

BRAKE SYSTEM

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ANTI—LOCK BRAKE SYSTEM (ABS)

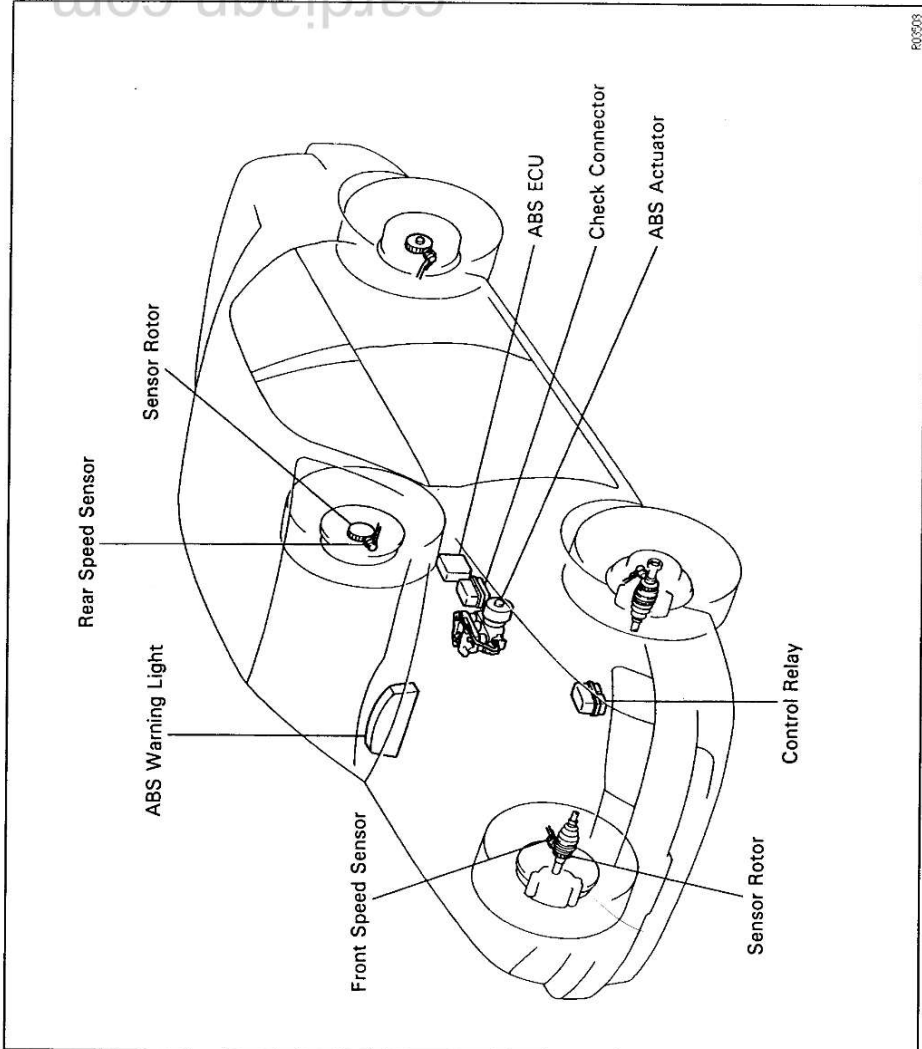
DESCRIPTION

- The ABS is a brake system which controls the brake cylinder hydraulic pressure of all four wheels during sudden braking and braking on slippery road surface, preventing the wheels from locking. This ABS provides the following benefits:
 - (1) Enables steering round an obstacle with a greater degree of certainty even when panic braking.
 - (2) Enables stopping in a panic brake while keeping the effect upon stability and steerability to a minimum, even on curves.
- The function of the ABS is to help maintain directional stability and vehicle steerability on most road conditions. However, the system cannot prevent the vehicle from skidding if the cornering speed limit is exceeded.
- In case a malfunction occurs, a diagnosis function and fail—safe system have been adopted for the ABS to increase serviceability.

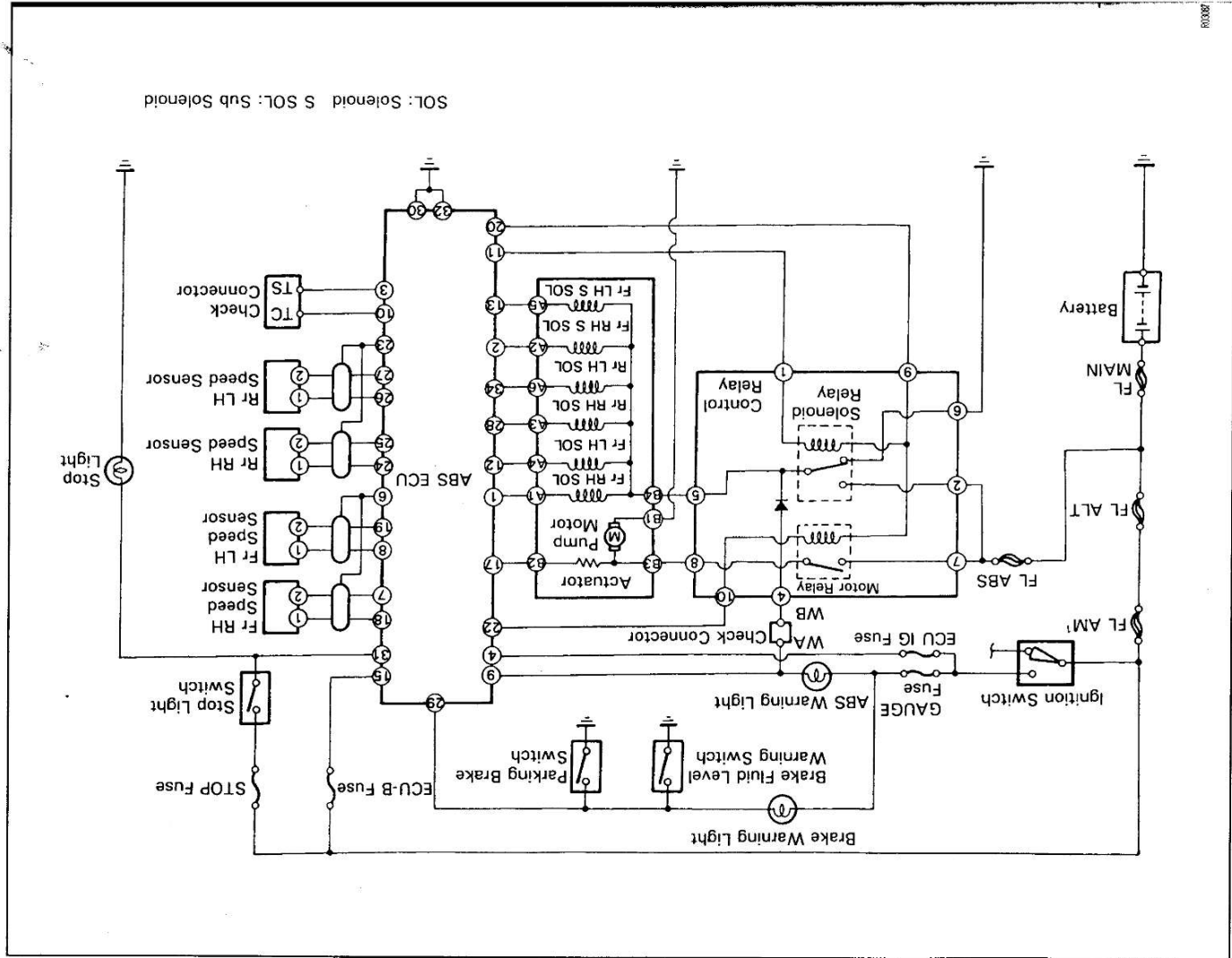
COMPONENTS FUNCTION

Component	Function
Front Speed Sensor	Detect the wheel speed of each of the left and right front wheels.
Rear Speed Sensor	Detect the wheel speed of each of the left and right rear wheels.
ABS Warning Light	Lights up to alert the driver when trouble has occurred in the Anti—Lock Brake System.
Actuator	Controls the brake fluid pressure to each brake cylinder through signals from the ECU.
ABS ECU	From the wheel speed signals from each sensor, it calculates acceleration, deceleration and slip values and sends signals to the actuator to control brake fluid pressure.

