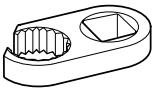
TO INDEX

E3 BRAKE CONTROL

■ ABS
1 ABS ACTUATOR UNIT
1-1 REMOVAL AND INSTALLATION
1-1-1 ARTICLES TO BE PREPARED

SST

Shape	Part No.	Part name
	09023-00100-000	Wrench,union nut

Tool

Brake pedal pusher,Long TORX® wrench T25

Instrument

Torque wrench

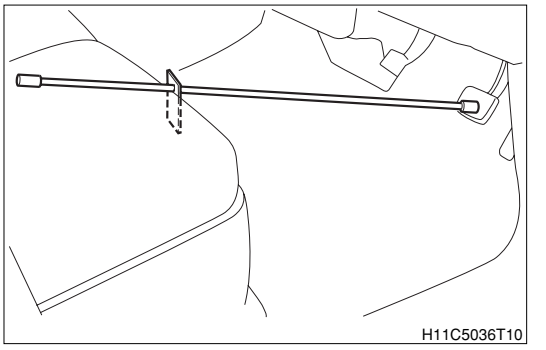
Lubricant, adhesive, others

Brake fluid(DOT3)

1-1-2 OPERATION BEFORE REMOVAL

1.After setting IG SW "LOCK" position, disconnect the negative (-) terminal of the battery.
2.Disconnect the connector of the brake actuator Ay.
3.Prevent brake fluid from flowing out, using the following procedure.
(1) Remove the disc wheels.
Refer to Page C3-3.

(2) Connect a bottle for air bleeding to the bleeder plug of the front disc brake caliper Ay RH/LH. Then, open the bleeder plug.
(3) Fully depress the brake pedal Ay. At this point, secure the brake pedal Ay.
TOOL: Brake pedal pusher



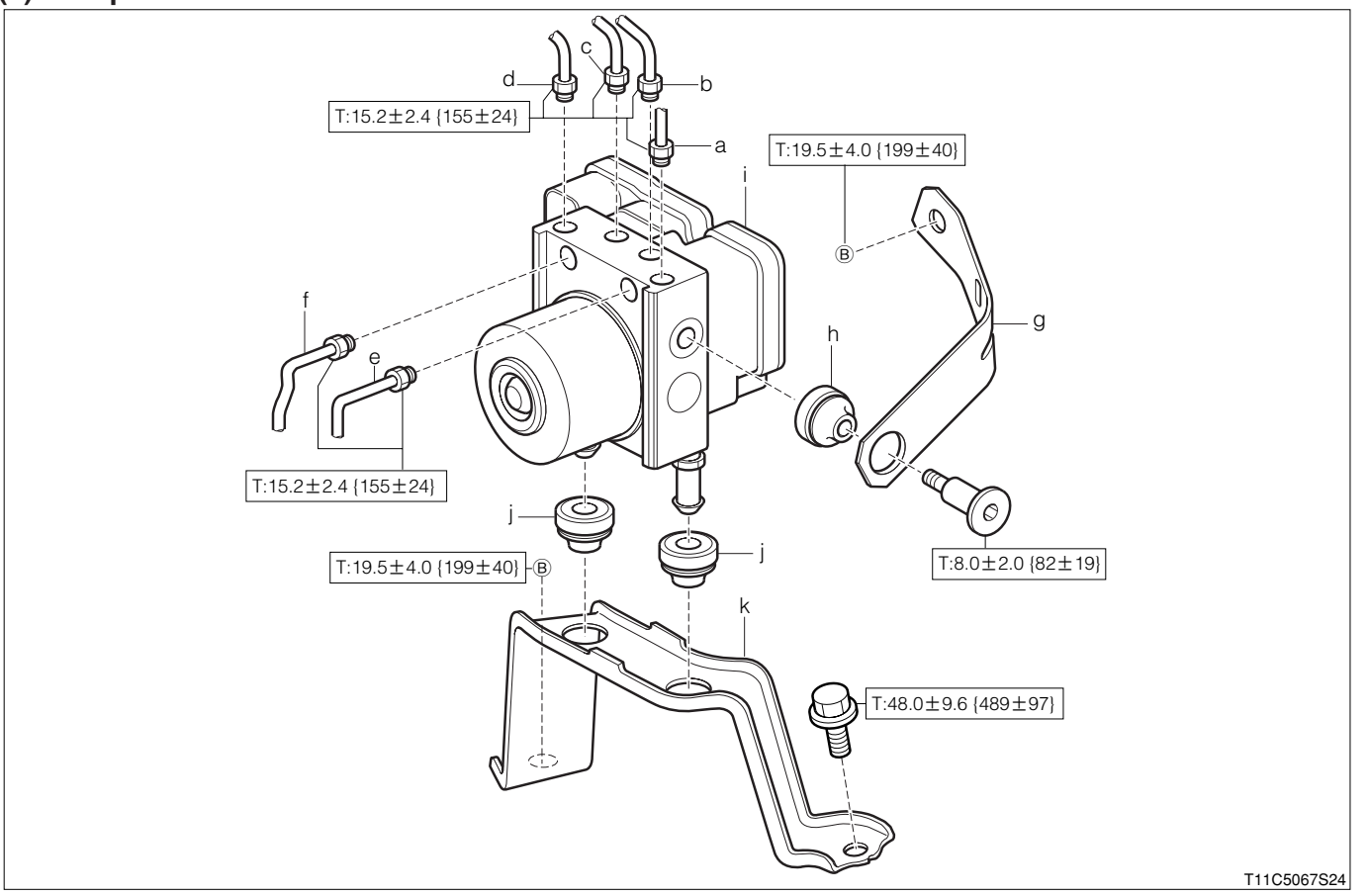
NOTE
- This closes the brake master cylinder S/A port, thus preventing the brake fluid from flowing out from the brake hydraulic circuit.

(4) Close the bleeder plug of the RH/LH front disc brake caliper Ay.

4.Remove the battery carrier.
Refer to Page J5-3.

1-1-3 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



Unit:N·m{kgf·cm}

(2) Removal and installation procedures

▼ ▲ 1 a Tube, front brake, No.1
▼ ▲ 2 b Tube, front brake, No.4
▼ ▲ 3 c Tube, front brake, No.2
▼ ▲ 4 d Tube, front brake, No.3
▼ ▲ 5 e Tube, rear brake, No.2
▼ ▲ 6 f Tube, rear brake, No.4
▲ 7 g Bracket, brake actuator (Upper side)
▲ 8 h Cushion, brake actuator bracket
▼ 9 i Actuator Ay, Brake
▲ 10 j Cushion, brake actuator bracket
▲ 11 k Bracket, brake actuator (Low side)

1-1-4 POINTS OF REMOVAL

(1) Tube, brake

1.Disconnect the tube from the brake actuator Ay.
2.Plug the disconnected tube with the bleeder plug cap or the like.

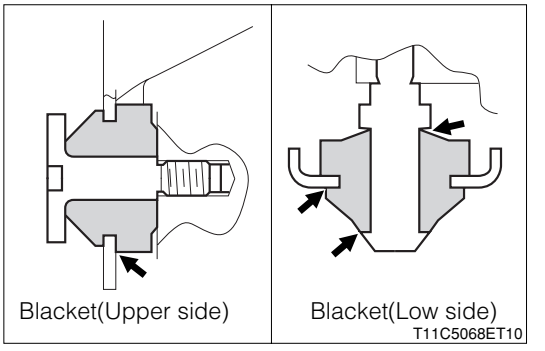
(2) Actuator Ay, brake

1.In order to prevent the brake fluid from flowing out, attach the bleeder plug or the like to the brake tube attaching section of the actuator assembly.

1-1-5 POINTS OF INSTALLATION

(1) Cushion, brake actuator bracket

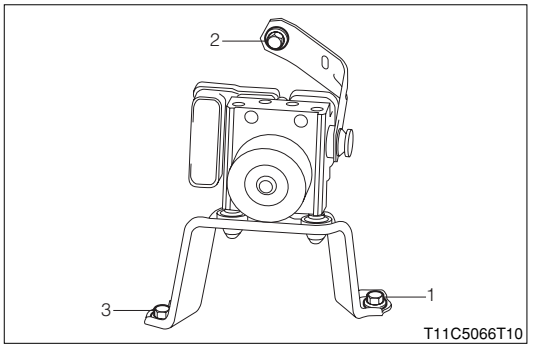
1.Install the cushion correctly to the brake actuator Ay and brake actuator bracket, as indicated in the right figure.



(2) Bracket, brake actuator

1.Using the Torx wrench T25, install the bracket (Upper side) assembled with the brake actuator bracket cushion to the brake actuator Ay.
TOOL: Long TORX® wrench T25

2.After installing the bolt (1) temporarily, securely tighten the bolts in an order of (2), (3) and (1).



(3) Tube, brake

1.Temporarily tighten the union nut until the tube flare section contacts closely with the seat.
2.Using the SST, tighten tube to the brake actuator Ay to the specified torque.
SST: 09023-00100-000

1-1-6 OPERATION AFTER INSTALLATION

1.Install the battery carrier.
Refer to Page J5-3.

2.Release the securing of the brake pedal Ay.
3.Connect the connector of the brake actuator Ay.
4.Connect the negative (−) terminal of the battery.
5.Perform air bleeding of the brake.
Refer to Page E1-4.

6.Install the disc wheels.
Refer to Page C3-3.

