DI174-01

CIRCUIT INSPECTION

DTC	11, 12	ABS Solenoid Relay Circuit

CIRCUIT DESCRIPTION

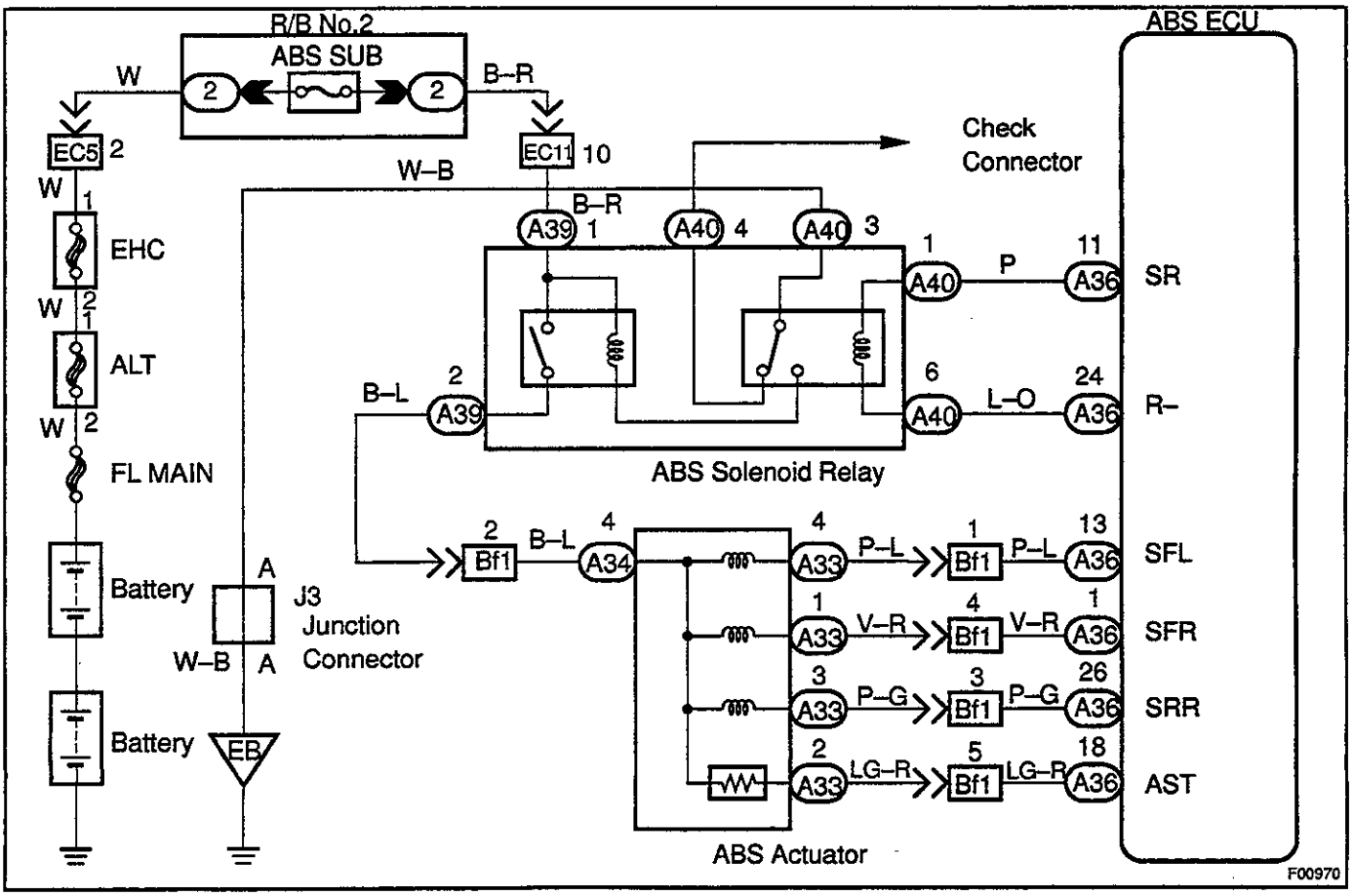
This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

DI

DTC No.	DTC Detecting Condition	Trouble Area
11	Conditions (1) and (2) continue for 0.2 sec. or more: (1) ABS solenoid relay terminal (SR) voltage: Battery voltage (2) ABS solenoid relay monitor terminal (AST) voltage: 0 V	• ABS solenoid relay • Open or short in ABS solenoid relay circuit
12	Conditions (1) and (2) continue for 0.2 sec. or more: (1) ABS solenoid relay terminal (SR) voltage: 0 V (2) ABS solenoid relay monitor terminal (AST) voltage: Battery voltage	• ABS solenoid relay • B+ short in ABS solenoid relay circuit

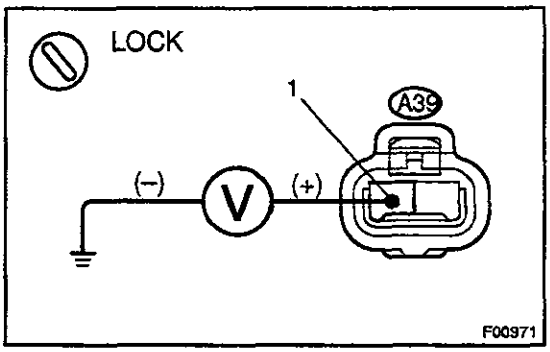
Fail – safe function:
If trouble in the ABS solenoid relay circuit, the ECU cuts off current to the ABS solenoid relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals A39 – 1 of ABS solenoid relay connector and body ground.**

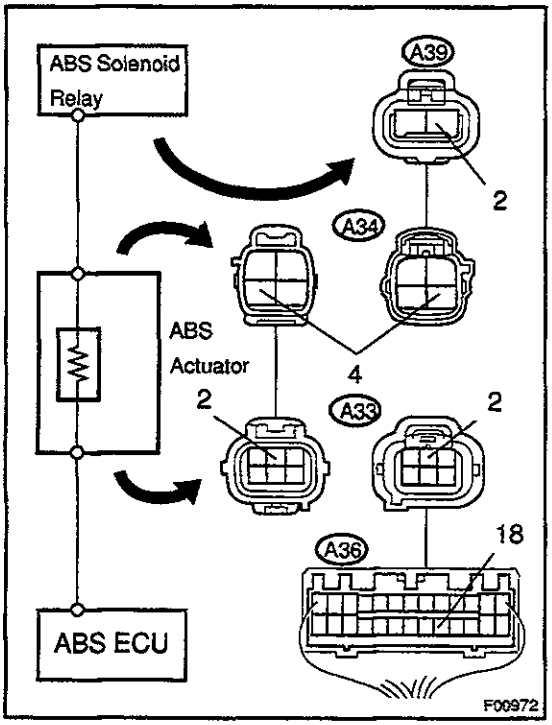


PREPARATION:
Disconnect the ABS solenoid relay connector(2P).
CHECK:
Measure the voltage between terminals A39 – 1 of ABS solenoid relay harness side connector and body ground.
OK:
Voltage: 22 – 26 V

NG	**Check and repair harness or connector.**

OK

2	**Check continuity between terminals A39 – 2 and A34 – 4, A34 – 4 and A33 – 2, A33 – 2 and A36 – 18.**

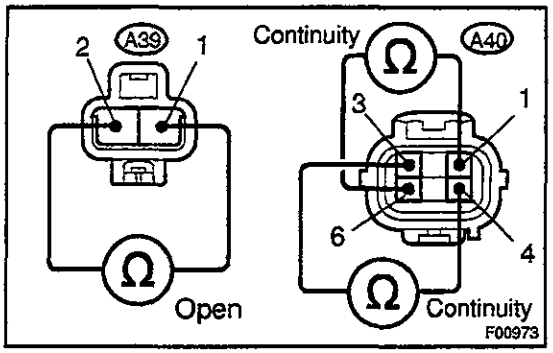


PREPARATION:
Disconnect the 2 connectors from ABS actuator.
CHECK:
Check continuity between terminals A39 – 2 and A34 – 4, A34 – 4 and A33 – 2, A33 – 2 and A36 – 18.
OK:
Continuity
HINT:
There is a resistance of about 5 Ω between terminals A34 – 2 and A33 – 2.

NG	**Repair or replace harness or ABS actuator.**

OK

3	**Check ABS solenoid relay.**

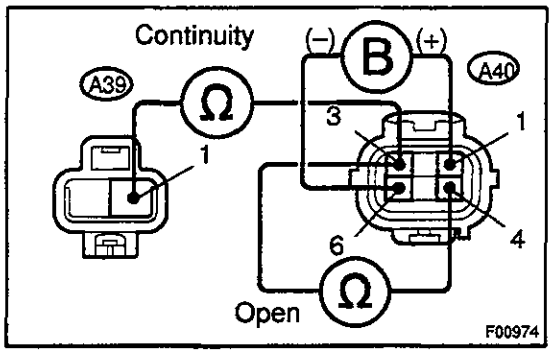


CHECK:

Check continuity between each terminal of ABS solenoid relay.

