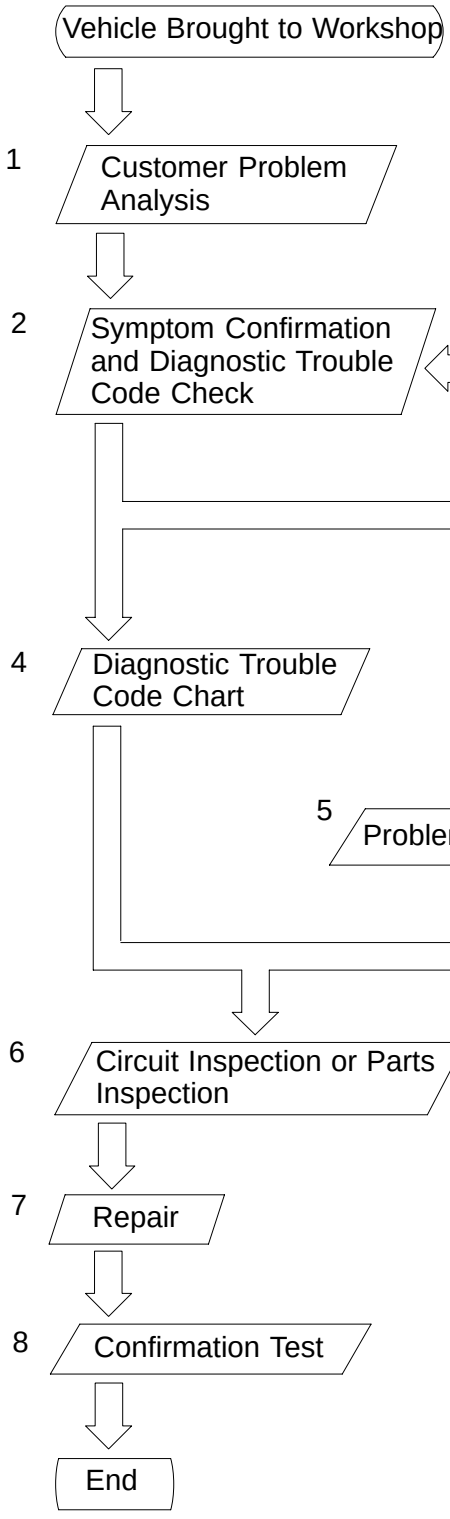
IN01U–15

HOW TO PROCEED WITH TROUBLESHOOTING

Carry out troubleshooting in accordance with the procedure below. Only a basic procedure is shown. Details in the Diagnostics section show the most effective methods for each circuit. Confirm troubleshooting procedures first for the relevant circuit before beginning troubleshooting of that circuit.



1

Ask the customer about the conditions and the environment in which the problem occurred.

2, 3

Confirm the symptoms and the problem conditions, and check the diagnostic trouble codes.
(When the problem symptoms do not appear during confirmation, use the symptom simulation method described later.)

4, 5, 6

Check the results obtained in Step 2. Confirm the inspection procedure for the system or the part that should be checked using the diagnostic trouble code chart or the problem symptoms table.

7

Check and repair the affected system or part in accordance with the instructions in Step 6.

8

After completing repairs, confirm that the problem has been eliminated.
(To be absolutely sure the problem no longer exists, perform the confirmation test under the same conditions and environment as when it occurred the first time.)

1. CUSTOMER PROBLEM ANALYSIS

- The 5 items in the table below are important points in the problem analysis.
- In troubleshooting, the problem symptoms must be confirmed accurately. Preconceptions should be discarded in order to give an accurate judgement. To ascertain what the problem symptoms are, it is extremely important to ask the customer about the problem and the conditions at the time it occurred.

Important Points in the Customer Problem Analysis

- What −−−−− Vehicle model, system name
- When −−−−− Date, time, occurrence frequency
- Where −−−−− Road conditions
- Under what conditions? −−−−− Running conditions, driving conditions, weather conditions
- How did it happen? −−−−− Problem symptoms

(Sample) Supplemental restraint system check sheet.

