

G - TESTS W/CODES - 2.2L

1994 Toyota Celica

1994 ENGINE PERFORMANCE
Toyota 2.2L Self-Diagnostics

Celica

INTRODUCTION

If no faults were found while performing F - BASIC TESTING, proceed with self-diagnostics. If no Diagnostic Trouble Codes (DTC) are present after entering self-diagnostics, proceed to steps in H - TESTS W/O CODES article for diagnosis by symptom (i.e., ROUGH IDLE, NO START, etc.).

NOTE: Diagnostic Trouble Codes (DTC) will be referred to as trouble codes in this article.

SELF-DIAGNOSTIC SYSTEM

Hard Failures

Hard failures cause Malfunction Indicator Light (MIL) on instrument panel to illuminate and remain on until problem is repaired. If light comes on and remains on (light may flash) during vehicle operation, corresponding trouble code will be retained in Electronic Control Module (ECM) memory on some trouble code applications. Not all trouble codes are retained in ECM memory. The cause of malfunction must be determined using trouble code charts. If a sensor fails, Electronic Control Module (ECM) will use a substitute value in its calculations to continue engine operation. In this condition, commonly known as limp-in mode, the vehicle runs but driveability will not be optimum.

NOTE: The MIL may also be referred to as the CHECK ENGINE light. The MIL may not illuminate when certain failure such as faulty starter signal or A/C switch signal exists, or if certain trouble codes are set.

Intermittent Failures

Intermittent failures may cause Malfunction Indicator Light (MIL) to flicker or illuminate and go out after intermittent fault goes away. However, the corresponding trouble code will be retained in ECM memory on some trouble code applications. Not all trouble codes are retained in ECM memory. Intermittent failures may be caused by a sensor, connector or wiring related problem. See INTERMITTENTS in H - TESTS W/O CODES article.

NOTE: Test Mode (if equipped) and Normal Mode on self-diagnostic system are used for retrieving trouble code from ECM memory. For information on different mode usage, see RETRIEVING TROUBLE CODES.

RETRIEVING TROUBLE CODES

NOTE: Trouble codes may be retrieved using Toyota scan tester in Normal Mode or Test Mode.

NOTE: Normal Mode is used to retrieve trouble code from Electronic Control Module (ECM) to determine problem area. Test Mode is used to check for trouble codes when operating vehicle to simulate conditions in which trouble code was set. Test mode

contains a higher sensing ability to detect malfunctions. Test Mode helps determine malfunctions caused by poor electrical connections, which are difficult to determine using Normal Mode. Test Mode also checks for malfunction in starter signal circuit, A/C switch signal and Park/Neutral switch signal.

NOTE: The Malfunction Indicator Light (MIL) on the instrument panel may also be referred to as CHECK ENGINE light.

Toyota Scan Tester

Connect scan tester to appropriate Data Link Connector (DLC). See Fig. 1. DLC No. 1 is used on all models. Using scan tester manufacturer's instructions, retrieve trouble codes.

Normal Mode

- 1) Before retrieving trouble code(s), verify MIL on instrument panel comes on with ignition on and engine off. The MIL should go off when engine is started.
- 2) If MIL does not come on with ignition on and engine off, check bulb circuit on instrument panel and wiring circuit between MIL and ECM. See appropriate wiring diagram in L - WIRING DIAGRAMS article. See ECM LOCATION.
- 3) If MIL remains on, self-diagnostic system has detected a malfunction or abnormality. Ensure battery voltage is greater than 11 volts and charging system is okay. Warm engine to normal operating temperature.
- 4) Apply parking brake. Shift the transmission/transaxle into Neutral (M/T) or Park (A/T). Turn A/C and all accessories off. Ensure throttle is in idle position.
- 5) Turn ignition on with engine off. Install Jumper Wire (SST 09843-18020) between terminals TE1 and E1 in appropriate Data Link Connector (DLC). See Fig. 1.
- 6) Count number of flashes from MIL on instrument panel. If system is operating properly (with no trouble codes), MIL will flash continuously and evenly. See Fig. 2.
- 7) If MIL will not flash, check TE1 and E1 wiring circuit. See appropriate TE1 & TE2 DIAGNOSTIC CIRCUIT CHECK chart under TROUBLE CODE CHARTS. See ECM LOCATION.
- 8) If trouble code exists, digits of trouble code will be flashed at approximately 1/2-second intervals. A 1 1/2-second pause separates first and second digits of code. See Fig. 2.
- 9) If more than one trouble code is stored, a 2 1/2-second pause will occur before next trouble code is flashed. Once all trouble codes are displayed, a 4 1/2-second pause will occur then trouble code(s) will be repeated.
- 10) Trouble codes are displayed in order of smallest to largest. After trouble codes are retrieved, remove jumper wire to exit Normal Mode. See NOTES ON TROUBLE CODES. For additional information on trouble codes, see TROUBLE CODE DIAGNOSTIC HINTS table under SELF-DIAGNOSTIC SYSTEM and appropriate TROUBLE CODE IDENTIFICATION table under TROUBLE CODE IDENTIFICATION.

NOTE: To repair failure causing trouble code, refer to proper trouble code chart under TROUBLE CODE CHARTS. Once repairs for trouble code are made, trouble code must be cleared from ECM memory. See CLEARING TROUBLE CODES.

Test Mode

- 1) Before retrieving trouble code(s), verify MIL on instrument panel comes on with ignition on and engine off. The MIL should go off when engine is started.
- 2) Check bulb circuit on instrument panel and wiring circuit

between MIL and ECM. See appropriate wiring diagram information in L - WIRING DIAGRAMS article. See ECM LOCATION.

3) Ensure battery voltage is greater than 11 volts and charging system is okay. Apply parking brake. Shift the transmission/transaxle to Neutral (M/T) or Park (A/T). Turn A/C and all accessories off. Ensure throttle is in idle position and ignition is off.

NOTE: Test Mode will not operate if jumper wire is installed between terminals TE2 and E1 in Data Link Connector (DLC) after ignition is turned on.

4) Install Jumper Wire (SST 09843-18020) between terminals TE2 and E1 in Data Link Connector (DLC) with ignition off. See Fig. 1.

5) Turn ignition on with engine off. Test Mode is operational if MIL on instrument panel flashes.

6) If MIL fails to flash, check TE2 wiring circuit. See appropriate TE1 & TE2 DIAGNOSTIC CIRCUIT CHECK chart under TROUBLE CODE CHARTS. See ECM LOCATION.

7) Drive vehicle at a speed greater than 6 MPH. ECM will set Trouble Codes 42 and 43 if vehicle is not driven. Try to simulate conditions of driveability complaint described by customer, and note when MIL comes on. This indicates when problem exists.

8) Stop vehicle, but DO NOT turn engine off. Install jumper wire between terminals TE1 and E1 in DLC. See Fig. 1. Count number of flashes from MIL on instrument panel. If system is operating properly (with no trouble codes), MIL will flash continuously and evenly. See Fig. 2.

9) If trouble code exists, digits of trouble code will be flashed at approximately 1/2-second intervals. A 1 1/2-second pause separates first and second digits of code. See Fig. 2.

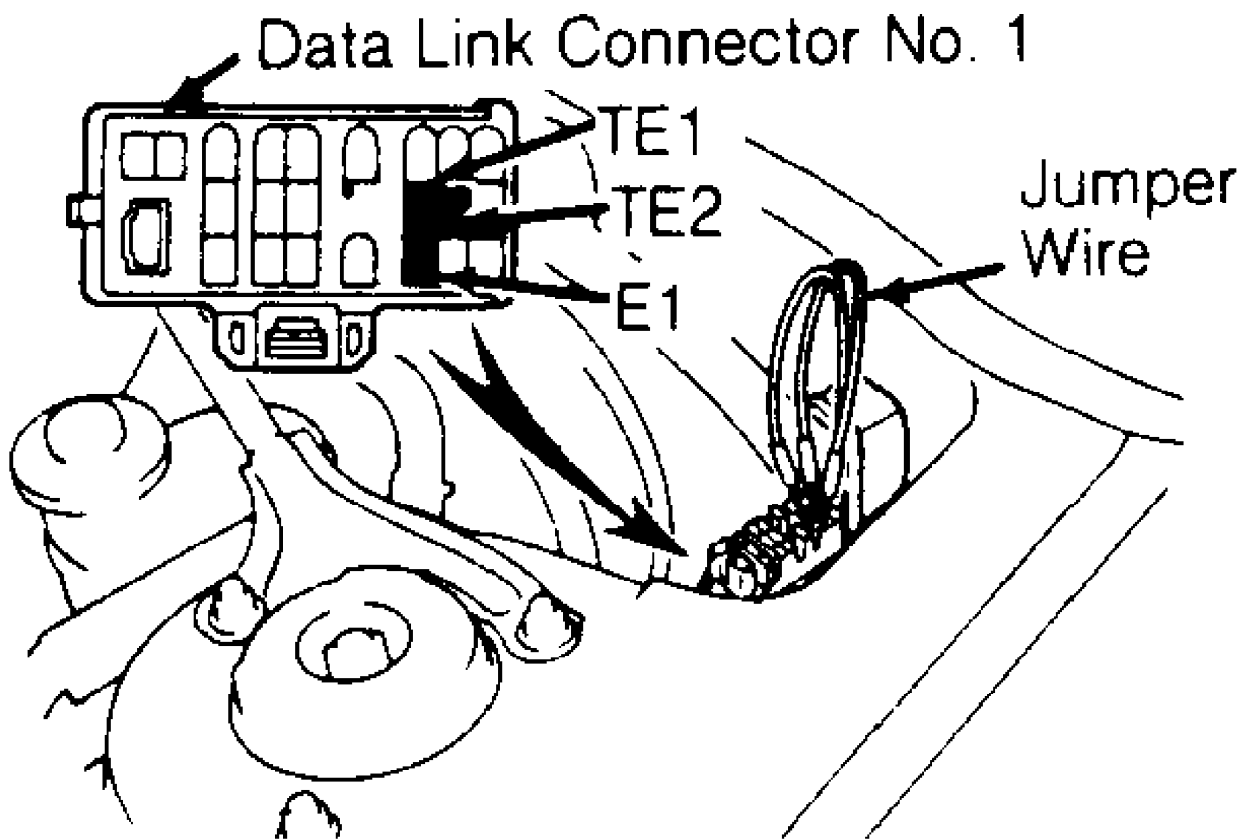
10) If more than one trouble code is stored, a 2 1/2-second pause will occur before next trouble code is flashed. Once all trouble codes are displayed, a 4 1/2-second pause will occur, then trouble code(s) will be repeated. Trouble codes are displayed in order of smallest to largest.

NOTE: On all models, Trouble Code 51 will normally be displayed if automatic transmission/transaxle is in any gear except Park or Neutral, A/C is turned on, or accelerator pedal is depressed.

11) After trouble code(s) is retrieved, remove jumper wires to exit Test Mode. See NOTES ON TROUBLE CODES. For additional information on trouble codes, see TROUBLE CODE DIAGNOSTIC HINTS table under SELF-DIAGNOSTIC SYSTEM and appropriate TROUBLE CODE IDENTIFICATION table under TROUBLE CODE IDENTIFICATION.

NOTE: The MIL may not come on if certain trouble code is set when in Test Mode. See appropriate TROUBLE CODE IDENTIFICATION table under TROUBLE CODE IDENTIFICATION.

NOTE: To repair failure causing trouble code, refer to proper trouble code chart under TROUBLE CODE CHARTS. Once repairs for trouble code are made, trouble code must be cleared from ECM memory. See CLEARING TROUBLE CODES.



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Fig. 1: Data Link Connector ID & Installing Jumper Wire (Celica)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

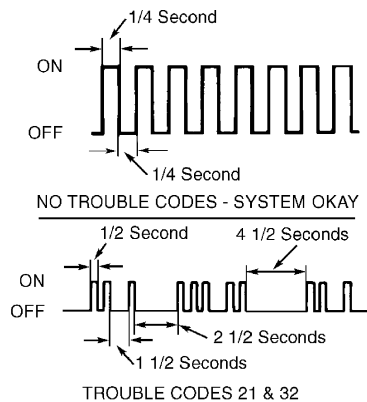


Fig. 2: Identifying Normal System Operation & Trouble Code Using MIL
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

NOTES ON TROUBLE CODES

1) When certain trouble codes occur, MIL on instrument panel will not come on. For designation of MIL operation on certain trouble codes, see appropriate TROUBLE CODE IDENTIFICATION table under TROUBLE CODE IDENTIFICATION.

2) When certain malfunctions or trouble codes initially occur, they will be temporarily stored in ECM memory, but MIL on instrument panel will not come on.

3) The second time malfunction or trouble code is detected, MIL on instrument panel will then come on, provided ignition is turned off and then back on after malfunction or trouble code was first detected. This is referred to as the Two Trip Detection Logic and only applies to specified trouble codes. See TWO TRIP DETECTION LOGIC TROUBLE CODES table.

NOTE: When road testing vehicle in Test Mode, the Two Trip Detection Logic will not function. In Test Mode, the MIL on instrument panel will come on the first time malfunction or trouble code is detected.

TWO TRIP DETECTION LOGIC TROUBLE CODES TABLE

Application	(1) Trouble Code
Celica	21, 25, 26, 27 & 71

(1) - Trouble codes may not apply to all models, as some trouble codes are used only on Calif. models.

4) In Normal Mode, MIL on instrument panel will go off after malfunction is repaired, but trouble codes, except ECM non-memory trouble codes, will be retained in ECM memory until cleared. ECM non-memory trouble codes are not stored in ECM memory. See ECM NON-MEMORY TROUBLE CODES table.

5) In Test Mode (if equipped), all trouble codes except ECM non-memory trouble codes are retained in ECM memory, even with ignition off and repairs made, until cleared. ECM non-memory trouble codes are not retained in ECM memory. See ECM NON-MEMORY TROUBLE CODES table.

NOTE: When in Test Mode, if vehicle is not driven at a speed greater than 6 MPH, ECM will set Trouble Codes 42 and 43. For MIL operation in relation to trouble code when in Test Mode, see appropriate TROUBLE CODE IDENTIFICATION table under TROUBLE CODE IDENTIFICATION.

ECM NON-MEMORY TROUBLE CODES TABLE

Application	Trouble Code
Normal Mode.....	16, 43 & 51
Test Mode	43 & 51

CLEARING TROUBLE CODES

1) After performing repairs, clear ECM memory of all stored trouble codes. To clear memory, turn ignition off. Remove proper fuse from fuse/relay box for approximately 30 seconds or more. See FUSE APPLICATION table and FUSE/RELAY BOX LOCATION table.

2) Depending on ambient temperature, fuse may need to be removed for more than 30 seconds, especially in colder temperatures. Install fuse. Road test vehicle. Ensure system operates properly (with

no trouble codes) and MIL flashes continuously and evenly. See Fig. 2.

NOTE: Trouble codes may also be cleared by disconnecting negative battery cable. However, other memory functions (clock, radio, alarm, seats, etc.) will be cancelled and must be reset.

3) With certain trouble codes, once trouble code has been cleared from ECM memory, a trouble code detection driving pattern test can be performed to verify repairs and that trouble has not reset. For information on trouble code detection driving pattern test, see TROUBLE CODE DETECTION DRIVING PATTERN TESTS.

FUSE APPLICATION TABLE

Model	Fuse (Amps)
Celica	EFI (15)

FUSE/RELAY BOX LOCATION TABLE

Application	Location
Celica	Driver Side, Front Corner Of Engine Compartment

TROUBLE CODE DETECTION DRIVING PATTERN TESTS

NOTE: Trouble code driving pattern test may be referred to as driving pattern test.

1) With certain trouble codes, once trouble code has been cleared from ECM memory, a trouble code detection driving pattern test can be performed to verify repairs and that trouble has not reset. Trouble code driving pattern test will duplicate conditions required to set specified trouble codes.

2) Trouble code detection driving pattern test lists procedure to be performed to ensure trouble code has not reset. See Fig. 3.

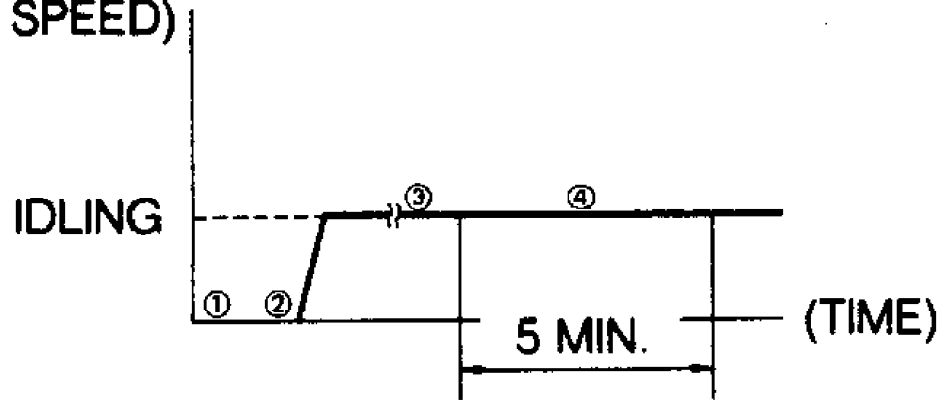
3) Trouble code detection driving pattern tests apply only to specified trouble codes. See TROUBLE CODE DETECTION DRIVING PATTERN TEST APPLICATION table. Trouble code detection driving pattern test will be included with proper trouble code chart under TROUBLE CODE CHARTS.

TROUBLE CODE DETECTION DRIVING PATTERN TEST APPLICATION TABLE

Model	(1) Trouble Code
Celica	21, 25, 26, 27, 52 & 71

(1) - Trouble codes listed may not apply to all models, as some trouble codes are used only on Calif. models.

MALFUNCTION: Open Or Short In Injector Or Blockage (ENGINE SPEED)



HINT: Before starting this test, ensure engine coolant temp. is 40°C (104°F) or less.
Before this test, check the feedback voltage for heated oxygen sensor.

- ① Disconnect the fuse EFI (15 A) for 10 sec. or more, with IG switch OFF.
- ② Initiate test mode (Connect terminal TE2 and E1 of DLC1) with IG switch OFF.
- ③ Start the engine and warm the engine up, with all ACC switch OFF.
- ④ After the engine is warmed up, let it idle for 5 min.

HINT: If a malfunction is detected the malfunction indicator lamp will light up during step ④.

NOTICE: If this procedure is not strictly followed, you cannot detect the malfunction.

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Fig. 3: Typical Trouble Code Detection Driving Pattern Test
Courtesy of Toyota Motor Sales, U.S.A., Inc.

ECM LOCATION

NOTE: For illustration of ECM location, refer to information in
E - THEORY/OPERATION article.

ECM LOCATION TABLE

Model	Location
Celica	Below Passenger's Side Of Dash, Underneath The Carpet

TROUBLE CODE DIAGNOSTIC HINTS

NOTE: To determine a common cause for a trouble code to be set,
see TROUBLE CODE DIAGNOSTIC HINTS table.

TROUBLE CODE DIAGNOSTIC HINTS TABLE (1)

Trouble Code	Diagnostic Hints
12	No "G", "G1", "G2" or "NE" Ignition Signal To ECM Within 2 Seconds After Engine Is Cranked, No "G" Ignition Signal To ECM For 3 Seconds

With Engine Speed Of 600-4000 RPM
Open In "G-" Circuit

- 13 No "NE" Ignition Signal To ECM When
Engine Speed Is Greater Than Approximately 1000 RPM,
No "G" Ignition Signal To ECM When "NE" Signal
Is Input 4 Times With Engine Speed Of 600-4000 RPM
- 14 No "IG" Or "IGF" Ignition Signal To ECM From
Ignitor Several Times In Succession
- 16 Fault In Transmission/Transaxle ECU Or ECM
- 21 Defective O2 Sensor, Open Or Short
Circuit In O2 Sensor Signal
- 22 Open Or Short Circuit In Engine Coolant
Temperature Sensor Signal
- 24 Open Or Short Circuit In Intake Air Temp. Sensor Signal
- 25 Lean Signal Sent By O2 Sensor For Several Seconds
- 26 Rich Signal Sent By O2 Sensor For Several Seconds
- 27 Open Or Short Circuit In Sub-O2 Sensor Signal
- 28 Defective O2 Sensor,
Open Or Short Circuit In O2 Sensor Signal
- 31 Open Or Short Circuit In Airflow
Meter Or MAP Sensor Signal
- 32 Open Or Short Circuit Between Airflow Meter Terminals
- 34 Turbocharger Pressure Is Abnormal
- 35 Open Or Short Circuit In Turbocharging Pressure
Sensor, MAP Sensor Or BARO Sensor
- 41 Open Or Short Circuit In Throttle Position Sensor Signal
- 42 No Signal From Vehicle Speed Sensor
For Several Seconds
- 43 No "STA" Signal To ECM Until Engine Reaches
800 RPM With Engine Cranking
- 47 Open Or Short Circuit In Sub-Throttle Position Sensor Signal
- 51 (2) Problem In One Of 3 Circuits Monitored By ECM
- 52 Open Or Short Circuit In Knock Sensor Signal
- 53 Knock Control In ECM Is Faulty
- 55 Open Or Short Circuit In Knock Sensor Signal
- 71 EGR Gas Temperature Less Than
Predetermined Level During EGR Control
- 78 Open Or Short Circuit In Fuel Pump Control
Circuit Or Fuel Pump Electronic Control Unit (ECU)
- 81 Open In ECT1 Circuit Between ECM & Transmission
Control Module (TCM) For At Least 2 Seconds
- 83 Open In ESA1 Circuit Between ECM & Transmission
Control Module (TCM) For 1/2 Second After
Engine Idles At Least 1/2 Second
- 84 Open In ESA2 Circuit Between ECM & Transmission
Control Module (TCM) For 1/2 Second After
Engine Idles At Least 1/2 Second
- 85 Open In ESA3 Circuit Between ECM & Transmission
Control Module (TCM) For 1/2 Second After
Engine Idles At Least 1/2 Second

- (1) - Listed are possible areas causing trouble codes. Not all trouble codes are used on all models.
- (2) - Throttle position sensor, Park/Neutral switch and A/C Signal circuits are monitored.

TROUBLE CODE IDENTIFICATION

TROUBLE CODE IDENTIFICATION TABLE

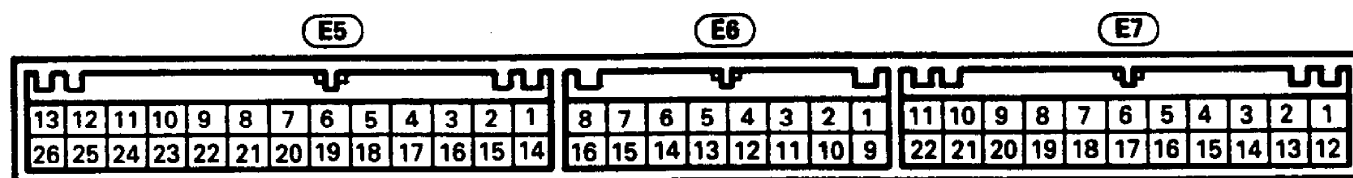
Code	System	(2)	(2)	Probable Cause
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Number	Affected	MIL In Normal Mode	MIL In Test Mode	
12	RPM Signal	ON	N/A	Distributor, Starter Or Circuit, ECM
13 (2.2L)	RPM Signal	(3)	(4)	Distributor Or Circuit, ECM
14	Ignition Signal	ON	N/A	Ignitor Or Circuit To ECM, ECM
16 (5)	A/T Control Signal	ON	N/A	ECM Or Circuit
21	Oxygen Sensor Signal	ON	ON	Oxygen Sensor Or Circuit, ECM
22	Engine Coolant Temperature Sensor Signal	ON	ON	Engine Coolant Temp. Sensor Or Circuit, ECM
24	Intake Air Temperature	ON	ON	Intake Air Temp. Sensor Or Circuit, ECM
25	Lean Air/Fuel Mixture			Injector Or Circuit, Oxygen Sensor Or Circuit Fuel Pressure, Ignition System, Vacuum Leak, Compression Pressure, ECM
26	Rich Air/Fuel Mixture	ON	ON	Injector Or Circuit, Oxygen Sensor Or Circuit Fuel Pressure, Ignition System, Vacuum Leak, Compression Pressure, ECM
27	Sub-Oxygen Sensor Signal	ON	ON	Sub-Oxygen Sensor Or Circuit, ECM
31	MAP Sensor Signal	ON	ON	MAP Sensor Or Circuit, ECM
41	Throttle Position Sensor Signal	ON	ON	Throttle Position Sensor Or Circuit, ECM
42 (2.2L)	Vehicle Speed Sensor Signal	ON	OFF	Vehicle Speed Sensor Or Circuit, ECM
43	Starter Signal	N/A	OFF	Starter Signal Circuit, Starter Relay, Ignition Switch Or Circuit, ECM
51	Switch	N/A	OFF	A/C Switch Circuit,

	Condition Signal			Park/Neutral Switch Or Circuit, TPS Or Circuit, ECM
52	Knock Sensor Signal	ON	N/A	Knock Sensor Or Circuit, ECM
71	EGR System Malfunction	ON	ON	EGR System, EGR Temp. Sensor Or Circuit, EGR-VSV, ECM
(1) - The 1.8L is the 7A-FE engine and 2.2L is the 5S-FE engine. (2) - ON indicates MIL on instrument panel will be illuminated. N/A indicates item is not included in malfunction diagnosis when using this mode. OFF indicates MIL on instrument panel will not be illuminated even if malfunction is detected. (3) - The MIL will be illuminated only if no "NE" signal is sent to ECM with engine at approximately 1000 RPM (Calif. models) or 1500 RPM (all others). (4) - The MIL will be illuminated only if no "G" signal is sent to ECM at least 4 times with engine speed between 500 and 4000 RPM. Also, on Calif. models, when in Test Mode, MIL will be illuminated if "NE" signal does not pulse 12 times to ECM during interval between "G1" and "G2" pulses. (5) - Applies only to models with electronic-controlled automatic transaxle.				

