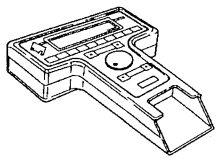
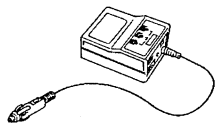
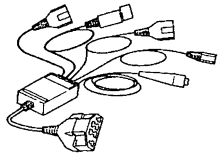
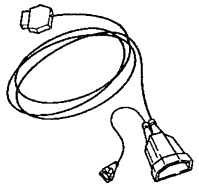
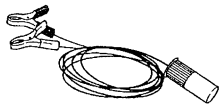
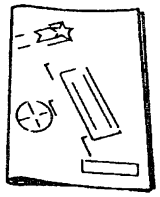
49 T088 001 Control Unit (Part of 49 T088 0A0) 	For diagnosis	49 T088 002 Vehicle Interface Module (Part of 49 T088 0A0) 	For diagnosis
49 T088 003 Super MECS Adapter (Part of 49 T088 0A0) 	For diagnosis	49 T088 005 STAR/DCL Adapter (Part of 49 T088 0A0) 	For diagnosis
49 T088 006 Battery Hookup Adapter (Part of 49 T088 0A0) 	For diagnosis	49 T088 008A Instruction Manual 	For diagnosis
49 T088 010B Program Card 	For diagnosis	—	—

TROUBLESHOOTING GUIDE

Precaution

Conditions that are not malfunctions

1. Vibration can sometimes be felt in the steering wheel, body, and/or brake pedal when the ABS is functioning; such vibration is simply an indication that the system is functioning.
2. The ABS warning light may illuminate under any of the following conditions:
   - When the vehicle is travelling on snow or ice with the parking brake activated or a brake dragging at one wheel.
   - When different size tires are used.
   - When tires of different gripping performance are used.
   - When (while the vehicle is jacked up or stuck) the front wheels only are spun for 20 seconds or more.
   - When there is insufficient battery voltage.

Note

- Under the above conditions, the warning light will not illuminate a second time when the ignition is switched OFF then back ON, and there will be no problem entry made to the control module memory.

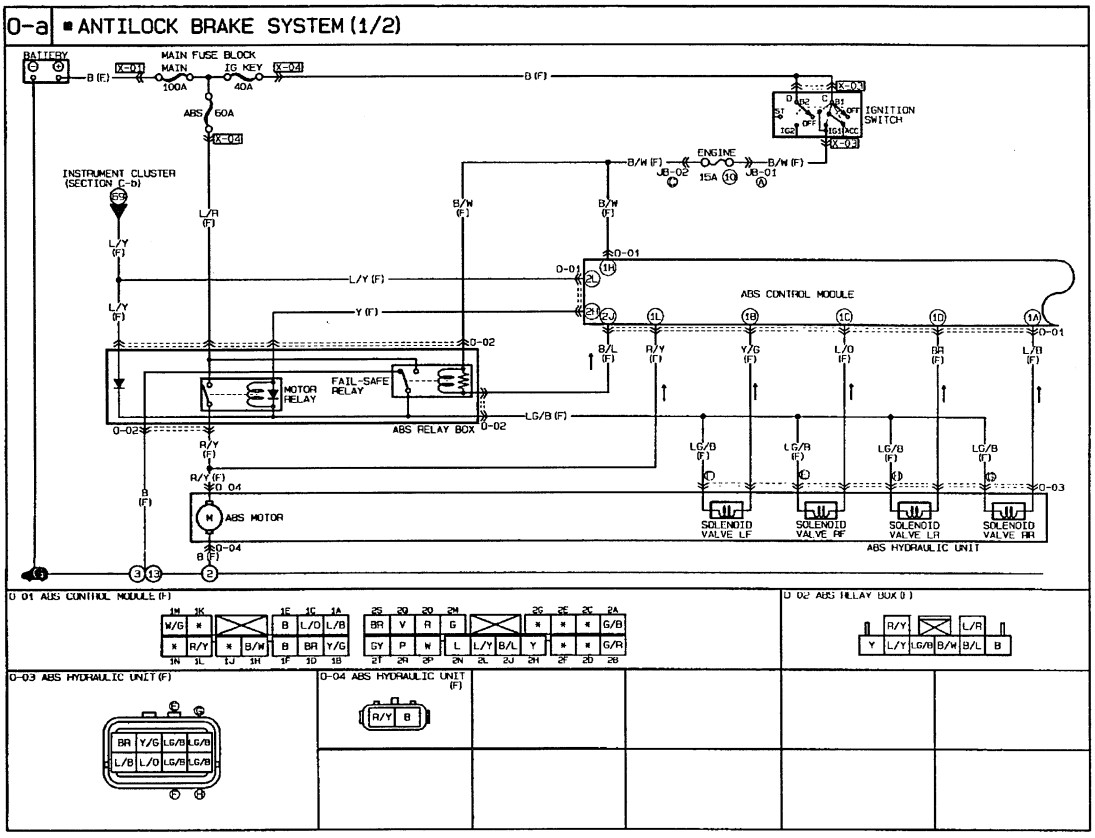
Troubleshooting notes

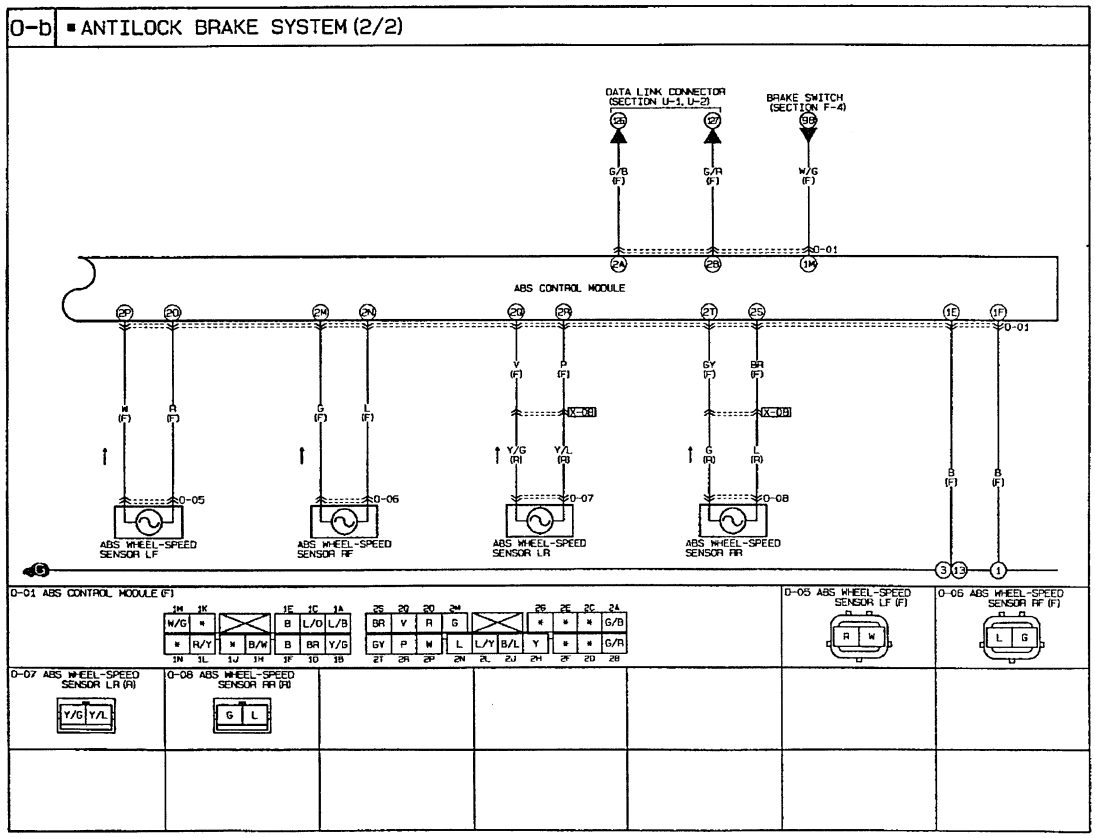
The ABS is composed of electrical components, mechanical components (ABS hydraulic unit), and the components of the standard brake system.

Fundamentally, malfunctions of the ABS electrical or mechanical components are judged by the on-board diagnosis function within the ABS control module. The malfunctions are indicated by the warning light in the instrument panel. The location of a malfunction is indicated by the technician switching the system to the diagnostic test mode.

The on-board diagnostic system must be used when diagnosing malfunctions of the ABS.

WIRING DIAGRAM





RELATIONSHIP CHART

Input \ Output	ABS hydraulic unit		ABS warning light	Data link connector
	Solenoid valve	ABS motor		
ABS wheel-speed sensor	○	○	○	○
Brake switch	○	○		
Fail-safe relay	○		○	○
Motor relay		○	○	○

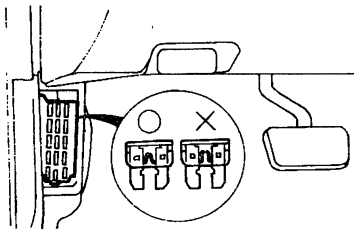
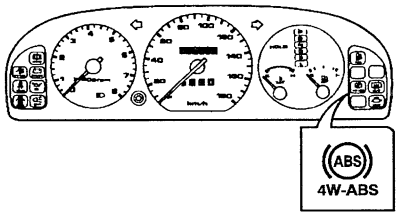
QUICK DIAGNOSIS CHART

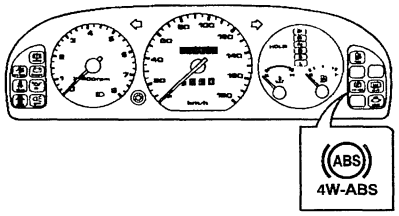
Symptom \ Cause		Input				Output				
		ABS wheel-speed sensor	Brake switch	ABS relay		ABS hydraulic unit		ABS warning light	Data link connector	ABS control module
				Fail-safe relay	Motor relay	Solenoid valve	ABS motor			
1	ABS warning light not illuminated when ignition switch turned ON							○		
2	ABS warning light remains ON	○	○	○		○	○	○		○
3	ABS warning light flashes								○	

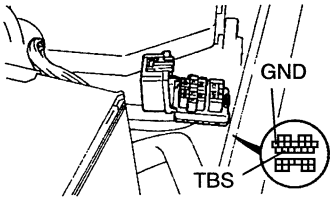
DIAGNOSTIC INDEX

No.	Troubleshooting Items	Remarks	Page
1	ABS warning light not illuminated when ignition switch turned ON	—	P–42
2	Warning light remains ON	Warning light remains ON and ABS does not operate	P–43
3	ABS warning light flashes	—	P–44

SYMPTOM TROUBLESHOOTING

1	WARNING LIGHT NOT ILLUMINATED WHEN IGNITION SWITCH TURNED ON		
DETAILED DESCRIPTION	—		
Possible cause: • If other warning indicators do not illuminate, METER 15 A fuse may be burnt. • Failed indicator light or open in related wiring harness.			
Step	**Inspection**		**Action**
1	Is METER 15 A fuse OK? ☞ **page P–54** 	Yes	Go to next step
		No	Repair METER 15 A fuse
2	Is harness of ABS warning light normal? ☞ **page P–51** 	Yes	Inspect ABS warning light ☞ **page P–51**
		No	• Inspect harness between ABS CM and ABS relay • Inspect harness between instrument panel and ABS CM • Inspect harness between instrument panel and ABS relay • Inspect ABS warning light bulb

