

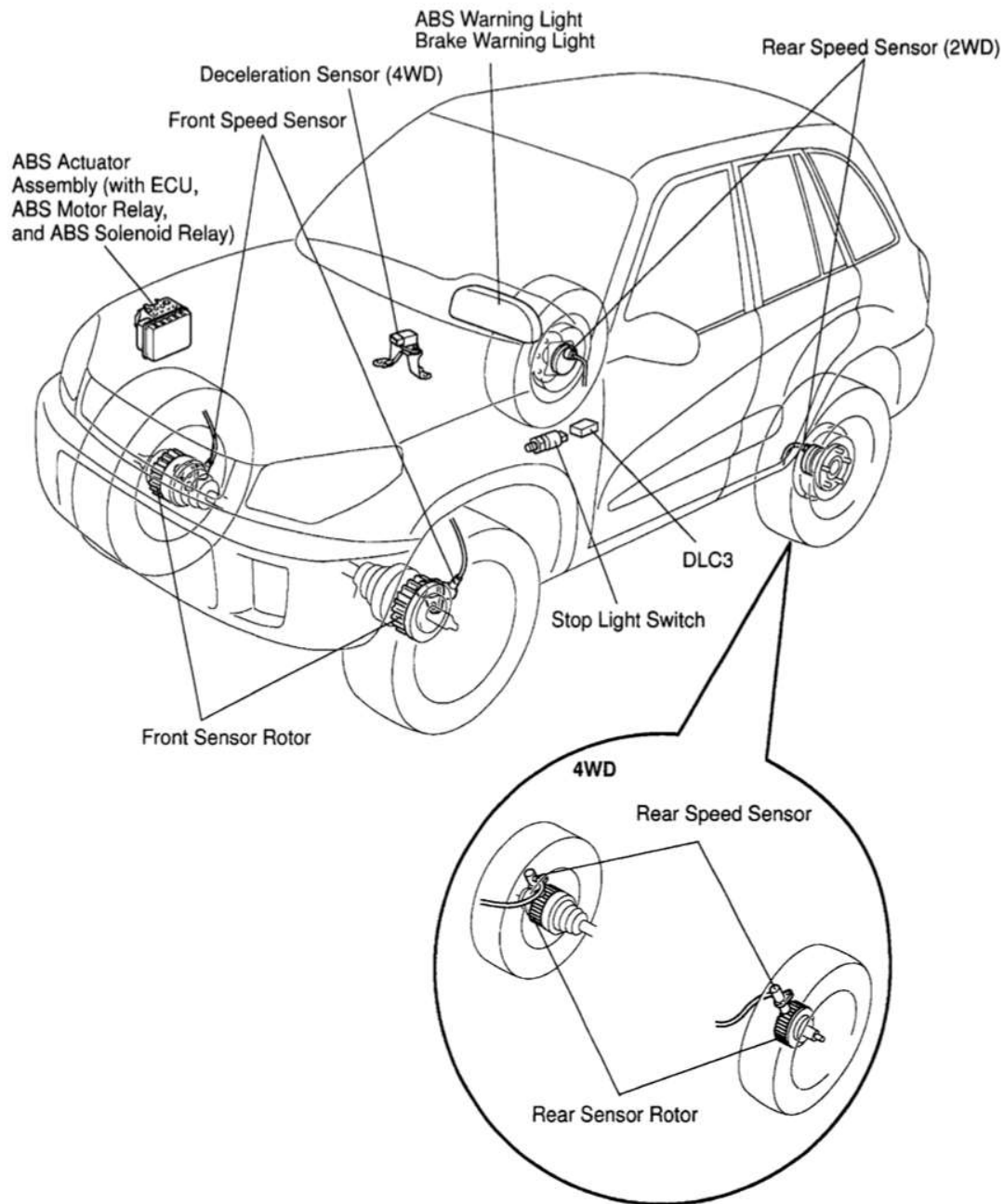
2002-03 BRAKES

Anti-Lock - RAV4

DESCRIPTION

CAUTION: See ANTI-LOCK BRAKE SAFETY PRECAUTIONS article in **GENERAL INFORMATION**.

Anti-Lock Brake System (ABS) consists of hydraulic unit, actuator, solenoids, pump motor, ABS Electronic Control Unit (ECU), relays, deceleration sensor, and wheel speed sensors. See **Fig. 1** . An ABS warning light is located in instrument cluster. ABS ECU performs a bulb test by illuminating ABS warning light for 3 seconds when ignition is turned on. A primary check is performed after each engine start, and when initial vehicle speed exceeds 6 MPH. Under normal operation, an actuator noise is heard as vehicle is started or as speed exceeds 6 MPH. Anti-lock system remains active until vehicle speed drops to less than 3 MPH.



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Fig. 1: Locating Brake System Components

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: For additional brake system information, see DISC & DRUM article in BRAKES.

OPERATION

Under normal driving conditions, ABS functions as a standard brake system. With detection of wheel lock-up, short pedal pulsations occurring in rapid succession will be felt in brake pedal. Pedal pulsation will continue until there is no longer a need for ABS function, or until vehicle speed falls to less than 3 MPH. Maintaining constant force on brake pedal provides shortest stopping distance.

BLEEDING BRAKE SYSTEM

CAUTION: Brake fluid will damage painted surfaces. If brake fluid contacts a painted surface, wipe off immediately and clean with alcohol. Use only DOT 3 brake fluid from a sealed container. DO NOT mix different brake fluid types.

NOTE: Use only DOT 3 brake fluid from a sealed container. DO NOT mix brake fluid types.

MASTER CYLINDER

Ensure brake fluid reservoir is full. Disconnect brakelines from master cylinder. Have an assistant slowly depress brake pedal and hold. Block off outlet ports on master cylinder with finger, then have assistant release brake pedal. Repeat 3 or 4 times or until master cylinder is bled.

BRAKELINES

NOTE: Bleed brakes from farthest wheel first to closest wheel.

Install bleeder hose with container of clean brake fluid on wheel cylinder or caliper. Depress brake pedal several times and hold, then loosen bleeder valve. Tighten bleeder valve when fluid flow stops, then release brake pedal. Repeat until air bubbles are no longer present for each wheel.

TROUBLE SHOOTING

PRELIMINARY INSPECTION

Begin diagnosis with a basic visual inspection of brake fluid level, tire size and other mechanical brake system components which may affect anti-lock operation. Check system sensors, wiring harness and connectors for proper installation, routing and connection. Ensure all system fuses are okay. Repair as necessary.

If cause of faulty operation cannot be located with basic diagnosis, ABS electronic control system must be checked. See **SELF-DIAGNOSTIC SYSTEM**.

When ignition is turned ON, ABS warning light should come on, then go out after 3 seconds. If ABS warning light does not operate as specified, go to **ABS WARNING LIGHT** under SYSTEM TESTS.

SYMPTOM DIAGNOSIS

If a normal DTC is displayed during DTC check but problem still occurs, check circuits for each problem symptom in order given in **SYMPTOM DIAGNOSIS** table, then see specified procedure or appropriate test under **SELF-DIAGNOSTIC SYSTEM** or **DIAGNOSTIC TESTS** .

SYMPTOM DIAGNOSIS

Symptom	Circuit, DTC Or Procedure
ABS Inoperative ⁽¹⁾	
Check DTC, Confirm Normal Code Is Output	<u>RETRIEVING DIAGNOSTIC TROUBLE CODES</u>
Power IG Source Circuit	<u>DTC 41</u>
Speed Sensor Circuit	<u>31, 32, 33 & 34</u>
Check For Hydraulic Leakage	Visual Inspection
ABS Does Not Operate Efficiently ⁽¹⁾	
Check DTC, Confirm Normal Code Is Output	<u>RETRIEVING DIAGNOSTIC TROUBLE CODES</u>
Speed Sensor Circuit	<u>31, 32, 33 & 34</u>
Stoplight Switch Circuit	<u>DTC 49: STOP LIGHT SWITCH CIRCUIT</u>
Check For Hydraulic Leakage	Visual Inspection
ABS Warning Light Or Brake Warning Abnormal	
ABS Warning Light Circuit	<u>ABS WARNING LIGHT</u>
Brake Warning Light Circuit	
ABS ECU	Replace ABS ECU
Unable To Perform DTC Check ⁽¹⁾	
ABS Warning Light Circuit	<u>ABS WARNING LIGHT</u>
Tc Terminal Circuit	<u>Tc TERMINAL</u>
Unable To Perform Sensor Diagnostics	
Ts Terminal Circuit	<u>Ts TERMINAL</u>
ABS ECU	Replace ABS ECU
⁽¹⁾ If all circuits check okay and problem is still occurring, replace ABS ECU.	

SELF-DIAGNOSTIC SYSTEM

NOTE: DO NOT start engine when retrieving diagnostic codes.

RETRIEVING DIAGNOSTIC TROUBLE CODES

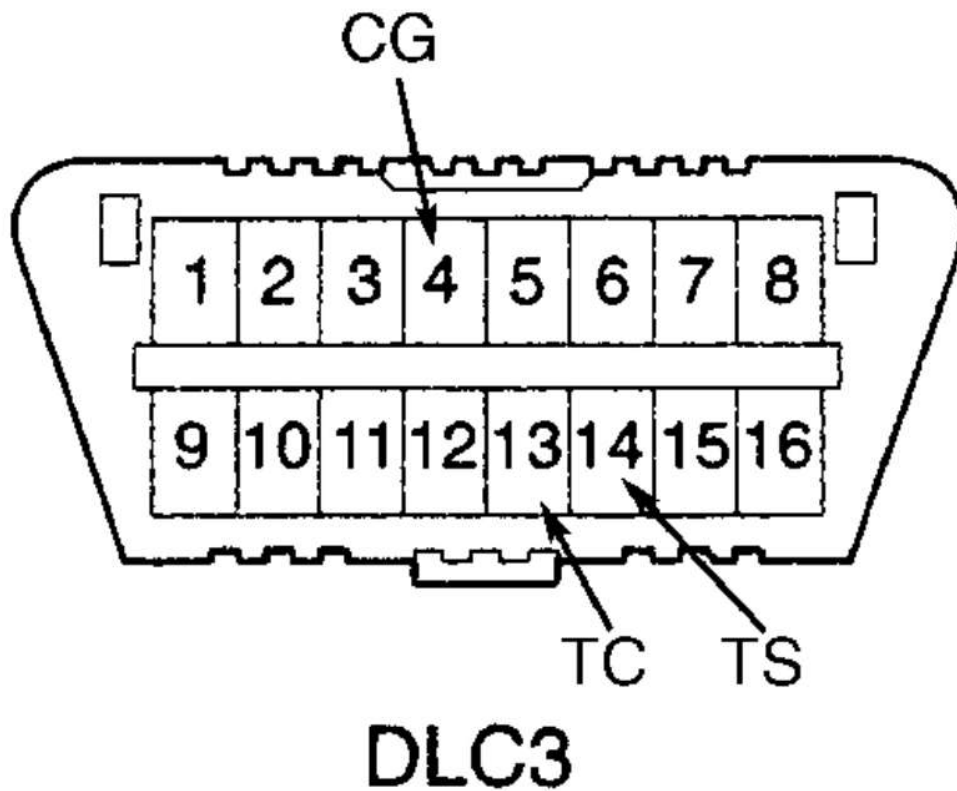
NOTE: Speed sensor diagnostics and code retrieval use different DLC terminals with short pin connector. If a speed sensor or speed sensor circuit problem is suspected, see **SPEED SENSOR DIAGNOSTICS** .

ABS Light Diagnostics

1. Ensure battery voltage is fully charged. Release parking brake. Turn ignition switch to ON position. ABS warning light and brake light should illuminate, then go out after 3 seconds. If warning light does not illuminate, check fuse, bulb, and wiring harness. If indicator check result is not normal, proceed to **ABS WARNING LIGHT** under SYSTEM TESTS.

NOTE: When parking brake is applied or the level of brake fluid is low, BRAKE warning light illuminates. If indicator check result is not normal, proceed to **ABS WARNING LIGHT** or **BRAKE WARNING LIGHT CIRCUIT** . Check ABS1 fuse, ABS2 fuse and ABS actuator assembly.

2. To check for DTC, use special tool (09843-18040), connect to terminals Tc and CG of DLC3. See **Fig. 2** . Turn ignition switch ON. Read DTC from ABS warning light on combination meter. If no code appeared, inspect ABS warning light circuit or diagnostic circuit. See **ABS WARNING LIGHT** or **Tc TERMINAL** under SYSTEM TESTS. If 2 or more malfunctions are indicated at the same time the lowest numbered DTC will be displayed first.
3. For code definitions, see **DIAGNOSTIC TROUBLE CODE DEFINITIONS** . For DTC diagnosis, see **DIAGNOSTIC TESTS** . After replacing or repairing components, clear diagnostic codes. See **CLEARING DIAGNOSTIC TROUBLE CODES** .



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Fig. 2: Identifying DLC3 Terminal

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Toyota Hand-Held Tester

Connect TOYOTA hand-held tester to DLC3. Turn ignition ON. Read DTC by following prompts on tester screen. Refer to TOYOTA hand-held tester operator's manual.

CLEARING DIAGNOSTIC TROUBLE CODES

NOTE: DTCs cannot be cleared by disconnecting battery cable or removing ECU-IG fuse.

ABS Warning Light

Using special tool (09843-18040), turn ignition switch ON. Clear DTC stored in ECU by depressing brake pedal 8 or more times within 5 seconds. Check that the warning light shows normal code. Remove tool from terminal of DLC3.

Toyota Hand-Held Tester

Connect TOYOTA hand-held tester to DLC3. Turn ignition switch ON. Operate TOYOTA tester to erase codes. Refer to TOYOTA hand-held tester operator's manual.

DIAGNOSTIC TROUBLE CODE DEFINITIONS

DTC DEFINITIONS

DTC	Code	Circuit/Malfunction
ABS-Related		
<u>C0200</u>	<u>31</u>	Malfunction In RF Speed Sensor Signal
<u>C0205</u>	<u>32</u>	Malfunction In LF Speed Sensor Signal
<u>C0210</u>	<u>33</u>	Malfunction In RR Speed Sensor Signal
<u>C0215</u>	<u>34</u>	Malfunction In LR Speed Sensor Signal
<u>C0226</u>	<u>21</u>	Open/Shorted RF Solenoid, Defective ABS Actuator
<u>C0236</u>	<u>22</u>	Open/Shorted LF Solenoid, Defective ABS Actuator
<u>C0246</u>	<u>23</u>	Open/Shorted RR Solenoid, Defective ABS Actuator
<u>C0256</u>	<u>24</u>	Open/Shorted LR Solenoid, Defective ABS Actuator
<u>C0273</u>	<u>13</u>	Open In ABS Pump Motor Relay Circuit
<u>C0274</u>	<u>14</u>	Short In ABS Pump Motor Relay Circuit
<u>C0278</u>	<u>11</u>	Open In ABS Solenoid Relay Circuit
<u>C0279</u>	<u>12</u>	Short In ABS Solenoid Relay Circuit
<u>C1235</u>	<u>35</u>	Foreign Matter Is Attached To Right Front Sensor
<u>C1236</u>	<u>36</u>	Foreign Matter Is Attached To Left Front Sensor
<u>C1237</u> ⁽¹⁾	<u>37</u> ⁽¹⁾	One Tire Is Different Size Than The Others
<u>C1238</u>	<u>38</u>	Foreign Matter Is Attached To Right Rear Sensor
<u>C1239</u>	<u>39</u>	Foreign Matter Is Attached To Left Rear Sensor
<u>C1241</u>	<u>41</u>	Excessively Low/High Battery Voltage
<u>C1243</u> ⁽²⁾	<u>43</u> ⁽²⁾	Deceleration Sensor Malfunction (Constant Output)
<u>C1244</u> ⁽²⁾	<u>44</u> ⁽²⁾	Open/Short In Deceleration Sensor Circuit
<u>C1245/ 45</u> ⁽²⁾	<u>45</u> ⁽²⁾	Deceleration Sensor Malfunction
<u>C1249</u>	<u>49</u>	Open In Stoplight Switch Circuit
<u>C1251</u>	<u>51</u>	Pump Motor Locked Up, Open Ground Circuit
Speed Sensor-Related		
<u>C1271</u>	<u>71</u>	RF Speed Sensor Signal Low Voltage
<u>C1272</u>	<u>72</u>	LF Speed Sensor Signal Low Voltage
<u>C1273</u>	<u>73</u>	RR Speed Sensor Signal Low Voltage

<u>C1274</u>	<u>74</u>	LR Speed Sensor Signal Low Voltage
<u>C1275</u>	<u>75</u>	RF Speed Sensor Abnormal Change In Output Voltage
<u>C1276</u>	<u>76</u>	LF Speed Sensor Abnormal Change In Output Voltage
<u>C1277</u>	<u>77</u>	RR Speed Sensor Abnormal Change In Output Voltage
<u>C1278</u>	<u>78</u>	LR Speed Sensor Abnormal Change In Output Voltage
(1) 2WD models.		
(2) 4WD models.		
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FREEZE FRAME DATA

The vehicle (sensor) status at the occurrence of abnormality of the diagnosis code, and during the ABS operation can be memorized and displayed using the hand-held tester. Only one record of freeze frame data is stored. However, freeze frame data during the ABS operating is always updated. After storage of freeze frame data, up to 31 ignition "ON" operations are stored and displayed. If the ignition switch "ON" operation exceeds 31 times, "31" appears on the display. See [Fig. 3](#).