TROUBLE CODE CHARTS

ECM TERMINAL IDENTIFICATION



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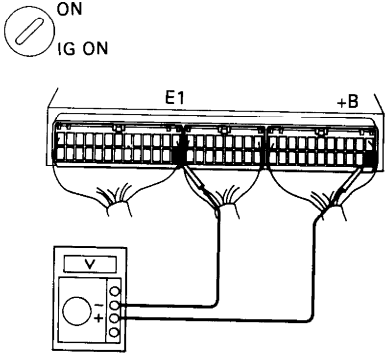
Fig. 4: ECM Terminal Identification
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DIAGNOSTIC CIRCUIT CHECK ("TE1" & "TE2" TERMINAL CIRCUIT)

Terminals "TE1" and "TE2" are located in Data Link Connectors (DLC) No. 1. DLC is located in engine compartment. When these terminals are connected/jumpered with the DLC "E1" terminal, Diagnostic Trouble Codes (DTC) can be accessed in the normal or test modes using the Malfunction Indicator Light (MIL) located in the instrument cluster.

Check for an open or short in wiring harness or for faulty ECM if test mode or output is not activated when DLC terminals "TE1" and "TE2" is jumpered to DLC terminal "E1" or when MIL blinks even though these terminals are not connected or jumpered.

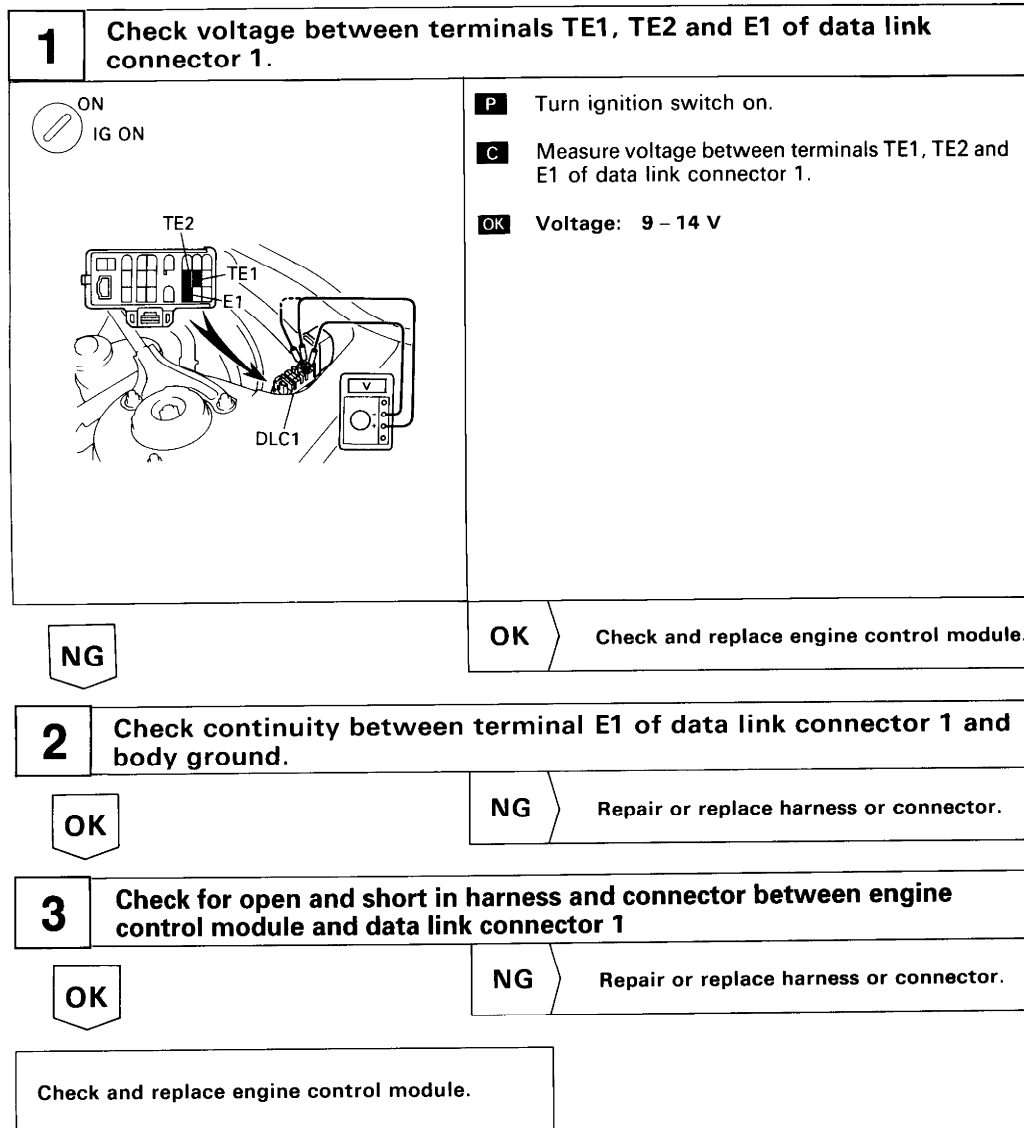
INSPECTION PROCEDURE

1	Check voltage between terminals +B and E1 of engine control module connector.
	P (1) Turn up the floor mat on the passenger side. (2) Turn ignition switch on. C Measure voltage between terminals +B and E1 of engine control module connector. OK Voltage: 9 – 14 V
NG	OK
2	Check for open in harness and connector between terminal E1 of engine control module and body ground
OK	NG Repair or replace harness or connector.

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Fig. 5: Diagnostic Circuit Check - Schematic
Courtesy of Toyota Motor Sales, U.S.A., Inc.

INSPECTION PROCEDURE

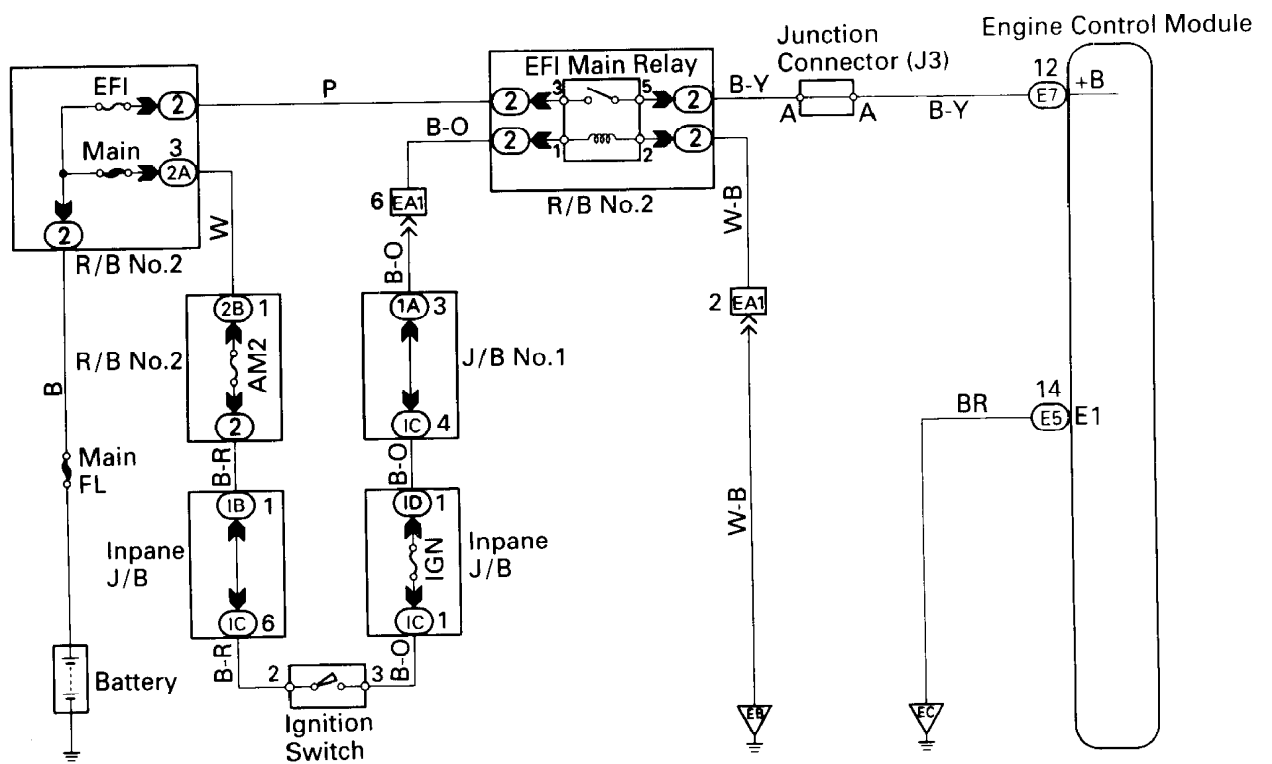


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Fig. 6: Diagnostic Circuit Check - Diagnostic Flowchart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

ECM POWER SOURCE CIRCUIT CHECK

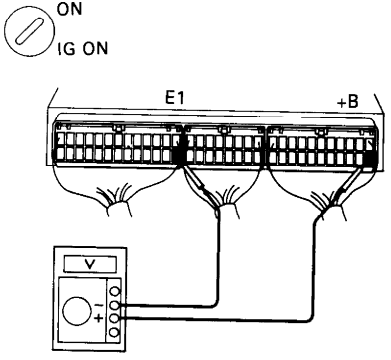
When ignition switch is turned on, battery positive voltage is applied to ignition coil, closing contacts in EFI main relay and supplying power to terminals +B and +B1 of ECM.



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Fig. 7: ECM Power Source Circuit Check - Schematic
Courtesy of Toyota Motor Sales, U.S.A., Inc.

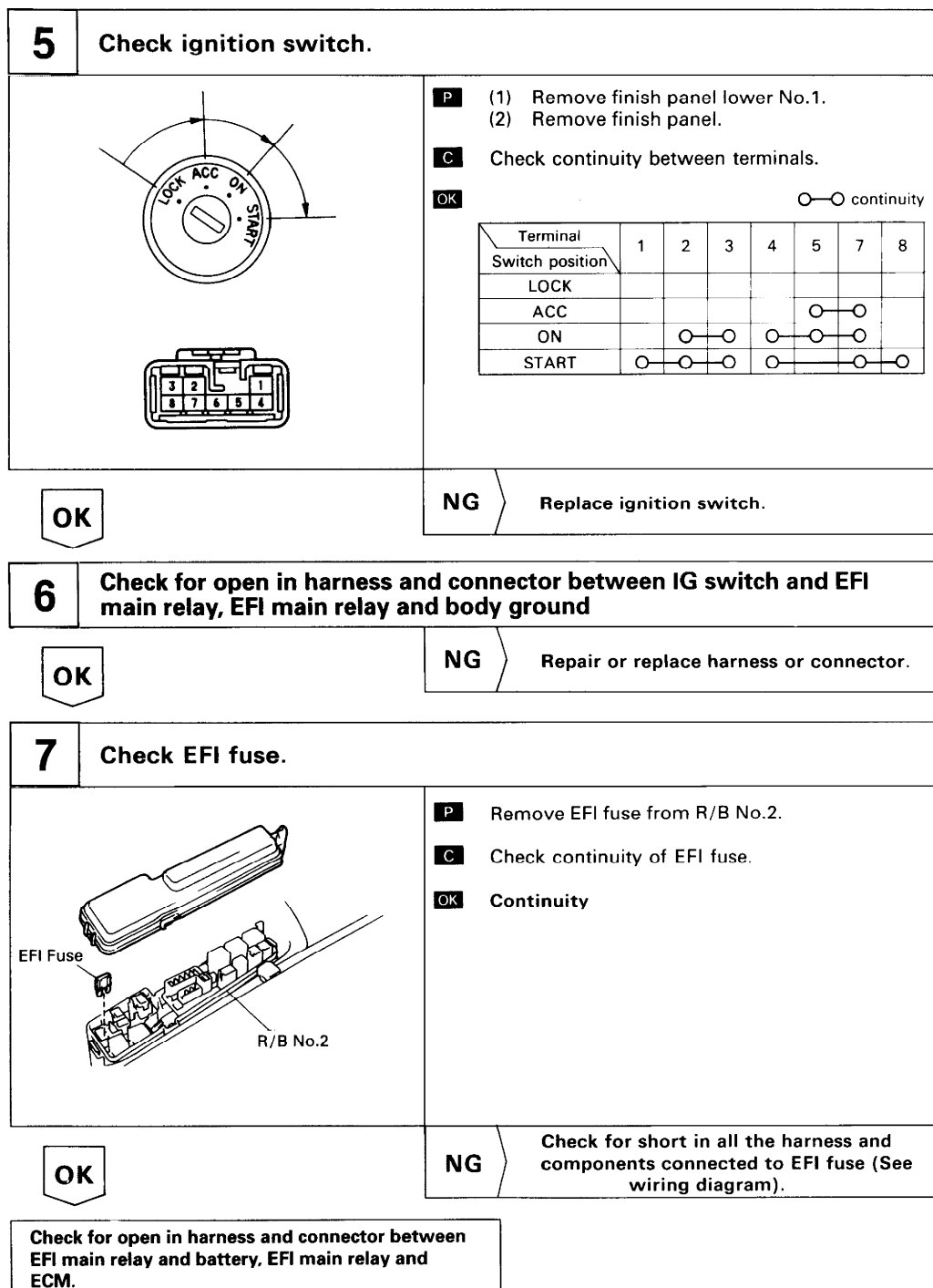
INSPECTION PROCEDURE

1	Check voltage between terminals +B and E1 of engine control module connector.
	P (1) Turn up the floor mat on the passenger side. (2) Turn ignition switch on. C Measure voltage between terminals +B and E1 of engine control module connector. OK Voltage: 9 – 14 V
NG	OK
2	Check for open in harness and connector between terminal E1 of engine control module and body ground
OK	NG Repair or replace harness or connector.

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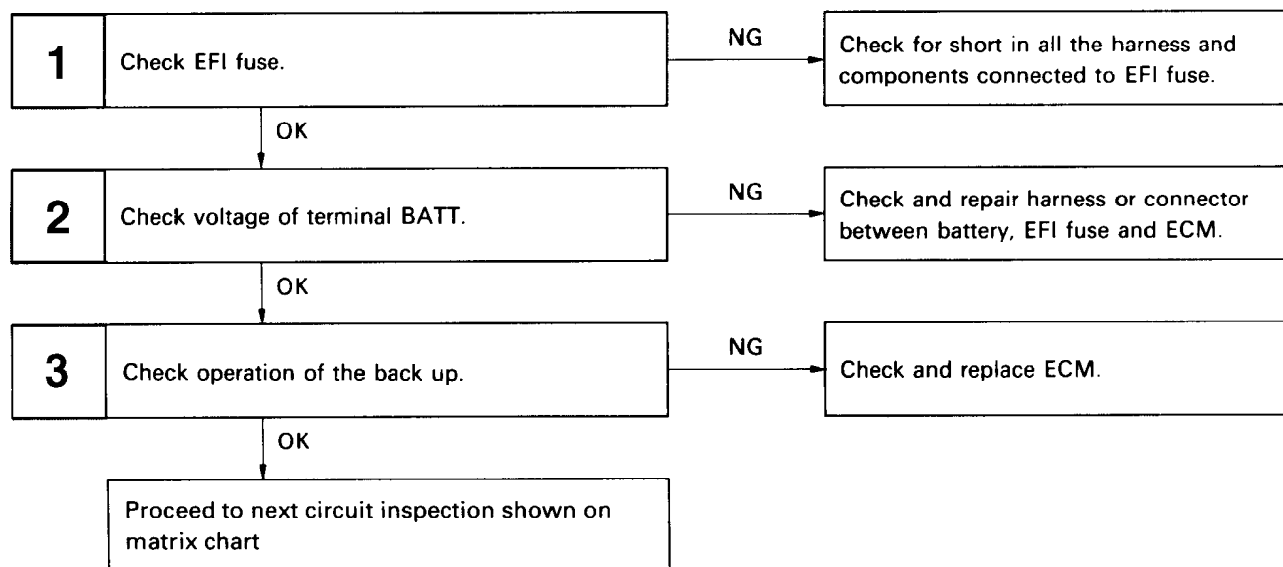
Fig. 8: ECM Power Source Circuit Check - Diagnostic Flowchart (1 Of 2)

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

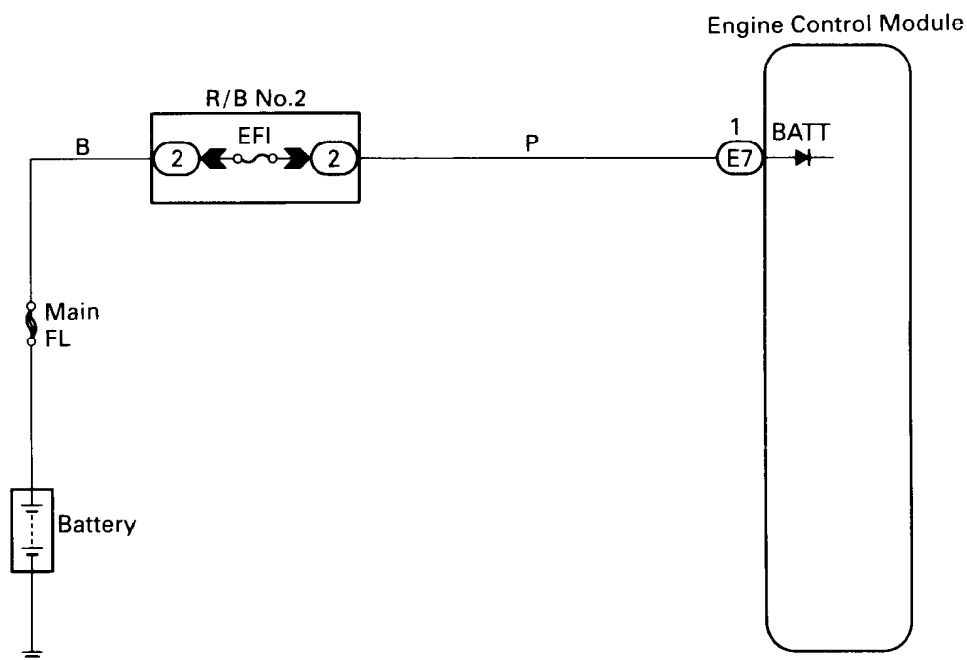


etc.

DIAGNOSTIC CHART



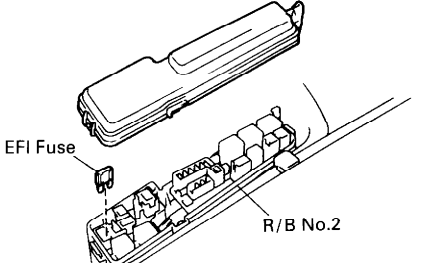
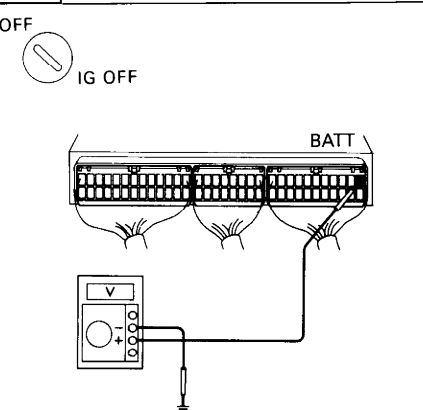
WIRING DIAGRAM



94B44801

Fig. 10: ECM Back-Up Power Source Circuit Check - Schematic
Courtesy of Toyota Motor Sales, U.S.A., Inc.

INSPECTION PROCEDURE

1	Check EFI fuse.
 EFI Fuse R/B No.2	P Remove EFI fuse from R/B No.2. C Check continuity of EFI fuse. OK Continuity
OK	NG Check for short in all the harness and components connected to EFI fuse (See wiring diagram).
2	Check voltage between terminal BATT of engine control module connector and body ground.
OFF IG OFF  BATT V	P Turn up the floor mat on the passenger side. C Measure voltage between terminal BATT of engine control module connector and body ground. OK Voltage: 9 – 14 V
OK	NG Check and repair harness or connector between engine control module and EFI fuse, EFI fuse and battery.
3	Are the diagnostic trouble codes still in the memory when the ignition switch is turned OFF?
YES	NO Check and replace engine control module.
See TROUBLE SHOOTING – NO CODES article.	

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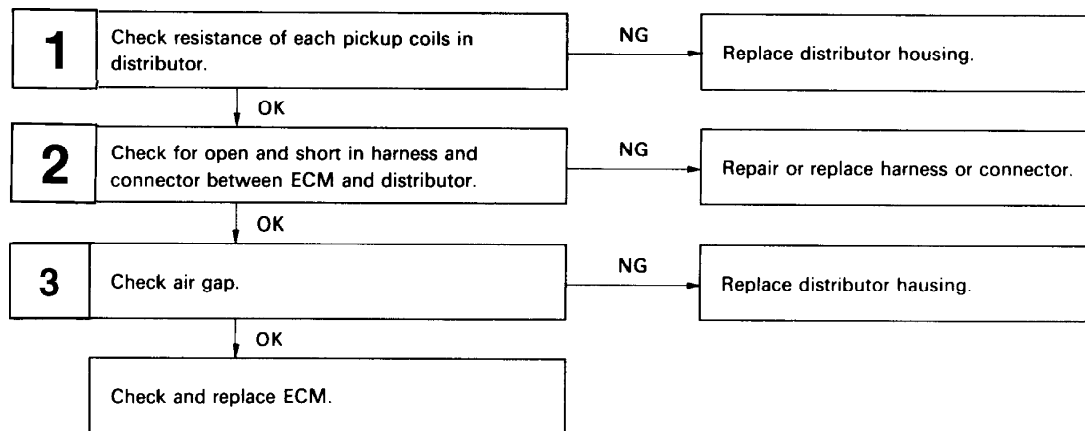
Fig. 11: ECM Back-Up Power Source Circuit Check – Diagnostic Flowchart
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC 12 - RPM SIGNAL (EXCEPT CALIF.)

