

ABS/ASR

SECTION 5A4 ABS/ASR

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ABS/ASR System

Description of Function and Operation

Description of ABS/ASR

ABS (Anti-lock Brake System) and ASR (Anti-Slip Regulator) are the system to prevent the wheels from locking and wheel spin, and to assure stability and steering ability of the vehicle.

When a malfunction occurs in the system, fail-safe deactivate the ABS and ASR, and the warning lamp comes on. Also, the self-diagnosis function is equipped to improve serviceability.

Contents of ABS Control

The ABS controls the brake fluid pressure in the way that the electronic hydraulic control unit (EHCU) hold/decrease/increase the brake fluid pressure during brake operation, based on the signal transmitted from the wheel speed sensor.

The EHCU calculate the wheel speed, the wheel acceleration speed, and the vehicle speed based on the signal transmitted from the wheel speed sensor. When brake is applied while the vehicle is running, the wheel speed abruptly goes down, and the difference from the vehicle speed becomes more than specified; the EHCU judges that the wheel turns toward being locked, and it performs holding of the brake fluid pressure.

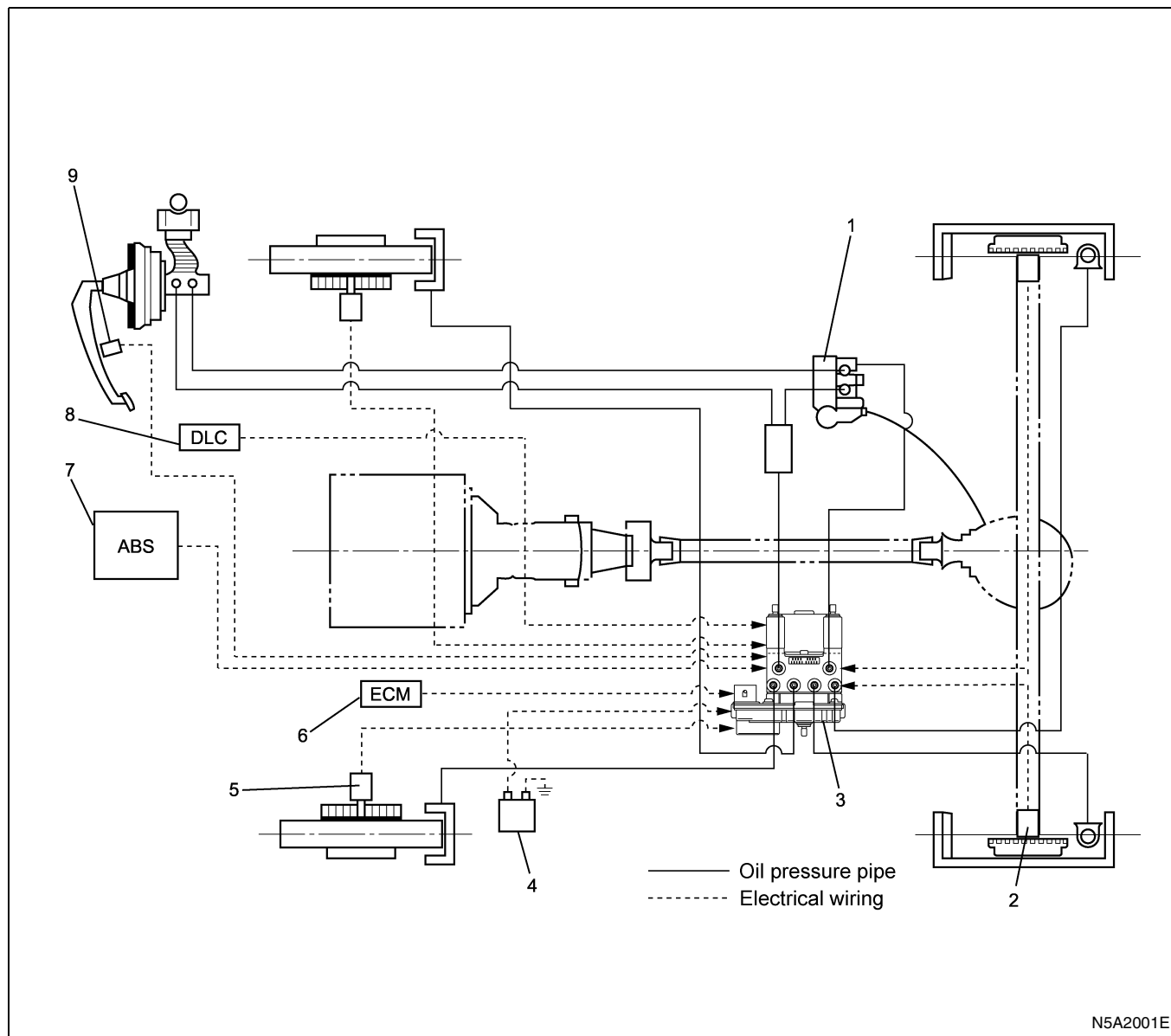
When the vehicle speed further goes down, the system judges that the wheel is about to be locked, and it performs decreasing of the brake fluid pressure. Consequently, when the system judges that wheel lock is avoided, it performs holding and increasing of the brake fluid pressure repeatedly.

Contents of ASR Control

The ASR controls the engine torque to prevent wheel spin of the drive wheel during sudden start/acceleration. The ABS/ASR control unit calculates the engine control speed (average of the drive wheel RH and LH speed) and the vehicle speed (driven wheel speed) based on the signal transmitted from each wheel speed sensor.

