010J9–01

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

Carry out a troubleshooting in accordance with the procedures on the following page. Here, only the basic procedures are shown. Details are provided in the Diagnostics section, showing the most effective methods for each circuit. Confirm the troubleshooting procedures first for the relevant circuit before beginning the troubleshooting of that circuit.

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.
Voltage: 10 – 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 applicable chart.

OK → **Go to step 5**

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4	DTC chart

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

→ **Go to step 6**

5	Problem symptoms chart

(a) Check the results obtained in step 3, then confirm the inspection procedures for the system or the part which should be checked using the problem symptoms table.

6	Circuit inspection or parts inspection

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

7	Repair

(a) Repair the affected system or part in accordance with the instructions in step 6.

8	Confirmation test

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

END

CUSTOMER PROBLEM ANALYSIS

HINT:

- In troubleshooting, the problem symptoms must be confirmed accurately and all preconceptions must be cleared 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 conditions when it occurred.
- The following 5 items are important points in the problem analysis. Past problems which are thought to be unrelated and the repair history, etc. may also help in some cases. So, as much information as possible should be gathered and its relationship with the problem symptoms should be correctly ascertained for a reference in troubleshooting. A customer problem analysis table is provided in the Diagnostics section for each system for your use.

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		**Registration No.**	
		Registration Year	/ /
		Frame 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 LAND CRUISER/LAND CRUISER PRADO has various functions. The first function is the Diagnostic Trouble Code (DTC) Check in which a malfunction in the signal circuits to the ECU is stored in code form in the ECU memory. 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, possible areas of the problem can be reduced down quickly and troubleshooting can be performed effectively. The diagnostic functions are incorporated in the following systems in LAND CRUISER/LAND CRUISER PRADO.

System	Diagnostic Trouble Code Check	Input Signal Check (Sensor Check)	Diagnostic Test Mode (Active Test)
EFI System (3RZ–FE Leaded Gasoline)	○ (with Check Mode)	○	
EFI System (3RZ–FE Unleaded Gasoline)	○ (with Check Mode)	○	○
ECD System (5L–E/1KZ–TE/1KD–FTV)	○ (with Check Mode)	○	○
TEMS & Rear Air Suspension System	○	○	○
ABS with EBD System	○	○	○
ABS with EBD & BA & TRC & VSC System	○	○	○
Electronically Controlled Automatic Transmission [ECT]	○ (with Check Mode)	○	
Air Conditioning System	○	○	
Supplemental Restraint 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 still occurring or has occurred in the past but returned to normal at present. In addition, it must be checked in the problem symptom check whether the malfunction indicated by the DTC is directly related to the problem symptom or not. For this reason, the DTC should be checked before and after the symptom confirmation to determine the current conditions. If this is not done, it may, depending on the case, result in an unnecessary troubleshooting for normally operating systems, making it more difficult to detect the problem area, or trying to repair irrelevant areas. Therefore, always follow the procedures in the correct order and perform the DTC check.
- A flow chart showing how to proceed with the troubleshooting using the diagnostic trouble code (DTC) check is shown in the this page. This flow chart shows how to utilize the DTC check effectively. Then, by carefully checking the results, this chart indicates how to proceed either to the DTC troubleshooting or to the troubleshooting of the problem symptoms table.

1	DTC check

2	Making a note and clearing of DTCs displayed

3 Symptom confirmation

a	Problem symptoms exist
b	No problem symptoms exist

a → **Go to step 5**

b

4 Simulation test using the symptom simulation methods

5 DTC check

a	DTC displayed
b	Normal code displayed

a → **Troubleshooting of problem indicated by DTC**

b

6 Symptom confirmation

a	No problem symptoms exist
b	Problem symptoms exist

If a DTC is displayed in the initial DTC check, it indicates that a trouble may have occurred in a wire harness or connector in that circuit in the past. Therefore, check the wire harness and connectors (See page 01–36).

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).