CUSTOMER PROBLEM ANALYSIS CHECK

SUPPLEMENTAL RESTRAINT SYSTEM Check Sheet

Inspector's Name _____

Customer's Name		**VIN**	
		Production Date	/ /
		Licence Plate No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

Date Problem First Occurred	/ /
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Other
Temperature	Approx.

Vehicle Operation	☐ Starting ☐ Idling ☐ Driving [☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other]

2. SYMPTOM CONFIRMATION AND DIAGNOSTIC TROUBLE CODE CHECK

The diagnostic system in the TOYOTA TUNDRA fulfills various functions.

- The first function is the Diagnostic Trouble Code (DTC) Check. In a DTC Check, a previous malfunction's DTC can be checked by a technician during troubleshooting. (A DTC is a code stored in the ECU memory whenever a malfunction in the signal circuits to the ECU occurs.)
- Another function is the Input Signal Check, which checks if the signals from various switches are sent to the ECU correctly. By using these check functions, the problem areas can be narrowed down and troubleshooting is more effective. Diagnostic functions are incorporated in the following systems in the TOYOTA TUNDRA.

System	Diagnostic Trouble Code Check	Input Signal Check (Sensor Check)	Diagnostic Test Mode (Active Test)
1. Engine 1GR−FE	○ (with Check Mode)	○	○
2. Engine 2UZ−FE	○ (with Check Mode)	○	○
3. Automatic Transmission A750E for 1GR−FE	○ (with Check Mode)	○	○
4. Automatic Transmission A750E/A750F for 2UZ−FE	○ (with Check Mode)	○	○
5. Tire Pressure Warning System	○	○	○
6. Anti−Lock Brake System	○	○	○
7. ABS with EBD & BA & TRAC & VSC System	○	○	○
8. Can Communication System	○		
9. Supplemental Restraint System	○ (with Check Mode)	○	
10.Cruise Control System	○	○	
11.Sliding Roof System		○	○
12.Body Control System		○	○
13.Driver Door Control System		○	○
14.Passenger Door Control System		○	○
15.Multiplex Communication System	○		