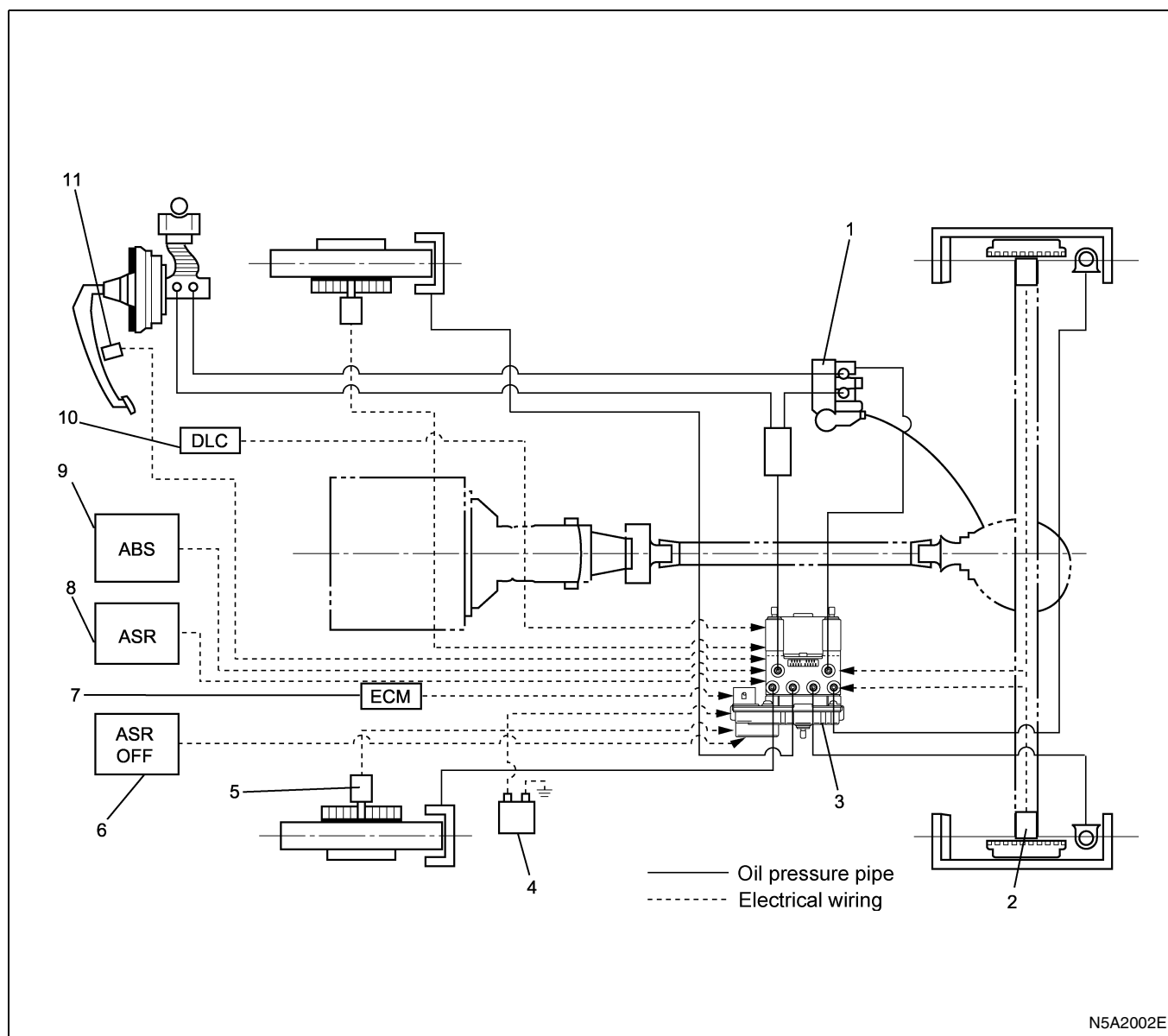
When the drive wheel spins and the speed difference between the engine control speed and the vehicle speed reaches the specified value, the ABS/ASR control unit send a signal to the engine control unit to operate the throttle closing direction to adjust the slip amount appropriately.

2WD ABS



Legend

- | | |
|---|-----------------------------|
| 1. LSPV | 6. Engine control unit |
| 2. Speed sensor (rear wheel) | 7. ABS warning lamp |
| 3. Electronic hydraulic control unit (EHCU) | 8. Self-diagnosis connector |
| 4. Battery | 9. Brake switch |
| 5. Speed sensor (front wheel) | |

ABS/ASR

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Legend

- | | |
|---|------------------------------|
| 1. LSPV | 7. Engine control unit |
| 2. Speed sensor (rear wheel) | 8. ASR warning lamp |
| 3. Electronic hydraulic control unit (EHCU) | 9. ABS warning lamp |
| 4. Battery | 10. Self-diagnosis connector |
| 5. Speed sensor (front wheel) | 11. Brake switch |
| 6. ASR OFF switch | |

Symptom Specific to the Model with ABS

The vehicle equipped with ABS may develop the following symptoms, but those are inherent to the system and not malfunction.

1. Kickback or vibration in the brake pedal, vibration in the steering wheel and vehicle are felt during abrupt braking or braking on a slippery surface.
2. Noise is generated around the brake pedal or from the vehicle rearward while ABS is in operation.

3. Motor operation noise is generated for short time immediately after engine starting.

Abbreviation

Abbreviations are used in this section. Followings are list of abbreviations for your convenience.