Hand-held tester display	Measurement Item	Reference Value*
G (BACK & FORTH)	Back and forth G (Only for 4WD)	-1.5 - 1.5
VEHICLE SPD	Vehicle speed	Speed indication of a meter
SPD GRADE	Vehicle speed grade (Only for 2WD)	-1.5 - 1.5
STOP LIGHT SW	Stop light switch signal	Stop light switch ON: ON, OFF: OFF
# IG ON	Numbers of operations of ignition switch ON after memorizing freeze frame data	0 - 31

*: If no conditions are specifically stated for "Idling", it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

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Fig. 3: Freeze Frame Data Table

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SPEED SENSOR DIAGNOSTICS

1. Ensure battery voltage exists. Turn ignition OFF. Using special tool (09843-18040), connect terminals Ts and CG if DLC3. See [Fig. 2](#). Start engine. Check ABS warning light blinks. If warning light does not blink, inspect ABS warning light circuit. See [ABS WARNING LIGHT](#) under SYSTEM TESTS.
2. Drive vehicle straight forward at a speed faster than 28 mph for several seconds and check that ABS warning light goes OFF. Stop vehicle. Using tool, connect terminals Ts and CG of DLC3. Turn ignition switch ON. Read number of blinks of ABS warning light.

NOTE: The sensor check may not be completed if front wheels are spun or steering wheel is turned during check.

3. For list of DTC and definitions, see [DIAGNOSTIC TROUBLE CODE DEFINITIONS](#). If every

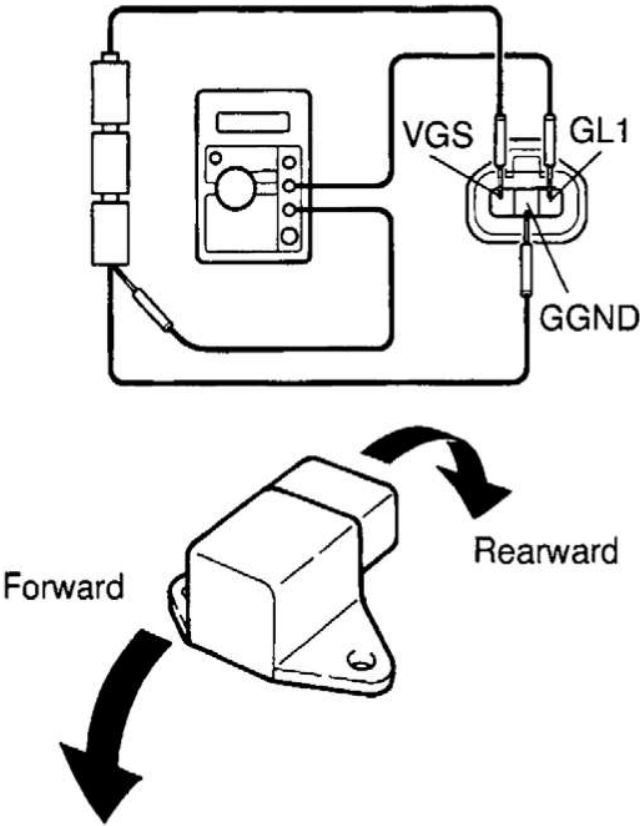
sensor is normal, a normal code is output. (A cycle of .25 seconds ON and .25 seconds OFF is repeated). If 2 or more malfunctions are identified at the same time, the lowest numbered code will be displayed first. After doing check, disconnect hand-held tester and turn ignition switch OFF.

DECELERATION SENSOR SIGNAL CHECK (4WD)

CAUTION: DO NOT apply voltage of 6 volts or more to terminals.

1. Connect 3 dry batteries of 1.5 volts in series. Connect terminal VGS to batteries' positive (+) terminal, and terminal GGND to batteries' negative (-) terminal. Apply about 4.5 volts to terminals VGS and GGND. Check output voltage of terminal GL1. See **Fig. 4**.

NOTE: **If the sensor is tilted a lot, it may show the wrong value. If dropped, the sensor should be replaced. When sensor is removed from vehicle, it should NOT be placed upside down.**



Condition	Standard Value
Horizontal	About 2.3 V
Lean forward	0.4 V – about 2.3 V
Lean rearward	About 2.3 V – 4.1 V

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Fig. 4: Declaration Sensor Terminal Check Table
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DIAGNOSTIC TESTS

DTCS C0200/ 31, C0205/ 32, C0210/ 33, C0215/ 34, C1235/ 35, C1236/ 36, C1238/ 38 & C1239/ 39:
SPEED SENSOR CIRCUIT

Circuit Description

Speed sensor detects wheel speed and sends appropriate signals to ABS ECU. These signals are used to control ABS system. Front and rear sensor rotors each have 48 teeth. When rotor rotates, magnetic field emitted by

permanent magnet in speed sensor generates an AC voltage. Since frequency of this AC voltage changes in direct proportion to speed of rotor, frequency is used by ABS ECU to detect speed of each wheel. If malfunction occurs in speed sensor circuit, ABS ECU cuts off current to ABS solenoid relay and prohibits ABS control.

DTC No. C0200/ 31 & C1235/ 35 - Right Front speed sensor.

DTC No. C0205/ 32 & C1236/ 36 - Left Front speed sensor.

DTC No. C0210/ 33 & C1238/ 38 - Right Rear speed sensor.

DTC No. C215/ 34 & C1239/ 39- Left Rear speed sensor.

DTC Detecting Condition

For DTC detection condition chart, see **Fig. 5** .

DTC No.	DTC Detection Condition	Trouble Area
C0200/31 C0205/32	Conditions of (a), (b), (c) or (d) is detected: (a) Conditions of (1), (2) and (3) continue for * sec. or more and condition of (4) occurs 7 times or more in the meantime of switching ignition switch ON and OFF: (1) ABS non-operation (2) Wheel speed is 10 km/h (6 mph) or more (3) One eighth of wheel speed is more than minimum wheel speed (4) Momentary interruption of speed sensor (b) Continues (1), (2), (3) and one of conditions (4), (5) and (6) continue for * sec. or more: (1) ABS non-operation (2) Maximum wheel speed is 10 km/h (6 mph) or more (3) Wheel speed is 0 km/h (0 mph) (4) ECU internal open circuit (5) Maximum rear wheel speed is not 0 km/h (0 mph) (6) Any of maximum rear wheel speed sensor is momentarily interrupted, or both of rear wheel is locked for a long time	• Each speed sensor harness and connector • Right front, left front, right rear or left rear speed sensor • Speed sensor rotor • Each speed sensor circuit
C0210/33 C0215/34	(c) Open circuit of ECU internal to wheel speed sensor is ON for 0.5 sec. (d) Conditions (1) and (2) continue for 10 sec. or more, and condition of (3) continues for 20 sec. or more and 8 time or more: (1) ABS non-operation (2) Maximum wheel speed is more than maximum front wheel speed for 20 km/h (12 mph) or more (3) Front maximum wheel speed is 20 km/h (12 mph) or more, ABS is non-operation and one eighth of maximum wheel speed is more than maximum rear wheel speed for 20 sec. or more	• Each speed sensor harness and connector • Rear axle hub • Right rear, left rear speed sensor • Speed sensor rotor • Each speed sensor circuit
C1235/35 C1236/36	Vehicle speed is at 20 km/h (12mph) or more and speed sensor signal pick up noise continues for 75 times or more for 5 sec.	• Each speed sensor harness and connector • Right front or left front speed sensor • Speed sensor rotor • Each speed sensor circuit
C1238/38 C1239/39		• Each speed sensor harness and connector • Right rear or left rear speed sensor • Speed sensor rotor • Each speed sensor circuit

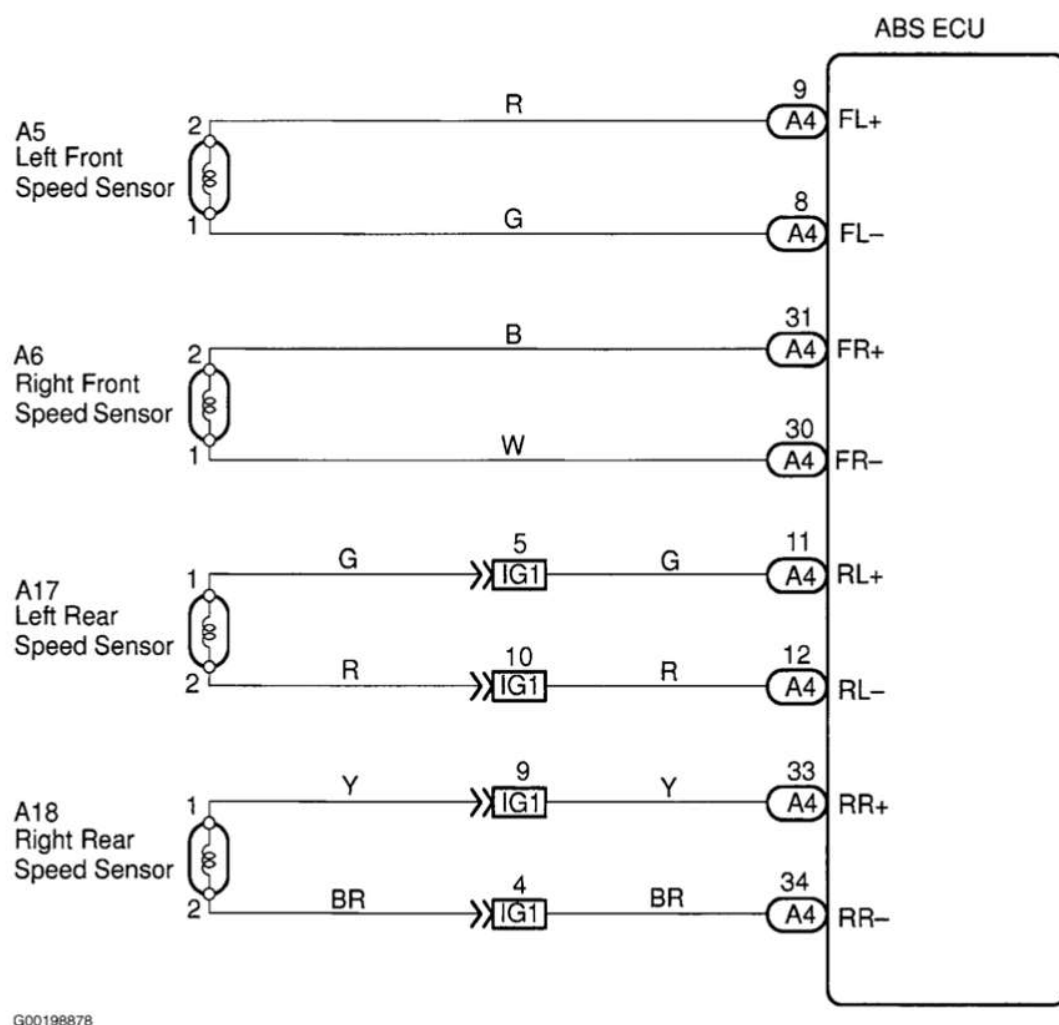
*: 2WD vehicle is for 15 sec. or more, 4WD vehicle is for 30 sec. or more

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Fig. 5: DTC Detection Condition Trouble Chart
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Diagnostic Procedure

For wiring diagram, see **Fig. 6** . For testing procedures, see **Fig. 7 -Fig. 11** .

**Fig. 6: DTCs 31-39 Wiring Diagram**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Start the inspection from step 1 in case of using the TOYOTA hand-held tester and start from step 2 in case of not using the TOYOTA hand-held tester.

1	Check output value of speed sensor.
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PREPARATION:

- (a) Connect the TOYOTA hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the TOYOTA hand-held tester main switch ON.
- (c) Select the DATALIST mode on the TOYOTA hand-held tester.

CHECK:

Check that there is no difference between the speed value output from the speed sensor and displayed on the hand-held tester and the speed value displayed on the speedometer when driving the vehicle.

OK:

There is almost no difference between the displayed speed values.

HINT:

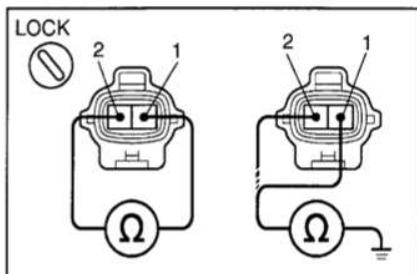
There is tolerance of $\pm 10\%$ in the speedometer indication.

OK

Check and replace ABS actuator assembly.

NG

2	Check speed sensor.
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**Front speed sensor:****PREPARATION:**

- (a) Remove the front fender liner.
- (b) Make sure that there is no looseness at the connector lock part and connecting part of the connector.
- (c) Disconnect the speed sensor connector.

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector.

OK:

Resistance: 0.6 – 2.5 k Ω at $-40 - 120^{\circ}\text{C}$

CHECK:

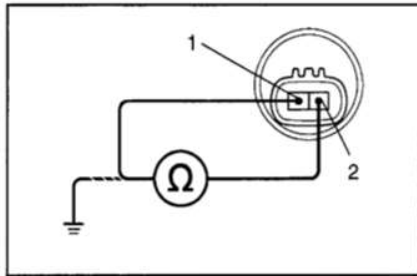
Measure the resistance between terminals 1 and 2 of the speed sensor connector and the body ground.

OK:

Resistance: 10 M Ω or higher

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Fig. 7: DTCs 31-39 Testing Procedures (1 of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**Rear speed sensor (2WD):****PREPARATION:**

- Make sure that there is no looseness at the connector lock part and connecting part of the connector.
- Disconnect the speed sensor connector at the hub bearing.

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector.

OK:

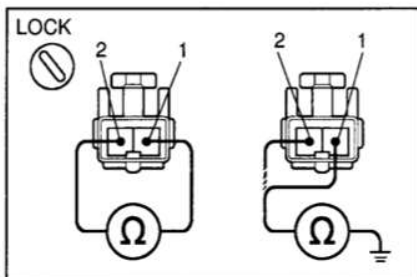
Resistance: 0.8 – 1.9 kΩ at –40 – 120°C

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector and the body ground.

OK:

Resistance: 1 MΩ or higher

**Rear speed sensor (4WD):****PREPARATION:**

- Make sure that there is no looseness at the connector lock part and connecting part of the connector.
- Disconnect the speed sensor connector at the hub bearing.

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector.

OK:

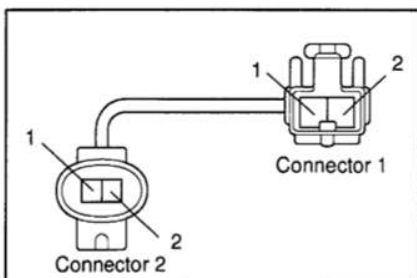
Resistance: 0.65 – 1.8 kΩ at –40 – 120°C

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector and the body ground.

OK:

Resistance: 1 MΩ or higher

**Rear speed sensor sub-wire harness (2WD):****PREPARATION:**

- Remove the seat cushion and seatback.
- Make sure that there is no looseness at the connector lock part and connecting part of the connector.
- Disconnect the speed sensor connector inside the vehicle.

CHECK:

- Measure the resistance between terminal 1 of connector 1 and terminal 2 of connector 2.
- Measure the resistance between terminal 2 of connector 1 and terminal 1 of connector 2.

OK:

Resistance: below 1 Ω

CHECK:

Measure the resistance between terminals 1 and 2 of the speed sensor connector 1 and the body ground.

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Fig. 8: DTCs 31-39 Testing Procedures (2 of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK:Resistance: 10 M Ω or higher**NG**

Replace speed sensor or sub-wire harness.

NOTICE:

Check the speed sensor signal last.

OK**3**

Check for open and short circuit in harness and connector between each speed sensor and ABS ECU.

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Repair or replace harness or connector.

OK**4**

Check speed sensor installation.

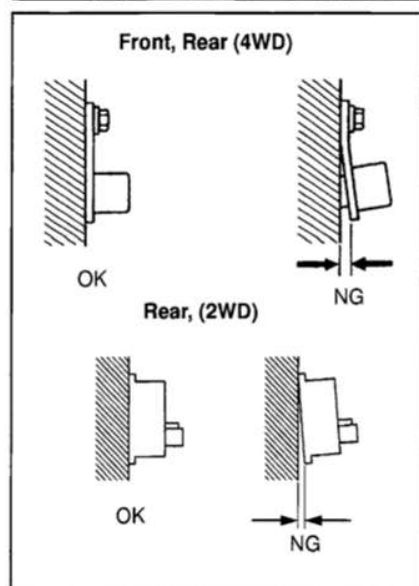
CHECK:

Check the speed sensor installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and steering knuckle or rear axle carrier.

Torque: 8.0 N·m (8.2 kgf·cm, 71 in·lbf) except 4WD.

**NG**Replace*¹ and repair*² speed sensor.**NOTICE:**

Check the speed sensor signal last.

