run engine at 4000 RPM for 3 minutes and measure resistance between EGR temperature sensor terminals. If resistance is 9000 ohms or less, replace ECM. If resistance is more than 9000 ohms, replace EGR temperature sensor.

DTC P0402: EXCESSIVE EXHAUST GAS RECIRCULATION (EGR) FLOW DETECTED

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

The EGR system recirculates exhaust gas through intake system

to reduce combustion temperature and NOx emissions. The amount of EGR valve opening is regulated by the EGR vacuum modulator according to engine load. Vacuum source to valve is controlled by the Vacuum Switching Valve (VSV), which is controlled by ECM.

The EGR valve is closed (VSV on) under the following conditions:

- * Coolant temperature less than 140°F (60°C).
- * Vehicle under deceleration.
- * Light engine load.
- * Engine racing.

Code is set when EGR temperature sensor value is high. Engine not yet at normal operating temperature. Possible causes are:

- * EGR valve stuck open.
- * EGR Vacuum Switching Valve (VSV).
- * EGR VSV open circuit.
- * EGR temperature sensor short circuit.
- * ECM.

Test Drive Confirmation

1) Connect scan tool. See Fig. 1. Start and warm engine to normal operating temperature. Operate vehicle at 43–56 MPH for 3 minutes or more. Stop vehicle and allow to idle for about 2 minutes. Turn ignition off.

2) Start engine and allow to idle. Operate vehicle at 43–56 MPH for 3 minutes or more. Stop vehicle and allow to idle for about 2 minutes.

3) Check READINESS TESTS. If COMPL is displayed on scan tool and MIL is not illuminated, system is normal. If INCMPL is displayed and MIL is not illuminated, repeat test drive procedure.

Diagnosis & Repair (Using Toyota Scan Tool)

1) Connect scan tool. See Fig. 1. Turn ignition on. Using scan tool, read EGR gas temperature. If EGR gas temperature is 302°F (150°C), go to step 4). If EGR gas temperature is not 302°F (150°C), go to next step.

NOTE: If EGR gas temperature displayed is 318.7°F (159.3°C), a short exists in EGR temperature sensor circuit.

2) Disconnect EGR temperature sensor connector. Sensor is located on EGR valve assembly. Read EGR gas temperature. If EGR gas temperature is not 37.6°F (3.1°C), go to next step. If EGR gas temperature is 37.6°F (3.1°C), replace sensor.

3) Turn ignition off. Access ECM below passenger's side of instrument panel, underneath carpet. Disconnect ECM E9 connector. See Fig. 5. Turn ignition on. Using scan tool, read EGR gas temperature. If EGR gas temperature is 37.6°F (3.1°C), locate and repair open circuit in wiring harness between ECM and EGR temperature sensor. If EGR gas temperature is not 37.6°F (3.1°C), replace ECM and retest.

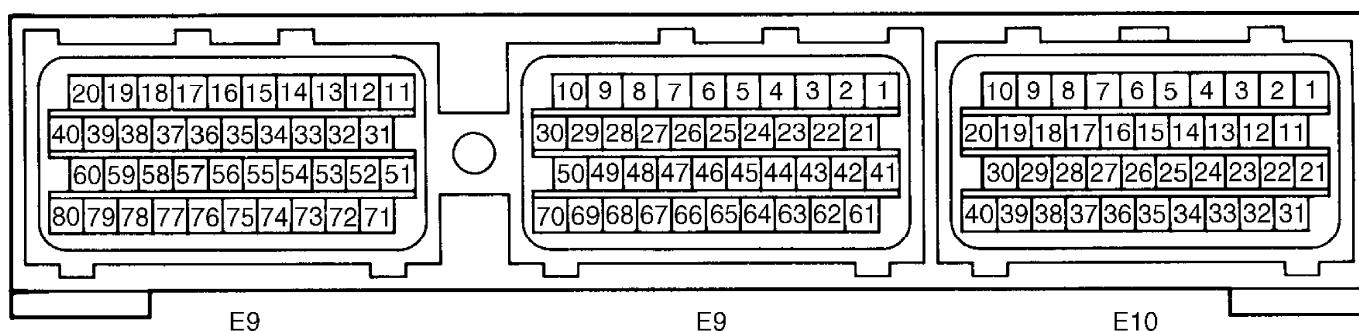
4) Check VSV. Using scan tool, select ACTIVE TEST mode. Check operation of VSV when activated by scan tool. VSV is located near intake manifold at left rear of engine. Apply air pressure to VSV port "E". With EGR system off, air from port "E" should not flow from port "F". See Fig. 4. With EGR system on, air from port "E" should flow from port "F". If VSV does not operate as specified, go to next step. If VSV operates as specified, check EGR valve. See appropriate I - SYSTEM/COMPONENT TESTS article.

5) Remove EGR VSV. Using ohmmeter, measure resistance between VSV terminals. Resistance should be 30–34 ohms at 68°F (20°C). Measure

resistance between each terminal and body of VSV. Resistance should be infinite. If resistance is not as specified, replace VSV. If resistance is as specified, go to next step.

6) Check VSV operation. Apply battery voltage to VSV terminals. Apply air pressure to VSV port "E". Air from port "E" should flow from port "F". See Fig. 4. Remove battery voltage from VSV terminals. Air from port "E" should not flow from port "F". Replace VSV as necessary.

7) If VSV meets all specifications in steps 5) and 6), check for short circuit in wiring harness between EGR VSV and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace ECM and retest.



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Fig. 5: Identifying Engine Control Module (ECM) Connector Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Diagnosis & Repair (Using OBD-II Scan Tool)

1) Disconnect EGR temperature sensor. Sensor is located on EGR valve assembly. Using ohmmeter, measure resistance between sensor terminals. If resistance is 2500 ohms or more (not immediately after driving vehicle), go to next step. If resistance is less than 2500 ohms, replace sensor.

2) Check for short circuit in wiring harness between EGR temperature sensor and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, go to next step.

3) Remove EGR VSV. VSV is located near intake manifold at left rear of engine. Using ohmmeter, measure resistance between VSV terminals. Resistance should be 30-34 ohms at 68°F (20°C). Measure resistance between each terminal and body of VSV. Resistance should be infinite. If resistance is not as specified, replace VSV. If resistance is as specified, go to next step.

4) Check VSV operation. Apply battery voltage to VSV terminals. Apply air pressure to VSV port "E". Air from port "E" should flow from port "F". See Fig. 4. Remove battery voltage from VSV terminals. Air from port "E" should not flow from port "F". Replace VSV as necessary.

5) If VSV meets all specifications in steps 3) and 4), check for short circuit in wiring harness between EGR VSV and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace ECM and retest.

DTC P0420: CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD

NOTE: Sensor No. 1 refers to sensor closest to engine block.
Sensor No. 2 refers to sensor located in front of rear catalytic converter.

Circuit Description

The ECM compares waveform of oxygen sensor located before catalytic converter with waveform of oxygen sensor located after converter to determine if converter performance has deteriorated. If both waveforms change at similar rate, catalyst performance has deteriorated. DTC is set when both oxygen sensors have same amplitude after vehicle is driven for 5 minutes at 20-50 MPH. Possible causes are:

- * Catalytic converter.
- * Oxygen sensor open or short circuit.
- * Oxygen sensor.

Diagnosis & Repair

1) Connect scan tool. See Fig. 1. Start and warm engine to normal operating temperature. Increase engine speed 2500-3000 RPM for about 3 minutes. Retrieve codes. See SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article.

2) If codes other than P0420 are present, diagnose and repair those codes first. If DTC P0420 is only displayed, check oxygen sensor No. 1 circuits. See DTC P0130: HEATED OXYGEN SENSOR CIRCUIT (SENSOR NO. 1) test. Repair as necessary. If oxygen sensor circuits and sensor are okay, go to next step.

3) Check sensor No. 2 circuits. See DTC P0136: HEATED OXYGEN SENSOR CIRCUIT (SENSOR NO. 2) test. Repair as necessary. If oxygen sensor circuits and sensor are okay, replace catalytic converter and retest.

DTC P0441: INCORRECT EVAP PURGE FLOW

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

The ECM changes duty signal to EVAP Vacuum Switching Valve (VSV) so that intake quantity of HC emissions is appropriate for driving conditions (engine load, engine speed, etc.) after engine is at normal operating temperature. DTC is set when proper response to computer command does not occur. Possible causes are:

- * VSV open or short circuit.
- * EVAP VSV.
- * ECM.
- * Vacuum hose blocked or disconnected.
- * Charcoal canister.

Diagnosis & Repair (Using Toyota Scan Tool)

1) Connect scan tool. See Fig. 1. Turn ignition on. Using scan tool, select ACTIVE TEST mode. Check operation of EVAP VSV when activated by scan tool. VSV is located at left rear of engine, below intake manifold.