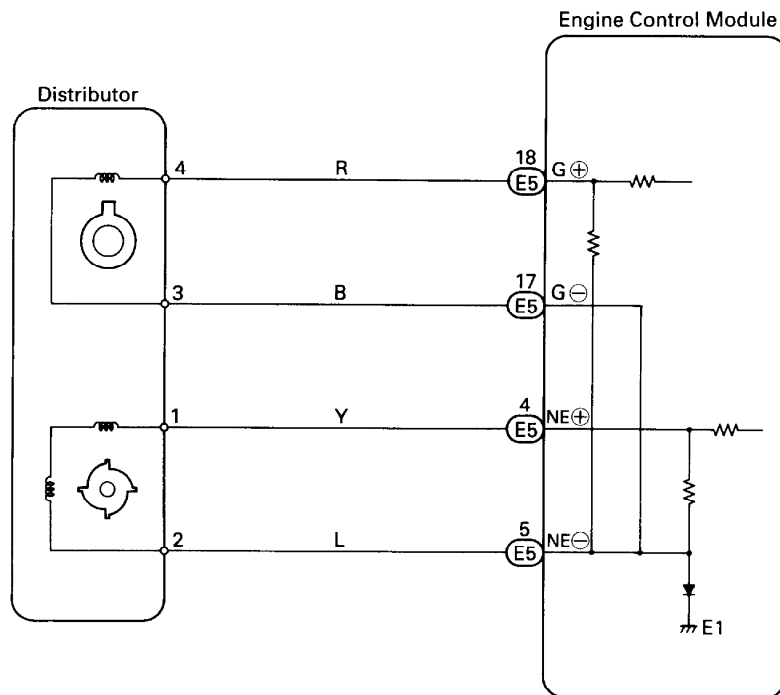
The distributor assembly contains 3 pick-up coils. The "G" signal informs ECM of the standard crankshaft position. The "NE" signal informs ECM of the crankshaft position and engine speed.

If "NE" signal is not present to ECM within 2 seconds or more with engine cranking, check for open or short in the "G" or "NE" circuit, or for faulty distributor.

If "G" signal is not present from ECM for 3 seconds or more with engine speed of 600-4000 RPM, check for open or short in "STA" circuit or for a faulty ECM.

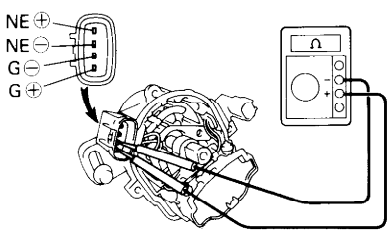


WIRING DIAGRAM

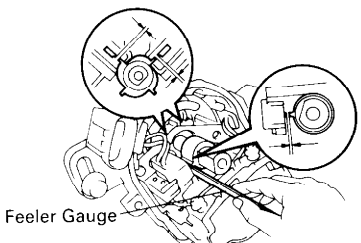


94C44885

Fig. 12: DTC 12 - Schematic
Courtesy of Toyota Motor Sales, U.S.A., Inc.

1	Check resistance of each pickup coils in distributor.													
	P Disconnect distributor connector. C Measure resistance between each terminal shown in table below. OK <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="2"></th> <th style="text-align: center;">Resistance</th> </tr> </thead> <tbody> <tr> <td rowspan="2" style="text-align: center;">G Pickup Coil (G⁺ – G[–])</td> <td style="text-align: center;">Cold</td> <td style="text-align: center;">185 ~ 275 Ω</td> </tr> <tr> <td style="text-align: center;">Hot</td> <td style="text-align: center;">240 ~ 325 Ω</td> </tr> <tr> <td rowspan="2" style="text-align: center;">NE Pickup Coil (NE⁺ – NE[–])</td> <td style="text-align: center;">Cold</td> <td style="text-align: center;">370 ~ 550 Ω</td> </tr> <tr> <td style="text-align: center;">Hot</td> <td style="text-align: center;">475 ~ 650 Ω</td> </tr> </tbody> </table> "Cold" is from – 10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).			Resistance	G Pickup Coil (G ⁺ – G [–])	Cold	185 ~ 275 Ω	Hot	240 ~ 325 Ω	NE Pickup Coil (NE ⁺ – NE [–])	Cold	370 ~ 550 Ω	Hot	475 ~ 650 Ω
		Resistance												
G Pickup Coil (G ⁺ – G [–])	Cold	185 ~ 275 Ω												
	Hot	240 ~ 325 Ω												
NE Pickup Coil (NE ⁺ – NE [–])	Cold	370 ~ 550 Ω												
	Hot	475 ~ 650 Ω												
OK	NG Replace distributor housing assembly.													

2	Check for open and short in harness and connector between engine control module and distributor	
OK	NG Repair or replace harness or connector.	

3	Check air gap.	
 Feeler Gauge	P Remove distributor cap and rotor. C Using a feeler gauge, measure the air gap between the signal rotor and pickup coil projection. OK Air gap: 0.2 – 0.4 mm (0.008 – 0.006 in.)	
OK	NG Replace distributor housing assembly.	

Check and replace engine control module.

Fig. 13: DTC 12 – Inspection Using Oscilloscope
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

94B44884

DTC	12	G, NE Signal Circuit (No.1) (Exc. California spec.)
------------	-----------	--

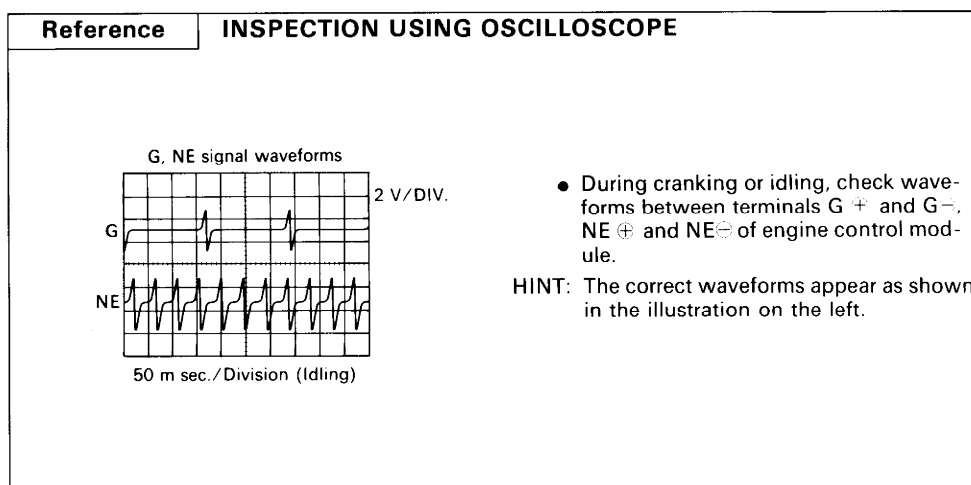
CIRCUIT DESCRIPTION

The distributor in the Engine Control System contains 3 pickup coils.

The G signals inform the ECM of the standard crankshaft position.

The NE signals inform the ECM of the crankshaft position and the engine speed.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
12	No NE signal to ECM with 2 sec. or more after cranking.	● Open or short in NE, G circuit ● Distributor
	No G signal to ECM for 3 sec. or more with engine speed between 600 rpm and 4,000 rpm.	● Open or short in STA circuit ● ECM



94144766

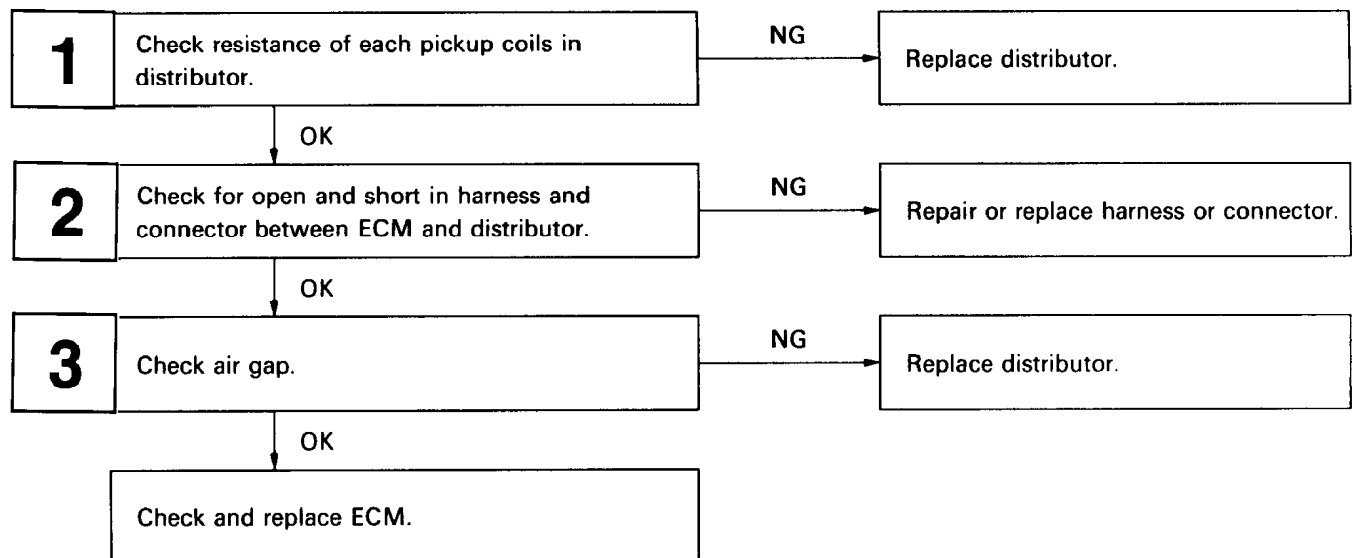
Fig. 14: DTC 12 - Diagnostic Flowchart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC 12 - RPM SIGNAL (CALIF.)

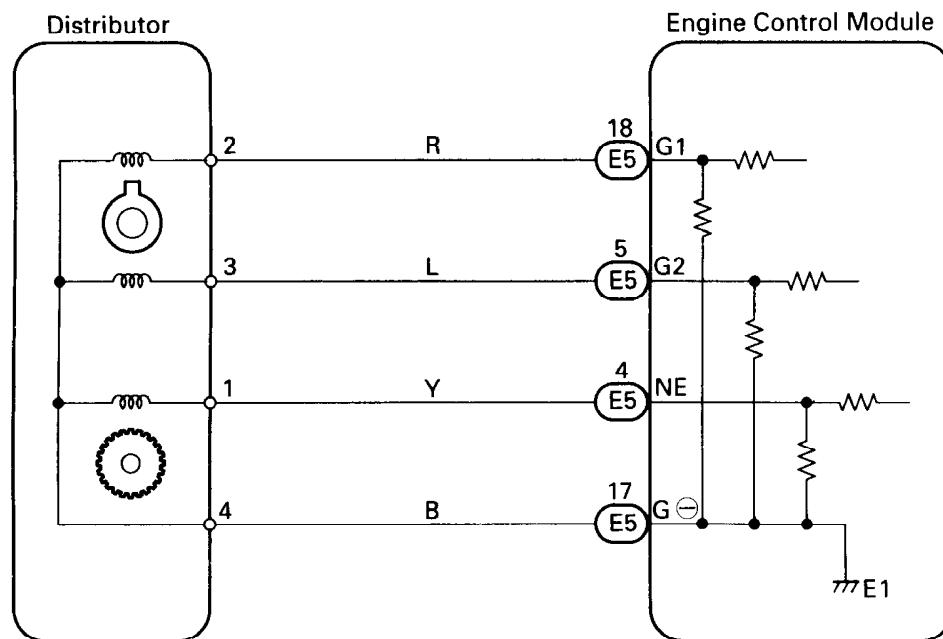
The distributor assembly contains 3 pick-up coils. The "G1" and "G2" signals inform ECM of the standard crankshaft position. The "NE" signal informs ECM of the crankshaft position and engine speed.

If "G1", "G2" or "NE" signal is not present to ECM within 2 seconds or more with engine cranking, check for open or short in the "G" or "NE" circuit, or for faulty distributor.

If "G" signal is not present to ECM for 3 seconds or more with engine speed between 600-4000 RPM, check for open or short in "STA" circuit or for a faulty ECM.

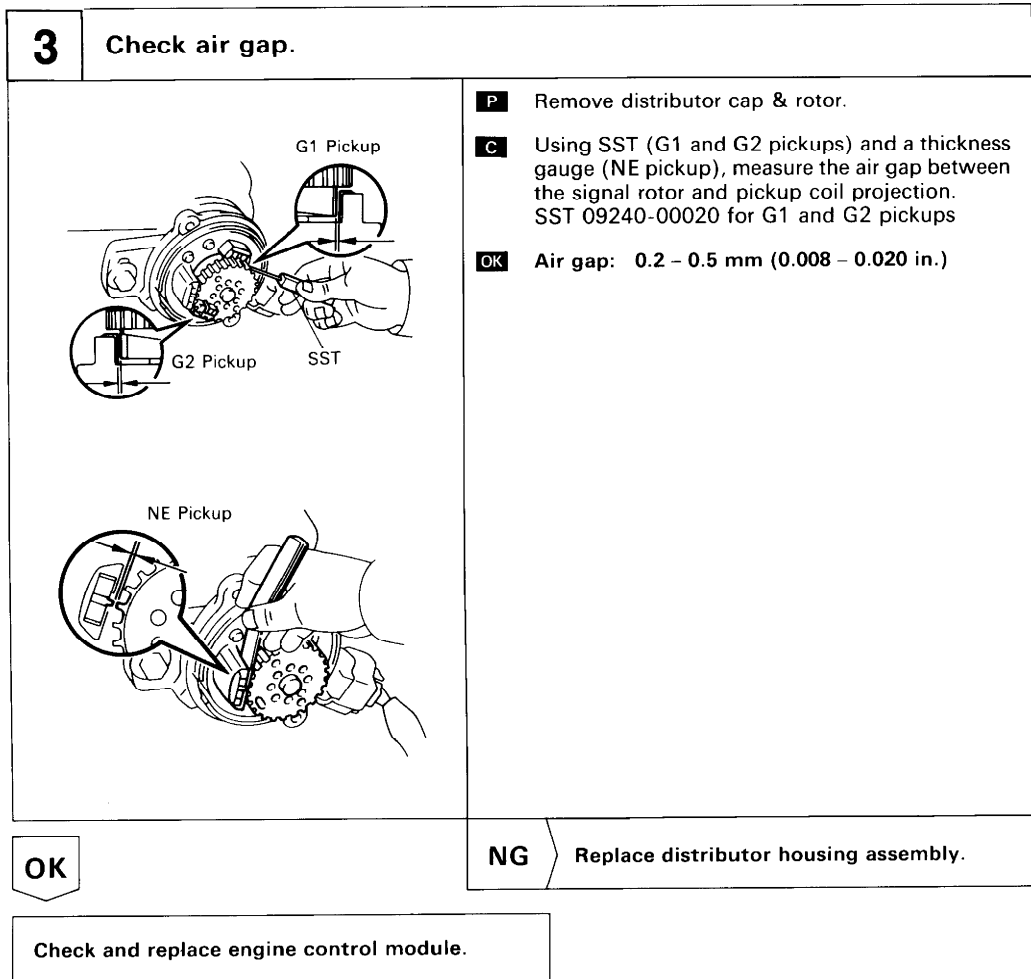


WIRING DIAGRAM



94E44887

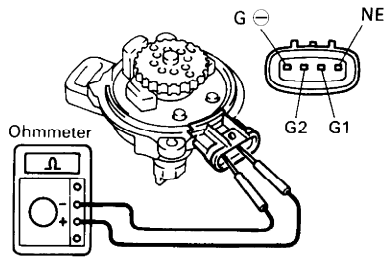
Fig. 15: DTC 12 - Schematic
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



94J44890
Fig. 16: DTC 12 - Diagnostic Flowchart (1 Of 2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

1

Check resistance of each pickup coils in distributor.



P Disconnect distributor connector.

C Measure resistance between each terminal shown in table below.

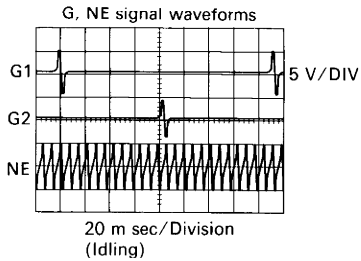
OK

		Resistance
G1 pickup coil (G1 - G ⊖)	Cold	125 ~ 200 Ω
	Hot	160 ~ 235 Ω
G2 pickup coil (G2 - G ⊖)	Cold	125 ~ 200 Ω
	Hot	160 ~ 235 Ω
NE pickup coil (NE - G ⊖)	Cold	155 ~ 250 Ω
	Hot	190 ~ 290 Ω

"Cold" is from -10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

Reference

INSPECTION USING OSCILLOSCOPE



- During cranking or idling, check waveforms between terminals G1, G2, NE and G ⊖ of engine control module.

HINT: The correct waveforms appear as shown in the illustration on the left.

OK

NG

Replace distributor assembly.

2

Check for open and short in harness and connector between engine control module and distributor

OK

NG

Repair or replace harness or connector.

94G44889

Fig. 17: DTC 12 - Diagnostic Flowchart (2 Of 2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC 13 - RPM SIGNAL

This code indicates that a momentary interruption of the "G" and "NE" signal from the distributor to ECM has occurred, but has returned to normal. This malfunction is usually a loose or dirty connector or terminal. For further diagnosis, refer to appropriate DTC 12 chart.

DTC 14 - IGNITION SIGNAL

ECM determines ignition timing. ECM turns on "Tr1" circuit at

a predetermined angle before desired ignition timing, and outputs an ignition signal to the Integrated Ignition Assembly (IIA). Since the width of the "IGT" signal is constant, dwell angle control circuit in the IIA determines the time control circuit starts primary current flow to ignition coil, based on engine RPM and ignition timing one revolution ago, that is, the time "Tr2" circuit turns on.

When it reaches the ignition timing, ECM turns off "Tr1" and outputs the "IGT" signal "0". This turns off "Tr2", interrupting the primary current flow and generating a high voltage in the secondary coil, firing the spark plugs. Also, by the counter electromotive force generated when the primary current is interrupted, the ignitor sends an ignition confirmation signal (IGF) to the ECM. The ECM stops fuel injection as a fail safe function when "IGF" signal is not input to ECM.

If "IGF" signal to ECM is not present after 4 consecutive "IGT" signals, check for open or short in "IGF" or "IGT" circuit from distributor to ECM. Check for faulty ignitor or ECM.

CIRCUIT DESCRIPTION

The ECM determines the ignition timing, turns on Tr₁ at a predetermined angle (°CA) before the desired ignition timing and outputs an ignition signal (IGT) "1" to the IIA.

Since the width of the IGT signal is constant, the dwell angle control circuit in the IIA determines the time the control circuit starts primary current flow to the ignition coil based on the engine speed and ignition timing one revolution ago, that is, the time the Tr₂ turns on.

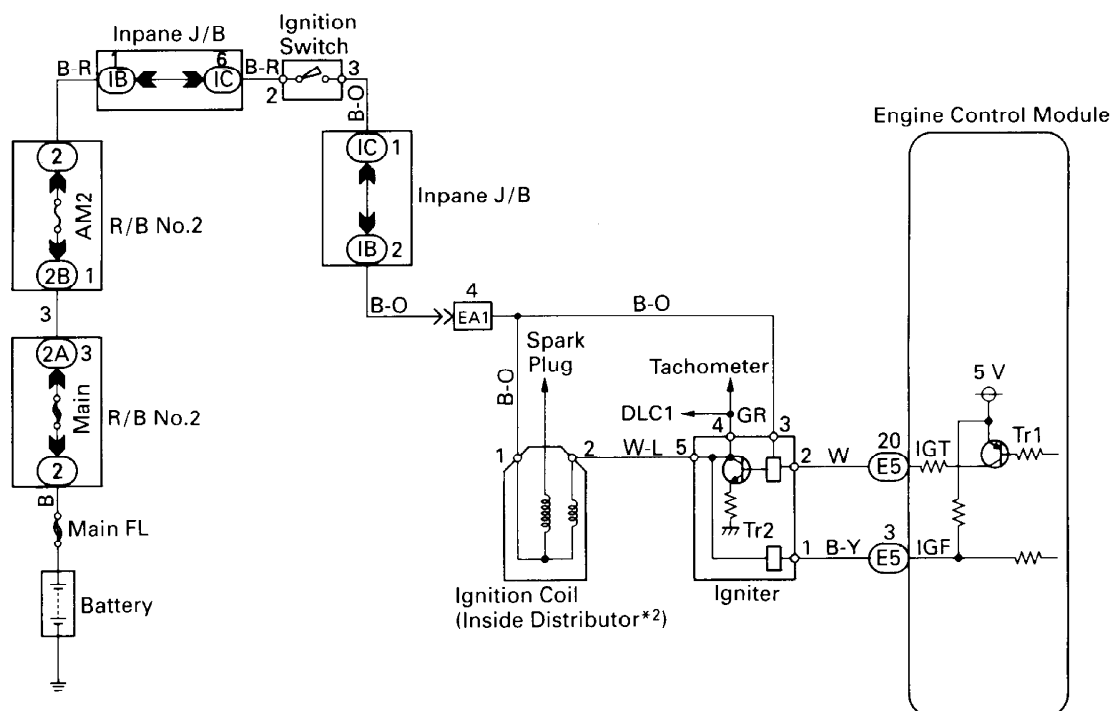
When it reaches the ignition timing, the ECM turns Tr₁ off and outputs the IGT signal "0".

This turns Tr₂ off, interrupting the primary current flow and generating a high voltage in the secondary coil which causes the spark plug to spark. Also, by the counter electromotive force generated when the primary current is interrupted, the IIA sends an ignition confirmation signal (IGF) to the ECM. The ECM stops fuel injection as a fail safe function when the IGF signal is not input to the ECM.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
14	No IGF signal to ECM for 4 (8*1) consecutive IGT signal.	• Open or short in IGF or IGT circuit from IIA to ECM. • IIA • ECM

*1: Only for California specification vehicles.

WIRING DIAGRAM



*2: Except California specification vehicles.

94A44891

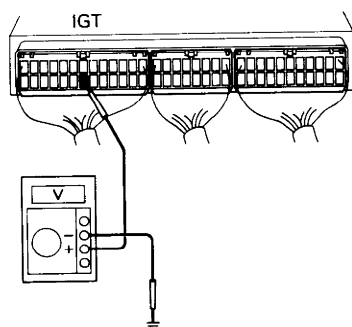
Fig. 18: DTC 14 - Schematic

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

4

Check voltage between terminal IGT of engine control module connector and body ground.

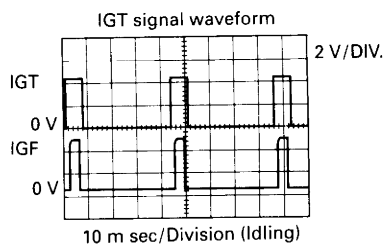
STA
STA ON



- P** Turn up the floor mat on the passenger side.
- C** Measure voltage between terminal IGT of engine control module connector and body ground when engine is cranked.
- OK** Voltage: **0.5 – 1.0 V**
(Neither 0 V nor 5 V)

Reference

INSPECTION USING OSCILLOSCOPE



- During cranking or idling, check waveform between terminal IGT, IGF and E1 of engine control module.