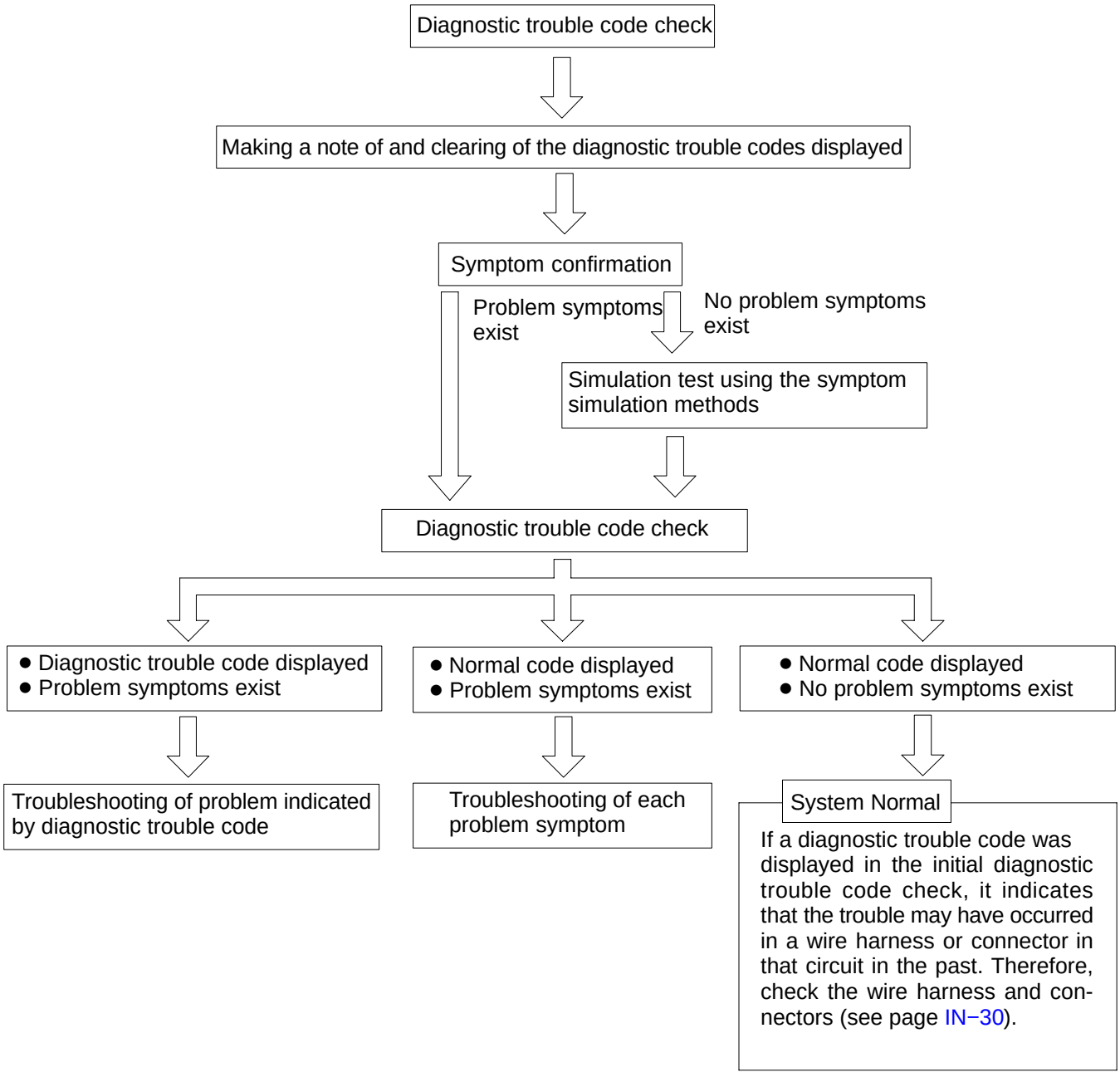
In the DTC Check, it is very important to determine whether the problem indicated by the DTC is: 1) still occurring, or 2) occurred in the past but has since returned to normal. In addition, the DTC should be compared to the problem symptom to see if they are related. For this reason, DTCs should be checked before and after confirmation of symptoms (i.e., whether or not problem symptoms exist) to determine current conditions, as shown in the table below.

Never skip the DTC Check. Failure to check DTCs may, depending on the case, result in unnecessary troubleshooting for systems operating normally or lead to repairs not pertinent to the problem. Follow the procedures listed above in the correct order.

DIAGNOSTIC TROUBLE CODE CHECK PROCEDURE

Diagnostic Trouble Code Check (Make a note of and then clear)	Confirmation of Symptoms	Diagnostic Trouble Code Check	Problem Condition
Diagnostic Trouble Code Display	Problem symptoms exist	Same diagnostic trouble code is displayed	Problem is still occurring in the diagnostic circuit
		Normal code is displayed	The problem is still occurring in a place other than in the diagnostic circuit (The diagnostic trouble code displayed first is either for a past problem or it is a secondary problem)
	No problem symptoms exist		The problem occurred in the diagnostic circuit in the past
Normal Code Display	Problem symptoms exist	Normal code is displayed	The problem is still occurring in a place other than the diagnostic circuit
	No problem symptoms exist	Normal code is displayed	The problem occurred in a place other than the diagnostic circuit in the past

Taking into account the points on the previous page, a flow chart showing how to proceed with troubleshooting using the diagnostic trouble code check is shown below. Directions from the flow chart will indicate how to proceed to DTC troubleshooting or to the troubleshooting of problem symptoms table.