2) Apply air pressure to VSV port "E". With VSV off, air from port "E" should not flow from port "F". See Fig. 4. With VSV on, air from port "E" should flow from port "F". If VSV operates as specified, go to step 6). If VSV does not operate as specified, go to next step.

3) Turn ignition off. Disconnect VSV connector. Using ohmmeter, measure resistance between VSV terminals. If resistance is 30-34 ohms at 68°F (20°C), go to next step. If resistance is not 30-34 ohms, replace VSV.

4) Check for continuity between each VSV terminal and VSV body. If continuity exists, replace VSV. If continuity does not exist,

connect battery voltage to VSV connector terminals. Apply air pressure to VSV port "E". Air from port "E" should flow from port "F". See Fig. 4. Remove battery voltage. Air from port "E" should not flow from port "F". If VSV does not operate as specified, replace VSV. If VSV operates as specified, go to next step.

5) Check for open or short circuit in wiring harness between EFI main relay and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace ECM and retest.

6) Check vacuum hose connections and correct routing. See appropriate illustration in M - VACUUM DIAGRAMS article. Repair vacuum hoses as necessary. If vacuum lines are okay, check charcoal canister. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace charcoal canister as necessary.

Diagnosis & Repair (Using OBD-II Scan Tool)

1) Turn ignition off. Disconnect EVAP VSV connector. VSV is located at left rear of engine, below intake manifold. Using ohmmeter, measure resistance between VSV terminals. If resistance is 30-34 ohms at 68°F (20°C), go to next step. If resistance is not 30-34 ohms, replace VSV. See Fig. 4.

2) Check for continuity between each VSV terminal and VSV body. If continuity exists, replace VSV. If continuity does not exist, connect battery voltage to VSV connector terminals. Apply air pressure to VSV port "E". Air from port "E" should flow from port "F". Remove battery voltage. Air from port "E" should not flow from port "F". If VSV does not operate as specified, replace VSV. If VSV operates as specified, go to next step.

3) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Turn ignition on. Measure voltage between ground and terminal No. 74 at Check Harness "B" connector. See Fig. 2. If voltage is 9-14 volts, go to next step. If voltage is not 9-14 volts, repair open or short circuit in wiring harness. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

4) Check vacuum hose connections and correct routing. See appropriate illustration in M - VACUUM DIAGRAMS article. Replace vacuum hoses as necessary. If vacuum hoses are okay, check charcoal canister. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace charcoal canister as necessary. If charcoal canister is okay, replace ECM.

DTC P0500: VEHICLE SPEED SENSOR FAULT

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

VSS outputs a 4-pulse signal for every revolution of the rotor shaft, which is driven by transmission output shaft. Signal is used by ECM to determine vehicle speed. DTC is set if there is no VSS signal to ECM while vehicle is being driven or if park/neutral switch is off. Possible causes are:

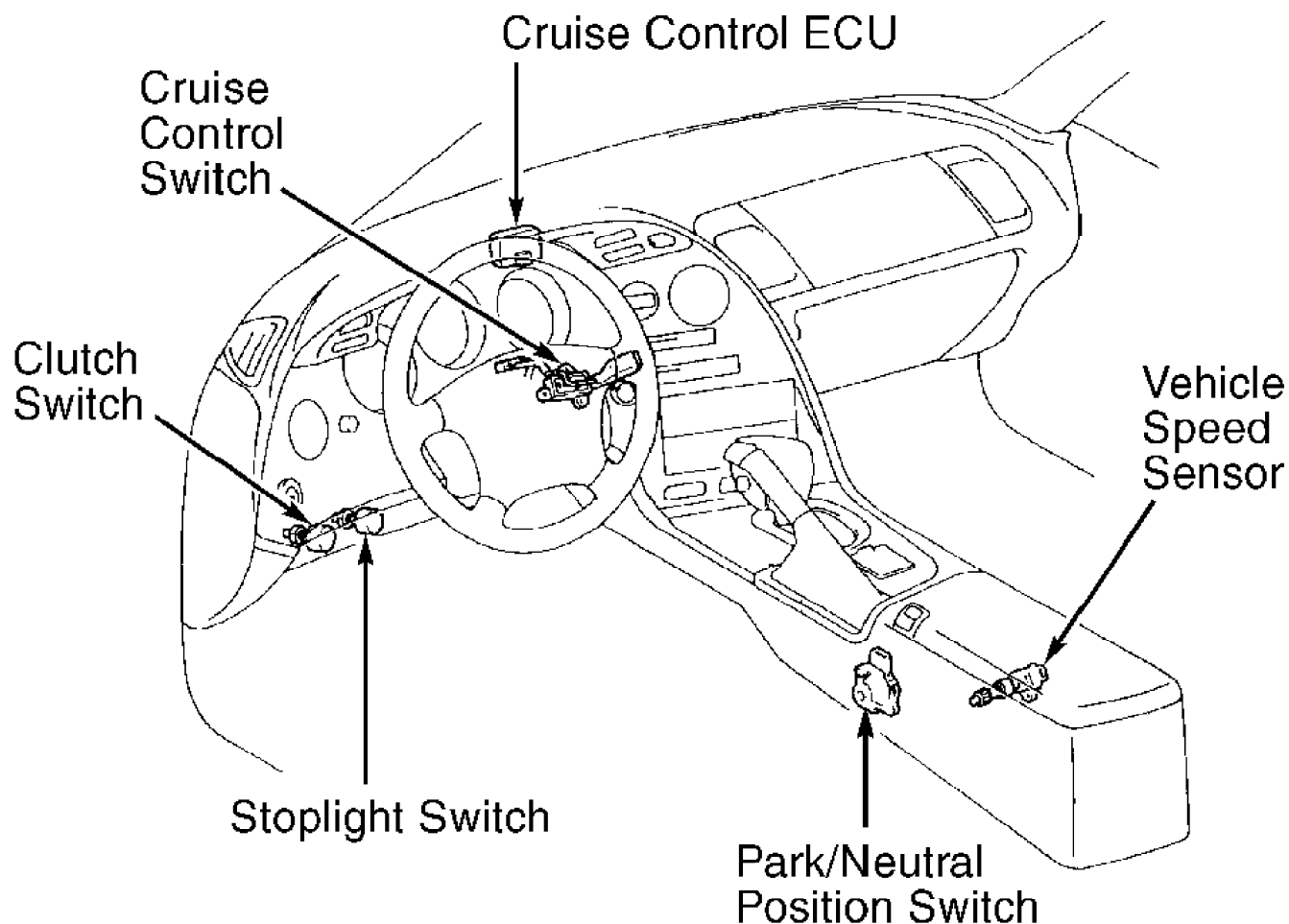
- * Vehicle speed sensor.
- * Open or short circuit in VSS circuit.
- * Instrument cluster.
- * ECM.

Diagnosis & Repair

1) Test drive vehicle and check operation of speedometer. If speedometer is not functioning correctly, see appropriate INSTRUMENT PANELS article in ACCESSORIES/SAFETY EQUIPMENT section. If speedometer is functioning correctly, go to next step.

2) Lift and support rear of vehicle. Disconnect power steering ECU Blue 6-pin connector. Power steering ECU is behind right side of instrument panel, right or glove box. Disconnect cruise control ECU Green 26-pin connector located behind glove box. See Fig. 6. Place transmission shift lever in Neutral. Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article.

3) Measure voltage between ground and terminal No. 2 at Check Harness "A" connector, while rotating front wheels. See Fig. 2. As rear wheels are rotated, voltage should pulse between zero and 5-6 volts. If voltage is as specified, replace ECM. If voltage is not as specified, check wiring harness wire between instrument cluster and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary.



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Fig. 6: Locating Cruise Control ECU
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC P0505: IDLE AIR CONTROL (IAC) SYSTEM MALFUNCTION

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

The ECM operates IAC valve to perform idle-up and provide feedback for target idling speed. DTC is set when idle speed continues to vary greatly from target speed. Possible causes are:

- * Idle Air Control (IAC) valve stuck or closed.
- * A/C switch circuit open or short.
- * IAC valve circuit open or short.
- * Air intake leak.

Repair & Diagnosis

1) Ensure engine is at normal operating temperature and all accessories are off. Ensure A/C is off. Shift transmission shift lever into Neutral position. Connect scan tool to DLC No. 3. See Fig. 1. Note engine RPM. Using a jumper wire, connect terminals TE1 and E1 at DLC No. 1. DLC No. 1 is mounted on firewall in right rear of engine compartment. See Fig. 7. Note engine RPM and compare with first RPM reading. If difference in engine speed is more than 100 RPM, go to step 6). If difference in engine speed is 100 RPM or less, go to next step.