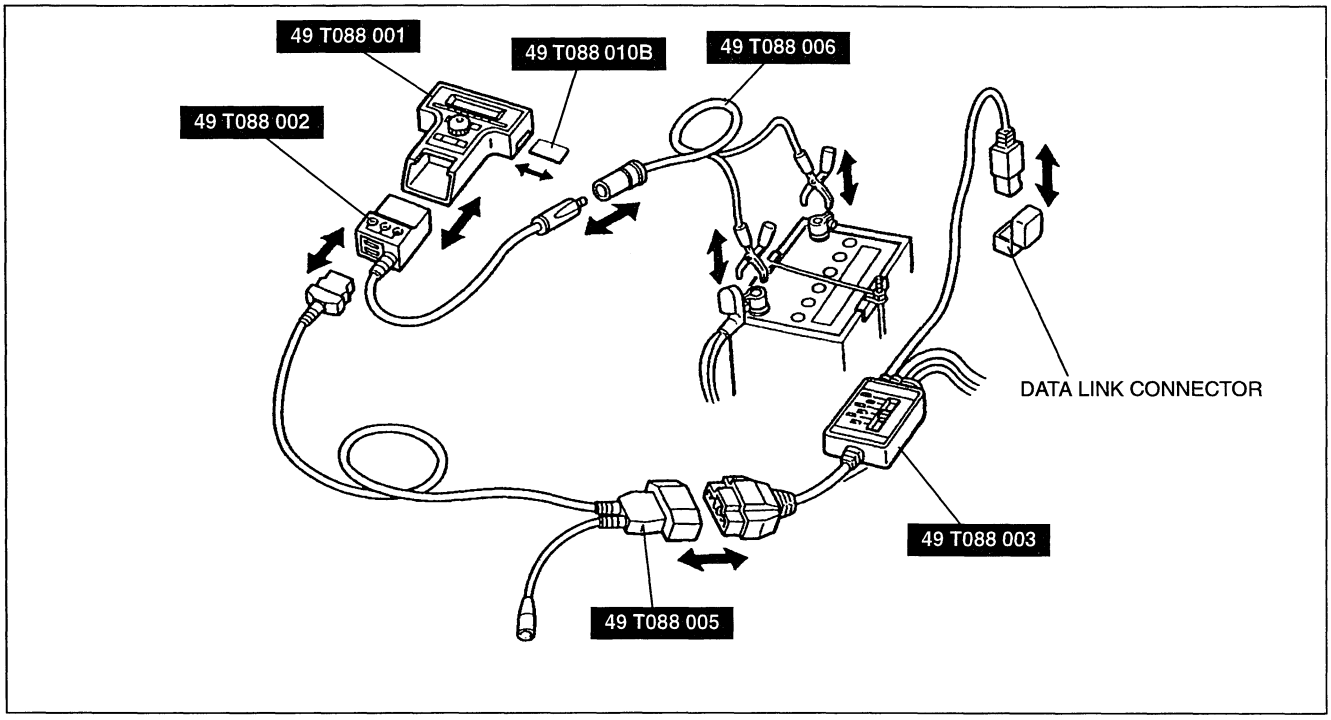
2	WARNING LIGHT REMAINS ON		
DETAILED DESCRIPTION	**Warning light remains ON and ABS does not operate**		
Possible cause: • If ABS warning light only illuminates, activate diagnostic mode and check for diagnostic trouble code • Malfunction of battery • Malfunction of ABS warning light harness (fail-safe relay) • Malfunction of ABS CM			
Step	**Inspection**		**Action**
1	With the **SSTs** (self diagnosis checker, system selecter), verify that diagnostic trouble code is indicated. (Connect the **SSTs** to the data link connector) ☞ **page P–45**	Yes	Read diagnostic trouble code ➪ Inspect as indicated ☞ **page P–47**
		No	Go to next step
2	Is battery voltage OK? ☞ **page P–51**	Yes	Go to next step
		No	Charge or replace battery
3	Is ABS warning light harness normal? ☞ **page P–51** 	Yes	Go to next step
		No	• Inspect harness between ABS CM and ABS relay • Inspect harness between instrument panel and ABS CM • Inspect harness between instrument panel and ABS relay
4	Connect terminal 2J of ABS CM connector (18 pin) to a ground and check the following points (IG ON) • Operation sound of relay is heard • ABS warning light is not illuminated • 1D terminal of ABS CM connector indicates 12V	Yes	Go to next step
		No	• Inspect ABS relay (fail-safe relay) • Inspect harness between ABS relay (fail-safe relay) and ABS CM, battery • Inspect harness between ABS relay (fail-safe relay) and ABS hydraulic unit
5	Is voltage at terminals 1E, 1F and 1H of ABS CM connector (12 pin) and terminals 2B and 2L of ABS CM connector (18 pin) as specified? ☞ **page P–56**	Yes	Replace ABS CM
		No	• Inspect harness between ABS CM and ground • Inspect harness between ignition switch and ABS CM • Inspect harness between data link connector and ABS CM • Inspect harness between ABS warning light and ABS CM

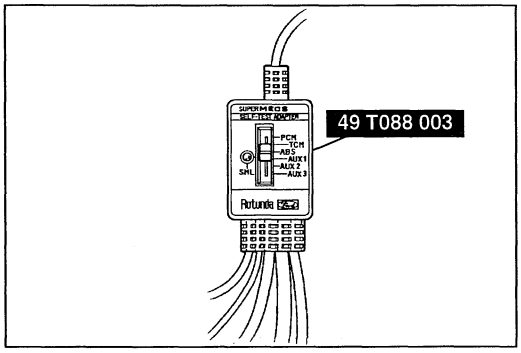
3	ABS WARNING LIGHT FLASHES		
DETAILED DESCRIPTION	—		
Possible cause: • Data link connector terminal TBS grounded			
Step	**Inspection**		**Action**
1	Verify that there is no continuity between terminal TBS and GND  	Yes	Inspect ABS CM
		No	Repair short between terminal TBS and ground

ON-BOARD DIAGNOSTIC SYSTEM
Inspection by diagnostic test mode
Outline

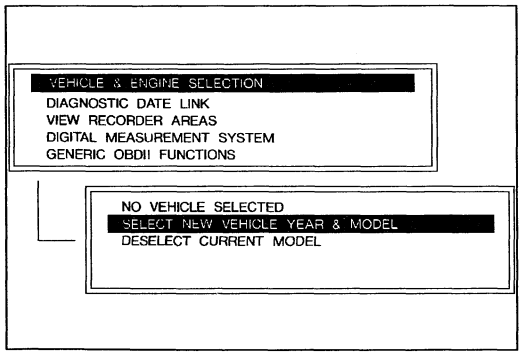
- The ABS control module contains an on-board diagnostic and memory functions to detect and indicate present and past failures.
  Read and note the diagnostic indications by using the **SST**, and take action according to the Diagnostic Trouble Code Table. (Refer to page P–47.)
- The ABS CM has a nonvolatile memory. Diagnostic trouble codes are not erased if the battery is disconnected. The memory should be cleared when servicing is finished. (Refer to page P–47.)

Inspection using NGS

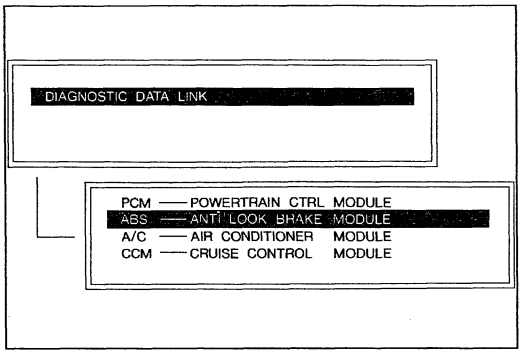




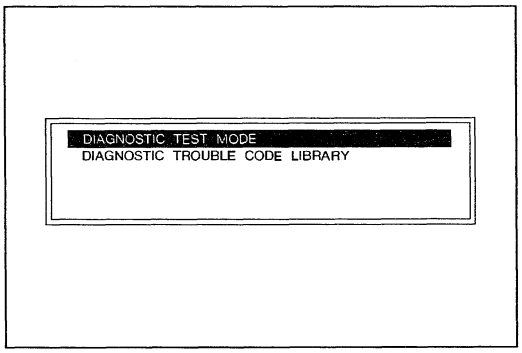
1. Connect the **SST** (NGS) to the data link connector and battery.
2. Set the **SST** (Super MECS Adapter) to ABS.



3. Select "VEHICLE & ENGINE SELECTION" on the **SST** (Control Unit) display, and then select the vehicle model, engine type, and model year.



4. Select "DIAGNOSTIC DATA LINK" on the **SST**, (Control Unit) display.
5. Select "ANTI LOCK BRAKE MODULE" on the **SST** (Control Unit) display.



6. Select "DIAGNOSTIC TEST MODE" on the **SST** (Control Unit) display.
7. (1) If a trouble code is displayed, refer to the Diagnostic trouble code table (Refer to page P–47.) and inspect the appropriate system area.
   (2) If "No codes received" is displayed, the system areas shown in the Diagnostic trouble code table are okay. Inspect another system area.

Memory Cancel

Diagnostic trouble codes memorized in the ABS control module are canceled by performing the following steps.

1. Connect the TBS terminal to GND at the data link connector.
2. Turn the ignition switch ON.
3. Output all memorized codes.
4. After verifying that the first code is repeated, depress the brake pedal 10 times at intervals of less than one second (1 sec.).

Note

Diagnostic trouble codes will not be canceled if:

- Intervals of depressing the brake pedal exceed one second (1 sec.).
- Brake switch has failed.
- While performing the memory cancel operation, the ABS warning light will not illuminate.
- When the memory cancel operation is completed, the ABS warning light comes on for 2—3 seconds, then goes off.
- After the memory is canceled, the ABS control module performs on-board diagnosis.

Diagnostic Trouble Code Table

Note

- If the ignition switch is turned OFF and ON again, and the vehicle is then accelerated to higher than 10 km/h {6.2 MPH}, diagnostic trouble code 15 will be replaced by a code from 11 through 14.

DTC	Display on the NGS	Possible cause	Diagnosis chart No.
11	WSS, SR (RH-FFRONT) — OPEN OR SHORT, DEFECT	Right front wheel-speed sensor Right front sensor rotor	ABS–1
12	WSS, SR (LH-FRONT) — OPEN OR SHORT, DEFECT	Left front wheel-speed sensor Left front sensor rotor	
13	WSS, SR (RH-REAR) — OPEN OR SHORT, DEFECT	Right rear wheel-speed sensor Right rear sensor rotor	
14	WSS, SR (LH-REAR) — OPEN OR SHORT, DEFECT	Left rear wheel-speed sensor Left rear sensor rotor	
15	WSS — OPEN OR SHORT	ABS wheel-speed sensor	ABS–2
22	SOLV (RH-FRONT) — OPEN OR SHORT	Right front solenoid valve	ABS–3
24	SOLV (LH-FRONT) — OPEN OR SHORT	Left front solenoid valve	ABS–3
26	SOLV (RH-REAR) — OPEN OR SHORT	Right rear solenoid valve	
28	SOLV (LH-REAR) — OPEN OR SHORT	Left rear solenoid valve	
51	FAIL-SAFE RELAY — OPEN OR SHORT, DEFECT	Fail-safe relay	ABS–4
53	MOTOR, MOTOR RELAY, OPEN OR SHORT, DEFECT	ABS motor Motor relay	ABS–5
61	ABS CONTROL UNIT — DEFECT	ABS control module	ABS–6

Diagnosis Chart

ABS–1	Diagnostic trouble code: 11—14		
Possible failure: ABS wheel-speed sensor, harness, ABS sensor rotor, hydraulic pressure 11: Right front 12: Left front 13: Right rear 14: Left rear			
Step	**Check item**	**Remark**	**Refer to**
1	Check control module connector	Check for poor connection	—
2	Check wiring harness between control module and ABS wheel-speed sensor	Check for open or short to ground	—
3	Check ABS wheel-speed sensor	—	P–59
4	Check ABS sensor rotor	—	P–59
5	Check brake switch	—	P–52
6	Check hydraulic system	If a problem is found, replace ABS hydraulic unit or repair hydraulic system piping as necessary	P–60
7	If all above are OK after diagnostic trouble code(s) is erased, recheck for diagnostic trouble code after driving from when vehicle is stopped to over 10 km/h {6 mph}	If code of 11—14 is obtained, replace ABS control module	P–63
8	If all above are OK, there was temporarily poor contact in wiring and now ABS system is functioning		

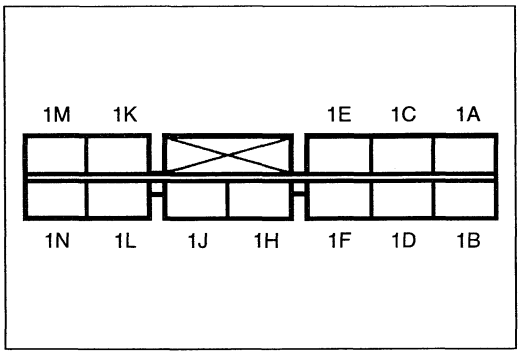
ABS–2	Diagnostic trouble code: 15		
Possible failure: ABS wheel-speed sensor, harness			
Step	**Check item**	**Remark**	**Refer to**
1	If all the malfunctions are OK after diagnostic trouble code is erased, recheck for diagnostic trouble code after driving from when vehicle is stopped to over 10 km/h {6 mph}	If code of 11—14 is obtained, go to ABS–1	Above
		If code 15 is obtained, replace ABS control module	P–63
		If nothing is displayed, there was temporarily poor contact in wiring and now ABS is OK	—

