010TS–01

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

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

1	VEHICLE BROUGHT TO WORKSHOP

2	CUSTOMER PROBLEM ANALYSIS

(a) Ask the customer about the conditions and environment when the problem occurred.

3	SYMPTOM CONFIRMATION AND DTC (AND FREEZE FRAME DATA) CHECK

(a) Check the battery positive voltage.
Standard: 11 to 14 V (Engine stopped)
(b) Visually check the wire harness, connectors and fuses for open and short, etc.
(c) Warm up the engine to the normal operating temperature.
(d) Confirm the problem symptoms and conditions, and check for DTCs according to the related chart.

OK → **Go to step 5**

NG

4	DTC CHART

(a) Check the results obtained in step 3, then confirm the inspection procedures for the system or part using the DTC chart.

→ **Go to step 6**

5	PROBLEM SYMPTOMS CHART

(a) Check the results obtained in step 3. Confirm the inspection procedures for the system or part using the problem symptoms table.

6	CIRCUIT INSPECTION OR PARTS INSPECTION

(a) Confirm the circuit in the system or the part that should be checked using the problem symptoms table or the results obtained in step 4.

7	REPAIR

(a) Repair the affected system or part according to the instructions in step 6.

8	CONFIRMATION TEST

(a) After completing repairs, confirm that the problem has been solved. If the problem does not recur, perform a confirmation test under the same conditions and in the same environment as when it occurred the first time.

END

CUSTOMER PROBLEM ANALYSIS

HINT:

- In troubleshooting, the problem symptoms must be confirmed accurately. Preconceptions should be discarded in order to give an accurate judgement. To clearly understand what the problem symptoms are, it is extremely important to ask the customer about the problem and the conditions at the time it occurred.
- As much information as possible should be gathered for reference. Past problems that seem unrelated may also help in some cases. In the Diagnostic section, a customer problem analysis table is provided for each system.
- 5 items are important points in the problem analysis:

Important Points with 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 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]

SYMPTOM CONFIRMATION AND DIAGNOSTIC TROUBLE CODE

HINT:

The diagnostic system in the HIGHLANDER/KLUGER has various functions.

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

System	Diagnostic Trouble Code Check	Input Signal Check (Sensor Check)	Diagnotis Test Mode (Active Test)
SFI System (3MZ–FE)	○ (with Check Mode)	○	○
ABS with BA & EBD System	○	○	○
ABS with EBD & BA & TRAC & VSC System	○	○	○
Electronic Controlled Automatic Transaxle [ECT]	○ (with Check Mode)	○	○
Air Conditioning System	○		○
Supplement Restraint System	○		
Power Window Control System	○		
Power Door Lock Control System	○		
Wireless Door Lock Control System	○		
Engine Immobiliser System	○		
Multiplex Communication System	○		
Cruise Control 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.
- A flow chart showing how to proceed with troubleshooting using the DTC check is shown below. Directions from the flow chart will indicate should be performed DTC troubleshooting or to the troubleshooting of each problem symptom.

1	**DTC CHECK**

2	**MAKE A NOTE OF DTCS DISPLAYED AND THEN CLEAR THE MEMORY**

3	**SYMPTOM CONFIRMATION**

a	Symptoms exist
b	No symptoms exist

a	Go to step 5

b

4	SIMULATION TEST USING THE SYMPTOM SIMULATION METHODS

5	DTC CHECK

a	DTC displayed
b	No DTC displayed

a	Troubleshooting of problem indicated by DTC

b

6	SYMPTOM CONFIRMATION

a	No symptoms exist
b	Symptoms exist

If a DTC was displayed in the initial DTC check, it indicates that the trouble may have occurred in a wire harness or connector in that circuit in the past. Check the wire harness and connectors (see page 01–33).

a	SYSTEM NORMAL

b

TROUBLESHOOTING OF EACH PROBLEM SYMPTOM

The problem is still occurring in a place other than the diagnostic circuit (the DTC displayed first is either for a past problem or a secondary problem).

SYMPTOM SIMULATION

HINT:

The most difficult case in troubleshooting is when no problem symptoms occur. In such cases, a thorough customer problem analysis must be carried out. 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 important repairs being overlooked and mistakes or delays.