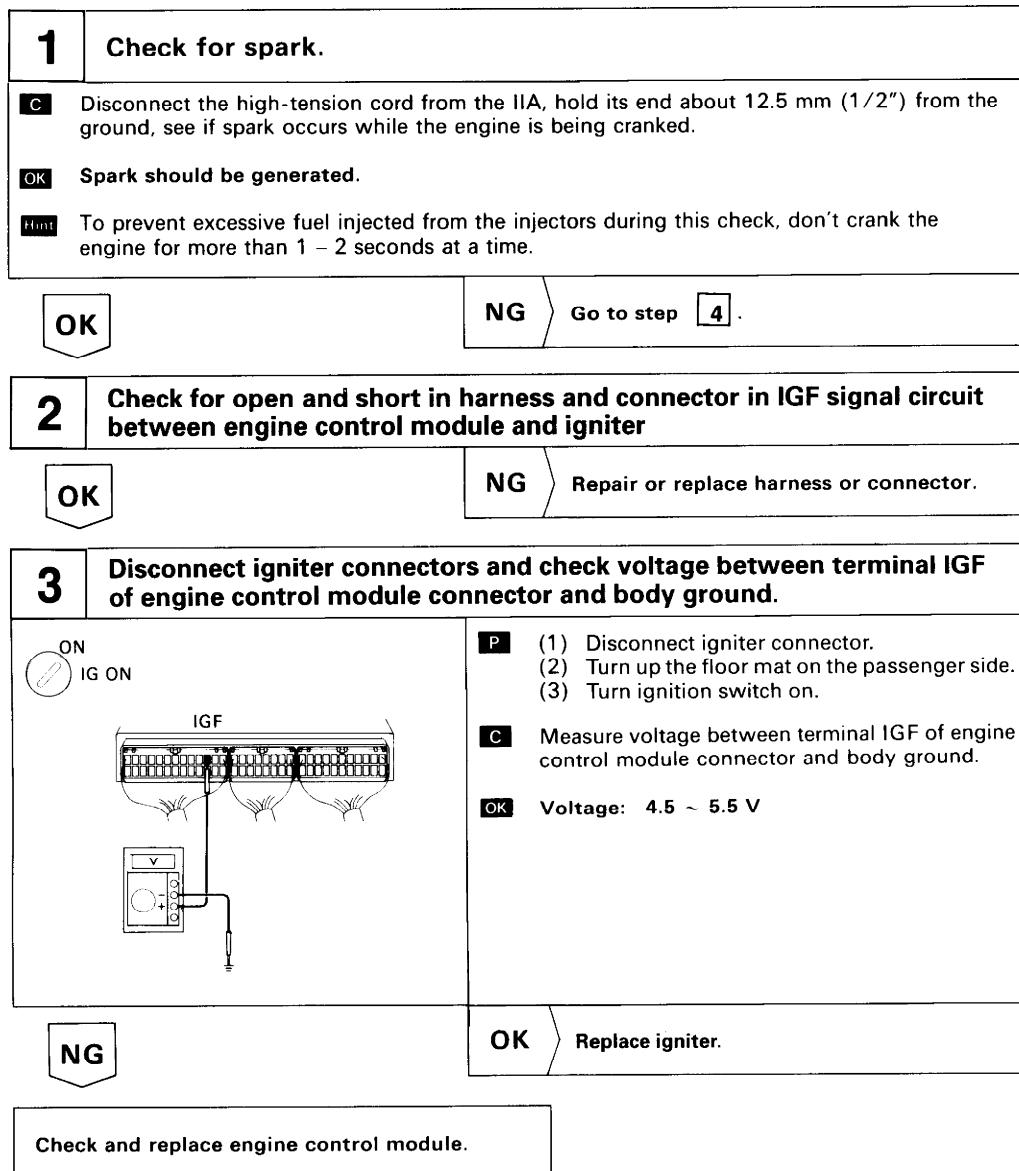
HINT: The correct waveform appears as shown in the illustration on the left, with rectangle waves.

OK

NG Go to step **8**.

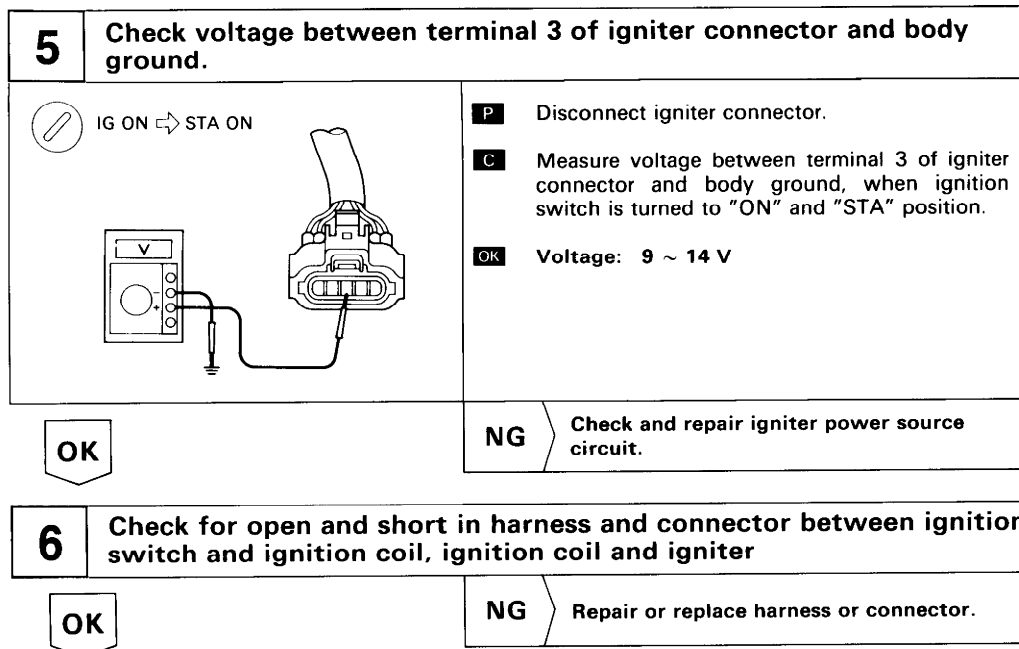
94D44894

Fig. 19: DTC 14 - Diagnostic Flowchart (1 Of 5)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



94C44893

Fig. 20: DTC 14 - Diagnostic Flowchart (2 Of 5)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



94E44895

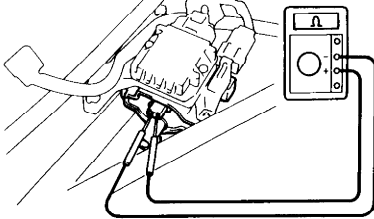
Fig. 21: DTC 14 - Diagnostic Flowchart (3 Of 5)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

7

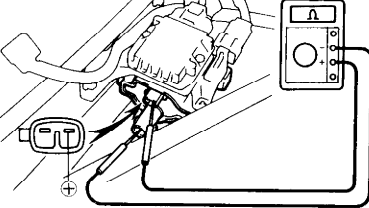
Check ignition coil.

For California spec.

Primary Coil

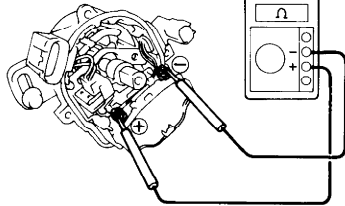


Secondary Coil

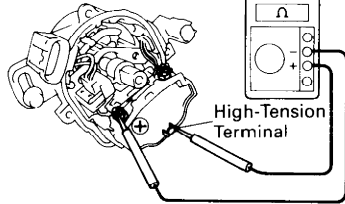


Exc. California spec.

Primary Coil



Secondary Coil



P For California spec.

- (1) Disconnect ignition coil connector.
- (2) Disconnect high-tension cord from ignition coil.

Exc. California spec.

- (1) Disconnect distributor connectors.
- (2) Remove distributor cap and rotor.
- (3) Remove ignition coil dust cover.

C

- (1) Check primary coil.
Measure resistance between the positive $\oplus$ and negative $\ominus$ terminals.
- (2) Check secondary coil.
Measure resistance between the positive $\oplus$ and high-tension terminals.

OK

		Resistance
Primary Coil	Cold	0.36 ~ 0.55 Ω
	Hot	0.45 ~ 0.65 Ω
Secondary Coil	Cold	9.0 ~ 15.4 k Ω
	Hot	11.4 ~ 18.1 k Ω

"Cold" is from -10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

OK

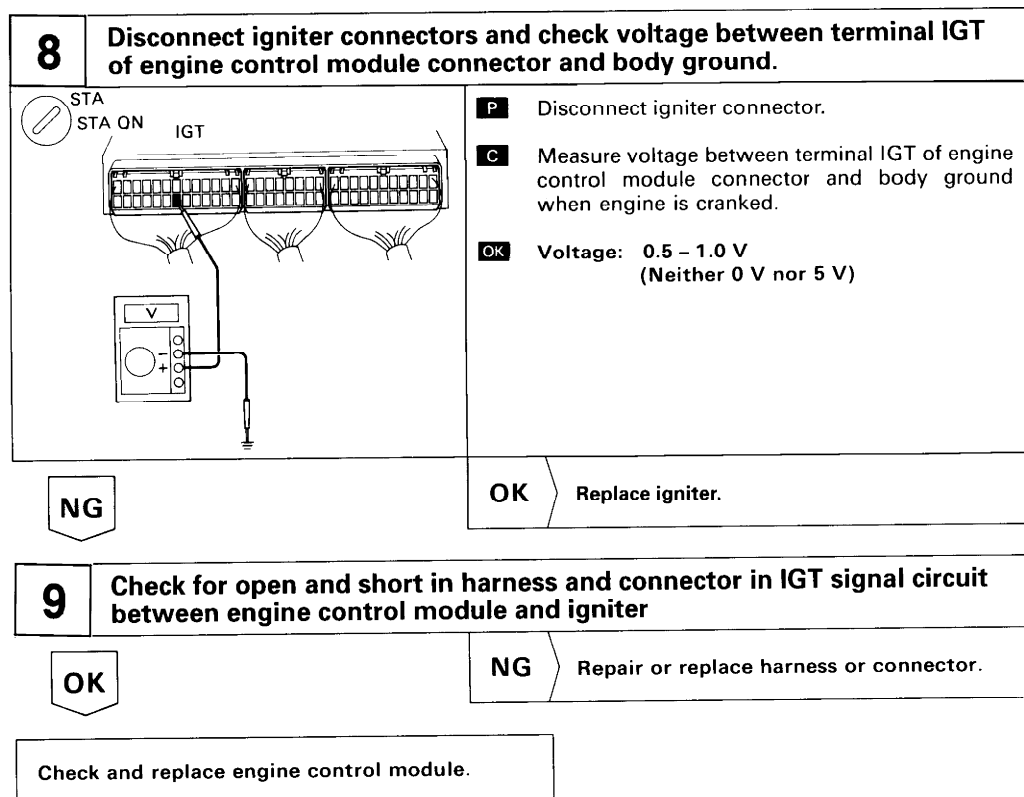
NG

Replace ignition coil.

Replace igniter.

94F44896

Fig. 22: DTC 14 - Diagnostic Flowchart (4 Of 5)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



94G44897
Fig. 23: DTC 14 - Diagnostic Flowchart (5 Of 5)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC 16 - ECT CONTROL SIGNAL

Signal from automatic transmission CPU retards engine ignition timing during shifting, thus momentarily reducing engine torque output for smooth clutch operation and reduce shift roughness.

If there is a fault in communications between ECM and A/T CPU, check for faulty ECM. Fault will set DTC 16 and prohibits transmission torque control.

DTC	16	A/T Control Signal Malfunction
------------	-----------	---------------------------------------

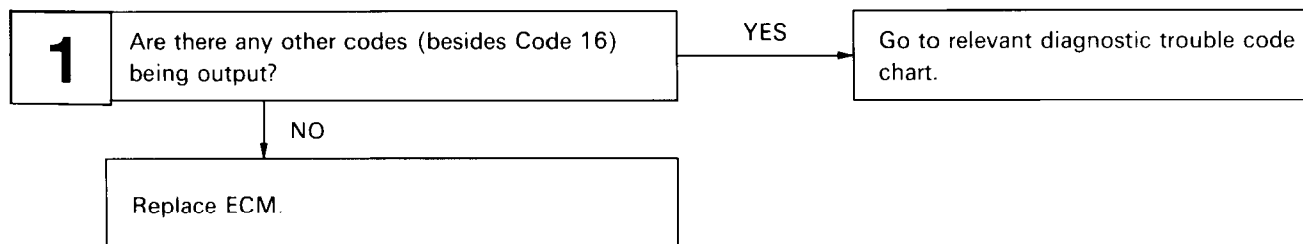
CIRCUIT DESCRIPTION

The signal from the A/T CPU retards the ignition timing of the engine during A/T shifting, thus momentarily reducing torque output of the engine for smooth clutch operation inside the transmission and reduced shift shock.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
16	Fault in communications between the engine CPU and A/T CPU in the ECM	• ECM

If the ECM detects the diagnostic trouble code "16" in memory, it prohibits the torque control of the A/T which performs smooth gear shifting.

DIAGNOSTIC CHART



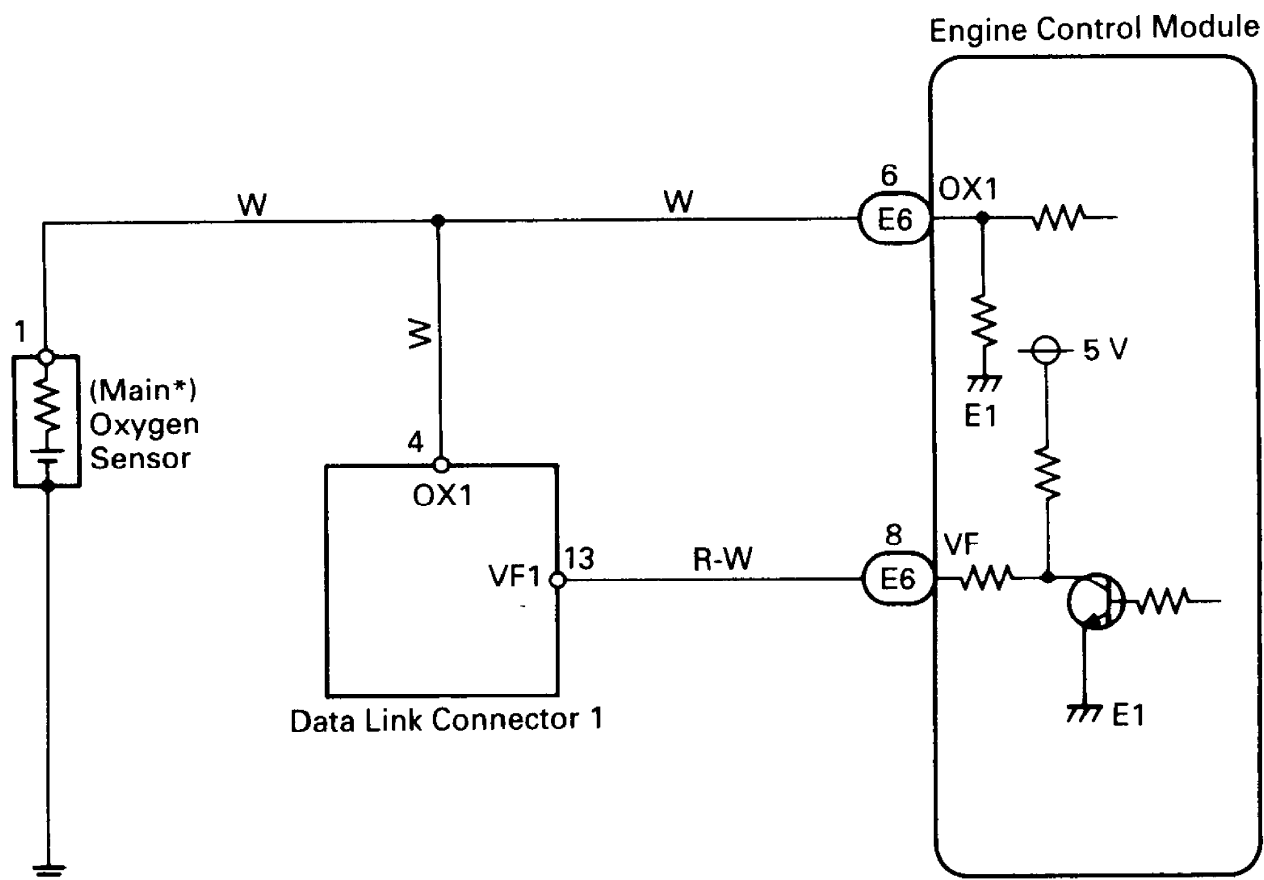
94II44898

Fig. 24: DTC 16 - Diagnostic Flowchart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC 21 - OXYGEN SENSOR SIGNAL

This code sets when the main oxygen sensor signal voltage is reduced between .35-.70 volt for 60 seconds under the following conditions:

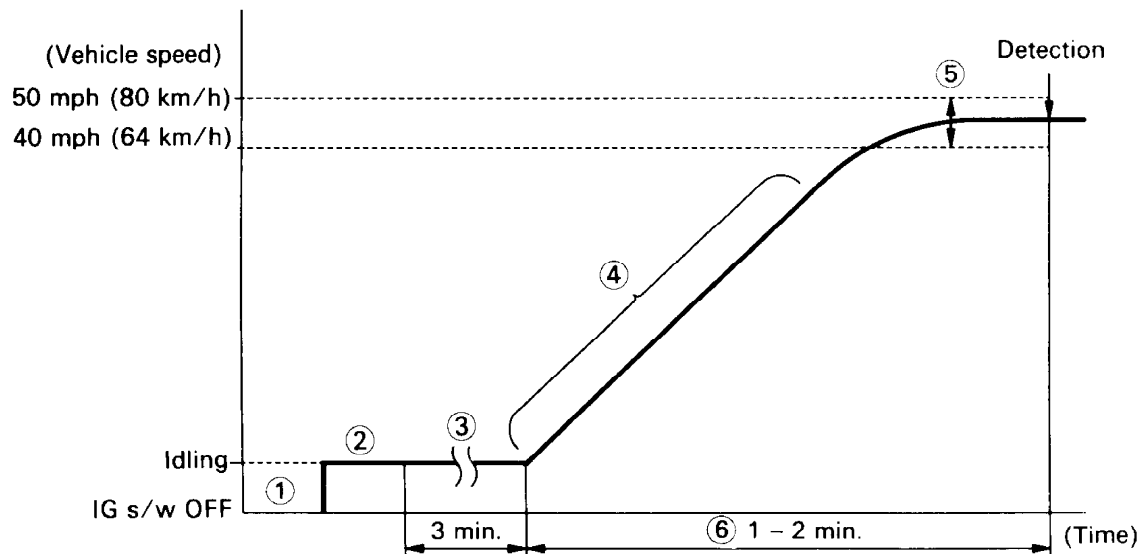
- * Engine coolant temperature at 176°F (80°C) or greater.
- * Engine speed at 1500 RPM or greater.
- * Engine load.
- * Main oxygen sensor signal voltage alternating at greater than or less than .45 volt.



94I44899

Fig. 25: DTC 21 - Schematic
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

Malfunction: (Main*) Oxygen Sensor Deterioration



- ① Disconnect the EFI fuse (15 A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminal TE2 and E1 of data link connector 1 with IG switch OFF).
- ② Start the engine and warm up with all ACC switch OFF.
- ③ After the engine is warmed up, let it idle for 3 min.
- ④ After performing the idling in ③, perform gradual acceleration with in the range 1,300 ~ 1,700 rpm (centered around 1,500 rpm) with the A/C switch ON and D position for A/T (5th for M/T).
(Take care that the engine speed does not fall below 1,200 rpm when shifting. Gradually depress the accelerator pedal and kept it. Steady so that engine braking does not occur).
- ⑤ Maintain the vehicle speed at 40 – 50 mph (64 – 80 km/h).
- ⑥ Keep the vehicle running for 1 – 2 min. after starting acceleration.

HINT: If a malfunction exists, the malfunction indicator lamp will light up after approx. 60 sec. from the start of acceleration.

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

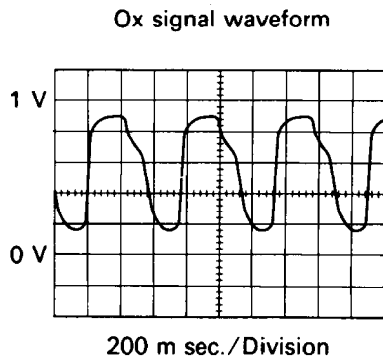
*: Only for California specification vehicles.

94C44778

Fig. 26: DTC 21 - Inspection Using Oscilloscope
Courtesy of Toyota Motor Sales, U.S.A., Inc.

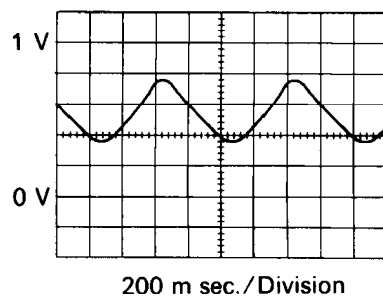
Reference

INSPECTION USING OSCILLOSCOPE



- With the engine racing (2,500 rpm) measure waveform between terminals OX1 and E1 of engine control module.

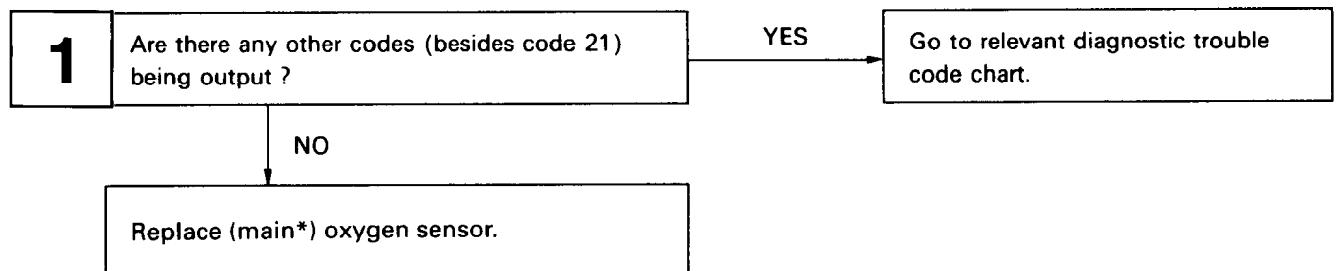
HINT: The correct waveform appears as shown in the illustration on the left, oscillating between approx. 0.1 V and 0.9 V.



If the oxygen sensor has deteriorated, the amplitude of the voltage will be reduced as shown on the left.

94H44781

Fig. 27: DTC 21 - Detection Driving Pattern
Courtesy of Toyota Motor Sales, U.S.A., Inc.



94B44900

Fig. 28: DTC 21 - Diagnostic Flowchart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

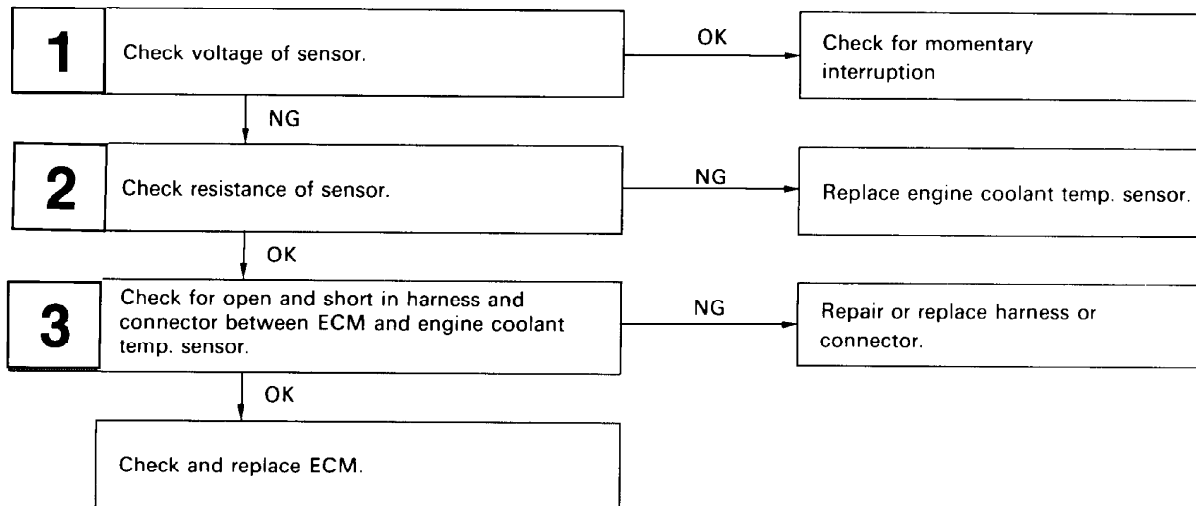
DTC 22 - ENGINE COOLANT TEMPERATURE SENSOR SIGNAL

The engine coolant temperature sensor is a thermistor that changes its resistance value according to engine coolant temperature. ECM supplies a 5-volt reference voltage to engine coolant temperature through ECM terminal "E6". When sensor resistance changes, ECM changes fuel injection volume to improve driveability during cold engine operation.