OK:

Terminals A40 – 1 and A40 – 6	Continuity (Reference value 240 Ω)
Terminals A40 – 3 and A40 – 4	Continuity
Terminals A39 – 1 and A39 – 2	Open



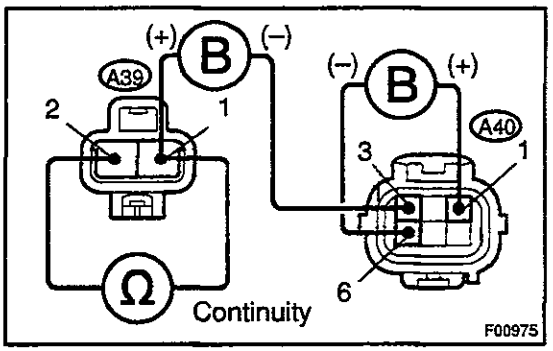
CHECK:

(a) Apply battery positive voltage between terminals A40 – 1 and A40 – 6.

(b) Check continuity between each terminal of ABS solenoid relay.

OK:

Terminals A40 – 3 and A40 – 4	Open
Terminals A40 – 3 and A39 – 1	Continuity (Reference value 240 Ω)



CHECK:

(a) Apply battery voltage between terminals A40 – 1 and A40 – 6, A39 – 1 and A40 – 3.

(b) Check continuity between each terminal of ABS solenoid relay.

OK:

Terminals A39 – 1 and A39 – 2	Continuity

NG → **Replace ABS solenoid relay.**

OK

4	Check for open and short in harness and connector between ABS solenoid relay and ABS ECU (See page IN–20).

NG → Repair or replace harness or connector.

OK

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

DI175-01

DTC	13, 14	ABS Motor Relay Circuit

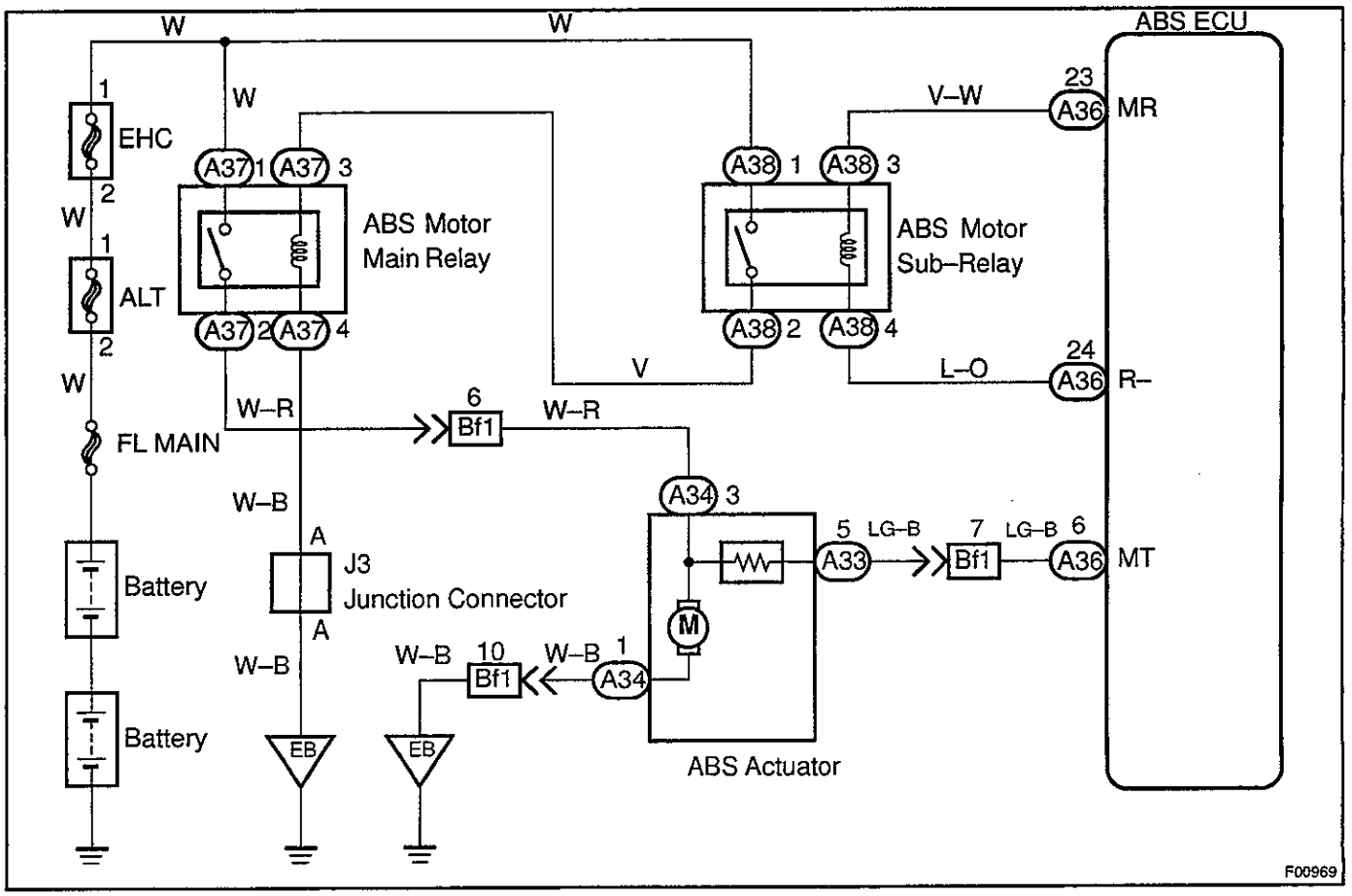
CIRCUIT DESCRIPTION

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

DTC No.	DTC Detecting Condition	Trouble Area
13	Conditions (1) and (2) continued for 0.2 sec. or more: (1) ABS motor relay terminal (MR) voltage: Battery voltage (2) ABS motor relay monitor terminal (MT) voltage: 0 V	• ABS motor main relay • ABS motor sub–relay • Open or short in ABS motor relay circuit
14	Conditions (1) and (2) continued for 2.5 sec. or more: (1) ABS motor relay terminal (MR) voltage: 0 V (2) ABS motor relay monitor terminal (MT) voltage: Battery voltage	• ABS motor main relay • ABS motor sub–relay • B+ short in ABS motor relay circuit

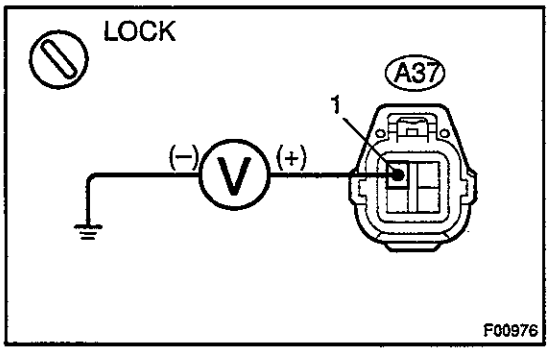
Fail – safe function:
If trouble occurs in the ABS motor relay circuit, the ECU cuts off current to the ABS solenoid relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminal A37 – 1 of ABS motor main relay and body ground.**

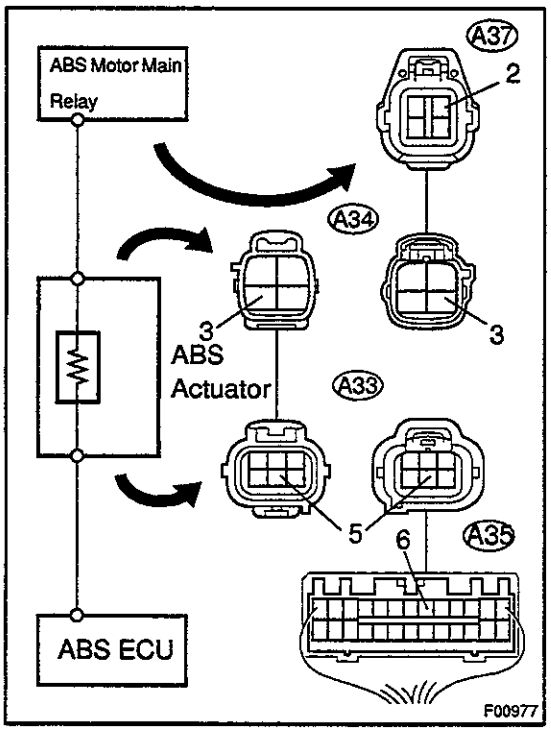


PREPARATION:
Disconnect the ABS motor main relay connector.
CHECK:
Measure voltage between terminal A37 – 1 of ABS motor main relay harness side connector and body ground.
OK:
Voltage: 22 – 26 V

NG	**Check and repair harness or connector.**

OK

2	**Check continuity between terminals A37 – 2 and A34 – 3, A34 – 3 and A33 – 5, A33 – 5 and A36 – 6.**

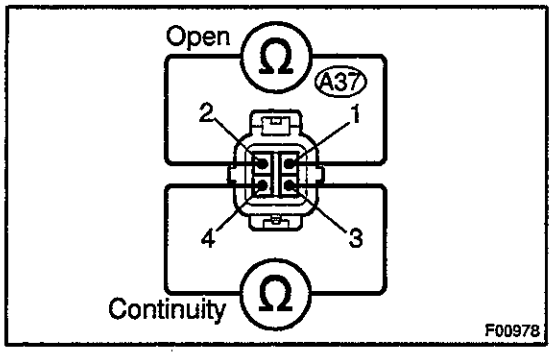


PREPARATION:
Disconnect the 2 connectors from ABS actuator.
CHECK:
Check continuity between terminals A37 – 2 and A34 – 3, A34 – 3 and A33 – 5, A33 – 5 and A36 – 6.
OK:
Continuity
HINT:
There is a resistance of about 5 Ω between terminals A34 – 3 and A33 – 5.