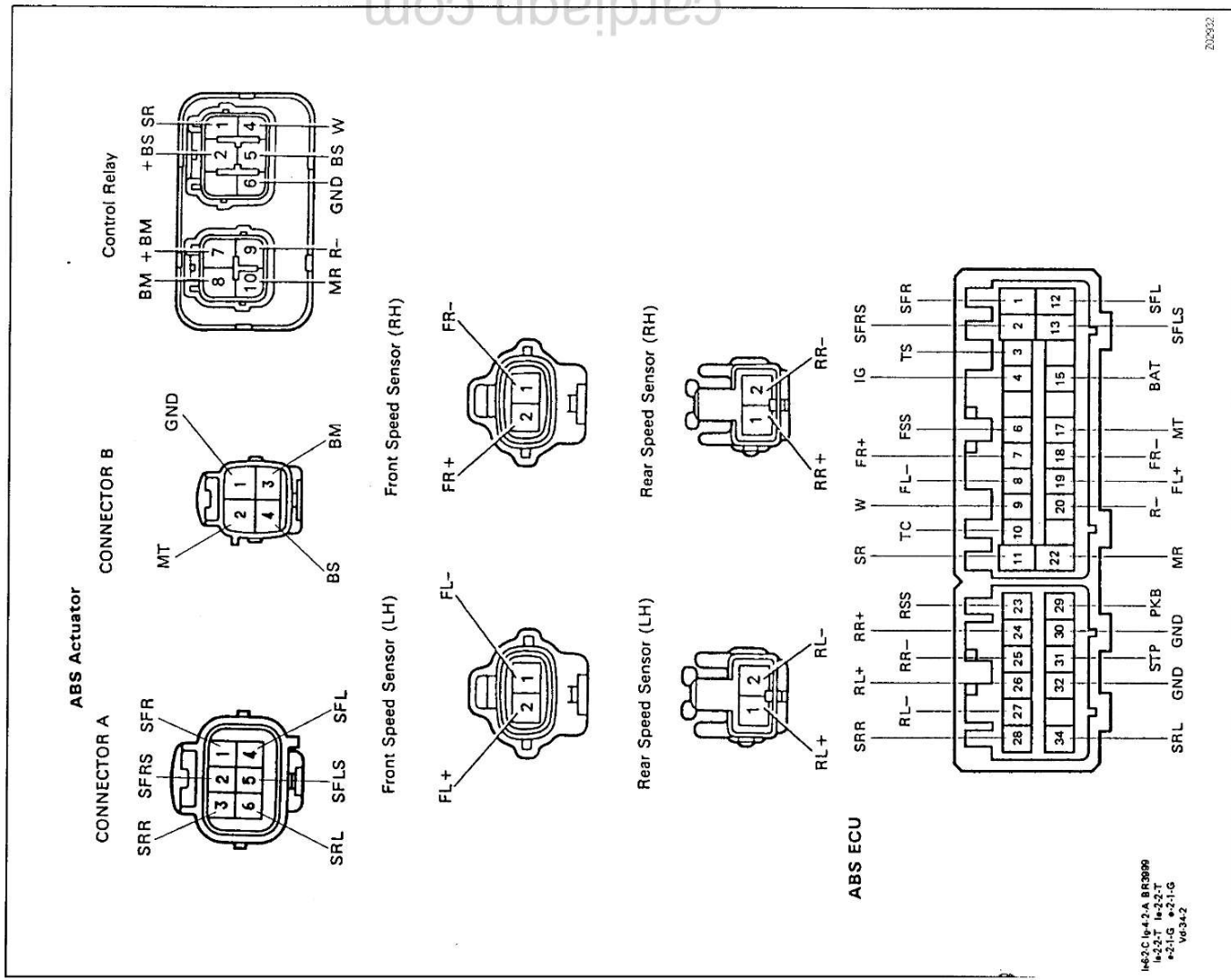
SYSTEM PARTS LOCATION

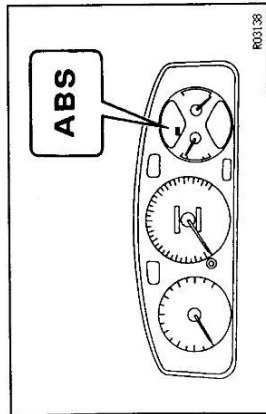


WIRING DIAGRAM

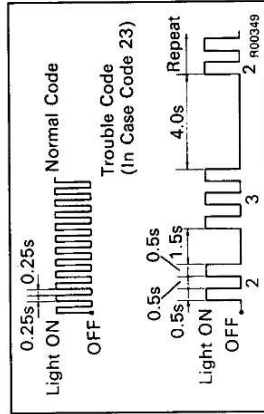


CONNECTORS

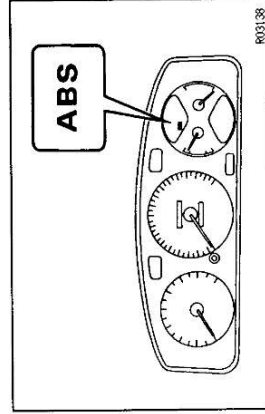




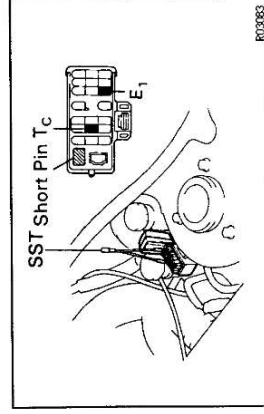
R03138



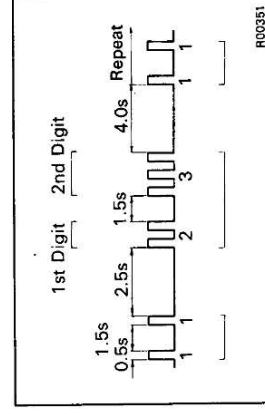
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DIAGNOSIS SYSTEM DESCRIPTION

If a malfunction occurs, the system will identify the problem and the ECU will store the codes for the trouble items.

At the same time, the system informs the driver of a malfunction via the "ABS" warning light in the combination meter.

By turning on the ignition switch, disconnecting the short pin of the check connector and use SST to connect Tc and E1 of the check connector, the trouble can be identified by the number of blinks (diagnostic code) of the warning light.

In the event of two codes, that having the smallest numbered code will be identified first.

HINT: The warning light does not show the diagnostic codes while the vehicle is running.

DIAGNOSIS SYSTEM INSPECTION

1. INSPECT BATTERY VOLTAGE

Inspect that the battery voltage is about 12 V.

2. CHECK THAT WARNING LIGHT TURNS ON

(a) Turn the ignition switch on.

(b) Check that the "ABS" warning light turns on for 3 seconds.

If not, inspect and repair or replace the fuse, bulb and wire harness.

3. READ DIAGNOSTIC CODE

(a) Turn the ignition switch on.

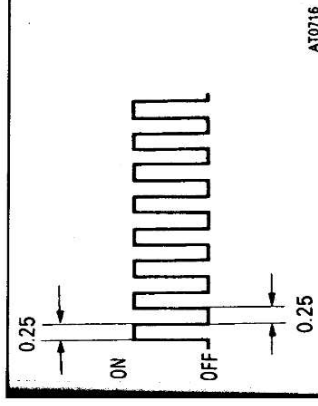
(b) Using SST, connect terminals Tc and E1 of the check connector.

SST 09843—18020

(c) Pull out the short pin from the terminals WA and WB of the check connector in engine room.

(d) In event of a malfunction, 4 seconds later the warning light will begin to blink. Read the number of blinks. (See DIAGNOSTIC CODE)

HINT: The first number of blinks will equal the first digit of a two digit diagnostic code. After a 1.5 second pause, the 2nd number of blinks will equal the 2nd number of a two digit code. If there are two or more codes, there will be a 2.5 second pause between each, and indication will begin after 4.0 second pause from the smaller value and continue in order to larger.



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(e) If the system is operating normally (no malfunction), the warning light will blink once every 0.5 seconds. Repair the system.

(f) After the malfunctioning components has been repaired, clear the diagnostic codes stored in the ECU.

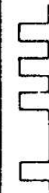
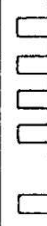
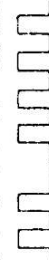
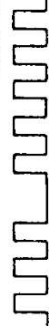
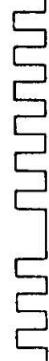
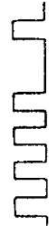
HINT: If you disconnect the battery cable while repairing, all diagnostic codes in the ECU will be erased.

(h) Remove the SST from terminals Tc and E1 of the check connector.

(i) Install the short pin to the terminals WA and WB.

(j) Turn the ignition switch on, and check that the "ABS" warning light goes off after the warning light goes on for 3 seconds.

DIAGNOSTIC CODE

Code No.	Light Pattern	Diagnosis	Trouble Part
11	ON OFF 	Open circuit in solenoid relay circuit	● Actuator inside wire harness ● Control relay ● Wire harness and connector of solenoid relay circuit
12		Short circuit in solenoid relay circuit	
13		Open circuit in pump motor relay circuit	● Actuator inside wire harness ● Control relay ● Wire harness and connector of pump motor relay circuit
14		Short circuit in pump motor relay circuit	
21		Open or short circuit in solenoid of front right wheel	● Actuator solenoid ● Wire harness and connector of actuator solenoid circuit
22		Open or short circuit in solenoid of front left wheel	
23		Open or short circuit in solenoid of rear right wheel	
24		Open or short circuit in solenoid of rear left wheel	
31		Front right wheel speed sensor signal malfunction	● Speed sensor ● Sensor rotor ● Wire harness and connector of speed sensor
32		Front left wheel speed sensor signal malfunction	
33		Rear right wheel speed sensor signal malfunction	
34		Rear left wheel speed sensor signal malfunction	
35		Open circuit in front left or rear right wheel speed sensor	● Rear sensor rotors
36		Open circuit in front right or rear left wheel speed sensor	
37		Wrong both rear axle hubs	
41		Abnormal battery voltage (less than 9.5 V/more than 16.2 V)	● Battery ● Voltage regulator
51		Pump motor of actuator locked or open circuit in pump motor circuit in actuator	● Pump motor, relay and battery ● Wire harness, connector and ground bolt or actuator pump motor circuit
Always on		Malfunction in ECU	● ECU

DIAGNOSTIC CODES CLEARING

CLEAR DIAGNOSTIC CODES

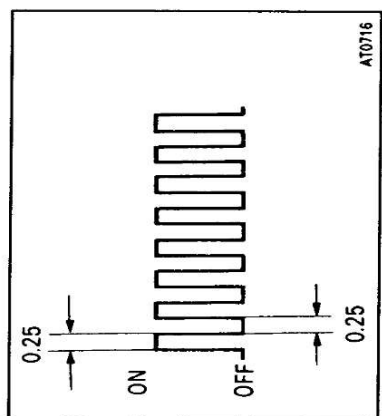
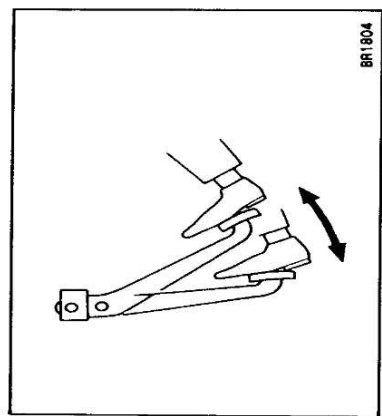
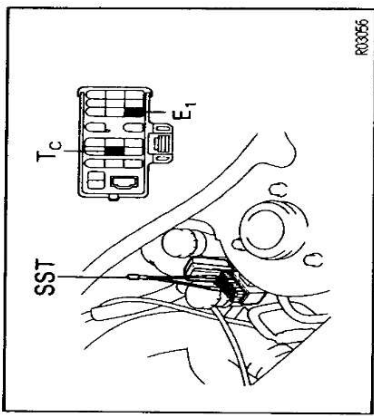
- (a) Pull the parking brake lever up.
- (b) Turn the ignition switch on.
- (c) Using SST, connect terminals Tc and E1 of the check connector.

SST 09843 — 18020

HINT: Keep the vehicle stopped vehicle speed 0 km/h (0 mph).

- (d) Clear the diagnostic codes stored in the ECU by depressing the brake pedal 8 or more times within 3 seconds.

- (e) Check that the warning light shows the normal code.
- (f) Remove the SST from terminals Tc and E1 of the check connector.
- (g) Check that the warning light goes off.