ABS–3	Diagnostic trouble code: 22—28		
Possible failure: Solenoid valve, harness 22: Right front, 24: Left front, 26: Right rear, 28: Left rear			
Step	**Check item**	**Remark**	**Refer to**
1	Check control module connector	Check for poor connection	—
2	Check wiring harness between ABS hydraulic unit and control module	Check for open or short to ground	—
3	Check ABS hydraulic unit solenoid valve	Check for open circuit	P–54
4	Check ABS warning light operation	If warning light remains illuminated after turning ignition switch ON, replace ABS control module	—
		If warning light does not illuminate after turning ignition switch ON, there was temporarily poor contact in wiring and now ABS system is functioning	

ABS–4	Diagnostic trouble code: 51		
Possible failure: Fail-safe relay			
Step	**Check item**	**Remark**	**Refer to**
1	Check pump fuse	Check pump fuse condition	P–54
		Check short to ground	—
2	Check ABS relay	Check for open circuit	P–64
3	Check wiring harness between ABS relay and ABS hydraulic unit or ABS control module	Check for open or short to ground	—
4	Check ABS warning light operation	If warning light remains illuminated after turning ignition switch ON, replace ABS control module	—
		If warning light does not illuminate after turning ignition switch ON, there was temporarily poor contact in wiring and now ABS system is functioning	

ABS–5	Diagnostic trouble code: 53		
Possible failure: ABS motor, motor relay			
Step	**Check item**	**Remark**	**Refer to**
1	Check motor relay	If pump motor continues operating after turning ignition switch OFF, motor relay may be faulty	P–65
2	Check ABS pump fuse	Check ABS pump fuse condition	P–54
		Check short to ground	—
3	Check wiring harness between ABS relay and ABS hydraulic unit and ABS control module	Check for open or short to ground	—
4	Check voltage at ABS control module terminal	Turn ignition switch ON and check motor relay terminal voltage	P–56
5	Check ABS motor	Check for open circuit	P–53
6	Check wiring harness between ABS motor and ground	Check for open circuit	—
7	Check wiring harness between ABS motor and ABS control module	Check for open or short to ground	—
8	Check ABS warning light operation	If warning light remains illuminated after turning ignition switch ON, replace ABS control module	—
		If warning light does not illuminate after turning ignition switch ON, there was temporarily poor contact in wiring and now ABS system is functioning	

ABS–6	Diagnostic trouble code: 61		
Possible failure: ABS control module			
Step	**Check item**	**Remark**	**Refer to**
1	—	Replace ABS control module	P–63



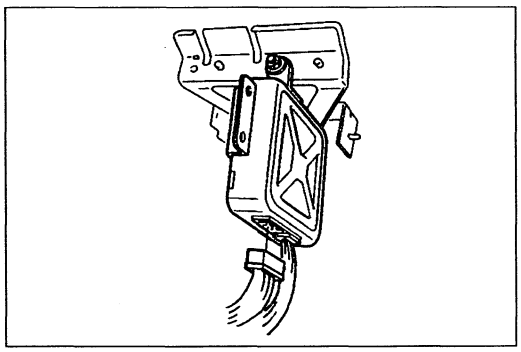
Inspection of ABS system
Check battery

Note
- If the battery voltage is low, the ABS warning light may illuminate.

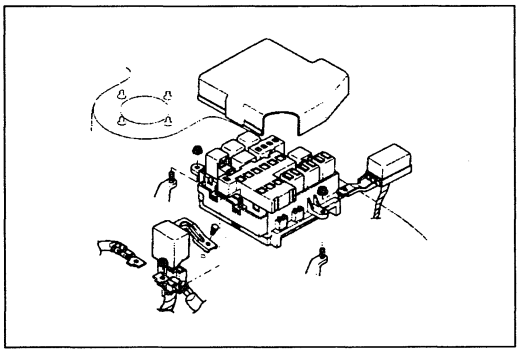
1. Start the engine.
2. Check the voltage at the battery and at the ABS control module terminal 1H.

Voltage: 10 V min.

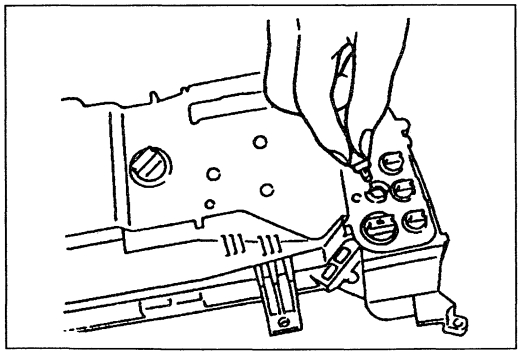
3. If the battery voltage is below the specification, charge or replace the battery as necessary.
4. If the battery voltage is within the specification and terminal 1H voltage is below the specification, check the wiring harness between the battery and the ABS control module terminal 1H.



Check ABS warning light harness
1. Turn the ignition switch OFF, and disconnect the ABS control module connector (18 pin).
2. Turn the ignition switch ON. If the warning light is ON, go to the next step. If the warning light is OFF, check the ABS relay and the harness. (Warning light — ABS relay, ABS relay — Ground)



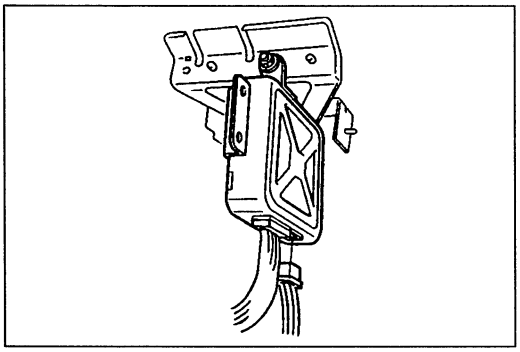
3. Disconnect the ABS relay connector.
4. If the warning light remains illuminated, check the warning light harness for a short to ground.



Check ABS warning light bulb
1. Remove the meter assembly.
2. Remove the warning light bulb from the rear of the cluster.
3. Check the condition of the bulb.
4. Replace the bulb if necessary.

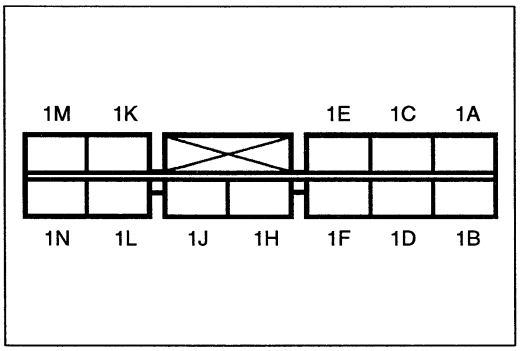
Check brake switch

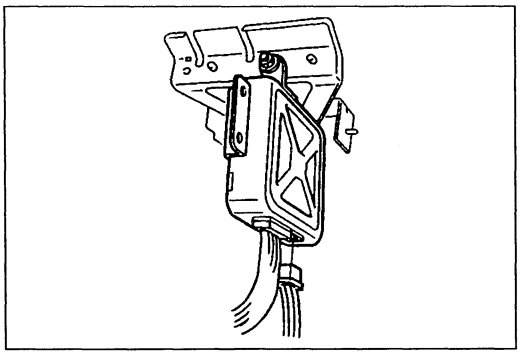
1. Depress the brake pedal.
2. Verify that the brake lights illuminate.
3. If they do not illuminate, check the following:
   - Brake light bulb
   - Brake light fuse
   - Brake switch
   - Brake light harness
4. Repair of replace any parts as necessary.

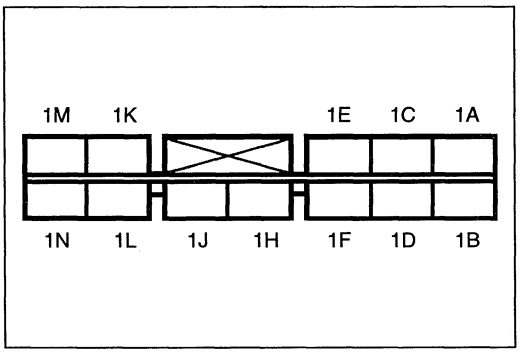


Check brake switch harness at ABS control module

1. Turn the ignition switch OFF.
2. Disconnect the ABS control module connector (12 pins).
3. Turn the ignition switch ON.
4. Check for voltage between terminal 1M at the vehicle side harness and ground. (Refer to page P–55.)
5. If not as specified, check the wiring harness between the brake switch and the ABS control module.





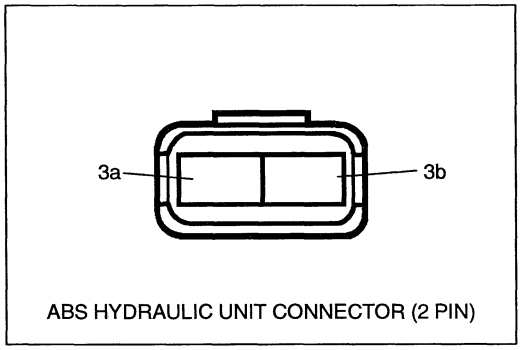


Check motor harness at ABS control module

1. Turn the ignition switch OFF, and disconnect the ABS control module connector (12 pin).
2. Measure the resistance between 1L terminal of the control module connector and ground.

   Resistance: 1 Ω max.

3. If not as specified, check the wiring harness between the ABS motor and the control module and check the ABS motor.



ABS HYDRAULIC UNIT CONNECTOR (2 PIN)

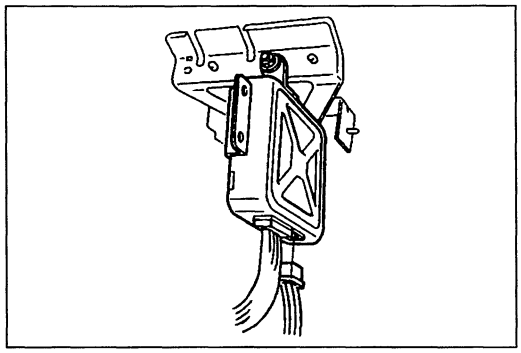
Check ABS motor at ABS hydraulic unit

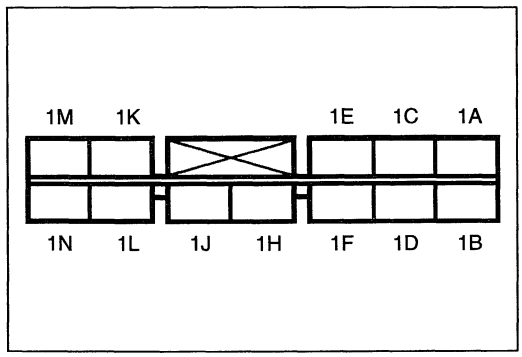
1. Turn the ignition switch OFF.
2. Disconnect the ABS hydraulic unit connector (2 pin).
3. Measure the resistance between the connector terminals.

   Resistance: 1 Ω max.

   Warning
   - **Allowing the ABS motor to operate for more than two seconds will cause it to overheat and become damaged. When checking the ABS motor and its related equipment, do not allow the ABS motor to operate for more than two seconds.**

4. Verify that the ABS motor operates when applying 12 V to the connector (2 pin).
5. If not as specified, replace the ABS hydraulic unit.



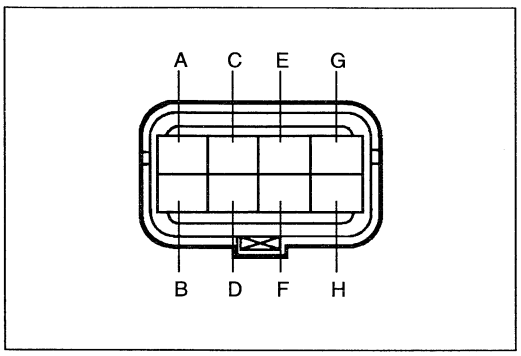


Check solenoid valve harness of ABS control module

1. Turn the ignition switch OFF.
2. Measure the resistance between a ground and the following terminals at the ABS control module connector (12 pin).
   Terminal: 1A, Right rear
   1B, Left front
   1C, Right front
   1D, Left rear

   Resistance: Approx. 3 Ω

3. If not as specified, check the wiring harness between the ABS hydraulic unit connector (8 pin) and the ABS control module.



Check solenoid valve at ABS hydraulic unit

1. Disconnect the ABS hydraulic unit connector (8 pin).
2. Measure the resistance between the following terminals.

Terminal
A—H
B—G
C—F
D—E

Resistance: approx. 3 Ω

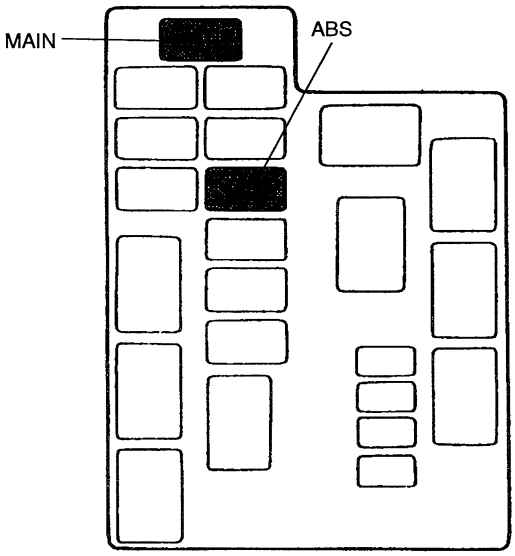
3. If not as specified, check the ABS hydraulic unit wiring harness or replace the ABS hydraulic unit if necessary.