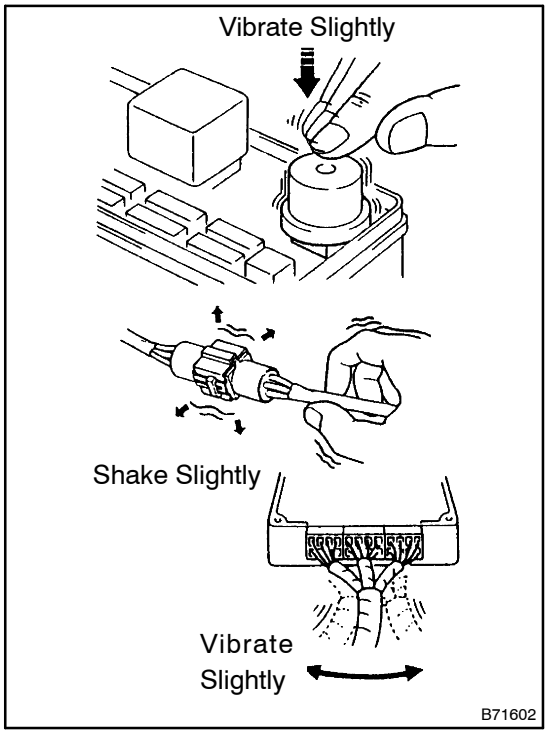
For example:

With a problem that only occurs when the engine is cold or occurs as a result of vibration caused by the road during driving, the problem can never be determined if the symptoms are being checked on a 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 effective 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 the 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. Also, confirm the problem symptoms at the same time. Refer to the problem symptoms table for each system to narrow down the possible causes.



1. VIBRATION METHOD: When vibration seems to be the major cause.

(a) PART AND SENSOR

(1) 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 open relays.

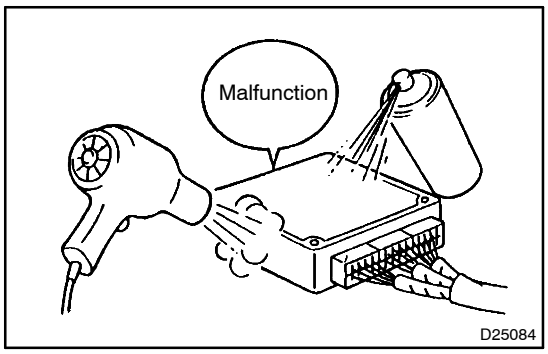
(b) CONNECTORS

(1) Slightly shake the connector vertically and horizontally.

(c) WIRE HARNESS

(1) Slightly shake the wire harness vertically and horizontally.

The connector joint and fulcrum of the vibration are the major areas that should be checked thoroughly.

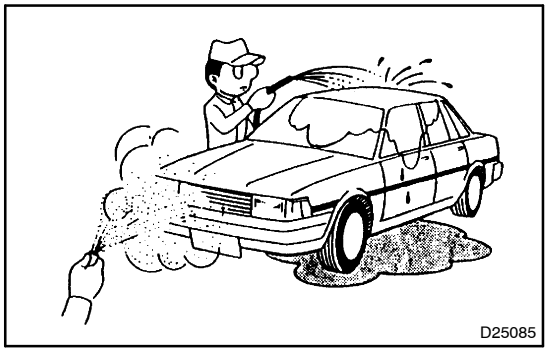


2. HEAT METHOD: If the problem seems to occur when the area in question is heated.

(a) Heat the component that is the possible cause of the malfunction with a hair dryer or similar device. Check if the malfunction occurs.

NOTICE:

- **Do not heat to more than 60°C (140°F). Exceeding this temperature may damage components.**
- **Do not apply heat directly to the parts in the ECU.**



3. WATER SPRINKLING METHOD: When the malfunction seems to occur on a rainy day or in highhumidity.

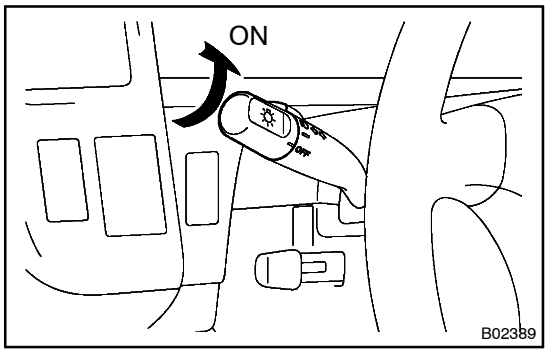
(a) Sprinkle water onto the vehicle and check if the malfunction occurs.