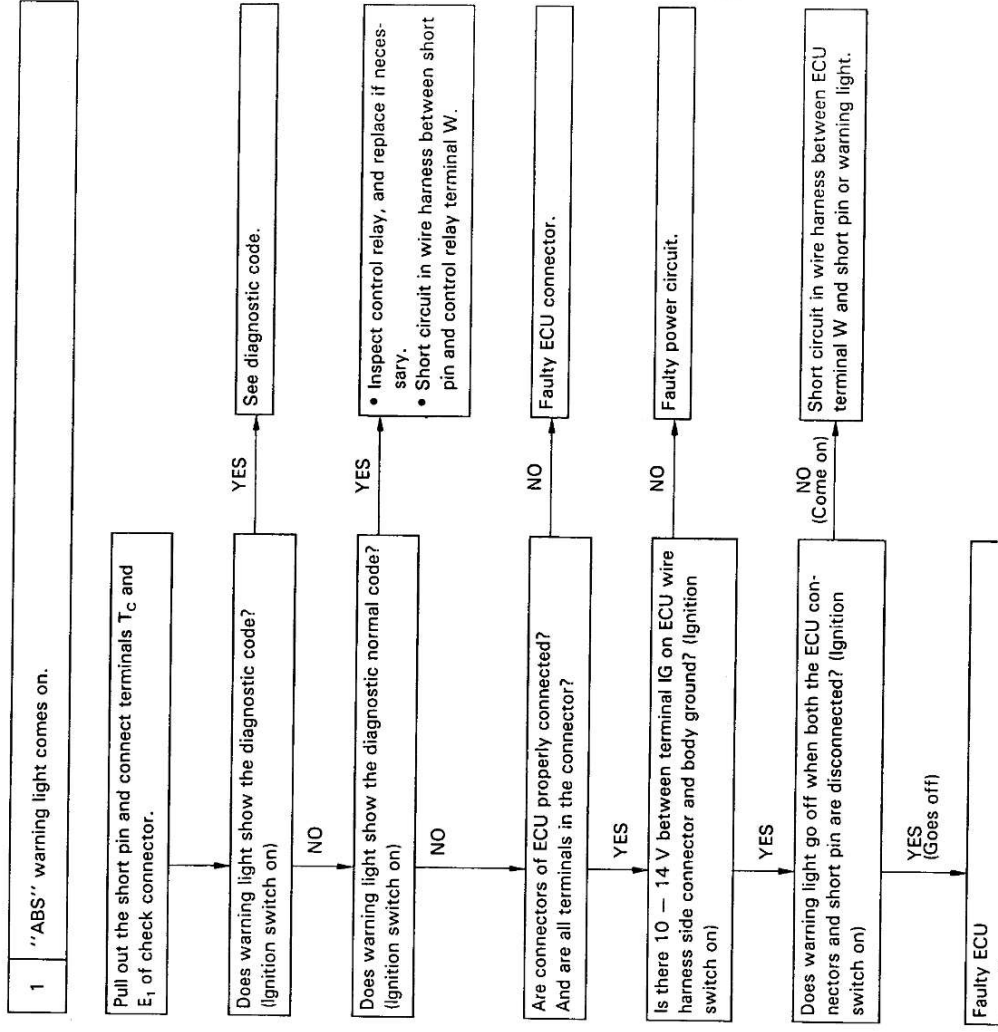


TROUBLESHOOTING

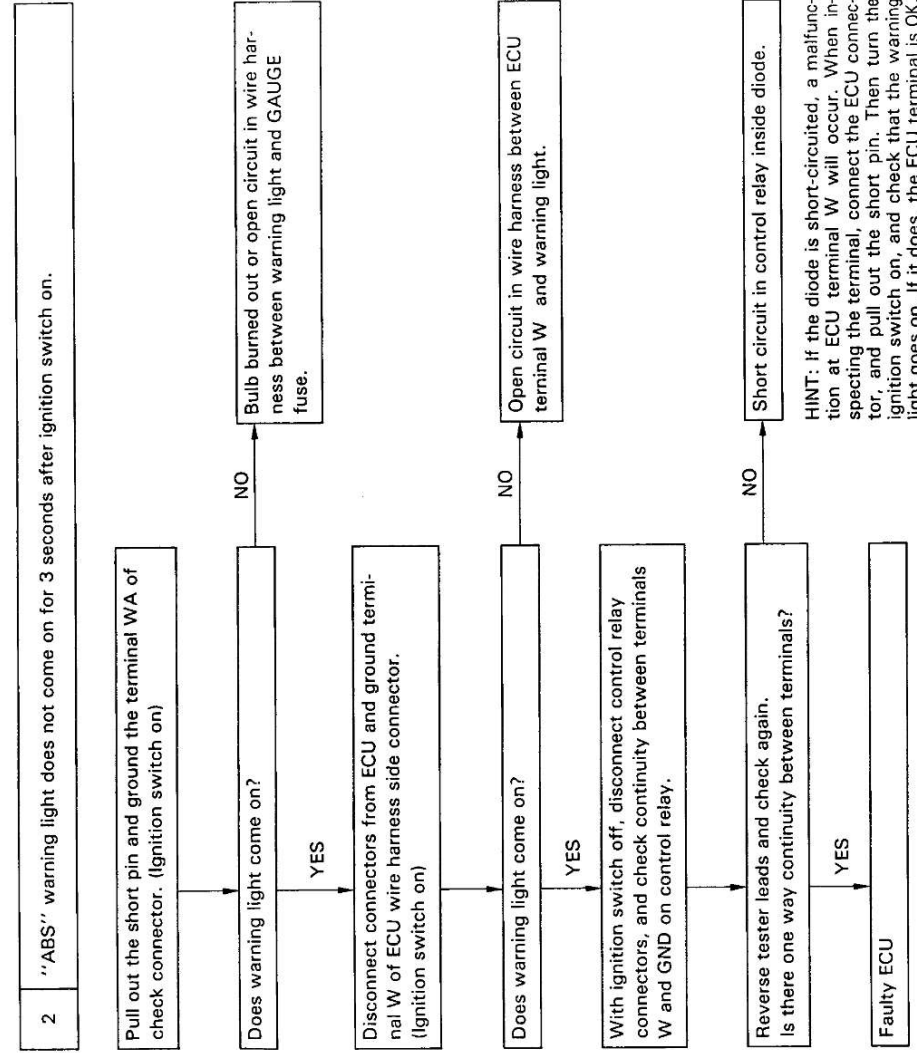
Problem		No.
"ABS" warning light	Always comes on after ignition switch is turned on.	1
	Does not come on for 3 seconds after ignition switch on.	2
	Goes on and off.	3
	Comes on while running.	1
Brake condition	Brakes pull. ※	4
	Braking inefficient. ※	4
	ABS operates at ordinary braking.	4
	ABS operates just before stopping at ordinary braking.	4
	Brake pedal pulsates abnormally while ABS is operating.	4
	Skidding noise occurs while ABS operating. (ABS operates inefficiently)	5

※ Also check the parts of the brake system (brake cylinders, pads, hydraulic lines, etc.) not specifically part of the ABS.

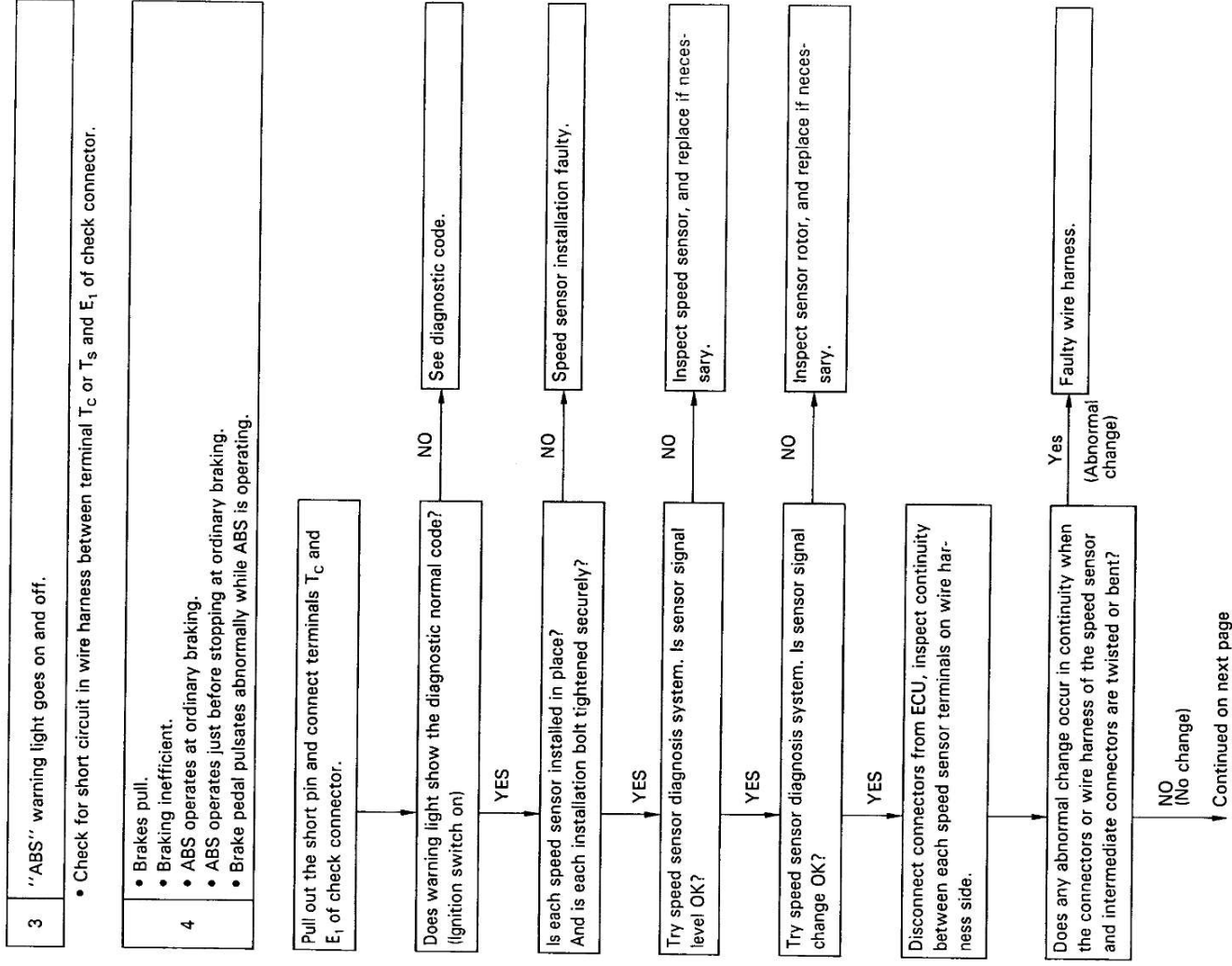
W0130



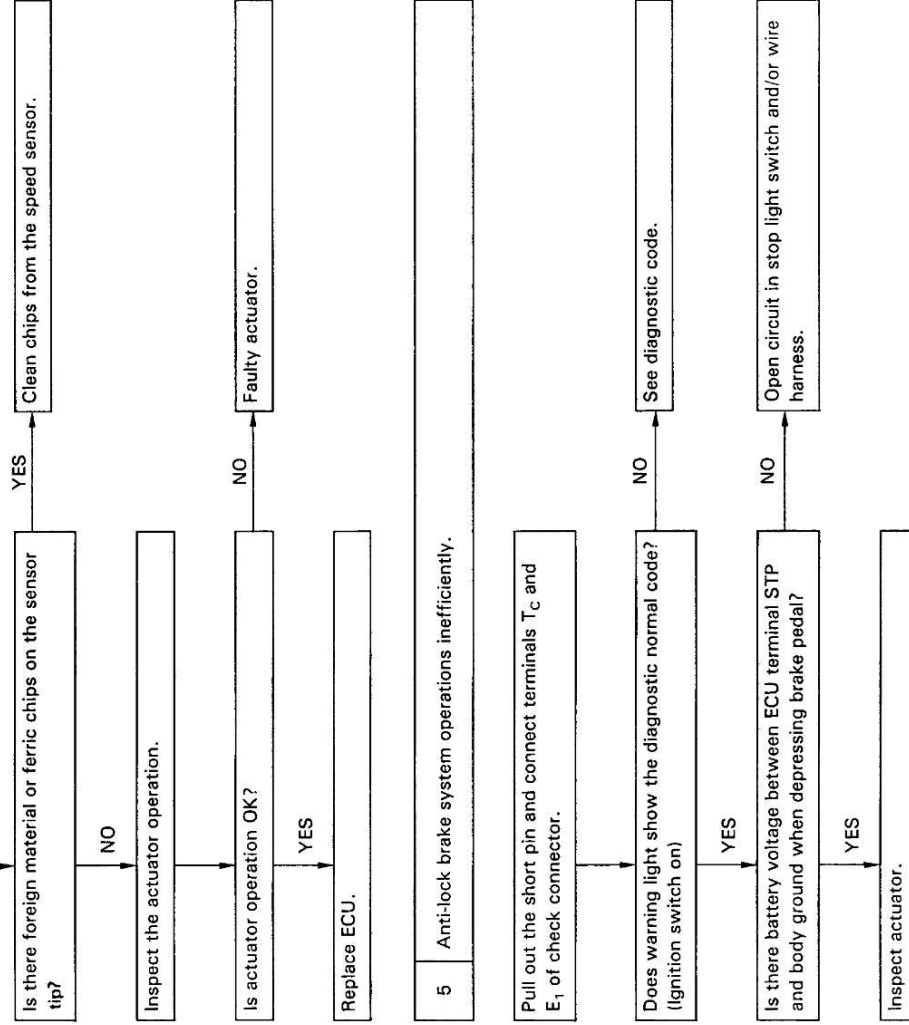
W0130



V011



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W011

SPEED SENSOR DIAGNOSIS SYSTEM DIAGNOSIS SYSTEM INSPECTION

PRECAUTION

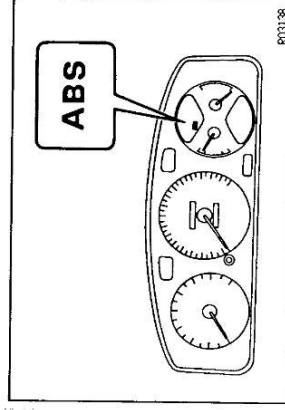
While checking the speed sensor diagnosis system, ABS does not operate and brake system operates as normal brake system.