3. SYMPTOM SIMULATION

The most difficult case in troubleshooting is when no problem symptoms occurring. In such cases, a thorough customer problem analysis must be carried out. Then simulate a simulation of the same or similar conditions and environment in which the problem occurred in the customer's vehicle should be carried out. No matter how much skill or experience a technician has, troubleshooting without confirming the problem symptoms will lead to something important in the repair operation being overlooked and lead to mistakes or delays in repairs.

For example:

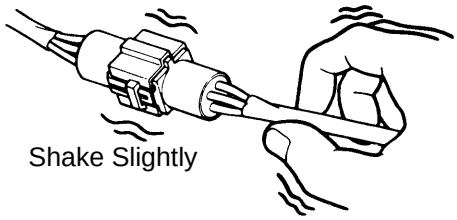
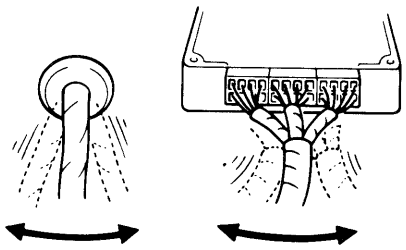
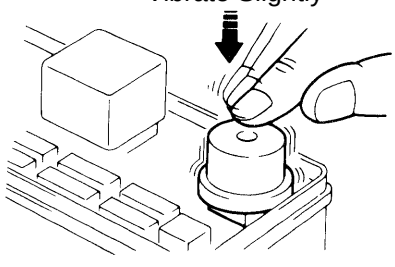
With a problem that only occurs when the engine is cold, or occurs as a result of vibration caused by road during driving, the problem can never be determined as long as the symptoms are being checked on stationary vehicle or a vehicle with a warmed−up engine.

Vibration, heat or water penetration (moisture) is difficult to reproduce. The symptom simulation tests below are effected substitutes for the conditions and can be applied on a stationary vehicle.

Important Points in the Symptom Simulation Test:

In the symptom simulation test, the problem symptoms as well as problem area or parts must be confirmed. First, narrow down the possible problem circuits according to the symptoms. Then, connect the tester and carry out the symptom simulation test, judging whether the circuit being tested is defective or normal, and also confirming the problem symptoms at the same time. Refer to the problem symptoms table for each system to narrow down the possible causes of the symptom.

<table>
<tr><td>1</td><td colspan="2">VIBRATION METHOD: When vibration seems to be the major cause.</td></tr>
<tr><td colspan="2">CONNECTORS
Slightly shake the connector vertically and horizontally.

WIRE HARNESS
Slightly shake the wire harness vertically and horizontally.
The connector joint, fulcrum of the vibration, and body through portion are the major areas that should be checked thoroughly.</td><td> 
Shake Slightly
 
Swing Slightly
FI2331
FI2332</td></tr>
<tr><td colspan="2">PARTS AND SENSOR
Apply slight vibration with a finger to the part of the sensor considered to be the cause of the problem and check whether or not the malfunction occurs.
HINT:
Applying strong vibration to relays may result in open relays.</td><td>Vibrate Slightly
 
FI2330</td></tr>
</table>

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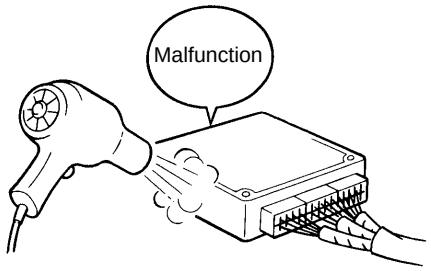
2	**HEAT METHOD: When the problem seems to occur when the suspect area is heated.**

Heat the component that is the likely cause of the malfunction with a hair dryer or similar device. Check whether or not if the malfunction occurs.

NOTICE:

(1) Do not heat to more than 60˚C (140˚F). (Exceeding this temperature may damage components.)

(2) Do not apply heat directly to parts in the ECU.



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3	**WATER SPRINKLING METHOD: When the malfunction seems to occur on a rainy day or in a high−humidity condition.**

Sprinkle water onto the vehicle and check whether or not if the malfunction occurs.