Check fuse

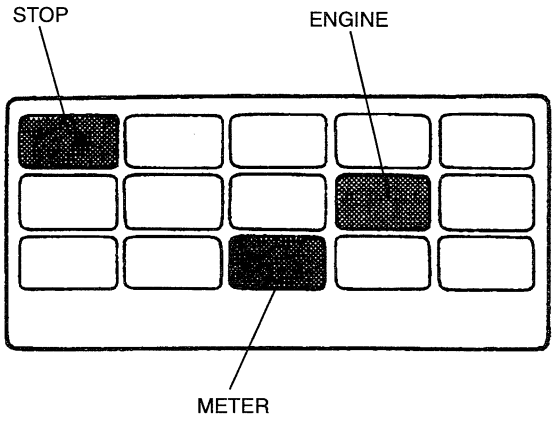
Check the fuses according to the following table. If a fuse is burnt, replace it.

Fuse name	Rating (Amp)	Location	Failure condition	Refer to
ABS	60	Main fuse block	• ABS warning light illuminates (Malfunction code 51 or 53) • ABS motor and solenoid valves do not operate	P–49, 50
MAIN	100		• Engine does not start	—
ENGINE	15	Fuse block (at driver's side)	• ABS warning light illuminates after engine started • ABS control module not activated	—
STOP	20		• Brake light does not illuminate	—
METER	15		• No ABS warning lights in instrument cluster illuminate	—

MAIN FUSE BLOCK

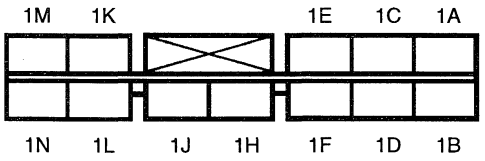


FUSE BLOCK

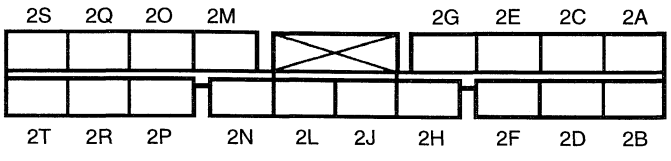


Check ABS control module

ABS CONTROL MODULE CONNECTOR



12 PIN



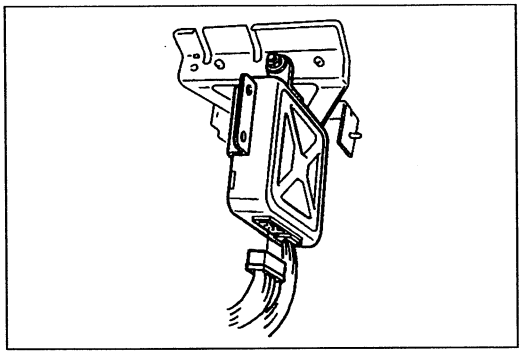
18 PIN

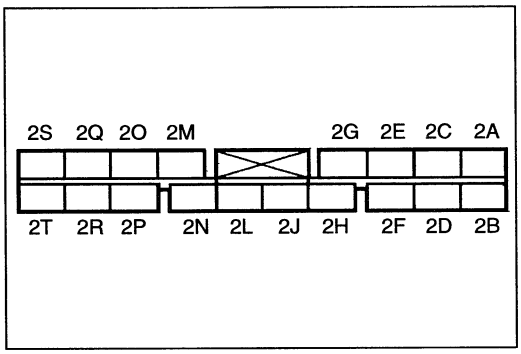
B+: Battery positive voltage

Connector	Terminal	Connected to	Condition	Voltage	Remark
12 pin	1A	Right rear wheel solenoid	Solenoid ON*	0—2	* Solenoid is ON only when ABS system is functioning. Voltage when solenoid is ON can be measured following "Hydraulic System Test" (Refer to P–60.)
			Ignition switch ON	B+	
	1B	Left front wheel solenoid	Solenoid ON*	0—2	
			Ignition switch ON	B+	
	1C	Right front wheel solenoid	Solenoid ON*	0—2	
			Ignition switch ON	B+	
	1D	Left rear wheel solenoid	Solenoid ON*	0—2	
			Ignition switch ON	B+	
	1E	Ground	Constant	0	
	1F	Ground	Constant	0	
	1H	Battery	Ignition switch ON	B+	
			Ignition switch OFF	0	
	1J	Not used	—	—	
	1K	Not used	—	—	
	1L	ABS motor	Motor running	B+	
			Motor stopped	0—1	
	1M	Brake switch	Brake pedal depressed	B+	
			Brake pedal released	0—2	
	1N	Not used	—	—	

B+: Battery positive voltage

Connector	Terminal	Connected to		Condition	Voltage	Remark
18 pin	2A	FBS check terminal		Ignition switch ON	0	
	2B	TBS check terminal		Normal mode	B+	
				Diagnostic test mode	0	
	2C	Not used		—	—	
	2D	Not used		—	—	
	2E	Not used		—	—	
	2F	Not used		—	—	
	2G	Not used		—	—	
	2H	Motor relay		Motor relay ON	0—2	
				Motor relay OFF	B+	
	2J	Fail-safe relay		Normal	0—2	
				If malfunction present	B+	
	2L	Warning light		Illuminated	0—3	
				Not illuminated	B+	
	2M	ABS wheel-speed sensor	Right front	Vehicle stopped	0	• Turn wheel at specified speed to prevent incorrect diagnosis • Check following terminals of ABS wheel-speed sensor in AC range: 2N–2M (right front) 2O–2P (left front) 2R–2Q (left rear) 2S–2T (right rear) • In DC range, ABS wheel-speed sensor voltage will be approx. 1.0V (with ignition switch ON)
	2N			Wheel turned 1 revolution per second	0.25—3.0	
	2O		Left front	Vehicle stopped	0	
	2P			Wheel turned 1 revolution per second	0.25—3.0	
	2Q		Left rear	Vehicle stopped	0	
	2R			Wheel turned 1 revolution per second	0.25—3.0	
	2S		Right rear	Vehicle stopped	0	
	2T			Wheel turned 1 revolution per second	0.25—3.0	

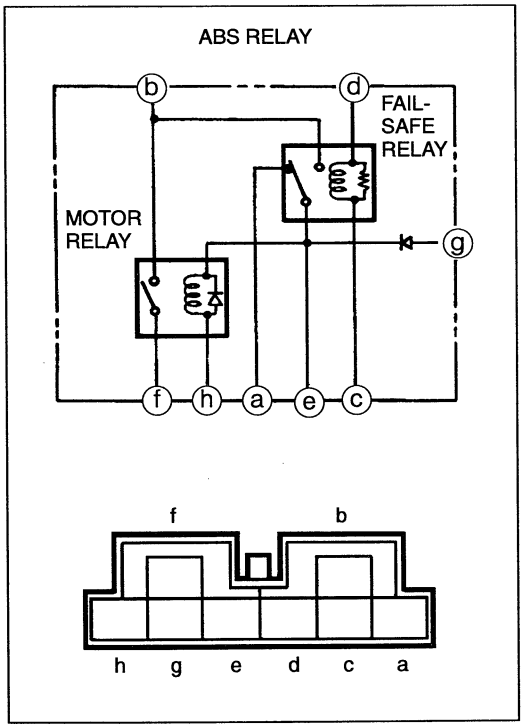




Check ABS relay harness (fail-safe relay)

1. Turn the ignition switch OFF and disconnect the ABS control module connector (18 pin).
2. Turn the ignition switch ON.
3. Connect terminal 2J of the control module connector (18 pin) to a ground.
4. Check the following points.

Condition	Action
Fail-safe relay in ABS relay does not click when 2J terminal grounded	• Check fail-safe relay • Check harness between fail safe relay and ABS control module
Warning light illuminates after grounding 2J terminal	• Check fail-safe relay
1D terminal of ABS control module connector does not indicate 12V	• Check fail-safe relay • Check harness between fail safe relay and ABS hydraulic unit



Check ABS relay (fail-safe relay)

1. Measure the resistance between terminals c and d of the ABS relay connector.

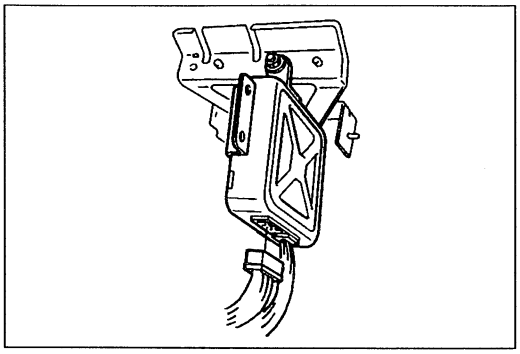
   Resistance: 60—100 Ω

2. Check for continuity between terminals a and e and between b and e.

Terminal	Continuity
a—e	Yes
b—e	No

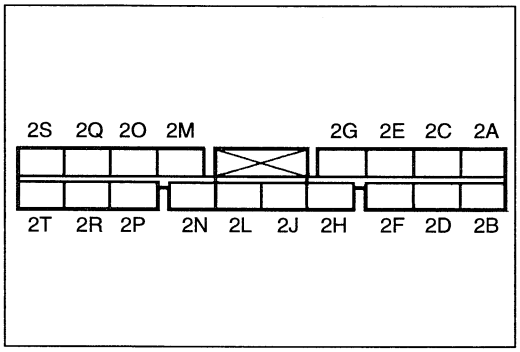
3. Apply 12 V between terminals d and c. Check for continuity between terminals a and e and between b and e.

Terminal	Continuity
b—e	Yes
a—e	No



Check ABS relay harness (motor relay)

1. Inspect the fail-safe relay.
2. Turn the ignition switch OFF and disconnect the ABS control module connector (18 pin).
3. Turn the ignition switch ON.
4. Connect terminal 2J to a ground.
5. Connect terminal 2H to a ground.
6. Check the following points.

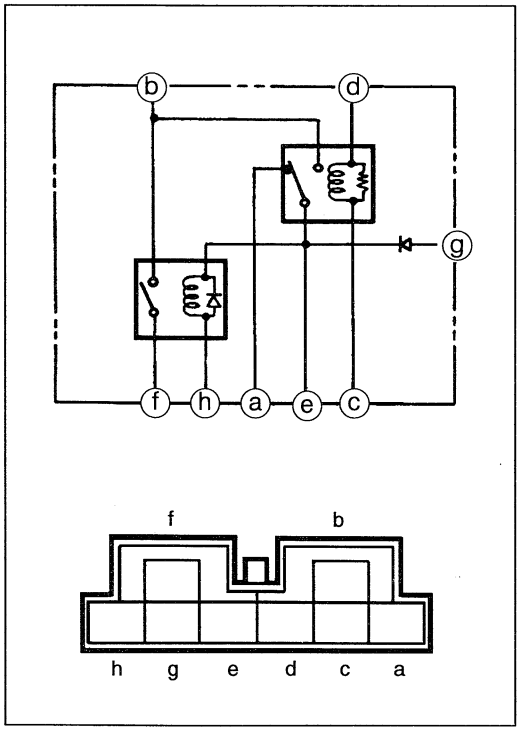


Caution

- **Allowing the ABS motor to operate for more than two seconds will cause it to overheat and become damaged. When checking the ABS motor and its related equipment, do not allow the ABS motor to operate for more than two seconds.**

Condition	Action
Motor relay in ABS relay does not click when terminals are grounded	• Check harness between motor relay and ABS control module • Check motor relay
ABS motor does not operate	• Check motor relay • Check harness between motor relay and ABS motor • Check fuse

7. If not as specified, replace the ABS relay.



Check ABS relay (motor relay)

1. Measure the resistance between terminals e and h, or between a and h of ABS relay connector.

   Resistance: 50—90 Ω

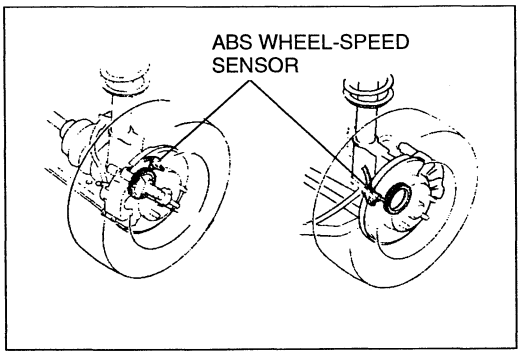
2. Check for continuity between terminals b and f.