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Fig. 9: DTCs 31-39 Testing Procedures (3 of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

*1: Front, rear (4WD)

Remove the sensor and reinstall it. Then do not exchange the sensor when it is as shown in the illustration at the time of reinstallation.

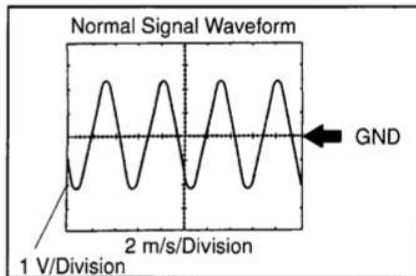
Clean the attached part, such as the tip of sensor, and reinstall the sensor.

*2: Rear (2WD)

Replace the speed sensor.

OK

5 Check speed sensor and sensor rotor serrations.



Reference: INSPECTION USING OSCILLOSCOPE

PREPARATION:

- Remove the ABS ECU with connector still connected.
- Connect the oscilloscope to terminals FR+, FL+, RR+ or RL+ and GND of the ABS ECU connector.

CHECK:

Drive the vehicle at about 20 km/h (13 mph), and check the signal waveform.

HINT:

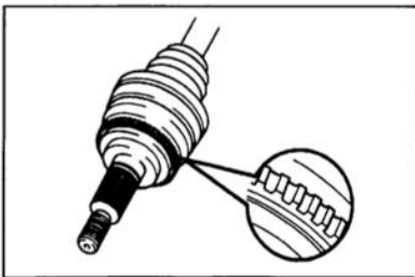
Check that foreign objects are stuck on the sensor tip in case of noise occurrence.

OK

Check and replace ABS actuator assembly.

NG

6 Check sensor rotor and sensor tip.



Front:

PREPARATION:

Remove the front drive shaft.

CHECK:

Check the sensor rotor serrations.

OK:

No scratches or missing teeth or no foreign objects.

HINT:

If foreign objects stick to the rotor, remove them.

PREPARATION:

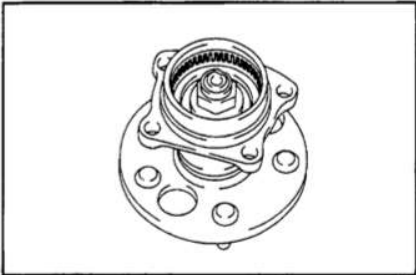
Remove the front speed sensor.

CHECK:

Check the sensor tip.

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Fig. 10: DTCs 31-39 Testing Procedures (4 of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



OK:
No scratches or no foreign objects on the sensor tip.

HINT:
If foreign objects stick to the sensor tip, remove them before re-use. Check the rotor for the presence of foreign objects and remove them if they stick.

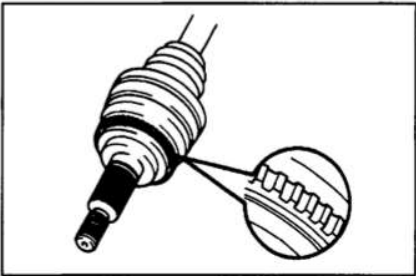
Rear (2WD):
PREPARATION:
Remove the rear axle hub.

CHECK:
Check the sensor rotor serrations.

OK:
No scratches or missing teeth or no foreign objects.

HINT:
If foreign objects stick to the rotor, remove them.

CHECK:
Check the sensor tip.



OK:
No scratches or no foreign objects on the sensor tip.

Rear (4WD):
PREPARATION:
Remove the rear drive shaft.

CHECK:
Check the sensor rotor serrations.

OK:
No scratches or missing teeth or no foreign objects.

HINT:
If foreign objects stick to the rotor, remove them.

PREPARATION:
Remove the rear speed sensor.

CHECK:
Check the sensor tip.

OK:
No scratches or no foreign objects on the sensor tip.

HINT:
If foreign objects stick to the sensor tip, remove them before re-use. Check the rotor for the presence of foreign objects and remove them if they stick.

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Replace sensor rotor or speed sensor.

NOTICE:
Check the speed sensor signal last.

OK

Check and replace ABS actuator assembly.

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Fig. 11: DTCs 31-39 Testing Procedures (5 of 5)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTCS C0226/ 21, C0236/ 22, C0246/ 23, C0256/ 24: ABS SOLENOID

Circuit Description

ABS solenoid turns on when signals are received from ABS ECU and controls pressure acting on calipers/wheel cylinders, thus controlling braking force. If malfunction occurs in actuator solenoid circuit, ABS ECU cuts off current to ABS solenoid relay and prohibits ABS control. To trigger DTC 21-24, solenoid relay is ON and IG1 terminal voltage is 9.5-18.5 volts, solenoid circuit is open/short for 0.05 seconds or longer.

DTCS C0226/ 21 - Right Front solenoid valve.

DTCS C0236/ 22 - Left Front solenoid valve.

DTCS C0246/ 23 - Right Rear solenoid valve.

DTCS C0256/ 24 - Left Rear solenoid valve.

Diagnostic Procedure

For wiring diagram, see **Fig. 12** . For testing procedures, start by clearing DTC. See **CLEARING DIAGNOSTIC TROUBLE CODES** under SELF-DIAGNOSTIC SYSTEM. Turn ignition OFF. Turn ignition back ON, and check if same DTC is stored in memory. IF not, there is no problem . If same DTC is stored, replace ABS ECU. See **ACTUATOR/ABS ECU** under REMOVAL & INSTALLATION.

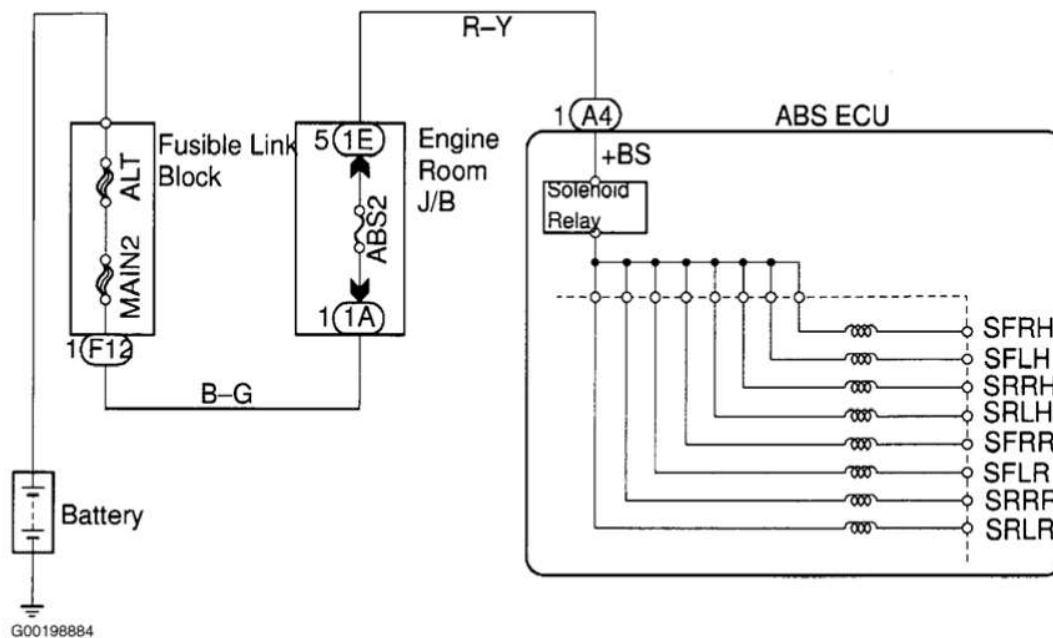


Fig. 12: DTCS 21-24 Wiring Diagram

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTCS C0273/ 13 & C0274/ 14: ABS MOTOR RELAY CIRCUIT

Circuit Description

The ABS motor relay supplies power to ABS pump motor. While ABS is activated, the ECU switches the ABS motor relay ON and operates ABS pump motor.

DTC Detecting Condition

For DTC detection chart and wiring diagram, see **Fig. 13** .

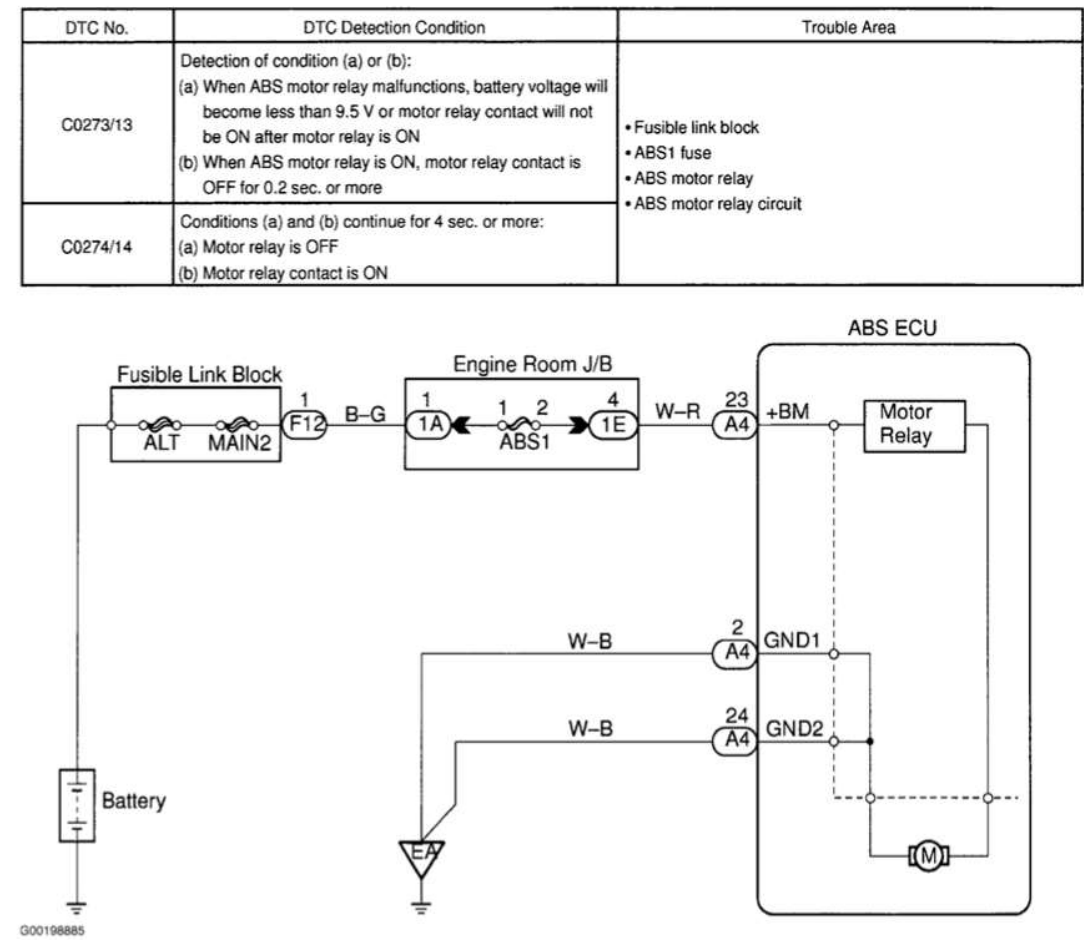


Fig. 13: DTCs 13 & 14 Wiring Diagram & Detection Chart
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

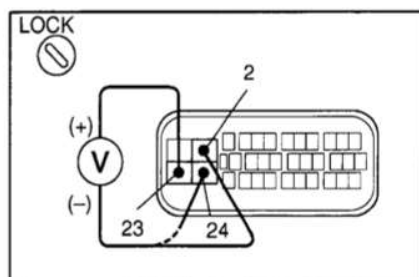
Diagnostic Procedure

For diagnostic procedures, see **Fig. 14** .

HINT:

Start the inspection from step 2 in case of using the hand-held tester and start from step 1 in case of not using the hand-held tester.

1	Check voltage between terminals +BM (23) and GND (2, 24) of ABS ECU connector.
----------	---

**PREPARATION:**

Disconnect the ABS ECU connector.

CHECK:

Measure the voltage between terminals 23 and 2 or 24 of the ABS ECU connector.

OK:

Voltage: 11 – 14 V

NG

**Check and replace ABS fuse.
Check and repair harness or connector.**

OK

2	Check ABS motor relay operation.
----------	---

PREPARATION:

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch ON and press the hand-held tester main switch ON.
- Select the ACTIVE TEST mode on the hand-held tester.

CHECK:

Check the operation sound of the ABS motor individually when operating it with the hand-held tester.

OK:

The operation sound of the ABS motor should be heard.

NG

Check and replace ABS actuator assembly.

OK

If same code is still output after DTC is deleted, check contact condition of each connection. If connection is normal, ECU may be defective.

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Fig. 14: DTCs 13 & 14 Testing Procedures

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTC C0278/ 11 & C0279/ 12: ABS SOLENOID RELAY**Circuit Description**

ABS solenoid relay supplies power to each ABS solenoid. After ignition switch is turned to ON position, if initial check is okay, relay turns on. If malfunction occurs in ABS solenoid relay circuit, ABS ECU cuts off current to ABS solenoid relay and prohibits ABS control.

DTC Detecting Condition

For DTC detection and wiring diagram, see **Fig. 15** .

DTC No.	DTC Detection Condition	Trouble Area
C0278/11	Detection of condition (a) or (b): (a) When ABS solenoid relay contact malfunctions, battery voltage will become less than 9.5 V or solenoid relay will not be ON after solenoid relay is ON (b) When the solenoid relay ON, all solenoid OFF and all solenoid contact is ON	• Fusible link block • ABS2 fuse
C0279/12	Condition (a), (b), (c) or (d) continues for more than 0.2 sec.: (a) In the midst of self diagnosis. (b) Solenoid relay OFF (c) All solenoid OFF (d) Which solenoid relay contact OFF	• ABS solenoid valve relay • ABS solenoid valve relay circuit

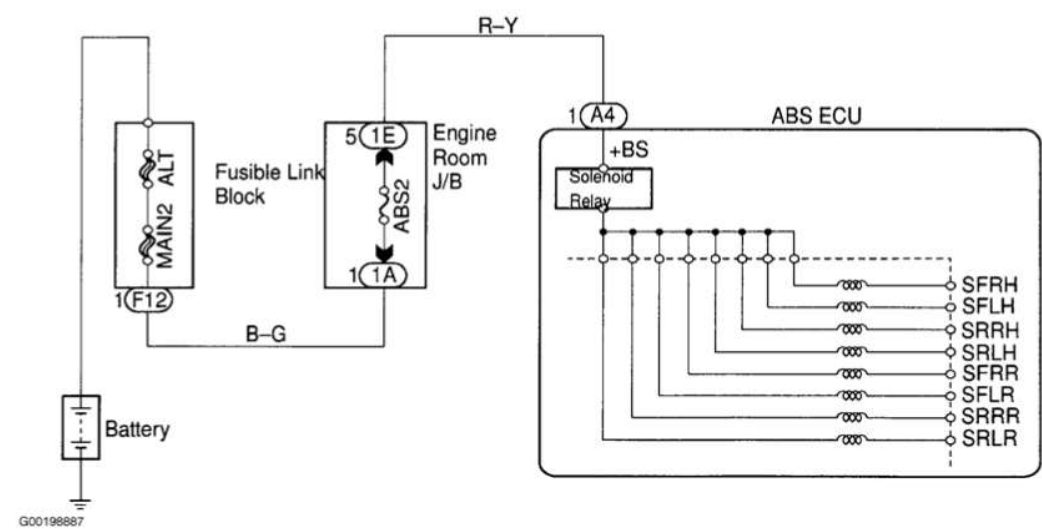


Fig. 15: DTCs 11 & 12 Detection Condition & Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

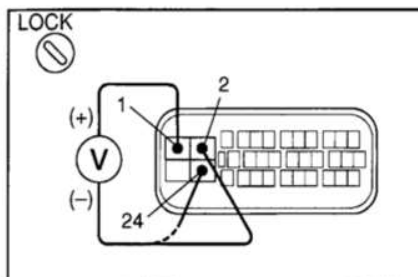
Diagnostic Procedure

For testing procedures, see **Fig. 16** .

HINT:

Start the inspection from step 2 in case of using the hand-held tester and start from step 1 in case of not using the hand-held tester.

1	Check voltage between terminals +BS (1) and GND (2, 24) of ABS ECU connector.
----------	--

**PREPARATION:**

Disconnect the ABS ECU connector.

CHECK:

Measure the voltage between terminals 1 and 2 or 24 of the ABS ECU connector.

OK:

Voltage: 11 – 14 V

NG

Check and repair harness or connector.

OK

2	Check ABS solenoid relay operation.
----------	--

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and press the hand-held tester main switch ON.
- (c) Select the ACTIVE TEST mode on the hand-held tester.

CHECK:

Check the operation sound of the ABS solenoid relay when operating it with the hand-held tester.

OK:

The operation sound of the ABS solenoid relay should be heard.

NG

Check and replace ABS actuator assembly.

OK

If same code is still output after DTC is deleted, check contact condition of each connection. If connection is normal, ECU may be defective.