NG	**Repair or replace harness or ABS actuator.**

OK

3	Check ABS motor main relay.

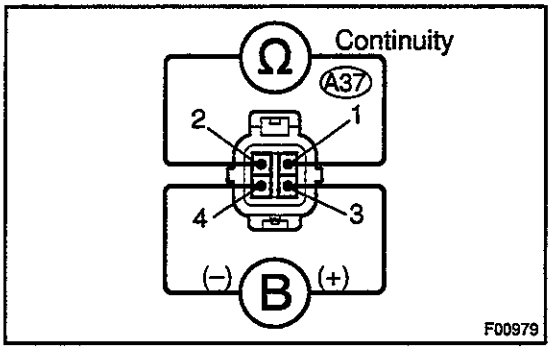


CHECK:

Check continuity between each terminal of ABS motor main relay.

OK:

Terminals A37 – 3 and A37 – 4	Continuity (Reference value 48 Ω)
Terminals A37 – 1 and A37 – 2	Open



CHECK:

(a) Apply battery voltage between terminals A37 – 3 and A37 – 4.

(b) Check continuity between terminals of ABS motor main relay.

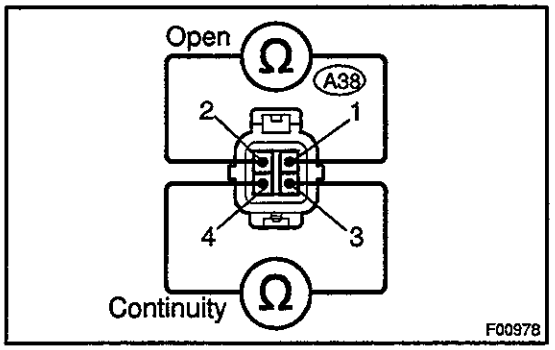
OK:

Terminals A37 – 1 and A37 – 2	Continuity

NG → **Replace ABS motor main relay.**

OK

4	Check ABS motor sub–relay.

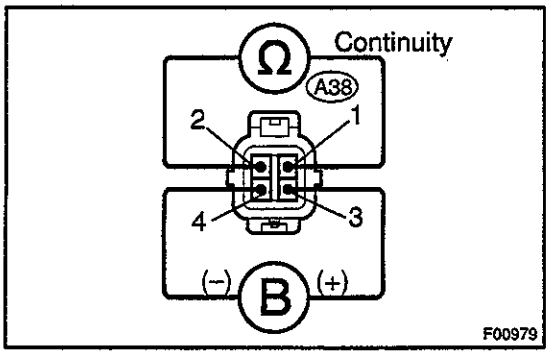


CHECK:

Check continuity between each terminal of ABS motor sub–relay.

OK:

Terminals A38 – 3 and A38 – 4	Continuity (Reference value 48 Ω)
Terminals A38 – 1 and A38 – 2	Open



CHECK:

(a) Apply battery voltage between terminals A38 – 3 and A38 – 4.

(b) Check continuity between terminals of ABS motor sub–relay.

OK:

Terminals A38 – 1 and A38 – 2	Continuity

NG → **Replace ABS motor sub–relay.**

OK

5	**Check for open and short in harness and connector between ABS control relay and ABS ECU (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

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

DI0CF-02

DTC	21, 22, 23	ABS Actuator Solenoid Circuit

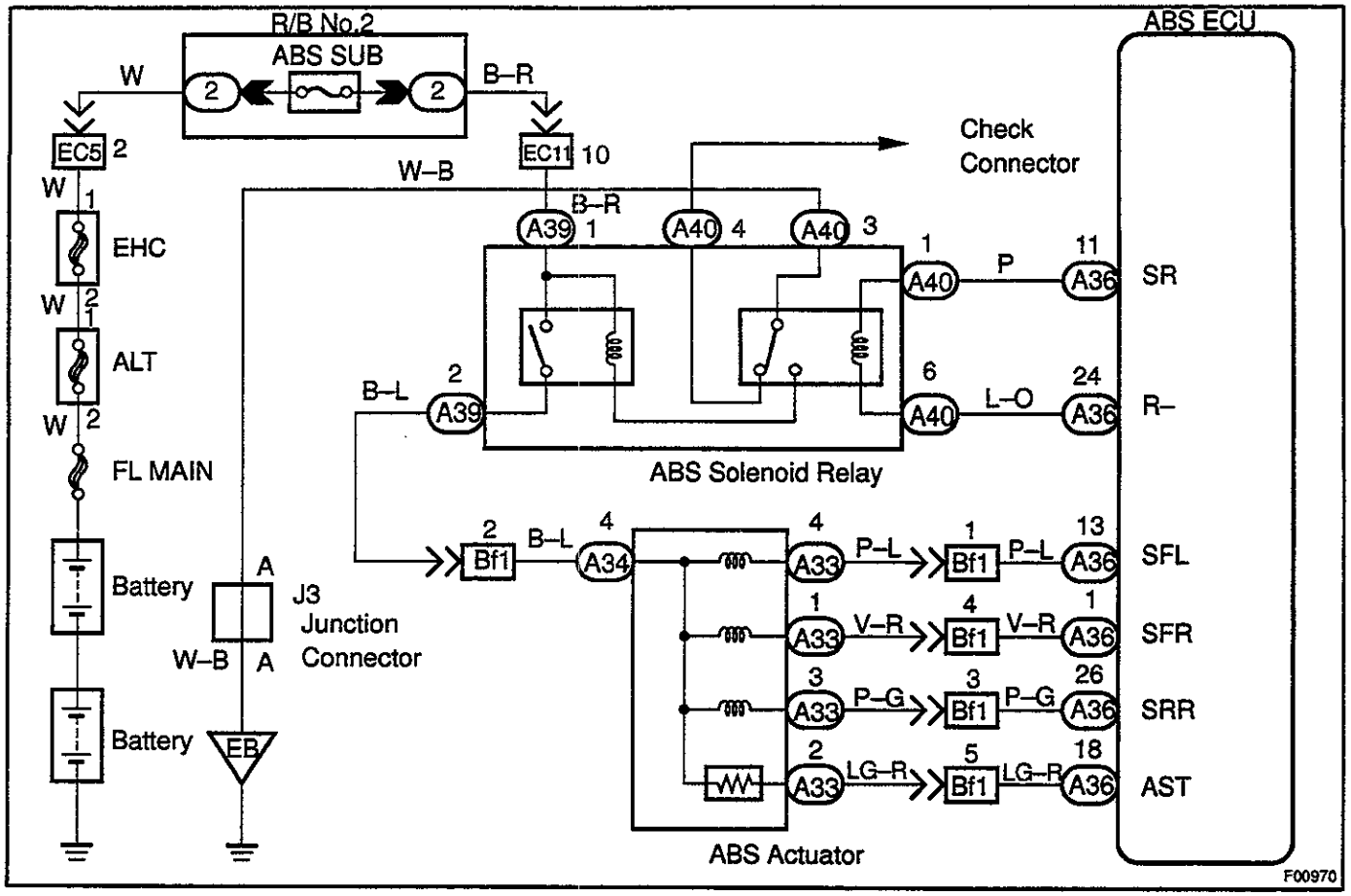
CIRCUIT DESCRIPTION

This solenoid goes on when signals are received from the ECU and controls the pressure acting on the wheel cylinders thus controlling the braking force.

DTC No.	DTC Detecting Condition	Trouble Area
21	Conditions (1) through (3) continue for 0.05 sec. or more: (1) ABS solenoid relay terminal (SR) voltage: Battery voltage (2) Voltage of ABS ECU terminal AST: Battery voltage (3) When open or short circuit of solenoid (SFR) continues for 0.05 sec. or more.	• ABS actuator • Open or short in SFR circuit
22	Conditions (1) through (3) continue for 0.05 sec. or more: (1) ABS solenoid relay terminal (SR) voltage: Battery voltage (2) Voltage of ABS ECU terminal AST: Battery voltage (3) When open or short circuit of solenoid (SFL) continues for 0.05 sec. or more.	• ABS actuator • Open or short in SFL circuit
23	Conditions (1) through (3) continue for 0.05 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery voltage (2) Voltage of ABS ECU terminal AST: Battery positive voltage (3) When open or short circuit of solenoid (SRR) continues for 0.05 sec. or more.	• ABS actuator • Open or short in SRR circuit

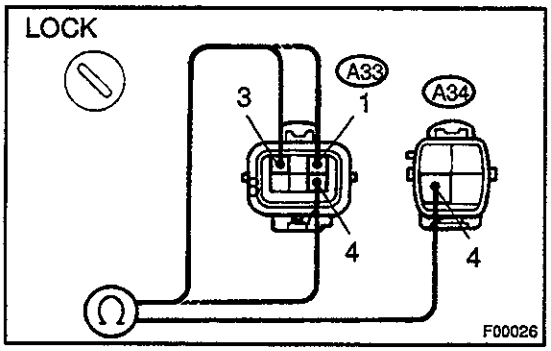
Fail – safe function:
If trouble occurs in the actuator solenoid circuit, the ECU cuts off current to the ABS solenoid relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ABS actuator solenoid.**



PREPARATION:
Disconnect the 2 connectors from ABS actuator.

CHECK:
Check continuity between terminals A34 – 4 and A4 – 1, 3, 4 of ABS actuator connector.

OK:

Continuity

HINT:
Resistance of each solenoid coil is 3.85 Ω.