1. INSPECT BATTERY VOLTAGE

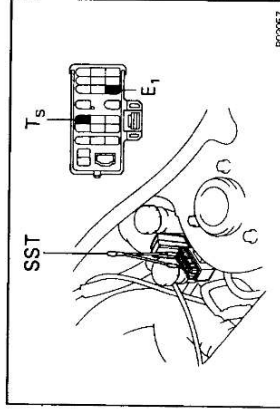
Inspect that the battery voltage is about 12 V.

2. CHECK THAT WARNING LIGHT TURNS ON

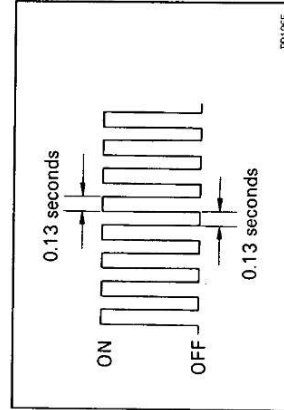
- Turn the ignition switch on.
- Check that the "ABS" warning light turns on for 3 seconds.
If not inspect and repair or replace the fuse, bulb and wire harness.
- Check that the "ABS" warning light turns off.
- Turn the ignition switch off.



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BR1065

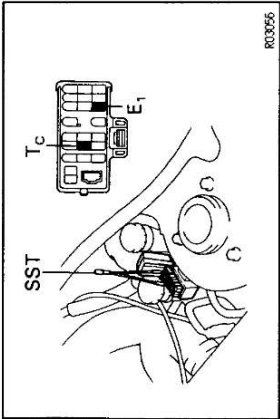
3. PERFORM FOLLOWING STEPS

- Using SST, connect terminals T_s and E_1 of the check connector in the engine room.
SST 09843 — 18020
- Pull the parking brake lever up, and start the engine.

- Check that the warning light blinks about 4 times every 1 second as shown.

4. DRIVE VEHICLE

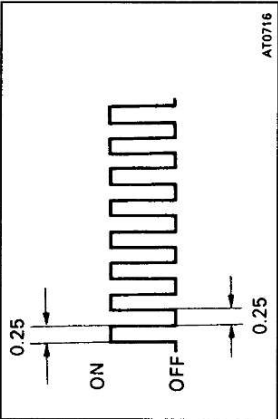
- Release the parking brake.
- Drive the vehicle faster than 80 km/h (50 mph) for several seconds.



R03056

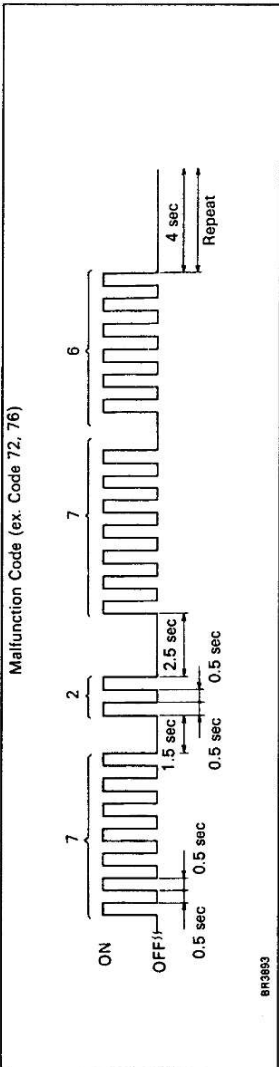
5. READ DIAGNOSTIC CODE

- (a) Stop the vehicle, and warning light will begin to blink.
- (b) Using SST, connect the terminals Tc and E1 of the check connector.



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- (c) Read the number of blinks of the "ABS" warning light.
(See DIAGNOSTIC CODE)
HINT: If normal, the warning light blinks 2 times every 1 second.
If two or more malfunctions are indicated at the same time, the smallest numbered code will be displayed first.



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6. REPAIR MALFUNCTIONING PARTS

- Repair or replace the malfunctioning parts.
HINT: When repairing or replacing parts, turn the ignition switch to OFF.

7. REMOVE SST

- Remove the SST from terminals Tc and E1 of the check connector.

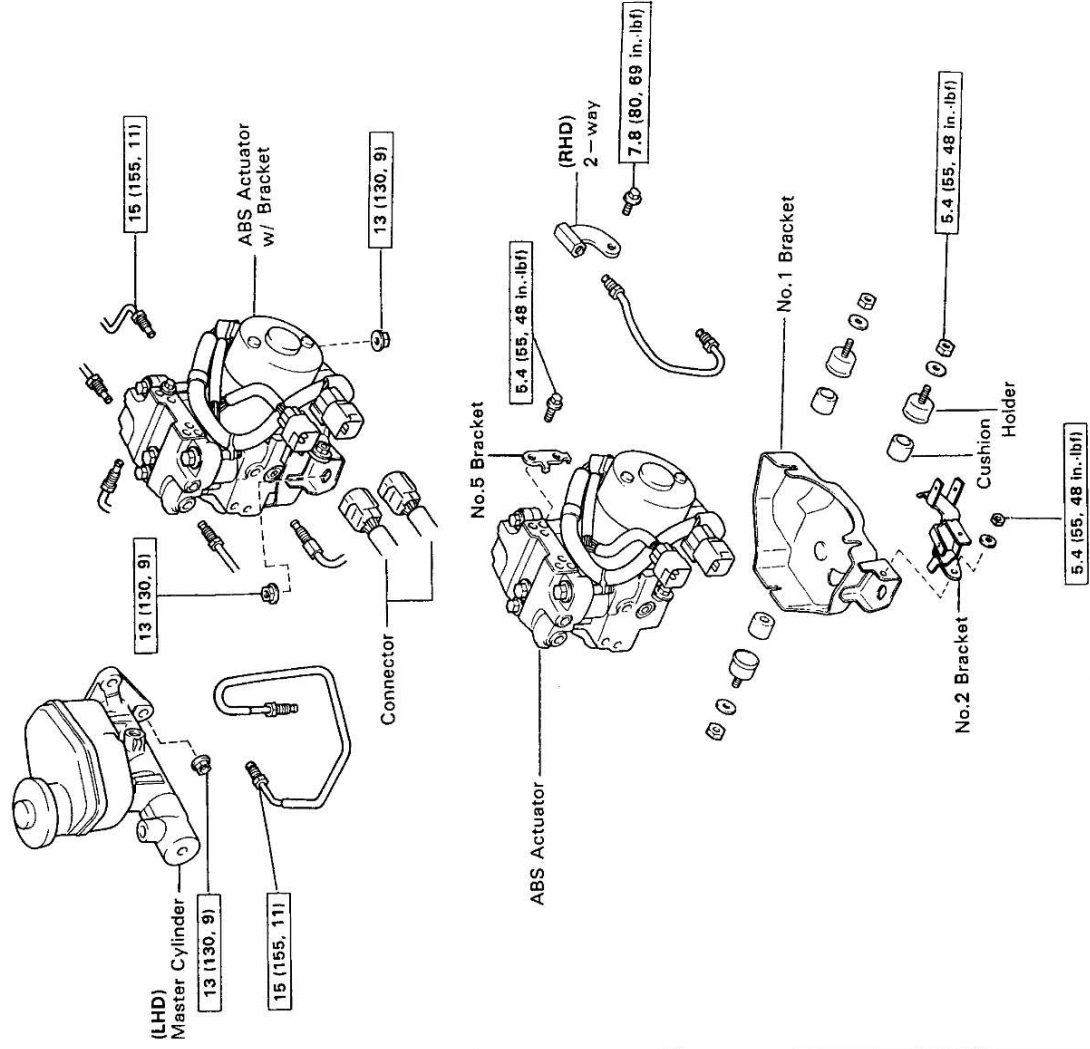
DIAGNOSTIC CODE

BR02W-01

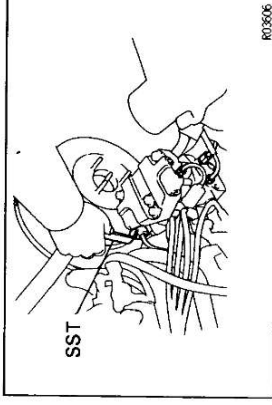
Code No.	Light Pattern	Diagnosis	Malfunctioning Part
	ON OFF	All speed sensors and sensor rotors are normal	
71		Low voltage of front right speed sensor signal	- Front right speed sensor - Sensor installation
72		Low voltage of front left speed sensor signal	- Front left speed sensor - Sensor installation
73		Low voltage of rear right speed sensor signal	- Rear right speed sensor - Sensor installation
74		Low voltage of rear left speed sensor signal	- Rear left speed sensor - Sensor installation
75		Abnormal change of front right speed sensor signal	Front right sensor rotor
76		Abnormal change of front left speed sensor signal	Front left sensor rotor
77		Abnormal change of rear right speed sensor signal	Rear right sensor rotor
78		Abnormal change of rear left speed sensor signal	Rear left sensor rotor

ABS ACTUATOR ABS ACTUATOR REMOVAL AND INSTALLATION

Remove and install the parts as shown.



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



(MAIN POINT OF REMOVAL AND INSTALLATION)

1. (LHD)
REMOVE MASTER CYLINDER
(See MASTER CYLINDER REMOVAL)
2. DISCONNECT AND CONNECT BRAKE TUBES
Using SST, disconnect and connect the brake tubes from/to the ABS actuator.
SST 09023-00100 or 09751-36011
Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)
3. BLEED BRAKE SYSTEM
(See BRAKE SYSTEM BLEEDING)

ABS ACTUATOR INSPECTION

1. INSPECT BATTERY VOLTAGE

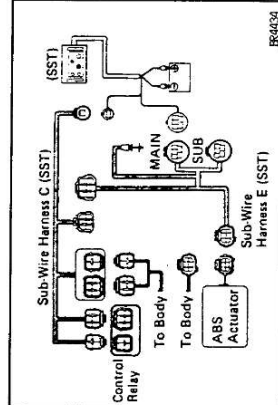
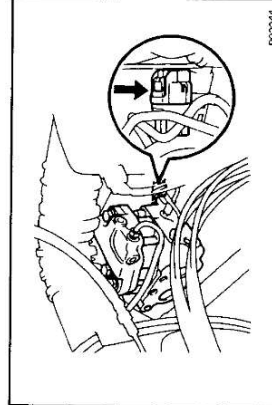
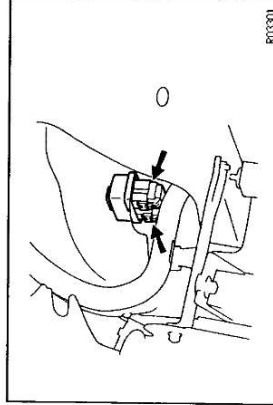
Battery voltage:

10 – 14.5 V

2. DISCONNECT CONNECTORS

(a) Remove the fender liner and disconnect the two connectors from the control relay.

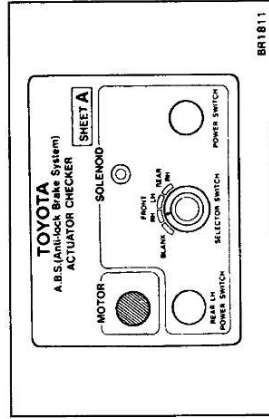
(b) Disconnect the connector from the actuator.