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Fig. 16: DTCs 11 & 12 Testing Procedures

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTC C1237/ 37: DIFFERENT TIRE SIZE (2WD ONLY)

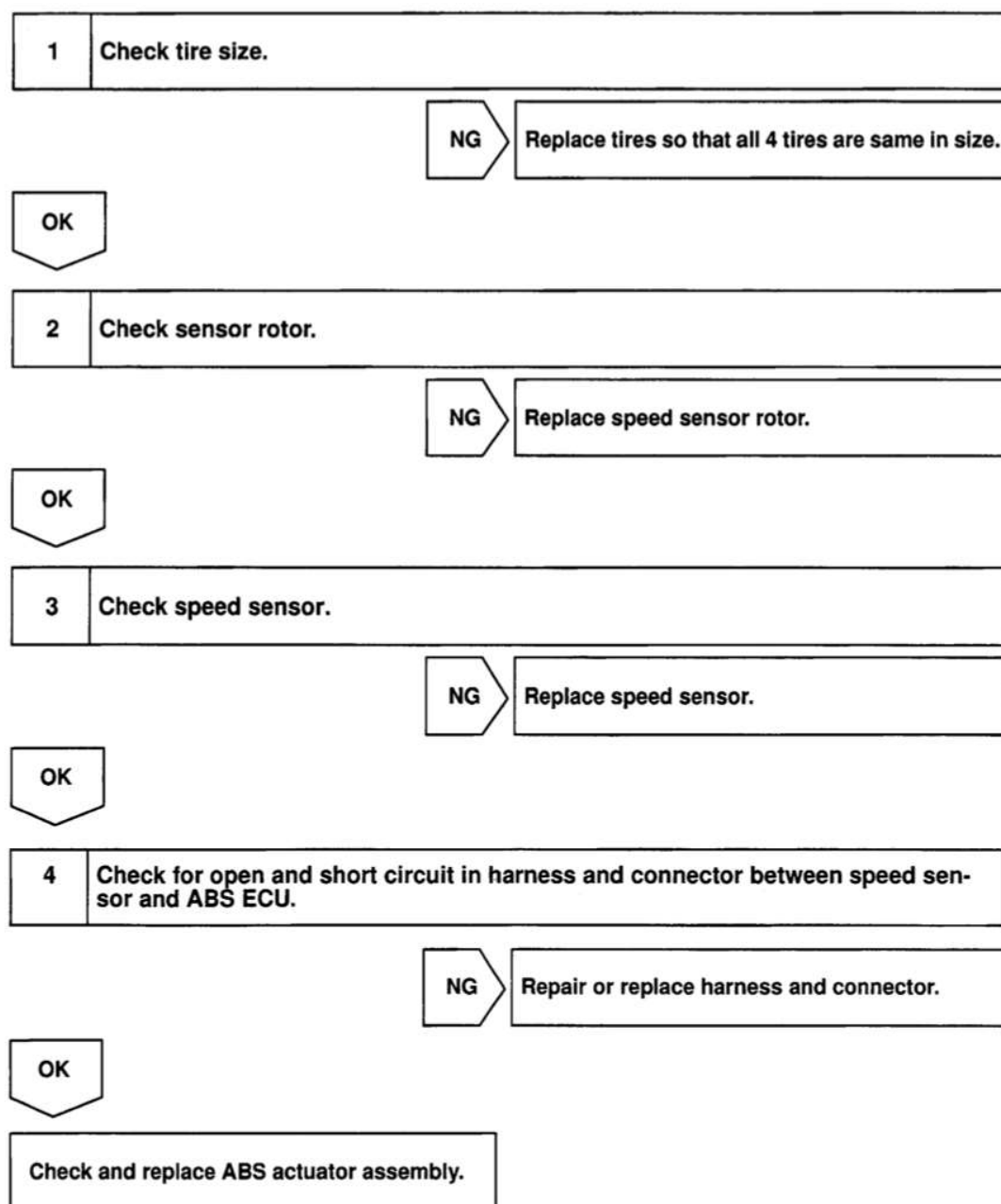
Circuit Description & DTC Detecting Condition

Detection of any of the following condition may set DTC 37:

- Driving at more than 12 mph for more than 260 seconds with 1 or 2 tires of different size.

Diagnostic Procedure

For testing procedures, see **Fig. 17** .



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Fig. 17: DTC 37 Testing Procedures

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTC C1241/ 41: IG POWER SOURCE CIRCUIT**Circuit Description**

Power source circuit is power source for ABS ECU, which includes actuator. If malfunction occurs in power source circuit, ABS ECU cuts off current to ABS solenoid relay and prohibits ABS control.

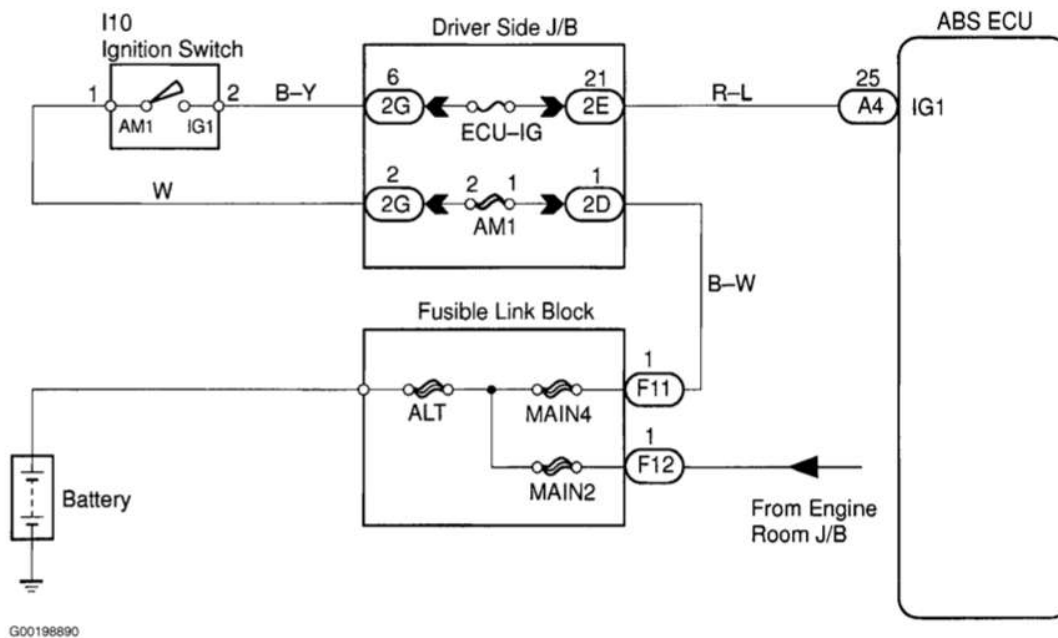
DTC Detecting Condition

Detection of the following condition may set DTC 41:

- At vehicle speed of about 2 mph or more, ECU terminal IG1 voltage is less than 9.4 volts, which continues for 10 seconds or more.
- IG1 terminal voltage is less than 9.5 volts or malfunction in motor relay contact and solenoid relay contact continues for 0.2 seconds.

Diagnostic Procedure

For wiring diagram, see **Fig. 18** . For testing procedures, see **Fig. 19** and **Fig. 20** .

**Fig. 18: DTC 41 Wiring Diagram**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

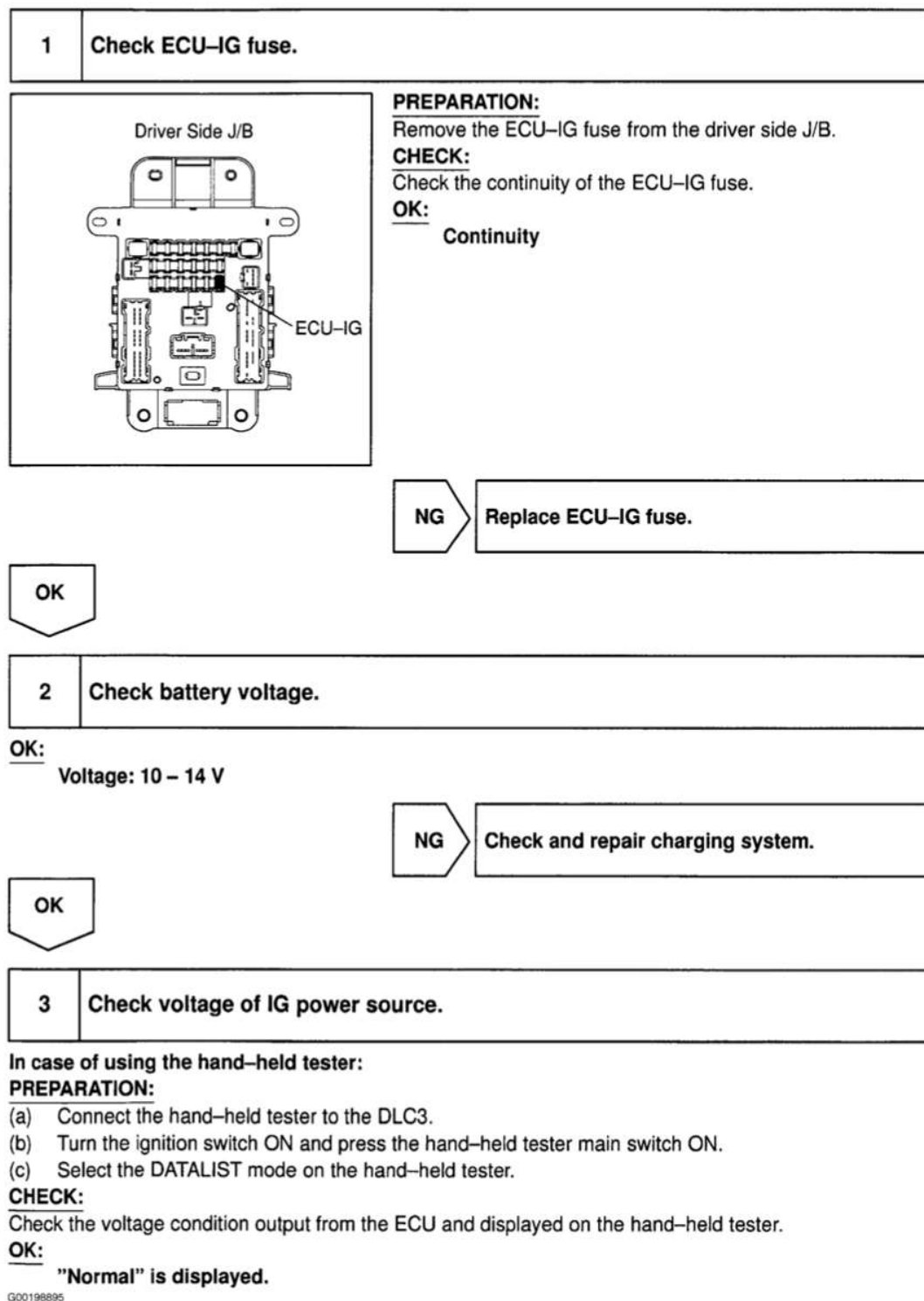
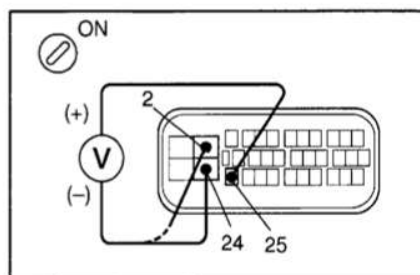


Fig. 19: DTC 41 Testing Procedures (1 of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



In case of not using the hand-held tester:

PREPARATION:

Disconnect the ABS ECU connector.

CHECK:

- (a) Turn the ignition switch ON.
- (b) Measure the voltage between terminals 25 and 2 or 24 of the ABS ECU connector.

OK:

Voltage: 10 – 14 V

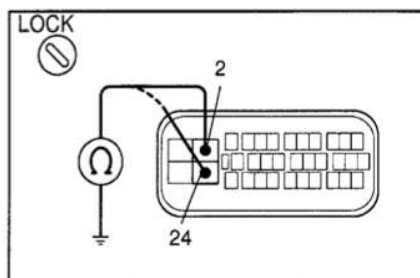
OK

Check or replace ABS actuator assembly.

NG

4

Check continuity between terminals GND (2, 24) of ABS ECU connector and body ground.



CHECK:

Measure the resistance between terminals 2 and 24 of the ABS ECU connector and the body ground.

OK:

Resistance: 1 Ω or less

NG

Repair or replace harness or connector.

OK

Check for open circuit in harness and connector between ABS ECU and ECU-IG fuse.

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Fig. 20: DTC 41 Testing Procedures (2 of 2)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTCS C1243/ 43 & C1245/ 45: DECELERATION SENSOR CIRCUIT (4WD ONLY)

Circuit Description

This sensor detects deceleration on the vehicle. The sensor signal is used in ABS control if the sensor functions abnormally. The ECU cuts off current to the ABS control solenoid relay and prohibits ABS control.

DTC Detecting Condition

Detection of the following conditions may set DTC 43 or 45:

- While vehicle speed goes from 0-18 mph, the condition that GL1 signals of ECU terminals did not change 40 mV or less continuously in sequence 16 times.
- At vehicle speed of 18 mph or more, the difference between acceleration and deceleration values, become more than 0.35 G and continues for 60 seconds or more.

Diagnostic Procedure

For testing procedures, see **Fig. 21** .

HINT:

Start the inspection from step1 in case of using the hand-held tester and start from step 2 in case of not using the hand-held tester.

1	Check output value of deceleration sensor.
----------	---

PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) Select the DATALIST mode on the hand-held tester.

CHECK:

Check that the deceleration value of the deceleration sensor displayed on the hand-held tester is changing when tilting the vehicle.

OK:

Deceleration value must be changing.

OK

Check and replace ABS actuator assembly.

NG

2	Check deceleration sensor.
----------	-----------------------------------

NG

Replace deceleration sensor.

OK

3	Check for open or short circuit in harness and connector between deceleration sensor and ABS ECU.
----------	--

NG

Repair or replace harness or connector.

OK

Check and replace ABS actuator assembly.

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Fig. 21: DTCs 43 & 45 Testing Procedures

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTC C1244/ 44: DECELERATION SENSOR CIRCUIT (4WD ONLY)

Circuit Description & DTC Detecting Condition

The sensor detects deceleration of the vehicle. The sensor signal is used on ABS control. If the sensor functions abnormally, the ABS warning light comes ON. If trouble occurs in the deceleration sensor circuit, the ECU cuts off the current to the ABS solenoid and prohibits ABS control and then the brake system becomes normal.

Detection of the following conditions may set DTC 44:

- ECU terminals GL1 values are between -1.5 and 1.5 G for 1.2 seconds or more.
- Deceleration sensor terminal VGS voltage is between 4.4-5.6 volts or more for 1.2 seconds or more.
- Deceleration sensor signal momentary open occurs 7 times or more.

Diagnostic Procedure

For wiring diagram, see **Fig. 22** . For testing procedures, check for open/short circuit in wiring harness and connector between deceleration sensor and ABS ECU. If fault is found, repair or replace wiring harness or connector. If no fault is found, check deceleration sensor. If deceleration sensor is found faulty, replace. See **DECELERATION SENSOR** under REMOVAL & INSTALLATION. If no fault is found, check and replace ABS actuator assembly. See **ACTUATOR/ABS ECU** under REMOVAL & INSTALLATION.

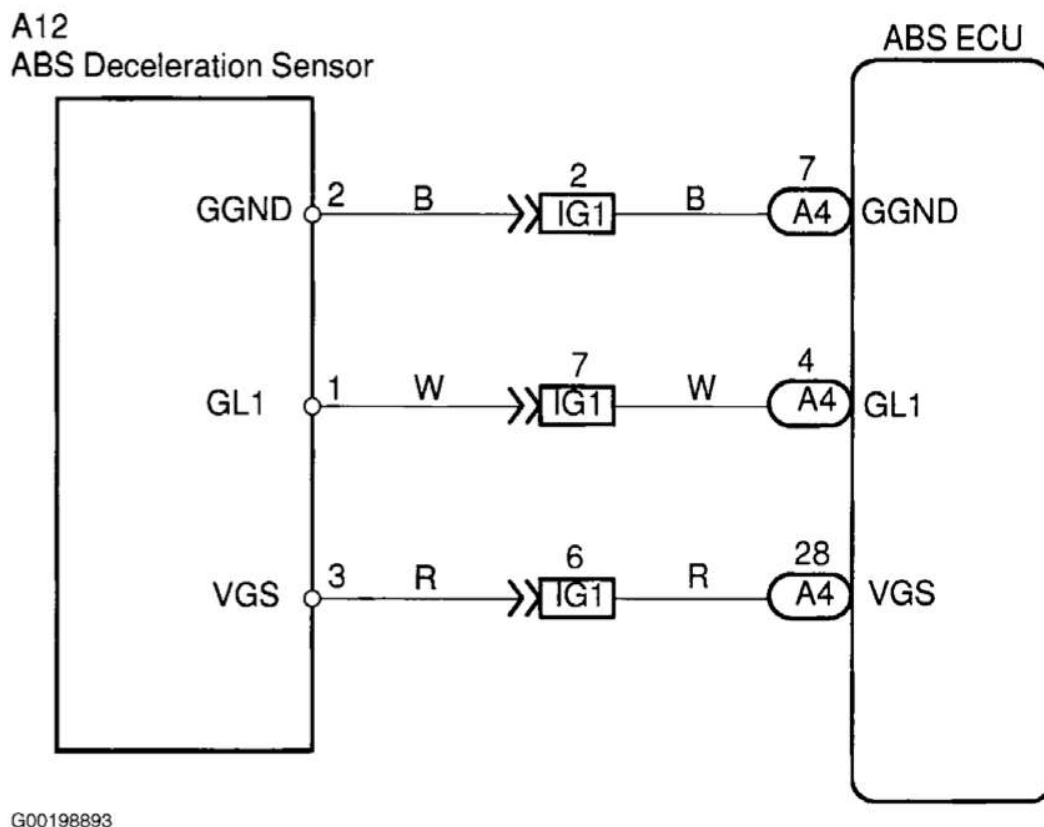


Fig. 22: DTC 44 Wiring diagram

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTC C1249/ 49: STOP LIGHT SWITCH CIRCUIT

DTC Detecting Condition

Detection of the following condition may set DTC 49:

- Battery voltage will become more than 9.5 volts and open circuit of stop light switch continues for 1 second or more.