Terminal	Continuity
b—f	No

3. Apply 12 V to terminals g (+) and h (–). Check for continuity between terminals b and f.

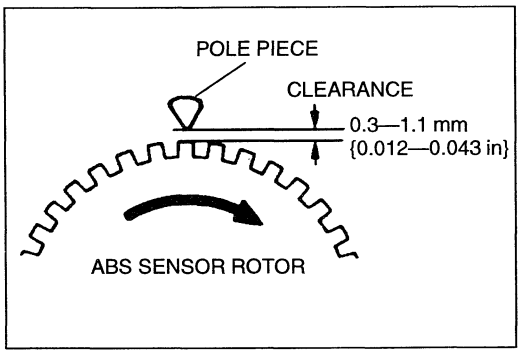
Terminal	Continuity
b—f	Yes

4. If not as specified, replace the ABS relay.



Check ABS wheel-speed sensor

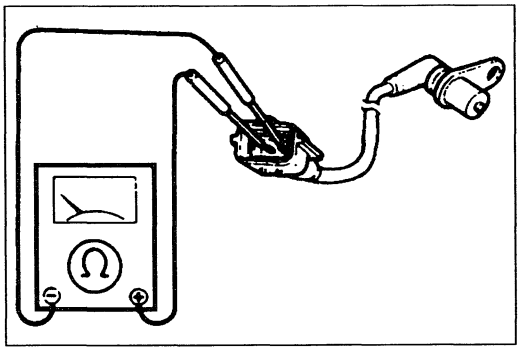
1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Remove the wheel and tire assembly.
3. Check for looseness and damage.



4. Check the clearance between the ABS wheel-speed sensor and the ABS sensor rotor at each wheel.

   Clearance: 0.3—1.1 mm {0.012—0.043 in}

5. If not as specified, replace the ABS wheel-speed sensor or ABS sensor rotor as necessary.



Check resistance of ABS wheel-speed sensor

1. Disconnect the ABS wheel-speed sensor connector.
2. Check the resistance at the ABS wheel-speed sensor.

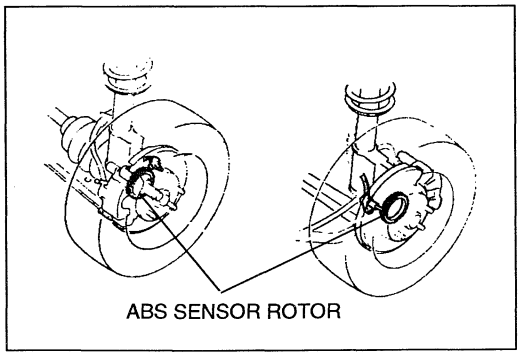
   Resistance: 1.6—2.0 kΩ

Check voltage of ABS wheel-speed sensor

1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Disconnect the ABS wheel-speed sensor connector.
3. Check each wheel by rotating it at one revolution per second.

   Voltage: 0.25—3.0 V (AC)

4. If not as specified, replace the ABS wheel-speed sensor or ABS sensor rotor as necessary.
5. Cancel the ABS control module memory.

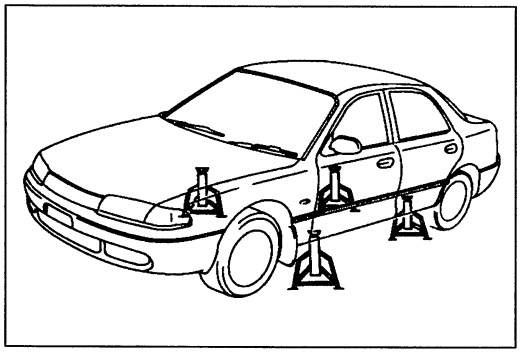


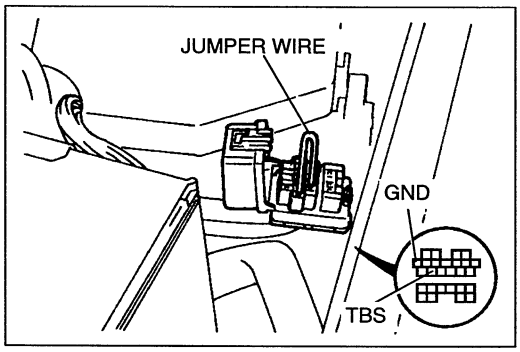
Check ABS sensor rotor

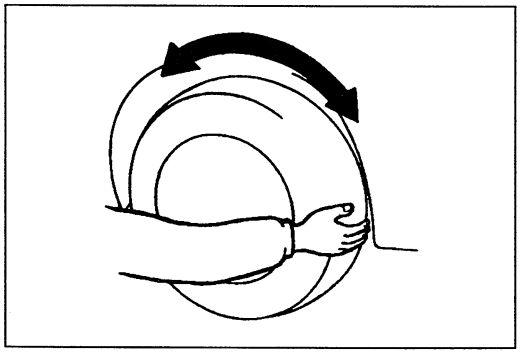
1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Remove the wheel and tire assembly.
3. Inspect the rotor for missing and damaged teeth.
4. Replace the ABS sensor rotor as necessary.

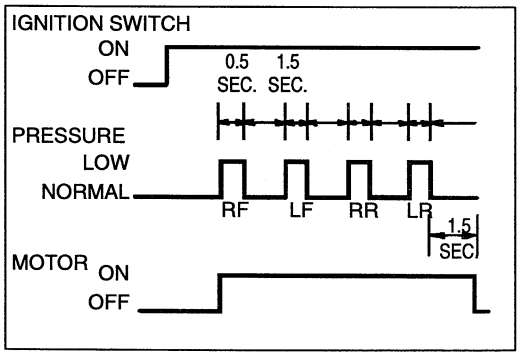
ABS HYDRAULIC UNIT

The ABS control module contains an on-board diagnostic function to check the hydraulic system operation. During the diagnostic test mode, the ABS control module activates the ABS hydraulic unit to reduce the hydraulic pressure of the right front, left front, right rear, left rear in sequence for 0.5 second each at intervals of 1.5 seconds.









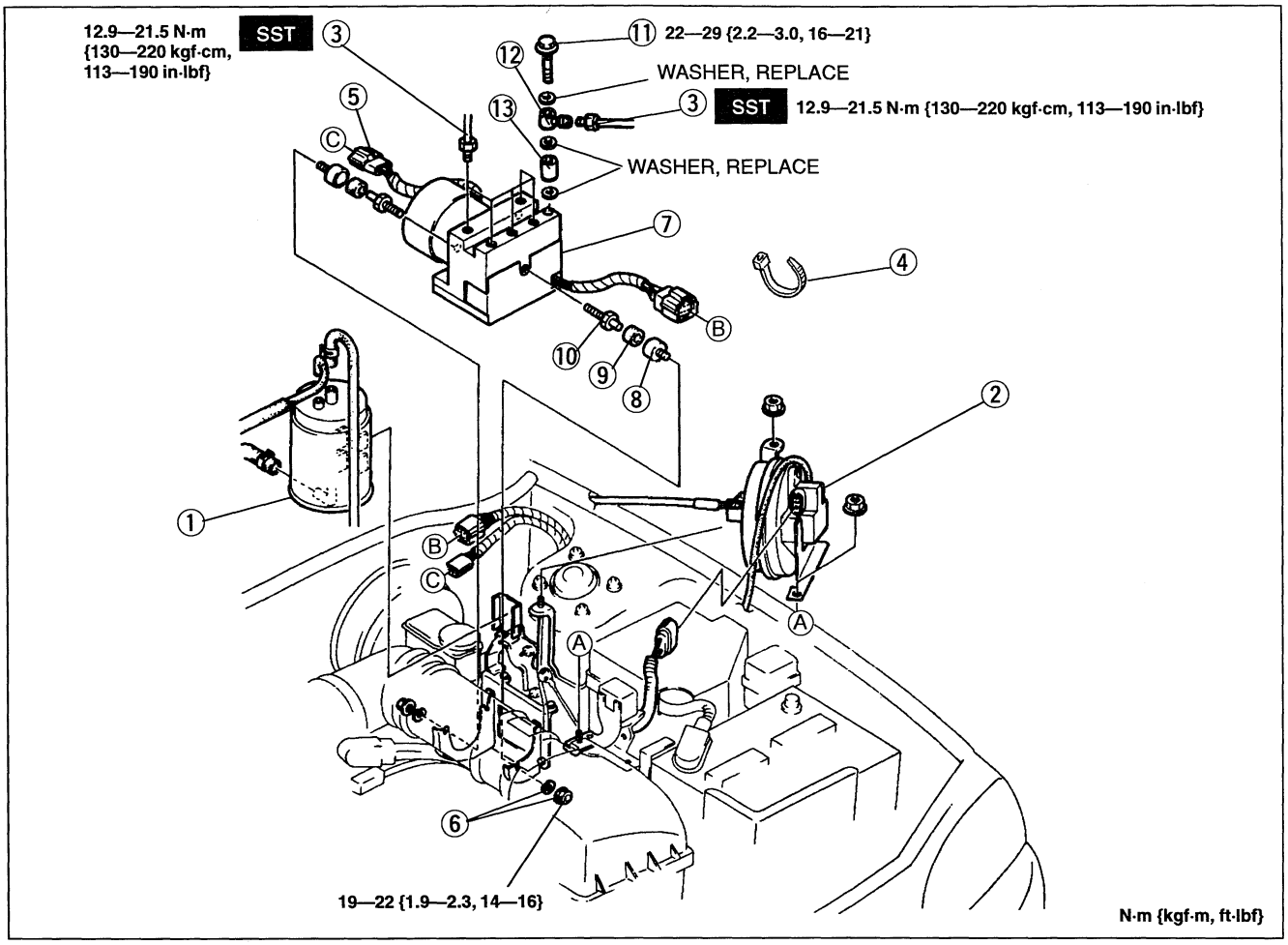
Inspection

1. Verify that the battery is fully charged.
   Verify that the ABS warning light goes out after the engine is started.
2. If the light stays ON after the engine has started, the ABS control module detects a failure and will not activate the ABS hydraulic unit.
3. Turn off the engine.
4. On level ground, jack up the vehicle and support it evenly on safety stands. Shift the transaxle to neutral or N range.
5. Release the parking brake.
6. Rotate the wheels by hand, and inspect for brake drag.
7. Using a jumper wire, connect the TBS and GND terminals of the data link connector.
8. Depress the brake pedal, and have an assistant verify that the right front wheel will not turn.
9. With the brake pedal still depressed, turn the ignition switch ON and verify that the brake is released momentarily (approx. **0.5 sec.**) and that the wheel turns when pressure reduction operates.
10. Check operation of the remaining wheels in order: left front, right rear, left rear.
11. If steps 9 and 10 show correct operation, the following systems are OK:
    - Brake piping to the ABS hydraulic unit
    - Braking system, including the ABS hydraulic unit
    - Electrical system in the ABS hydraulic unit (solenoid, ABS motor, etc.)
    - ABS control module, its output system (solenoid, relay, etc.) and harness

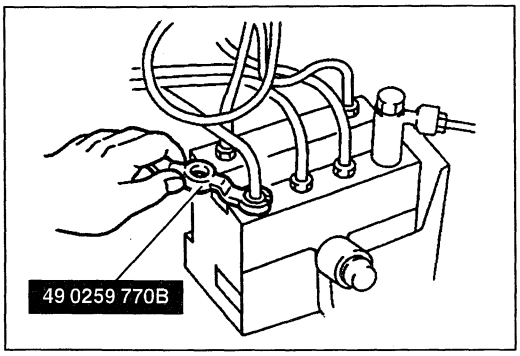
    The following are not checked with the above steps.
    - Input system and harness of the ABS control module
    - Intermittent failure
    - Fluid leakage
12. Replace the ABS hydraulic unit if necessary.

Removal / Installation

1. Remove the nuts mounting the fuel filter and igniter to the bracket, and move them toward the engine.
2. Remove the ABS hydraulic unit in the order shown in the figure, referring to **Removal Note**.
3. The ABS hydraulic unit is not serviceable. If there is a malfunction, replace the ABS hydraulic unit assembly. Install in the reverse order of removal, referring to **Installation Note**.
4. Add brake fluid, bleed the air, and check for fluid leakage.
5. Verify that the diagnostic trouble codes have been canceled. (Refer to page P–47.)