2 FRONT WHEEL SPEED SENSOR

2-1 REMOVAL AND INSTALLATION

2-1-1 ARTICLES TO BE PREPARED

Instrument

Torque wrench

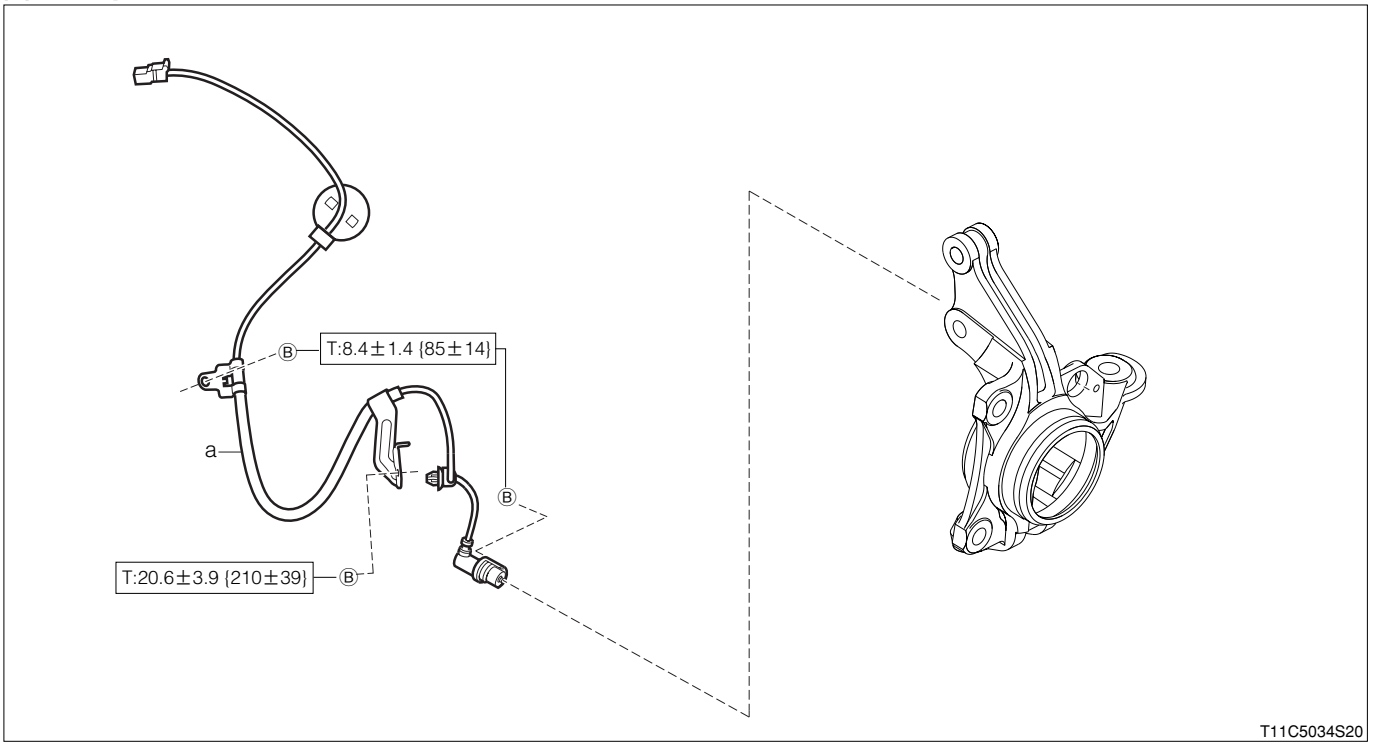
2-1-2 OPERATION BEFORE REMOVAL

1.After setting the IG SW "LOCK" position, disconnect the negative (−) terminal of the battery.
2.Remove the disc wheels. (Front)
Refer to Page C3-3.

3.Disconnect the connectors of the RH/LH front speed sensors.

2-1-3 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



Unit:N·m{kgf·cm}

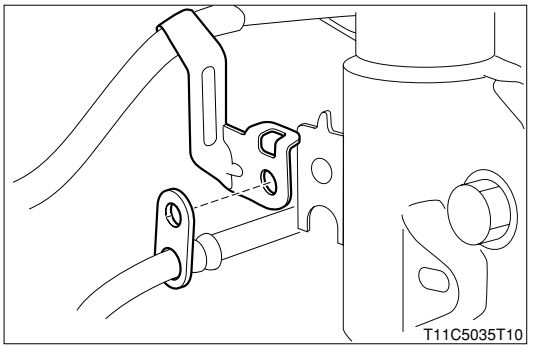
(2) Removal and installation procedures

▲ 1 a Sensor, speed, front RH/LH

2-1-4 POINTS OF INSTALLATION

(1) Sensor, speed, front RH/LH

1.Install the sensor bracket in such a way that it is interposed by the brackets of the RH/LH front shock absorber Ay and the flexible hose, as indicated in the right figure. Tighten it by the bolt.



2-1-5 OPERATION AFTER INSTALLATION

1.Connect the connector of the RH/LH front speed sensors.
2.Install the disc wheels. (Front)
Refer to Page C3-3.

3.Connect the negative (−) terminal of the battery.

3 REAR WHEEL SPEED SENSOR

3-1 REMOVAL AND INSTALLATION

3-1-1 ARTICLES TO BE PREPARED

Tool

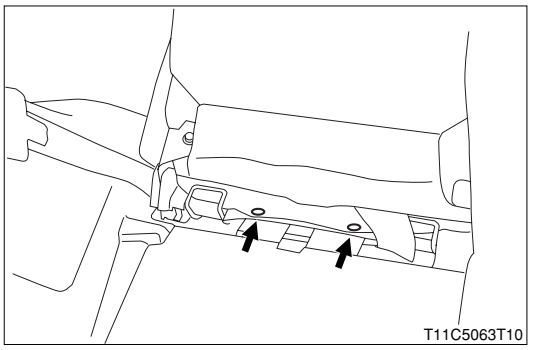
Long TORX® wrench T55

Instrument

Torque wrench

3-1-2 OPERATION BEFORE REMOVAL

1.After setting the IG SW "LOCK" position, disconnect the negative (−) terminal of the battery.
2.Remove the rear door scuff plate RH/LH.
Refer to Page I2-48.

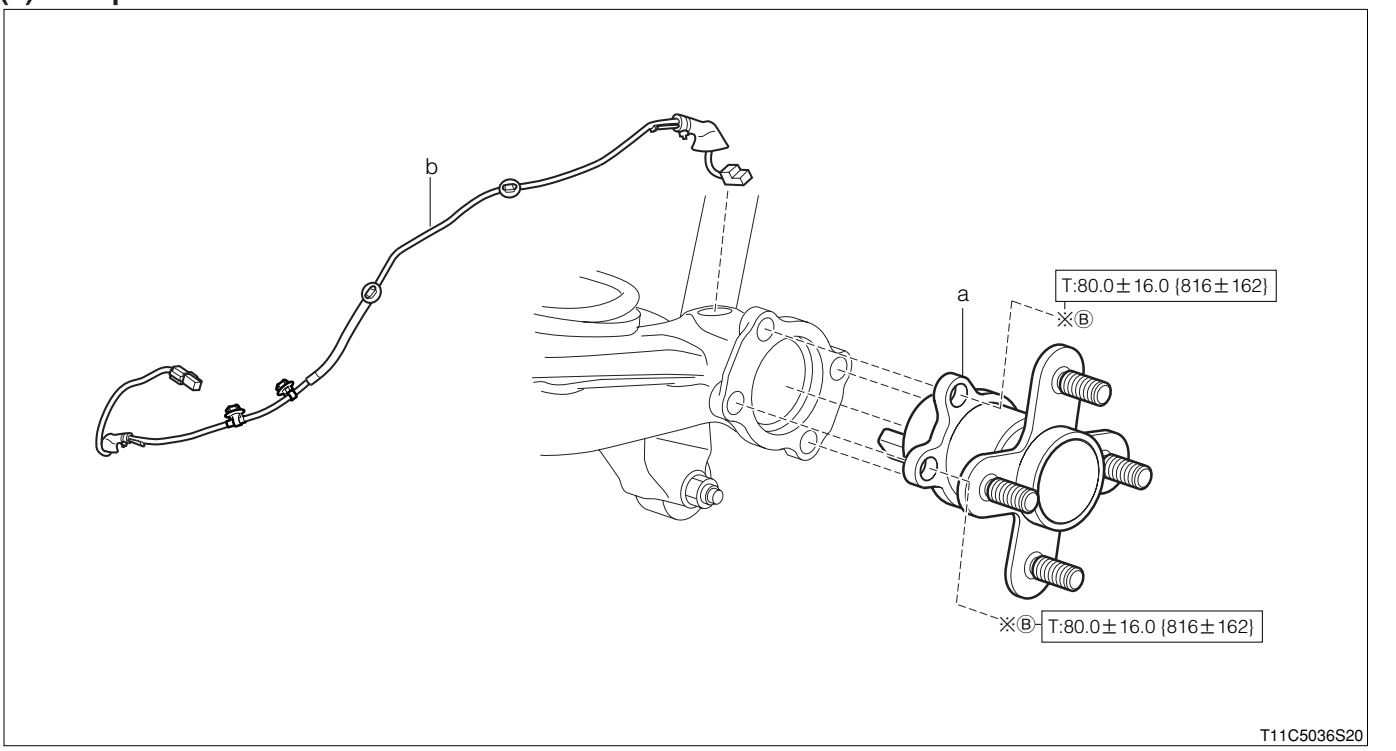


3.Tilt forward the seatback of the rear RH/LH seat Ay. Remove the clips of the carpet.
4.Erect the cushions of the rear RH/LH seat Ay. Turn over the carpet around the rear RH/LH seat Ay.
5.Remove the rear floor board front RH/LH.
Refer to Page I2-57.

6.Detach the clip at one point of the rear RH/LH quarter trim panel Ay. Float the rear RH/LH quarter trim panel Ay.
7.Disconnect the connectors of the RH/LH speed sensor wires.
8.Remove the drum brake.
Refer to Page E1-65.

3-1-3 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



※:Non - reusable parts
Unit:N·m{kgf·cm}

(2) Removal and installation procedures

▼ ▲ 1 a Hub & bearing Ay, rear axle
2 b Wire, speed sensor, RH/LH

3-1-4 POINTS OF REMOVAL

(1) Hub & bearing Ay, rear axle

1.Remove the bolt retaining the hub & bearing assembly, using a long Torx wrench T55.
TOOL: Long TORX® wrench T55

2.Slowly pull out the hub & bearing assembly from the rear suspension arm assembly. Disconnect the connector from the speed sensor wire RH/LH.

3-1-5 POINTS OF INSTALLATION

(1) Hub & bearing Ay, rear axle

1.Connect the connectors of the RH/LH speed sensor wires to the hub & bearing Ay. Install the hub & bearing Ay to the rear suspension arm Ay.
2.Secure the hub & bearing assembly and rear brake backing plate subassembly RH/LH, using a long Torx wrench T55.
TOOL: Long TORX® wrench T55

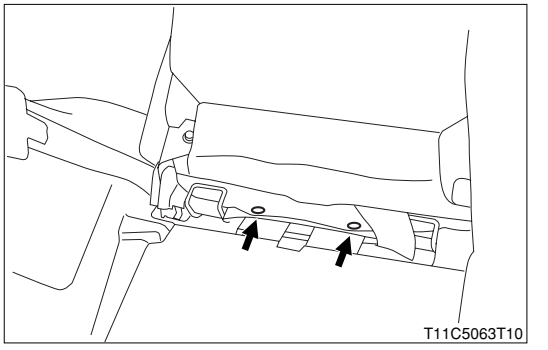
3-1-6 OPERATION AFTER INSTALLATION

1.Install the drum brake.
Refer to Page E1-65.

2.Connect the connectors of the RH/LH speed sensor wires.
3.Install the rear quarter trim panel Ay RH/LH.
4.Install the rear floor board front RH/LH.
Refer to Page I2-57.

5.Place the carpet around the RH/LH rear seat Ay. Return the cushion to the original place.
6.Tilt the seatback of the RH/LH rear seat Ay and install the carpet clips.
7.Install the rear door scuff plate RH/LH.
Refer to Page I2-48.

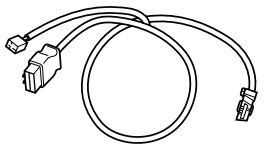
8.Connect the negative (−) terminal of the battery.