Diagnostic Procedure

For wiring diagram, see **Fig. 23** . For testing procedures, see **Fig. 24** .

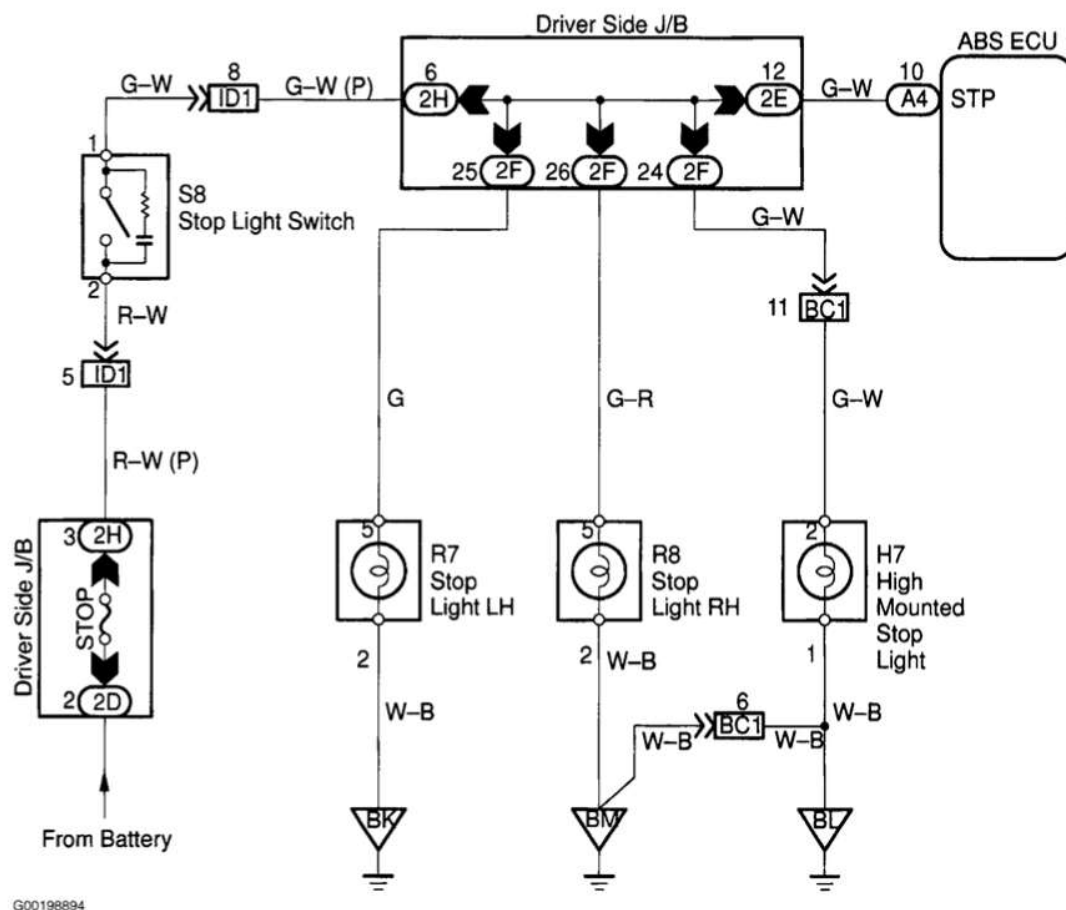


Fig. 23: DTC 49 Wiring Diagram

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1 Check operation of stop light.

CHECK:

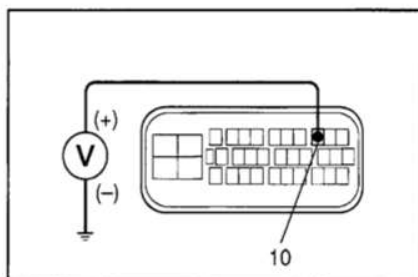
Check that stop light turns ON when the brake pedal is depressed and turns OFF when the brake pedal is released.

NG

Repair stop light circuit.

OK

2 Check voltage between terminal STP (10) of ABS ECU connector and body ground.



PREPARATION:

Disconnect the ABS ECU connector.

CHECK:

Measure the voltage between terminal 10 of the ABS ECU connector and the body ground when the brake pedal is depressed.

OK:

Voltage: 10 – 14 V

OK

Check and replace ABS actuator assembly.

NG

3 Check for open circuit in harness (including stop light bulb) and connector between ABS ECU and stop light switch.

NG

Repair or replace harness, connector or stop light bulb.

OK

Check and replace ABS actuator assembly.

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Fig. 24: DTC 49 Testing Procedures

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTC C1251/ 51: ABS PUMP MOTOR LOCK

Circuit Description & DTC Detecting Condition

If trouble occurs in ABS pump motor, the ECU cuts off current to ABS relay and prohibits ABS control.

Diagnostic Procedure

For wiring diagram and detection conditions, see **Fig. 25** . For testing procedures, see **Fig. 26** .

DTC No.	DTC Detection Condition	Trouble Area
C1251/51	Conditions (a), (b) and (c) continue for 0.024 sec.: (a) While checking self diagnosis of ECU, after current flows to motor for 0.3 sec. within 0.054 sec. from turning OFF motor relay, and motor relay contact turned OFF continues for 0.024 sec. (b) While checking self diagnosis of ECU, after current flows to motor for 1.4 sec. within 0.054 sec. from turning OFF motor relay (c) Motor relay contact turned OFF	ABS pump motor

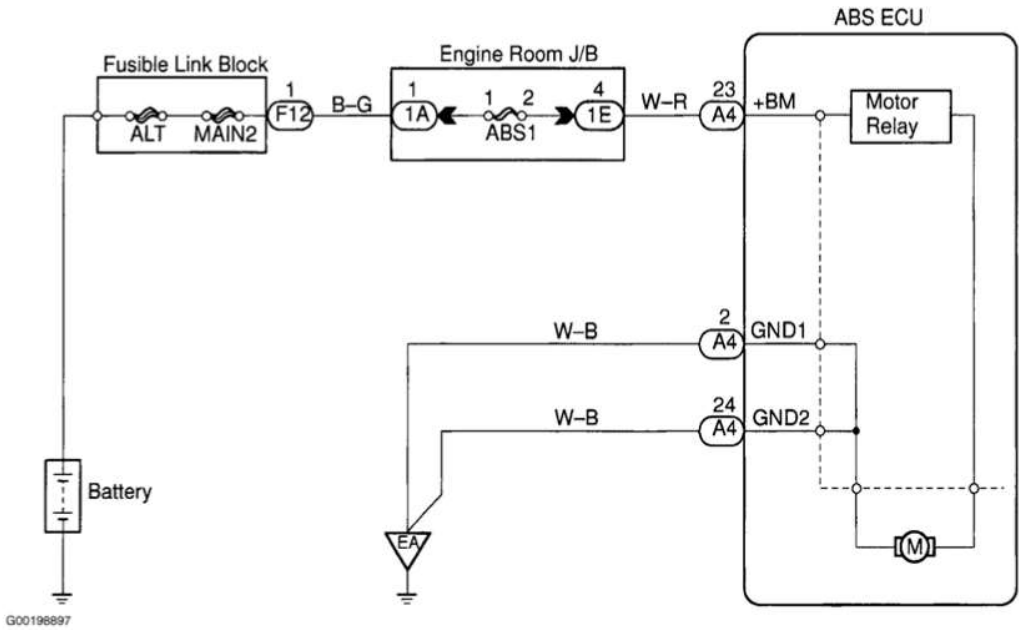
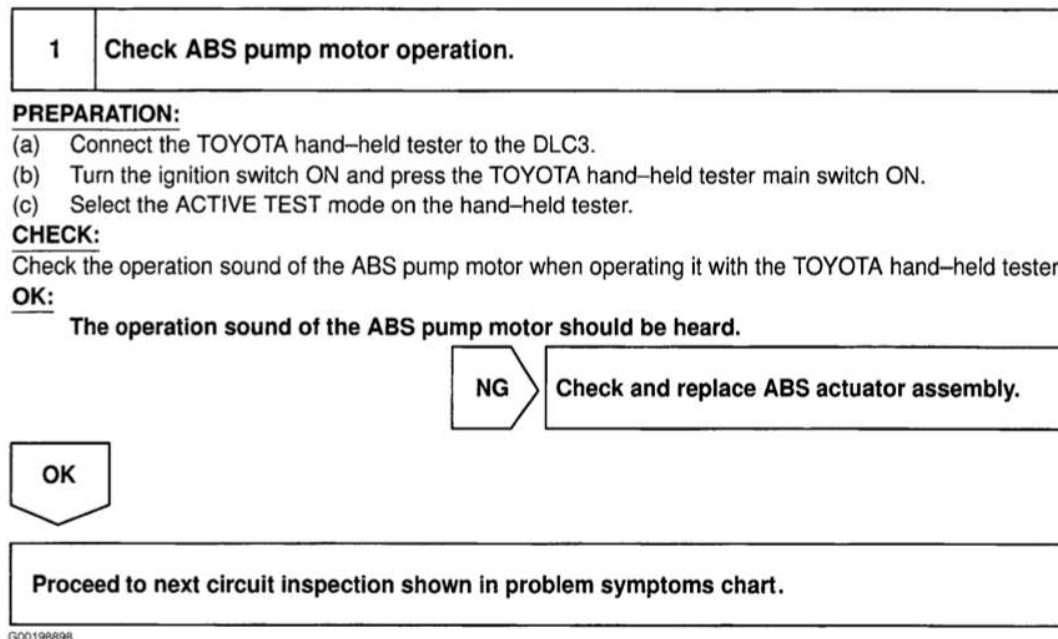


Fig. 25: DTC 51 Wiring Diagram & Detection Conditions
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**Fig. 26: DTC 51 Testing Procedures**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTCS C1271/ 71, C1272/ 72, C1273/ 73 & C1274/ 74: LOW OUTPUT VOLTAGE FROM SPEED SENSOR**Circuit Description & Detecting Conditions****DTC C1271/ 71** - Right Front Speed Sensor.**DTC C1272/ 72** - Left Front Speed Sensor.**DTC C1273/ 73** - Right Rear Speed Sensor.**DTC C1274/ 74** - Left Rear Speed Sensor.

For DTCs 71-74, an abnormally low output voltage has been detected from speed sensor. Check the following:

- All speed sensors.
- Sensor installation.
- Sensor rotors.

DTCS C1275/ 75, C1276/ 76, C1277/ 77 & C1278/ 78: ABNORMAL CHANGE IN SPEED SENSORS**Circuit Description & Detecting Conditions****DTC C1275/ 75** - Right Front Speed Sensor.**DTC C1276/ 76** - Left Front Speed Sensor.

- DTC C1277/ 77 - Right Rear Speed Sensor.
- DTC C1278/ 78 - Left Rear Speed Sensor.

For DTC's 75-78, an abnormal change in output voltage was detected by the speed sensors. Check the following:

- Right front speed sensor rotors.
- Left front speed sensor rotors.
- Right rear speed sensor rotors.
- Left rear speed sensor rotors.

SYSTEM TESTS

SYSTEM TEST INDEX

Symptom	Perform Test:
ABS Warning Light	<u>A</u>
ABS ECU Malfunction	<u>B</u>
Brake Warning Light Circuit	<u>C</u>
Tc Terminal	<u>D</u>
Ts Terminal	<u>E</u>

TEST A: ABS WARNING LIGHT

Circuit Description

If ABS ECU detects a system malfunction, ABS ECU illuminates ABS warning light while at the same time prohibiting ABS control.

Diagnostic Procedure

For wiring diagram, see **Fig. 27** . For testing procedures, see **Fig. 28** and **Fig. 29** .

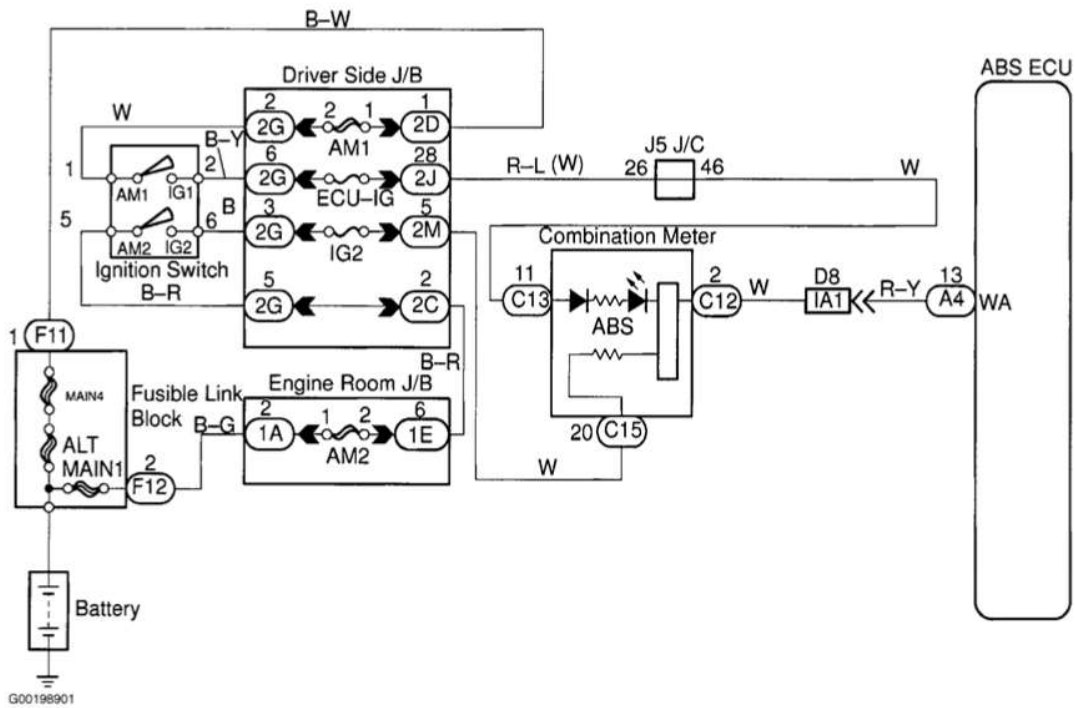


Fig. 27: ABS Warning Light Circuit Wiring Diagram
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Troubleshoot in accordance with the table below for each trouble symptom.

ABS warning light does not light up	*1
ABS warning light remains on	*2

*1: Start the inspection from step 1 in case of using the TOYOTA hand-held tester and start from step 2 in case of not using the TOYOTA hand-held tester.
*2: After the inspection with step 3, start the inspection from step 4 in case of using the TOYOTA hand-held tester and start from step 5 in case of not using the TOYOTA hand-held tester.

1	Check operation of the ABS warning light.
---	---

PREPARATION:

- (a) Connect the TOYOTA hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and push the TOYOTA hand-held tester main switch ON.
- (c) Select the ACTIVE TEST mode on the TOYOTA hand-held tester.

CHECK:

Check that "ON" and "OFF" operation of the ABS warning light can be done on the combination meter by the TOYOTA hand-held tester.

OK

Check and replace ABS actuator assembly.

NG

2	Check ABS warning light.
---	--------------------------

NG

Replace bulb or combination meter assembly.