3. CONNECT ACTUATOR CHECKER (SST) TO ACTUATOR

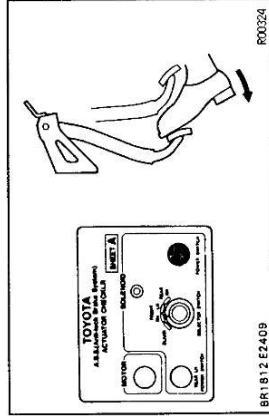
(a) Connect the actuator checker (SST) to the actuator, control relay and body side wire harness through the sub-wire harness C and E (SST) as shown.
SST 09990-00150, 09990-00200 and 09990-00210

- (b) Connect the red cable of the checker to the battery positive (+) terminal and black cable to the negative (-) terminal. Connect the black cable of the sub-wire harness to the battery negative (-) terminal or body ground.
- (c) Place the "SHEET A" (SST) on the actuator checker.

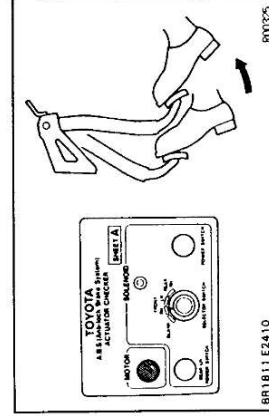


4. INSPECT MAIN SOLENOID AND PUMP MOTOR OPERATION

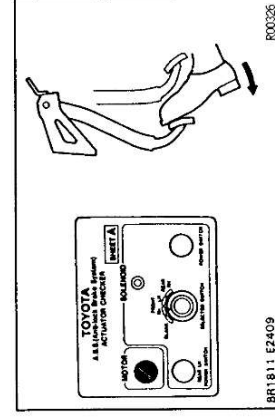
- (a) Start the engine, and run it at idle.
- (b) Turn the selector switch of the actuator checker to "FRONT RH" position.
- (c) Push and hold in the MOTOR switch for a few seconds.
- (d) Depress the brake pedal and hold it until the step (g) is completed.
- (e) Push the POWER SWITCH, and check that the brake pedal does not go down.
- (f) Release the switch, and check that the pedal goes down.



- (g) Push and hold in the MOTOR switch for a few seconds, and check that the pedal returns.
- (h) Release the brake pedal.

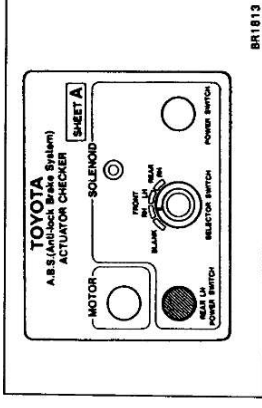


- (i) Push and hold in the MOTOR switch for a few seconds.
- (j) Depress the brake pedal and hold it for about 15 seconds. As you hold the pedal down, push the MOTOR switch for a few seconds. Check that the brake pedal does not pulsate.



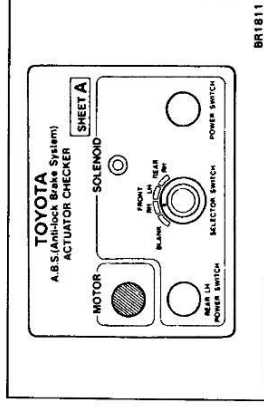
5. (FOR OTHER WHEELS)

- (a) Turn the selector switch to "FRONT LH" position.
 - (b) Repeating (c) to (j) of the step 4, check the actuator operation similarly.
 - (c) Similarly, inspect "REAR RH" and "REAR LH" position.
- HINT: When inspecting "REAR LH" position, push the REAR LH switch instead of the POWER SWITCH, and you can inspect in any selector switch position.



6. PUSH MOTOR SWITCH

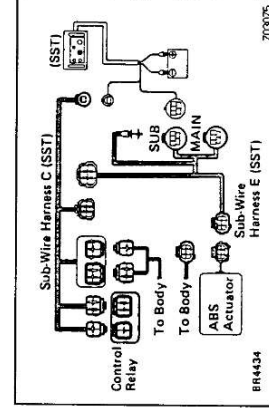
- (a) Push and hold in the MOTOR switch for a few seconds.



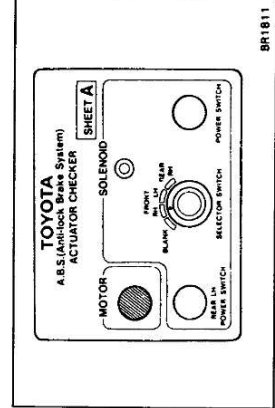
7. INSPECT FRONT SUB SOLENOID OPERATION

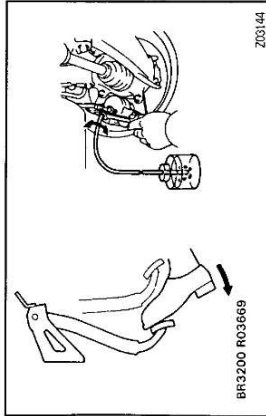
- (a) Jack up and support vehicle.
- (b) Check the fluid level in the reservoir. If necessary, add brake fluid.

- (c) Disconnect the MAIN connector of the sub-wire harness E from the actuator checker and connect the SUB connector as shown.

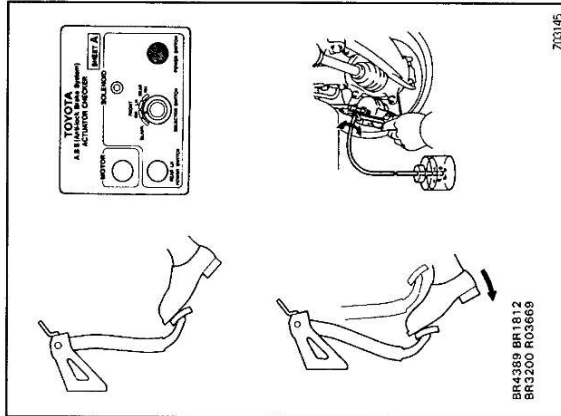


- (d) Turn the selector switch of the actuator checker to "FRONT RH" position.
- (e) Push and hold in the MOTOR switch for a few seconds.





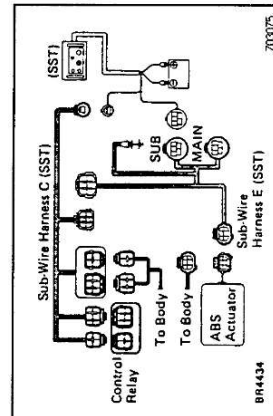
- (f) With the brake pedal depressed, loosen the bleeder plug of the front RH wheel and check the speed of the brake pedal descent.
- (g) Tighten the bleeder plug and release the brake pedal.



- (h) Depress the brake pedal while performing steps (i) to (j).
- (i) With the POWER SWITCH pushed in, loosen the bleeder plug and check that the speed of the brake pedal descent is slower than in (f).
- (j) Release the POWER SWITCH.
- (k) Tighten the bleeder plug, then release the brake pedal. HINT: Tighten the bleeder plug before releasing the brake pedal.
- (l) Push and hold in the MOTOR switch for a few seconds.

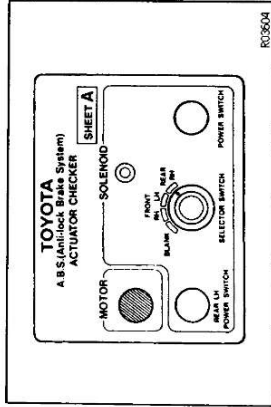
(FOR FRONT LH WHEEL)

- (a) Turn the selector switch to "FRONT LH" position.
- (b) Repeating (e) to (l) of step 7, check the front sub solenoid operation the same way.

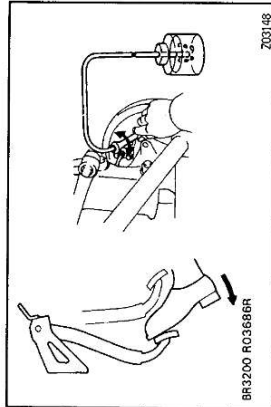


8. INSPECT REAR PRESSURE INCREASE CONTROL VALVE OPERATION

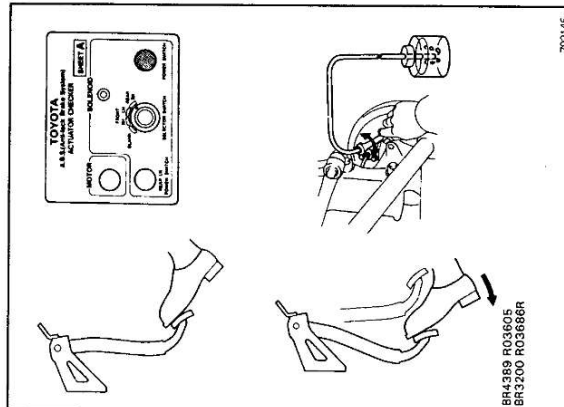
- (a) Check that the SUB connector of sub-wire harness E is connected to the actuator checker. HINT: The wire harness connection is the same as for inspection of the front sub solenoid.



- (b) Turn the selector switch of the actuator checker to "REAR RH" position.
- (c) Push and hold in the MOTOR switch for a few seconds.



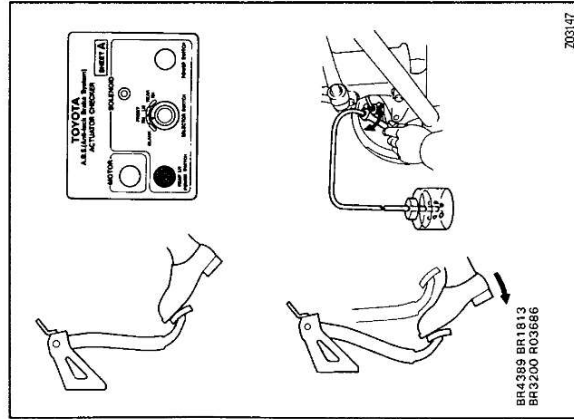
- (d) With the brake pedal depressed, loosen the bleeder plug of the rear RH wheel and check the speed of the brake pedal descent.
- (e) Tighten the bleeder plug and release the brake pedal. HINT: Tighten the bleeder plug before releasing the brake pedal.



- (f) Depress the brake pedal while performing steps (g) and (h).
- (g) With the POWER SWITCH pushed in, loosen the bleeder plug.
- (h) Release the POWER SWITCH, then check that the speed of the brake pedal descent is slower than in (d).
- (i) Tighten the bleeder plug and release the brake pedal. HINT: Tighten the bleeder plug before releasing the brake pedal.
- (j) Push and hold in the MOTOR switch for a few seconds.

(FOR REAR LH WHEEL)

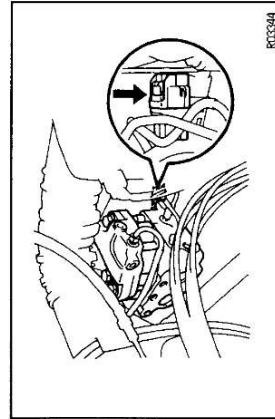
- (a) With the brake pedal depressed, loosen the bleeder plug of the rear LH wheel and check the speed of the brake pedal descent.
- (b) Tighten the bleeder plug and release the brake pedal.



- (c) Depress the brake pedal while performing steps (d) and (e).
- (d) With the **POWER SWITCH REAR LH** pushed in, loosen the bleeder plug.
HINT: Any position of the selector switch will do.
- (e) Release the **REAR LH** switch and check that the pedal descent speed is slower than in (a).
- (f) Tighten the bleeder plug and release the brake pedal.
HINT: Tighten the bleeder plug before releasing the brake pedal.
- (g) Push and hold in the **MOTOR** switch for a few seconds.