NOTICE:

(1) Never sprinkle water directly into the engine compartment. Indirectly change the temperature and humidity by applying water spray onto the front of the radiator.

(2) Never apply water directly onto electronic components.

HINT:

If a vehicle is subject to water leakage, the leaked water may damage the ECU. When testing a vehicle with a water leakage problem, special caution must be taken.

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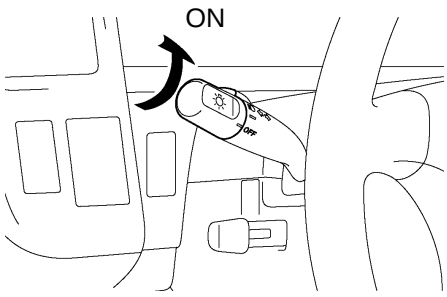
4	**OTHER: When a malfunction seems to occur when electrical load is excessive.**

Turn on all electrical loads including the heater blower, head lights, rear window defogger, etc. and check to see if the malfunction occurs.



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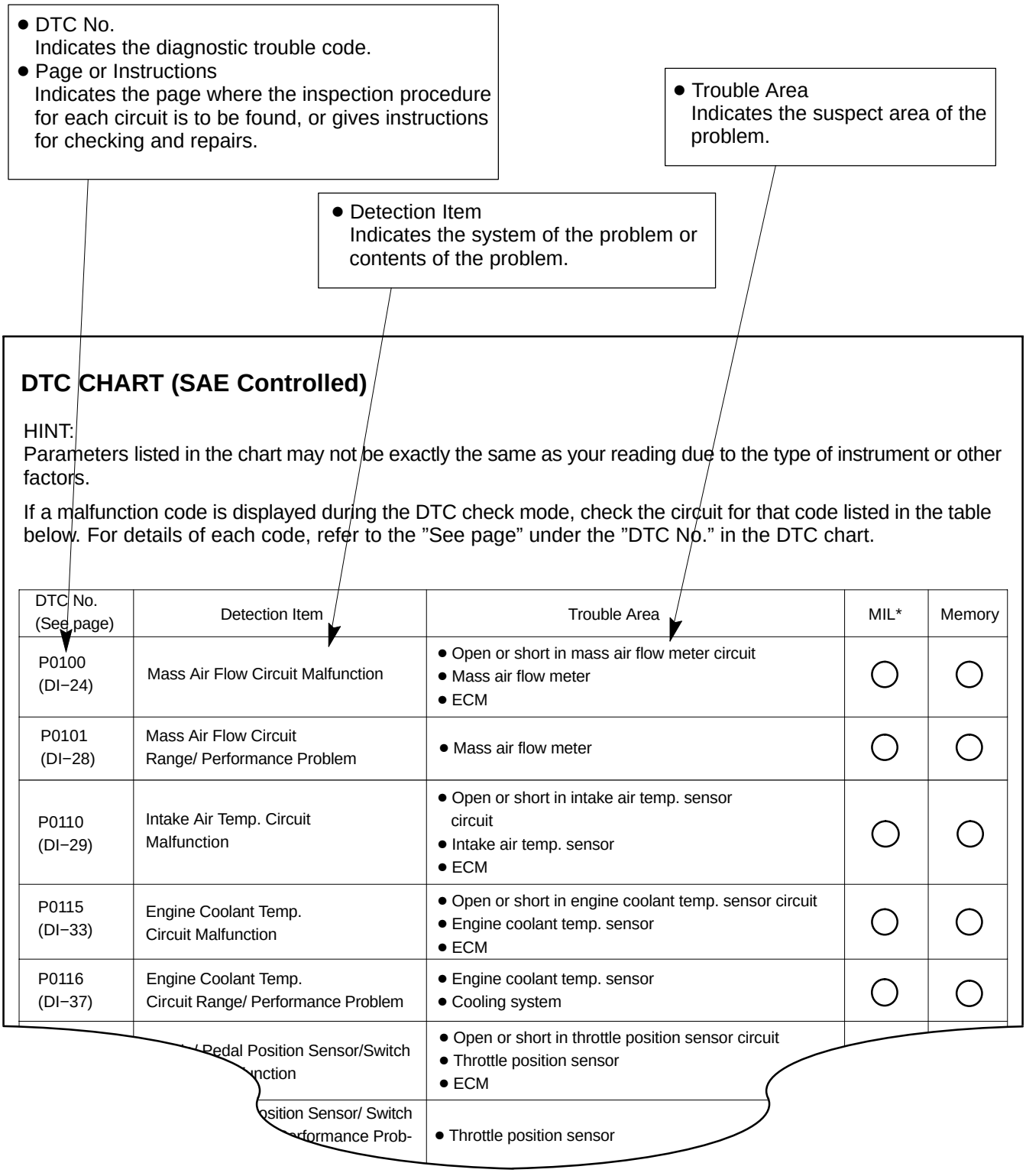
4. DIAGNOSTIC TROUBLE CODE CHART