1. Charcoal canister
2. Cruise control actuator
3. Brake pipe
   Removal Note ..... below
   Installation Note ..... page P–62
4. Band
5. Connector
6. Nut and washer
7. ABS hydraulic unit
   Installation Note ..... page P–62
8. Casing
9. Mount rubber
10. Hex stud
11. Connector bolt
12. Connector
13. Spacer

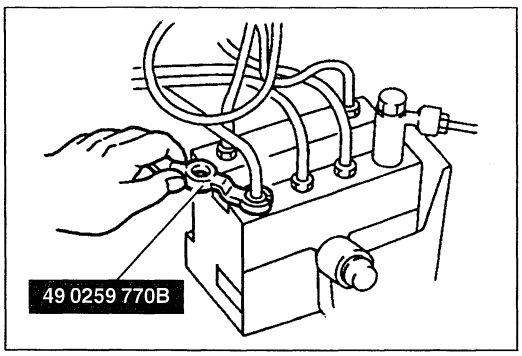


Removal note
Brake pipe

Caution

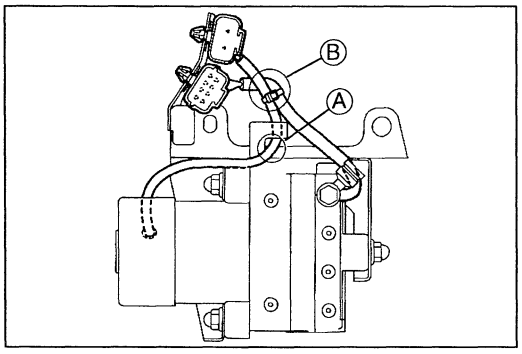
- **Brake fluid will damage painted surfaces. If brake fluid does get on a painted surface, wipe it off immediately.**

Loosen the brake pipes by using the **SST**.



Installation note
Brake pipe
Tighten the brake pipe by using the **SST**.

Tightening torque:
12.9—21.5 N·m {130—220 kgf·cm, 113—190 in·lbf}

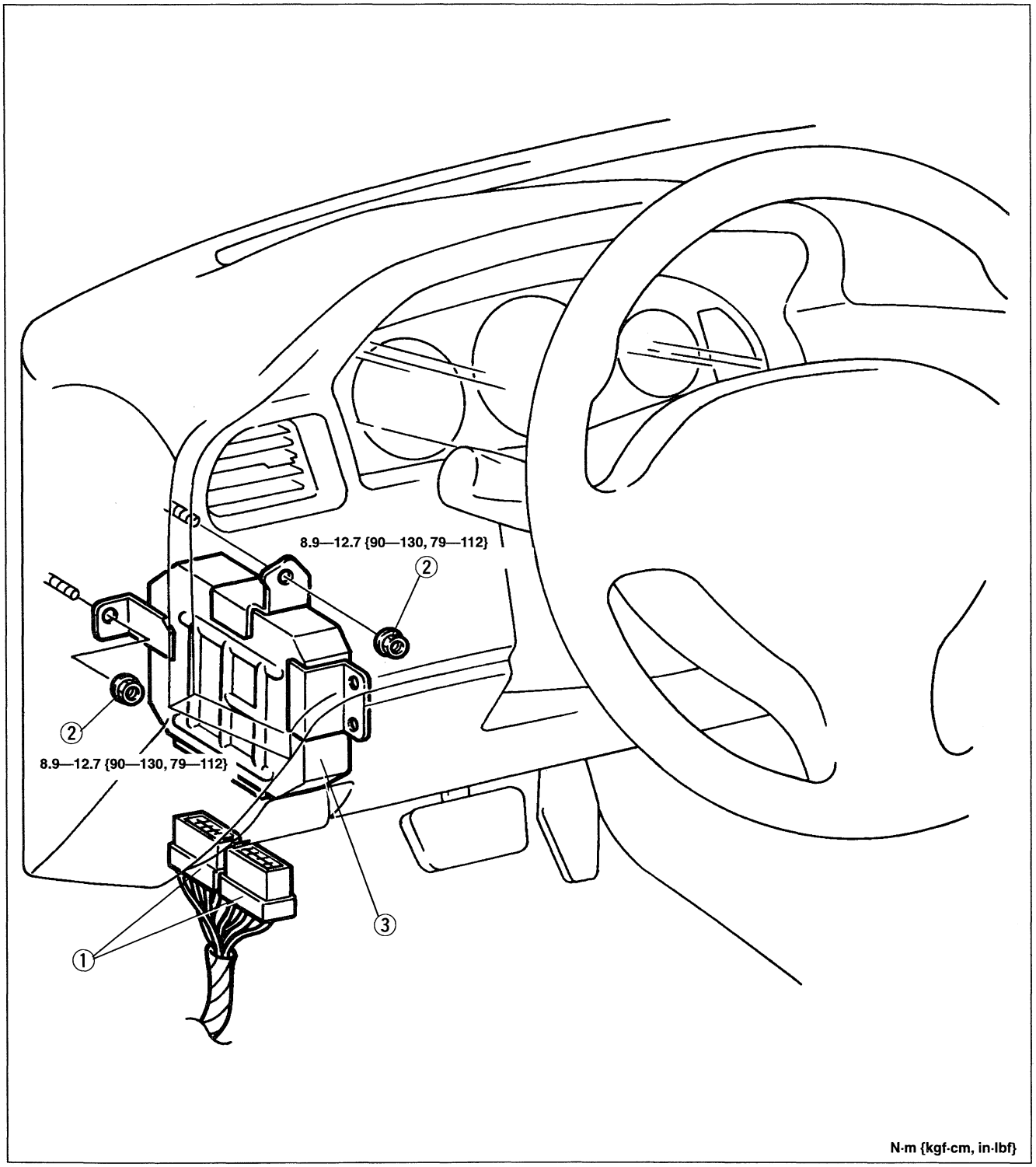


ABS hydraulic unit
1. Fix the ABS motor-harness to the clip as shown in Ⓐ.
2. Tie the solenoid harness and the ABS motor-harness together by using a band as shown in Ⓑ.
3. Fix the connector to the bracket.
4. Cut off **1—10 mm {0.04—0.39 in}** of the band from the tied part.

ABS CONTROL MODULE

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.
4. Connect the negative battery cable and verify that the diagnostic trouble codes have been canceled. (Refer to page P–47.)

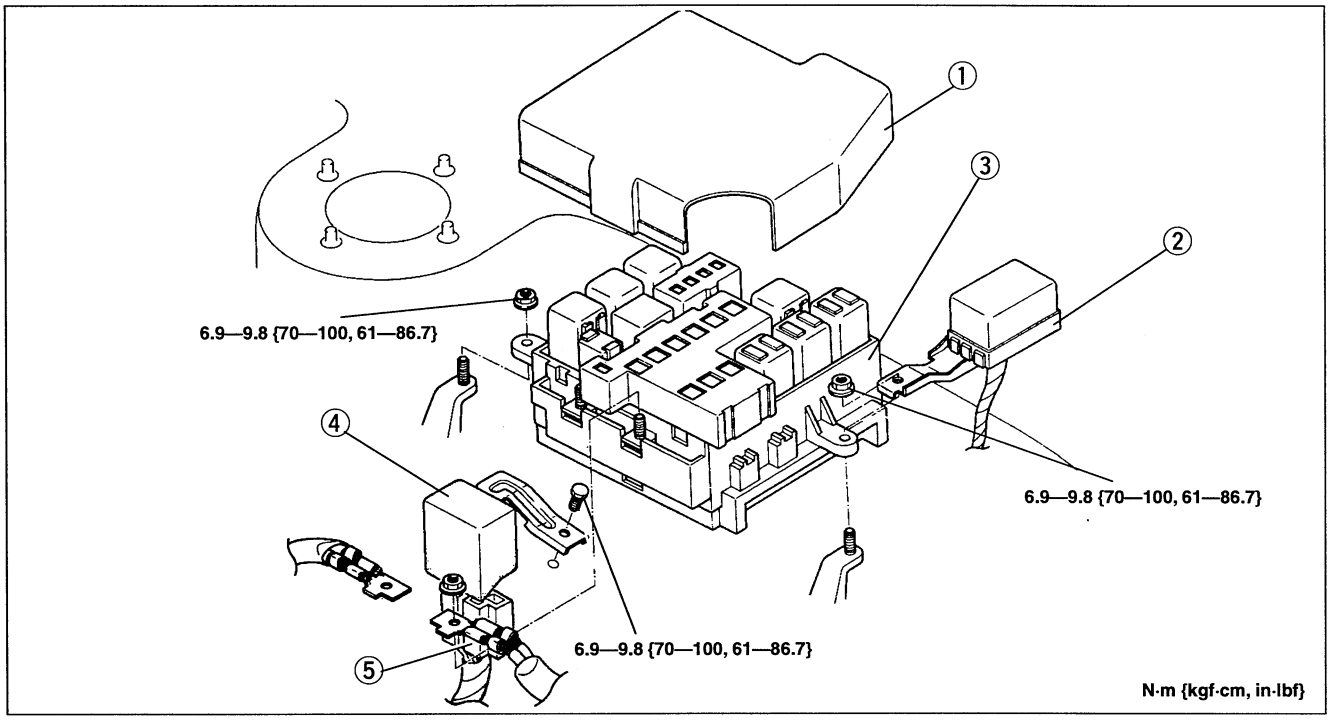


1. Connector
2. Nut
3. ABS control module

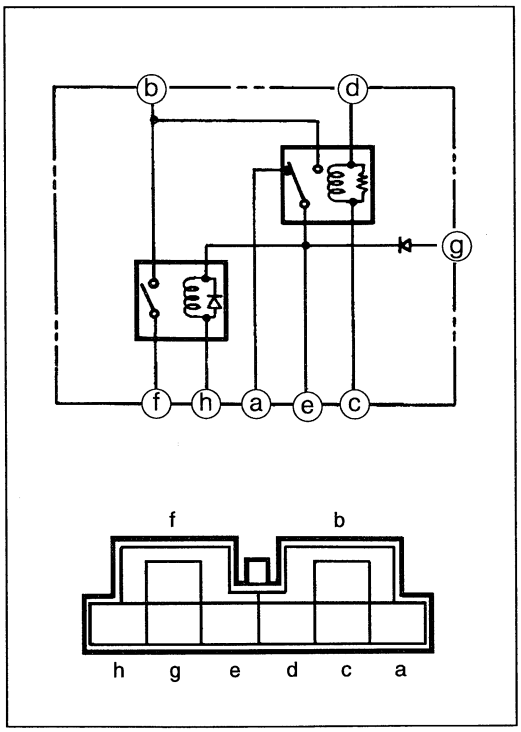
ABS RELAY

Removal / Inspection / Installation

1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.
4. Connect the negative battery cable and verify that the diagnostic trouble codes have been canceled. (Refer to page P–47.)



1. Fuse block cover
2. Data link connector
3. Fuse block
4. ABS relay
   Inspection ..... below
5. Connector



Inspection

ABS relay (fail-safe relay)

1. Measure resistance between terminals e and d of the ABS relay box connector.

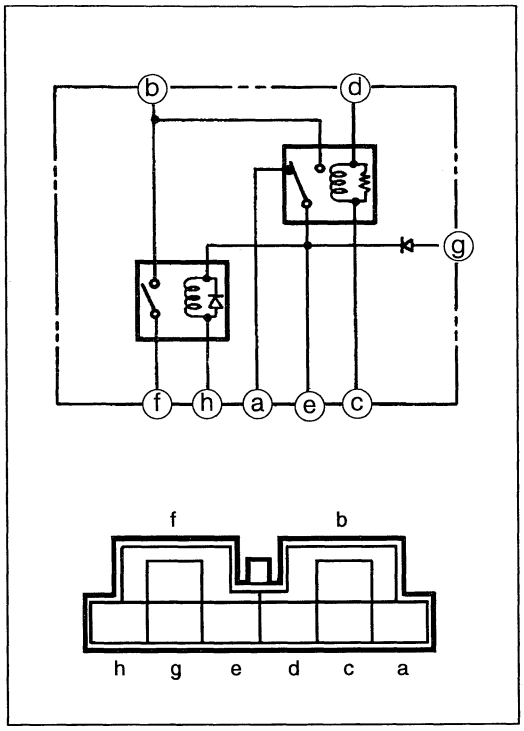
   Resistance: 60—100 Ω

2. Check for continuity between terminals a and e and between b and e.

Terminal	Continuity
a—e	Yes
b—e	No

3. Apply 12 V between terminals d and c. Check for continuity between terminals b and e and between a and e.

Terminal	Continuity
b—e	Yes
a—e	No



4. If not as specified, replace the ABS relay.

ABS relay (motor relay)