NOTICE:

- **Never sprinkle water directly into the engine compartment. Indirectly change the temperature and humidity by applying water spray onto the front of the radiator.**
- **Never apply water directly onto electronic components.**

HINT:

If the vehicle has or had a water leakage problem, the leakage may have damaged the ECU or connections. Look for evidence of corrosion or shorts. Proceed with caution during water tests.



4. HIGH ELECTRICAL LOAD METHOD: When a malfunction seems to occur when electrical load is excessive.

(a) Turn on all the electrical loads including the heater blower, headlights, rear window defogger, etc., and check if the malfunction occurs.

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. The Supplemental Restraint System (SRS) diagnostic trouble code chart is shown below as an example.

- DTC No.
  Indicates the diagnostic trouble code.
- Page or Instructions
  Indicates the page where the inspection procedures for each circuit is to be found, or gives instructions for checking and repairs.

- Trouble Area
  Indicates the suspect areas of the problem.

- Detection Item
  Indicates the system or details of the problem.

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit for that code listed in the table below (Proceed to the page given for that circuit).

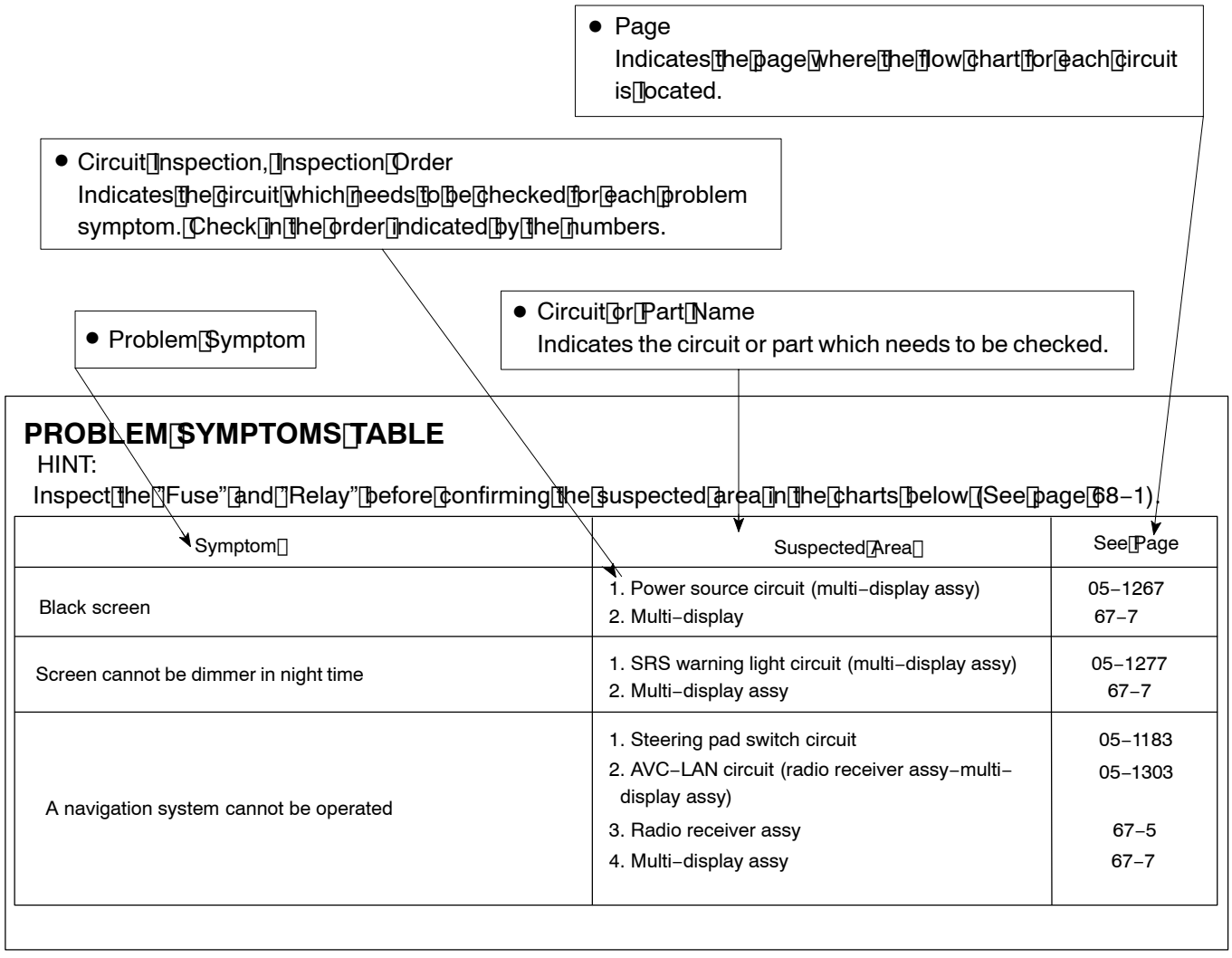
DTC No. (See page)	Detection Item	Trouble Area	SRS Warning Light
B0100/13 (05–119)	● Short in D squib circuit	● Steering wheel pad (squib) ● Spiral cable ● Airbag sensor assembly ● Wire harness	ON
B0101/14 (05–124)	● Open in D squib circuit	● Steering wheel pad (squib) ● Spiral cable ● Airbag sensor assembly ● Wire harness	ON
B0102/11 (05–128)	● Short in D squib circuit (to ground)	● Steering wheel pad (squib) ● Spiral cable ● Airbag sensor assembly ● Wire harness	ON
B0103/12 (05–132)	● Short in D squib circuit (to B+)	● Steering wheel pad (squib) ● Spiral cable ● Airbag sensor assembly ● Wire harness	ON
B0105/53 (05–136)	● Short in P squib circuit	● Front passenger airbag assembly (squib) ● Airbag sensor assembly ● Wire harness	ON
B0106/54	● Open in P squib circuit	● Front passenger airbag assembly (squib) ● Airbag sensor assembly ● Wire harness	
	b circuit (to Ground)	● Front passenger airbag assembly (squib) ● Airbag sensor assembly ● Wire harness	