OK

Check for open circuit in harness and connector between ECU-IG fuse and ABS warning light.
--

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Fig. 28: ABS Warning Light Testing Procedures (1 of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

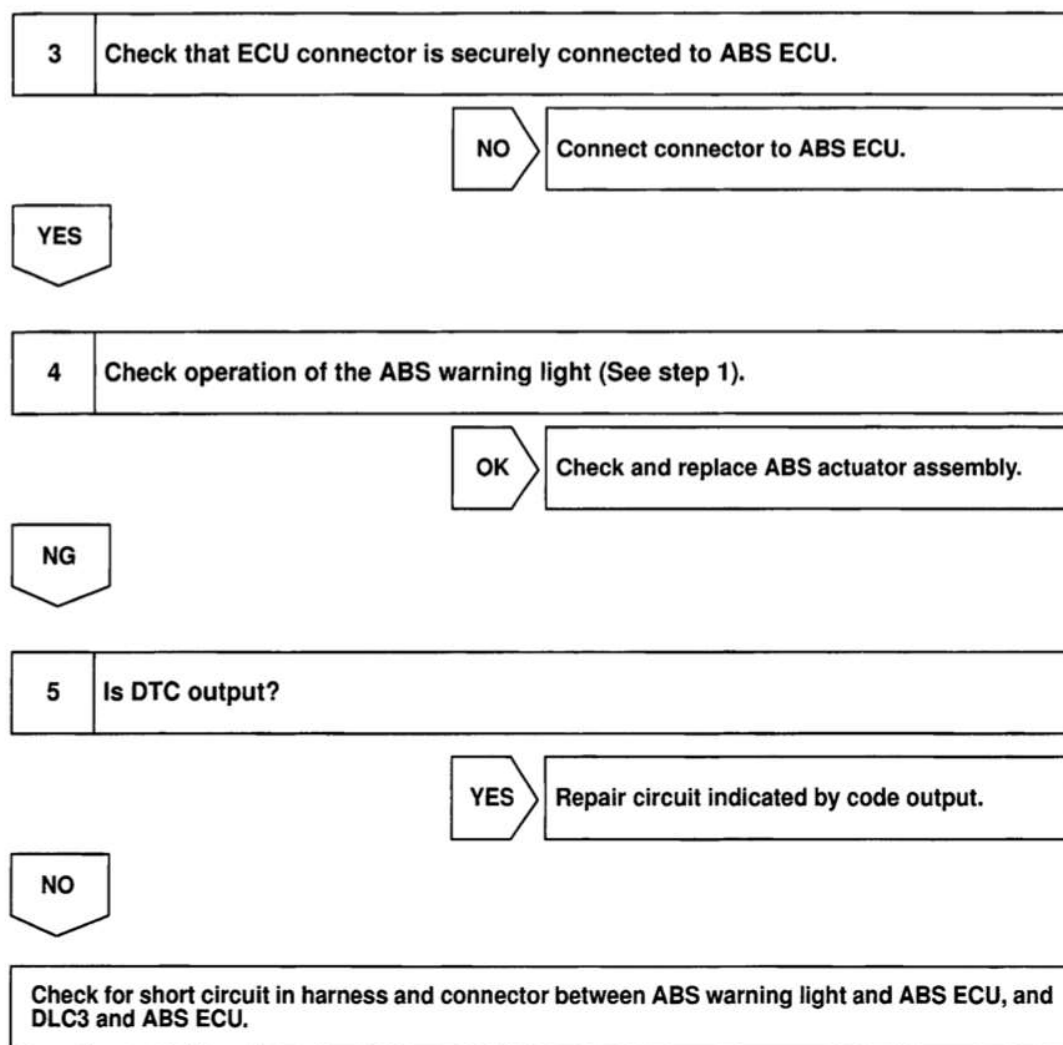


Fig. 29: ABS Warning Light Testing Procedures (2 of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEST B: ABS ECU MALFUNCTION

Circuit Description

If ABS ECU detects a system malfunction, ABS ECU illuminates ABS warning light while at the same time prohibiting ABS control.

Diagnostic Procedure

For testing procedures, see **Fig. 30** and **Fig. 31**.

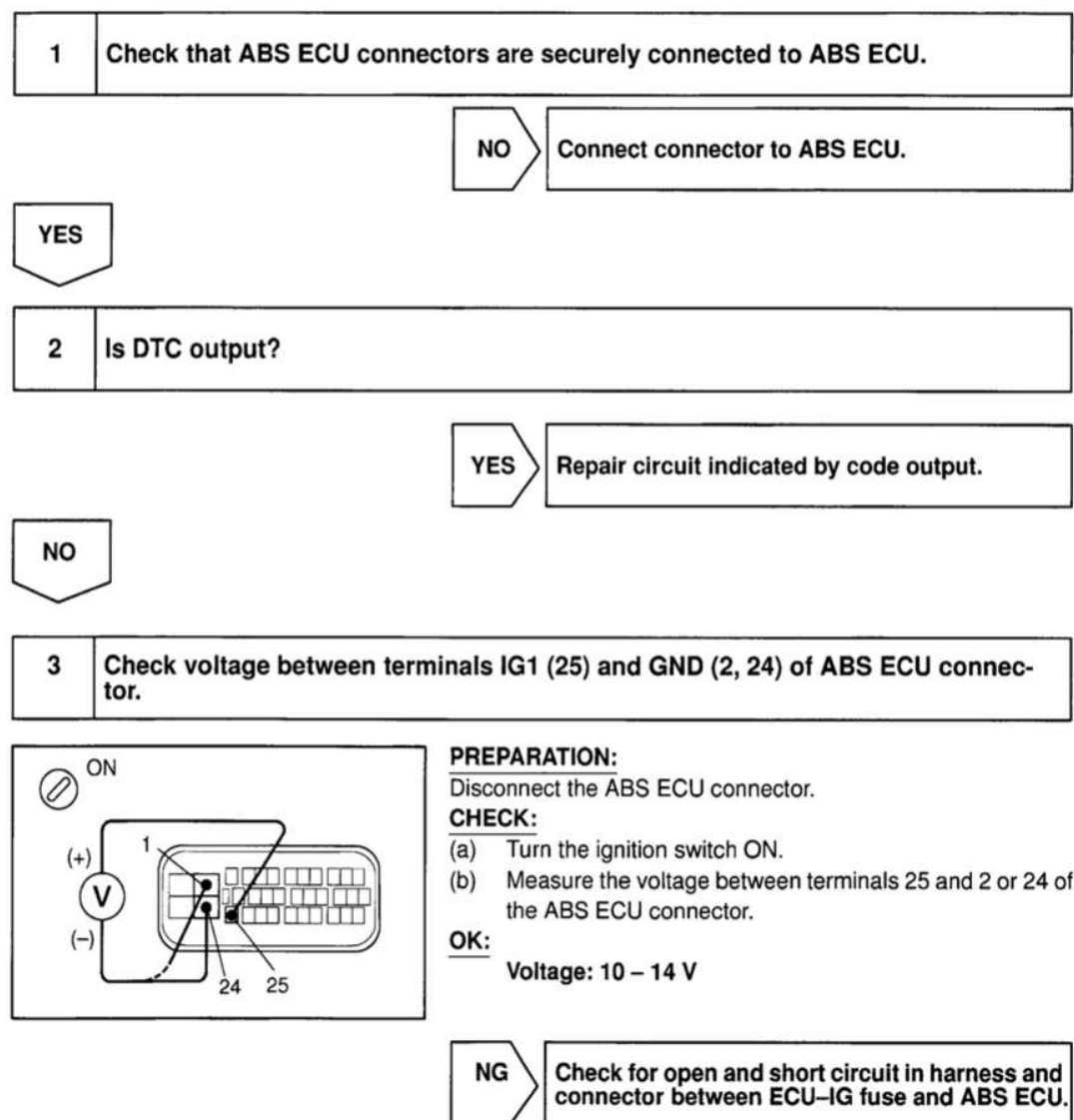


Fig. 30: ABS ECU Malfunction Testing Procedures (1 of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



4	Check ABS warning light.
---	--------------------------

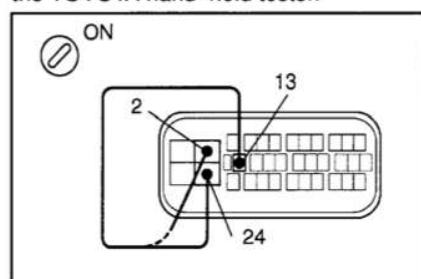
In case of using the TOYOTA hand-held tester:

PREPARATION:

- (a) Connect the TOYOTA hand-held tester to the DLC3.
- (b) Turn the ignition switch ON and press the TOYOTA hand-held tester main switch ON.
- (c) Select the ACTIVE TEST mode on the TOYOTA hand-held tester.

CHECK:

Check that "ON" and "OFF" operation of the ABS warning light can be done on the combination meter by the TOYOTA hand-held tester.



In case of not using the hand-held tester:

PREPARATION:

Disconnect the ABS ECU connector.

CHECK:

- (a) Using a service wire, connect terminal WA (13) and GND (2 or 24) of the ABS ECU connector.
- (b) Turn the ignition switch ON.

OK:

ABS warning light goes off

OK	Check and replace ABS actuator assembly.
----	--



Check for open or short circuit in harness and connector between ABS warning light and ABS ECU, and DLC3 and ABS ECU.

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Fig. 31: ABS ECU Malfunction Testing Procedures (2 of 2)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEST C: BRAKE WARNING LIGHT CIRCUIT

Circuit Description

The brake warning light illuminates when brake fluid is insufficient, the EBD is abnormal, or the parking brake is applied.

Diagnostic Procedure

For wiring diagram, see **Fig. 32** . For testing procedures, see **Fig. 33** .

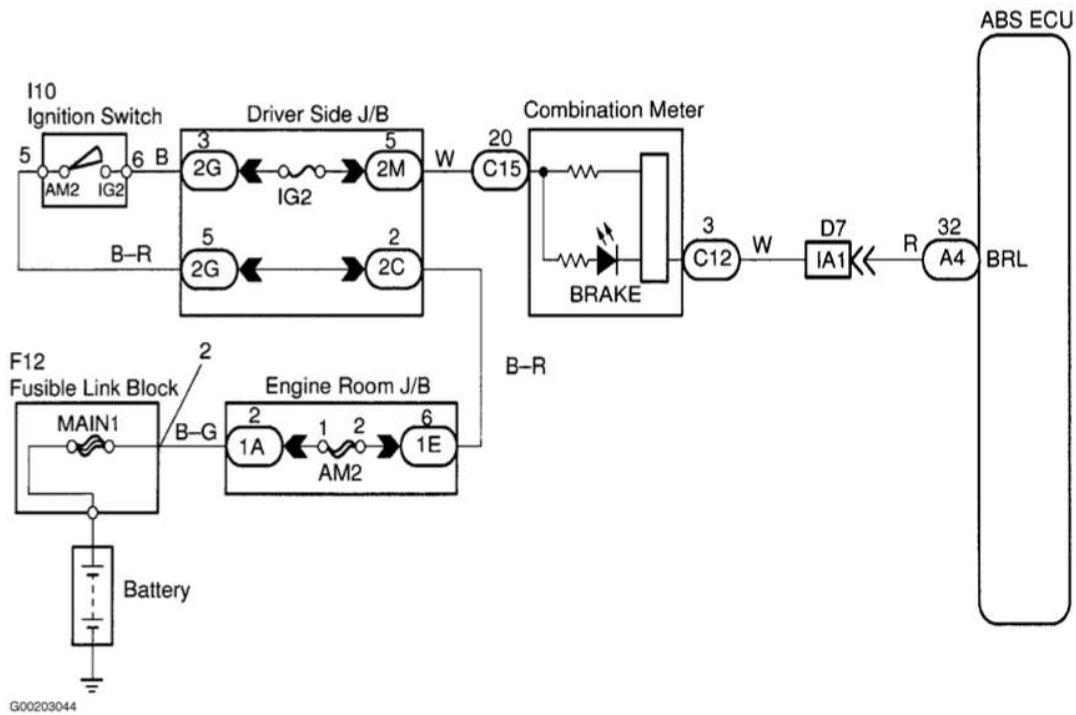


Fig. 32: Brake Warning Light Wiring Diagram
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

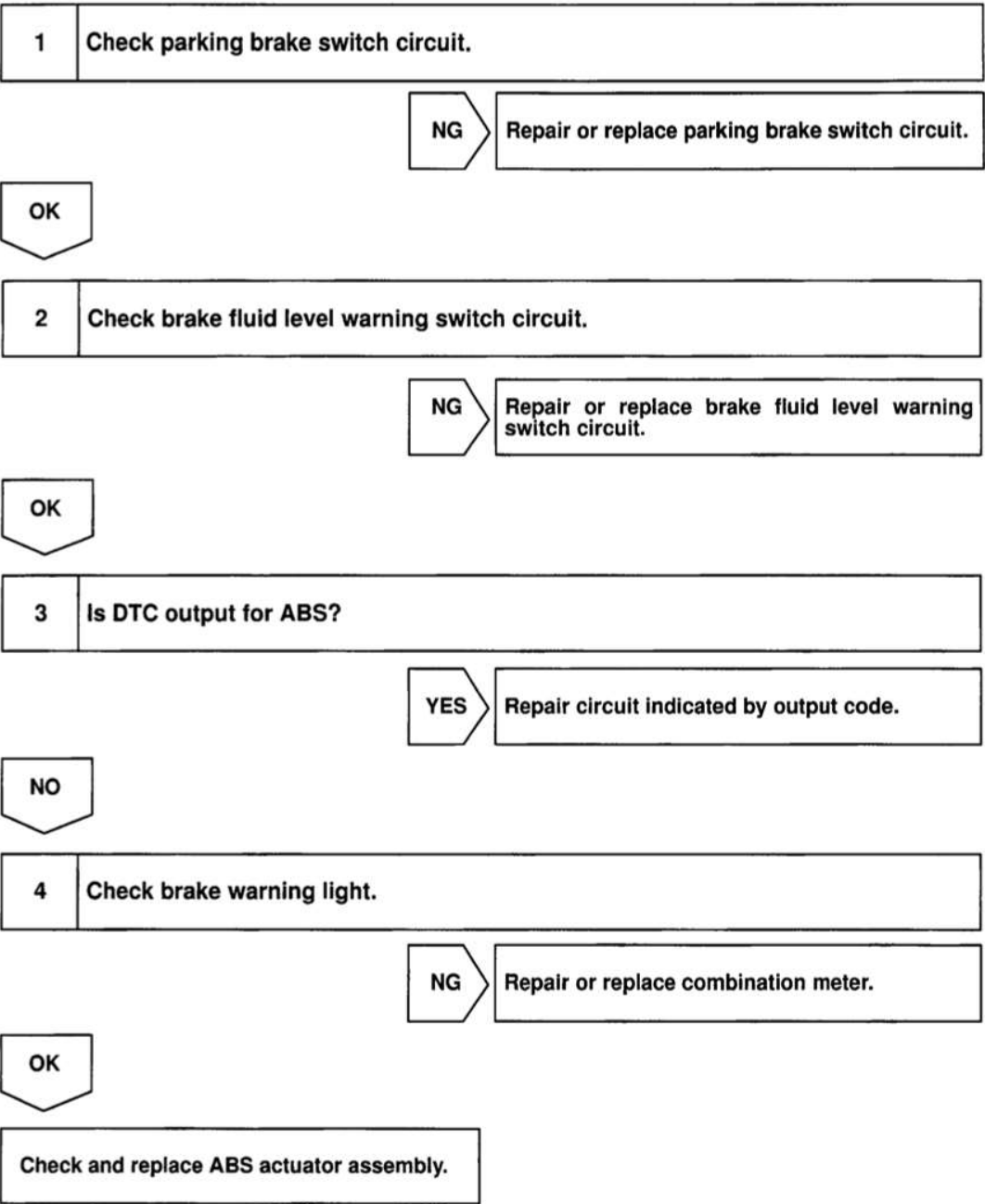


Fig. 33: Brake Warning Light Testing Procedures
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEST D: TC TERMINAL

Circuit Description

Connecting terminals Tc and CG of DLC3 causes ABS warning light to blink and output a DTC.

Diagnostic Procedure

For wiring diagram, see **Fig. 34** . For testing procedures, see **Fig. 35** .