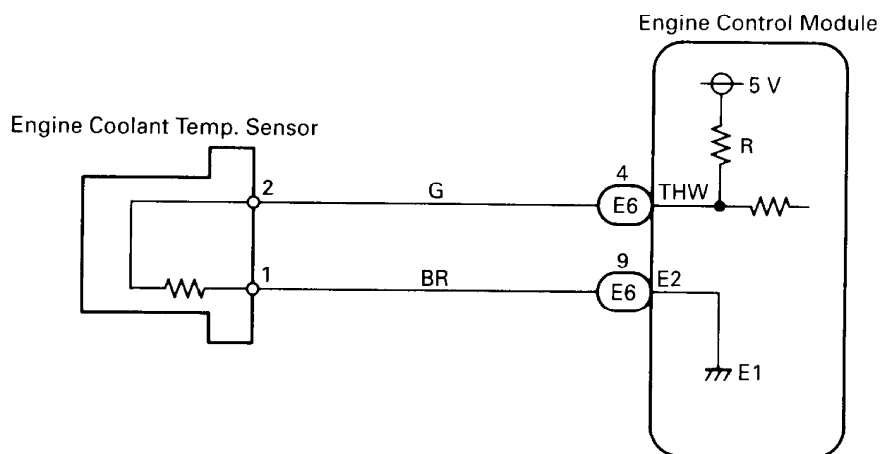
A failure code is set when there is an open or short in engine coolant temperature sensor circuit for .5 second or more. Check for open or short in engine coolant temperature sensor circuit, a faulty sensor or ECM.

DIAGNOSTIC CHART

HINT: If diagnostic trouble codes "22" (engine coolant temperature sensor circuit), "24" (intake air temperature sensor circuit), "31" (manifold absolute pressure sensor circuit) and "41" (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.



WIRING DIAGRAM



94C44901

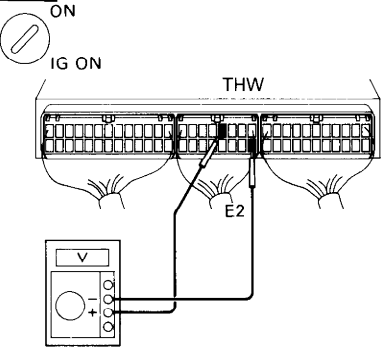
Fig. 29: DTC 22 - Schematic
Courtesy of Toyota Motor Sales, U.S.A., Inc.

INSPECTION PROCEDURE

HINT: If diagnostic trouble codes "22" (engine coolant temperature sensor circuit), "24" (intake air temperature sensor circuit), "31" (manifold absolute pressure sensor circuit) and "41" (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.

1

Check voltage between terminals THW and E2 of engine control module connector.



P

(1) Turn up the floor mat on the passenger side.
(2) Turn ignition switch on.

C

Measure voltage between terminals THW and E2 of engine control module connector.

OK

Engine Coolant Temp. °C (°F)	Voltage
20 (68) (Engine is cool)	0.5 – 3.4 V
80 (176) (Engine is hot)	0.2 – 1.0 V

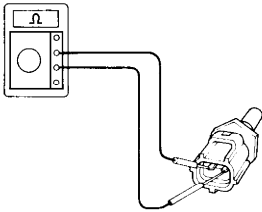
NG

OK

Check for momentary interruption

2

Check engine coolant temp. sensor.



P

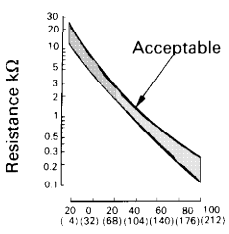
Disconnect the engine coolant temp. sensor connector.

C

Measure resistance between terminals.

OK

Resistance is within Acceptable Zone on chart.



Engine coolant temp. °C (°F)	Resistance
20 (68)	2 – 3 kΩ
80 (176)	0.2 – 0.4 kΩ

OK

NG

Replace engine coolant temp. sensor.

3

Check for open and short in harness and connector between engine control module and engine coolant temp. sensor

OK

NG

Repair or replace harness or connector.

Check and replace engine control module.

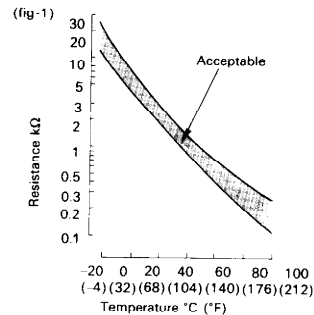
Fig. 30: DTC 22 – Voltage Reference Chart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC	22	Engine Coolant Temp. Sensor Circuit
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CIRCUIT DESCRIPTION

The engine coolant temperature sensor senses the coolant temperature. A thermistor built into the sensor changes its resistance value according to the coolant temperature. The lower the coolant temperature, the greater the thermistor resistance value, and the higher the coolant temperature, the lower the thermistor resistance value (See Fig. 1.).

The engine coolant temperature sensor is connected to the ECM (See next page). The 5 V power source voltage in the ECM is applied to the engine coolant temperature sensor from the terminal THW via a resistor R. That is, the resistor R and the engine coolant temperature sensor are connected in series. When the resistance value of the engine coolant temperature sensor changes in accordance with changes in the coolant temperature, the potential at the terminal THW also changes. Based on this signal, the ECM increases the fuel injection volume to improve drivability during cold engine operation. If the ECM detects the diagnostic trouble code 22, it operates the fail safe function in which the engine coolant temp. is assumed to be 80°C (176°F).



< Reference >

Engine coolant Temp. °C (°F)	Resistance (kΩ)	Voltage (V)
-20 (-4)	16.0	4.3
0 (32)	5.9	3.4
20 (68)	2.5	2.4
40 (104)	1.2	1.5
60 (140)	0.6	0.9
80 (176)	0.3	0.5
100 (212)	0.1	0.2

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
22	Open or short in engine coolant temp. sensor circuit for 0.5 sec. or more.	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM

94144782

Fig. 31: DTC 22 - Diagnostic Flowchart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC 24 - INTAKE AIR TEMPERATURE SENSOR SIGNAL

Intake Air Temperature (IAT) sensor is built into air cleaner cover. The IAT sensor senses the intake air temperature. If ECM detects a problem in this circuit, it operates in the fail safe mode in which the intake air temperature is assumed to be 68°F (20°C).

A failure code is set there is an open or short in IAT sensor circuit for .5 second or more. Check for open or short in IAT circuit, a faulty IAT sensor or ECM.

DTC	24	Intake Air Temp. Sensor Circuit
------------	-----------	--

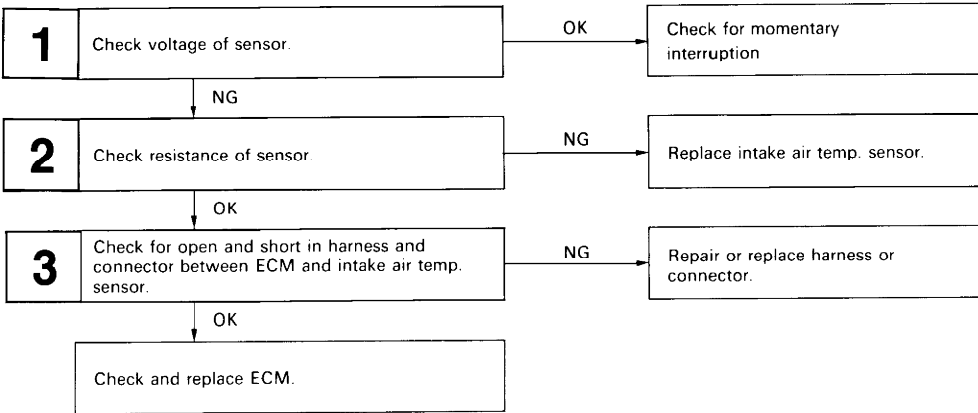
CIRCUIT DESCRIPTION

The intake air temp. sensor is built into the air cleaner cap and senses the intake air temperature. The structure of the sensor and connection to the ECM is the same as in the engine coolant temp. sensor shown on page EG-434.
If the ECM detects the diagnostic trouble code "24", it operates the fail safe function in which the intake air temperature is assumed to be 20°C (68°F).

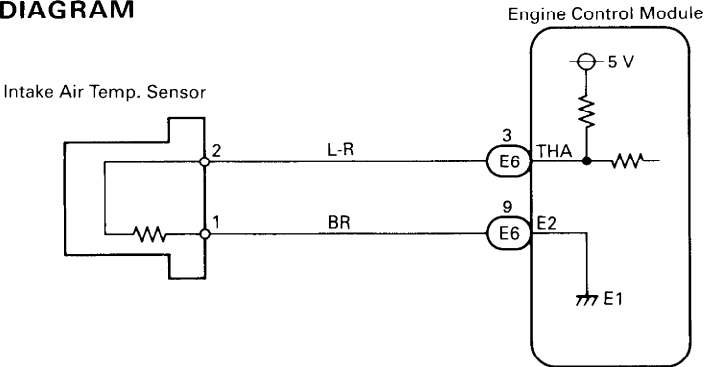
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
24	Open or short in intake air temp. sensor circuit for 0.5 sec. or more.	• Open or short in intake air temp. sensor circuit. • Intake air temp. sensor • ECM

DIAGNOSTIC CHART

HINT: If diagnostic trouble codes "22" (engine coolant temperature sensor circuit), "24" (intake air temperature sensor circuit), "31" (manifold absolute pressure sensor circuit) and "41" (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.

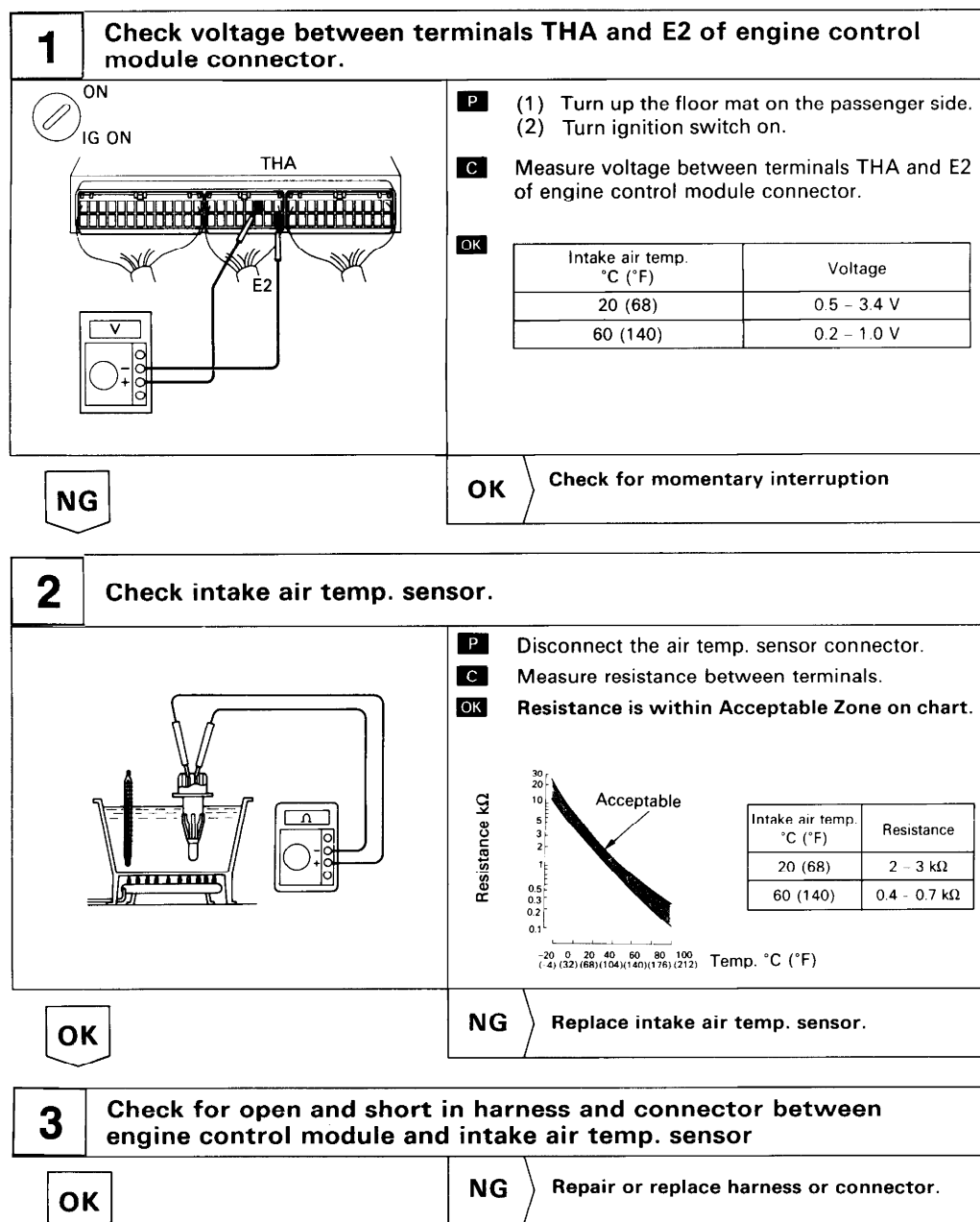


WIRING DIAGRAM



94F44904

Fig. 32: DTC 24 - Schematic
Courtesy of Toyota Motor Sales, U.S.A., Inc.



Check and replace engine control module.

94H44906
Fig. 33: DTC 24 – Diagnostic Flowchart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC 25/26 - LEAN OR RICH AIR/FUEL MIXTURE

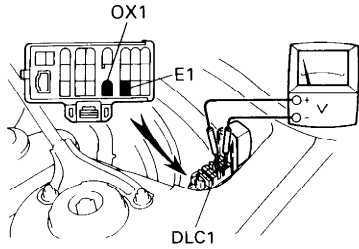
DTC 25 is set under following conditions:

- * Main oxygen sensor voltage is .45 volt or less (lean) for 90 seconds when engine coolant temperature is at 140°F (60°C) or greater, and engine speed at 1500 RPM or greater.
- * Engine speed varies by greater than 15 RPM over the preceding crank position period during a period of 30 seconds or more with engine idling and engine coolant temperature at 140°F (60°C) or

greater.

DTC 26 is set under following conditions:

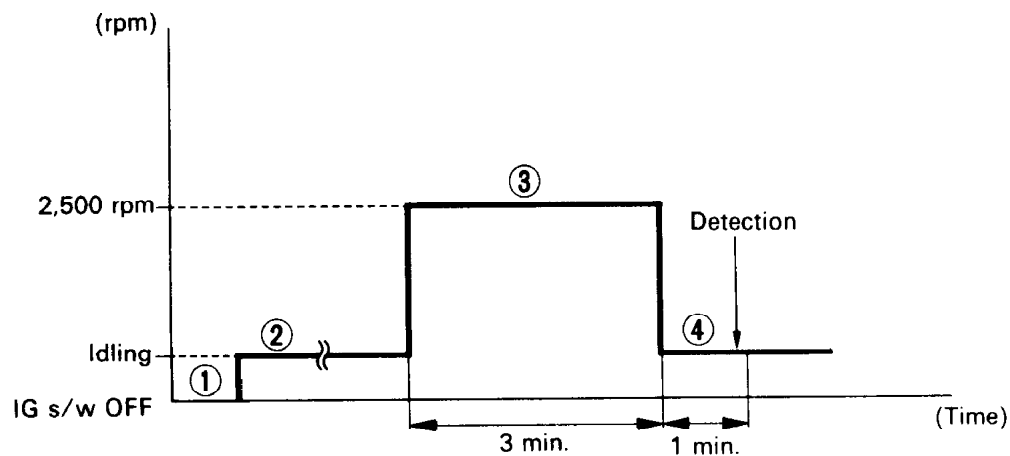
- * Engine speed varies by greater than 15 RPM over the preceding crank position during a period of 50 seconds or more with engine idling and engine coolant temperature at 140°F (60°C) or greater.

2	Check voltage between terminals OX1 and E1 of data link connector 1.
	P Warm up engine to normal operating temperature. C Measure voltage between terminals OX1 and E1 of data link connector 1 when engine is suddenly raced to full throttle. OK The voltage should be 0.5 V or higher at least once. Hint Perform inspection within 1 second.
NG	OK Go to step 7 .

94B44793

Fig. 34: DTC 25/26 - Detection Driving Pattern
Courtesy of Toyota Motor Sales, U.S.A., Inc.

**Malfunction: Open or Short in (Main*) Oxygen Sensor
Open or Short in Injector Circuit, Injector Leak or Blockage.**



HINT: Before this test, check the feedback voltage for (main*) oxygen sensor.

- ① Disconnect the EFI fuse (15 A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminal TE2 and E1 of data link connector 1 with IG switch OFF).
- ② Start engine and warm up.
- ③ After the engine is warmed up, let it race at 2,500 rpm for 3 min.
- ④ After performing the racing in ③, perform idling for 1 min.

HINT: If a malfunction exists, the malfunction indicator lamp will light up during step ④.

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

***: Only for California specification vehicles.**

94J44791

Fig. 35: DTC 25/26 - Diagnostic Flowchart (1 Of 4)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

3

Check for open and short in harness and connector between engine control module and (main*) oxygen sensor, engine control module and data link connector 1

OK

NG

Repair or replace harness or connector.

4

Check each item found to be a possible cause of problem.

Check each circuit found to be a possible cause of trouble according to the results of the check in **1** or **2**. The numbers in the table below show the order in which the checks should be performed.

(Main*) oxygen sensor signal continue at 0 V.	Possible Cause
1	Faulty sensor installation.
2	Air leakage
3	Misfire
4	Fuel system
5	Injector circuit
6	Characteristics deviation in engine coolant temp. sensor.
7	Characteristics deviation in intake air temp. sensor.
8	Characteristics deviation in manifold absolute pressure sensor.
9	Valve timing

*: Except California specification vehicles.

OK

NG

Repair or replace.

5

Check compression

OK

NG

Repair or replace.

6

Does malfunction disappear when a good (main*) oxygen sensor is installed?

NO

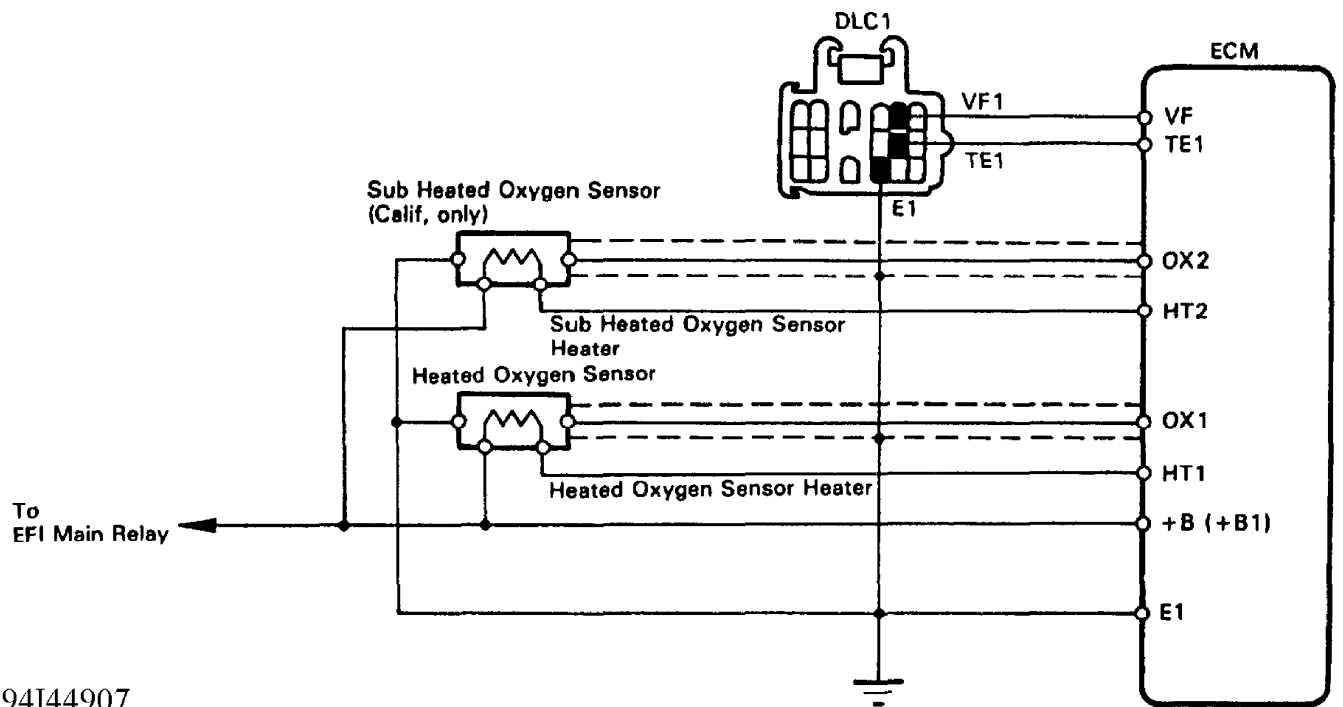
YES

Replace (main*) oxygen sensor.

Check and replace engine control module.

*: Only for California specification vehicles.

94C44794
Fig. 36: DTC 25/26 - Diagnostic Flowchart (2 Of 4)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



94T44907

Fig. 37: DTC 25/26 - Diagnostic Flowchart (3 Of 4)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

7	Check each item found to be a possible cause of problem.																											
Check each circuit found to be a possible cause of trouble according to the results of the check in 1 . The numbers in the table below show the order in which the checks should be performed.																												
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 33%;">(Main*) oxygen sensor signal continue at 5.0 V.</th> <th style="width: 33%;">(Main*) oxygen sensor signal is normal</th> <th style="width: 33%;">Possible Cause</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>7</td> <td>Injector circuit</td> </tr> <tr> <td></td> <td>3</td> <td>Misfire</td> </tr> <tr> <td>6</td> <td>4</td> <td>Valve timing</td> </tr> <tr> <td></td> <td>1</td> <td>Air leakage</td> </tr> <tr> <td>1</td> <td>2</td> <td>Fuel system</td> </tr> <tr> <td>5</td> <td>8</td> <td>Characteristics deviation in manifold absolute pressure sensor.</td> </tr> <tr> <td>3</td> <td>5</td> <td>Characteristics deviation in engine coolant temp. sensor.</td> </tr> <tr> <td>4</td> <td>6</td> <td>Characteristics deviation in intake air temp. sensor.</td> </tr> </tbody> </table>		(Main*) oxygen sensor signal continue at 5.0 V.	(Main*) oxygen sensor signal is normal	Possible Cause	2	7	Injector circuit		3	Misfire	6	4	Valve timing		1	Air leakage	1	2	Fuel system	5	8	Characteristics deviation in manifold absolute pressure sensor.	3	5	Characteristics deviation in engine coolant temp. sensor.	4	6	Characteristics deviation in intake air temp. sensor.
(Main*) oxygen sensor signal continue at 5.0 V.	(Main*) oxygen sensor signal is normal	Possible Cause																										
2	7	Injector circuit																										
	3	Misfire																										
6	4	Valve timing																										
	1	Air leakage																										
1	2	Fuel system																										
5	8	Characteristics deviation in manifold absolute pressure sensor.																										
3	5	Characteristics deviation in engine coolant temp. sensor.																										
4	6	Characteristics deviation in intake air temp. sensor.																										
OK NG Repair or replace.																												

8	Check compression
OK NG Repair or replace.	

9	Does malfunction disappear when a good (main*) oxygen sensor is installed?
NO YES Replace (main*) oxygen sensor.	

Check and replace engine control module.