4 CONTROL SYSTEM

4-1 ARTICLES TO BE PREPARED

SST

Shape	Part No.	Part name
	09991-87404-000 (09991-87401-000)	Wire,engine control system inspection
	09991-87403-000	Wire,diagnosis check

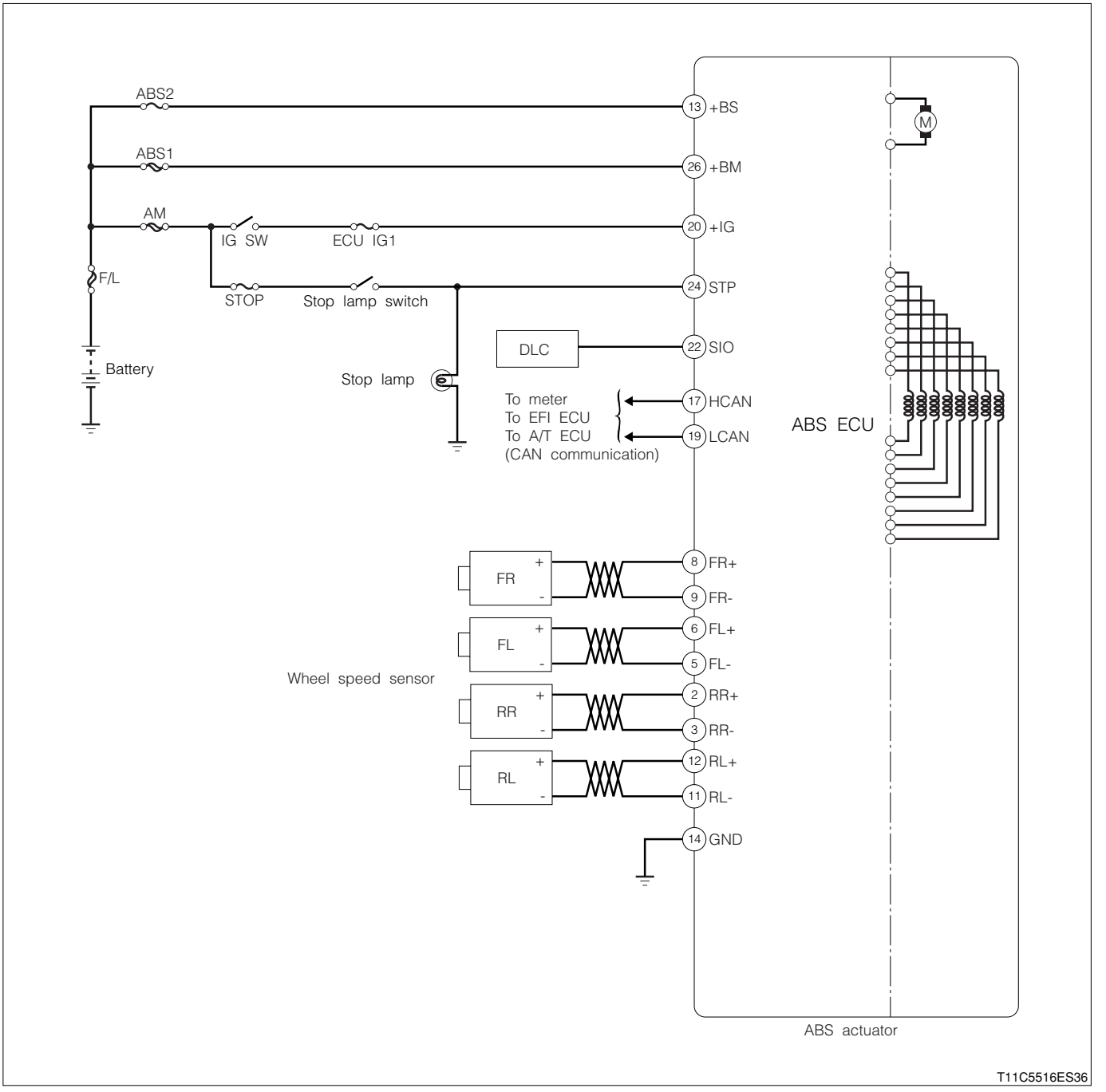
Instrument

Electrical Tester

4-2 HANDLING INSTRUCTIONS OF CONTROL SYSTEM

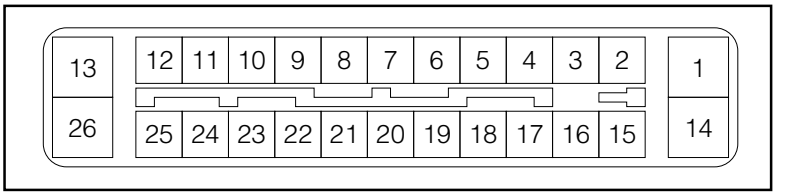
1. Never apply big shocks to the ABS actuator and sensors, etc. during the removal/installation, etc. for they are precision components. Do not use any such parts that have undergone big shocks (E.g. dropped to the floor).
2. Make sure water does not get in the system when conducting an inspection during rainy weather or when the vehicle is washed. Do not allow water to get to the ABS actuators or sensors.
3. If the vehicle becomes normal by judging that the ABS ECU was abnormal and by replacing the ABS ECU, be sure to install the old ABS actuator (That has been judged to be malfunctioning) in order to confirm that the initially-observed malfunction may be reproduced. Then, finally judge that the ABS ECU was malfunctioning.
4. Do not disassemble the ABS actuator.
5. Make sure that the brake related parts of each wheel are installed properly.
6. When a wireless device is to be mounted, care must be exercised as for the following points given below.
   (1) Place the antenna as far away as possible from the ABS ECU.
   (2) The feeder of the antenna should be routed as far away as possible (Minimum distance: 30 cm) from the ABS ECU and wire harness. Also, make certain to avoid routing the feeder for a long distance in parallel with these parts.
   (3) The antenna should be matched well.
   (4) Do not install wireless devices with a high output.

4-3 SYSTEM WIRING DIAGRAM



T11C5516ES36

4-4 ARRANGEMENT OF ECU TERMINAL



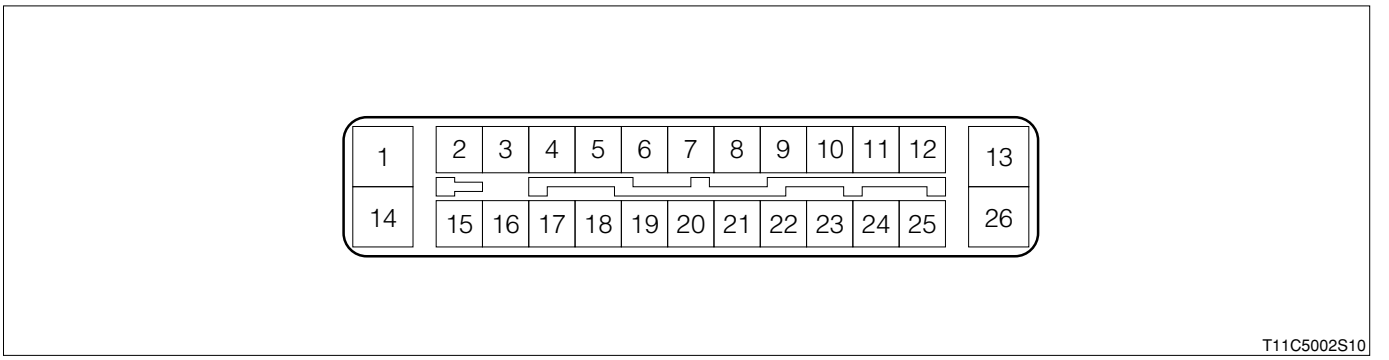
T11C5001S10

Terminal name

Terminal No.	Terminal code	Terminal name
1	–	–
2	RR+	Input of the rear right wheel speed sensor (+)
3	RR–	Input of the rear right wheel speed sensor (–)
4	–	–
5	FL–	Input of the front left wheel speed sensor (–)
6	FL+	Input of the front left wheel speed sensor (+)
7	–	–
8	FR+	Input of the front right wheel speed sensor (+)
9	FR–	Input of the front right wheel speed sensor (–)
10	–	–
11	RL–	Input of the rear left wheel speed sensor (–)
12	RL+	Input of the rear left wheel speed sensor (+)
13	+BS	Solenoid valve power supply
14	GND	Earth
15	–	–
16	–	–
17	HCAN	CAN communication HI
18	–	–
19	LCAN	CAN communication LO
20	+IG	Power supply through IG SW
21	–	–
22	SIO	External communication
23	–	–
24	STP	Input of the stop lamp SW
25	–	–
26	+BM	Motor power supply

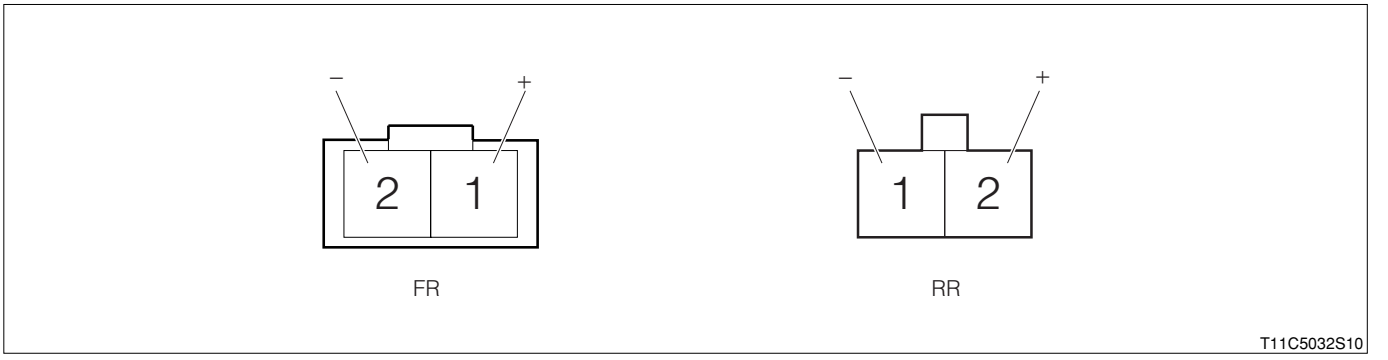
4-5 ARRANGEMENT OF VEHICLE HARNESS SIDE CONNECTOR TERMINALS

ABS ECU

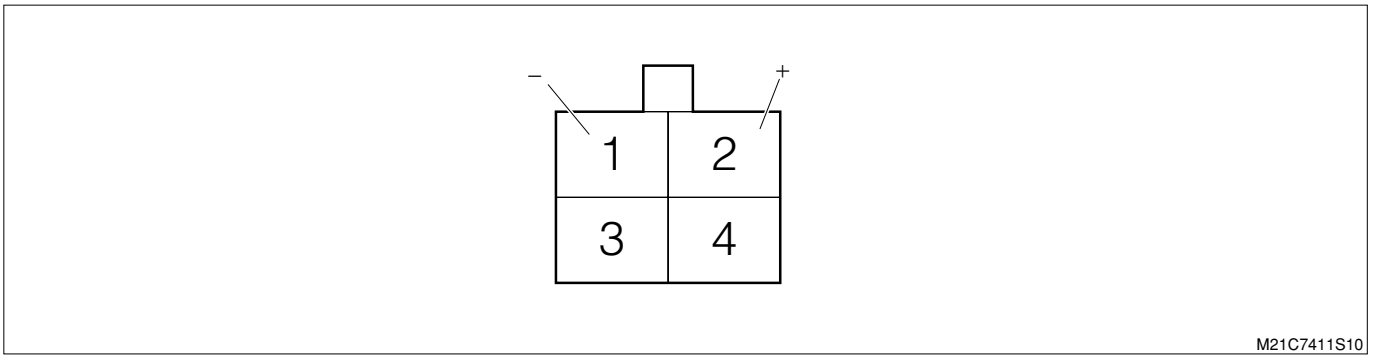


As for the terminal names of computer at the ABS ECU vehicle harness side, refer to the computer connector terminal arrangement diagram.