ABS

Anti-lock brake system

ASR

Anti-slip regulator

CKT

Circuit

DLC

Data link connector

DTC

Diagnostic trouble code

ECM

Engine control module

ECU

Electronic control unit

EHCU

Electronic hydraulic control unit

FL

Front left

FR

Front right

GEN

Generator

HU

Hydraulic unit

LSPV

Load sensing proportioning valve

MV

Millivolt

RR

Rear right

RPS

Revolution per second

VDC

Volts, direct current

VAC

Volts, alternating current

VIM

Vehicle interface module

W/L

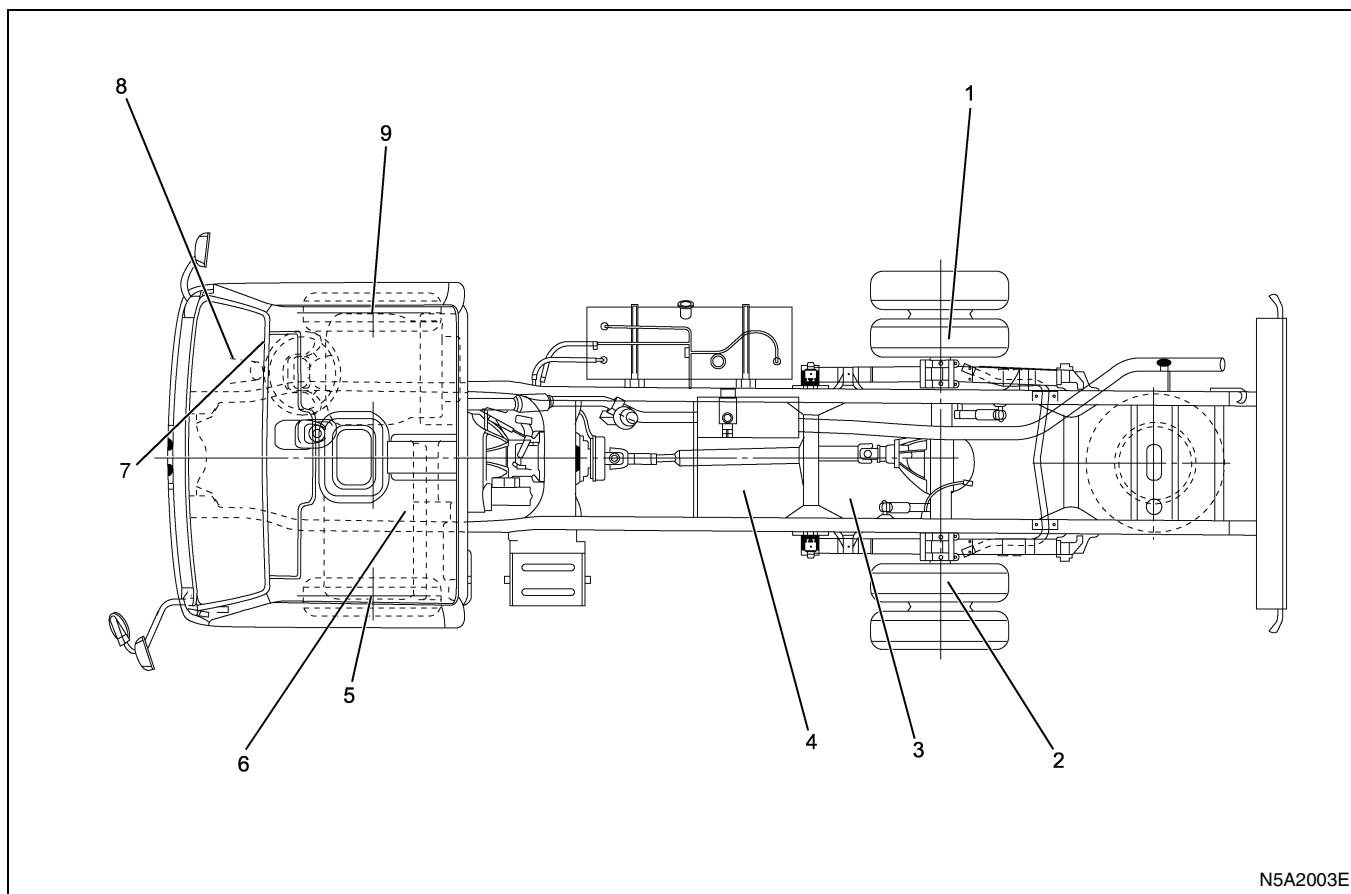
Warning light

WSS

Wheel speed sensor

System Component

Component location

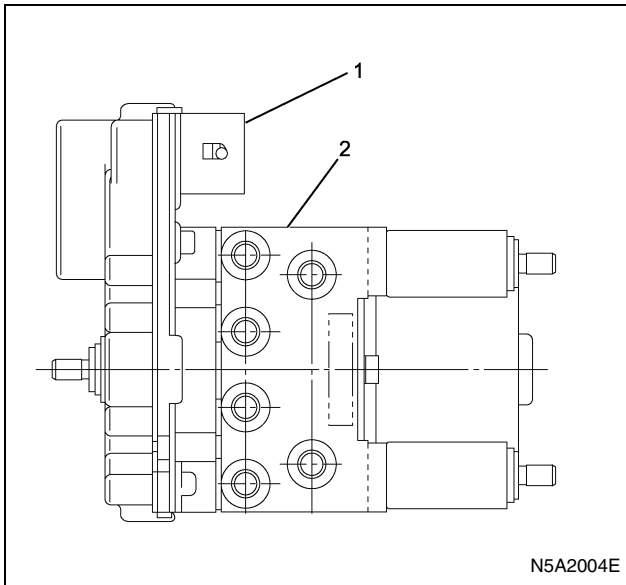


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Legend

- | | |
|--------------------------|-----------------------------|
| 1. Rear speed sensor RH | 6. Engine control unit |
| 2. Rear speed sensor LH | 7. Self-diagnosis connector |
| 3. LSPV | 8. ABS/ASR warning lamp |
| 4. EHCU | 9. Front speed sensor RH |
| 5. Front speed sensor LH | |

Electronic Hydraulic Control Unit (EHCU)



Legend

1. Electronic control unit part
2. Hydraulic control unit part

EHCU consists of ECU and HU. The ECU consists of the ABS/ASR control part, the fault detecting part, and the fail-safe part. It drives the hydraulic unit etc. based on the signal transmitted from each sensor. In case of system failure, it stops the fail-safe and returns to the normal brake. Also, the self-diagnosis function is equipped to indicate the trouble part during diagnosis.

The HU consists of the motor, the plunger pump, and the solenoid valve.

Solenoid valve: Decrease, hold, increase the brake fluid pressure based on the signal transmitted from the ECU.

Reservoir: Temporarily store the brake fluid from each caliper to lower the fluid pressure smoothly.

Plunger pump: Send the brake fluid stored in the reservoir to the master cylinder.

Motor: Drive the plunger pump based on the signal from ECU.

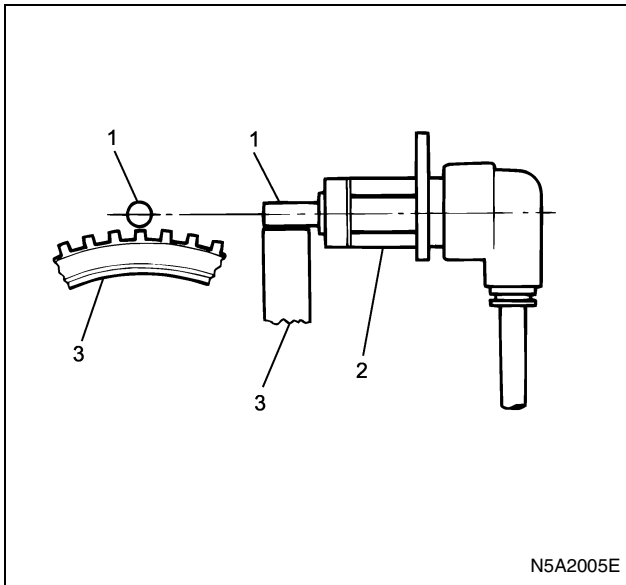
Check valve: Control the brake fluid flow.

CAUTION:

Turning the key ON with the harness disconnected from the EHCU means that the CAN communication line is not connected at this moment. Therefore, the systems which perform CAN communication such as engine and Smoother are judged as faulty. After replacing the EHCU, clear the DTCs of the systems which perform CAN communication. Also, do not drive the vehicle with the EHCU removed.