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 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, the 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

HINT:

Inspect the "Fuse" and "Relay" before confirming the suspected area in the charts below. (See page 68–1).

Symptom	Suspected Area	See Page
Black screen	1. Power source circuit (multi–display assy) 2. Multi–display	05–1267 67–7
Screen cannot be dimmer in night time	1. SRS warning light circuit (multi–display assy) 2. Multi–display assy	05–1277 67–7
A navigation system cannot be operated	1. Steering pad switch circuit 2. AVC–LAN circuit (radio receiver assy–multi–display assy) 3. Radio receiver assy 4. Multi–display assy	05–1183 05–1303 67–5 67–7

CIRCUIT INSPECTION

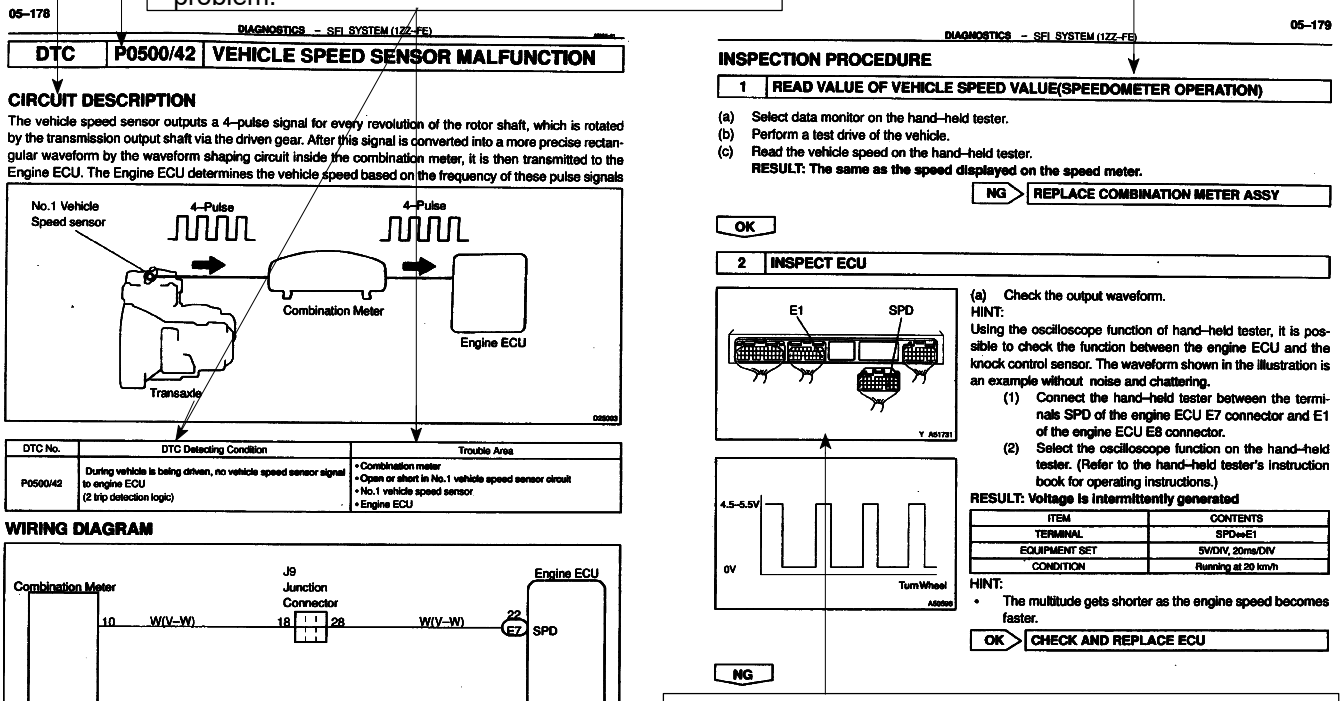
How to read and use each page is shown below.