2) Turn ignition off. Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Turn ignition on. Using DVOM, measure voltage between ground and terminals No. 32, 33, 34 and 35 at Check Harness "B" connector. See Fig. 2. If all readings are 9-14 volts, go to step 4). If any reading is not 9-14 volts, go to next step.

3) Check IAC valve resistance. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace IAC valve as necessary. If IAC valve resistance is as specified, check for open or short circuit in wiring harness between EFI main relay and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary.

4) Check IAC valve operation. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace IAC valve as necessary. If valve is okay, go to next step.

5) Remove IAC valve from throttle body. Check IAC valve and throttle body for carbon build-up and blockage. Repair or replace IAC valve and/or throttle body as necessary. If IAC valve is okay, replace ECM.

6) Check air induction system for leaks. Repair air induction system as necessary. If air induction system is okay, an open or short in A/C switch signal circuit may exist. Check A/C amplifier. See appropriate article in AIR CONDITIONING & HEATING section. Repair as necessary.

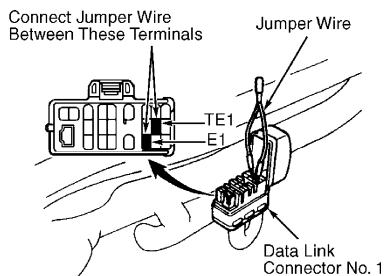


Fig. 7: Installing Jumper Wire between DLC No. 1 Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC P0510: CLOSED THROTTLE POSITION (CTP) SWITCH MALFUNCTION

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

The TP sensor is a variable resistor that monitors throttle opening. The ECM determines vehicle driving condition and adjusts air/fuel mixture accordingly. The CTP switch is located inside of TP sensor. If CTP switch is defective, TP sensor must be replaced. DTC is set if CTP switch does not turn on or off when vehicle is driven. Possible causes are:

- * Open in CTP switch circuit.
- * CTP switch.
- * ECM.

NOTE: If DTC P0110, P0115 and P0120 are output simultaneously, ground (E2) circuit may be open.

Diagnosis & Repair (Using Toyota Scan Tool)

1) Connect scan tool. See Fig. 1. Using scan tool, read CTP switch signal. With throttle fully open, if CTP switch signal is on, go to step 4). With throttle fully closed, if CTP switch signal is off, go to next step.

2) Disconnect TP sensor connector. Connect a jumper wire between terminals No. 3 (Red wire) and No. 4 (White/Black wire) at TP sensor wiring harness connector. Turn ignition on. Using scan tool, read CTP switch signal. If CTP switch signal is on, replace TP sensor. If CTP switch signal is off, go to next step.

3) Turn ignition off. Remove jumper wire. Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS -INTRODUCTION article. Connect a jumper wire between terminals No. 64 and 65 at Check Harness "B" connector. See Fig. 2. Turn ignition on. Using scan tool, read CTP switch signal. If CTP switch signal is on, check for an open in wiring harness between TP sensor and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If CTP switch signal is off, replace ECM.

4) Disconnect TP sensor connector. Using scan tool, read CTP switch signal. If CTP switch signal is off, replace TP sensor. If CTP switch signal is on, go to next step.

5) Disconnect Check Harness "B" connector. See Fig. 2. Turn ignition on. Using scan tool, read CTP switch signal. If CTP switch signal is off, locate and repair short circuit in wiring harness between TP sensor and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. If CTP switch signal is on, replace ECM.

Diagnosis & Repair (Using OBD-II Scan Tool)

1) Ensure ignition is off. Disconnect TP sensor connector. Turn ignition on. Using DVOM, measure voltage between terminals No. 3 (Red wire) and No. 4 (White/Black wire) at TP sensor wiring harness connector. If voltage is 9-14 volts, replace TP sensor. If voltage is not 9-14 volts, go to next step.

2) Turn ignition off. Check for an open in wiring harness between TP sensor and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace ECM.

DTC P1200: FUEL PUMP CONTROL CIRCUIT

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

The fuel pump is controlled in 2 steps (high and low speeds) and is operated by the fuel pump ECU which receives a signal from ECM to compensate fuel pressure for start, light engine load or high engine load. DTC is set during the following 3 conditions:

- 1) Open or short in fuel pump circuit is detected for one second or more with engine speed of 1000 RPM or less.
- 2) Open in input circuit of fuel pump ECU with engine speed of 1000 RPM or less.
- 3) Open or short in fuel pump ECU diagnostic signal line with engine speed of 1000 RPM or less.

Possible causes for all conditions are:

- * Fuel pump ECU open or short circuit.
- * Fuel pump ECU.
- * ECM power supply circuit.
- * Fuel pump.
- * ECM.

Diagnosis & Repair

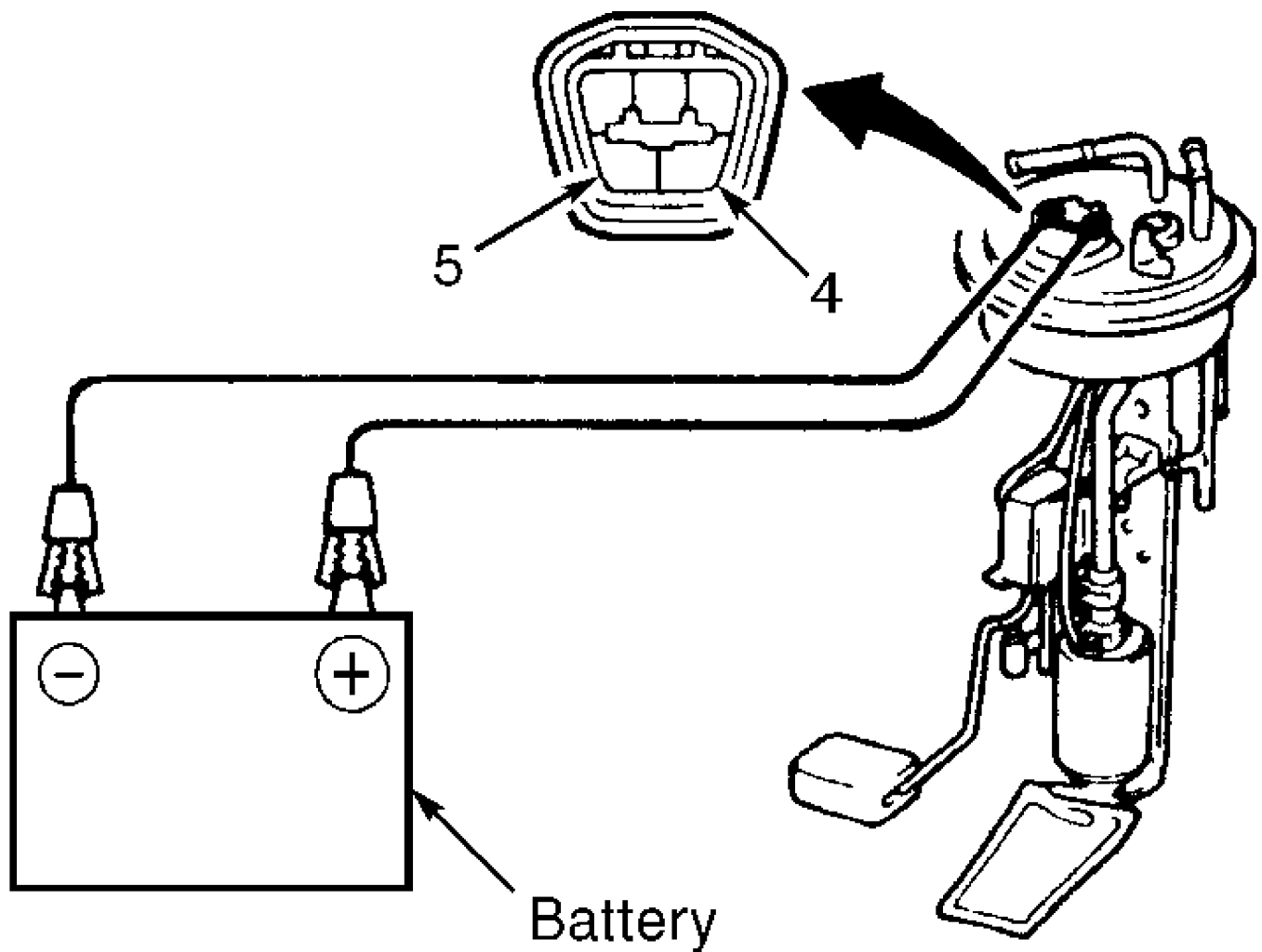
1) Remove rear floor carpet, spare tire and cover. Remove service hole cover. Disconnect fuel pump connector. Using jumper wires, apply positive battery voltage to terminal No. 4 and ground to terminal No. 5 at fuel pump. See Fig. 8. DO NOT apply battery voltage to fuel pump for more than 10 seconds. Listen for fuel pump operating sound and feel for pressure in fuel line near fuel filter. If fuel pump operates, go to step 5). If fuel pump does not operate, go to next step.