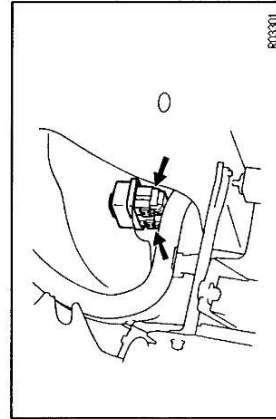
9. DISCONNECT ACTUATOR CHECKER (SST) FROM ACTUATOR

Remove the "SHEET A" (SST) and disconnect the actuator checker (SST) and sub—wire harness C and E (SST) from the actuator, control relay and body side wire harness.



10. CONNECT CONNECTORS

- (a) Connect the connector to the actuator.



- (b) Connect the two connectors to the control relay and install the fender liner.

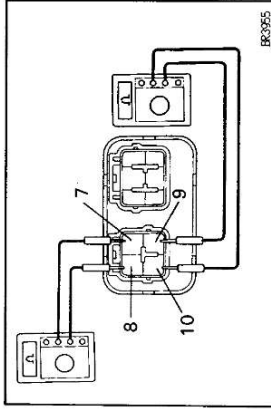
11. CLEAR DIAGNOSTIC CODES

(See DIAGNOSTIC CODES CLEARING)

12. CHECK FLUID LEVEL IN RESERVOIR TANK

Check the fluid level and add fluid if necessary.

Fluid: SAE J1703 or FMVSS No.116 DOT 3



CONTROL RELAY

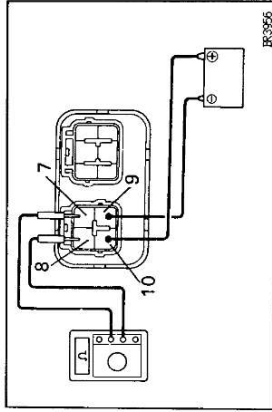
CONTROL RELAY INSPECTION

1. INSPECT CONTINUITY OF MOTOR RELAY CIRCUIT

- (a) Check that there is continuity between terminals 9 and 10.
- (b) Check that there is no continuity between terminals 7 and 8.
If continuity is not as specified, replace the relay.

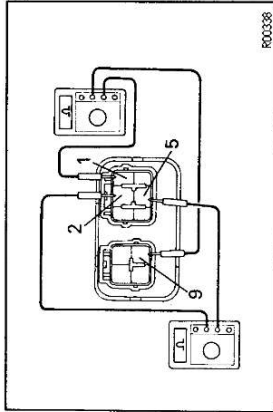
2. INSPECT OPERATION OF MOTOR RELAY CIRCUIT

- (a) Connect the positive (+) lead from the battery to terminal 10 and negative (—) lead to terminal 9.
- (b) Check that there is continuity between terminals 7 and 8.
If operation is not as specified, replace the relay.



3. INSPECT CONTINUITY OF SOLENOID RELAY CIRCUIT

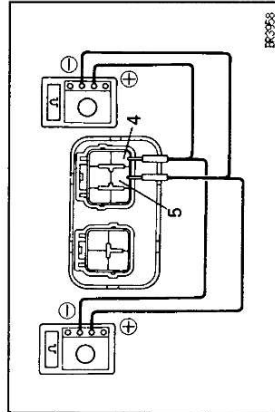
- (a) Check that there is continuity between terminals 1 and 9.
- (b) Check that there is no continuity between terminals 2 and 5.



- (c) Connect the positive lead from the ohmmeter to terminal 4 and connect negative lead to terminal 5.
- (d) Check that there is continuity between terminals.
- (e) Connect the two leads in reverse, and check that there is no continuity between terminals.

If continuity is not as specified, replace the relay.

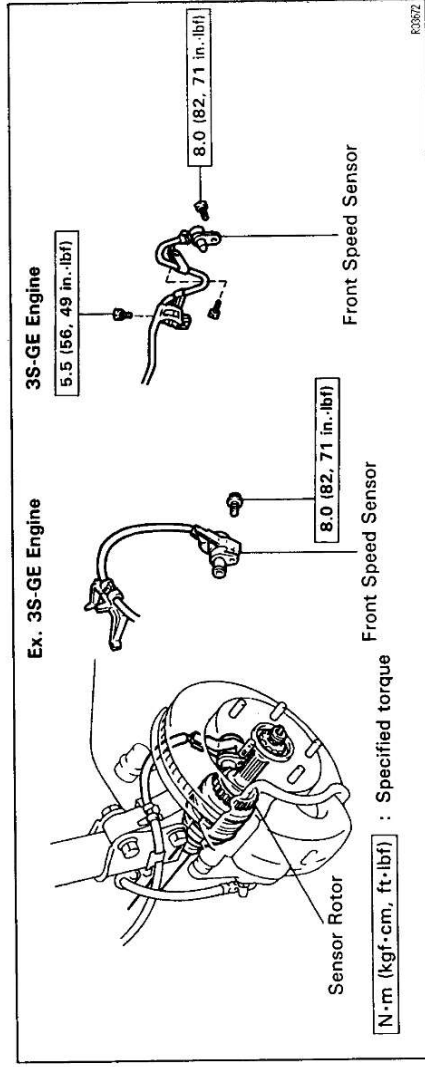
HINT: For the different type ohmmeter, there is no continuity for step (d), and there is continuity for step (e).



4. INSPECT OPERATION OF SOLENOID RELAY CIRCUIT

- (a) Connect the positive (+) lead from the battery to terminal 1 and negative (—) lead to terminal 9.
- (b) Check that there is continuity between terminals 2 and 5.
- (c) Check that there is no continuity between terminals 2 and 6.
If operation is not as specified, replace the relay.

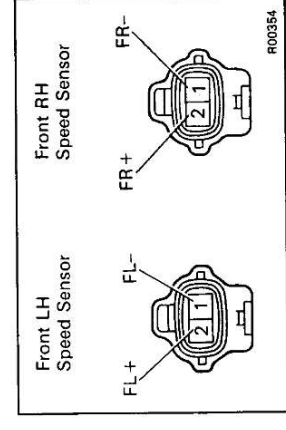
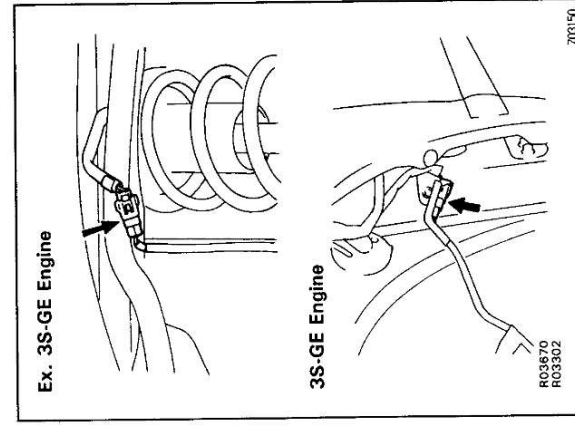
FRONT SPEED SENSOR COMPONENTS



FRONT SPEED SENSOR INSPECTION

1. INSPECT SPEED SENSOR

- Remove the fender liner.
- Disconnect the speed sensor connector.



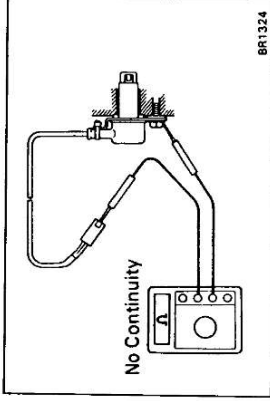
- Measure the resistance between terminals.

Resistance:

0.92—1.22 kΩ

If resistance value is not as specified, replace the sensor.

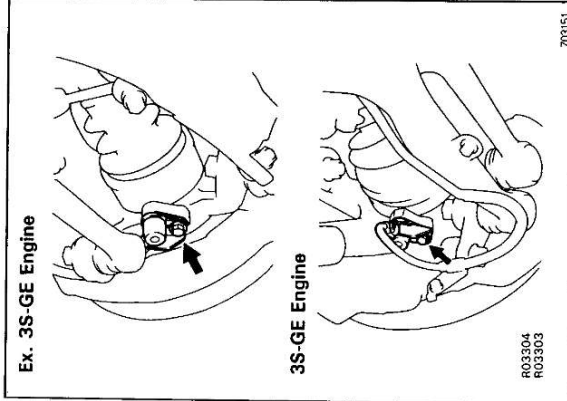
- Check that there is no continuity between each terminal and sensor body.
- If there is continuity, replace the sensor.
- Connect the speed sensor connector.
- Install the fender liner.



2. INSPECT SENSOR INSTALLATION

Check that the sensor installation bolt is tightened properly. If not, tighten the bolt.

Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)

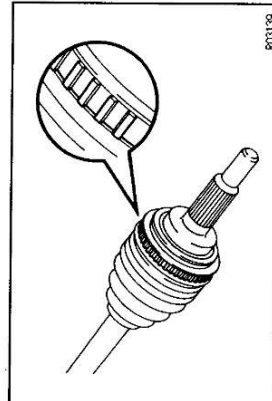


3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

- Remove the drive shaft.
- Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth.
- Install the drive shaft.

(See SA section)

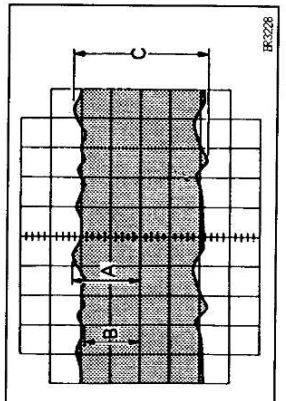
NOTICE: To prevent damage to the serrations, do not strike the drive shaft.



FRONT SPEED SENSOR AND SENSOR ROTOR SERRATIONS INSPECTION (REFERENCE)

INSPECT FRONT SPEED SENSOR AND SENSOR ROTOR SERRATIONS BY USING AN OSCILLOSCOPE

- Connect an oscilloscope to the speed sensor connector.



- (b) Run the vehicle at 20 km/h (12.4 mph), and inspect speed sensor output wave.
- (c) Check that C is 0.5 V or more.
- If not as specified, replace the speed sensor.
- (d) Check that B is 30 % or more of A.
- If not as specified, replace the drive shaft.

FRONT SPEED SENSOR REMOVAL

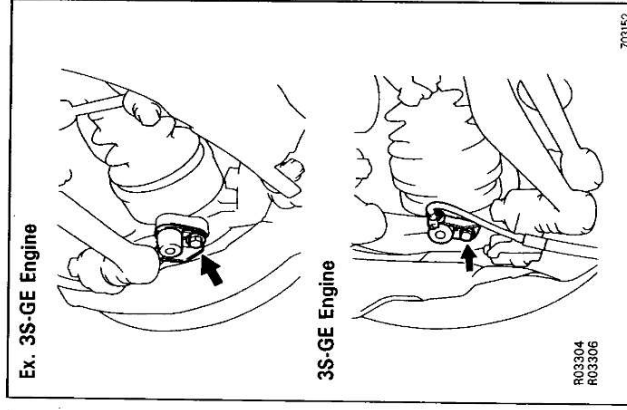
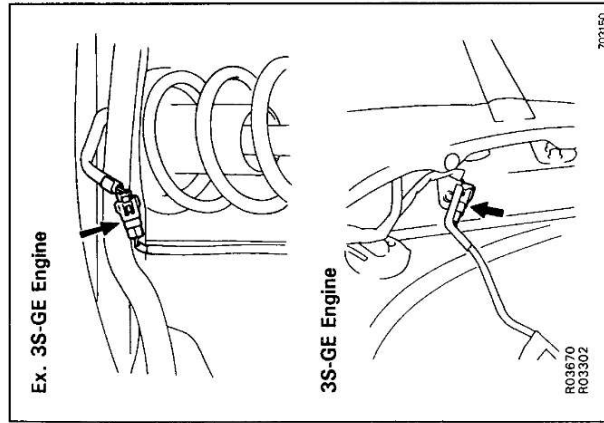
1. DISCONNECT SPEED SENSOR CONNECTOR

- (a) Remove the fender liner.