1. Measure the resistance between terminals e and h or between a and h of the ABS relay connector.

   Resistance: 50—90 Ω

2. Check for continuity between terminals b and f.

Terminal	Continuity
b—f	No

3. Apply 12 V to terminals g (+) and h (–). Check for continuity between terminals b and f.

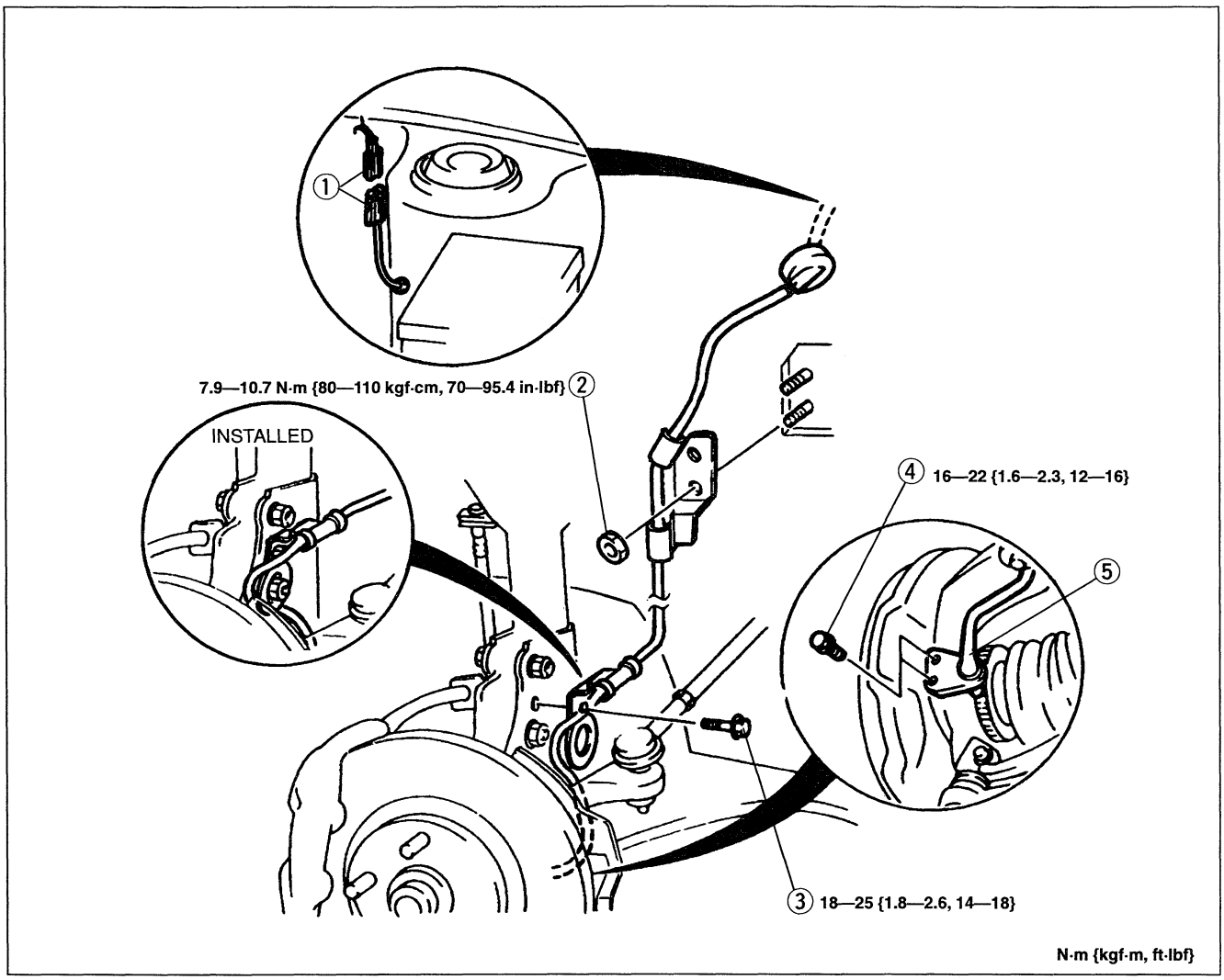
Terminal	Continuity
b—f	Yes

4. If not as specified, replace the ABS relay.

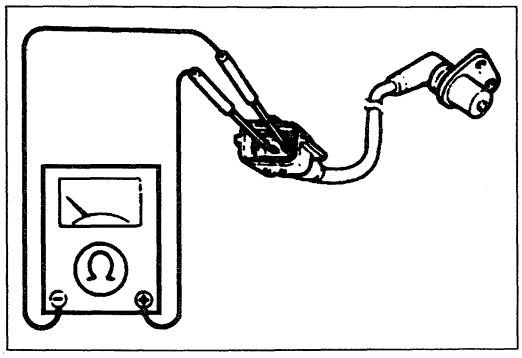
ABS WHEEL-SPEED SENSOR (FRONT)

Removal / Inspection / Installation

1. Jack up the vehicle and support it on safety stands.
2. Remove the wheel and tire assembly.
3. Remove in the order shown in the figure.
4. Install in the reverse order of the removal.
5. Install the wheel and tire assembly.
6. Verify that the diagnostic trouble codes have been cancelled. (Refer to page P–47.)



1. Connector
2. Nut
3. Bolt
4. Bolt
5. ABS wheel-speed sensor
   Inspection ..... below



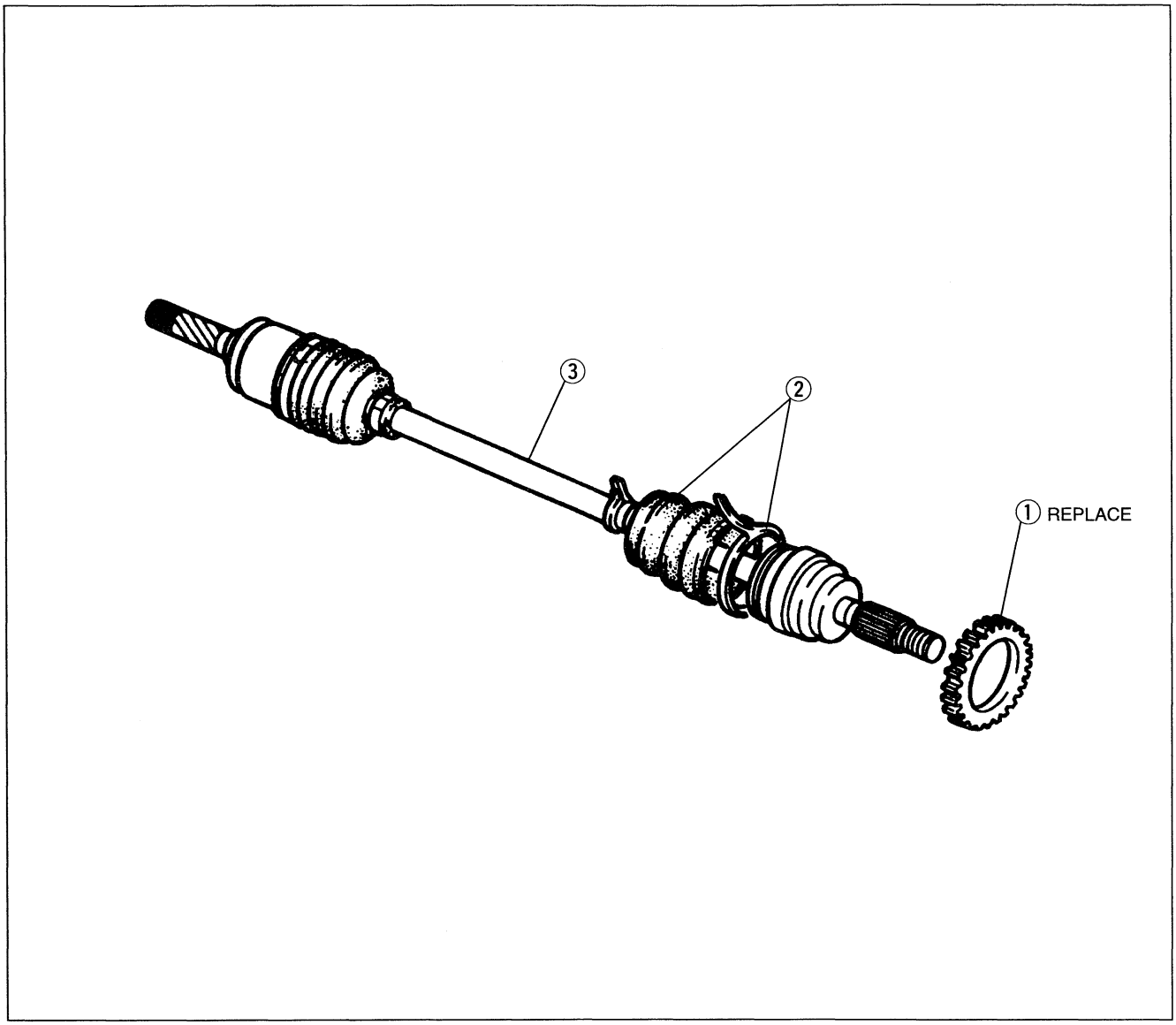
Inspection

1. Check the resistance at the ABS wheel-speed sensor terminals.

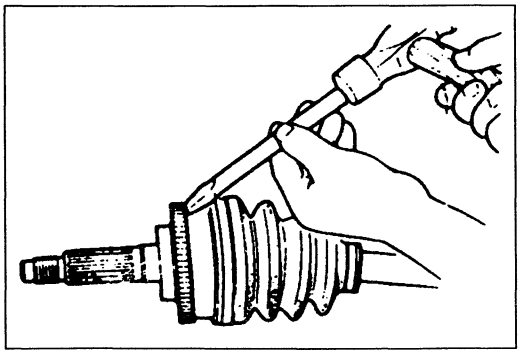
   Resistance: 1.6—2.0 kΩ

2. If not as specified, replace the ABS wheel-speed sensor.

ABS SENSOR ROTOR (FRONT)
Removal / Inspection
1. Inspect the ABS sensor rotor for missing and damaged teeth.
2. Remove the drive shaft assembly from the vehicle. (Refer to section M.)
3. Remove in the order shown in the figure, referring to **Removal Note**.



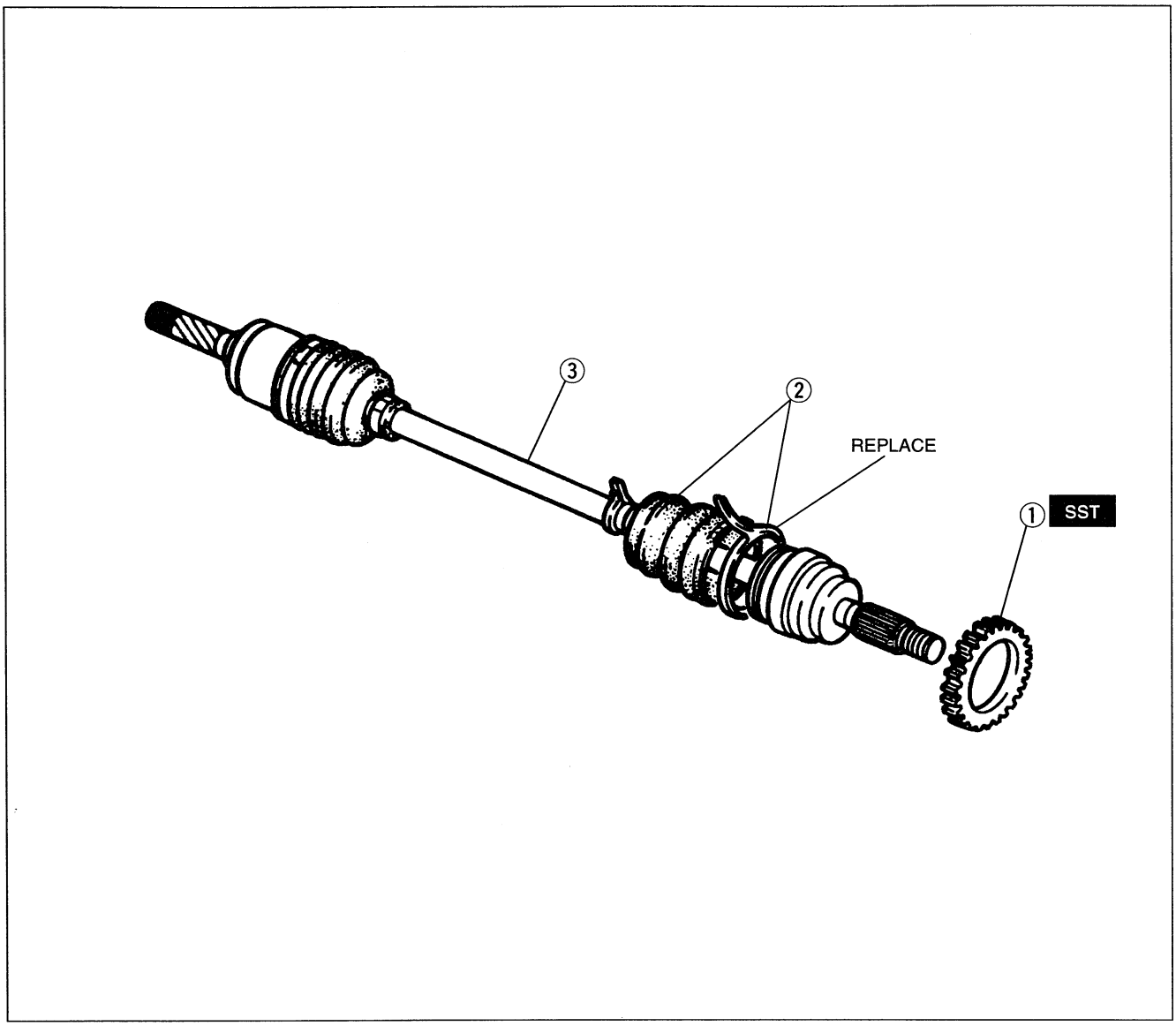
1. ABS sensor rotor
   Removal Note ..... below
2. Boot band and boot
3. Drive shaft
   Removal ..... section M



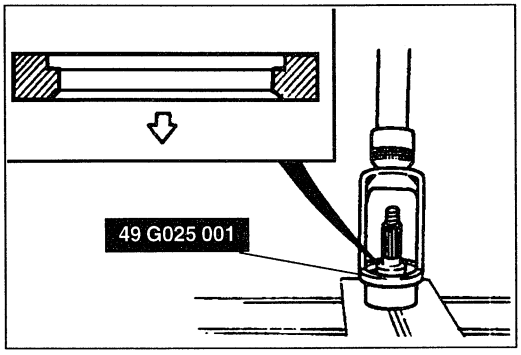
Removal note
ABS sensor rotor
Tap the ABS sensor rotor off the drive shaft by using a chisel.