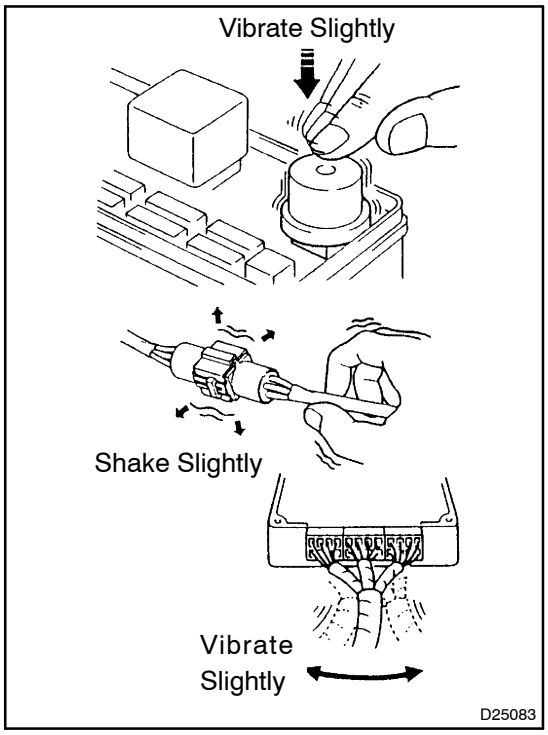
SYMPTOM SIMULATION

HINT:

The most difficult case in troubleshooting is that no problem symptoms occurs. In such cases, a thorough customer problem analysis must be carried out. Then simulate the same or similar conditions and environment in which the problem occurred in the customer's vehicle. No matter how much experience a technician has, or how skilled he may be, if he proceeds to troubleshoot without confirming the problem symptoms, he will tend to overlook something important in the repair operation and make a wrong guess somewhere, which will only lead to a standstill. For example, for a problem which only occurs when the engine is cold, or for a problem which occurs due to vibration caused by the road during driving, etc., the problem can never be determined with the engine hot condition or the vehicle at a standstill. Since vibration, heat or water penetration (moisture) is a likely cause for the problem which is difficult to reproduce, the symptom simulation tests introduced here are effective measures in a point that the external causes are applied to the vehicle in a stationary condition.

Important points in the symptom simulation test:

In the symptom simulation test, the problem symptoms should be confirmed, and the problem area or parts must also be found out. To do so, reduce the possible problem circuits according to the symptoms before starting this test and have the hand–held tester connected beforehand. After that, 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 of each system to reduse the possible causes of the symptom.



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

(a) PART AND SENSOR

(1) Apply slight vibration with your finger to the part of the sensor considered to be the problem cause and check that the malfunction occurs.

HINT:

Applying strong vibration to relays may result in open relays.

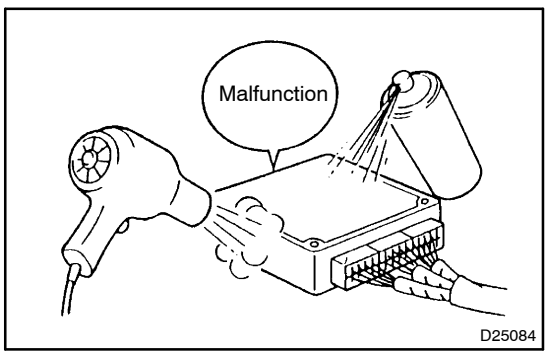
(b) CONNECTORS

(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 to be checked thoroughly.



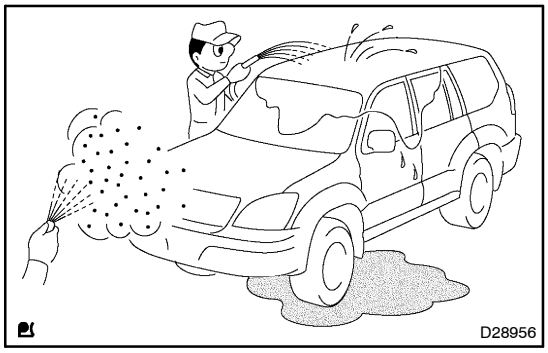
2. HEAT METHOD: When the problem seems to occur when the suspect area is heated.

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

NOTICE:

- **Do not heat the components to more than 60°C (140°F) (Temperature is limited so as not to damage the 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 a high–humidity condition.

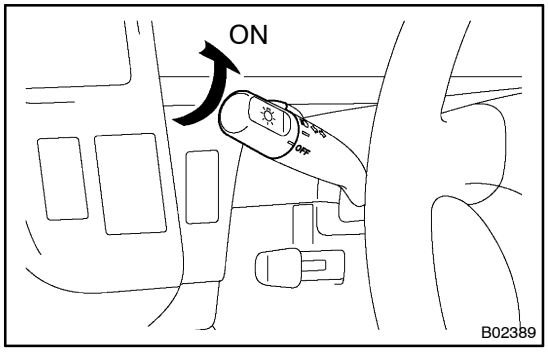
(a) Sprinkle water onto the vehicle and check if the malfunction occurs.