- (b) Disconnect the speed sensor connector.

2. REMOVE SPEED SENSOR

- (a) Remove the clamp bolts holding the sensor harness to the body, shock absorber and lower arm.



FRONT SPEED SENSOR INSTALLATION

1. INSTALL SPEED SENSOR

Install the speed sensor to the steering knuckle.

Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)

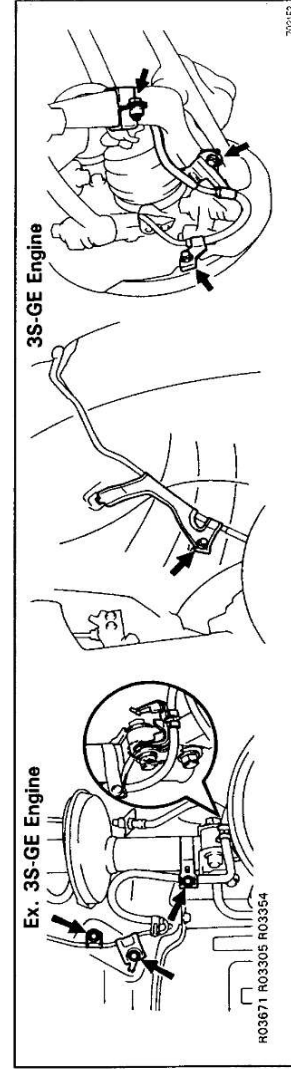
2. CONNECT SPEED SENSOR CONNECTOR

- (a) Install the sensor harness with the clamps and bolts in place.

Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)

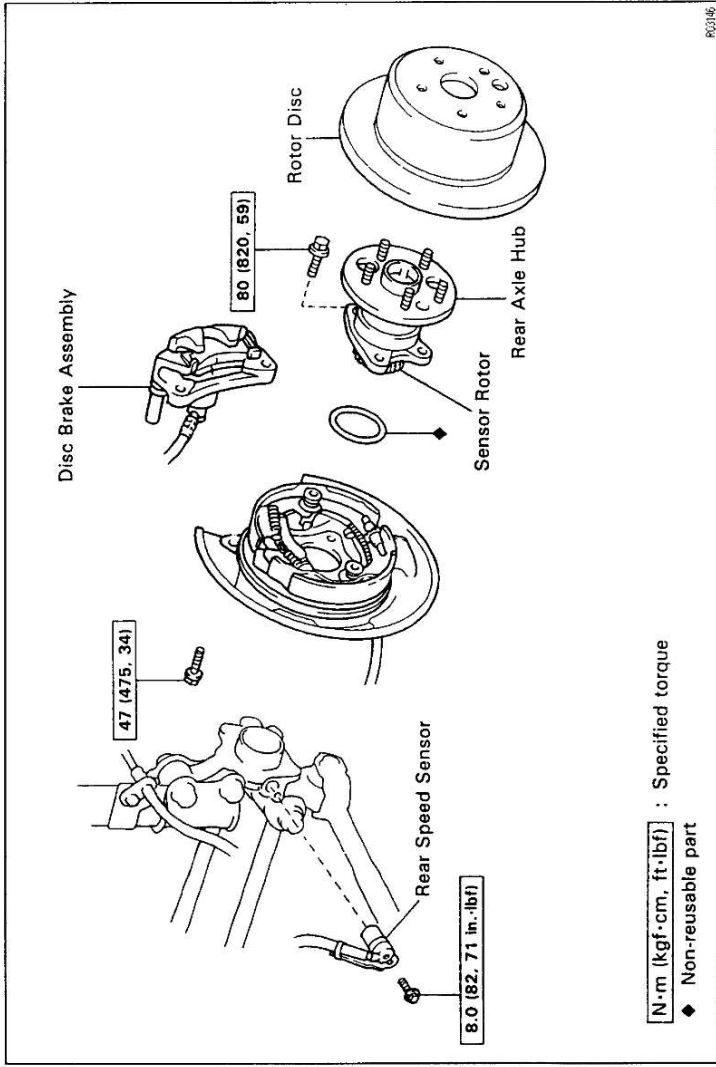
- (b) Connect the speed sensor connector.

- (c) Install the fender liner.



REAR SPEED SENSOR COMPONENTS

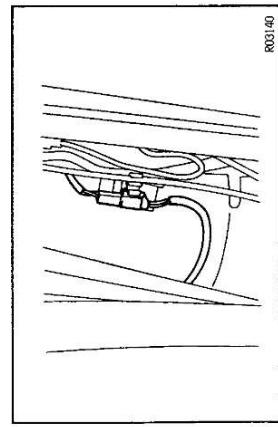
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REAR SPEED SENSOR INSPECTION

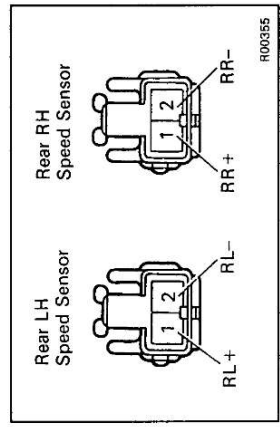
- INSPECT SPEED SENSOR
 - Remove the seat cushion and side seatback.
 - Disconnect the speed sensor connector.



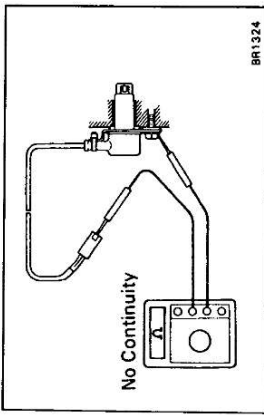
- Measure the resistance between terminals.

Resistance:
1.05—1.45 kΩ

If resistance value is not as specified, replace the sensor.

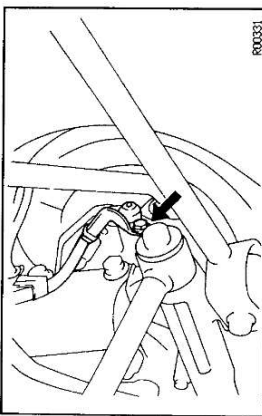


- Check that there is no continuity between each terminal and sensor body.
- If there is continuity, replace the sensor.
- Connect the speed sensor connector.
- Install the side seatback and the seat cushion.



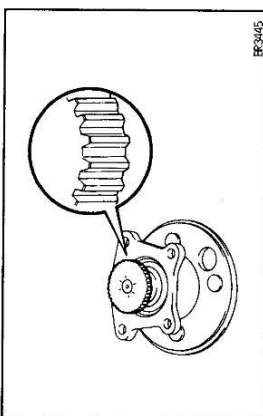
2. INSPECT SENSOR INSTALLATION

Check that the sensor installation bolt is tightened properly. If not, tighten the bolt.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

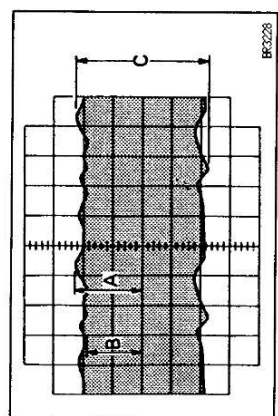
- Remove the axle hub assembly. (See SA section)
- Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth.
- Install the axle hub assembly. (See SA section)

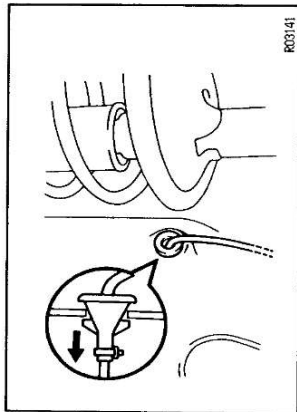


REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS INSPECTION (REFERENCE)

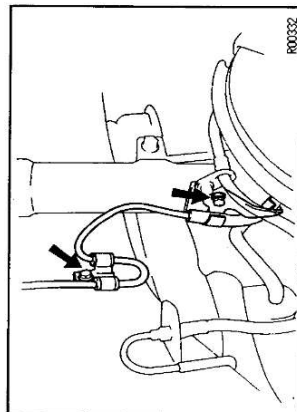
INSPECT REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS BY USING AN OSCILLOSCOPE

- Connect an oscilloscope to the speed sensor connector.
- Run the vehicle at 20 km/h (12.4 mph), and inspect speed sensor output wave.
- Check that C is 0.8 V or more.
- If not as specified, replace the speed sensor.
- Check that B is 40 % or more of A.
- If not as specified, replace the rear axle hub.

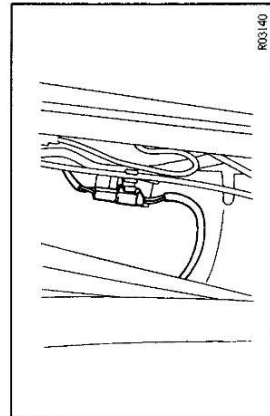




- (b) Install the grommet securely.

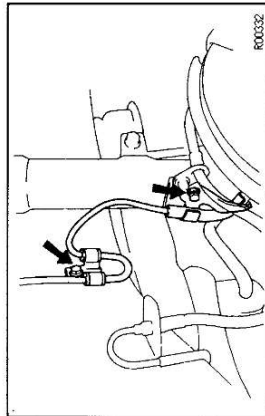


- (c) Install the sensor harness with the clamps and bolts in place.
Torque: 5.5 N·m (56 kgf·cm, 49 in.-lbf)
- (d) Install the side seatback and seat cushion.

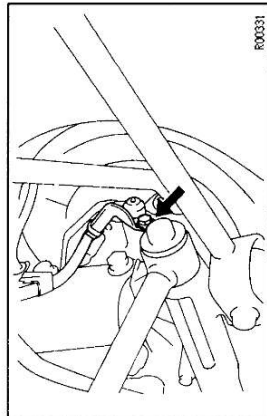


REAR SPEED SENSOR REMOVAL

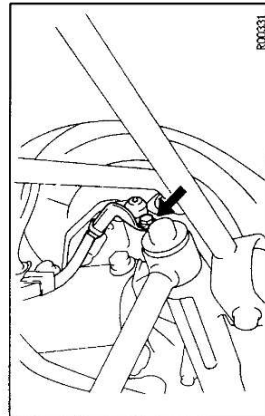
1. **DISCONNECT SPEED SENSOR CONNECTOR**
- (a) Remove the seat cushion and side seatback.
- (b) Disconnect the speed sensor connector, and pull out the sensor wire harness with the grommet.



- (c) Remove the two clamp bolts holding the sensor wire harness to the body and shock absorber.

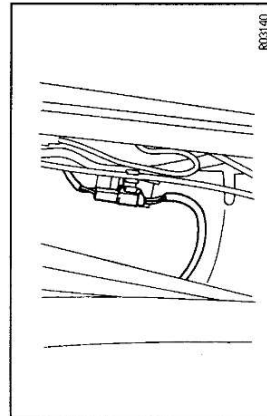


2. **REMOVE SPEED SENSOR**
- Remove the speed sensor from the axle carrier.



REAR SPEED SENSOR INSTALLATION

1. **INSTALL SPEED SENSOR**
- Install the speed sensor to the axle carrier.
- Torque: 8.0 N·m (82 kgf·cm, 71 in.-lbf)

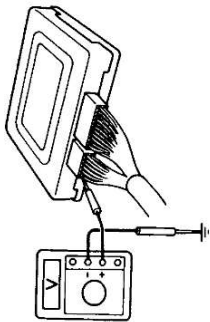


2. **CONNECT SPEED SENSOR CONNECTOR**
- (a) Pass the sensor harness through the body panel hole, and connect the connector.