Use Diagnostic Trouble Codes (DTCs) (from the DTC checks) in the table below to determine the trouble area and proper inspection procedure. Engine diagnostic trouble code chart is shown below as an example.



DTC CHART (SAE Controlled)

HINT:
Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check mode, check the circuit for that code listed in the table below. For details of each code, refer to the ”See page” under the ”DTC No.” in the DTC chart.

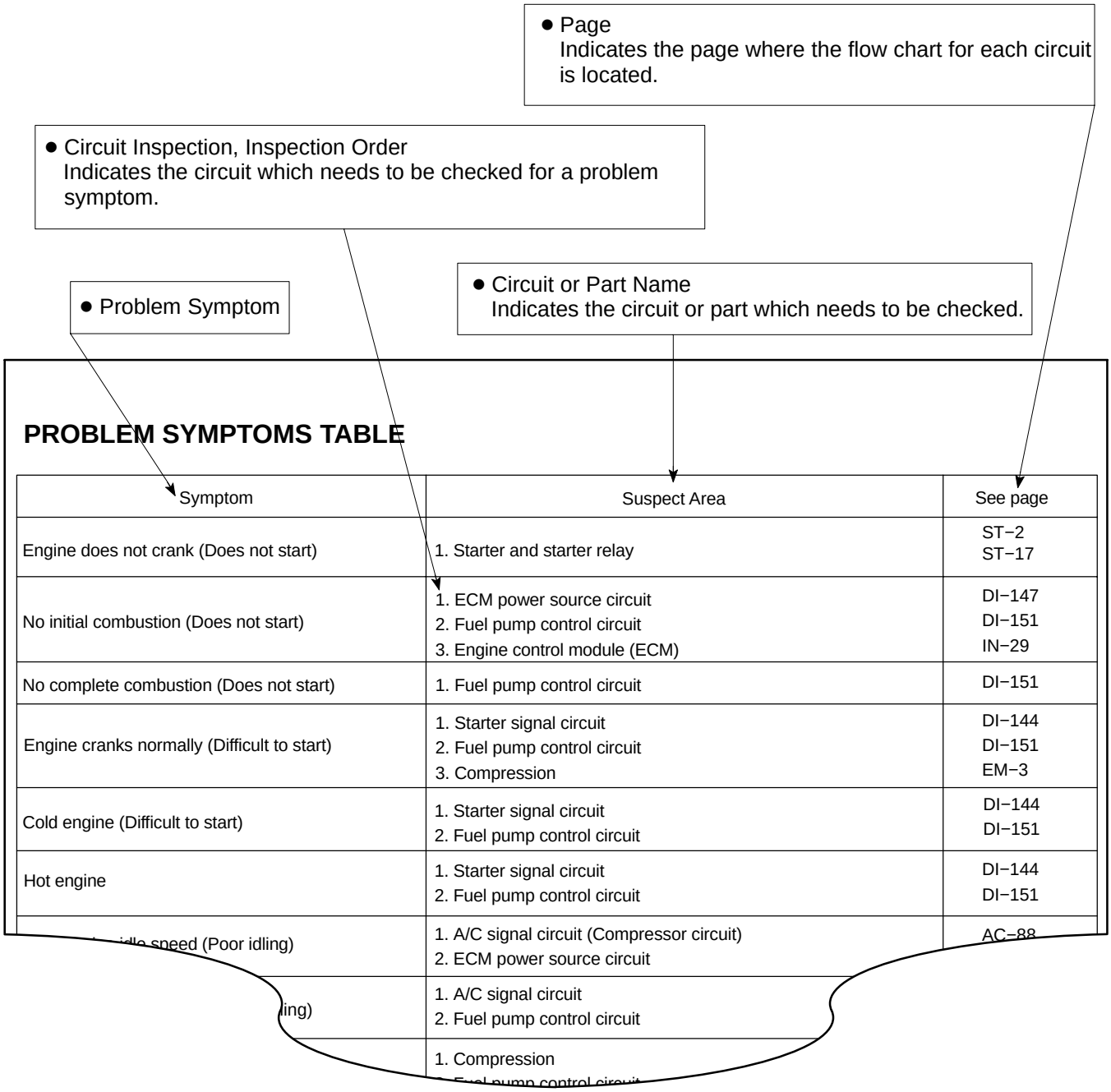
DTC No. (See page)	Detection Item	Trouble Area	MIL*	Memory
P0100 (DI−24)	Mass Air Flow Circuit Malfunction	● Open or short in mass air flow meter circuit ● Mass air flow meter ● ECM	○	○
P0101 (DI−28)	Mass Air Flow Circuit Range/ Performance Problem	● Mass air flow meter	○	○
P0110 (DI−29)	Intake Air Temp. Circuit Malfunction	● Open or short in intake air temp. sensor circuit ● Intake air temp. sensor ● ECM	○	○
P0115 (DI−33)	Engine Coolant Temp. Circuit Malfunction	● Open or short in engine coolant temp. sensor circuit ● Engine coolant temp. sensor ● ECM	○	○
P0116 (DI−37)	Engine Coolant Temp. Circuit Range/ Performance Problem	● Engine coolant temp. sensor ● Cooling system	○	○
	/Pedal Position Sensor/Switch nction	● Open or short in throttle position sensor circuit ● Throttle position sensor ● ECM		
	sition Sensor/ Switch rformance Prob-	● Throttle position sensor		

5. PROBLEM SYMPTOMS TABLE

The suspected circuits or parts for each problem symptom are shown in the table below. Use this table to troubleshoot when, during a DTC check, a ”Normal” code is displayed in the diagnostic trouble code check but the problem is still occurring. Numbers in the table show the inspection order in which the circuits or parts should be checked.

HINT:

In some cases, a problem is not detected by the diagnostic system even though a problem symptom is present. It is possible that the problem is occurring outside the detection range of the diagnostic system, or that the problem is occurring in a completely different system.



PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	1. Starter and starter relay	ST–2 ST–17
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. Engine control module (ECM)	DI–147 DI–151 IN–29
No complete combustion (Does not start)	1. Fuel pump control circuit	DI–151
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI–144 DI–151 EM–3
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI–144 DI–151
Hot engine	1. Starter signal circuit 2. Fuel pump control circuit	DI–144 DI–151
idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. ECM power source circuit	AC–88
ling)	1. A/C signal circuit 2. Fuel pump control circuit	
	1. Compression 2. Fuel pump control circuit	

6. CIRCUIT INSPECTION

How to read and use each page is shown below.

● Diagnostic Trouble Code No. and Detection Item

● Circuit Description
The major role and operation of the circuit and its component parts are explained.