Wheel Speed Sensor

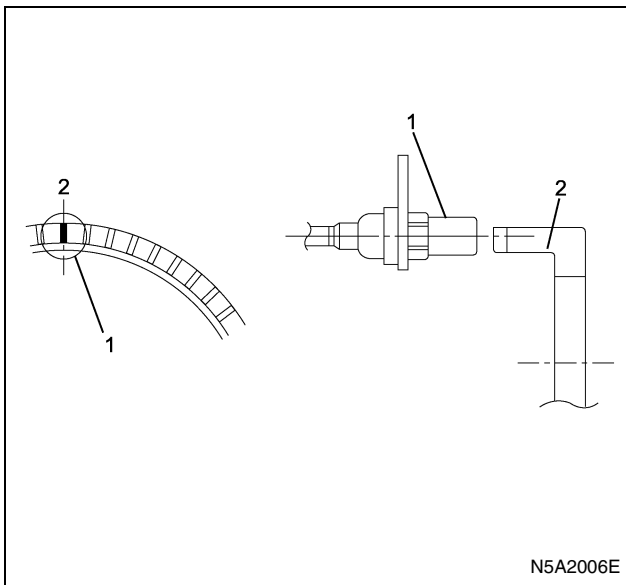
Front speed sensor



Legend

1. Electrode
2. Sensor
3. Sensor rotor

Rear speed sensor



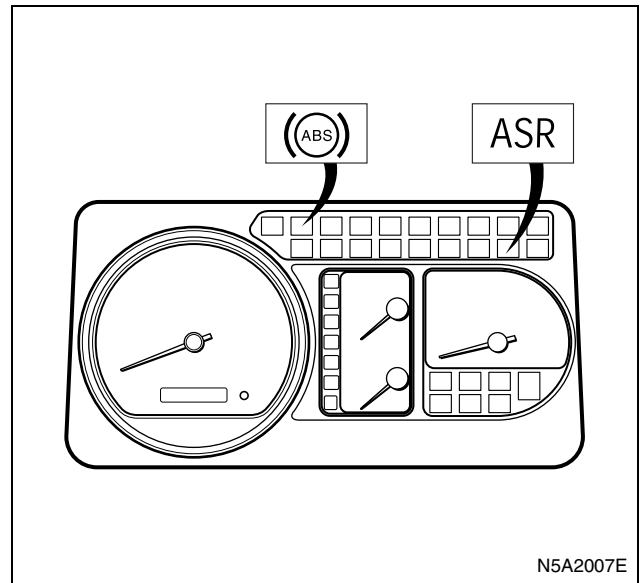
Legend

1. Sensor
2. Sensor rotor

The front speed sensor consists of permanent magnet and coil, and the rear speed sensor is the 2 wire system hall IC type and is installed to the knuckle for front wheels, and to the brake back plate for rear wheels. Sensor rotors inserted in front/rear wheel hubs rotate to generate voltage in the sensor. Frequency of this voltage varies in relation to the rotor revolution speed;

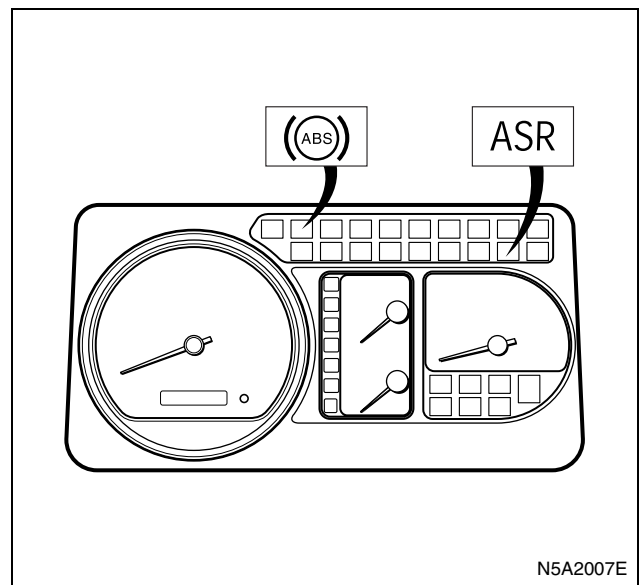
therefore this allows the sensor to detect the vehicle speed.

ABS Warning Lamp



The ABS warning lamp comes on with the starter switch ON, and then goes off if the ABS is normal. It also comes on in case of ABS malfunction, and indicates the trouble code with blinking pattern upon change of the EHCU to diagnosis mode.

ASR Indicator/Off Lamp



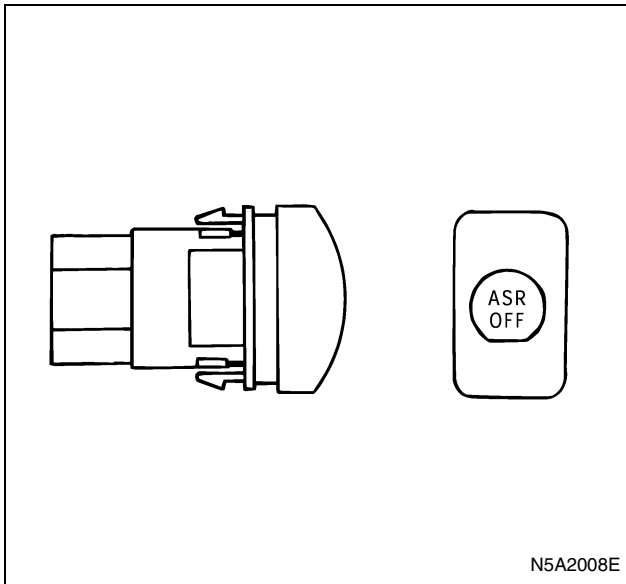
The ASR warning lamp comes on with the starter switch ON, and then goes off if the ASR is normal. It blinks while the ASR is in operation. It comes on in case of ASR malfunction and when the ASR off switch is pressed to deactivate the system. It indicates the trouble code with blinking pattern upon changing to the diagnosis mode.

CAUTION:

When either of the ABS or ASR is faulty (which does not affect the other), the warning lamp of the affected sys-

tem only comes on and prohibit the system operation.
In this case, the other system is still workable if normal.