NOTICE:

- **Never sprinkle water directly onto the engine compartment, but indirectly change the temperature and humidity by applying water spray onto the radiator front surface.**
- **Never apply water directly onto the electronic components.**

HINT:

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



4. OTHERS: When the 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

The inspection procedures are shown in the table below. This table permits an efficient and accurate troubleshooting using the diagnostic trouble codes displayed in the diagnostic trouble code chart. Proceed with troubleshooting in accordance with the inspection procedures listed in the diagnostic chart corresponding to the diagnostic trouble codes displayed. The diagnostic trouble code chart for the Supplemental Restraint System 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 of the problem or contents 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).

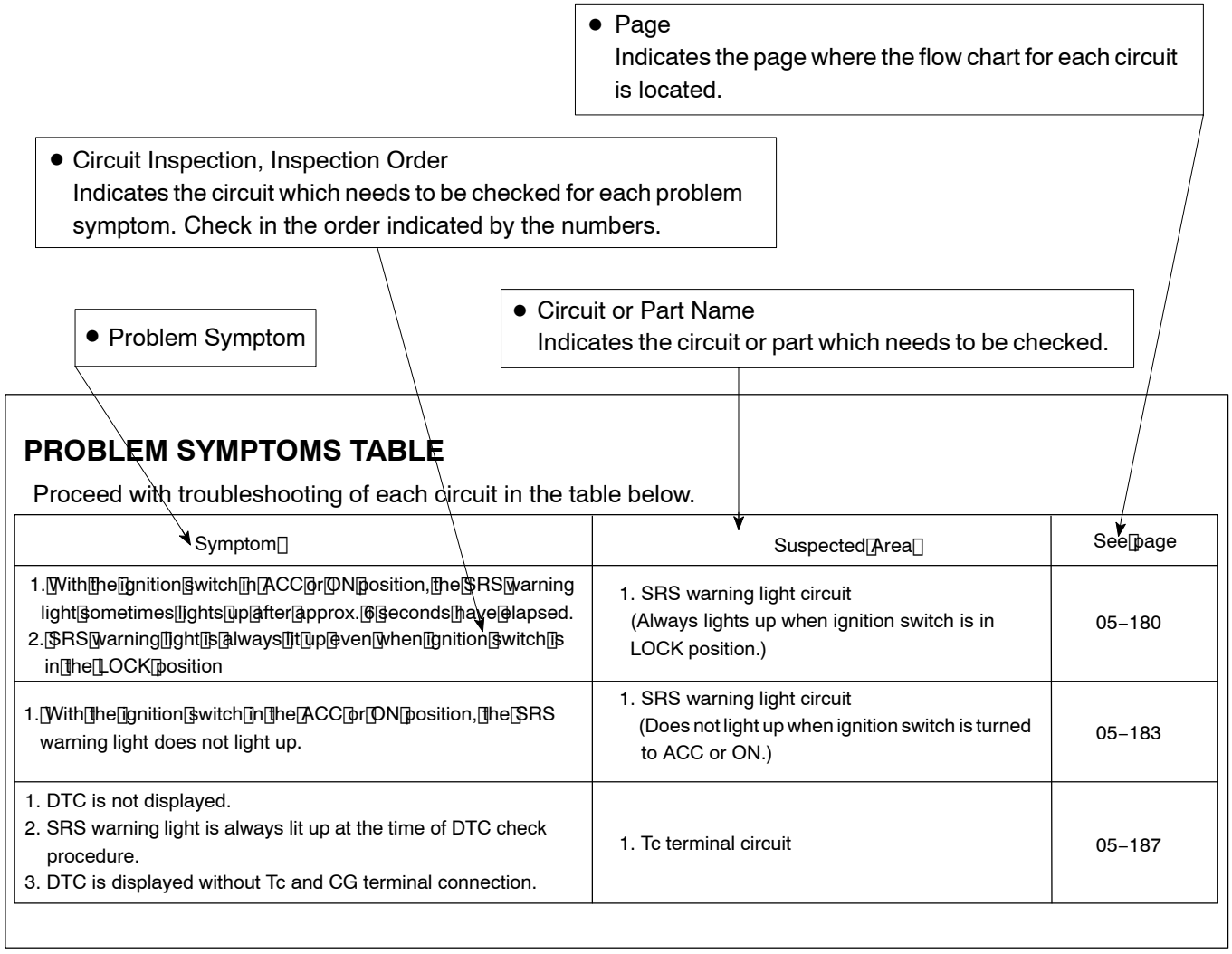
DTC No. (See page)	Detection Item	Trouble Area	SRS Warming Light
B0100/13 (05–119)	● Short in D squib circuit	● Steering wheel pad (squib) ● Spiral cable ● Airbag sensor assembly ● Wire harness	ON
B0101/14 (05–124)	● Open in D squib circuit	● Steering wheel pad (squib) ● Spiral cable ● Airbag sensor 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 the problem when a Normal code is displayed in the diagnostic trouble code chart but the problem is still occurring. Numbers in the table indicate the inspection order in which the circuits or parts should be checked.