NG	**Replace ABS actuator.**

OK

2	Check for open and short in harness and connector between ABS ECU and actuator (See page IN–20).

NG → Repair or replace harness or connector.

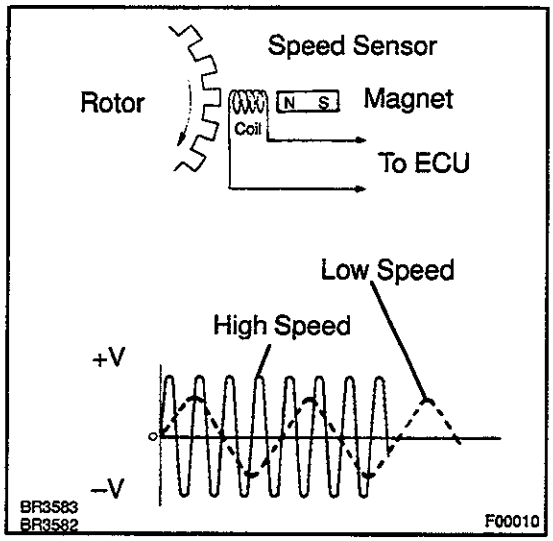
OK

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

DI176-01

DTC	31, 32, 33, 34,35,36	Speed Sensor Circuit

CIRCUIT DESCRIPTION

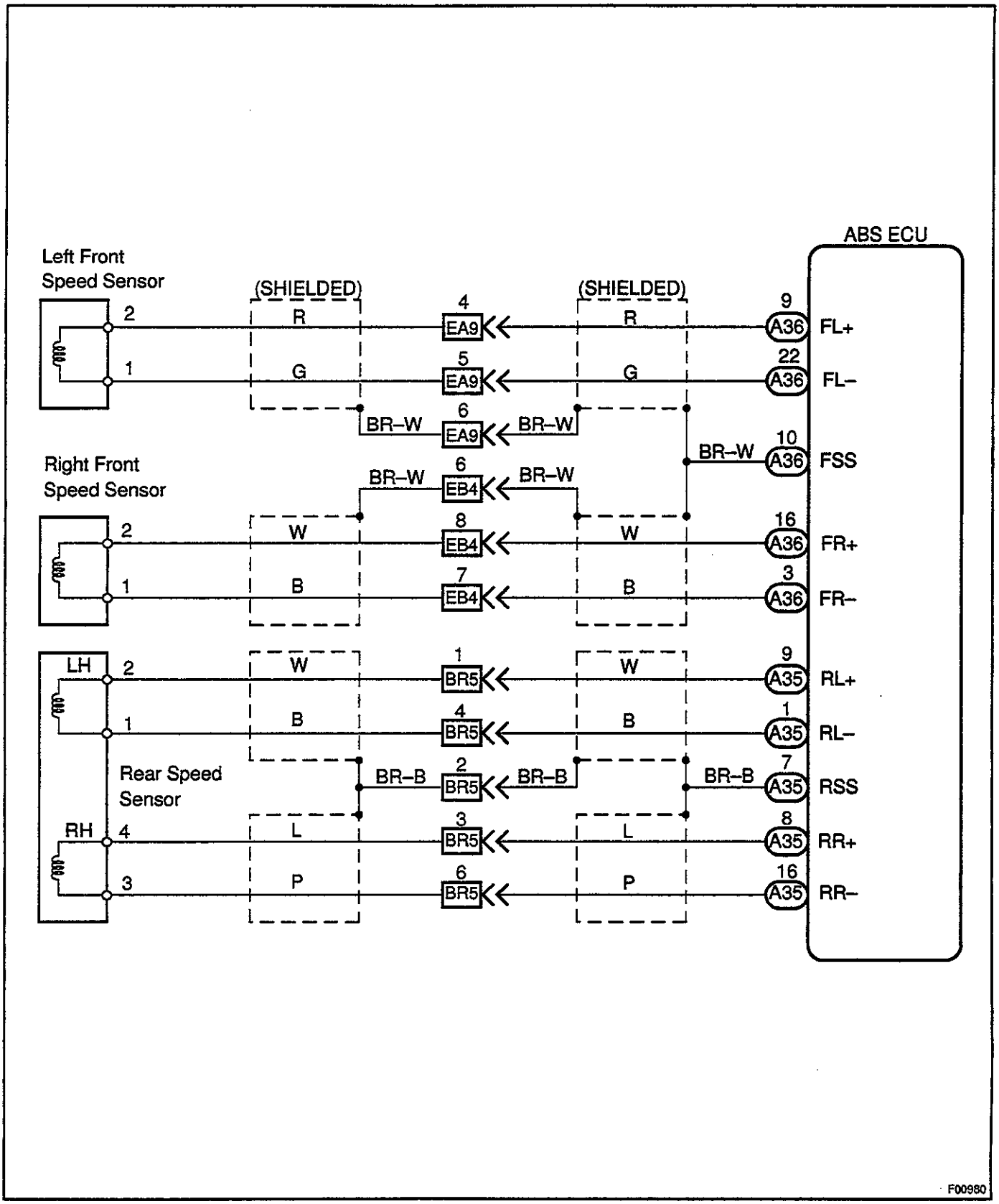


The speed sensor detects wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS system. The front and rear rotors each have 48 serrations.
When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.

DTC No.	DTC Detecting Condition	Trouble Area
31, 32, 33, 34	Detection of any of conditions (1) through (3): (1) At vehicle speed of 10 km/h (6 mph) or more, pulses are not input for 15 sec. (2) Momentary interruption of the speed sensor signal occurs at least 7 times in the time between switching the ignition switch ON and switching it OFF. (3) Abnormal fluctuation of speed sensor signals with the vehicle speed 20 km/h or more. (4) Abnormal fluctuation of speed sensor signals with the vehicle speed 20 km (12 mph) or more are send more than 75 times within 5 sec.	• Right front, left front, right rear and left rear speed sensor • Open or short in each speed sensor circuit
35	Speed sensor signal is not input for about 0.8 sec. while left front and right rear speed sensor signals are being checked with IG switch ON.	• Open in left front or right rear speed sensor circuit
36	Speed sensor signal is not input for about 0.8 sec. while right front and left rear speed sensor signals are being checked with IG switch ON.	• Open in right front or left rear speed sensor circuit

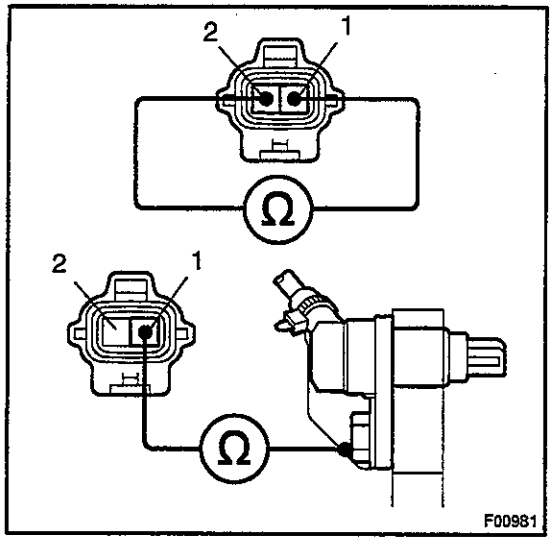
HINT:
DTC No. 31 is for the right front speed sensor.
DTC No. 32 is for the left front speed sensor.
DTC No. 33 is for the right rear speed sensor.
DTC No. 34 is for the left rear speed sensor.
Fail – safe function:
If trouble occurs in the speed sensor circuit, the ECU cuts off current to the ABS solenoid relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check speed sensor.**



FRONT

PREPARATION:

Disconnect speed sensor connector.

CHECK:

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

OK:

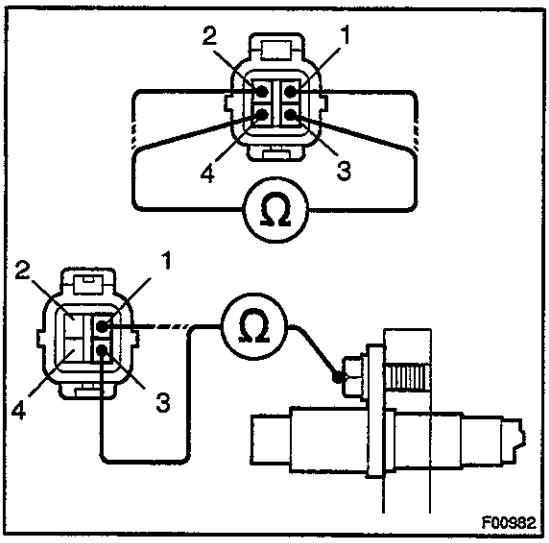
Resistance: 0.92 – 1.22 kΩ (at 20 °C)

CHECK:

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

OK:

Resistance: 1 MΩ or higher



REAR

PREPARATION:

Disconnect speed sensor connector.

CHECK:

Measure resistance between terminals 1 and 2, 3 and 4 of speed sensor connector.

OK:

Resistance: 0.7 – 1.1 kΩ (at 20 °C)

CHECK:

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

OK:

Resistance: 1 MΩ or higher

NG	**Replace speed sensor.**

NOTICE:

Check the speed sensor signal last (See page DI–3).