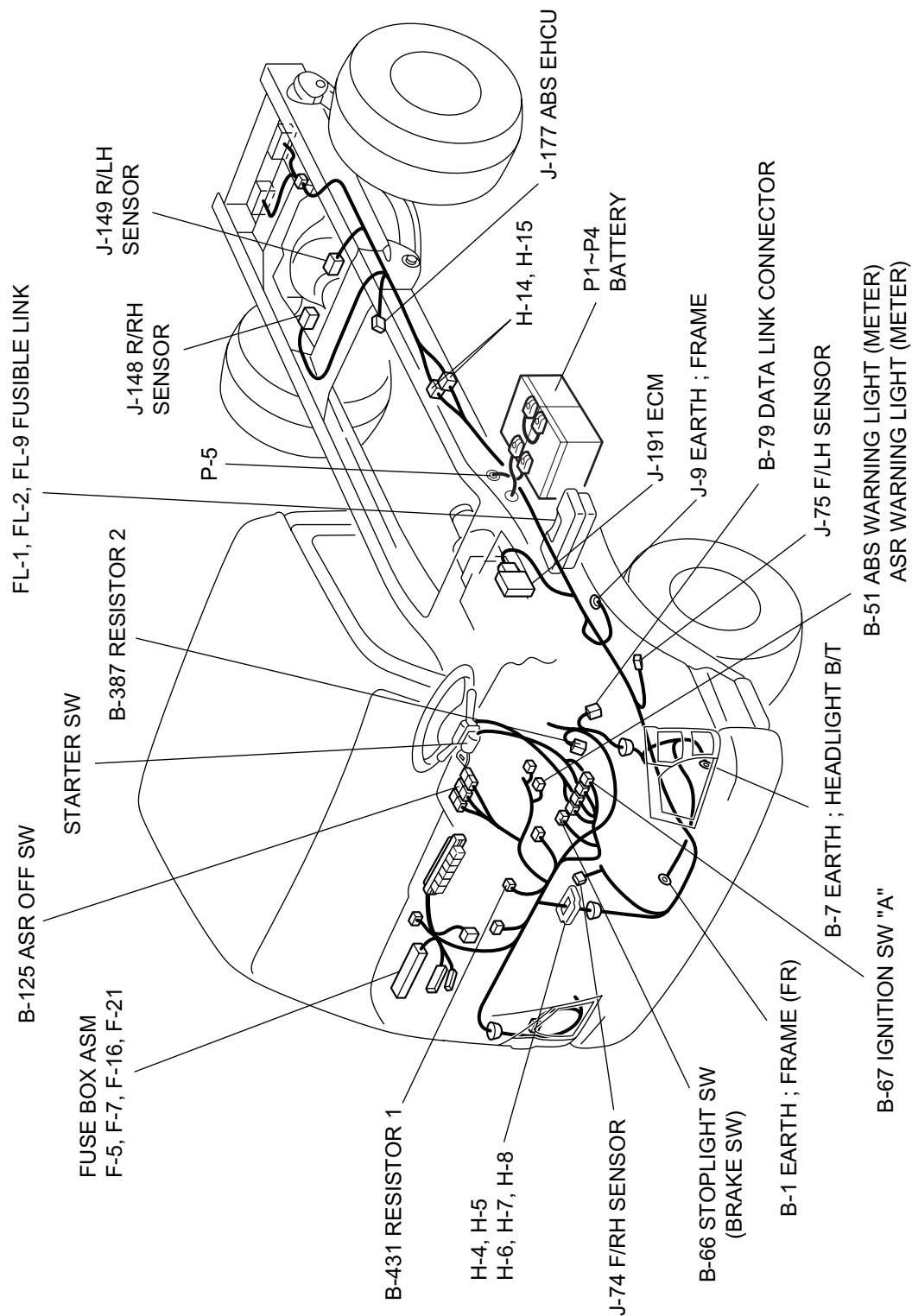
ASR Off Switch



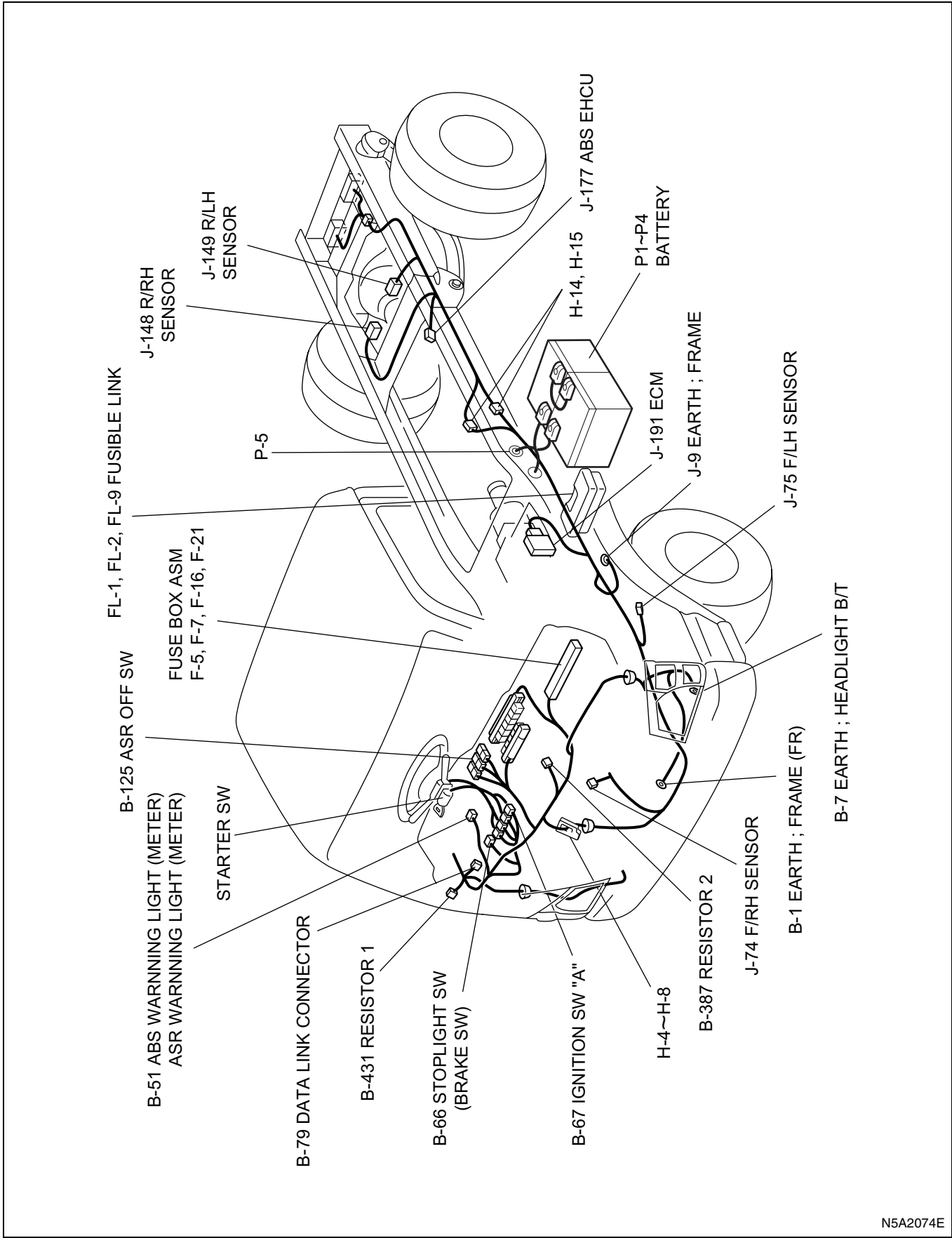
Pressing the ASR off switch after starting the engine deactivates the ASR, and pressing again bring the system to stand-by condition. The ASR is set stand-by condition whenever the engine is started regardless of switch condition.