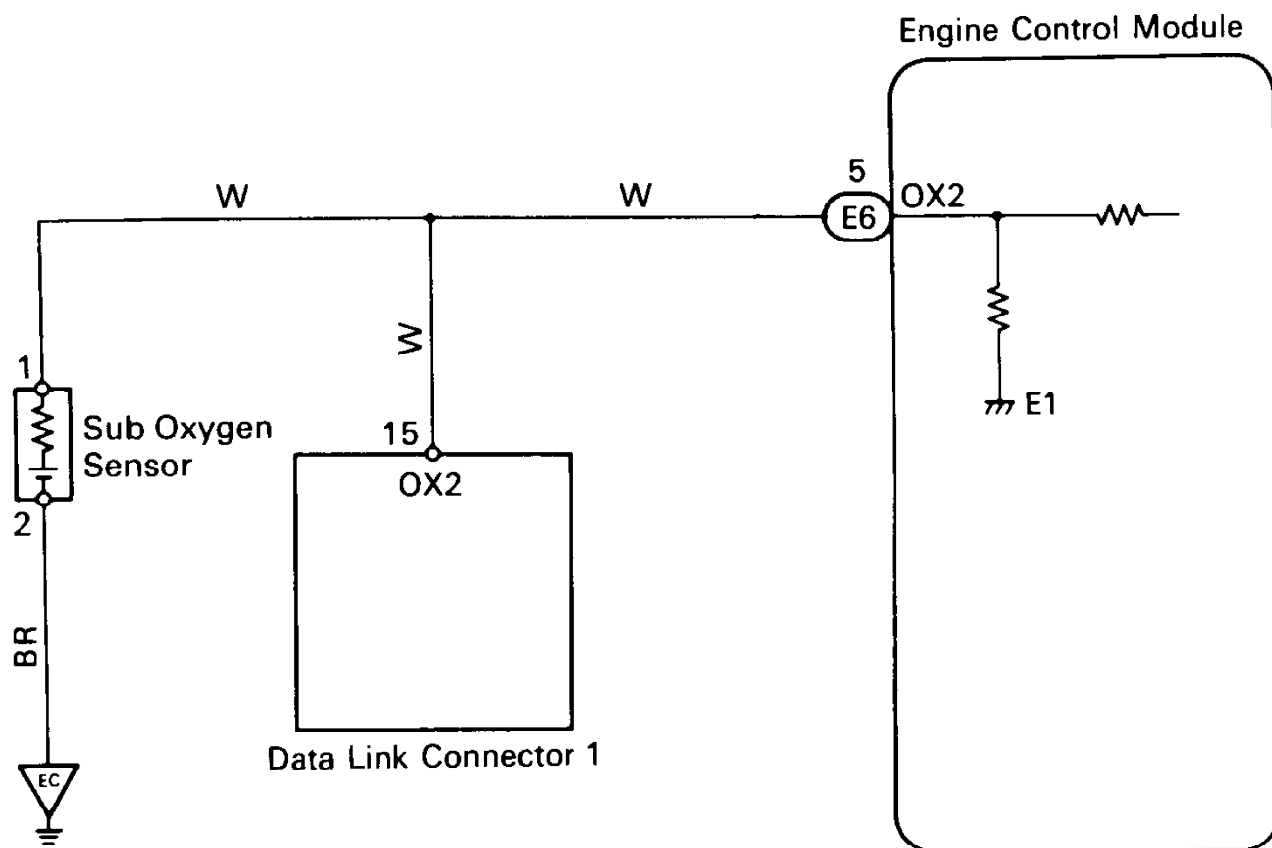
*: Only for California specification vehicles.

94D44795
 Fig. 38: DTC 25/26 - Diagnostic Flowchart (4 Of 4)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC 27 - SUB-OXYGEN SENSOR SIGNAL (CALIF.)

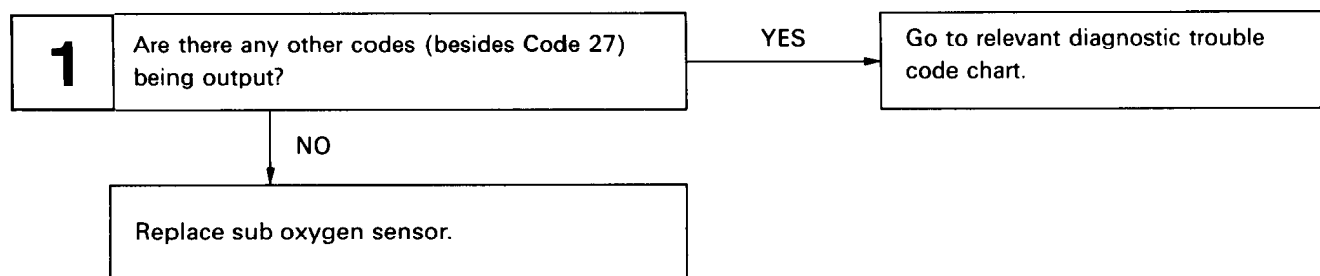
DTC 27 is set when the main oxygen sensor signal is .45 volt or greater and sub-oxygen sensor signal is .45 volt or less when engine coolant temperature is at 176°F (80°C) or greater and engine speed at 1500 RPM or greater with accelerator pedal fully depressed for more than 2 seconds.

Check for open or shorted circuit in sub-oxygen sensor circuit, a faulty sub-oxygen sensor or ECM.



94J44908

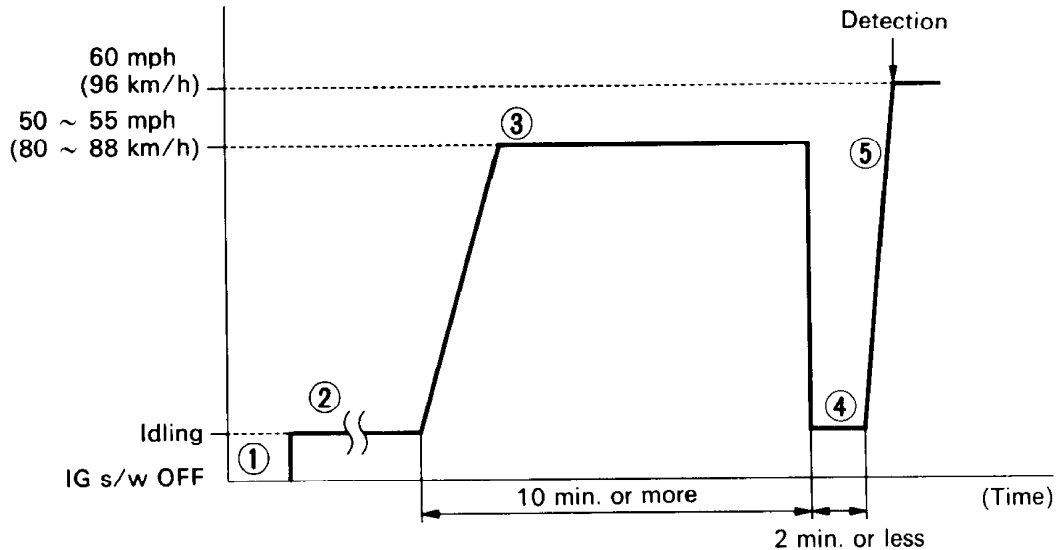
Fig. 39: DTC 27 - Schematic
Courtesy of Toyota Motor Sales, U.S.A., Inc.



94A44909

Fig. 40: DTC 27 - Detection Driving Pattern
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Malfunction: Open or Short in Sub Oxygen Sensor



- ① Disconnect the EFI fuse (15 A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminals TE2 and E1 of data link connector 1 with IG switch OFF).
- ② Start the engine and warm up, with all ACC switch OFF.
- ③ After the engine is warmed up, let it drive at 50 ~ 55 mph (80 ~ 88 km/h) for 10 min. or more.
- ④ After driving, stop at a safe place and perform idling for 2 min. or less.
- ⑤ After performing the idling in ④, perform acceleration to 60 mph (96 km/h) with the throttle valve fully open.

HINT: If a malfunction exists, the malfunction indicator lamp will light up during step ⑤.

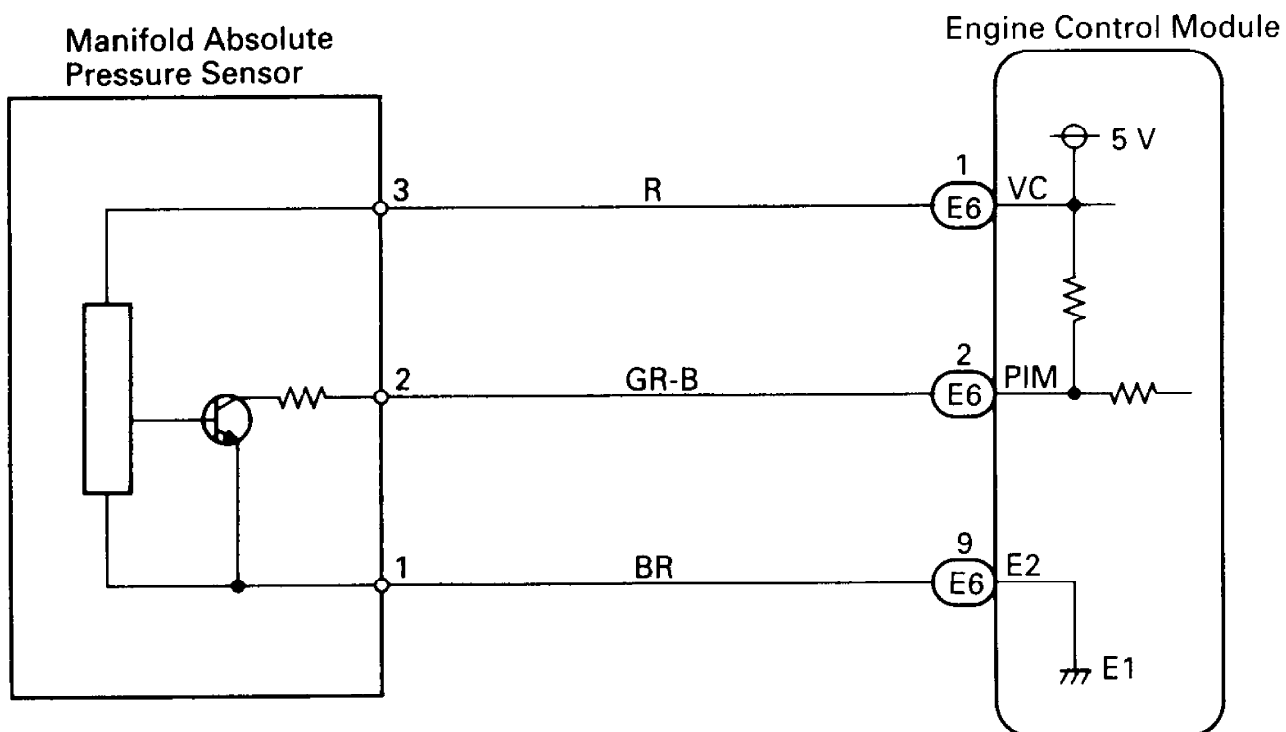
NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

94E44796

Fig. 41: DTC 27 - Diagnostic Flowchart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

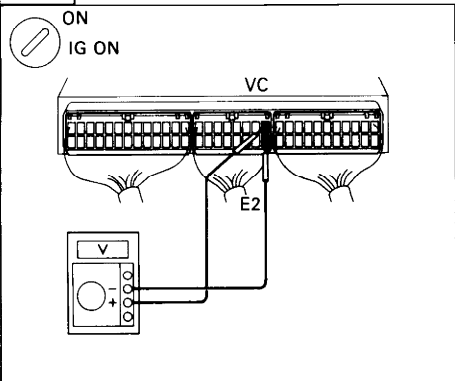
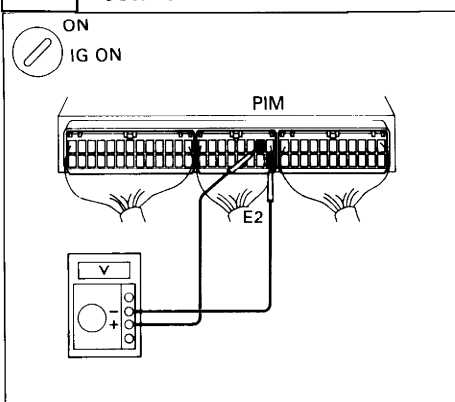
DTC 31 - MAP SENSOR SIGNAL

MAP sensor detects the intake manifold absolute pressure as a voltage. ECM determines basic injection duration and basic ignition advance angle based on this voltage. DTC 31 sets when there is an open or short in MAP sensor circuit for .5 second or more. Check for an open or shorted MAP sensor circuit, a faulty MAP sensor or ECM.



94D44910

Fig. 42: DTC 31 - Schematic
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

1	Check voltage between terminals VC and E2 of engine control module connector.
	P (1) Turn up the floor mat on the passenger side. (2) Turn ignition switch on. C Measure voltage between terminals VC and E2 of engine control module connector. OK Voltage: 4.5 – 5.5 V
OK	NG Check and replace engine control module.
2	Check voltage between terminals PIM and E2 of engine control module connector.
	P Turn ignition switch on C Measure voltage between terminals PIM and E2 of engine control module connector. OK Voltage: 3.3 – 3.9 V
NG	OK When diagnostic trouble code 31 is displayed, check and replace ECM.
3	Check for open and short in harness and connector between engine control module and manifold absolute pressure sensor
OK	NG Repair or replace harness or connector.

Check and replace manifold absolute pressure sensor.

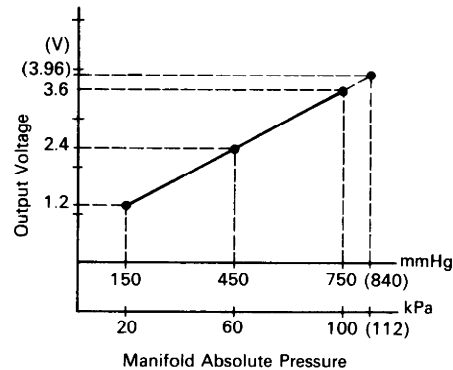
Fig. 43: DTC 31 – Output Voltage/Absolute Pressure Reference Chart
 Courtesy of Toyota Motor Sales, U.S.A., Inc. 94F44912

DTC	31	Manifold Absolute Pressure Sensor Circuit
------------	-----------	--

CIRCUIT DESCRIPTION

By a built-in sensor unit, the manifold absolute pressure sensor detects the intake manifold pressure as a voltage. The ECM then determines the basic injection duration and basic ignition advance angle based on this voltage.

Since the manifold absolute pressure sensor does not use the atmospheric pressure as a criterion, but senses the absolute pressure inside the intake manifold (the pressure in proportion to the preset absolute vacuum 0), it is not influenced by fluctuations in the atmospheric pressure due to high altitude and other factors. This permits it to control the air-fuel ratio at the proper level under all conditions.



DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
31	Open or short in manifold absolute pressure sensor for circuit 0.5 sec. or more.	• Open or short in manifold absolute pressure sensor circuit • manifold absolute pressure sensor • ECM

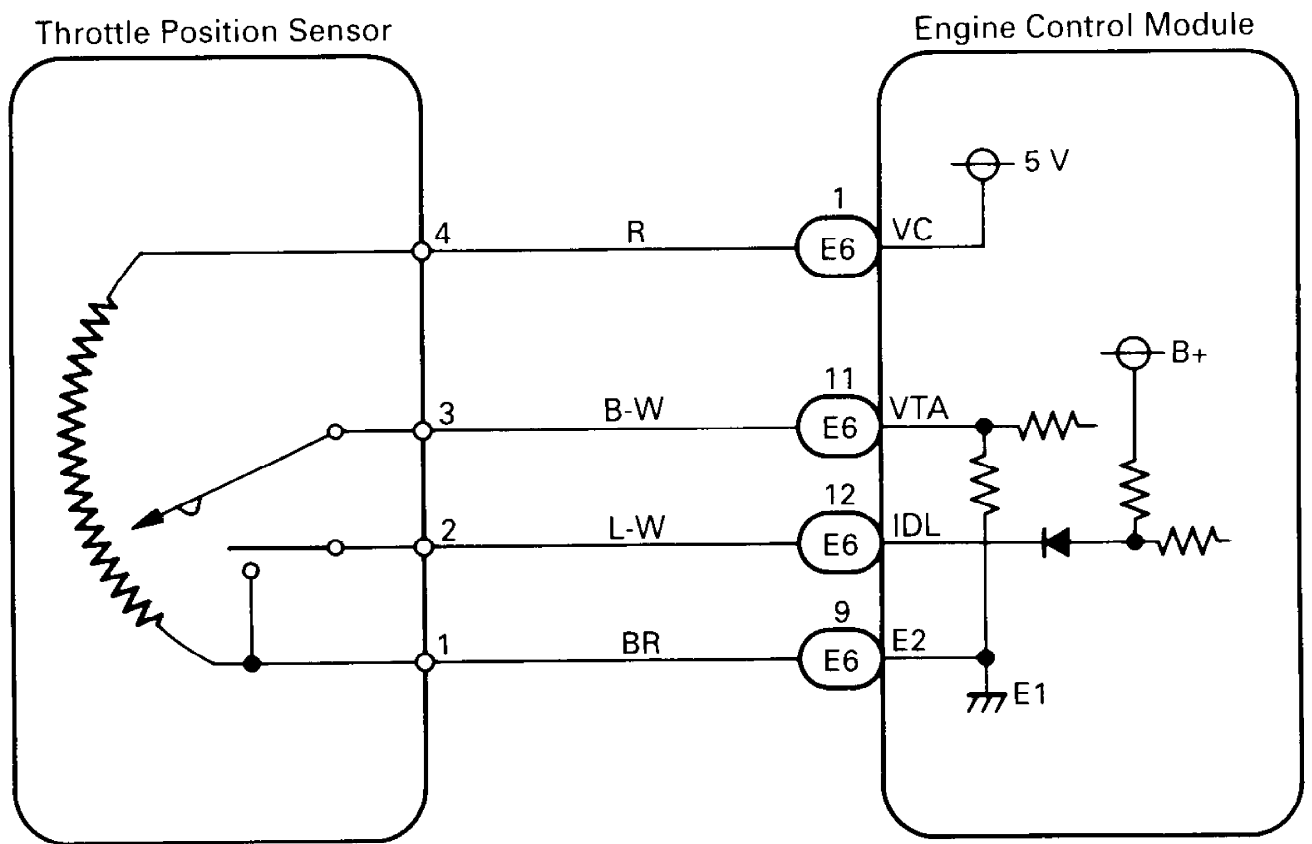
If the ECM detects diagnostic trouble code "31", it operates the fail safe function, keeping the ignition timing and fuel injection volume constant and making it possible to drive the vehicle.

94H44799

Fig. 44: DTC 31 - Diagnostic Flowchart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

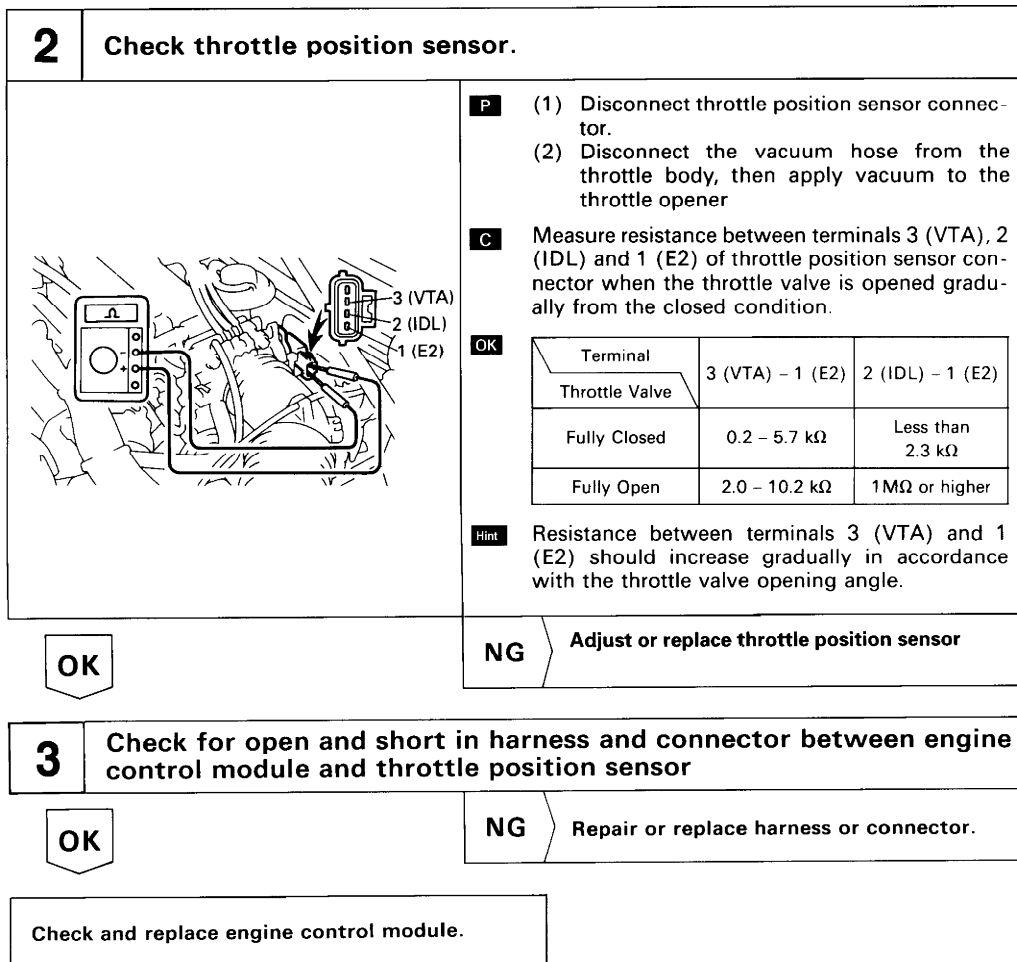
DTC 41 - THROTTLE POSITION SENSOR SIGNAL

DTC 41 is set when there is an open or short in throttle position sensor circuit for .5 second or greater. Code will not set when throttle position connector is disconnected. Check for open or short in throttle position sensor circuit, a faulty throttle position sensor or ECM.



94G44913

Fig. 45: DTC 41 - Schematic
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



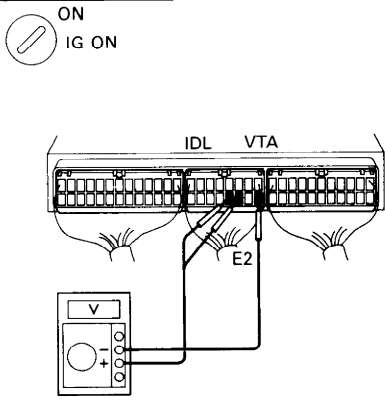
94J44916
 Fig. 46: DTC 41 – Diagnostic Flowchart (1 Of 2)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

INSPECTION PROCEDURE

HINT: If diagnostic trouble code "22" (engine coolant temperature sensor circuit), "24" (intake air temperature sensor circuit), "31" (manifold absolute pressure sensor circuit) and "41" (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.

1

Check voltage between terminals VTA, IDL and E2 of engine control module connector.



P (1) Turn up the floor mat on the passenger side.
(2) Turn ignition switch ON.

C Measure voltage between terminals VTA, IDL and E2 of engine control module connector when the throttle valve is opened gradually from the closed condition.

OK

Terminal Throttle Valve	VTA - E2	IDL - E2
Fully Closed	0.3 - 0.8 V	0 - 3.0 V
Fully Open	3.2 - 4.9 V	9 - 14 V

Hint The voltage should increase steadily in proportion to the throttle valve opening angle.