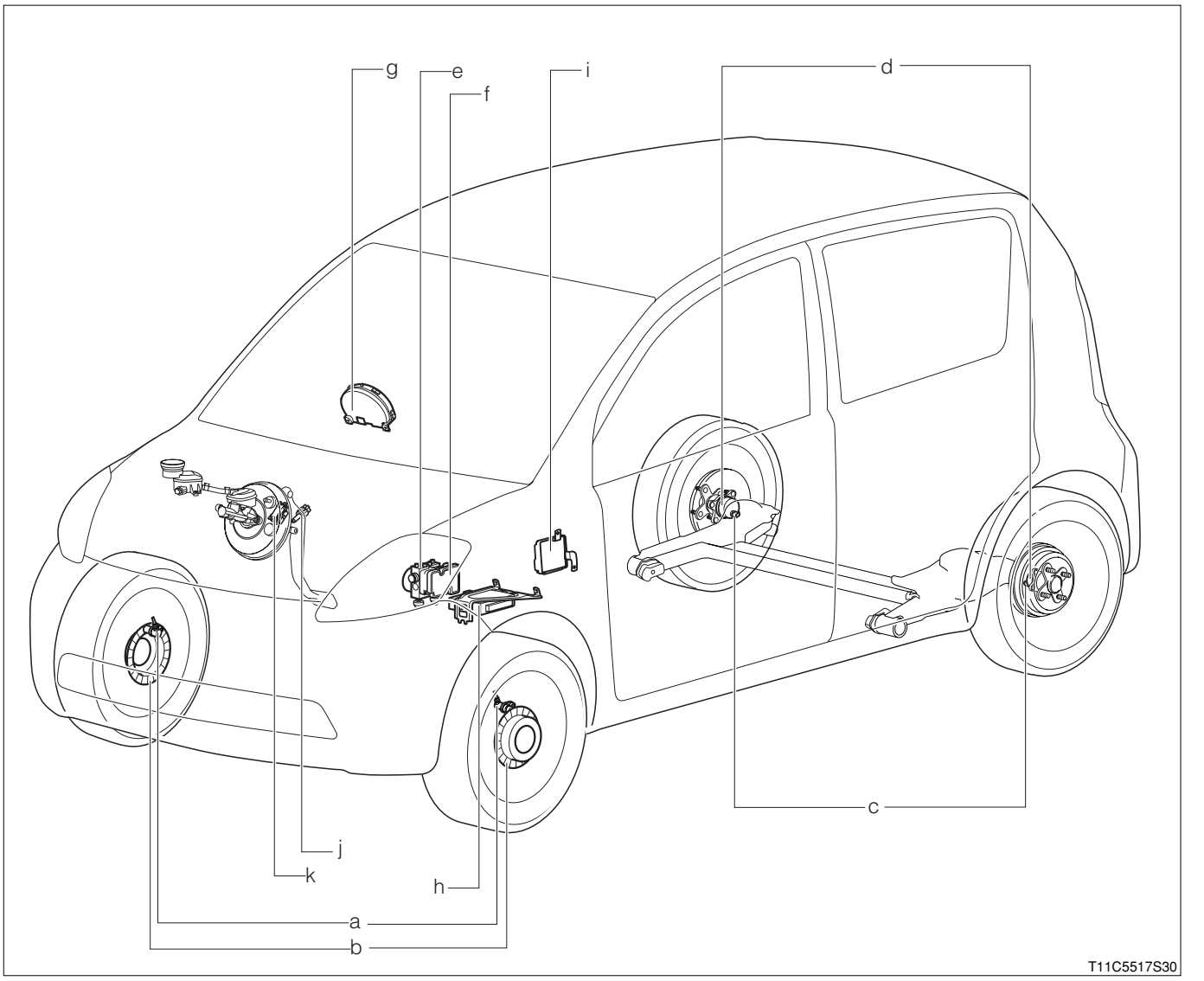
Wheel speed sensor



Stop lamp SW



4-6 LOCATION OF COMPONENTS



a	Front wheel speed sensor
b	Front wheel speed sensor rotor
c	Rear wheel speed sensor
d	Rear wheel speed sensor rotor
e	ABS actuator
f	ABS ECU
g	Combination meter (Incorporating the warning lamp)
h	EFI ECU
i	Transmission control ECU
j	Stop lamp SW
k	DLC

4-7 HOW TO PROCEED WITH TROUBLE SHOOTING

1.This system is equipped with a diagnosis function capable of performing the self-diagnosis for malfunctioning sections. This will be an important help at the time of trouble-shooting. The diagnosis of this system has a backup that uses an EEPROM (Non-volatile ROM). Hence, the diagnosis code is stored in the memory even if the power is cut off.

Σ1. Bringing of malfunctioning vehicles to workshop

▼Go to Σ2.

Σ2. Inquiry with customer

Fully obtain information about the conditions and environmental phenomena in which the malfunctions took place.

▼Go to Σ3.

Σ3. Confirmation of normal indication of diagnosis code of LCD inside meter

1.Using the SST, short-circuit the DLC terminals 4 (ECU-T) and 13 (E).

SST: 09991-87403-000
09991-87404-000

2.Ensure that the LCD inside the meter indicates the diagnosis code (Including the normal codes).

SPECIFIED VALUE: Indicated

NOTE

- It is permissible that codes other than the CAN-related codes are outputted.

▼If it is OK, go to Σ4.

▼In the case of NG, check the meter in particular about the points given below. If no problems are found, replace the meter.

(1) Check the harness between the meter and the DLC and the harness between the DLC and the body earth.

(2) Check the power supply system and the earth system of the meter.

Σ4. Confirmation of diagnosis code (Related to CAN)

1.Confirm that the CAN related-diagnosis codes (Codes 0051 through 0053) are not indicated on the LCD in the meter.

SPECIFIED VALUE: Codes 0051 through 0053 are not indicated.

▼If it is OK, go to Σ5.

▼In the case of NG, refer to the item of the CAN communication system.

Refer to Page L2-1

Σ5. Confirmation and recording of diagnosis code

Refer to Page E3-19.

▼Go to Σ6.

Σ6. Erasing of diagnosis code

Refer to Page E3-20.

▼In the case of erasable one, proceed to Σ7.

▼In the case of inerasable one, proceed to Σ9.

⊳7. Running test using the sensor check function (Test mode)
Refer to Page E3-23.

▼Go to ⊳8.

⊳8. Basic check
Refer to Page E3-25.

▼Go to ⊳9.

⊳9. Reconfirmation of malfunctioning phenomena
Confirm the phenomenon to grasp the malfunctioning situation.
▼Go to ⊳10.

⊳10. Reconfirmation of diagnosis code
Narrow down the malfunctioning system.
Refer to Page E3-19.

▼If the malfunction is reproduced and the normal code is outputted, proceed to ⊳11.
▼If the malfunction is not reproduced and the normal code is outputted, proceed to ⊳11.
▼If an abnormal code is outputted, proceed to ⊳12.

⊳11. Trouble-shooting according to malfunction phenomenon.
Refer to Page E3-32.

▼Go to ⊳13.

⊳12. Trouble-shooting according to diagnosis code
As for the system for which the abnormal code was outputted at the first check, check its harness with a top priority.
Refer to Page E3-26.

▼Go to ⊳13.

⊳13. Erasing of diagnosis code
Refer to Page E3-20.

▼In the case of erasable one, proceed to ⊳14.
▼In the case of inerasable one, proceed to ⊳9.

⊳14. Running test by sensor check function (Test mode)
Refer to Page E3-23.

▼In the case of the normal one, proceed to ⊳15.
▼If an abnormal code is outputted, proceed to ⊳9.

∑15. Confirmation test

Confirm that the malfunctioning phenomenon the customer had been appealing has been solved completely and the vehicle has been restored to the normal condition.

▼If OK, complete the check.

▼If it is NG, go to ∑3.

4-7-1 SERVICE NOTICE

1.Although the system is normal, the warning lamps may light according to the vehicle running conditions or the work contents.

Warning lamp illuminating	Cases where there is a possibility of lighting	Lamp extinguishing conditions	Control conditions
·ABS warning lamp ·Brake warning lamp	When the front wheels only are turned at a speed of 10 km/h or more by stacking, jacking up or chassis roller, etc.	After setting IG SW "LOCK" position once: Run the vehicle at a speed of 10 km/h or more, When the normal state is confirmed,	ABS control: Suspend. EBD control: Suspend
	The brakes are dragging,		
	During quick accelerating period		

4-8 INQUIRY

1.When the vehicle is encountered with a malfunction, even if an attempt is made to remove its cause, it is impossible to find out the cause, unless the malfunction phenomenon can be actually confirmed. Hence, the vehicle may not be remedied to the normal condition regardless of the repairing operations if the cause is not known. The diagnosis through inquiries to the customer is to be performed in order to collect information from the customer before confirming the malfunction phenomenon. This step will be a very important help in reproducing the malfunction phenomenon.

2.Since the information obtained by the diagnosis through interviews is referred to during the trouble shooting, it is imperative to make an inquiry of the customer, centering on the items related to the malfunction, instead of simply asking general questions.

3.In addition, during the diagnosis through interviews, utmost attention must be paid to complaints of the customer, for it may include phenomena peculiar to the ABS-equipped vehicles.

4-8-1 DIAGNOSIS INTERVIEW SHEET FOR ABS SYSTEM

Checked by		Check date	Day Month (Day of week)

Customer information

Name of customer	Mr./Ms.	Gender of customer (Male, Female)		Age [Approx.]	Occupation [ ]	
		Area where vehicle is mainly used	Urban, suburb, seashore, mountain, others		Parking place	Outdoor, indoor

Details of vehicle

Date when vehicle was brought to workshop	Day Month (Day of week)	Date when malfunction took place	Day Month (Day of week)	Repair history	No, Yes (How many times?)	
Frame No.		Registration date	Day Month Year	Vehicle model		
Engine type		Transmission	5M/T·3A/T·4A/T·CVT electronically-controlled 4A/T		Driving	2WD·4WD
Running distance	km	Equipment	Tire [ ]· Wheel [Steel · Aluminum]			

Weather

☐ Fine	☐ Cloudy	☐ Rainy	☐ Snow	☐ Other( )
Temperature(Approx. ℃)				

Frequency of malfunction

☐ Always ☐ Under certain condition( ) ☐ Sometimes( )

Road conditions

☐ Urban ☐ Suburb ☐ Express way ☐ Mountain road (uphill, downhill)
☐ Snowy road ☐ Icy road ☐ Dry concrete ☐ Wet asphalt

Driving conditions

☐ When the brake pedal is depressed lightly.
☐ When the brake pedal is depressed at a vehicle speed of ( ) km/h during driving.
☐ During hard braking at vehicle speed of ( ) km/h.
☐ When the brake pedal is depressed at a vehicle speed of ( ) km/h during curve driving (right curve, left curve).
☐ Others

State of parts

☐ Wear of tire
☐ Wear breakage of brake
☐ Others

Phenomena

ABS warning lamp	☐ Always illuminated when IG SW is turned ON.
	☐ Does not illuminate for three seconds after IG SW is turned ON.
Brake warning lamp	☐ Always illuminated when IG SW is turned ON.
	☐ Does not illuminate for three seconds after IG SW is turned ON.
Brake malfunction	☐ Uneven brake application.
	☐ Lack of brake efficiency.
	☐ ABS is actuated during normal braking.
	☐ Pedal vibrates during ABS operation.
☐ ABS warning lamp is illuminated during running.	
☐ Others	

Diagnosis indication (Short circuit of T terminal)	During check	☐ Normal ☐ Abnormal code [ ]
	Second time	☐ Normal ☐ Abnormal code [ ]
	nd(rd) time	☐ Normal ☐ Abnormal code [ ]

4-9 CONFIRMATION, RECORD AND ERASURE OF DIAGNOSIS CODE

NOTE

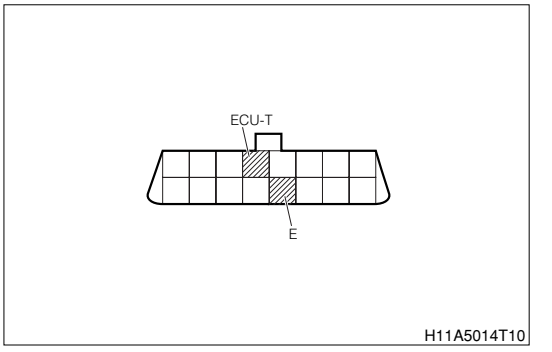
- When any abnormality code of the diagnosis is indicated, it is necessary to confirm the relationship with the reproduced malfunction phenomenon by ascertaining whether the system malfunction has occurred in the past or it still persists up to the present. To this end, the diagnosis code should be indicated twice, i.e. before and after the confirmation of the phenomenon

4-9-1 CHECKING METHOD OF DIAGNOSIS

(1) Indication by ABS warning lamp

1.Stop the vehicle.