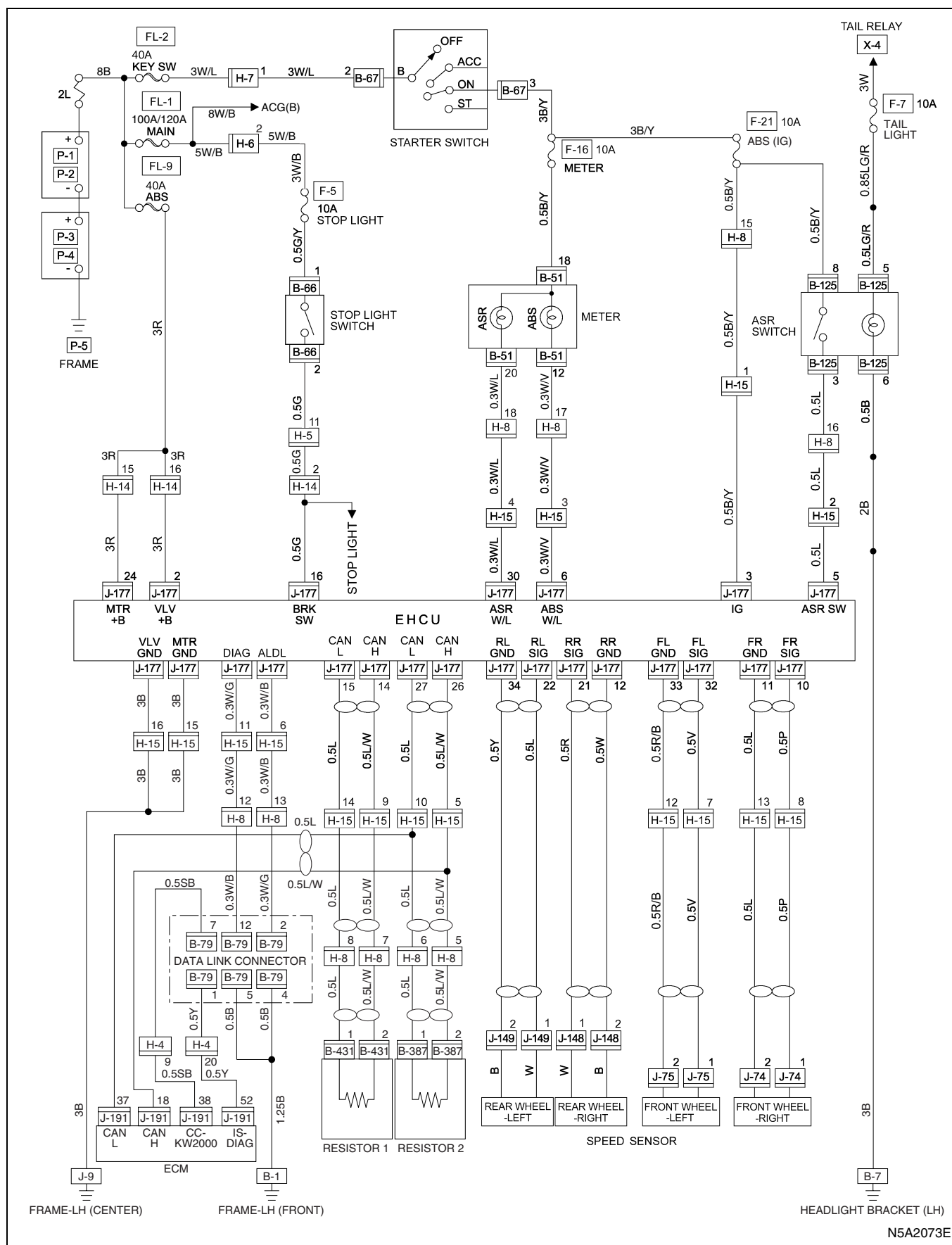
Parts Location

LHD Model

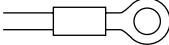
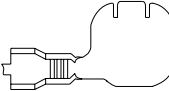
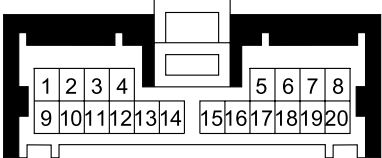
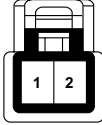
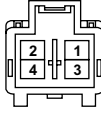
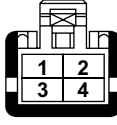
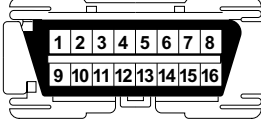
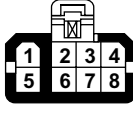


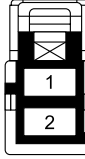
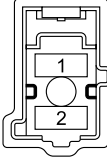
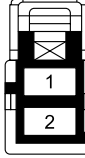
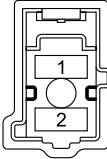
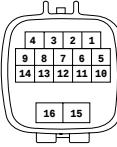
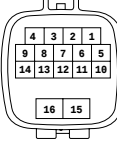
RHD Model



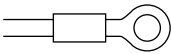
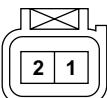


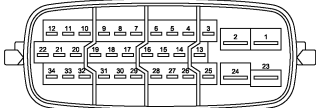
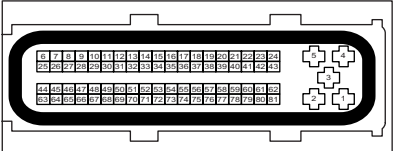
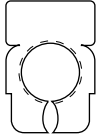
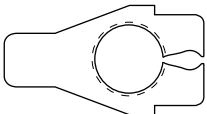
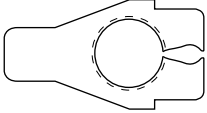
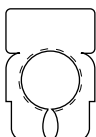
Connector List

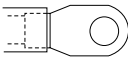
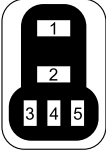
No.	Connector Face
B-1	 000-001
B-7	 000-012
B-51	 020-004
B-66	 002-031
B-67	 004-002
B-67	 004-001
B-79	 016-005
B-125	 008-001

No.	Connector Face
B-387	 002-038
B-387	 002-039
B-431	 002-038
B-431	 002-039
H-14	 016-004
H-14	 016-003
H-15	 016-003
H-15	 016-004