2) Remove left side quarter panel to access fuel pump ECU. Disconnect fuel pump ECU 8-pin connector. Turn ignition on. Measure voltage between ground and terminal No. 1 (Blue wire) at fuel pump ECU wiring harness connector. If voltage is 9-14 volts, go to next step. If voltage is not 9-14 volts, check for open or short circuit in wiring harness between EFI main relay and fuel pump ECU. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary.

3) Measure voltage between terminals No. 8 (White/Black wire) and No. 5 (Violet/White wire) at fuel pump wiring harness connector. If voltage is 4.5-5.5 volts, go to next step. If voltage is not 4.5-5.5 volts, check for open or short in Violet/White wire between ECM and fuel pump ECU. Also check White/Black wire between fuel pump ECU and ground. Repair wiring as necessary. If wiring harness is okay, replace ECM.

4) Check fuel pump. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace fuel pump as necessary. If fuel pump is okay, check for open or short circuit in wiring harness between terminal No. 2 (Blue/Red wire) at fuel pump ECU, fuel pump (Blue wire) and ground (White/Black wire). Repair wiring as necessary. If wiring harness is okay, replace fuel pump ECU.

5) Check for open or short circuit in Green wire between ECM and fuel pump ECU. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace ECM.



97106195

Fig. 8: Checking Fuel Pump Operation
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC P1300: IGNITOR CIRCUIT MALFUNCTION

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

The ECM determines ignition timing and outputs ignition signals (IGT) for each cylinder. Based on IGT signals, the ignitor controls the primary ignition signals (IGC) for all ignition coils. The ignitor also sends an ignition confirmation signal (IGF) as a fail-safe measure to the ECM. DTC is set when there is no IGF signal to ECM for 6 consecutive IGT signals during engine operation. Possible causes are:

- * IGF or IGT open or short circuit from ignitor to ECM.
- * Ignitor.
- * ECM.

Diagnosis & Repair

1) Check for spark at misfiring cylinder. See IGNITION CHECKS in appropriate F - BASIC TESTING article. If spark is present, go to next step. If spark is not present, go to step 4).

2) Check for open or short in IGF circuit (Red/Yellow wire) between ECM and ignitor. Ignitor is located near left shock tower. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If circuit is okay, go to next step.

3) Disconnect Black 12-pin and 4-pin ignitor connectors. Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Turn ignition on. Measure voltage between ground and terminal No. 58 at Check Harness "B" connector. See Fig. 2. If voltage is 4.5-5.5 volts, replace ignitor. If voltage is not 4.5-5.5 volts, replace ECM.

4) Check for open or short in all IGT circuits between ECM and ignitor. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If circuits are okay, go to next step.

5) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Measure voltage between ground and terminals No. 52, 53, 54, 56 and 57 at Check Harness "B" connector while cranking engine. See Fig. 2. Voltage should be .1-4.5 volts at each terminal. If voltage is as specified, go to next step. If voltage is not as specified, replace ECM.

6) Disconnect Black 12-pin and 4-pin ignitor connectors. Measure voltage between ground and terminals No. 52, 53, 54, 55, 56 and 57 at Check Harness "B" connector while cranking engine. Voltage should be .1-4.5 volts at each terminal. If voltage is as specified, go to next step. If voltage is not as specified, replace ECM.

7) Turn ignition on. Measure voltage between ground and terminal No. 2 (Black/Orange wire) at ignitor 4-pin wiring harness connector. If voltage is 9-14 volts, go to next step. If voltage is not 9-14 volts, check and repair ignitor power source circuit. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

8) Check for open or short circuit in wiring harness between ignition switch and ignition coil, and between ignition coil and ignitor. Repair wiring as necessary. If wiring harness is okay, check ignition coil. See IGNITION CHECKS in appropriate F - BASIC TESTING article. Replace coil as necessary. If coil is okay, go to next step.

9) Check EFI main relay. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace relay as necessary. If relay is okay, replace ignitor.

DTC P1335: CRANKSHAFT POSITION (CKP) SENSOR CIRCUIT

See DTC P0335 OR P1335: CRANKSHAFT POSITION (CKP) SENSOR CIRCUIT test.

DTC P1400: SUB-THROTTLE POSITION (TP) SENSOR CIRCUIT MALFUNCTION

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

The sub-TP sensor operates same way as main TP sensor, but is

used for traction control. The sub-throttle valve is opened or closed by the sub-throttle actuator according to signals from the throttle control ECU. DTC is set when ECM consistently detects less than .3 volt from VTA2 circuit and closed sub-throttle position switch is off. DTC can also be set if ECM consistently detects more than 4.9 volts on VTA2 circuit. Possible causes are:

- * Open or short in sub-TP sensor circuit.
- * Sub-TP sensor.
- * ECM.

Diagnosis & Repair

1) Access ECM below passenger's side of instrument panel, underneath carpet. Remove intake air duct and disconnect sub-throttle valve step motor connector. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Turn ignition on. Measure voltage between terminals No. 65 and 42 at Check Harness "B" connector. Voltage should be .3-.8 volt with sub-throttle valve fully closed, and 3.2-4.9 volts with sub-throttle valve fully open (WOT). Go to next step.

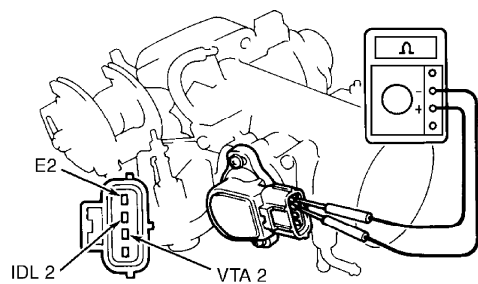
2) Measure voltage between terminals No. 63 and 65 at Check Harness "B" connector. Voltage should be 0-3 volts with sub-throttle valve fully closed, and 9-14 volts with sub-throttle valve fully open (WOT). Go to next step

3) Voltage readings taken in steps 1) and 2) should increase steadily in proportion to throttle valve opening angle. If voltage measured is as specified, check wiring harness connectors. Problem may be intermittent. If voltage is not as specified, go to next step.

4) Disconnect sub-TP sensor connector. Using ohmmeter, measure resistance between terminals VTA2 and E2 at sub-TP sensor. See Fig. 9. Resistance should be 340-6300 ohms with sub-throttle valve fully closed, and 2000-10,800 ohms with sub-throttle valve fully open (WOT). Resistance should increase steadily in proportion to throttle valve opening angle. Go to next step.

5) Measure resistance between terminals IDL2 and E2 at sub-TP sensor. Resistance should be less than 500 ohms with sub-throttle valve fully closed, and infinite resistance with sub-throttle valve fully open (WOT). If resistance is as specified, go to next step. If resistance is not as specified, check sub-TP sensor adjustment. See appropriate D - ADJUSTMENTS article. Adjust as necessary. If adjustment is okay, replace sub-TP sensor.

6) Check for open or short circuit in wiring harness between sub-TP sensor and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace ECM.



95H34568
Fig. 9: Identifying Sub-TP Sensor Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC P1401: THROTTLE POSITION (TP) SENSOR CIRCUIT RANGE/PERFORMANCE FAULT

Circuit Description

The sub-TP sensor operates same way as main TP sensor, but is used for traction control. The sub-throttle valve is opened or closed by the sub-throttle actuator according to signals from the throttle control ECU. DTC is set when the difference between throttle valve opening angle and sub-throttle valve opening angle is more than 35 degrees. Possible cause is:

- * Sub-Throttle Position (TP) sensor.

Diagnosis & Repair

If only DTC P1401 is displayed, replace sub-TP sensor. If other codes are displayed, diagnose and repair those codes first.