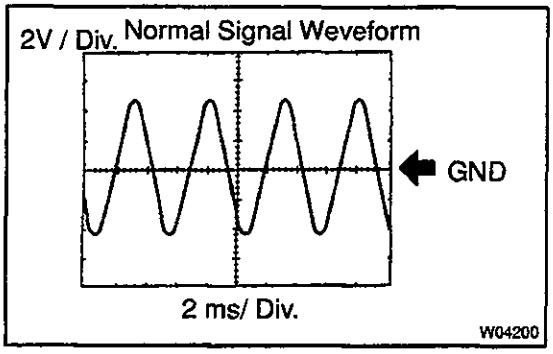
OK

2	**Check for open and short in harness and connector between each speed sensor and ECU (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

3	**Check speed sensor and sensor rotor serrations.**



REFERENCE: INSPECTION USING OSCILLOSCOPE

PREPARATION:

(a) Remove the ABS ECU with connector still connected.

(b) Connect the oscilloscope to the terminals FR+, FL+, RR+, or RL+ and GND of the ABS ECU.

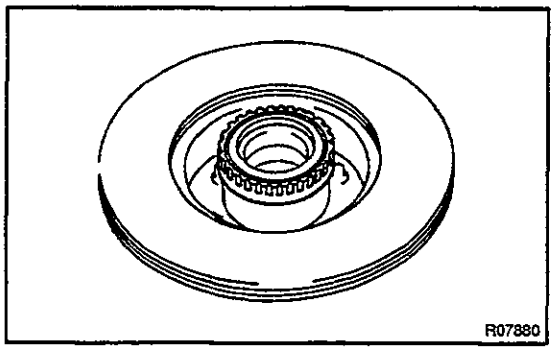
CHECK:

Drive the vehicle at 30 km/h (19 mph), and check the signal waveform.

OK → **Replace speed sensor.**

NG

4	**Check sensor rotor and sensor installation.**



FRONT

PREPARATION:

Remove axle hub (See Pub. No. RM339E on page SA–11).

CHECK:

Check sensor rotor serrations.

OK:

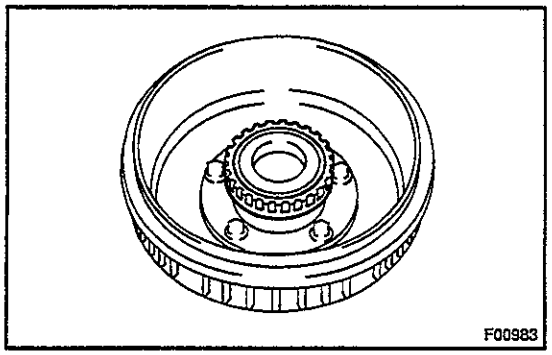
No scratches or missing teeth.

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.


F00983

REAR

PREPARATION:

Remove the axle hub (See Pub. No. RM339E on page SA–46).

CHECK:

Check the sensor rotor serrations.

OK:

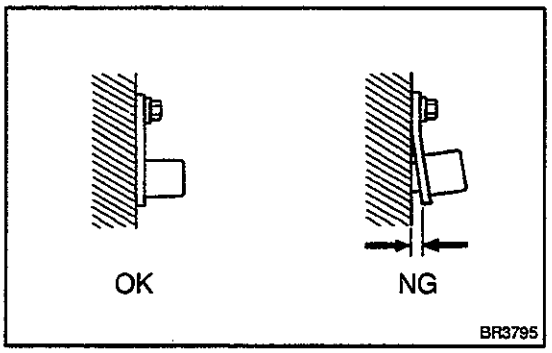
No scratches or missing teeth.

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.



BR3795

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.

NG → **Replace speed sensor or rotor.**

NOTICE:

Check the speed sensor signal last (See page DI–3).

OK

Check and replace ABS ECU.

DTC	41	IG Power Source Circuit

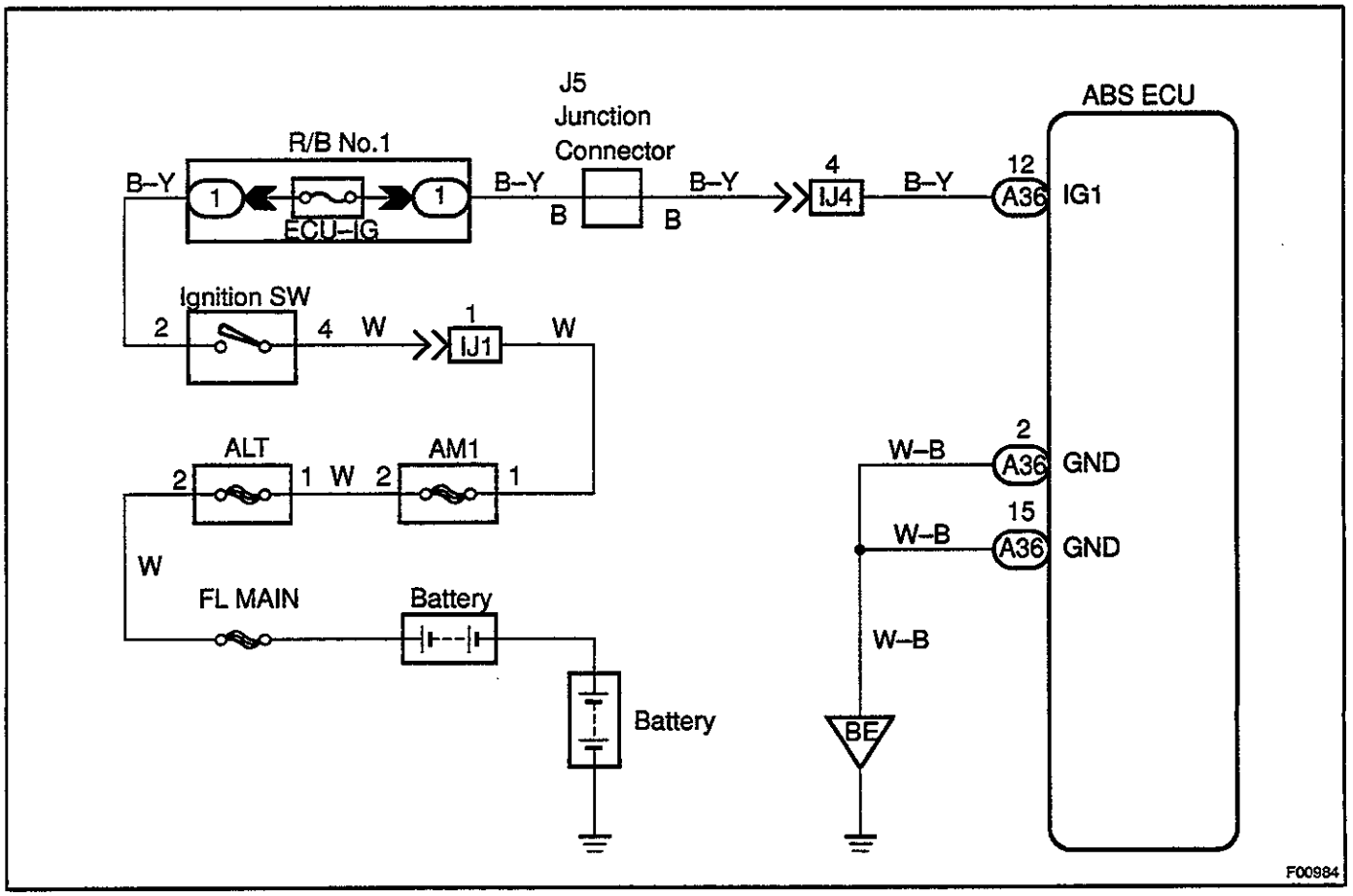
CIRCUIT DESCRIPTION

This is the power source for the ECU, hence the actuators.

DTC No.	DTC Detecting Condition	Trouble Area
41	Vehicle speed is 3 km/h (1.9 mph) or more and voltage of ECU terminal IG1 remains at more than 34 V for more than 1.2 sec. or below 21 V for more than 10 sec.	• Battery • IC regulator • Open or short in power source circuit • ECU

Fail safe function:
If trouble occurs in the power source circuit, the ECU cuts off current to the ABS solenoid relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check battery voltage.**

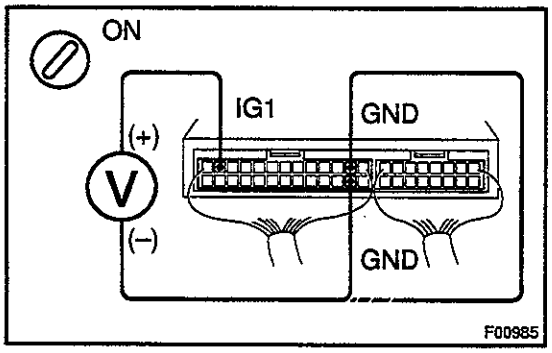
OK:

Voltage: 22 – 26 V

NG → **Check and repair the charging system.**

OK

2	**Check voltage between terminals IG1 and GND of ABS ECU connector.**



PREPARATION:

Remove ABS ECU with connectors still connected.

CHECK:

(a) Turn the ignition switch ON.

(b) Measure voltage between terminals IG1 and GND of ABS ECU connector.