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

● Diagnostic Trouble Code No. and Detection Item

● Indicates the diagnostic trouble codes, diagnostic trouble code settings and suspect areas for a problem.

● Inspection Procedures
Use the inspection procedures 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.



05–178 DIAGNOSTICS – SFI SYSTEM (1ZZ-FE)

DTC P0500/42 VEHICLE SPEED SENSOR MALFUNCTION

CIRCUIT DESCRIPTION

The 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 Engine ECU. The Engine ECU determines the vehicle speed based on the frequency of these pulse signals

DTC No.	DTC Detecting Condition	Trouble Area
P0500/42	During vehicle is being driven, no vehicle speed sensor signal to engine ECU (2 trip detection logic)	• Combination meter • Open or short in No.1 vehicle speed sensor circuit • No.1 vehicle speed sensor • Engine ECU

WIRING DIAGRAM

05–179 DIAGNOSTICS – SFI SYSTEM (1ZZ-FE)

INSPECTION PROCEDURE

1 READ VALUE OF VEHICLE SPEED VALUE(SPEEDOMETER OPERATION)

(a) Select data monitor on the hand–held tester.
(b) Perform a test drive of the vehicle.
(c) Read the vehicle speed on the hand–held tester.
RESULT: The same as the speed displayed on the speed meter.

NG → REPLACE COMBINATION METER ASSY

OK

2 INSPECT ECU

(a) Check the output waveform.
HINT:
Using the oscilloscope function of hand–held tester, it is possible to check the function between the engine ECU and the knock control sensor. The waveform shown in the illustration is an example without noise and chattering.
(1) Connect the hand–held tester between the terminals SPD of the engine ECU E7 connector and E1 of the engine ECU E8 connector.
(2) Select the oscilloscope function on the hand–held tester. (Refer to the hand–held tester's instruction book for operating instructions.)

RESULT: Voltage is intermittently generated

ITEM	CONTENTS
TERMINAL	SPD⇔E1
EQUIPMENT SET	5V/DIV, 20ms/DIV
CONDITION	Running at 20 km/h

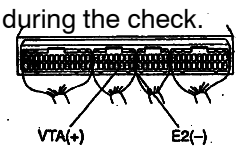
HINT:
• The multitude gets shorter as the engine speed becomes faster.

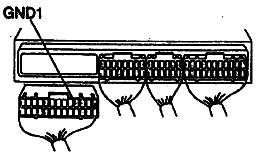
OK → CHECK AND REPLACE ECU

NG

● Wiring Diagram
This shows a wiring diagram of the circuit.
Use this diagram together with 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.

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





Connector being checked is connected.
Connections of tester are indicated by (+), (–) after terminals name.

Connector being checked is disconnected.
For inspection of connector with body ground, there is nothing about the body ground written down.

D25842