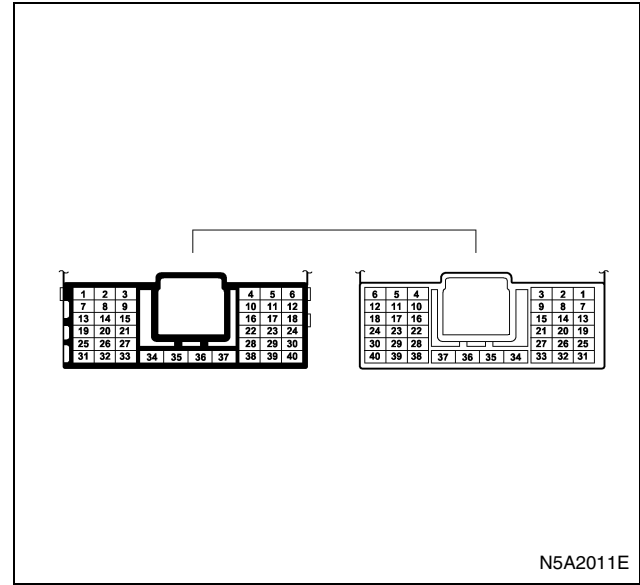
5A4-14 ABS/ASR

No.	Connector Face
J-9	 000-001
J-74	 002-012
J-74	 002-011
J-75	 002-012
J-75	 002-011
J-148	 002-012
J-148	 002-011
J-149	 002-012

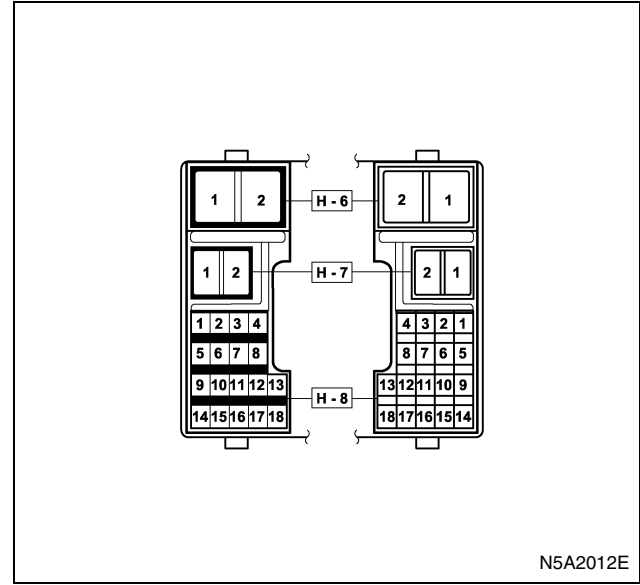
No.	Connector Face
J-149	 002-011
J-177	 034-001
J-177	 034-002
J-191	 081-001
P-1	 000-004
P-2	 000-006
P-3	 000-006
P-4	 000-004

No.	Connector Face
P-5	 000-002
X-4	 005-006

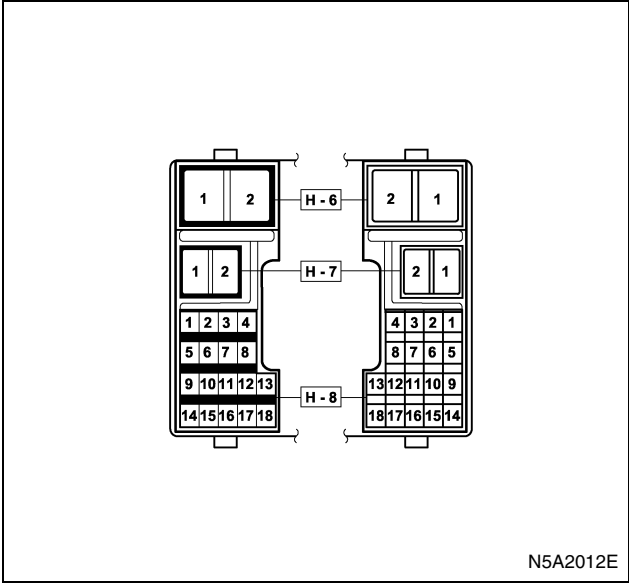
H-5



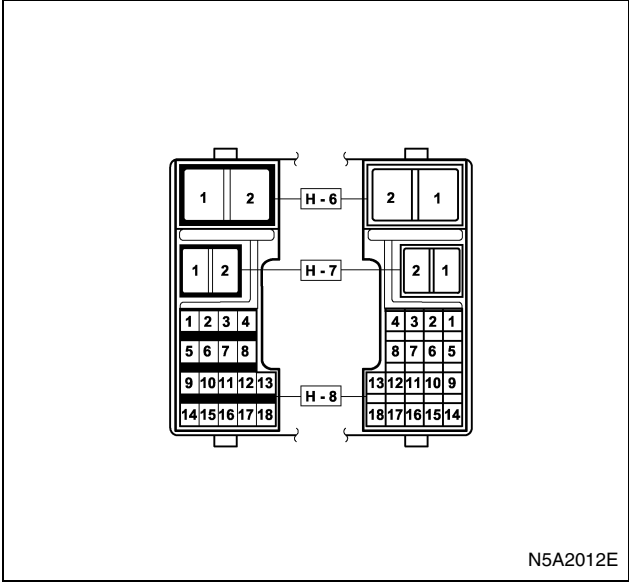
H-6



H-7



H-8



Procedure of Trouble Diagnosis

Description of Diagnosis

Trouble symptom related to ABS and ASR can be classified into two kinds; one is with ABS/ASR warning lamp illumination pattern, the other is from the trouble symptoms noticeable by the driver.

Refer to “Diagnosis with illumination pattern” in the first case, and “List of trouble symptoms” in the latter case for diagnostic procedures. Also, diagnostics with Tech 2 is available. Refer to sections 5A and 5C for the diagnosis of mechanical trouble, including brake noise, brake judder (vibration of pedal or vehicle body during normal brake operation), break pulling to one side, parking brake fault.

About Self-Diagnosis

Self-diagnosis function is equipped with the EHCUC, it performs the checks as shown in the illustration below to

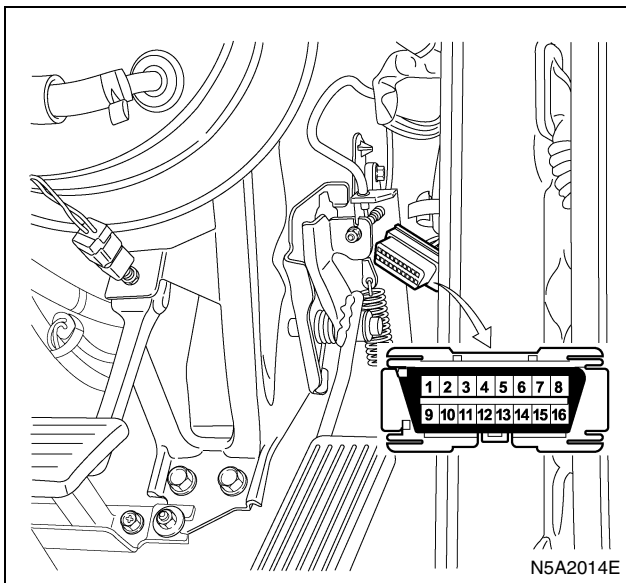
examine the system for fault and identify the trouble part every time the system starts. If it found to be faulty, the system illuminates the ABS/ASR warning lamp to notify the fault, and stores the diagnostic trouble code (DTC). Illumination pattern differ depending on the fault condition; refer to "Diagnostic procedure with illumination pattern" described in later, and check and repair according to the relevant flow chart.