2.With the IG SW set to "LOCK", short-circuit the ECU-T terminal and E terminal of the DLC located below the instrument panel.



CAUTION

- Be sure to employ the specified SST for short-circuit of the DLC.
- If the short-circuit of the DLC is made for wrong positions, it may cause a malfunction. Be very careful not to select wrong terminals.

SST: 09991-87404-000
09991-87403-000

3.After setting the IG SW "ON" position, read out the flashing number of the ABS warning lamp.

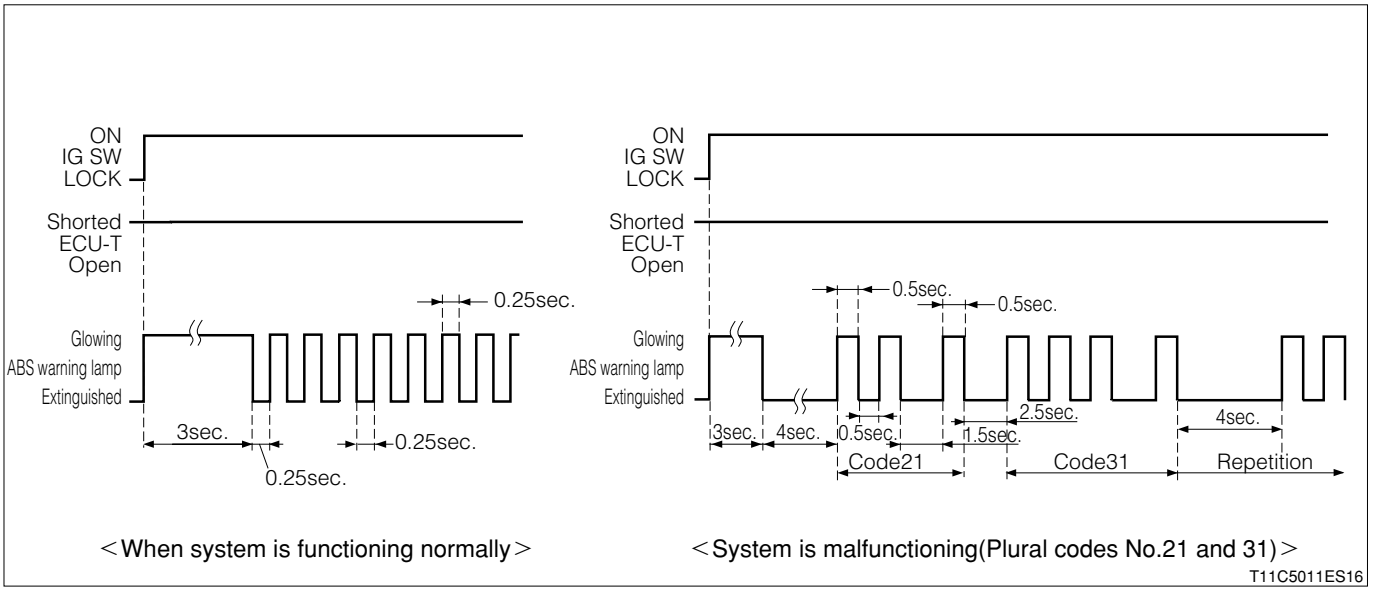
(1) When the system is functioning normally, the flashing interval is 0.25 second.

(2) If there is one malfunction code, after a pause of four seconds, the same code will be outputted.

(3) If plural codes are outputted, the respective codes will be outputted at an interval of 2.5 seconds. After all the codes have been outputted, there will be another 4 second pause before the output of the codes starts over again.

NOTE

- When the DLC is short-circuited, the warning lamps other than that for ABS will flash. However, this does not represent a malfunction of the system.
- When plural codes are outputted, they will appear in the order of the code number, starting from the smaller one.



4-9-2 CANCELING METHOD OF DIAGNOSIS

NOTE

- When the section for which codes are outputted has been repaired, erase the abnormality code memorized in the ECU by the following method given below.
- When the memory is erased, the test mode function (See the next item) will automatically start, and the ABS warning lamp will flash. In this case, perform the test mode function and check that each sensor has no abnormality.
- If the abnormal code can not erased, again carry out the check and repair for the abnormal code generating point.

(1) Erasure by stop lamp SW

1.Stop the vehicle.

2.With the IG SW set to "LOCK", short-circuit the ECU-T terminal and E terminal of the DLC located below the instrument panel.

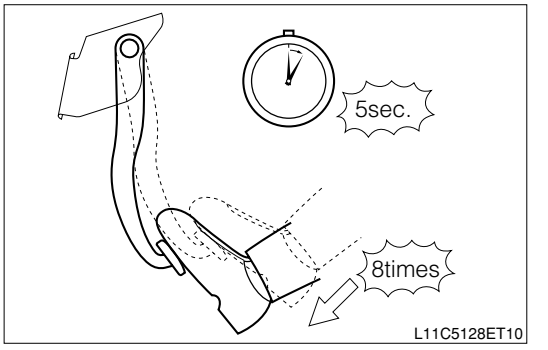
Refer to Page A1-19.

CAUTION

- Be sure to employ the specified SST for short-circuiting the DLC.
- If the short-circuit of the DLC is made for wrong positions, it may cause a malfunction. Be very careful not to select wrong terminals.

SST: 09991-87404-000
09991-87403-000

3.After setting the IG SW to "ON", within 0.5 second to three seconds, start depressing the brake pedal. Within five seconds from this point, repeat "ON" and "OFF"of the stop lamp switch more than eight times.



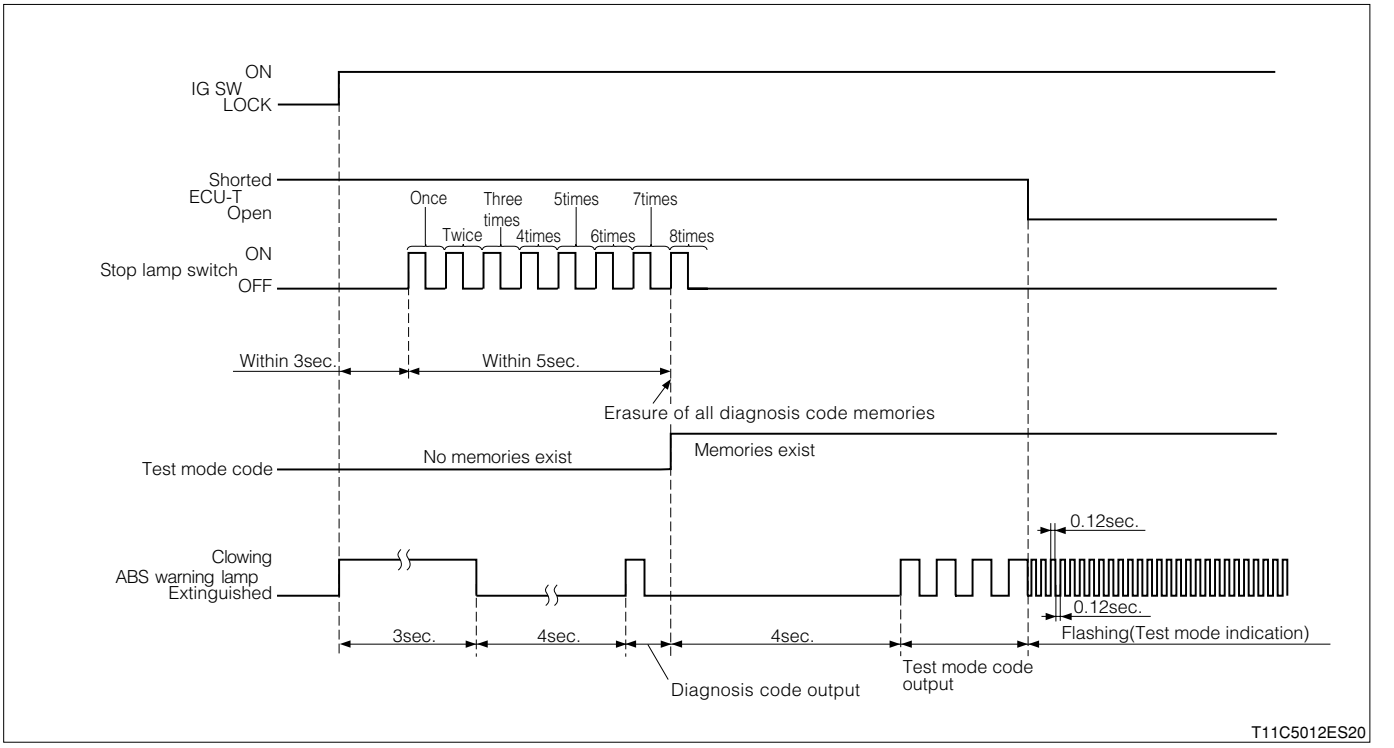
NOTE

- If the malfunction still persists after the abnormal code has been erased, again record the abnormal code. After being extinguished four seconds, the ABS warning lamp outputs the diagnosis code and test mode code.
- If there is no malfunction, the test mode code only is outputted.
- If the diagnosis code cannot be erased, set the IG SW "LOCK" position. Then, perform the operation above again.

4.Open the ECU-T terminal and E terminal.

NOTE

- If there is no malfunction when the ECU-T terminal and the E terminal are opened, the ABS warning lamp flashes (Test mode indication). At this point, release the short-circuiting. With the IG SW "LOCK" position again, run the vehicle to check the function of each sensor.