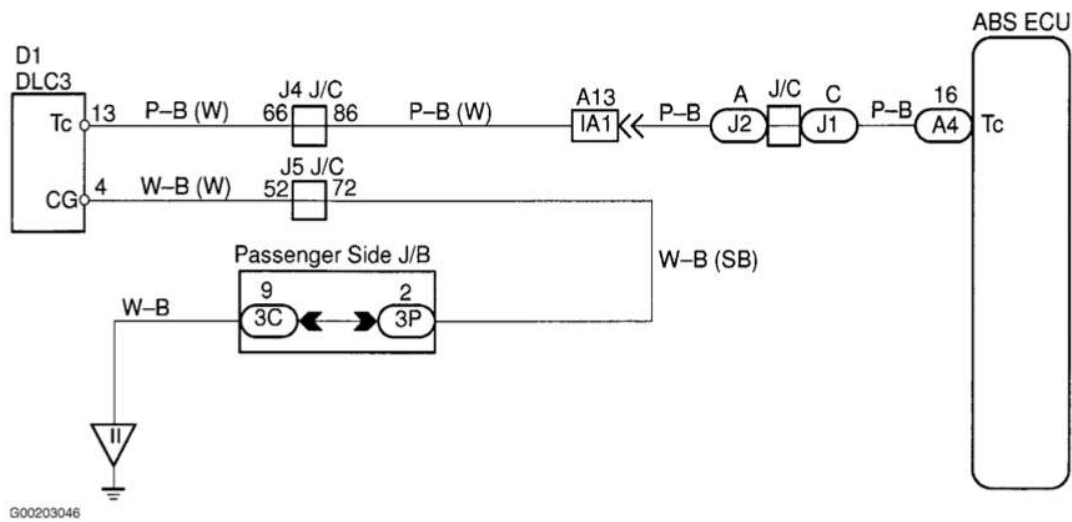


Fig. 34: Tc Terminal Wiring Diagram

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

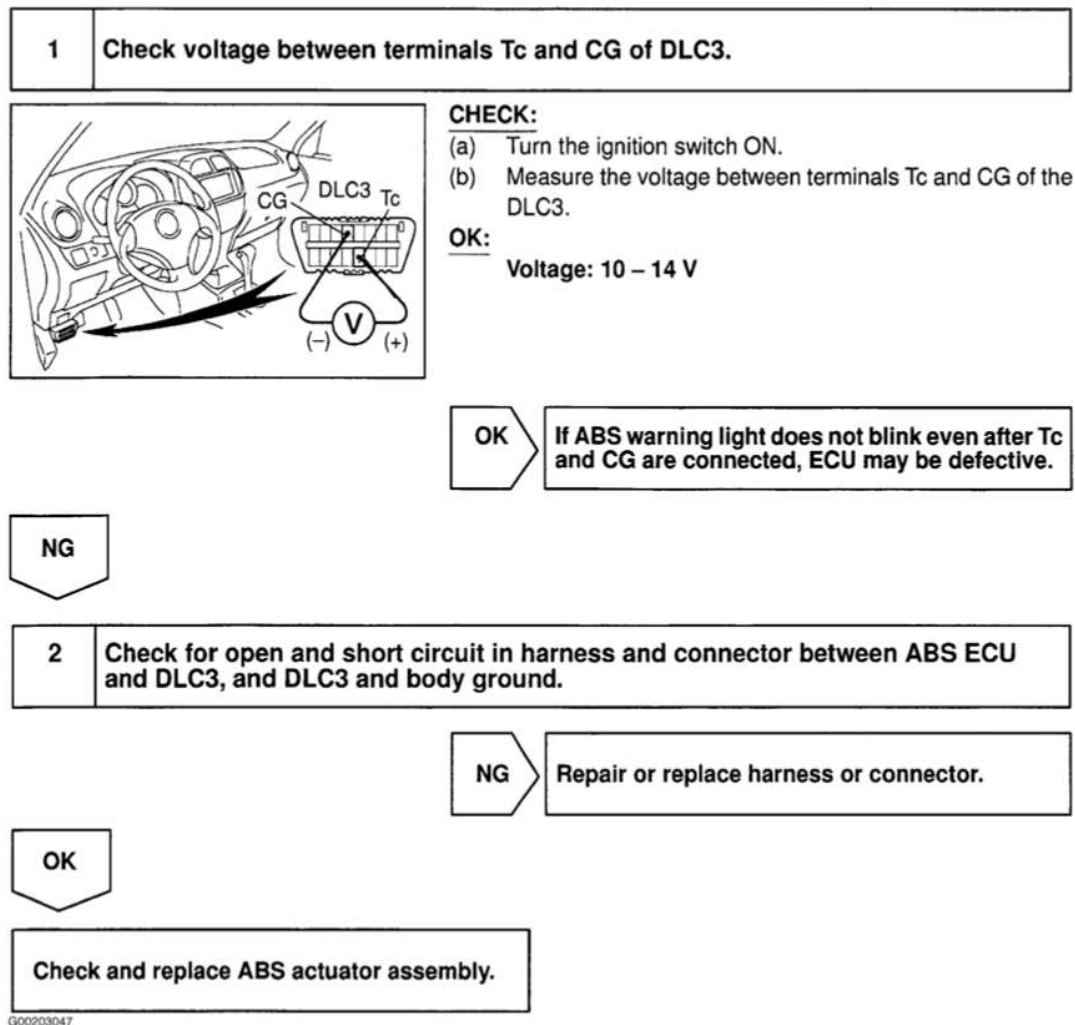


Fig. 35: Tc Terminal Testing Procedures

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEST E: TS TERMINAL

Circuit Description

Sensor check circuit detects abnormalities in speed sensor signal which cannot be detected when checking for DTCs. Connecting terminals Ts and CG of DLC3 in engine compartment starts sensor check.

Diagnostic Procedure

For wiring diagram, see **Fig. 36** . For testing procedures, see **Fig. 37** .

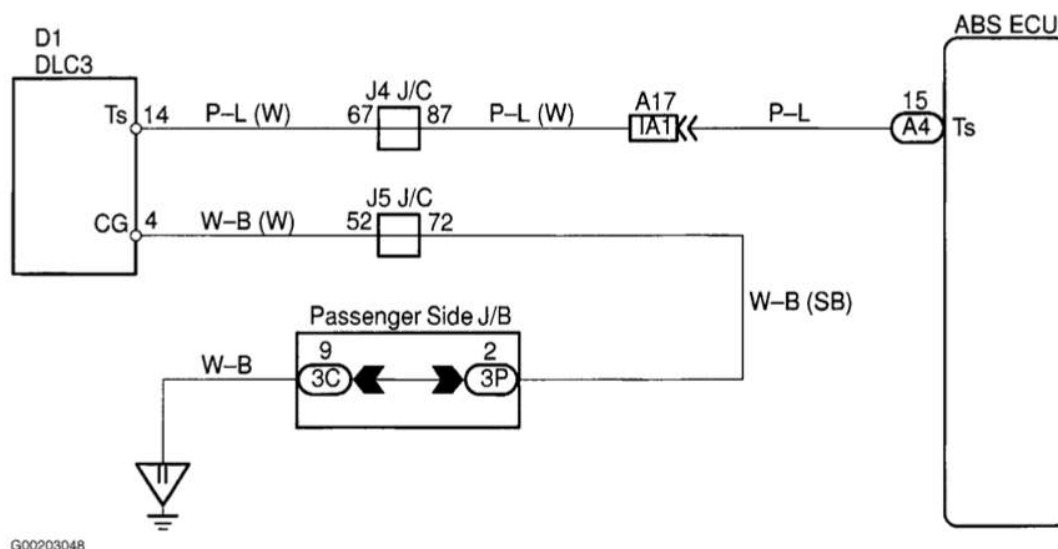
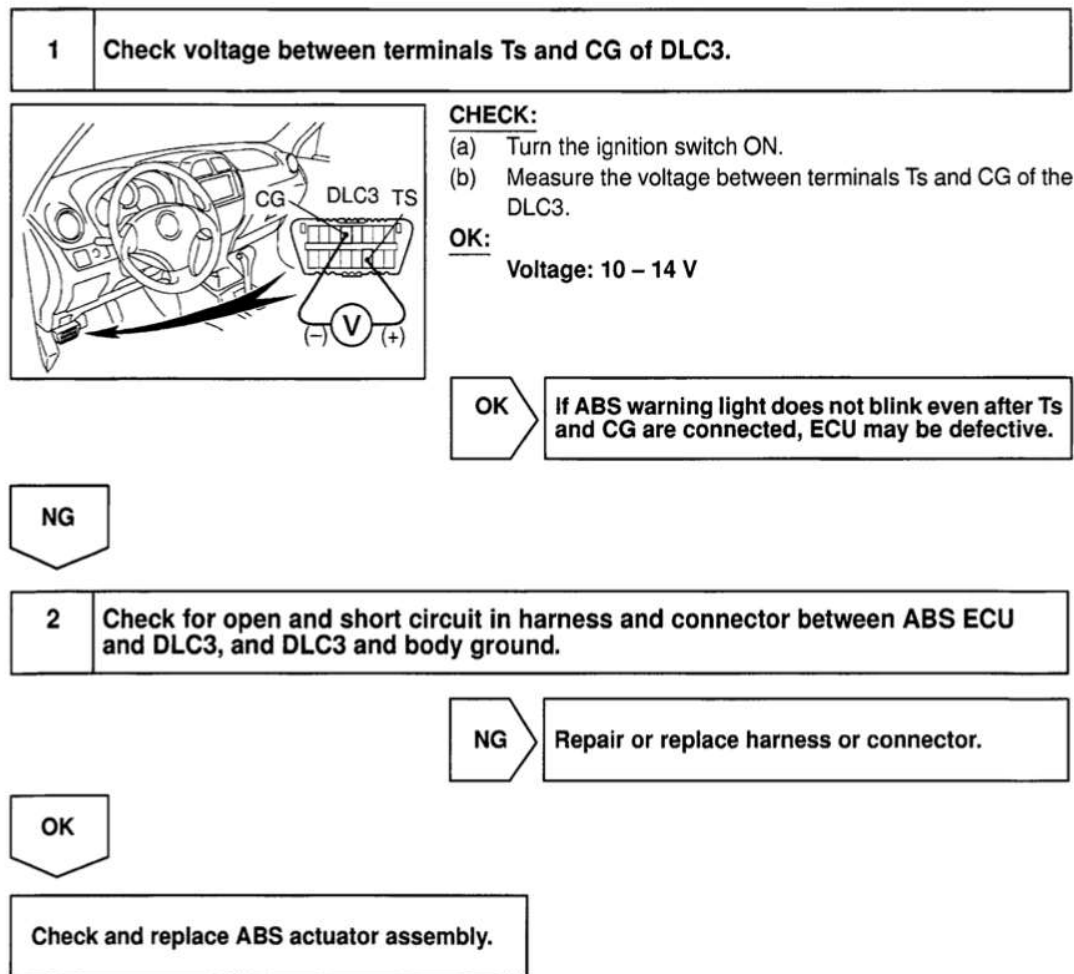


Fig. 36: Ts Terminal Wiring Diagram
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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Fig. 37: Ts Terminal Testing Procedures

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

COMPONENT TESTS

Components are tested with related circuit. See **DIAGNOSTIC TESTS** . ABS ECU values can be measured using Toyota hand-held tester and breakout box. ABS circuits and wiring harness can also be tested by backprobing ABS ECU connectors and comparing measured voltages with ABS ECU standard values chart. See **Fig. 43** .

REMOVAL & INSTALLATION

WARNING: Hydraulic system may be under high pressure. Use caution when opening hydraulic system.

ACTUATOR/ABS ECU

Removal & Installation

1. Using special tool (09023-00100), disconnect 6 brake lines from ABS actuator. Disconnect power steering fluid reservoir with bracket. See **Fig. 38** . Remove the 2 bolts and disconnect PS fluid reservoir with bracket from body. Disconnect connector. Remove 3 bolts and ABS actuator assembly. Remove 2 nuts and actuator from actuator bracket. Remove 2 cushion bolts and 3 cushions.
2. To install, reverse removal procedure. Tighten brakeline fittings to specification. See **TORQUE SPECIFICATIONS** . Bleed brake system. See **BLEEDING BRAKE SYSTEM** .

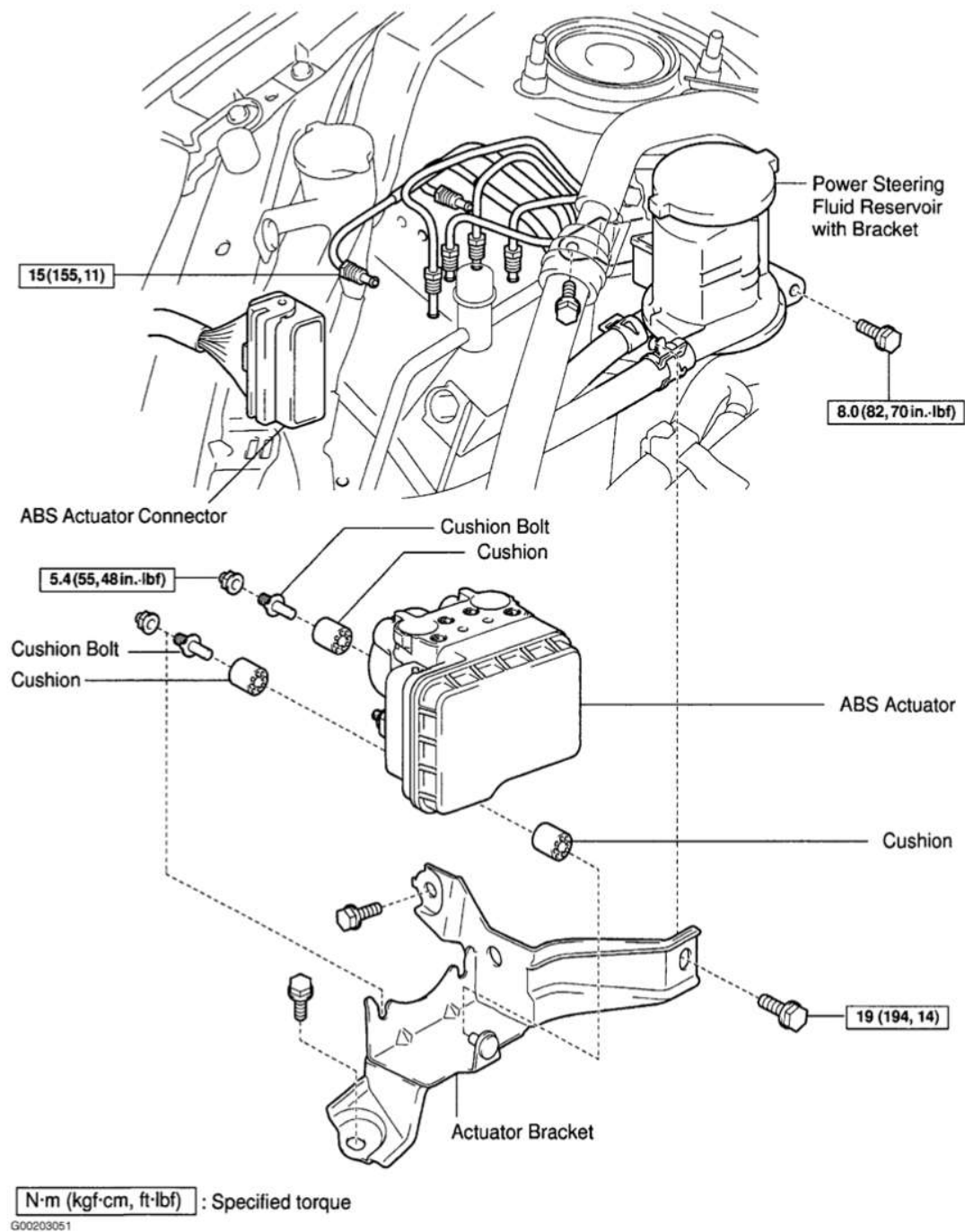
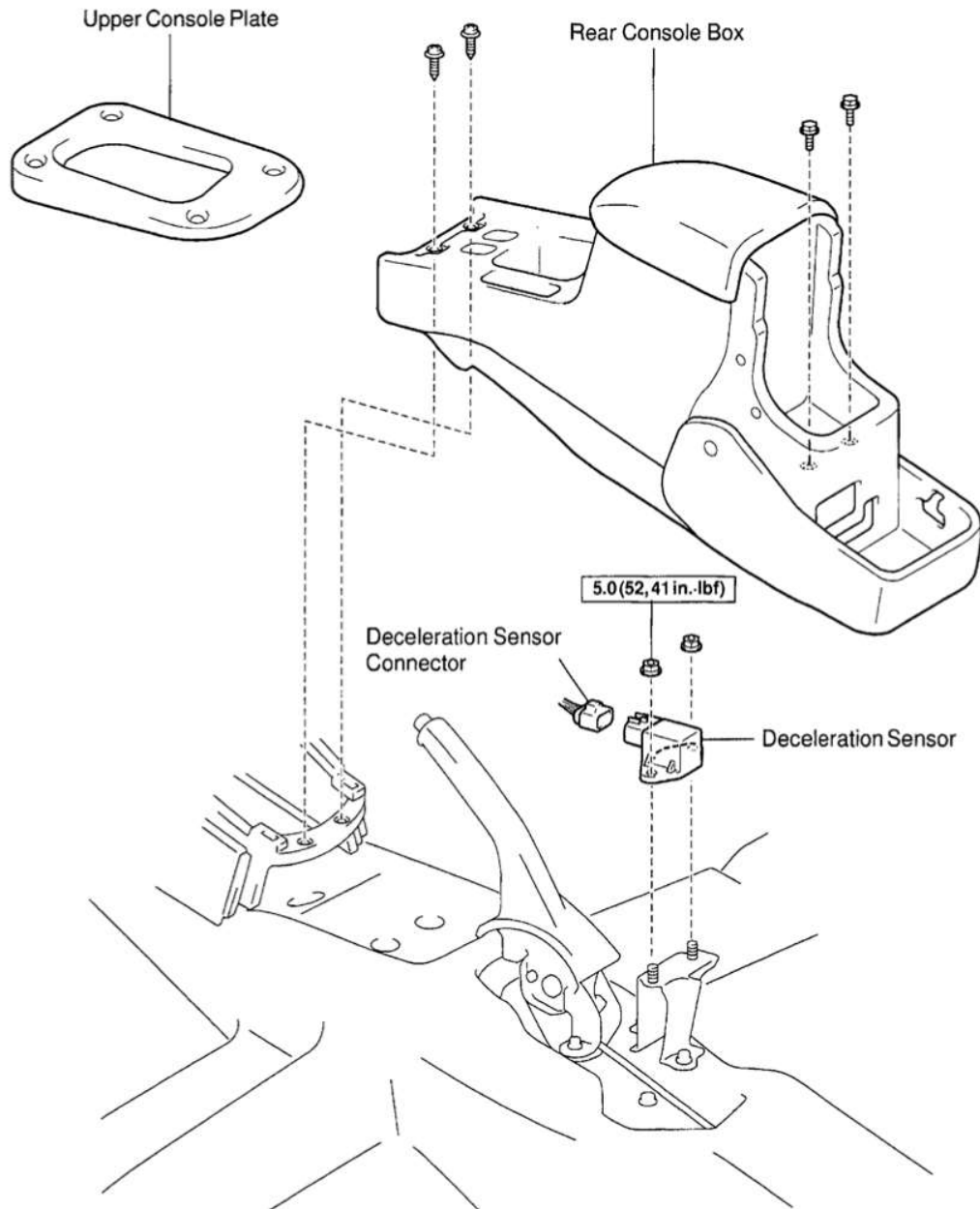


Fig. 38: Identifying ABS Actuator & Components
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DECELERATION SENSOR

Removal & Installation

Remove rear console box and upper console plate. Disconnect sensor connector. Remove the 2 nuts and deceleration sensor. See **Fig. 39** . Torque sensor mounting bolts to specification. See **TORQUE SPECIFICATIONS** .