NG

OK Check for momentary interruption

94144915

Fig. 47: DTC 41 - Diagnostic Flowchart (2 Of 2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

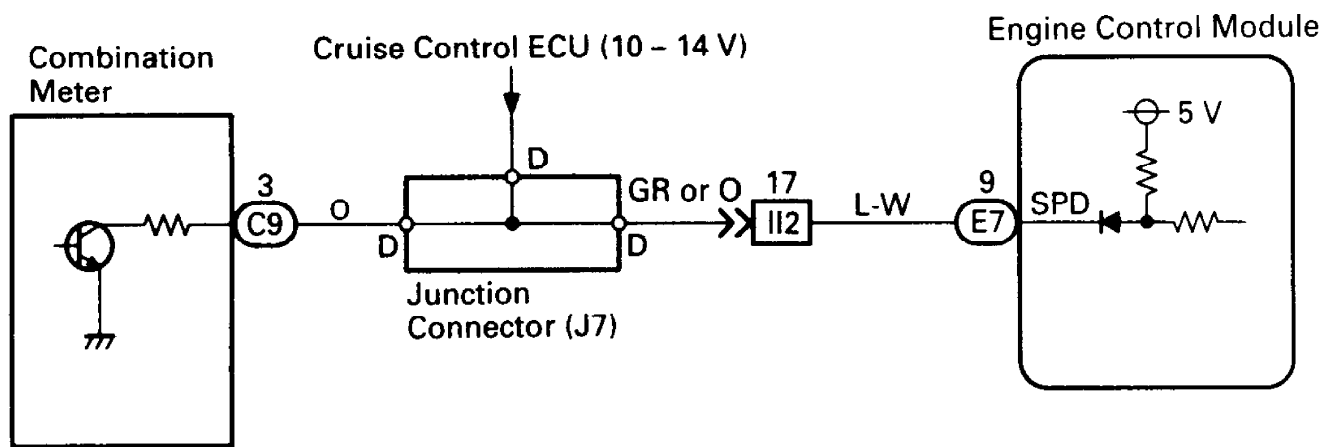
DTC 42 - VEHICLE SPEED SENSOR SIGNAL

The No. 1 vehicle speed sensor outputs a 4-pulse signal for every revolution of the rotor shaft, which is rotated by transmission output shaft. ECM determines vehicle speed based on the frequency of these pulse signals.

DTC 42 is set when following conditions are detected continuously for 8 seconds or more:

- * On vehicles equipped with A/T, No. 1 vehicle speed signal reads zero MPH with engine speed at 3000 RPM or greater and with P/N switch off.
- * On vehicles equipped with M/T, No. 1 vehicle speed signal reads zero MPH with engine speed at 3000-5000 RPM, engine coolant temperature at 176°F (80°C) or greater and with drive wheels turning (driving load).

Check for open or short in No. 1 vehicle speed sensor circuit, a faulty No. 1 vehicle speed sensor, a faulty combination meter or ECM.



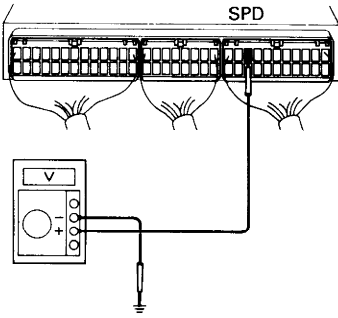
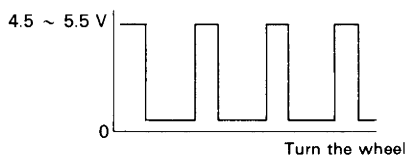
94C44919

Fig. 48: DTC 42 - Schematic
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

1	Check operation of speedometer.
C	Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.
Hint	The vehicle speed sensor is operating normally if the speedometer display is normal.

OK

NG Check speedometer circuit.

2	Check voltage between terminal SPD of engine control module connector and body ground.
 	P (1) Turn up the floor mat on the passenger side. (2) Disconnect cruise control ECU connector. (3) Shift the shift lever to N position or neutral. (4) Jack up a front wheel on one side. (5) Turn ignition switch on. C Measure voltage between terminal SPD of engine control module connector and body ground when the wheel is turned slowly. OK Voltage is generated intermittently. 
OK	NG Check speedometer circuit.

Check and replace engine control module.

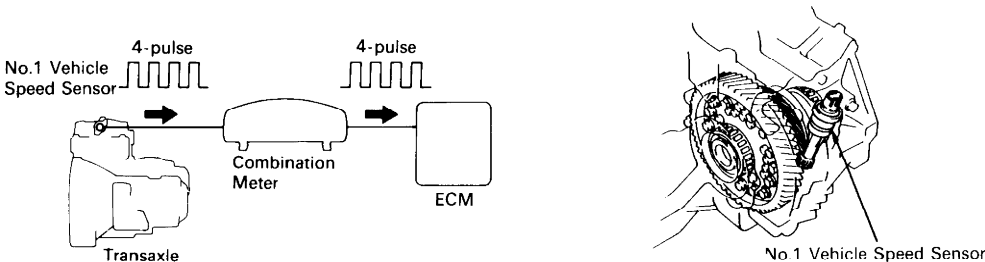
94F44920

Fig. 49: DTC 42 - Voltage Reference Chart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC	42	No.1 Vehicle Speed Sensor Signal Circuit
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CIRCUIT DESCRIPTION

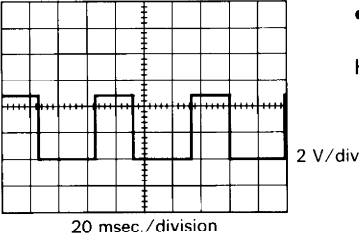
The No.1 vehicle speed sensor outputs a 4-pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
42	For A/T All conditions below are detected continuously for 8 sec. or more. (a) No.1 Vehicle speed signal: 0 mph (km/h) (b) Engine speed: 3,000 rpm or more (c) Park/Neutral position switch: OFF	• Open or short in No.1 vehicle speed sensor circuit. • No.1 vehicle speed sensor. • Combination meter. • ECM
	For M/T All conditions below are detected continuously for 8 sec. or more. (a) No.1 vehicle speed signal: 0 mph (km/h) (b) Engine speed: Between 3,100 rpm and 5,000 rpm (c) Engine coolant temp.: 80°C (176°F) or more (d) Load driving	

HINT: In test mode, diagnostic trouble code 42 is output when vehicle speed is 3 mph (5 km/h) or below.

<Reference>



• Waveform between terminals SPD and E1 when vehicle speed is approx. 12 mph (20 km/h).

HINT: The greater the vehicle speed, the greater the number of No.1 vehicle speed sensor signals produced.

94A44917

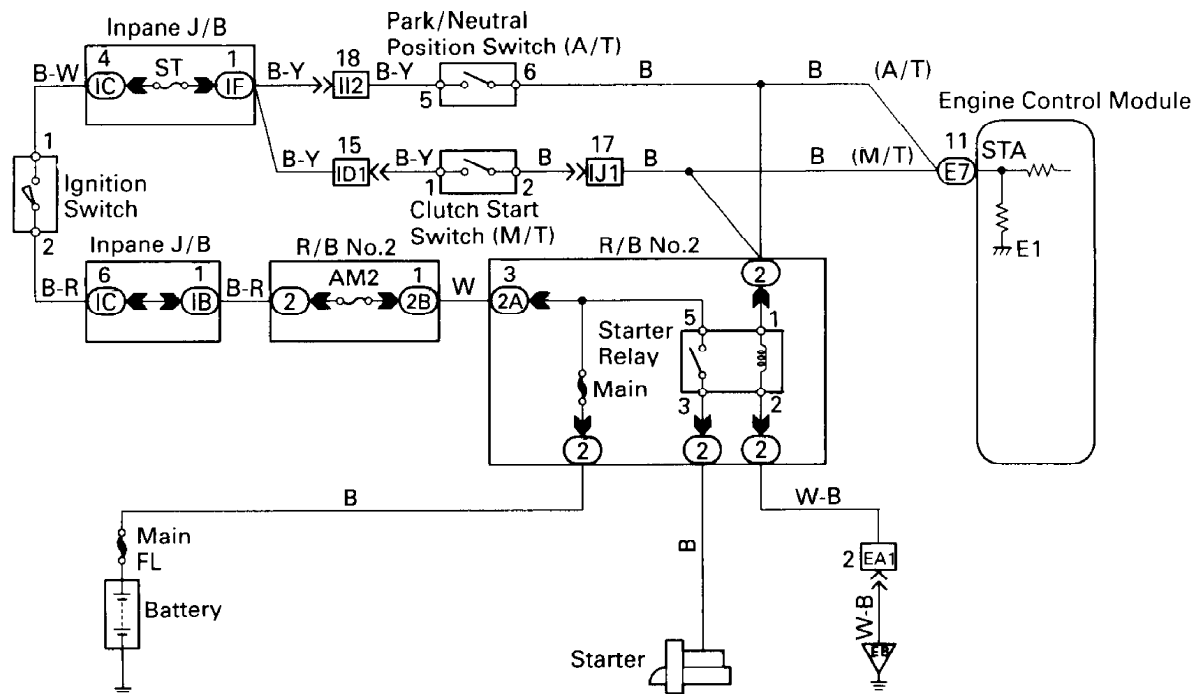
Fig. 50: DTC 42 - Diagnostic Flowchart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC 43 - STARTER SIGNAL

While engine is being cranked, battery voltage is applied to ECM terminal "E5" (STA). Starter signal is mainly used to increase fuel injection volume for the starting injection control and after-start injection control.

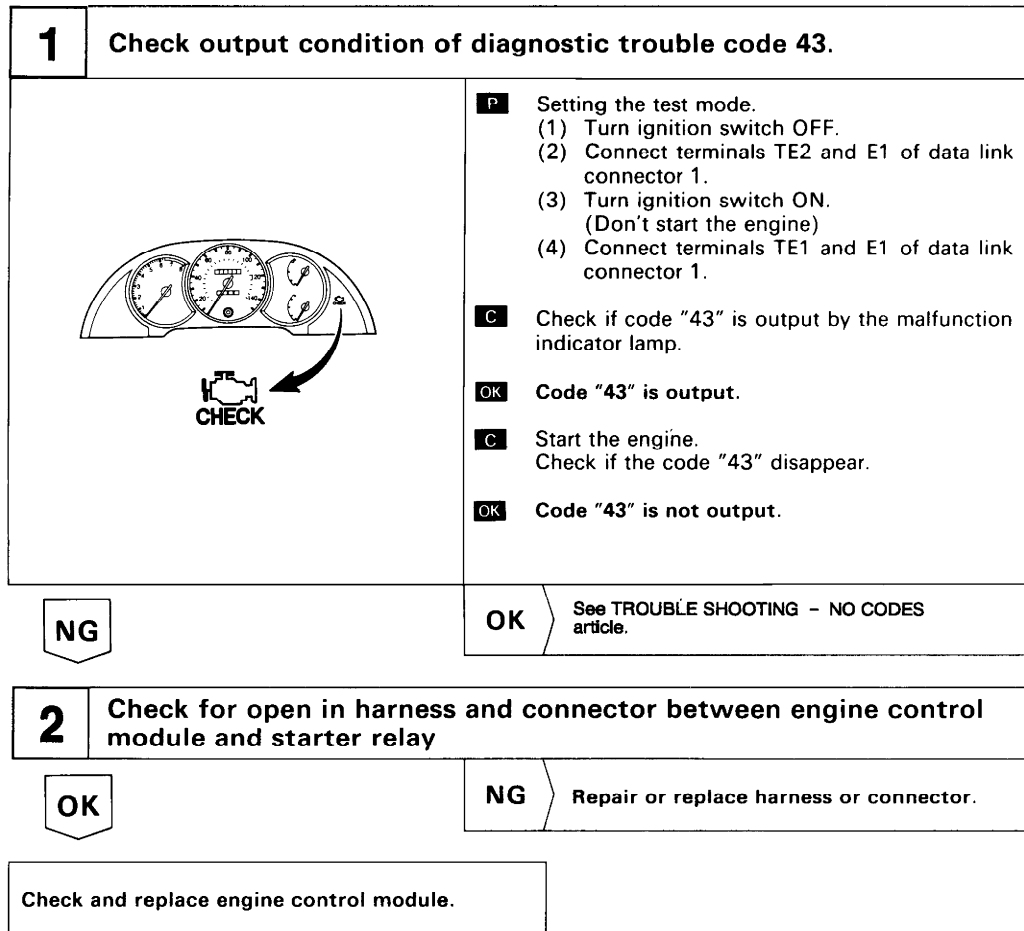
DTC 43 is set when there is no starter signal to ECM. Check

for open or short in starter signal circuit, an open or short in ignition switch or starter relay circuit or a faulty ECM.



94G44921

Fig. 51: DTC 43 - Schematic
Courtesy of Toyota Motor Sales, U.S.A., Inc.



94144816
Fig. 52: DTC 43 - Diagnostic Flowchart
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC 51 - SWITCH CONDITION SIGNAL

ECM uses Park/Neutral (P/N) position switch signal to determine whether transmission is in Park or Neutral, or in some other gear.

ECM uses the output from A/C switch to determine whether or not A/C is operating, so that it can increase idle speed if necessary.

ECM detects idle condition through "IDL" terminal of throttle position sensor.

DTC 51 is set when throttle position switch is off for 3 seconds or more after engine starts. P/N position switch is off with shift position in either Reverse, Drive or Low (A/T). A/C switch on. Check throttle position sensor "IDL" circuit, accelerator pedal and cable adjustment, P/N position switch circuit, A/C switch circuit or for faulty ECM.

DTC	51	Switch Condition Signal Circuit
------------	-----------	--

CIRCUIT DESCRIPTION

Park/Neutral Position Switch Signal*

The ECM uses the signals from the park/neutral position switch to determine whether the transmission is in park or neutral, or in some other gear.

Air Conditioning Switch Signal

The ECM uses the output from the air conditioning switch to determine whether or not the air conditioning is operating so that it can increase the idling speed of the engine if necessary.

Throttle Position Sensor IDL Signal

The IDL contacts are mounted in the throttle position sensor, and detects the idle condition.

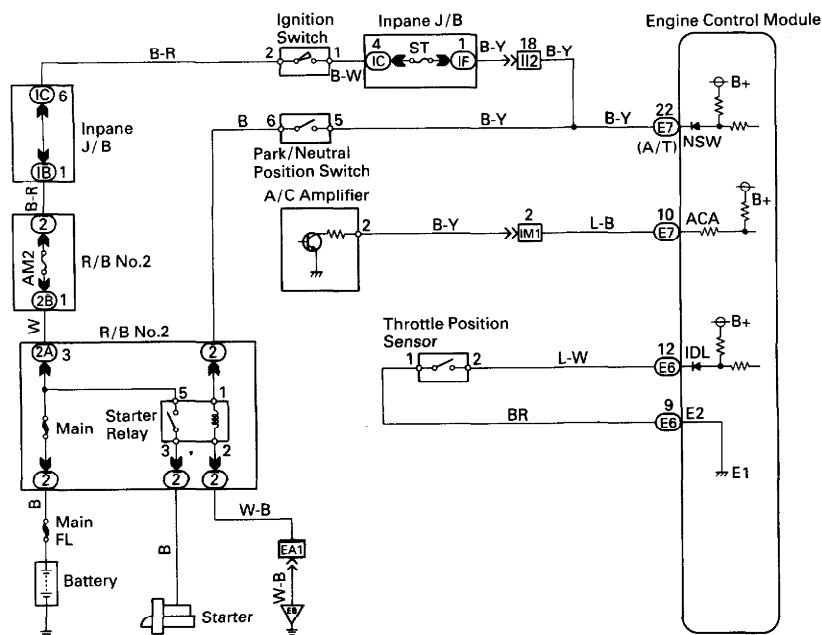
DTC No.	Diagnostic Code Detecting Condition	Trouble Area
51	(1) 3 sec. or more after engine starts with closed throttle position switch OFF (IDL). (2)* Park/Neutral position switch OFF. (Shift position in "R", "D", "2" or "L"). (3) A/C switch ON.	• Throttle position sensor IDL circuit • Accelerator pedal and cable • Park/Neutral position switch circuit • A/C switch circuit • ECM

*: Only vehicles with A/T.

HINT: In this circuit, diagnosis can only be made in the test mode.

DIAGNOSTIC CHART

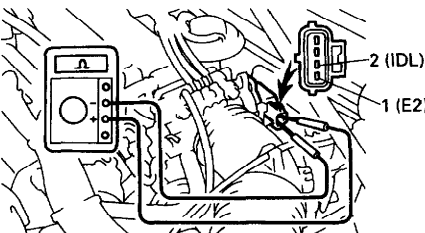
WIRING DIAGRAM



94E44929

Fig. 53: DTC 51 - Schematic
Courtesy of Toyota Motor Sales, U.S.A., Inc.

2
Check resistance of throttle position sensor.



P (1) Disconnect throttle position sensor connector.
 (2) Disconnect the vacuum hose from the throttle body, then apply vacuum to the throttle opener

C Measure resistance between terminals 2 (IDL) and 1 (E2) of throttle position sensor connector.

OK

Throttle Valve	Resistance
Fully closed	Less than 2.3 kΩ
Opened	1 MΩ or higher

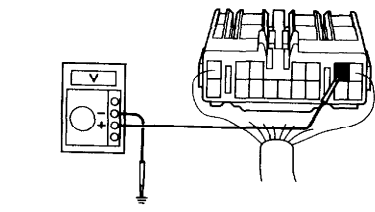
OK

NG Adjust or replace throttle position sensor

Check and repair harness or connector between engine control module and throttle position sensor.

3
Disconnect A/C amplifier connector, check voltage between terminal AC2 of A/C amplifier connector and body ground.

ON
IG ON



P (1) Remove glove compartment
 (2) Disconnect A/C amplifier connector.
 (3) Turn ignition switch on.

C Measure voltage between terminal AC2 of A/C amplifier connector and body ground.

OK Voltage: 9 – 14 V

OK

OK Check and replace A/C amplifier.

4
Check for open and short in harness and connector between engine control module and A/C amplifier

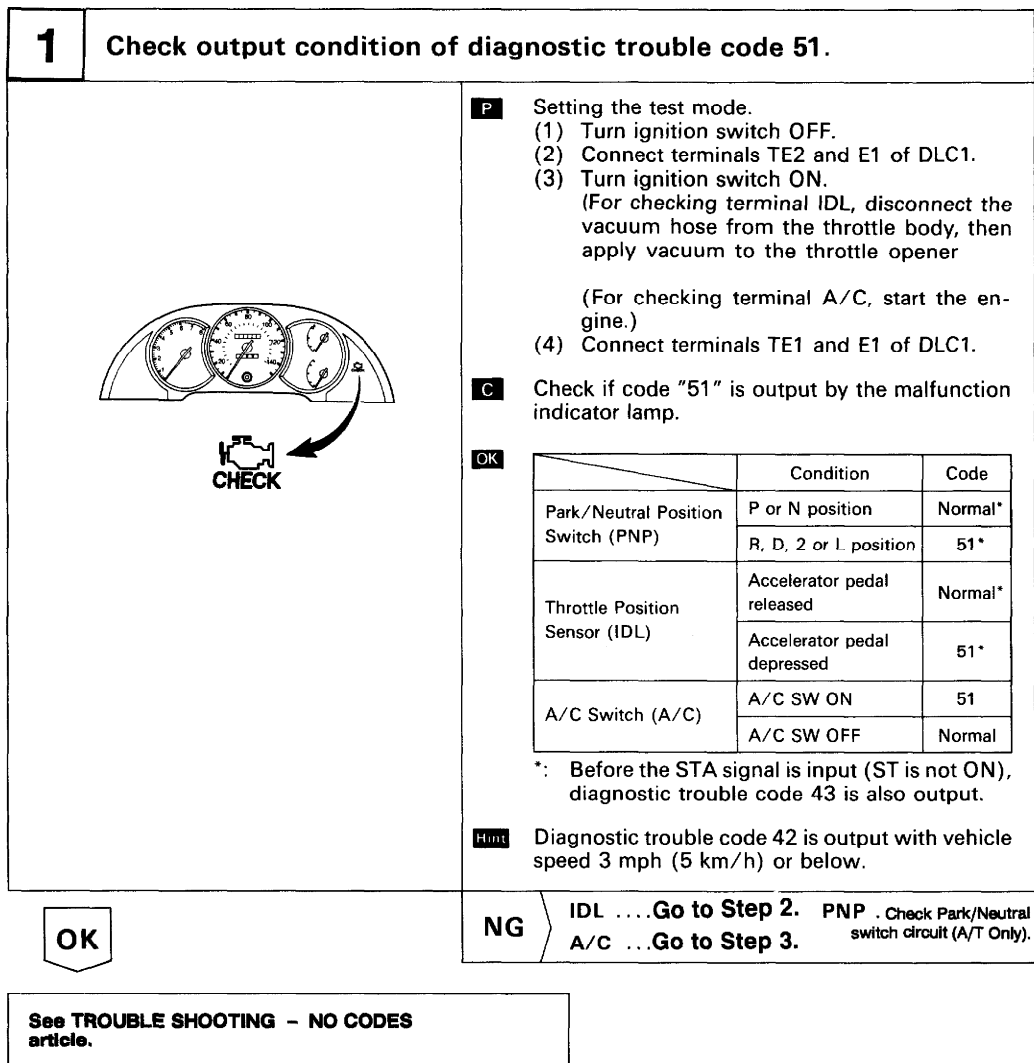
OK

NG Repair or replace harness or connector.

Check and replace engine control module.

Fig. 54: DTC 51 – Diagnostic Flowchart (1 Of 2)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

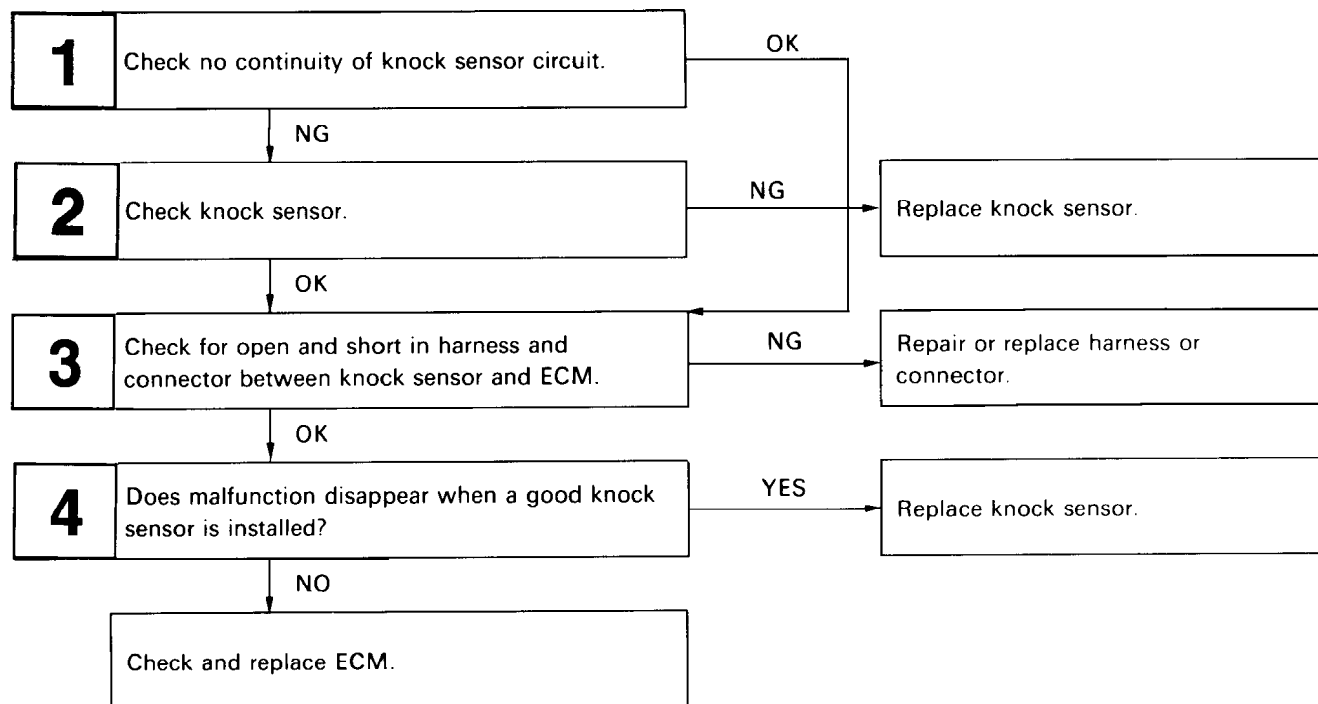
94A44826



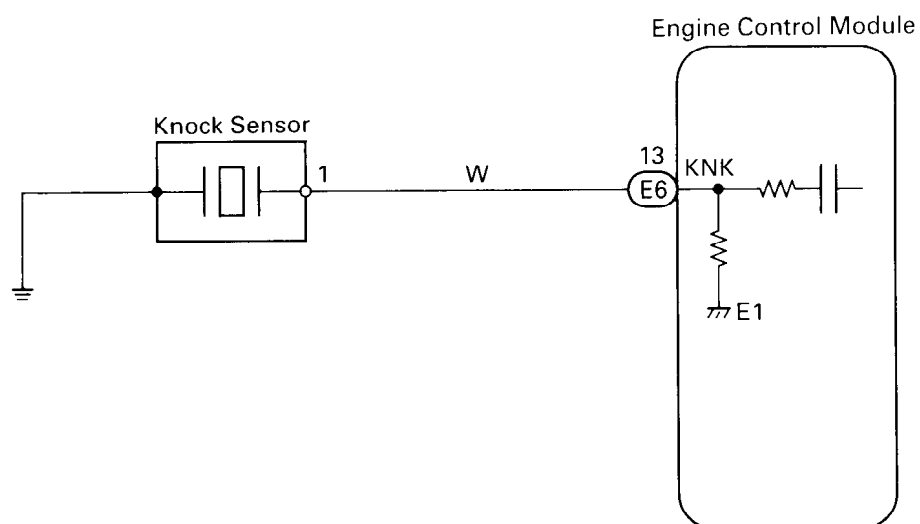
94J44825
 Fig. 55: DTC 51 - Diagnostic Flowchart (2 Of 2)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC 52 - KNOCK SENSOR SIGNAL

DTC 52 is set when ECM detects an open or short in the knock sensor circuit with engine speed of 1200-6000 RPM. Check for open or short in knock sensor circuit, a loose or faulty knock sensor or faulty ECM.