HINT:

When the problem is not detected by the diagnostic system even though the problem symptom is present, it is considered that the problem is occurring outside the detection range of the diagnostic system, or that the problem is occurring in a system other than the diagnostic system.



PROBLEM SYMPTOMS TABLE

Proceed with troubleshooting of each circuit in the table below.

Symptom	Suspected Area	See page
1. With the ignition switch in ACC or ON position, the SRS warning light sometimes lights up after approx. 60 seconds have elapsed. 2. SRS warning light is always lit up even when ignition switch is in the LOCK position	1. SRS warning light circuit (Always lights up when ignition switch is in LOCK position.)	05–180
1. With the ignition switch in the ACC or ON position, the SRS warning light does not light up.	1. SRS warning light circuit (Does not light up when ignition switch is turned to ACC or ON.)	05–183
1. DTC is not displayed. 2. SRS warning light is always lit up at the time of DTC check procedure. 3. DTC is displayed without Tc and CG terminal connection.	1. Tc terminal circuit	05–187

CIRCUIT INSPECTION

How to read and use each page is shown below.

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

● Diagnostic Trouble Code No. and Detection Item

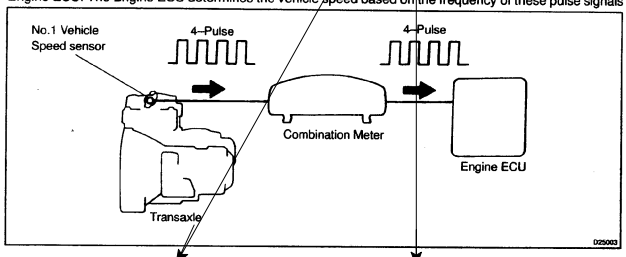
● Indicates the diagnostic trouble codes, diagnostic trouble code set parameters and suspect areas of the problem.

● 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.

DTC	P0500/42	VEHICLE SPEED SENSOR MALFUNCTION

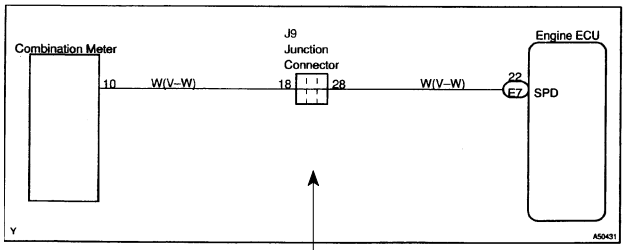
CIRCUIT DESCRIPTION

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



● 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.

INSPECTION PROCEDURE

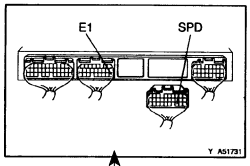
1 READ VALUE OF VEHICLE SPEED VALUE(SPEEDOMETER OPERATION)

(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.

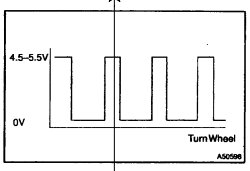
NG > REPLACE COMBINATION METER ASSY

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

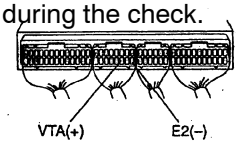
ITEM	CONTENTS
TERMINAL	SPD⇔E1
EQUIPMENT SET	5V/DIV, 20ms/DIV
CONDITION	Running at 20 km/h

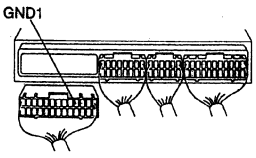
HINT:
• The multitude gets shorter as the engine speed becomes faster.

OK > CHECK AND REPLACE ECU

NG

● 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.
On inspection with body ground side is not specified.

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