4-9-3 CONTENTS OF DIAGNOSIS

Contents of diagnosis

Code No.		Warning indication (Provided: ○,Not-provided:×)		Code memory (Provided: ○,Not-provided:×)	Contents of diagnosis	
Two digit	Four digit	ABS	Brake		System diagnosed	Diagnosis items
11	C0278	○	○	○	Solenoid relay	Open/short
15	C1241	○	×/○※1	○	Power supply	Voltage dropping/rise
21	C0200	○	×※2	○	Wheel speed sensor front right	Open/short
22	C0205	○	×※2	○	Wheel speed sensor front left	Open/short
23	C0210	○	×※2	○	Wheel speed sensor rear right	Open/short
24	C0215	○	×※2	○	Wheel speed sensor rear left	Open/short
25	C1235	○	×※2	○	Wheel speed sensor front right	Abnormal intervals
26	C1236	○	×※2	○	Wheel speed sensor front left	Abnormal intervals
27	C1238	○	×※2	○	Wheel speed sensor rear right	Abnormal intervals
28	C1239	○	×※2	○	Wheel speed sensor rear left	Abnormal intervals
29	C1237	○	×※2	○	Rotor	Missing teeth
51	C1251	○	×	○	Motor pump	Abnormality of non-rotation
52	C0226	○	○	○	Holding or front/right pressure-reducing solenoid	Abnormal
54	C0236	○	○	○	Holding or front/left pressure-reducing solenoid	Abnormal
56	C0246	○	○	○	Holding or rear/right pressure-reducing solenoid	Abnormal
58	C0256	○	○	○	Holding or rear/left pressure-reducing solenoid	Abnormal
77	C1300	○	○	○	ABS ECU	ECU internal abnormality

※1:When the voltage rises: "○", When the voltage drops:"×"
※2:When failure occurred on two or more wheels: "○"

4-10 SENSOR CHECK FUNCTION (TEST MODE)

1.The test mode is executed, immediately after any abnormal code has been erased through the brake pedal operation or at the time when the IG SW is turned "ON" for the first time after a new ABS actuator has been installed. Then, the test mode checks the following items to detect any abnormal output of each sensor, the rotor deformation or missing tooth, etc.

(1) Output voltage of wheel speed sensor

(2) Output interval of wheel speed sensor

During the test mode, the ABS warning lamp flashes. When the check of each sensor completes normally, the lamp is extinguished.

4-10-1 OUTPUT OF TEST MODE CODE

1.The indicating method of the test mode code output is the same as that of the diagnosis code output. Refer to Page E3-19.

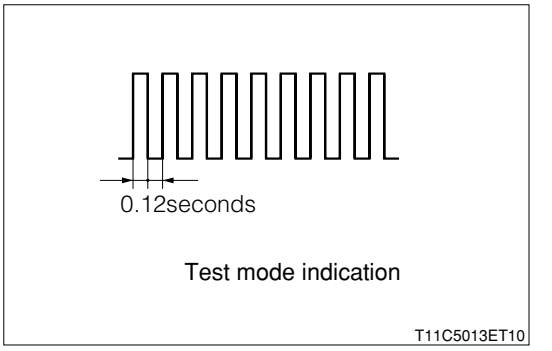
4-10-2 HOW TO ERASE TEST MODE CODE

1.When the test mode starts, all the test mode codes are automatically memorized.

2.Turn "ON" the IG SW with the DLC ECU-T terminal and E terminal released. Ensure that the ABS warning lamp flashes in the test mode indication.

CAUTION

- If the ABS warning lamp remains illuminated, the system may be malfunctioning. Therefore, confirm the diagnosis code.

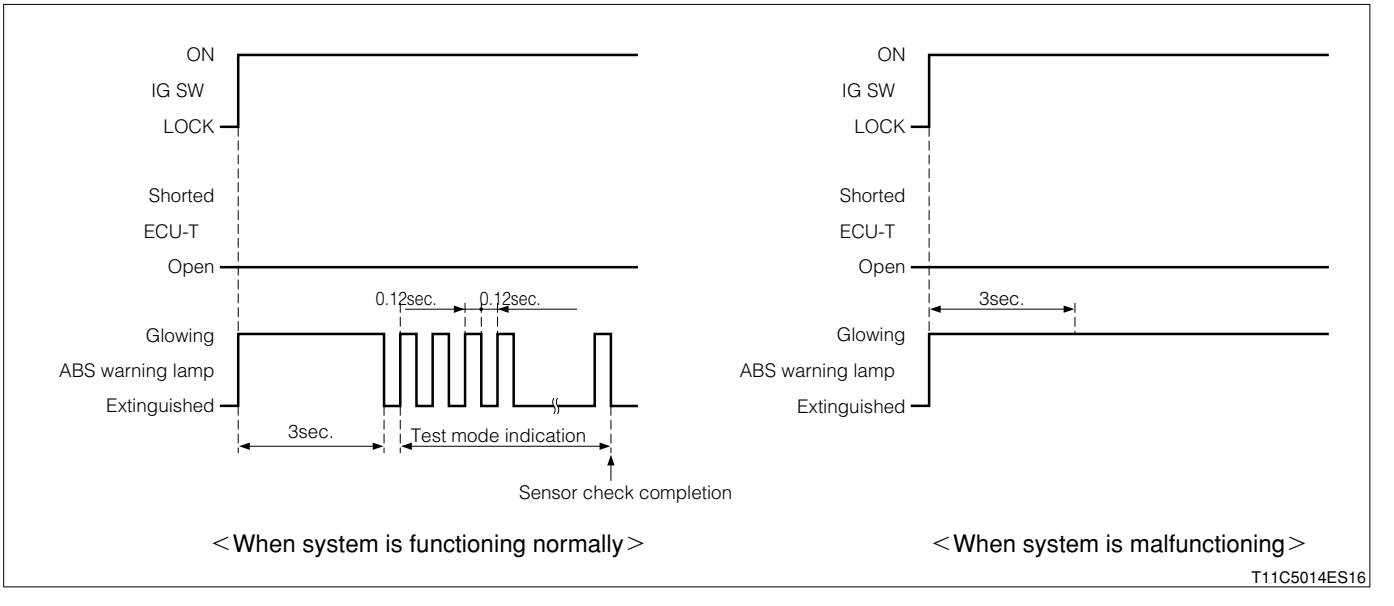


3.Run the vehicle straight at a speed of 40 km/h or more.

4.Stop the vehicle.

NOTE

- If the test finishes successfully for all the check items, the test mode code will be automatically erased and the ABS warning lamp will go out.
- If the vehicle has not been run or the test mode check conditions have not been satisfied, the memorized test mode code will not be erased. The ABS warning lamp will keep flashing (Test mode indication).



4-10-3 CONTENTS OF DIAGNOSIS

Test mode code table

Check system	Code No.		Check items	Releasing conditions
	Two digit	Four digit		
Wheel speed sensor Output voltage	81	C1271	The right front wheel speed sensor is malfunctioning electrically.	Run the vehicle straight at a speed of 4 km/h to 7 km/h.
	82	C1272	The left front wheel speed sensor is malfunctioning electrically.	
	83	C1273	The right rear wheel speed sensor is malfunctioning electrically.	
	84	C1274	The left rear wheel speed sensor is malfunctioning electrically.	
Wheel speed sensor Output interval	85	C1275	Right front wheel speed sensor interval faulty	Run the vehicle straight at least five seconds at a vehicle speed of 10 km/h to 40 km/h. Or run the vehicle straight up to 40 km/h or more.
	86	C1276	Left front wheel speed sensor interval faulty	
	87	C1277	Right rear wheel speed sensor interval faulty	
	88	C1278	Left rear wheel speed sensor interval faulty	

4-11 BASIC CHECK

4-11-1 ABS ECU

(1) Circuit check

1.During the system check, carry out the ABS ECU circuit check, following the procedure given below. If faulty, repair the circuit or connector concerned. If the check results are normal, replace the ABS actuator.

CAUTION

- When you apply a tester to the ABS ECU connector or short-circuit to the body earth, use the SST to reduce the possibility of damage to the terminals.

SST: 09991-87403-000

(2) Visual check of connector section and check of contact pressure

1.After setting the IG SW "LOCK" position, remove the negative (−) terminal of the battery.
2.Check the connector of the ABS actuator.

(3) Earth circuit check

1.After setting the IG SW "LOCK" position, remove the negative (−) terminal of the battery.
2.Disconnect the connector of the ABS actuator. Check that there is continuity between the following harness side connector terminal and the body earth.
(1) Harness side connector 14 (GND)−Body earth
SPECIFIED VALUE: Continuity exists.

(4) Power supply circuit check

1.Disconnect the connector of the ABS actuator. Measure the voltage between the following harness side connector terminal and the body earth.
(1) Harness side connector 13 (+BS)−Body earth
(2) Harness side connector 26 (+BM)−Body earth
(3) Harness side connector 20 (+IG) terminal −Body earth (To be measured with IG SW "ON")
SPECIFIED VALUE: Battery voltage

4-11-2 MEASUREMENT OF BATTERY VOLTAGE

1.Measure the battery voltage with the engine stopped.
SPECIFIED VALUE: 10−14V (When engine is stopped)

4-11-3 CHECK OF BRAKE FLUID

Refer to Page E1-3.

4-11-4 BRAKE WORKING CONDITION CHECK

Refer to Page E1-2

4-11-5 CHECK OF WARNING LAMP

1.Set the IG SW "ON" position. Ensure that the ABS warning lamp and brake warning lamp illuminate for about three seconds and, then, they go out.

NOTE

- Conduct the brake warning lamp check with the parking brake released.

4-12 TROUBLE SHOOTING ACCORDING TO DIAGNOSIS CODE

4-12-1 NO.11 (SOLENOID RELAY SYSTEM)

(1) Diagnostic code output conditions

1.When the solenoid relay remains in the "OFF" state, although the ECU turns "ON" the solenoid relay.
2.When the solenoid relay remains in the "ON" state, although the ECU turns "OFF" the solenoid relay.

NOTE

- The ABS ECU monitors the solenoid relay circuit at all times.

(2) Checking points

1.Is the ABS 2 fusible link normal?
2.Is the harness between the ABS 2 fusible link and ABS actuator normal?
3.Are all connected connectors normal?

(3) Checking method

Σ1. Check of ABS2 fusible link

SPECIFIED VALUE: Not fused.

▼If it is OK, go to Σ2.
▼If it is NG, go to Σ3.

Σ2. Check of continuity between the ABS2 fusible link and ABS actuator

1.After setting the IG SW "LOCK" position, remove the negative (−) terminal of the battery.
2.Separate the connectors of the ABS2 fusible link and ABS actuator. Check the harness.
(1) Terminal between the ABS2 fusible link connector downstream side and the ABS actuator harness side connector 13 (+BS)
(2) Between the ABS actuator harness side connector 14 (GND) and the body earth

SPECIFIED VALUE: Continuity exists.

▼If OK, replace the ABS actuator.
Refer to Page E3-1.

▼If NG, repair the harness and connectors between the ABS actuator and the ABS2 fusible link.

Σ3. Check continuity between the ABS2 fusible link and the ABS actuator.

1.After setting the IG SW "LOCK" position, remove the negative (−) terminal of the battery.
2.Separate the connectors of the ABS2 fusible link and ABS actuator. Check the harness.
(1) Between the ABS2 fusible link connector downstream side and the body earth

SPECIFIED VALUE: No continuity exists.

▼If it is OK, go to Σ4.
▼If NG, repair the harness and connectors between the ABS actuator and the ABS2 fusible link.

Σ4. Check the ABS2 fusible link for operating conditions.

1.After the ABS2 fusible link has been replaced, install the connector and negative (−) terminal of the battery. Turn "ON" the IG SW.

SPECIFIED VALUE: The fusible link should not burn out.

▼If OK, observe for a while.
▼If NG, replace the ABS actuator.
Refer to Page E3-1.