DTC P1405: TURBO PRESSURE SENSOR CIRCUIT MALFUNCTION

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

Turbo pressure sensor detects air intake chamber pressure and converts pressure reading into a voltage signal that is used by ECM to control turbo pressure. DTC is set when ECM detects an open or short in turbo pressure sensor circuit. Possible causes are:

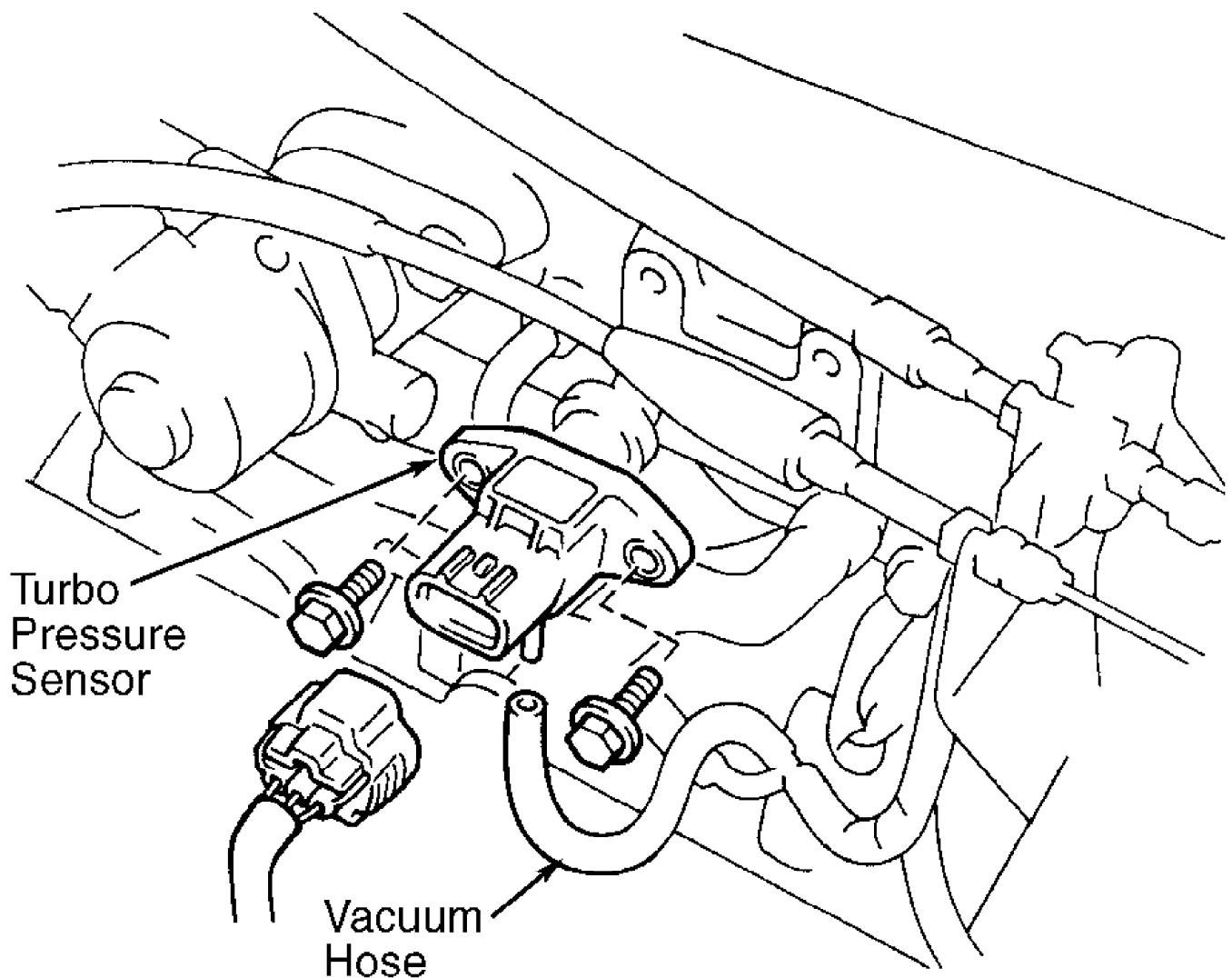
- * Turbo pressure sensor open or short circuit.
- * Turbo pressure sensor.
- * ECM.

Diagnosis & Repair

1) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Turn ignition on. Measure voltage between terminals No. 41 and 65 at Check Harness "B" connector. If voltage is 4.5-5.5 volts, go to next step. If voltage is not 4.5-5.5 volts, replace ECM.

2) Measure voltage between terminals No. 62 and 65 at Check Harness "B" connector. If voltage is 2.3-3.0 volts, replace ECM. If voltage is not 2.3-3.0 volts, go to next step.

3) Check for open or short circuit in wiring harness between turbo pressure sensor and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. See Fig. 10. Repair wiring as necessary. If wiring harness is okay, replace turbo pressure sensor.



95F34566

Fig. 10: Locating Turbo Pressure Sensor
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC P1406: TURBO PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

Turbo pressure sensor detects air intake chamber pressure and converts pressure reading into a voltage signal that is used by ECM to control turbo pressure. DTC is set when ECM detects turbo pressure sensor output is out of range. Possible cause is:

- * Turbo pressure sensor.

Diagnosis & Repair

If only DTC P1406 is displayed, replace turbo pressure sensor. If other codes are displayed, diagnose and repair those codes first and retest.

DTC P1511: BOOST PRESSURE LOW FAULT

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

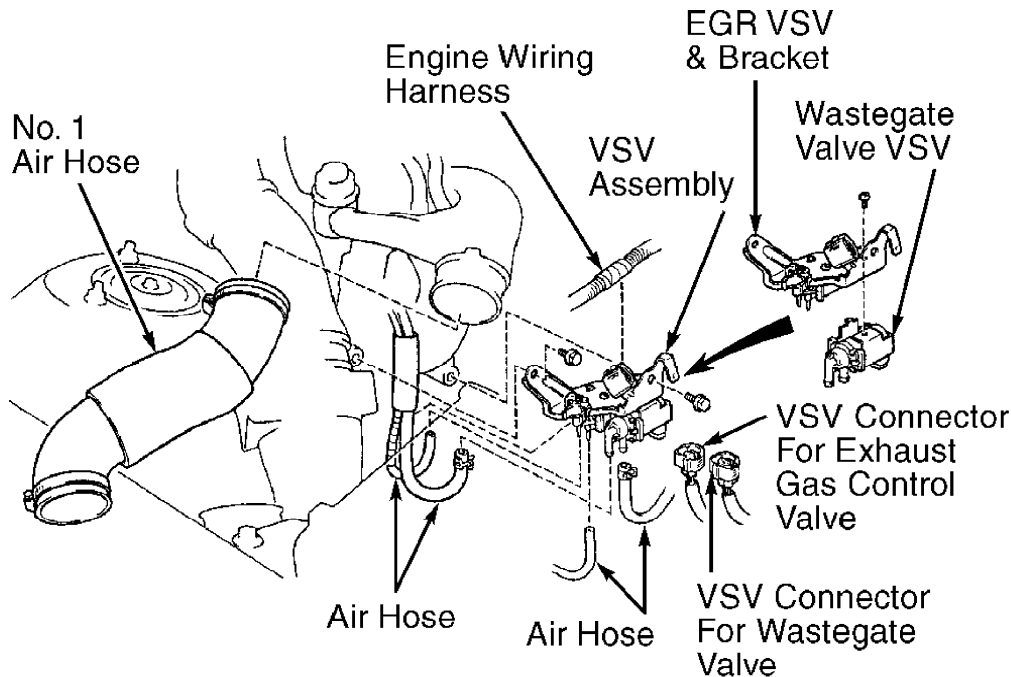
Maximum turbocharging pressure is controlled by a wastegate valve in turbocharger. The wastegate valve is operated by a vacuum actuator controlled by a Vacuum Switching Valve (VSV). The ECM signals the VSV to open or close. DTC is set when manifold absolute pressure is out of range under the following conditions. Engine is at normal operating temperature, full throttle and engine speed is 2600 RPM or more. Possible causes are:

- * Wastegate valve actuator.
- * VSV short circuit.
- * Air intake leak.
- * ECM.

Diagnosis & Repair (Using Toyota Scan Tool)

1) Connect scan tool to DLC No. 3 connector. See Fig. 1.

Using scan tool, select ACTIVE TEST mode. Check operation of wastegate valve VSV when activated by scan tool. VSV is located near air hose for mass airflow sensor. See Fig. 11.



96F10202

Fig. 11: Locating EGR VSV & Wastegate Valve VSV
Courtesy of Toyota Motor Sales, U.S.A., Inc.

2) Apply air pressure to VSV port "E". With VSV on, air from port "E" should flow from port "F". See Fig. 4. With VSV off, air from

port "E" should not flow from port "F". If VSV operates as specified, go to step 4). If VSV does not operate as specified, go to next step.

3) Check wastegate valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.

4) Using scan tool, select ACTIVE TEST mode. Check operation of exhaust by-pass valve VSV when activated by scan tool. VSV is located above turbocharger.

5) Apply air pressure to VSV port "E". With VSV on, air from port "E" should flow from port "F". See Fig. 4. With VSV off, air from port "E" should not flow from port "F". If VSV operates as specified, go to step 7). If VSV does not operate as specified, go to next step.

6) Check exhaust by-pass valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.