DTC	P0325	Knock Sensor 1 Circuit Malfunction

CIRCUIT DESCRIPTION

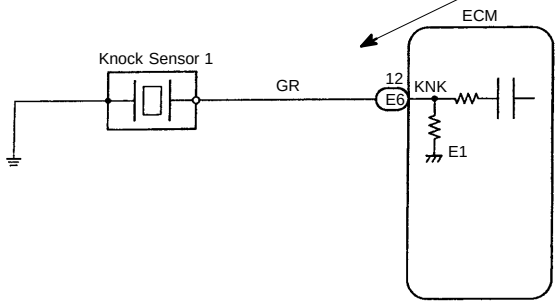
Knock sensor is fitted to the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	DTC Detecting Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed, 1,200 rpm or more.	● Open or short in knock sensor1 circuit ● Knock sensor 1 (looseness) ● ECM

If the ECM detects the above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.

● Indicates the diagnostic trouble code (DTC), set parameter and suspect area of the problem.

WIRING DIAGRAM



● Wiring Diagram
This is a wiring diagram of the circuit.
Use this diagram together with an ELECTRICAL WIRING DIAGRAM to thoroughly understand the circuit.
Wire colors are indicated by an alphabetical code:
B = Black; L = Blue; R = Red; BR = Brown;
LG = Light Green; V = Violet; G = Green;
O = Orange; W = White; GR = Gray; P = Pink;
Y = Yellow; SB = Sky Blue.
The first letter indicates the basic wire color and the second letter indicates the color of the stripe.

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● Indicates the position of the ignition switch during the check.

LOCK
Ignition Switch LOCK (OFF)

ON
Ignition Switch ON

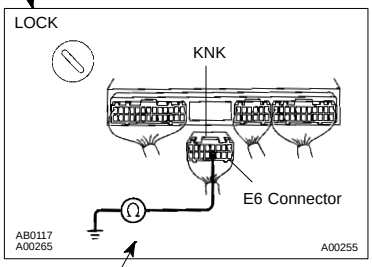
START
Ignition Switch START

ACC
Ignition Switch ACC

● Inspection Procedure
Use the inspection procedure to determine if the circuit is normal or abnormal. If it is abnormal, use it to determine whether the problem is located in the sensors, actuators, wire harness or ECU.

INSPECTION PROCEDURE

1	**Check continuity between terminal KNK of ECM connector and body ground.**



PREPARATION:
(a) Remove the glove compartment (See page SF–68).
(b) Disconnect the E6 connector of ECM.

CHECK:
Measure resistance between terminal KNK of ECM connector and body ground.

OK:
Resistance: 1 MΩ or higher

OK	**Go to step 3.**

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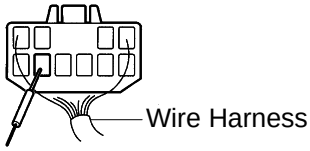
2	**Check knock sensor (See page SF–61).**

OK	**Replace knock sensor.**

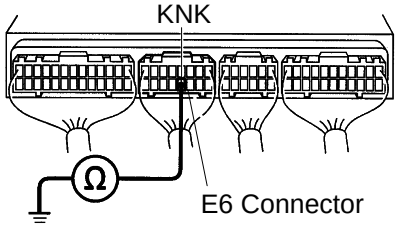
● Indicates the place to check the voltage or resistance.
● Indicates the connector position to checked (from the front or back side).



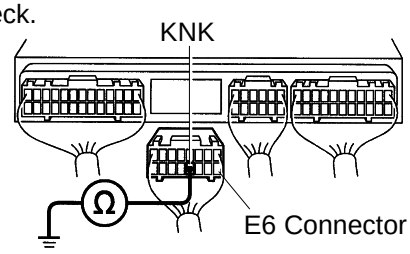
Check from the connector back side (with harness).

Check from the connector front side (without harness). In this case, care must be taken not to bend the terminals.

● Indicates the condition of the connector of ECU during the check.



Connector being checked is connected.



Connector being checked is disconnected.

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