Installation

1. Install in the order shown in the figure, referring to **Installation Note**.
2. Install the drive shaft assembly onto the vehicle. (Refer to section M.)



1. ABS sensor rotor
   Installation Note ..... below
2. Boot and boot band
3. Drive shaft
   Installation ..... section M



Installation note

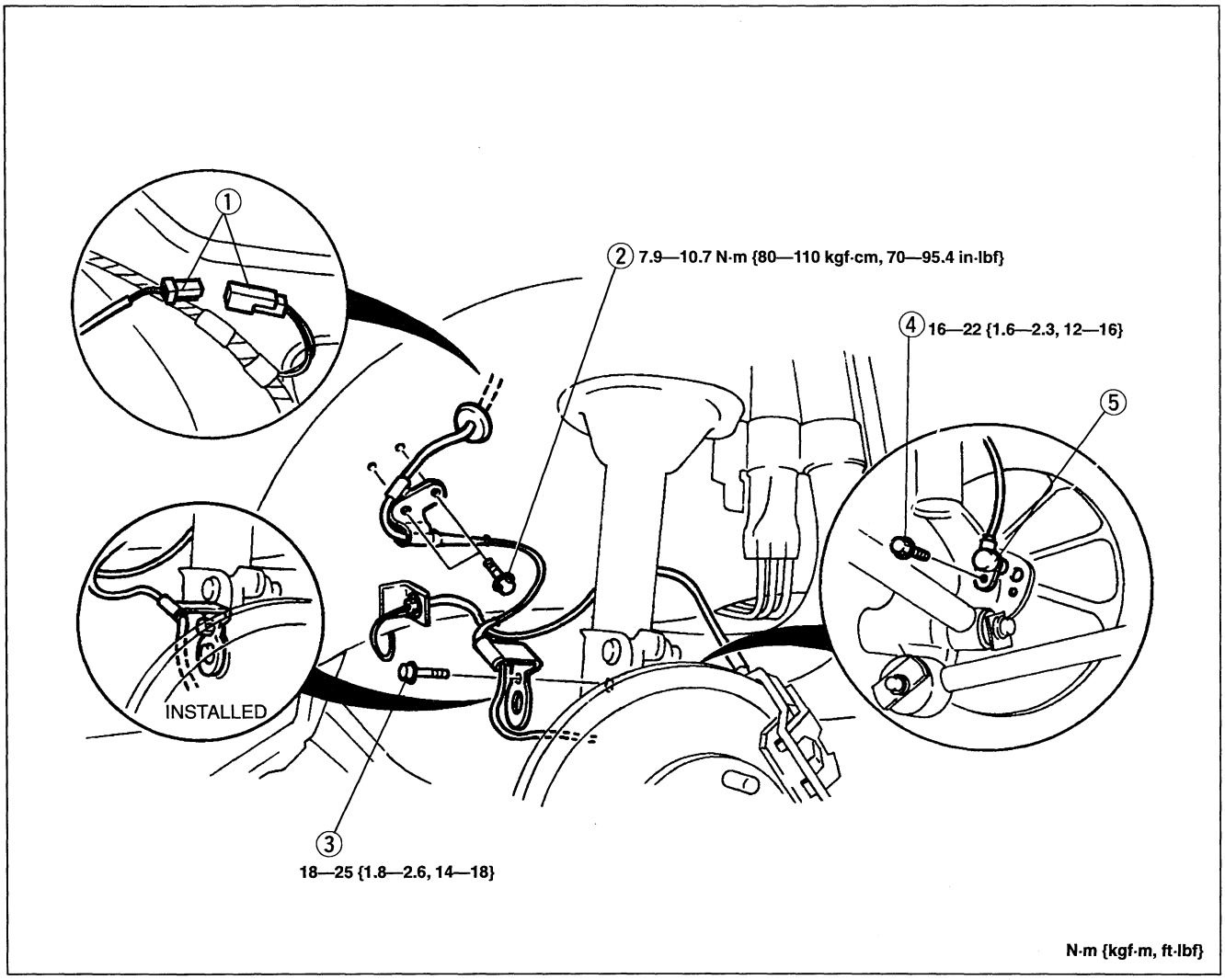
ABS sensor rotor

Set a new ABS sensor rotor on the drive shaft in the direction shown and press it onto the shaft assembly by using the **SST**.

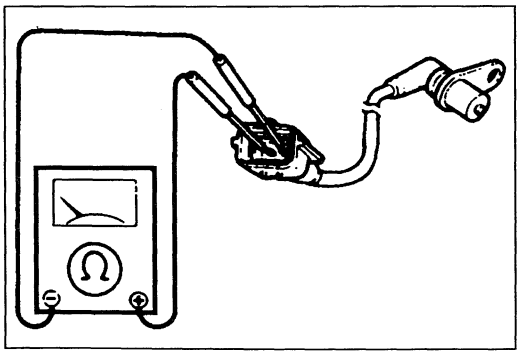
ABS WHEEL-SPEED SENSOR (REAR)

Removal / Inspection / Installation

1. Jack up the vehicle and support it on safety stands.
2. Remove the wheel and tire assembly.
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal.
5. Install the wheel and tire assembly.
6. Verify that the diagnostic trouble codes have been canceled. (Refer to page P–47.)



1. Connector
2. Bolt
3. Bolt
4. Bolt
5. ABS wheel-speed sensor
   Inspection ..... below



Inspection

1. Check resistance at the ABS wheel-speed sensor terminals.

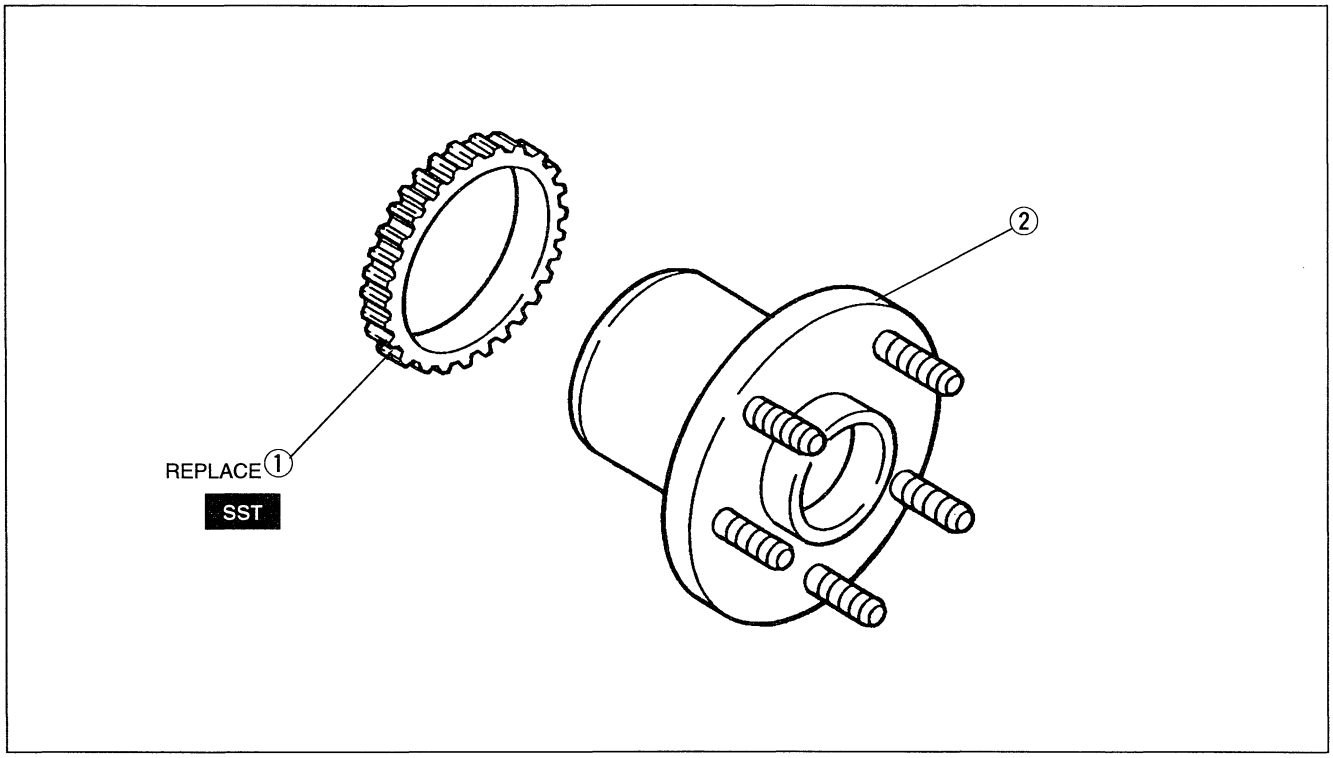
   Resistance: 1.6—2.0 Ω

2. If not as specified, replace the ABS wheel-speed sensor.

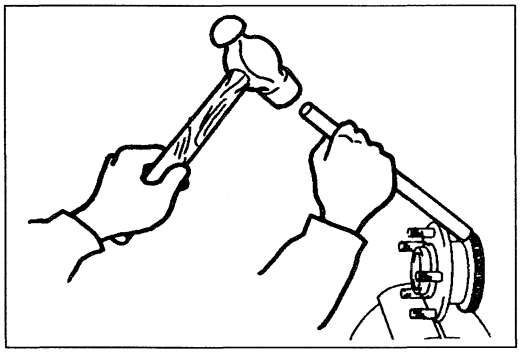
ABS SENSOR ROTOR (REAR)

Removal / Installation

1. Remove the rear wheel hub assembly from the vehicle. (Refer to section M.)
2. Remove in the order shown in the figure, referring to **Removal Note**.
3. Install in the order shown in the figure, referring to **Installation Note**.
4. Install the rear wheel hub assembly onto the vehicle. (Refer to section M.)



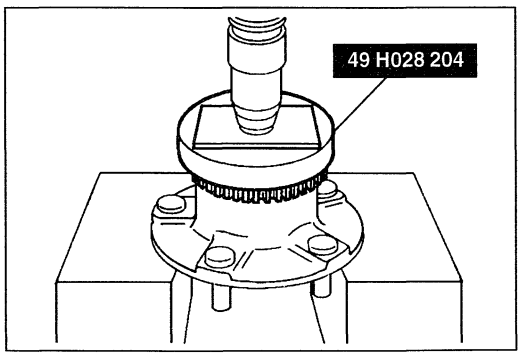
1. ABS sensor rotor
   - Removal Note ..... below
   - Installation Note ..... below
2. Wheel hub



Removal note

ABS sensor rotor

Tap the ABS sensor rotor off the wheel hub by using a chisel.



Installation note

ABS sensor rotor

1. Install a new rear ABS sensor rotor onto the wheel hub.
2. Using a steel plate and the **SST**, press the rotor until it is flush with the wheel hub.

Note

- The ABS sensor rotor can be installed in either direction.