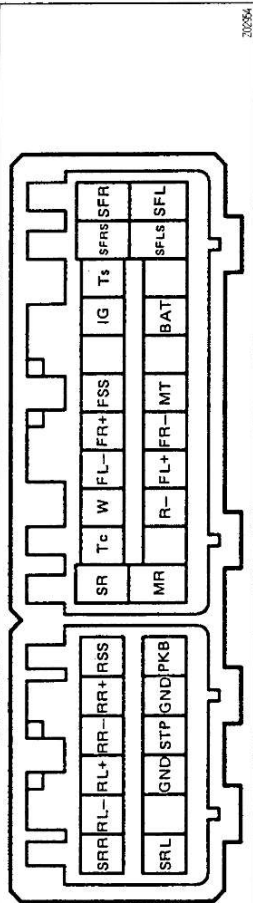
ANTI-LOCK BRAKE SYSTEM CIRCUIT

SYSTEM CIRCUIT INSPECTION 1. INSPECT SYSTEM CIRCUIT WITH CONNECTORS CONNECTED

- Remove the ABS ECU.
- Using a voltmeter with high impedance (10 k Ω /V minimum), measure the voltage at each terminal and body ground.



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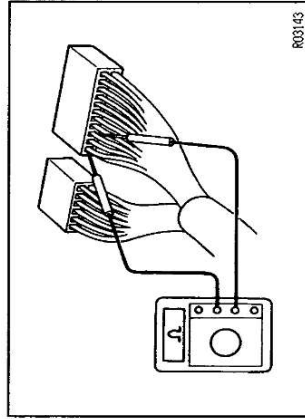
3/2004

Tester Connection	Check Item	Condition	Specified Value	Trouble Part
RL--	Continuity	IG switch off	Continuity	ABS ECU
SRR	Voltage	IG switch on and "ABS" warning light goes off	Battery voltage	Actuator
PKB	Voltage	IG switch on and PKB lever pulled	About 0 V	Parking brake switch
		IG switch on and PKB lever returned	Battery voltage	Level warning switch
GND	Continuity	IG switch off	Continuity	Wiring harness
STP	Voltage	IG switch off and brake pedal depressed	Battery voltage	Stop light switch
	Continuity	IG switch off and brake pedal returned	Continuity	Stop light
GND	Continuity	IG switch off	Continuity	Wiring harness
SRL	Voltage	IG switch on and "ABS" warning light goes off	Battery voltage	Actuator

If the circuit is not as specified, check and repair or replace the trouble part shown in the table above.

Tester Connection	Check Item	Condition	Specified Value	Trouble Part
SFR	Voltage	IG switch on and "ABS" warning light goes off	Battery voltage	Actuator
SFRS	Voltage	IG switch on and "ABS" warning light goes off	Battery voltage	ABS ECU
TS	Voltage	IG switch on and check connector T_S-E_1 not connected	Battery voltage	ABS ECU
IG	Voltage	IG switch on and check connector T_S-E_1 connected	About 0 V	ECU-IG Fuse
FSS	Continuity	IG switch on	Battery voltage	ABS ECU
FL--	Continuity	IG switch off	Continuity	ABS ECU
W	Voltage	IG switch on and "ABS" warning light goes on	About 0 V	ABS ECU "ABS" warning light
TC	Voltage	IG switch on and "ABS" warning light goes off	Battery voltage	ABS ECU
SR	Voltage	IG switch on and check connector T_C-E_1 connected	Battery voltage	ABS ECU
		IG switch on and "ABS" warning light goes on	About 0 V	ABS ECU
SFL	Voltage	IG switch on and "ABS" warning light goes off	Battery voltage	Actuator
SFLS	Voltage	IG switch on and "ABS" warning light goes off	Battery voltage	Actuator
BAT	Voltage	IG switch on and "ABS" warning light goes off	Battery voltage	ECU-B Fuse
FR--	Continuity	IG switch off	Continuity	ABS ECU
R--	Continuity	IG switch off	Continuity	ABS ECU
RR--	Continuity	IG switch off	Continuity	ABS ECU

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2. INSPECT SYSTEM CIRCUIT WITH CONNECTORS DISCONNECTED

- (a) Disconnect the connectors from the ECU, inspect at the wire harness side connector.

Tester Connection	Check Item	Specified Value	Trouble Part	Tester Connection	Check Item	Specified Value	Trouble Part
Body SFR ↔ ground	Resistance	About 2.2 Ω	Actuator	FL ↔ FL—	Resistance	0.92 — 1.22 kΩ	Front LH speed sensor
Body SFRS ↔ ground	Resistance	About 2.2 Ω	Actuator	MR ↔ R—	Resistance	50 — 80 Ω	Control relay
FR ↔ FR—	Resistance	0.92 — 1.22 kΩ	Front RH speed sensor	RR ↔ RR—	Resistance	1.05 — 1.45 kΩ	Rear RH speed sensor
SR ↔ R—	Resistance	60 — 100 Ω	Control relay	RL ↔ RL—	Resistance	1.05 — 1.45 kΩ	Rear LH speed sensor
Body SFL ↔ ground	Resistance	About 2.2 Ω	Actuator	Body SRR ↔ ground	Resistance	About 2.2 Ω	Actuator
Body SFLS ↔ ground	Resistance	About 2.2 Ω	Actuator	Body SRL ↔ ground	Resistance	About 2.2 Ω	Actuator
Body MT ↔ ground	Continuity	Continuity	Actuator				

W1115

- If the circuit is not as specified, check and repair or replace the trouble part shown in the table above.
- (b) Connect the connectors, and install the ECU in place.

SERVICE SPECIFICATIONS

SERVICE DATA

Brake pedal height (from asphalt sheet)		
LHD vehicles		138—148 mm (5.43—5.83 in.)
RHD vehicles		159—169 mm (6.26—6.65 in.)
Brake pedal freeplay		1—6 mm (0.04—0.24 in.)
Brake pedal reserve distance at 490 N (50 kgf, 110.2 lbf)		More than
For General	4A—FE, 3S—FE engine (RHD) 4A—FE, 3S—FE engine (LHD)	85 mm (3.35 in.) 65 mm (2.56 in.)
For Europe	4A—FE, 3S—FE engine (RHD) w/o ABS 4A—FE, 3S—FE engine (RHD) w/ ABS 3S—GE engine (RHD) 4A—FE, 3S—FE engine (LHD) w/o ABS 4A—FE, 3S—FE engine (LHD) w/ ABS 3S—GE engine (LHD) 2C engine (RHD) w/o ABS 2C engine (RHD) w/ ABS 2C engine (LHD) w/o ABS 2C engine (LHD) w/ ABS	90 mm (3.54 in.) 85 mm (3.35 in.) 90 mm (3.54 in.) 70 mm (2.76 in.) 65 mm (2.56 in.) 70 mm (2.76 in.) 85 mm (3.35 in.) 80 mm (3.15 in.) 65 mm (2.56 in.) 60 mm (2.36 in.)
Brake booster push rod to piston clearance (w/SST)		0 mm (0 in.)
Vacuum pump blade height	Limit	13.3 mm (0.524 in.)
Vacuum pump blade thickness	Limit	5.95 mm (0.2343 in.)
Vacuum pump blade length	Limit	22.98 mm (0.9047 in.)
Front brake pad thickness (Ex. 3S—GE engine)	STD	12.0 mm (0.472 in.)
Front brake pad thickness (Ex. 3S—GE engine)	Limit	1.0 mm (0.039 in.)
Front brake pad thickness (3S—GE engine)	STD	10.0 mm (0.394 in.)
Front brake pad thickness (3S—GE engine)	Limit	1.0 mm (0.039 in.)
Front brake disc thickness (3S—FE engine)	STD	28.0 mm (1.102 in.)
Front brake disc thickness (3S—FE engine)	Limit	26.0 mm (1.024 in.)
Front brake disc thickness (Ex. 3S—FE engine)	STD	25.0 mm (0.984 in.)
Front brake disc thickness (Ex. 3S—FE engine)	Limit	23.0 mm (0.906 in.)
Front brake disc runout	Limit	0.05 mm (0.0020 in.)
Rear brake drum inside diameter	STD	200.0 mm (7.874 in.)
Rear brake drum inside diameter	Limit	201.0 mm (7.913 in.)
Rear brake drum lining thickness	STD	4.0 mm (0.157 in.)
Rear brake drum lining thickness	Limit	1.0 mm (0.039 in.)
Rear brake drum to shoe clearance		0.6 mm (0.024 in.)
Rear drum brake clearance between rear shoe and lever		Less than 0.35 mm (0.0138 in.)
Rear drum brake adjusting shim thickness		0.2 mm (0.008 in.) 0.3 mm (0.012 in.) 0.4 mm (0.016 in.) 0.5 mm (0.020 in.) 0.6 mm (0.024 in.) 0.9 mm (0.035 in.)
Rear brake disc pad thickness	STD	10.0 mm (0.394 in.)
Rear brake disc pad thickness	Limit	1.0 mm (0.039 in.)
Rear brake disc thickness	STD	10.0 mm (0.394 in.)

Rear brake disc thickness	Limit	9.0 mm (0.354 in.)
Rear brake disc runout	Limit	0.15 mm (0.0059 in.)
Rear brake disc inside diameter	STD	170 mm (6.69 in.)
Rear brake disc inside diameter	Limit	171 mm (6.73 in.)
Parking brake lining thickness	STD	2.0 mm (0.079 in.)
Parking brake lining thickness	Limit	1.0 mm (0.039 in.)
Parking brake lever travel at 196 N (20 kgf, 44 lbf)		4–7 clicks
Parking brake clearance between rear shoe and lever		Less than 0.35 mm (0.0138 in.)
Parking brake adjusting shim thickness for rear disc brake		0.3 mm (0.012 in.)
		0.6 mm (0.024 in.)
		0.9 mm (0.035 in.)

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TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Master cylinder x Piston stopper bolt	10	100	7
Master cylinder x Reservoir	1.7	17.5	15.2 in·lbf
Master cylinder x Brake booster	13	130	9
Brake tube union nut	15	155	11
Brake booster clevis lock nut	25	260	19
Brake booster x Pedal bracket	13	130	9
Vacuum pump x Alternator	7.8	80	69 in·lbf
Vacuum pump x Check valve	74	750	54
Vacuum pump x Vacuum union	14	140	10
Vacuum pump x Oil outlet union	32	325	24
Front disc brake cylinder installation bolt	34	350	25
Bleeder plug	8.3	85	74 in·lbf
Front disc brake torque plate x Steering knuckle	94	960	69
Front disc brake cylinder x Flexible hose	30	310	22
Rear drum brake wheel cylinder x Backing plate	10	100	7
Parking brake cable bracket x Backing plate	7.8	80	69 in·lbf
Flexible hose x Shock absorber	29	300	22
Rear disc brake cylinder installation bolt	20	200	14
Rear disc brake torque plate x Dust cover	47	475	34
Rear disc brake cylinder x Flexible hose	30	310	22
Proportioning valve installation nut	7.8	80	69 in·lbf
Load sensing proportioning valve x Suspension arm	25	260	19
Load sensing proportioning valve x Body	39	400	29
ABS actuator x ABS actuator No.1 bracket	5.4	55	48 in·lbf
ABS actuator x ABS actuator No.3 bracket	13	130	9
ABS actuator No.3 bracket x Body	19	195	14
Front speed sensor installation bolt	8.0	82	71 in·lbf
Rear speed sensor installation bolt	8.0	82	71 in·lbf
ABS ECU bracket x Body	5.5	56	49 in·lbf