4-12-2 NO.15 (ABS ECU POWER SUPPLY SYSTEM)

(1) Diagnostic code output conditions

1.When the power supply voltage of the ABS ECU is below 9.7V,
2.When the power supply voltage of the ABS ECU exceeds 18.0 V,

NOTE

- The ABS ECU monitors the power supply voltage.

(2) Checking points

1.Is the alternator normal?
2.Is the battery normal?
3.Is the ABS 2 fusible link normal?
4.Are the harness and connector between the battery and ABS actuator normal?

(3) Checking method

⌦1. Check of the voltage between the ABS2 fuse and the ABS actuator

1.After the IG SW has been set to "LOCK" position, disconnect the connector from the ABS actuator.
2.After turning "ON" the IG SW, measure the voltage between the terminals given below.
(1) Between the ABS actuator harness side connector 13 (+BS) terminal and the 14 (GND) terminal
SPECIFIED VALUE: 10.0V−16.0V

▼If OK, observe for a while.
▼If it is NG, go to ⌦2.

⌦2. Continuity check between the ABS2 fuse and the ABS actuator

1.After setting the IG SW "LOCK" position, measure the resistance between the following terminals given below.
(1) Between the ABS actuator harness side connector 13 (+BS) terminal and the ABS2 fuse downstream side terminal
SPECIFIED VALUE: Continuity exists.

▼If it is OK, go to ⌦3.
▼If NG, carry out the following operations.
(2) Check the harness between the ABS2 fuse and the ABS actuator.
(3) Repair or replace the harness and connector

⌦3. Check continuity between the ABS actuator and the earth.

1.After the IG SW has been set to "LOCK" position, disconnect the connector from the ABS actuator.
2.Measure the resistance between the following terminals.
(1) Between the ABS actuator harness side connector 14 (GND) and the body earth
SPECIFIED VALUE: No continuity exists.

▼If OK, check and repair the battery or the alternator.
▼If NG, carry out the following operations.
(2) Repair of harness and connector
(3) Check of body earth section

4-12-3 NO.21 THROUGHT NO.29 (WHEEL SPEED SENSOR, ROTOR SYSTEM)

(1) Diagnostic code output conditions

① No.21, No.22, No.23, No.24: Wheel speed sensor system open wire / short

1.When open wire or short is detected in the wheel speed sensor system or improper connection of the connector is detected:

② No.25, No.26, No.27, No.28: Wheel speed sensor interval abnormal

1.When no wheel speed sensor signal is inputted during running:
2.When signal is missing during running:
3.When noises are mixed in the signal during running:
4.When ABS control and EBD control are judged as abnormal:

NOTE

- When this code is outputted, check not only the circuits, but also the installing conditions, etc. of the wheel speed sensor and rotor.

③ No.29: Rotor teeth missing

1.When the signals are missing periodically according to the tire rotation.

(2) Checking points

① No.21, No.22, No.23, No.24: Wheel speed sensor system open wire / short

1.Are the harness and connector between the wheel speed sensor and ABS actuator normal?
2.Is the sensor resistance in the range of 0.9kΩ − 2kΩ?

② No.25, No.26, No.27, No.28, No29: Wheel speed sensor interval abnormal

1.Are the wheel speed sensor and the rotor installing conditions normal? (Are there any factors causing an unstable output of the wheel speed sensor?)

③ No.29: Rotor teeth missing

1.Does the rotor exhibit any teeth missing, deformation or excessive play?

(3) Checking method

Σ>1. Unit check of wheel speed sensor

1.Carry out the unit check of the wheel speed sensor.
Refer to Page E3-36.

Refer to Page E3-37.

DIAGNOSIS CODES	Applicable item of check
No.21, No25	Right front wheel speed sensor
No.22, No26	Left front wheel speed sensor
No.23, No27	Right rear wheel speed sensor
No.24, No28	Left rear wheel speed sensor

▼If it is OK, go to Σ>2.
▼If NG, carry out the following checks.
(1) Check of the wheel speed sensor installing conditions
(2) Adjustment, repair or replacement of the wheel speed sensor and wheel speed sensor rotor
(3) Check the axle bearing for excessive play.

∑2. Continuity check between the wheel speed sensor and the ABS actuator

1.Separate the connectors of the affected wheel speed sensor and ABS actuator. Check the harness.

Check contents according to diagnosis codes

No.21, No25	Between the front wheel speed sensor harness side connector 1 (+) terminal and the ABS actuator harness side connector 8 (FR+) terminal
	Between the front wheel speed sensor harness side connector 2 (−) terminal and the ABS actuator harness side connector 9 (FR−) terminal
No.22, No26	Between the front wheel speed sensor harness side connector 1(+) terminal and the ABS actuator harness side connector 6(FL+) terminal
	Between the front wheel speed sensor harness side connector 2 (−) terminal and the ABS actuator harness side connector 5 (FL−) terminal
No.23, No27	Between the rear wheel speed sensor harness side connector 1 (−) terminal and the ABS actuator harness side connector 3 (RR−) terminal
	Between the rear wheel speed sensor harness side connector 2 (+) terminal and the ABS actuator harness side connector 2 (RR+) terminal
No.24, No28	Between the rear wheel speed sensor harness side connector 1 (−) terminal and the ABS actuator harness side connector 11 (RL−) terminal
	Between the rear wheel speed sensor harness side connector 2 (+) terminal and the ABS actuator harness side connector 12 (RL+) terminal

SPECIFIED VALUE: Continuity exists.

▼If it is OK, go to ∑3.

▼If NG, repair the harness and connectors between the wheel speed sensor and the ABS actuator.

∑3. Check the harness between the wheel speed sensor and the ABS actuator.

1.Visually check the wheel speed sensor concerned and the harness between the wheel speed sensor and the ABS actuator. Check to see if each harness is damaged or the connector has poor contact.

▼If it is OK, go to ∑4.

▼If NG, repair the harness and connectors between the wheel speed sensor and the ABS actuator.

∑4. Check of the wheel speed sensor

1.Check that the installing conditions of the wheel speed sensor or the wheel speed sensor rotor exhibits no abnormality.

▼If OK, replace the ABS actuator.

Refer to Page E3-1.

▼If NG, repair the installing condition of the wheel speed sensor and replace the wheel speed sensor rotor.

4-12-4 NO.51 (MOTOR PUMP SYSTEM)

(1) Diagnostic code output conditions

1.When the motor pump is not operating

(2) Checking points

1.Is the ABS 1 fusible link normal?

2.Is the harness between the ABS 1 fusible link and ABS actuator normal?

(3) Checking method

Σ1. Check of ABS1fusible link

SPECIFIED VALUE: Not burnt out

▼If it is OK, go to Σ2.

▼If it is NG, go to Σ3.

Σ2. Continuity check between the ABS1 fusible link and the ABS actuator

1.After setting the IG SW "LOCK" position, remove the negative (−) terminal of the battery.

2.Separate the connectors of the ABS1fusible link and ABS actuator. Check the harness.

(1) Between the ABS1 fusible link connector downstream side and the ABS actuator harness side connector 26 (+BM) terminal.

SPECIFIED VALUE: Continuity exists.

▼If OK, replace the ABS actuator.

Refer to Page E3-1.

▼If NG, repair the harness and connectors between the ABS1fusible link and the ABS actuator.

Σ3. Continuity check between the ABS1 fusible link and the ABS actuator

1.After setting the IG SW "LOCK" position, remove the negative (−) terminal of the battery.

2.Separate the connectors of the ABS1 fusible link and ABS actuator. Check the harness.

(1) Between the ABS1 fusible link connector downstream side and the body earth

SPECIFIED VALUE: No continuity exists.

▼If it is OK, go to Σ4.

▼If NG, repair the harness and connectors between the ABS1 fusible link and the ABS actuator.

Σ4. Check of the ABS1 fusible link for operating conditions

1.After replacing the ABS1 fusible link, connect the connector and the negative (−) terminal of the battery. Then, turn "ON" the IG SW.

SPECIFIED VALUE: The fusible link should not burn out.

▼If OK, observe for a while.

▼If NG, replace the ABS actuator.

Refer to Page E3-1.

4-12-5 NO.52, NO.54, NO.56, NO.58 (SOLENOID SYSTEM)

(1) Repairing method

1.Replace the ABS actuator.

Refer to Page E3-1.

4-12-6 NO.77 (ABS ECU SYSTEM)

(1) Repairing method

1.Replace the ABS actuator.

Refer to Page E3-1.

4-13 TROUBLE SHOOTING ACCORDING TO MALFUNCTION PHENOMENA

4-13-1 THE ABS WARNING LAMP REMAINS ILLUMINATED BY TURNING "ON" IG SW.

(1) Checking points

1.Has the diagnosis function detected any abnormal sections?
2.Is the connector of the ABS actuator normally connected?
3.Is the CAN communication operating normally?

(2) Checking method

Σ>1.Confirmation of diagnosis codes

1.Perform the diagnosis code output indication by the ABS warning lamp.
Refer to Page E3-19.

2.After turning "ON" the IG SW, check the lightening state of the ABS warning lamp.
SPECIFIED VALUE: Output the abnormal codes.

▼If OK, perform the trouble-shooting according to the diagnosis code table.
Refer to Page E3-19.

▼If it is NG, go to Σ>2.

Σ>2. Check of connector fitting state

1.After setting the IG SW "LOCK"
2.After turning "ON" the IG SW, check the lightening state of the ABS warning lamp.
SPECIFIED VALUE: abnormal codes are outputted.

▼If OK, perform the trouble-shooting according to the diagnosis code table.
Refer to Page E3-19.

▼If it is NG, go to Σ>3.

Σ>3. Confirmation of diagnosis codes

SPECIFIED VALUE: The normal code is indicated.

▼If OK, observe for a while. (Normal code indication)
▼If it is NG, go to Σ>4.

Σ>4. Check of ECU IG1 fuse

SPECIFIED VALUE: Not burnt out

▼If it is OK, go to Σ>5.
▼If NG, replace the ECU IG1 fuse and check the ECU IG1 fuse system.

⊃5. Check the CAN communication continuity between the ABS actuation and the combination meter.

1.After setting the IG SW "LOCK", remove the negative (−) terminal of the battery. Stop the short-circuiting the DLC.

2.Disconnect the connector of the ABS actuator. Check continuity between the ABS actuator harness side connector CAN communication (HCAN and LCAN) and the combination meter harness side connector CAN communication (HCAN and LCAN)

Refer to Page L2-14.

SPECIFIED VALUE: Continuity exists.

▼If OK, perform the trouble-shooting of the CAN communication.

Refer to Page L2-1.

▼If NG, repair the harness between the ABS actuator and the combination meter.

4-13-2 THE BRAKE WARNING LAMP REMAINS ILLUMINATED BY TURNING "ON" IG SW.

(1) Checking points

1.When the brake warning lamp is illuminated at the same time with the ABS warning lamp, perform the troubleshooting for the case The ABS warning lamp is illuminated at all times with the IG SW "ON" position.

Refer to Page E3-32.

2.If the brake warning lamp only is illuminated at all times, refer to the following.

(1) Is the parking brake SW "ON" position?
(2) Is the brake fluid level normal?
(3) Is the parking brake SW normal?
(4) Is the brake fluid level SW normal?
(5) Are the brake fluid level SW and parking brake SW system circuit normal?
(6) Is there open wire in the brake warning lamp system circuit?
(7) Is the combination meter normal?