7) Using scan tool, select ACTIVE TEST mode. Check operation of intake air control valve VSV when activated by scan tool. VSV is located right rear of engine. See Fig. 12.

8) Apply air pressure to VSV port "E". See Fig. 13. With VSV on, air from port "E" should flow from port "F". With VSV off, air from port "E" should flow from small filter on end of VSV. If VSV operates as specified, go to step 10). If VSV does not operate as specified, go to next step.

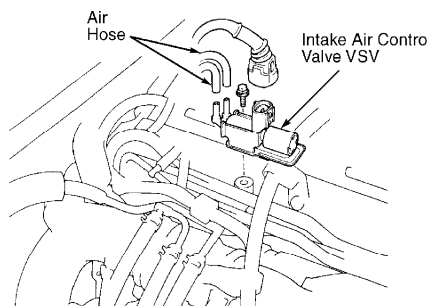
9) Check intake air control valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.

10) Using scan tool, select ACTIVE TEST mode. Check operation of exhaust gas control valve VSV when activated by scan tool. VSV is located near air hose for mass airflow sensor. See Fig. 11.

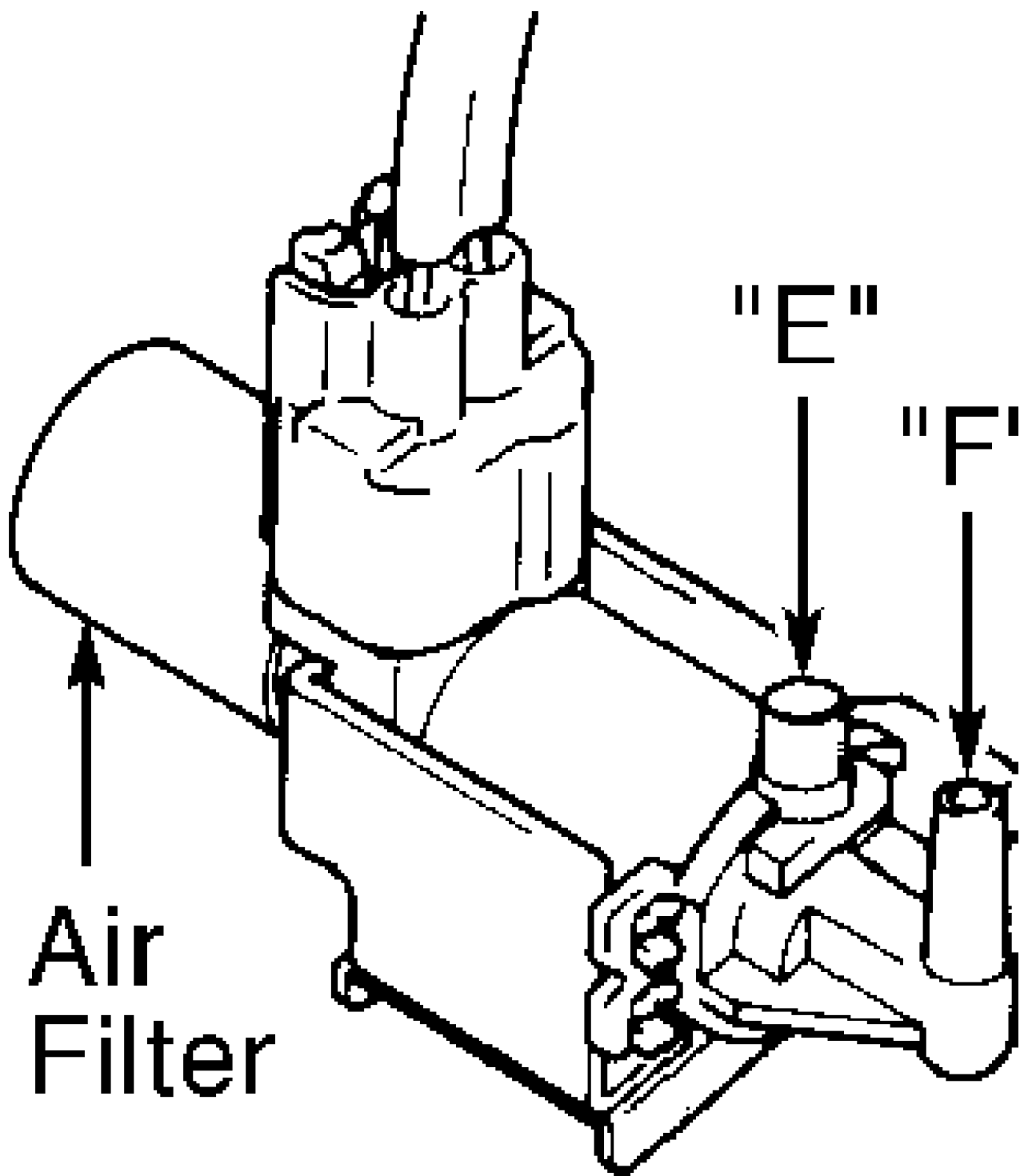
11) Apply air pressure to VSV port "E". See Fig. 13. With VSV on, air from port "E" should flow from port "F". With VSV off, air from port "E" should flow from small filter on end of VSV. If VSV operates as specified, go to step 13). If VSV does not operate as specified, go to next step.

12) Check exhaust gas control valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, check for open or short circuit in wiring harness between EFI main relay and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace ECM.

13) Check vacuum hoses. See appropriate illustration in M - VACUUM DIAGRAMS article. Replace vacuum hoses as necessary. If all hoses are okay and are routed properly, check turbocharger operation. See appropriate I - SYSTEM/COMPONENT TESTS article. Repair turbocharger as necessary. If turbocharger is okay, replace ECM.



97G06199
Fig. 12: Locating Intake Air Control Valve VSV
Courtesy of Toyota Motor Sales, U.S.A., Inc.



Air
Filter

95A32094

Fig. 13: Intake Air Control Valve VSV (Exhaust Gas Control Valve VSV
Is Similar) Id
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Diagnosis & Repair (Using OBD-II Scan Tool)

- 1) Check wastegate valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.
- 2) Check exhaust by-pass valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.
- 3) Check intake air control valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.
- 4) Check exhaust gas control valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.
- 5) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Measure voltage between ground and terminals No. 38, 39, 40 and 60 at Check Harness "B" connector. See Fig. 2. Voltage should be 9-14 volts at each terminal.
- 6) If voltage is as specified, go to next step. If voltage is not as specified, repair wiring harness between VSV and ECM. See appropriate wiring diagram in I - WIRING DIAGRAMS article.
- 7) Check vacuum hoses. See appropriate illustration in M - VACUUM DIAGRAMS article. Replace vacuum hoses as necessary. If all hoses are okay and are routed properly, check turbocharger operation. See appropriate I - SYSTEM/COMPONENT TESTS article. Repair as necessary. If turbocharger is okay, replace ECM.

DTC P1512: BOOST PRESSURE HIGH FAULT

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

Maximum turbocharging pressure is controlled by a wastegate valve in turbocharger. The wastegate valve is operated by a vacuum actuator controlled by a Vacuum Switching Valve (VSV). The ECM signals the VSV to open or close. DTC is set when manifold absolute pressure is out of range under the following conditions. Engine is at normal operating temperature and engine speed is 3400 RPM or less. Possible causes are:

- * Wastegate valve actuator.
- * VSV short circuit.
- * ECM.

Diagnosis & Repair (Using Toyota Scan Tool)

- 1) Connect scan tool to DLC No. 3 connector. See Fig. 1. Using scan tool, select ACTIVE TEST mode. Check operation of wastegate valve VSV when activated by scan tool. VSV is located near air hose for mass airflow sensor. See Fig. 11.
- 2) Apply air pressure to VSV port "E". With VSV on, air from port "E" should flow from port "F". See Fig. 4. With VSV off, air from port "E" should not flow from port "F". If VSV operates as specified, go to step 4). If VSV does not operate as specified, go to next step.
- 3) Check wastegate valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.
- 4) Using scan tool, select ACTIVE TEST mode. Check operation of exhaust by-pass valve VSV when activated by scan tool. VSV is located above turbocharger.
- 5) Apply air pressure to VSV port "E". With VSV on, air from

port "E" should flow from port "F". See Fig. 4. With VSV off, air from port "E" should not flow from port "F". If VSV operates as specified, go to step 7). If VSV does not operate as specified, go to next step.

6) Check exhaust by-pass valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, check for open or short circuit in wiring harness between EFI main relay and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace ECM.

7) Check vacuum hoses. See appropriate illustration in M - VACUUM DIAGRAMS article. Replace vacuum hoses as necessary. If all hoses are okay and are routed properly, check wastegate valve operation. See appropriate I - SYSTEM/COMPONENT TESTS article. If wastegate valve is functioning properly, go to next step. If wastegate valve is not functioning properly, replace No. 1 turbocharger assembly.