N·m (kgf·cm, ft·lbf) : Specified torque

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Fig. 39: Removing & Installing Deceleration Sensor
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

FRONT SENSOR ROTORS

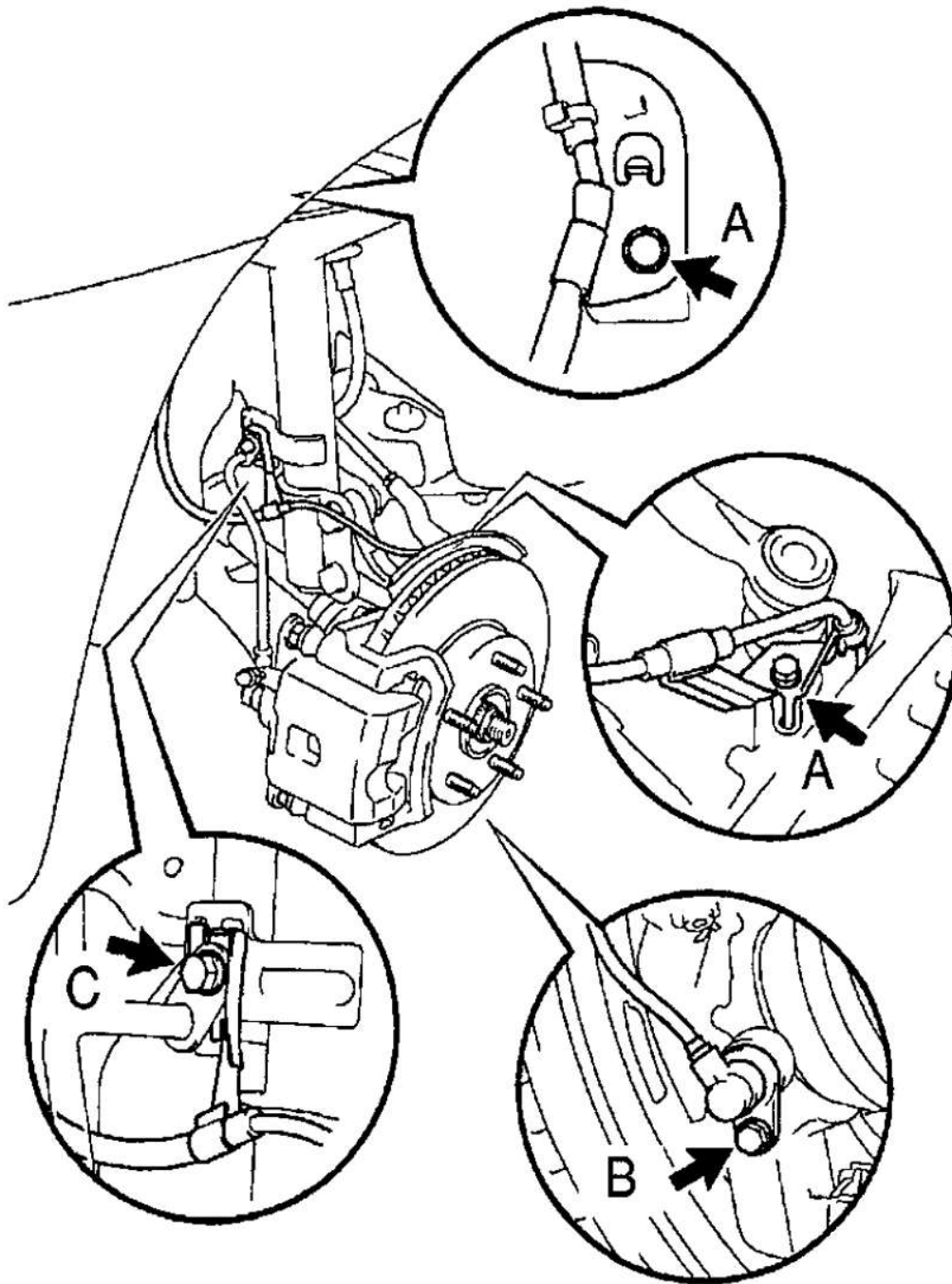
Removal & Installation

Front sensor is part of front hub. For removal and installation of front hub, see appropriate article in DRIVE AXLES. For axle shaft removal and installation procedure, see AXLE-SHAFT article in DRIVE AXLES.

FRONT WHEEL SPEED SENSORS

Removal & Installation

Turn over fender liner. Disconnect sensor connector from sensor wiring harness. Remove sensor connector from body. Remove wiring harness clamp from body. Remove the 4 bolts and sensor. See **Fig. 40** . Tighten wheel speed sensor mounting bolts to specifications. See **TORQUE SPECIFICATIONS** .



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Fig. 40: Identifying Wheel Sensor Mounting Bolts

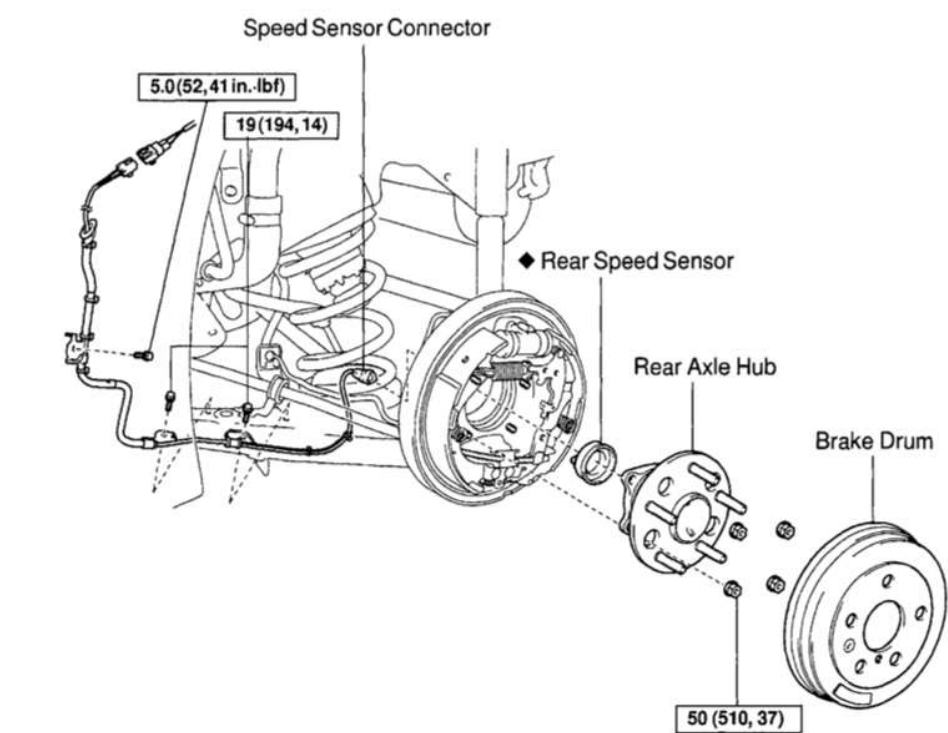
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REAR WHEEL SPEED SENSORS

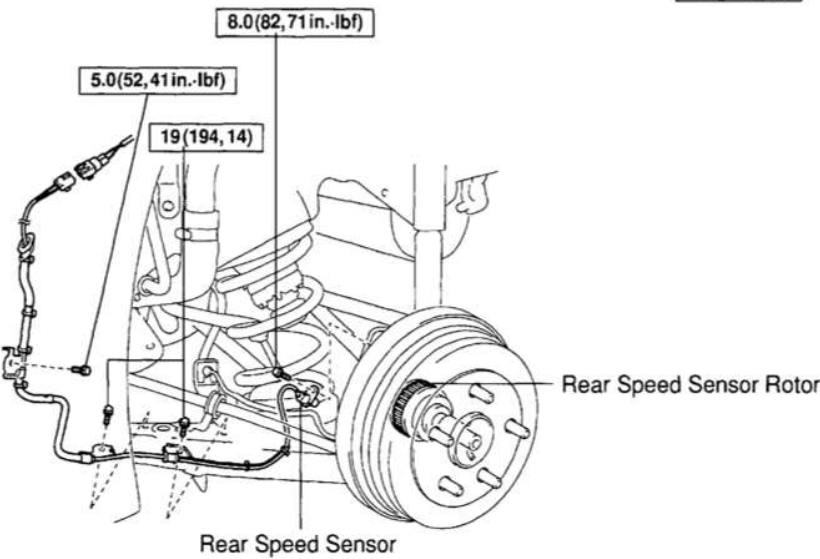
Removal

Remove seat cushion and rear side trim. Disconnect speed sensor connector. Remove the 3 clamp bolts holding the sensor wiring harness to body and suspension arm. For 2WD, remove speed sensor with axle hub. For 4WD, remove the bolt and speed sensor from axle hub carrier. See **Fig. 41** .

2WD



4WD



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

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Fig. 41: Identifying Rear Speed Sensor Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Disassembly 2WD Only

Using a pin punch and hammer, drive out the 2 pins, and remove the 2 attachments from special tool (09520-00031, 09520-00040, or 09251-00020). Mount axle hub assembly in a soft jaw vise. Using special tool (09520-00031, 09520-00040, 09251-00020) and 2 bolts, (Diameter: 12 mm, Pitch: 1.5 mm), remove ABS speed sensor.

NOTE: Do not allow any foreign matter to stick to sensor rotor. Pull out ABS speed sensor straight, so not to damage sensor rotor. If sensor rotor is damaged, replace axle hub assembly. See appropriate AXLE-SHAFT article.

Reassembly

CAUTION: Do not tap the speed sensor with a hammer directly. Press in ABS speed sensor straight and slowly.

Clean contacting surface of axle hub and new ABS speed sensor. Place ABS speed sensor on axle hub so that it is set at the bottom of axle hub and is in right position. Using the special tool (09527-10011, 09710-04101, 09950-60020, or 09951-00680) and a press, install a NEW ABS speed sensor to the axle hub. See **Fig. 42**.

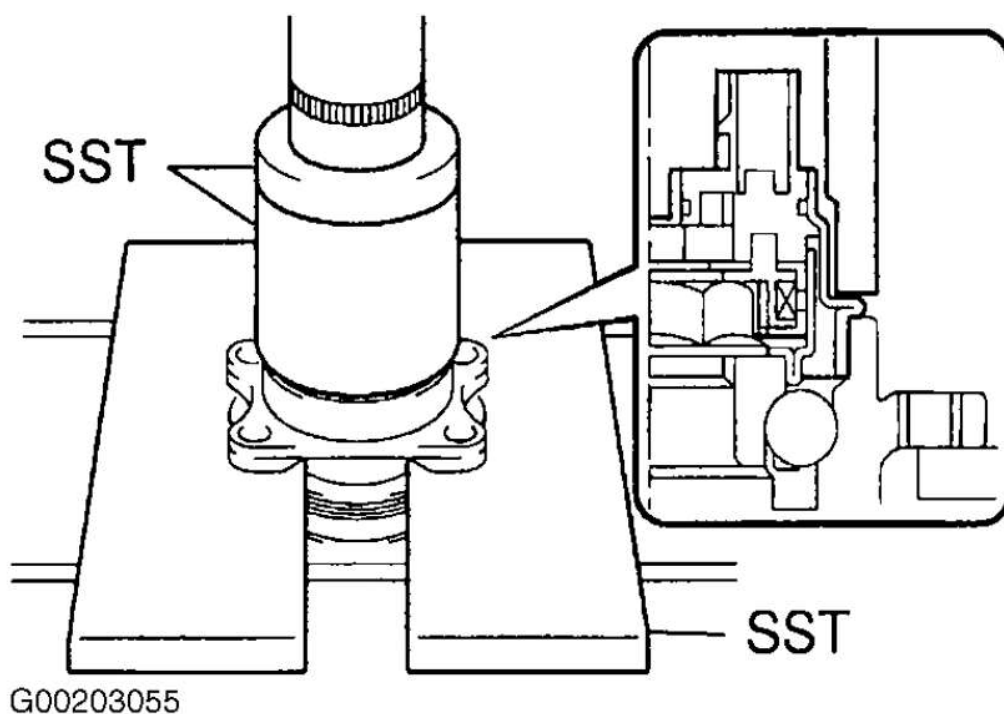


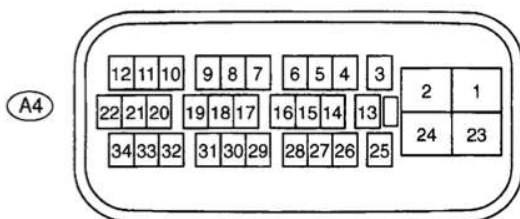
Fig. 42: Pressing ABS Speed Sensor Onto Hub
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Installation

To install, reverse order of removal. Torque all hardware to specifications. See **TORQUE SPECIFICATIONS**.

ABS ECU PIN VOLTAGES

ABS circuits and wiring harness can be tested by backprobing ABS ECU connectors and comparing measured voltages with ABS ECU standard values chart. See **Fig. 43**.



Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
+BS (A4-1) – GND (A4-2, 24)	R-Y – W-B	Always	11 – 14
GL1 (A4-4) – GGND (A4-7)*	W – B	IG switch ON Vehicle is placed on horizontal surface	2.0 – 3.0
FL+ (A4-9) – FL- (A4-8)	R – G	IG switch ON Slowly turn left front wheel	AC generation
STP (A4-10) – GND (A4-2, 24)	G-W – W-B	Stop light switch ON	10 – 14
		Stop light switch OFF	Below 1.0
RL+ (A4-11) – RL- (A4-12)	G – R	IG switch ON Slowly turn left rear wheel	AC generation
WA (A4-13) – GND (A4-2, 24)	R-Y – W-B	IG switch ON ABS warning light ON	10 – 14
		IG switch ON ABS warning light OFF	Below 2.0
D/G (A4-14) – GND (A4-2, 24)	W – W-B	IG switch ON	10 – 14
Ts (A4-15) – GND (A4-2, 24)	P-L – W-B	IG switch ON	10 – 14
Tc (A4-16) – GND (A4-2, 24)	P-B – W-B	IG switch ON	10 – 14
PKB (A4-18) – GND (A4-2, 24)	R-B – W-B	IG switch ON Parking switch ON	Below 1.0
		IG switch ON Parking switch OFF	10 – 14
+BM (A4-23) – GND (A4-2, 24)	W-R – W-B	Always	11 – 14
IG1 (A4-25) – GND (A4-2, 24)	R-L – W-B	IG switch ON	10 – 14
VGS (A4-28) – GGND (A4-7)*	R – B	IG switch ON	4.5 – 5.5
FR+ (A4-31) – FR- (A4-30)	B – W	IG switch ON Slowly turn right front wheel	AC generation
RR+ (A4-33) – RR- (A4-34)	Y – BR	IG switch ON Slowly turn right rear wheel	AC generation
BRL (A4-32) – GND (A4-2, 24)	R – W-B	IG switch ON Brake warning light ON	10 – 14
		IG switch ON Brake warning light OFF	Below 2.0

*: Only for 4WD

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Fig. 43: ABS ECU Terminal Pin Voltage Chart
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
ABS Actuator Bracket Mounting Bolt/Nut	14 (19)
Brakeline Fittings	11 (15)
Axle Hub Nuts (4)	37 (50)
Wheel Lug Nut	81 (110)
Wheel Speed Sensor Mounting Bolt C	14 (19)
INCH Lbs. (N.m)	
ABS Actuator Cushion Nut	48 (6)
Deceleration Sensor Connector Nuts	41 (5)
Power Steering Fluid Reservoir Bracket Bolt	70 (8)
Wheel Speed Sensor Mounting Bolt "A"	41 (5)
Wheel Speed Sensor Mounting Bolt "B"	71 (8)

WIRING DIAGRAMS

See **ANTI-LOCK BRAKES** under SYSTEM WIRING DIAGRAMS article in ELECTRICAL.