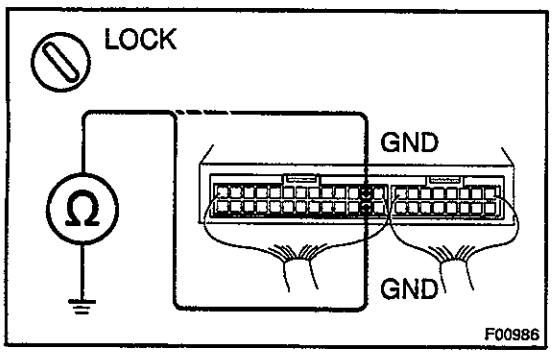
OK:

Voltage: 22 – 26 V

OK → **Check and replace ABS ECU.**

NG

3	**Check continuity between terminals GND of ABS ECU connector and body ground.**



CHECK:

Measure resistance between terminals GND of ABS ECU connector and body ground.

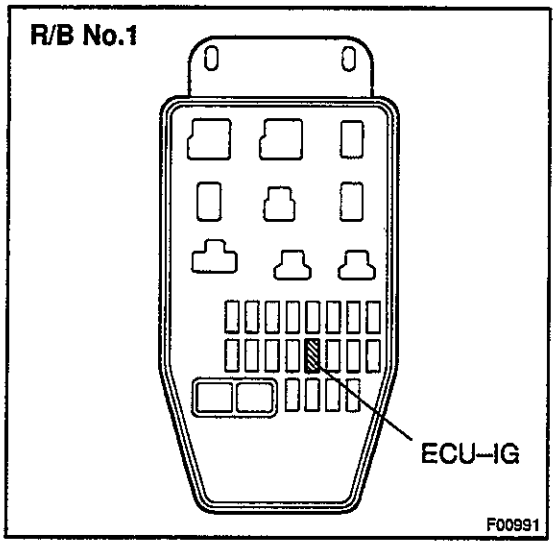
OK:

Resistance: 1 Ω or less

NG → **Repair or replace harness or connector.**

OK

4	Check ECU–IG fuse.



PREPARATION:
Remove ECU–IG fuse from R/B No.1.
CHECK:
Check continuity of ECU–IG fuse.
OK:
Continuity

NG → **Check for short in all the harness and components connected to ECU–IG fuse (See attached wiring diagram).**

OK →

Check for open in harness and connector between ABS ECU and battery (See page IN–20).

D0QC-02

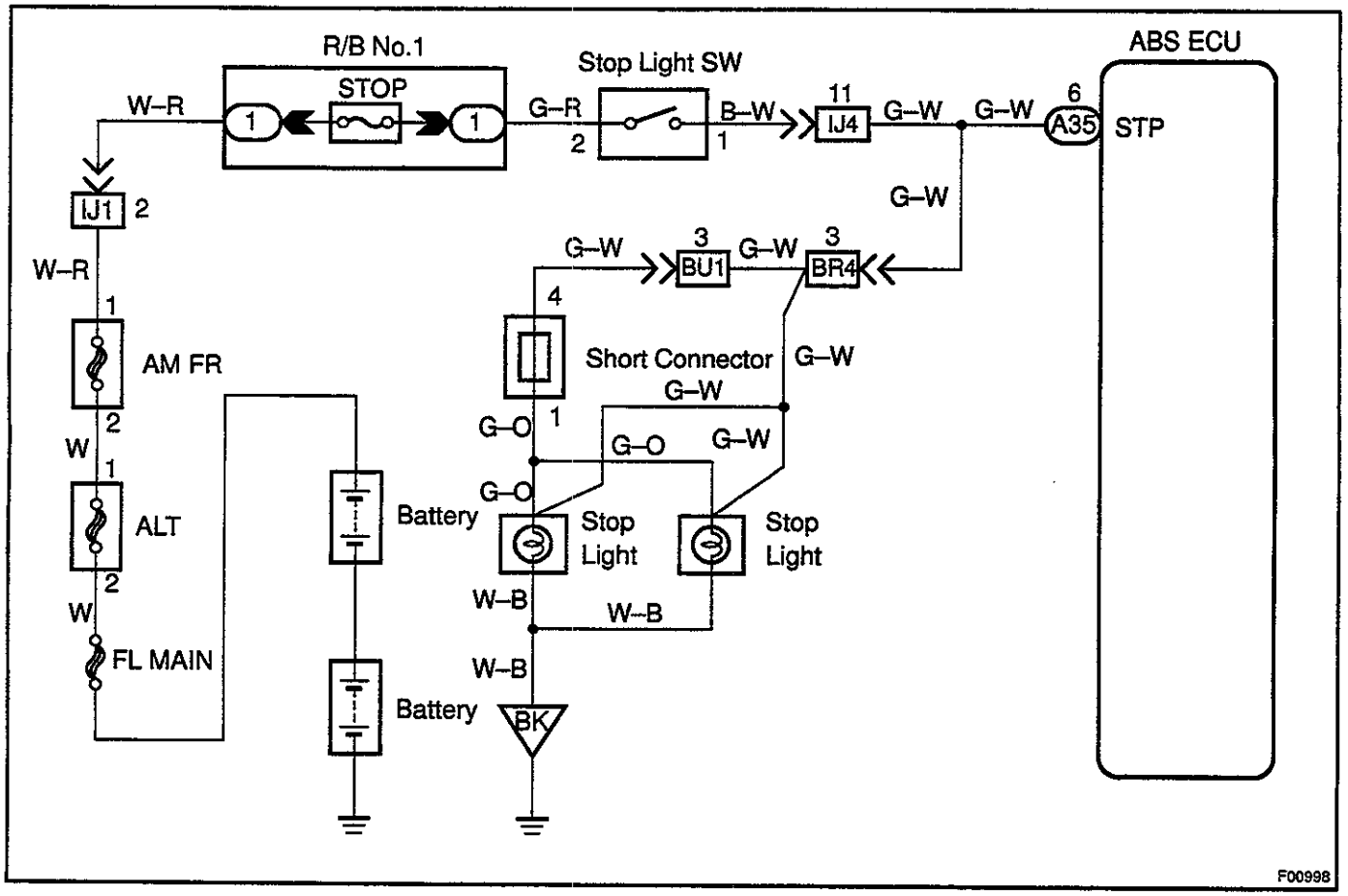
DTC	49	Stop Light Switch Circuit

CIRCUIT DESCRIPTION

This stop light switch senses whether the brake pedal is depressed or released, and sends the signal to the ECU.

DTC No.	DTC Detecting Condition	Trouble Area
49	ABS ECU terminal IG1 voltage is 21 V to 34 V and ABS is in non–operation. The open circuit of the stop light switch circuit continues for 0.3 sec. or more.	• Open in stop light switch circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

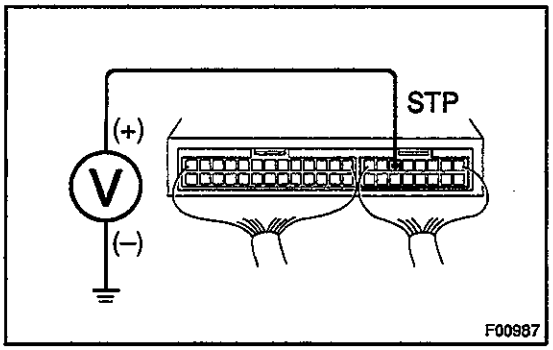
1	**Check operation of stop light.**

CHECK:
Check that stop light lights up when brake pedal is depressed and turns off when brake pedal is released.

NG → **Repair stop light circuit (See Pub. No. RM339E on page BE–28).**

OK

2	**Check voltage between terminal STP of ABS ECU and body ground.**



PREPARATION:
Remove ABS ECU with connectors still connected.
CHECK:
Measure voltage between terminal STP of ABS ECU and body ground when brake pedal is depressed.
OK:
Voltage: 22 – 26 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–9).**

NG

3	**Check for open in harness and connector between ABS ECU and stop light switch (See page IN–20).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ABS ECU.