8) Check exhaust by-pass valve operation. See appropriate I - SYSTEM/COMPONENT TESTS article. If exhaust by-pass valve is functioning properly, replace ECM. If exhaust by-pass valve is not functioning properly, replace No. 2 turbocharger assembly.

Diagnosis & Repair (Using OBD-II Scan Tool)

1) Check wastegate valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.

2) Check exhaust by-pass valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.

3) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Measure voltage between ground and terminals No. 38 and 60 at Check Harness "B" connector. See Fig. 2. Voltage should be 9-14 volts at each terminal.

4) If voltage is as specified, go to next step. If voltage is not as specified, repair wiring harness between wastegate valve VSV and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

5) Check vacuum hoses. See appropriate illustration in M - VACUUM DIAGRAMS article. Replace vacuum hoses as necessary. If all hoses are okay and are routed properly, check wastegate valve operation. See appropriate I - SYSTEM/COMPONENT TESTS article. If wastegate valve is functioning properly, go to next step. If wastegate valve is not functioning properly, replace No. 1 turbocharger assembly.

6) Check exhaust by-pass valve operation. See appropriate I - SYSTEM/COMPONENT TESTS article. If exhaust by-pass valve is functioning properly, replace ECM. If exhaust by-pass valve is not functioning properly, replace No. 2 turbocharger assembly.

DTC P1520: STOPLIGHT SWITCH SIGNAL MALFUNCTION (A/T ONLY)

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM harness connector and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

The stoplight signal is used to detect when brakes have been applied. ECM uses this signal to control fuel cut-off engine speed. DTC is set if stoplight switch does not turn off when vehicle is being driven. Possible causes are:

- * Short in stoplight switch signal circuit.
- * Stoplight switch.
- * ECM.

Diagnosis & Repair

1) Check stoplights. If stoplights do not function properly, repair as necessary and retest system. If stoplights function properly, go to next step.

2) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Measure voltage between ground and terminal No. 4 at Check Harness "A" connector. See Fig. 2. With brake pedal depressed, voltage should be 7.5-14.0 volts. With brake pedal released, voltage should be less than 1.5 volt. If voltage is not as specified, go to next step. If voltage is as specified, check wire harness and connectors. Problem is intermittent.

3) Check for short circuit in wiring harness between ECM and stoplight switch. Repair wiring as necessary. If wiring harness is okay, replace ECM. Retest system.

DTC P1600: ECM BATT MALFUNCTION

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

Battery voltage is supplied to ECM BATT terminal (constant). DTC is set when open in back-up power source is detected. Possible causes are:

- * Back-up power source open circuit.
- * ECM.

Diagnosis & Repair

1) Turn ignition off. Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Measure voltage between ground and terminal No. 33 at Check Harness "A" connector. See Fig. 2. If voltage is 9-14 volts, replace ECM. If voltage is not 9-14 volts, go to next step.

2) Remove and inspect EFI No. 1 fuse. EFI No. 1 fuse is located in engine compartment left side fuse box. Replace fuse as necessary. If fuse is okay, check circuit between EFI fuse and ECM. See appropriate wiring diagram in I - WIRING DIAGRAMS article. Repair wiring as necessary.

DTC P1605: KNOCK CONTROL CPU FAULT

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

Knock sensors are located on front and rear left side of cylinder block. Sensor generates voltage when engine block vibrates due to knocking. DTC is set if there is a ECM malfunction for knock sensor circuit. Possible cause is:

- * ECM.

Diagnosis & Repair

If any codes other than DTC P1605 are displayed, diagnose and repair those codes first. If only DTC P1605 is displayed, replace ECM.

DTC P1630: TRACTION CONTROL SYSTEM MALFUNCTION

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

Traction control information from throttle control ECU is sent to ECM (ETC+ and ETC- circuits). Engine control information from ECM is sent to throttle control ECU (EFI+ and EFI- circuits). DTC is set if a malfunction exists in traction control system and there is no EFI+ or EFI- signal from ECM for 5 seconds or more. Possible causes are:

- * Open or short in ETC+ or ETC- circuits.
- * Open or short in EFI+ or EFI- circuits.
- * Throttle control ECU.
- * ECM.

Diagnosis & Repair

1) Check for any DTCs for traction control system. See TRACTION CONTROL article in BRAKE section. If any DTCs are present, repair traction control system as necessary. If no DTCs are present, go to next step.

NOTE: If TRAC OFF indicator is off, a fault exists in EFI+ or EFI- circuits. If TRAC OFF indicator is on, a fault exists in EFC+ or EFC- circuits.

2) Check for open or short in circuits EFI+, EFI-, EFC+ and EFC- in wiring harness between ECM and throttle control ECU. See appropriate wiring diagram in wiring diagrams. Repair wiring as necessary. If wiring harness is okay, replace ECM.

DTC P1652: IDLE AIR CONTROL VALVE (IACV) CONTROL CIRCUIT MALFUNCTION

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

IACV controls opening and closing of the No. 2 intake air passage in order to pass the charged air from turbocharger No. 2. DTC is set if during engine idling, VSV1 output voltage at ECM is low. Possible causes are:

- * Open or short in VSV circuit for IACV.
- * VSV for IACV.
- * ECM.

Diagnosis & Repair (Using Toyota Scan Tool)

1) Connect scan tool to DLC No. 3 connector. See Fig. 1. Using scan tool, select ACTIVE TEST mode. Check operation of intake air control valve VSV when activated by scan tool. VSV is located

right rear of engine. See Fig. 12.

2) Apply air pressure to VSV port "E". See Fig. 13. With VSV on, air from port "E" should flow from port "F". With VSV off, air from port "E" should flow from small filter on end of VSV. If VSV operates as specified, check VSV and ECM connections. Problem is intermittent. If VSV does not operate as specified, go to next step.

3) Check intake air control valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, check for open or short circuit in wiring harness between EFI main relay and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace ECM.

Diagnosis & Repair (Using OBD-II Scan Tool)

1) Check intake air control valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.

2) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Measure voltage between ground and terminal No. 40 at Check Harness "B" connector. See Fig. 2. If voltage is 9-14 volts, replace ECM. If voltage is not 9-14 volts, repair wiring harness as necessary. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

DTC P1658: WASTEGATE VALVE CONTROL CIRCUIT MALFUNCTION

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

Maximum turbocharging pressure is controlled by a wastegate valve in turbocharger. The wastegate valve is operated by a vacuum actuator controlled by a Vacuum Switching Valve (VSV). The ECM signals the VSV to open or close. DTC is set when under wastegate VSV operating conditions and rapid acceleration, voltage changes occur at VSV4 circuit of ECM. Possible causes are:

- * Wastegate valve VSV.
- * VSV open or short circuit.
- * ECM.

Diagnosis & Repair (Using Toyota Scan Tool)

1) Connect scan tool to DLC No. 3 connector. See Fig. 1. Using scan tool, select ACTIVE TEST mode. Check operation of wastegate valve VSV when activated by scan tool. VSV is located near air hose for mass airflow sensor. See Fig. 11.

2) Apply air pressure to VSV port "E". With VSV on, air from port "E" should flow from port "F". See Fig. 4. With VSV off, air from port "E" should not flow from port "F". If VSV operates as specified, go to step 4). If VSV does not operate as specified, go to next step.

3) Check wastegate valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.

4) Check for open or short circuit in wiring harness between EFI main relay and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace ECM.

Diagnosis & Repair (Using OBD-II Scan Tool)

1) Check wastegate valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.

2) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Measure voltage between ground and terminal No. 60 at Check Harness "B" connector. See Fig. 2. Voltage should be 9-14 volts (A/T) or 3 volts or less (M/T).

3) If voltage is as specified, replace ECM. If voltage is not as specified, repair wiring harness between wastegate valve VSV and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

DTC P1661: EXHAUST GAS CONTROL VALVE CIRCUIT MALFUNCTION

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

Exhaust gas control valve controls opening and closing of No. 2 exhaust passage in order to operate No. 2 turbocharger. DTC is set with engine idling, VSV2 output voltage signal at ECM is low. Possible causes are:

- * Exhaust Gas Control valve VSV.
- * VSV open or short circuit.
- * ECM.

Diagnosis & Repair (Using Toyota Scan Tool)

1) Connect scan tool to DLC No. 3 connector. See Fig. 1. Using scan tool, select ACTIVE TEST mode. Check operation of exhaust gas control valve VSV when activated by scan tool. VSV is located near air hose for mass airflow sensor. See Fig. 11.

2) Apply air pressure to VSV port "E". See Fig. 13. With VSV on, air from port "E" should flow from port "F". With VSV off, air from port "E" should flow from small filter on end of VSV. If VSV operates as specified, check VSV and ECM connections. Problem is intermittent. If VSV does not operate as specified, go to next step.