NOTE

- Perform the check with the parking brake released.

(2) Checking method

1.Perform the trouble-shooting of the combination meter.

Refer to Page J3-27.

4-13-3 THE ABS WARNING LAMP DOES NOT GO ON FOR THREE SECONDS AFTER IG SW IS SET TO "ON" POSITION.

(1) Checking points

NOTE

- The ABS warning lamp illuminates about three seconds.

1.Is the combination meter normal?

(2) Checking method

1.Perform the trouble-shooting of the combination meter.

Refer to Page J3-30.

4-13-4 THE BRAKE WARNING LAMP DOES NOT GO TO ON FOR THREE SECONDS AFTER IG SW IS SET TO "ON" POSITION.

(1) Checking points

NOTE

- The brake warning lamp illuminates about three seconds.

1.Is the combination meter normal?

(2) Checking method

1.Perform the trouble-shooting of the combination meter.

Refer to Page J3-29.

4-13-5 BRAKE MALFUNCTIONS (THE BRAKES ON ONE SIDE ONLY WORK; THE BRAKING EFFECT IS INSUFFICIENT; THE ABS OPERATES DURING NORMAL BRAKING; THE PEDAL VIBRATES DURING ABS OPERATION), AND THE ABS WARNING LAMP ILLUMINATES WHILE DRIVING.

(1) Checking points

1.Although it is not easy to evaluate malfunctions as they are observed differently depending upon the running conditions and road conditions, perform the following checking methods when the diagnosis code is the normal code.

(2) Checking method

Σ1.Check of ABS warning lamp

1.Perform the diagnosis code output indication.
Refer to Page E3-19.

2.After turning "ON" the IG SW, check the lightening state of the ABS warning lamp.
SPECIFIED VALUE: The normal code is flashing.

▼If it is OK, go to Σ2.
▼If NG, perform the trouble-shooting according to the diagnosis code table.
Refer to Page E3-19.

Σ2. Check of the installing conditions of each wheel speed sensor

1.Check the installing conditions of each wheel speed sensor.
SPECIFIED VALUE: Ensure that the retaining bolts exhibit no looseness and are installed correctly.

▼If it is OK, go to Σ3.
▼If NG, the installation of the wheel speed sensor is improper.

Σ3. Continuity check between the terminals of each wheel speed sensor

1.Disconnect the connector of the ABS actuator. Check continuity between the terminals of each harness side sensor.
▼If it is OK, go to Σ4.
▼If NG, the wire harness is faulty.

Σ4. Check of harness fitting state

1.Check the continuity state while the harness and connector are being moved.
SPECIFIED VALUE: Malfunction exists.

▼If OK, the wire harness fitting is poor.
▼If it is NG, go to Σ5.

Σ5. Check of the wheel speed sensor system

1.Check the wheel speed sensor.
Refer to Page E3-36.

▼If OK, observe for a while.
▼If NG, the following is true.
(1) The wheel speed sensor malfunctioning
(2) The wheel speed sensor rotor malfunctioning
(3) The wheel speed sensor malfunctioning

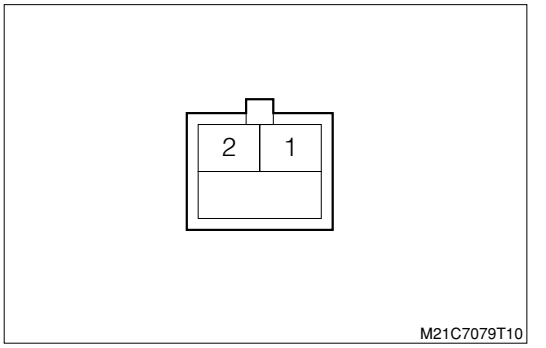
4-14 UNIT CHECK

4-14-1 STOP LAMP SWITCH

1.Check continuity between the connector terminals of the stop lamp switch.

SPECIFIED VALUE:

SW conditions	Continuity
When released	Exists
When pushed	Not exists



4-14-2 FRONT WHEEL SPEED SENSOR

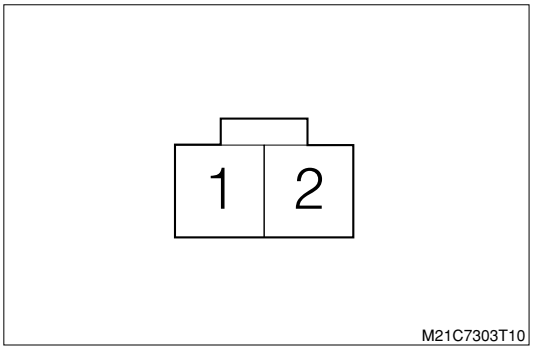
(1) Measurement and visual inspection

1.Measure the resistance between the connector terminals.
SPECIFIED VALUE: 1.60±0.20kΩ (at time of 20°C)

2.Check the wheel speed sensor installation condition.
SPECIFIED VALUE: The sensor should not float up from the sensor installation surface.

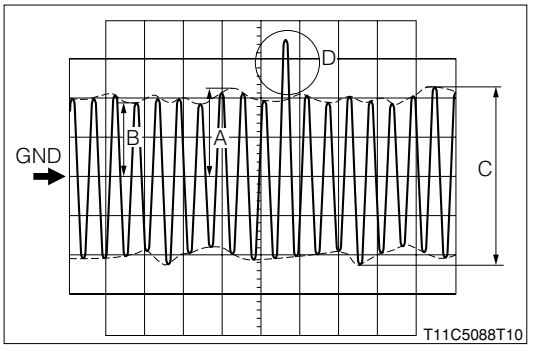
3.Check the tightened condition of the wheel speed sensor installation bolts.
TIGHTENING TORQUE: 8.4±1.4N·m{85±14kgf·cm}

4.Check if debris is stuck to the end of the front wheel sensor.
SPECIFIED VALUE: There should be no foreign matters attached, scratches, chips or deformation.



(2) Inspection using an oscilloscope

1.Using an oscilloscope, check the output waveform between the wheel speed sensor connector terminals when running at a speed of 20 km/h or more.
(1) Connecting terminals:
1 (FR+)−2 (FR−), 1 (FL+)−2 (FL−)
SPECIFIED VALUE: When C is 0.5V or more
B is 70% or more of A
D will not occur.



NOTE

- If C is deviated from the requirement, check the wheel speed sensor.
- If B is deviated from the requirement, check the wheel speed sensor rotor.
- If D is generated, check the tip-end of the sensor.

4-14-3 FRONT WHEEL SPEED SENSOR ROTOR

1.Check the wheel speed sensor rotor of the axle hub.
SPECIFIED VALUE: There should be no problems with the rotor, such as scratches, chips, or deformation.

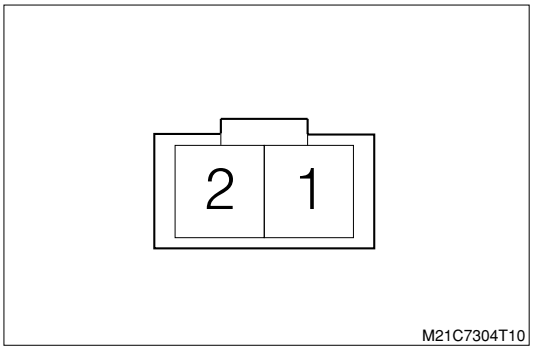
NOTE

- Air gap between wheel speed sensor and sensor rotor: 1.2±0.5 mm (Reference)

4-14-4 REAR WHEEL SPEED SENSOR

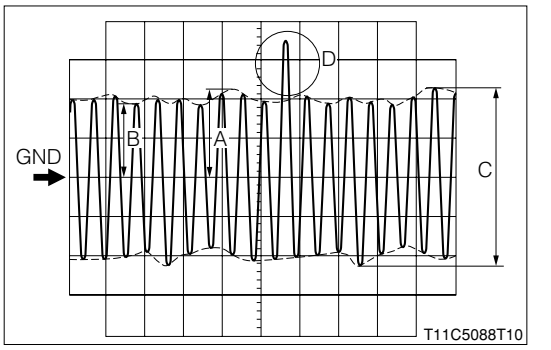
(1) Measurement and visual Inspection

1.Measure the resistance between the connector terminals.
SPECIFIED VALUE: 1.11±0.20kΩ (At time of 20°C)



(2) Inspection using an oscilloscope

1.Using an oscilloscope, check the output waveform between the wheel speed sensor connector terminals when running at a speed of 20 km/h or more.
(1) Connecting terminals:
2 (RR+)−1 (RR−), 2 (RL+)−1 (RL−)
SPECIFIED VALUE: When C is 0.5V or more
B is 70% or more of A
D will not occur.



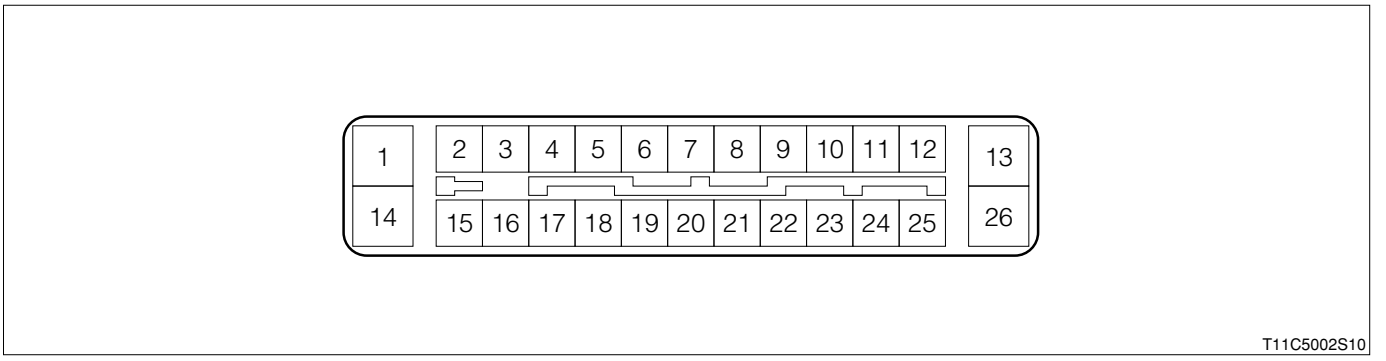
NOTE

- If C, B and D are deviated from the requirements, check the rear axle hub & bearing Ay.

4-15 ECU INPUT/OUTPUT SIGNAL CHECK

1. After setting the IG SW "LOCK", disconnect the connector of the ABS actuator. At the harness side connector, check the voltage, resistance and continuity between each terminal and the body earth.

Harness side connector



ABS ECU input/output characteristic

Check system	Connection				Measuring condition	Specification value
Power supply	20	+IG	−	Body earth	IG SW "ON"	10.0 − 16.0V
Wheel speed sensor	6	FL+	5	FL−	IG SW "LOCK"	1.1±0.2kΩ
	8	FR+	9	FR−	IG SW "LOCK"	1.1±0.2kΩ
	12	RL+	11	RL−	IG SW "LOCK"	1.2±0.15kΩ
	2	RR+	3	RR−	IG SW "LOCK"	1.2±0.15kΩ
Stop lamp SW	24	STP	−	Body earth	When the brake pedal is depressed	10.0 − 16.0V
					When the brake pedal is released	0V or less