DI0QN-02

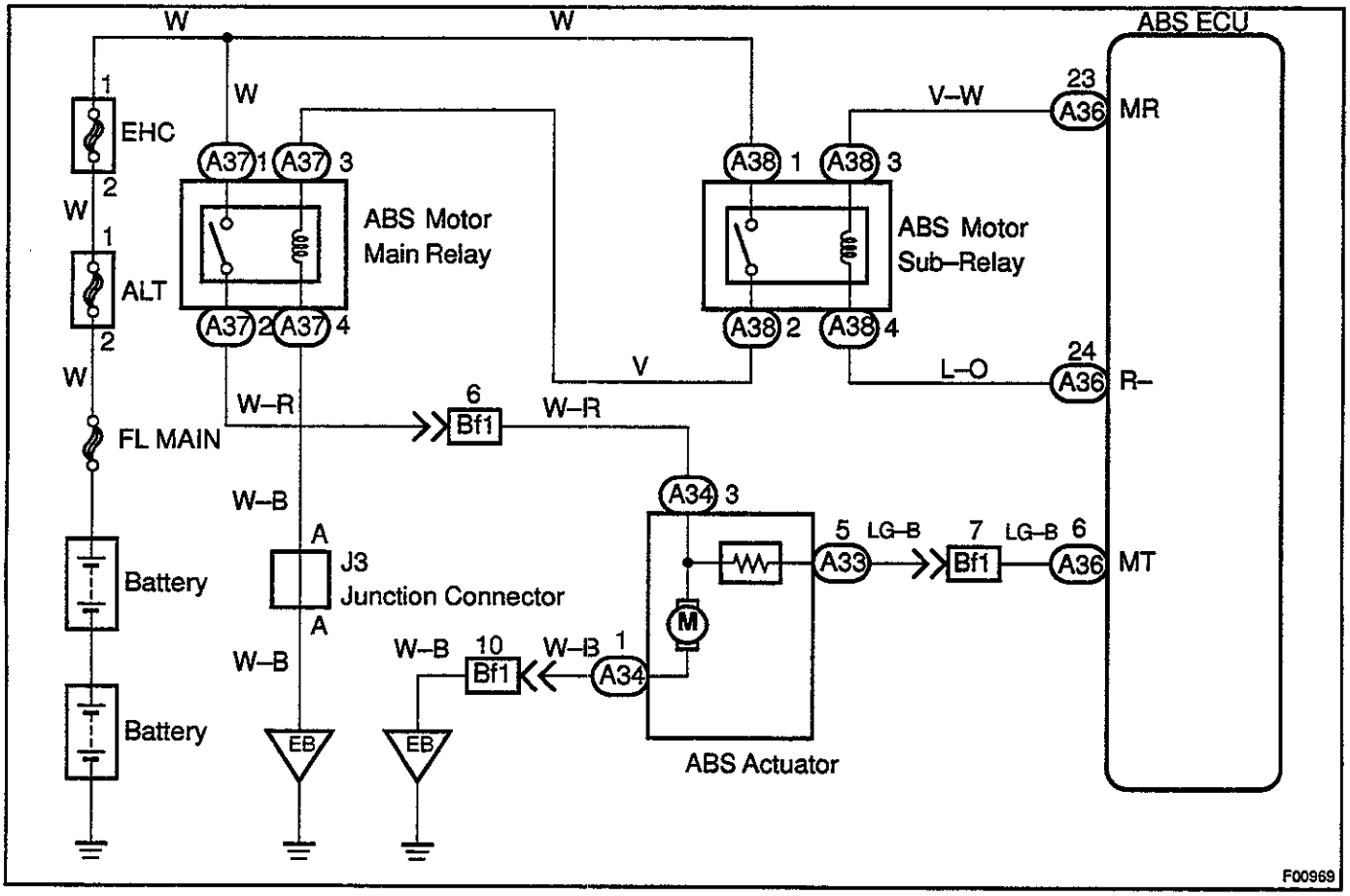
DTC	51	ABS Pump Motor Lock

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
51	Pump motor is not operating normally during initial check.	• ABS pump motor

Fail–safe function:
If trouble occurs in the ABS pump motor, the ECU cuts off current to the ABS solenoid relay and prohibits ABS control.

WIRING DIAGRAM



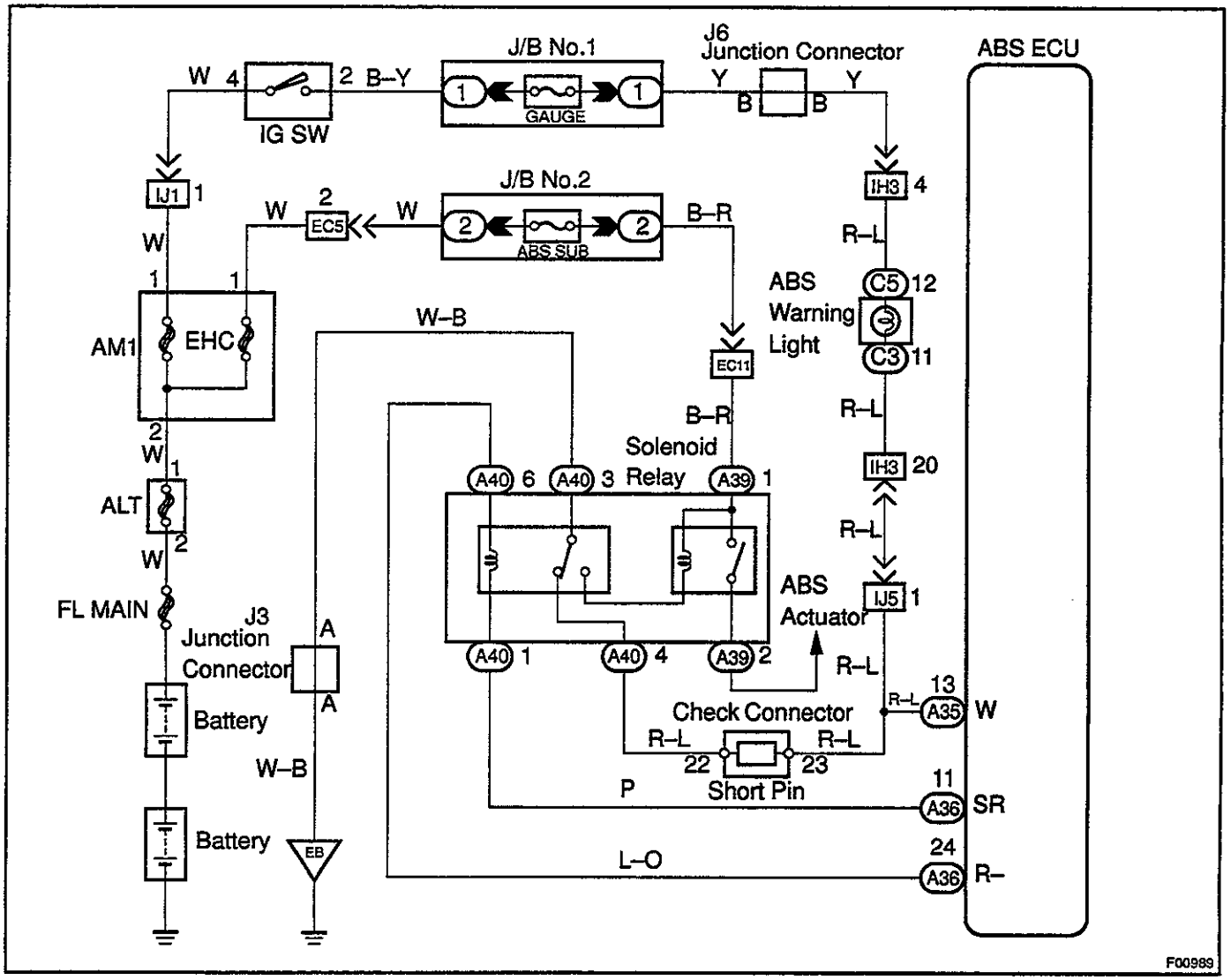
DI177-01

ABS Warning Light Circuit

CIRCUIT DESCRIPTION

If the ECU detects trouble, it lights the ABS warning light while at the same time prohibiting ABS control. At this time, the ECU records a DTC in memory.
After removing the short pin of the check connector, connect terminals Tc and E_1 of the check connector to make the ABS warning light blink and output the DTC.

WIRING DIAGRAM

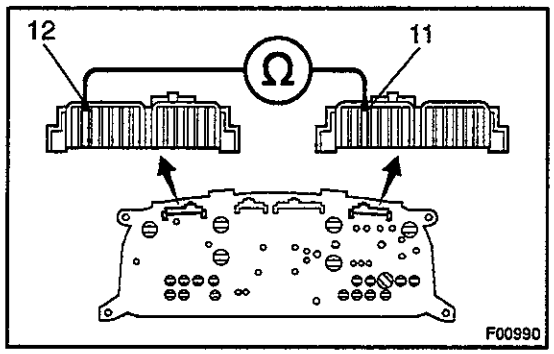


INSPECTION PROCEDURE

Troubleshooting in accordance with the chart below for each trouble symptom.

ABS warning light does not light up	Go to step 1
ABS warning light remains on	Go to step 3

1 Check ABS warning light.

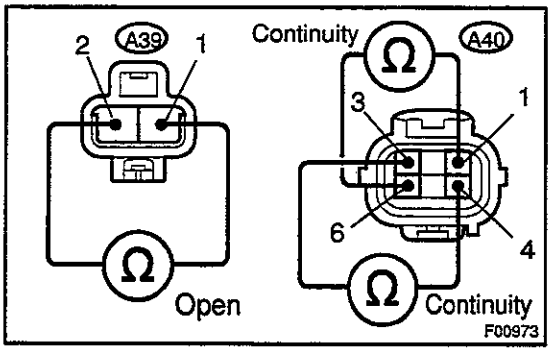


PREPARATION:
Remove the combination meter.
CHECK:
Check continuity between terminals C3 – 11 and C5 – 12.
OK:
Continuity

NG → **Repair bulb or combination meter assembly.**

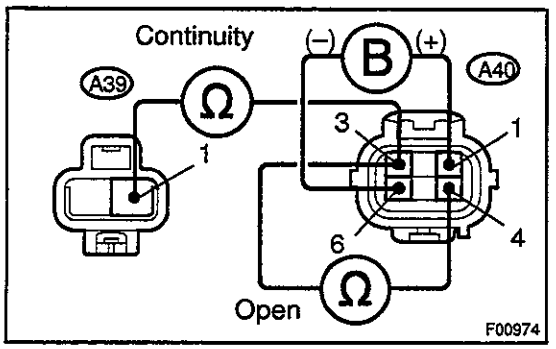
OK

2 Check ABS solenoid relay.



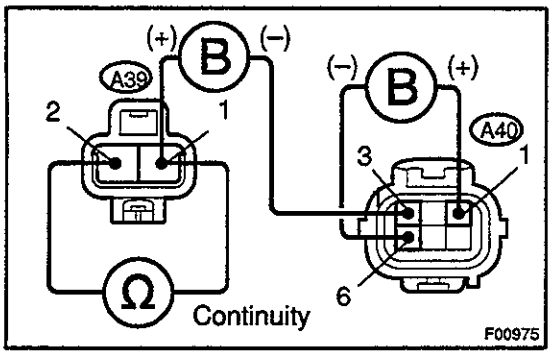
CHECK:
Check continuity between each terminal of ABS solenoid relay.
OK:

Terminals A40 – 1 and A40 – 6	Continuity (Reference value 240 Ω)
Terminals A40 – 3 and A40 – 4	Continuity
Terminals A39 – 1 and A39 – 2	Open



CHECK:
(a) Apply battery positive voltage between terminals A40 – 1 and A40 – 6.
(b) Check continuity between each terminal of ABS solenoid relay.
OK:

Terminals A40 – 3 and A40 – 4	Open
Terminals A40 – 3 and A39 – 1	Continuity (Reference value 240 Ω)



CHECK:

(a) Apply battery voltage between terminals A40 – 1 and A40 – 6, A39 – 1 and A40 – 3.