3) Check exhaust gas control valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, check for open or short circuit in wiring harness between EFI main relay and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace ECM.

Diagnosis & Repair (Using OBD-II Scan Tool)

1) Check exhaust gas control valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.

2) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Measure voltage between ground and terminal No. 39 at Check Harness "B" connector. See Fig. 2. Voltage should be 9-14 volts.

3) If voltage is as specified, replace ECM. If voltage is not as specified, repair wiring harness between exhaust gas control valve VSV and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

DTC P1662: EXHAUST BY-PASS VALVE CONTROL CIRCUIT MALFUNCTION

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

Exhaust by-pass valve control opening and closing of exhaust by-pass passage to ensure a smooth transition from turbo No. 1 operation to turbo No. 2 operation. DTC is set with engine idling, VSV3 output voltage signal at ECM is low. Possible causes are:

- * Exhaust by-pass valve VSV.
- * VSV open or short circuit.
- * ECM.

Diagnosis & Repair (Using Toyota Scan Tool)

1) Connect scan tool to DLC No. 3 connector. See Fig. 1. Using scan tool, select ACTIVE TEST mode. Check operation of exhaust by-pass valve VSV when activated by scan tool. VSV is located above turbocharger.

2) Apply air pressure to VSV port "E". With VSV on, air from port "E" should flow from port "F". See Fig. 4. With VSV off, air from port "E" should not flow from port "F". If VSV operates as specified, check VSV and ECM connections. Problem is intermittent. If VSV does not operate as specified, go to next step.

3) Check exhaust by-pass valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, check for open or short circuit in wiring harness between EFI main relay and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring harness is okay, replace ECM.

Diagnosis & Repair (Using OBD-II Scan Tool)

1) Check exhaust by-pass valve VSV. See appropriate I - SYSTEM/COMPONENT TESTS article. Replace VSV as necessary. If VSV is okay, go to next step.

2) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS - INTRODUCTION article. Measure voltage between ground and terminal No. 38 at Check Harness "B" connector. See Fig. 2. Voltage should be 9-14 volts.

3) If voltage is as specified, replace ECM. If voltage is not as specified, repair wiring harness between exhaust by-pass valve VSV and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

DTC P1780: PARK/NEUTRAL POSITION (PNP) SWITCH

CAUTION: If ECM replacement is instructed in following testing, always ensure ECM connectors and ground circuit are okay. If either are suspect, repair and repeat testing to confirm ECM malfunction.

Circuit Description

The PNP switch sends a signal to ECM when transmission is in Neutral or Park. This signal is used for air/fuel correction and for idle speed control. DTC is set under 2 conditions:

- * When 2 or more switches are on simultaneously for "N", "R", "2" and "L" position.
- * ECM is receiving an ON signal from PNP switch when vehicle is

being operated for more than 30 seconds at 44 MPH or more (1500-2500 RPM).

Possible causes are:

- * PNP switch short circuit.
- * PNP switch.
- * ECM.

NOTE: Toyota scan tool can be used to confirm PNP switch from CURRENT DATA.

Diagnosis & Repair

1) Access ECM below passenger's side of instrument panel, underneath carpet. Connect Check Harness "A" (SST 09990-01000) to ECM. See TEST PREPARATION under SELF-DIAGNOSTIC SYSTEM in SELF-DIAGNOSTICS INTRODUCTION article. Turn ignition on. Measure voltage between ground and specified terminal at Check Harness "A". See PARK/NEUTRAL POSITION SWITCH VOLTAGE table. See Fig. 2. If voltage is as specified, replace ECM. If voltage is not as specified, go to next step.

PARK/NEUTRAL POSITION SWITCH VOLTAGE

| Shifter Position | (1) Terminal No. | Volts |
|----------------------|------------------|---------------|
| Park & Neutral | 7 | Less Than 1.5 |
| | 9 | Less Than 1.5 |
| | 10 | Less Than 1.5 |
| | (2) 76 | Less Than 1.5 |
| Reverse | 7 | Less Than 1.5 |
| | 9 | (3) 10-14 |
| | 10 | Less Than 1.5 |
| | (2) 76 | (3) 10-14 |
| Drive | 7 | Less Than 1.5 |
| | 9 | Less Than 1.5 |
| | 10 | Less Than 1.5 |
| | (2) 76 | 10-14 |
| 2 | 7 | 10-14 |
| | 9 | Less Than 1.5 |
| | 10 | Less Than 1.5 |
| | (2) 76 | 10-14 |
| Low | 7 | Less Than 1.5 |
| | 9 | Less Than 1.5 |
| | 10 | 10-14 |
| | (2) 76 | 10-14 |

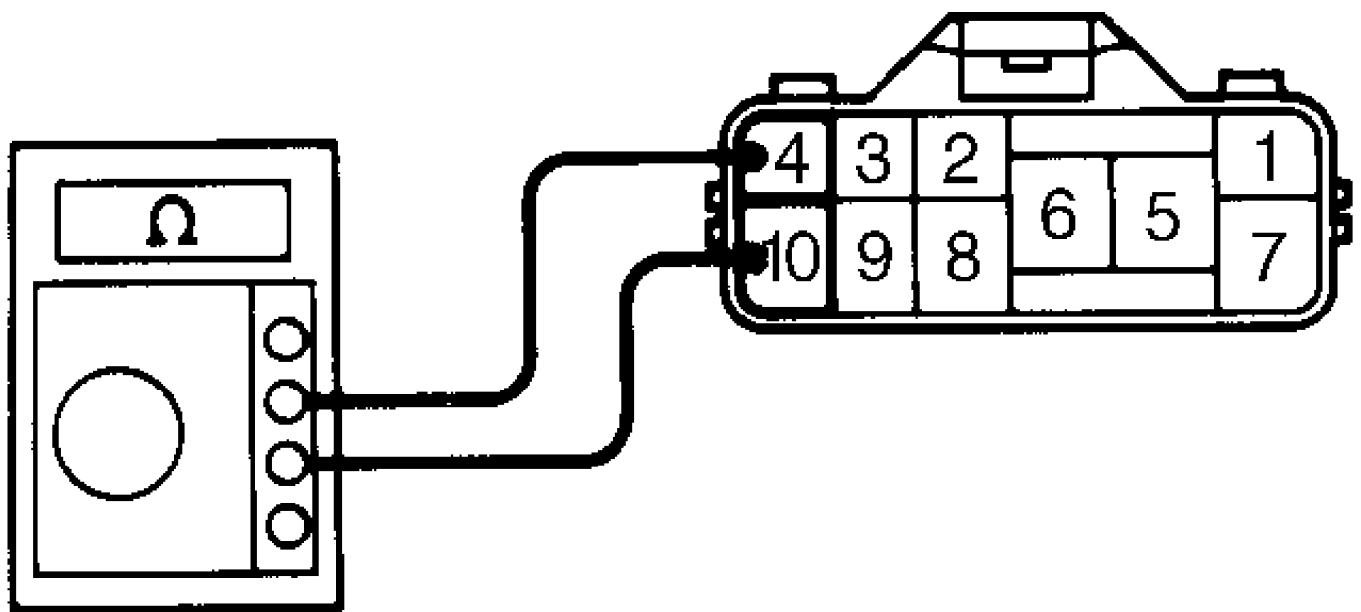
(1) - Measure voltage between ground and terminal listed at "A" connector. See Fig. 2.

(2) - Measure voltage between ground and terminal listed at "B" connector. See Fig. 2.

(3) - Voltage may slightly be less due to lighting of reverse lights.

2) Disconnect PNP switch connector. Using ohmmeter, check continuity of switch terminals with shift lever in specified positions. See Figs. 14 and 15. Replace PNP switch as necessary. If PNP switch is okay, go to next step.

3) Check wiring harness between battery and PNP switch and between PNP switch and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring harness as necessary. If wiring harness is okay, replace ECM.



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Fig. 14: Identifying PNP Switch Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

○ — ○ Continuity

| Terminal Shift Position | 6 | 5 | 4 | 7 | 8 | 10 | 9 | 2 | 3 |
|-------------------------------|-------|---|-------|---|---|----|---|---|---|
| P | ○ — ○ | | ○ — ○ | | | | | | |
| R | | | ○ — ○ | | ○ | | | | |
| N | ○ — ○ | | ○ — ○ | | | ○ | | | |
| D | | | ○ — ○ | | | | ○ | | |
| 2 | | | ○ — ○ | | | | | ○ | |
| L | | | ○ — ○ | | | | | | ○ |

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Fig. 15: PNP Switch Continuity Chart
Courtesy of Toyota Motor Sales, U.S.A., Inc.