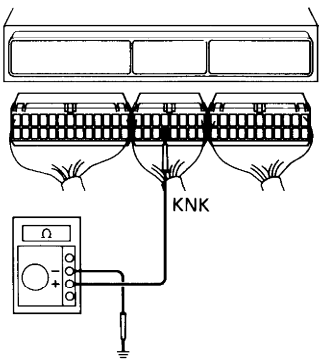


WIRING DIAGRAM



94I44923

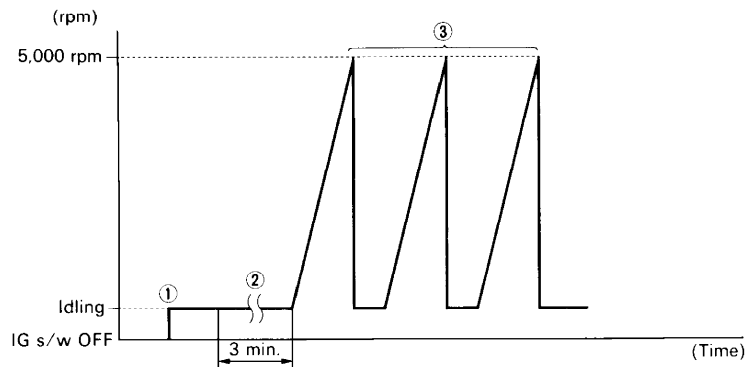
Fig. 56: DTC 52 - Schematic
Courtesy of Toyota Motor Sales, U.S.A., Inc.

1	Check continuity between terminal KNK of engine control module connector and body ground.
OFF  IG OFF 	P (1) Turn up the floor mat on the passenger side. (2) Disconnect engine control module connectors. C Measure resistance between terminal KNK of engine control module connector and body ground. OK Resistance: 1 MΩ or higher
NG	OK Go to step 3.

94A44925

Fig. 57: DTC 52 - Detection Driving Pattern
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

Malfunction: Open or Short in Knock Sensor



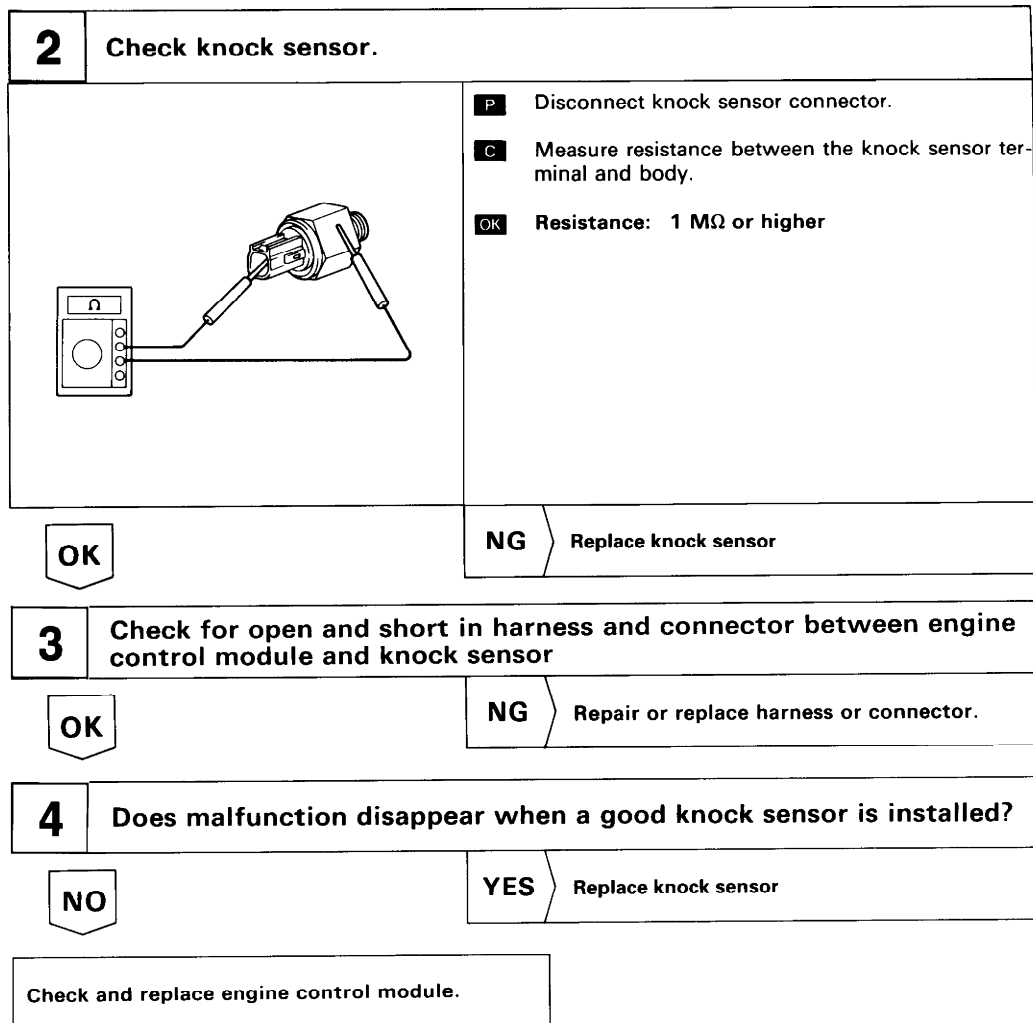
- ① Start engine and warm up.
- ② After engine is warmed up, let it idle for 3 min.
- ③ With the A/C ON, perform quick racing (5,000 rpm) 3 times.
 (Rapidly depress the accelerator pedal and suddenly release it.)

HINT: If a malfunction exists, the malfunction indicator lamp will light up when sudden racing is performed.

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

94J44817

Fig. 58: DTC 52 - Inspection Using Oscilloscope
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

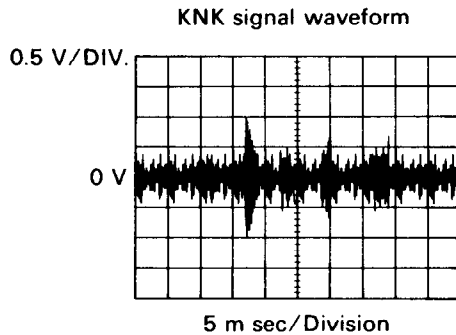


94F44821

Fig. 59: DTC 52 - Diagnostic Flowchart (1 Of 2)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

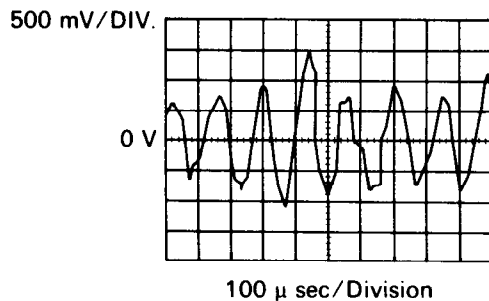
Reference

INSPECTION USING OSCILLOSCOPE



- With the engine racing (4,000 rpm) measure waveform between terminal KNK of engine control module and body ground.

HINT: The correct waveform appears as shown in the illustration on the left.



- Spread the time on the horizontal axis, and confirm that period of the wave is 132 μ sec. (Normal mode vibration frequency of knock sensor: 7.6 KHz).

HINT: If normal mode vibration frequency is not 7.6 KHz, the sensor is malfunctioning.

94G44822

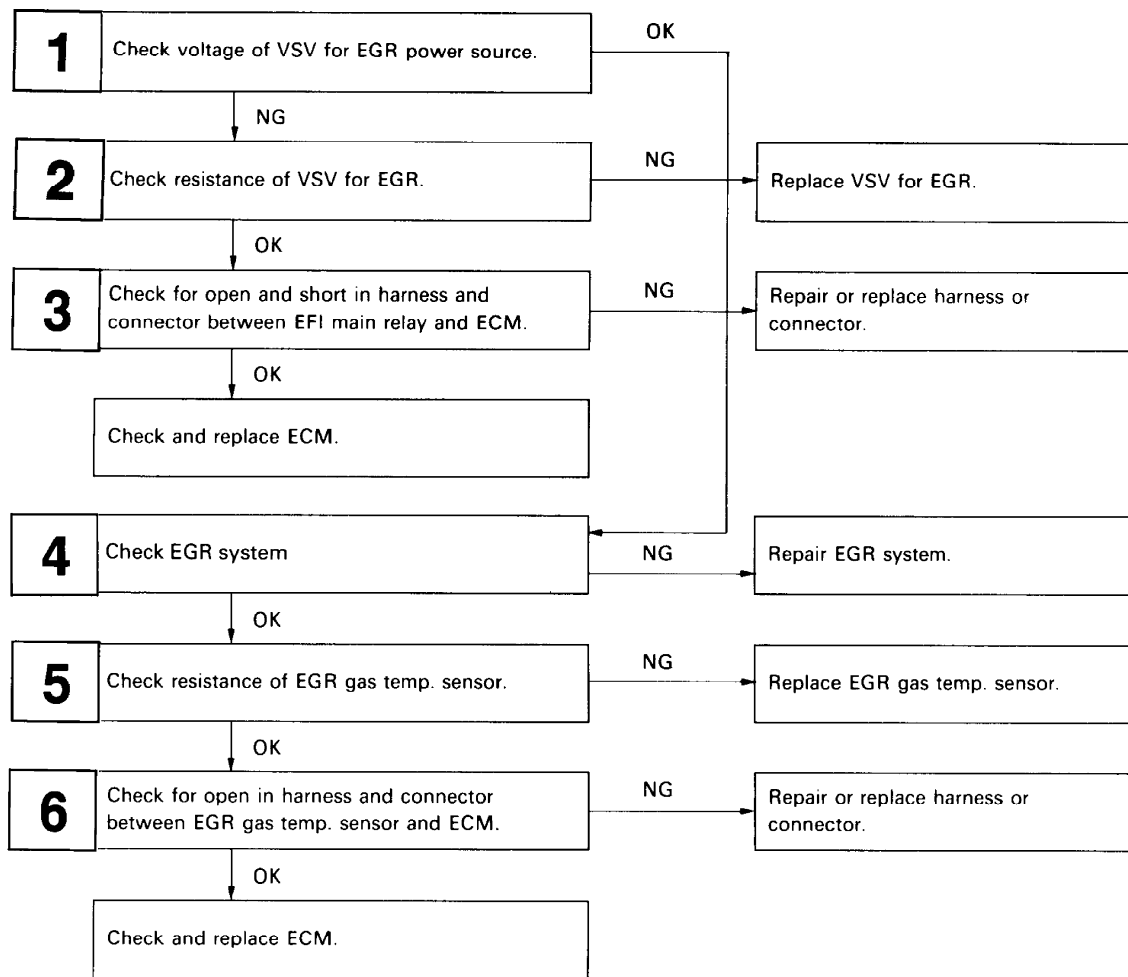
Fig. 60: DTC 52 - Diagnostic Flowchart (2 Of 2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC 71 - EGR SYSTEM MALFUNCTION

DTC 71 is set when EGR temperature is 140°F (60°C) or less for 50 seconds under the following conditions:

- * Engine coolant temperature at 140°F (80°C) or greater.
- * EGR operation possible. Except A/T in 3rd gear or M/T in 5th gear, cruising at 55-60 MPH on a flat road.

Check for open in EGR temperature sensor circuit, a shorted EGR VSV circuit, a plugged EGR passage or a faulty ECM.



WIRING DIAGRAM

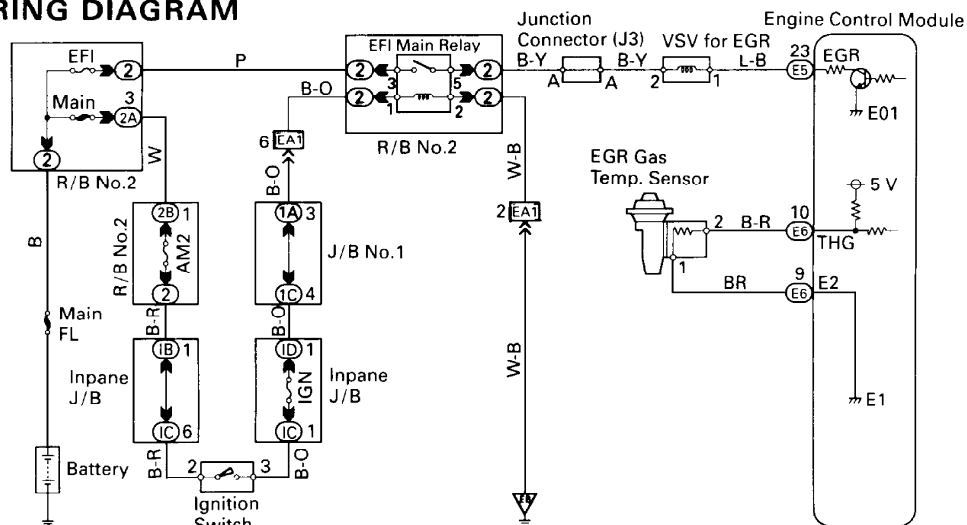
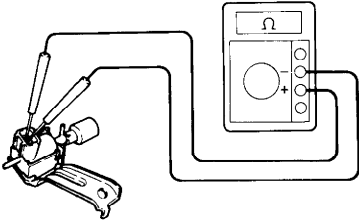
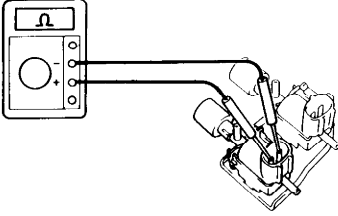


Fig. 61: DTC 71 - Schematic
Courtesy of Toyota Motor Sales, U.S.A., Inc.

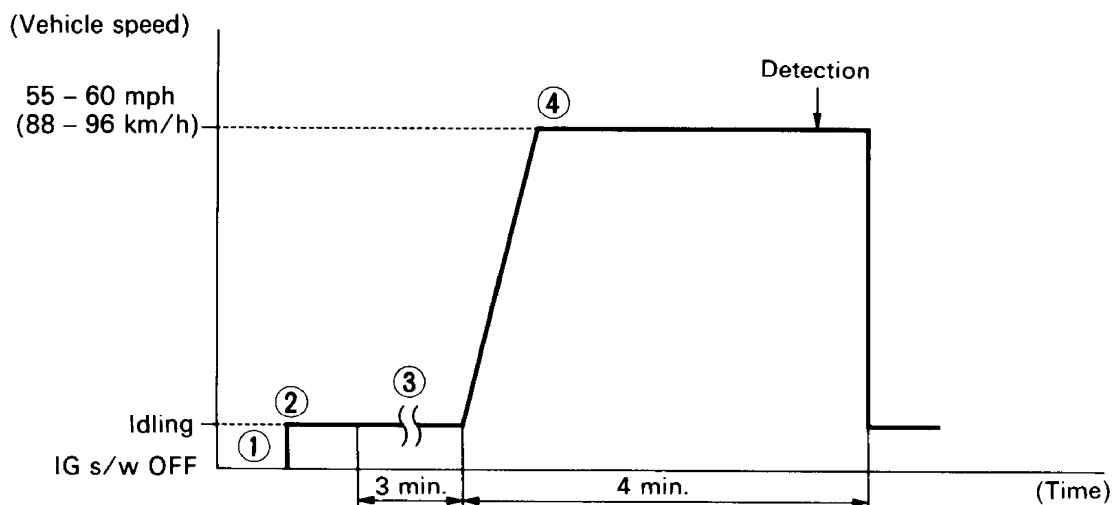
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2 Check resistance between terminals of VSV for EGR.	
Exc. California spec.  Only for California spec. 	P Remove VSV for EGR. C Measure resistance between terminals of VSV for EGR. OK Resistance: 33 – 39 Ω at 20°C (68°F) *: Except California specification vehicles.
OK	NG Replace VSV for EGR.

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Fig. 62: DTC 71 - Detection Driving Pattern
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

Malfunction: Open in EGR gas temp. sensor circuit



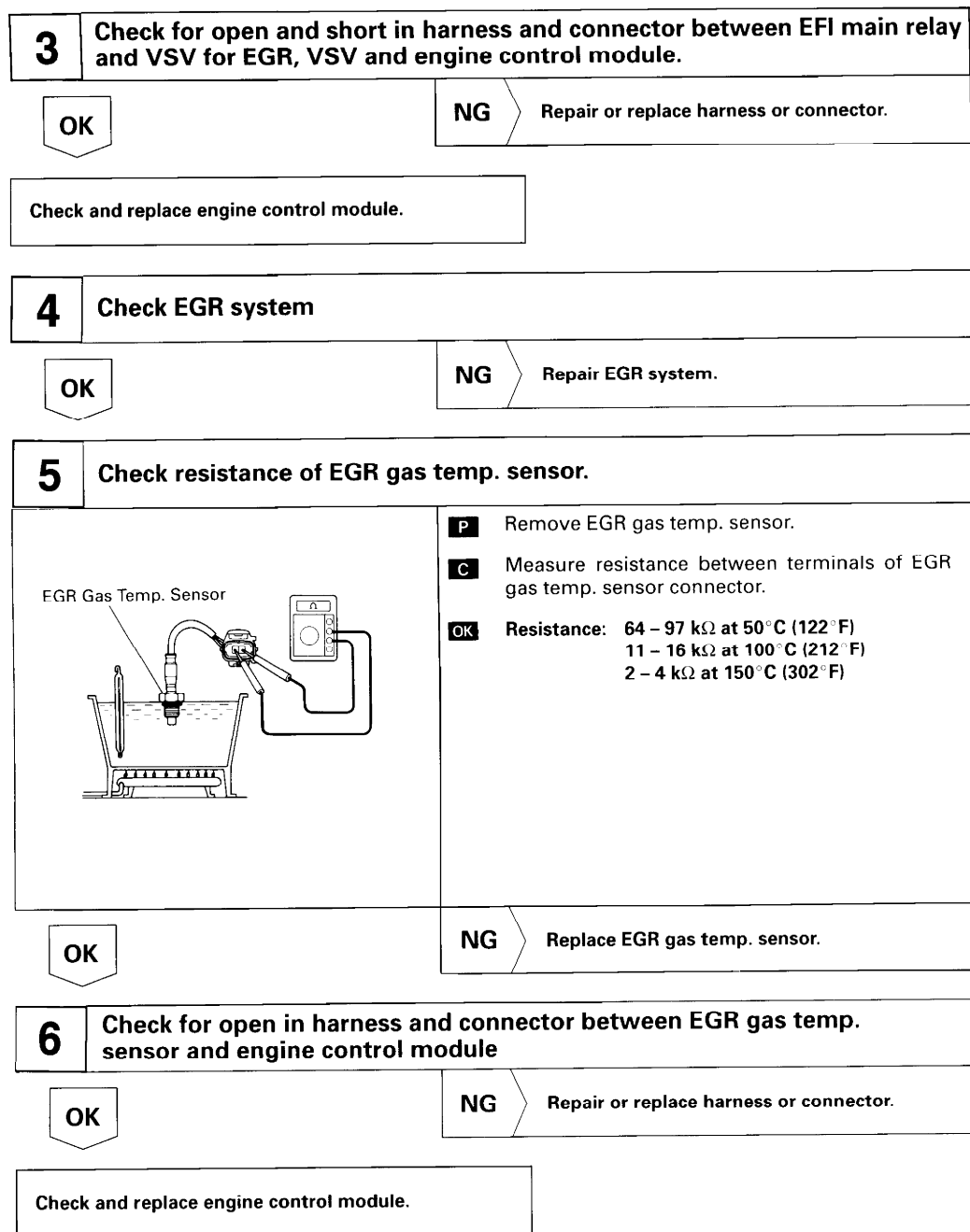
- ① Disconnect the EFI fuse (15 A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminals TE2 and E1 of data link connector 1 with IG switch OFF).
- ② Start the engine and warm up.
- ③ After the engine is warmed up, let it idle for 3 min.
- ④ With the A/C ON and transmission in 5th gear (A/T in "D" position), drive at 55 ~ 60 mph (88 ~ 96 km/h) for 4 min. or less.

HINT: If a malfunction exists, the malfunction indicator lamp will light up during step ④.

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

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Fig. 63: DTC 71 - Diagnostic Flowchart (1 Of 3)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

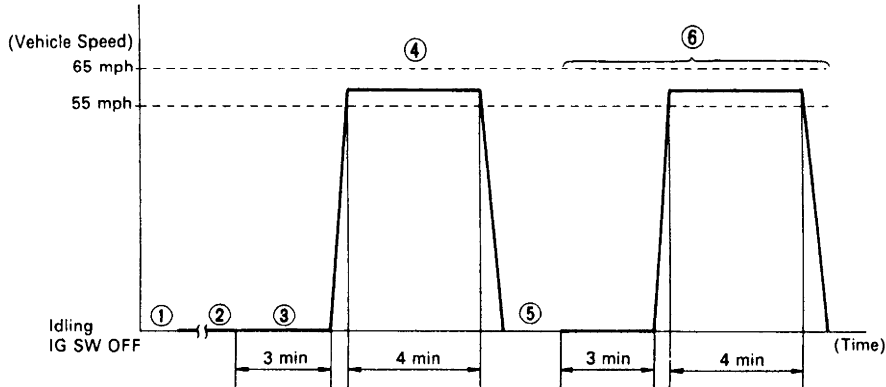


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Fig. 64: DTC 71 – Diagnostic Flowchart (2 Of 3)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

DTC No.	71	EGR System Malfunction (A/T and California)
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Malfunction: Short in VSV circuit for EGR, Loose EGR Hose, valve Stuck



HINT: A/C SW OFF in this test.

- ① Disconnect the EFI Fuse (15 A) for 10 sec. or more, with IG SW OFF.
- ② Start the engine and warm the engine up.
- ③ After engine is warmed up, let it idle for 3 min..
- ④ With the transmission in 5th gear ("D" position for A/T), drive at 88 – 105 km/h (55 – 65)mph for 4 min..
- ⑤ After driving, stop at safe place and turn the Ignition Switch OFF for 3 sec. or more.
- ⑥ Start the engine and perform steps ③ and ④ again.

HINT: If a malfunction is detected, the malfunction indicator lamp will light up when driving at 88 – 105 km/h (55 – 65 mph).

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

94144824

Fig. 65: DTC 71 – Diagnostic Flowchart (3 Of 3)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

SUMMARY

If no hard trouble codes are present, driveability symptoms exist or intermittent trouble codes exist, proceed to steps in H – TESTS W/O CODES article for diagnosis by symptom (i.e., ROUGH IDLE, NO START, etc.) or intermittent procedures.