(b) Check continuity between each terminal of ABS solenoid relay.

OK:

Terminals A39 – 1 and A39 – 2	Continuity

NG → **Replace ABS solenoid relay.**

OK

Check for open in harness and connector between check connector and ABS solenoid relay and body ground (See page IN–20).

3	Is DTC output?

Check DTC on page DI–3.

YES → **Repair circuit indicated by the code output.**

NO

4	Does ABS warning light go off if short pin is removed?

NO → **Check for short in harness and connector between warning light and check connector and ECU (See page IN–20).**

YES

5	Check ABS solenoid relay (See step 2).

NG → Replace ABS solenoid relay.

OK →

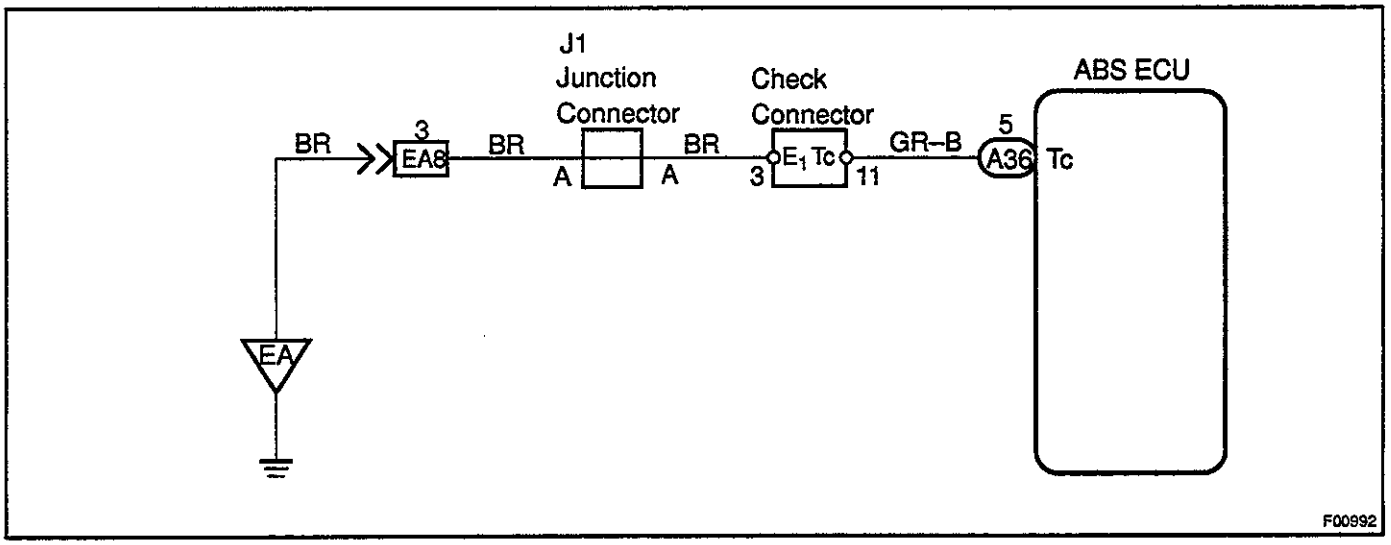
Check for short in harness and connector between check connector and ABS control relay (See page IN–20).

Tc Terminal Circuit

CIRCUIT DESCRIPTION

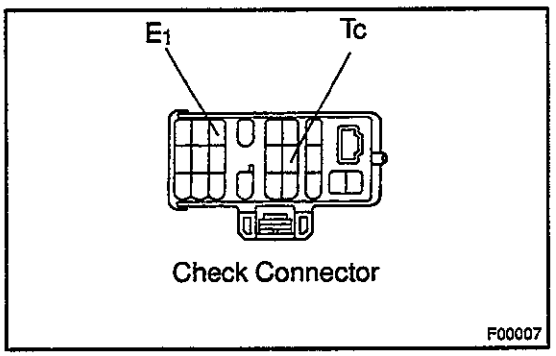
Connecting terminals Tc and E_1 of the check connctor causes the ECU to display the DTC by flashing the ABS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals Tc and E_1 of check connctor.**



CHECK:

(a) Turn the ignition switch ON.

(b) Measure voltage between terminals Tc and E_1 of check connctor.

OK:

Voltage: 22 – 26 V

OK	**If ABS warning light does not blink even after Tc and E_1 are connected, the ECU may be defective.**

NG

2	Check for open and short in harness and connector between ABS ECU and check connctor, check connctor and body ground (See page IN–20).

NG → Repair or replace harness or connector.

OK →

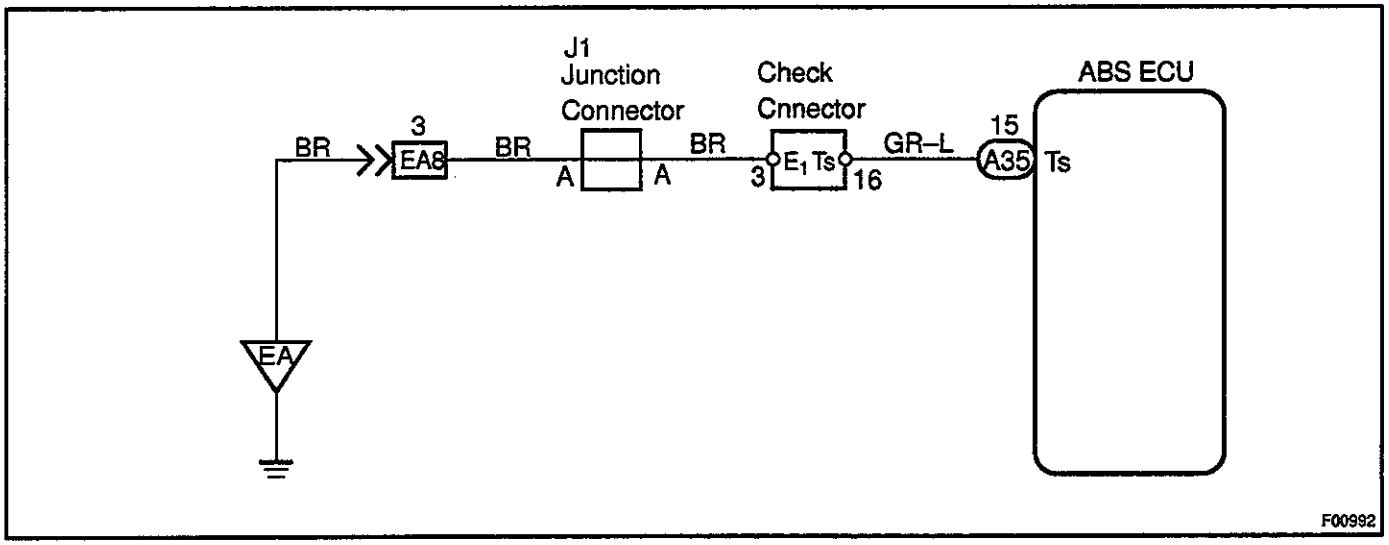
Check and replace ABS ECU.

Ts Terminal Circuit

CIRCUIT DESCRIPTION

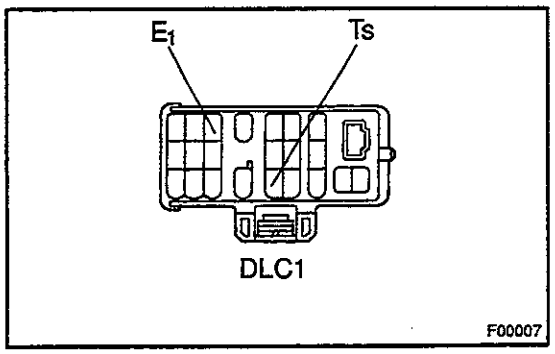
The sensor check circuit detects abnormalities in the speed sensor signal which cannot be detected with the DTC check.
Connecting terminals Ts and E_1 of the check connector in the engine compartment starts the check.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals Ts and E_1 of check connector.**



CHECK:

(a) Turn the ignition switch ON.
(b) Measure voltage between terminals Ts and E_1 of check connector.

OK:

Voltage: 22 – 26 V

OK	**If ABS warning light does not blink even after Ts and E_1 are connected, the ECU may be defective.**

NG

2	Check for open and short in harness and connector between ABS ECU and check connector, check connector and body ground (See page IN–20).

NG → Repair or replace harness or connector.

OK →

Check and replace ABS ECU.

Check for fluid Leakage

Check for fluid leakage from actuator or hydraulic lines.