CAUTION:

Lamp illumination is reset every time the starter switch is OFF (system OFF), however the diagnosis code will not be erased unless it is compulsory erased. In case of faults while driving and intermittent fault, the control unit may judge it as normal at the time of diagnosis and indicate the normal code. Therefore perform the check and repair according to the diagnosis flow.

How to Indicate Trouble Codes

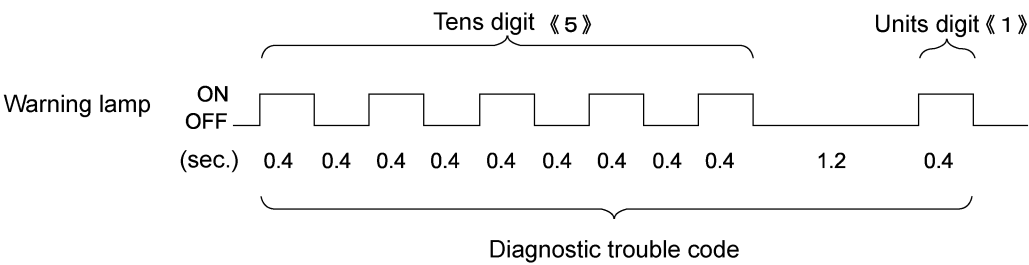
The vehicle must be parked (vehicle speed 3.3km/h (2 mph) or less). Short the terminal No. 12 with No. 4 or 5 (ground) of the self-diagnosis connector, and turn the starter switch to ON. The ABS/ASR warning lamp will blink to indicate the diagnosis trouble code.



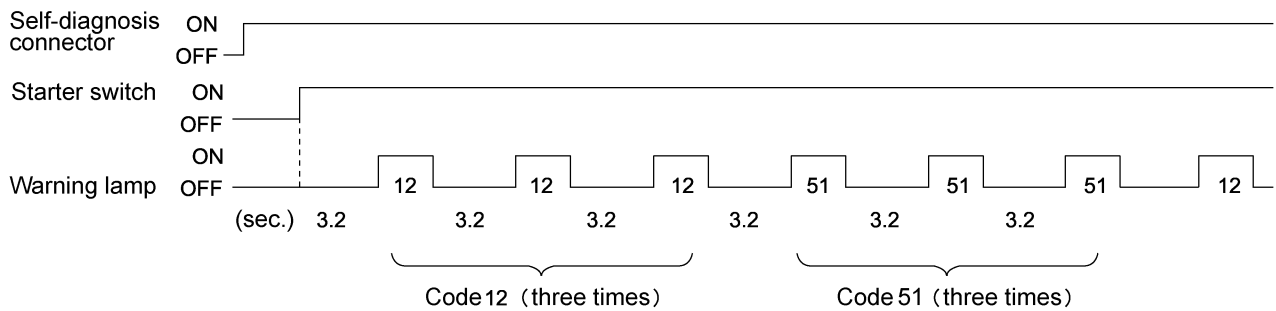
The normal code 12 is repeatedly displayed if normal. If faulty, after displaying the normal code 12 for three times, the stored diagnosis trouble code (DTC) is displayed for three times. Then back to the normal code again and repeats this display order. Maximum 6 codes are stored, and these are displayed in the reverse chronological order.

For details concerning DTCs, refer to "List of Diagnostic Trouble Code (DTC)" described later.

How to read diagnostic trouble code ; for code 51



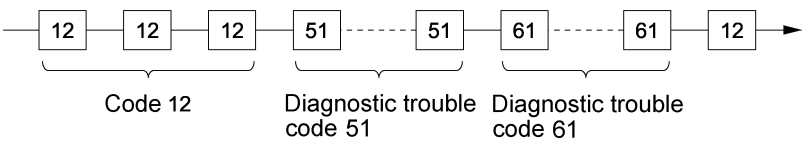
Indication sample of diagnostic trouble code ; for code 51



* Warning lamp : ABS/ASR warning lamp

N5A2015E

Indication sample of multiple diagnostic trouble code ; for code 51,61



N5A2016E

How to Clear Diagnosis Trouble Code (DTC)

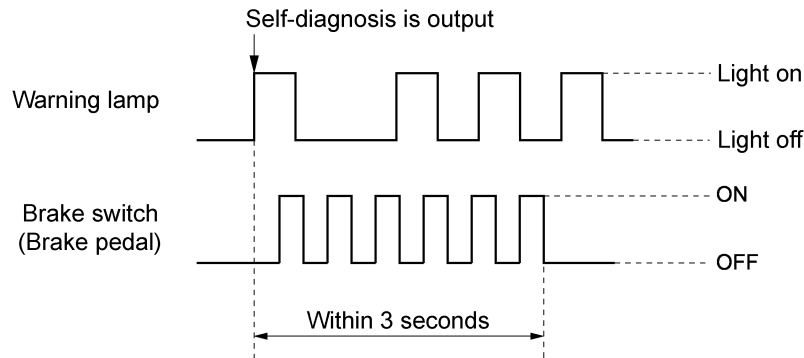
DTCs stored in the EHCUC will not be erased automatically upon repair. Clear the DTCs using either of the following procedure:

1. Input the brake switch ON/OFF signal for six times within three seconds while self-diagnosis result is being output.

2. Use Tech 2 to clear.

CAUTION:

- After performing the DTC clear procedure, ensure that it is cleared.
- If the step 1 does not work, perform with the step2.



N5A2017E

Precautions During Diagnosis

At general baintenance

Adhere the following precautions when servicing and diagnosing of the ABS/ASR and other vehicle control systems.

- When performing electric-arc welding on the vehicle, disconnect the EHCUC connector before starting welding work.
- Do not connect/disconnect the EHCUC connector when the starter switch is ON.
- The EHCUC is a non-disassembled part. Do not loosen the bolts and plugs of the EHCUC.
- Be especially careful not to allow dirt, dust or metallic powder to get into the hydraulic circuit during checking and servicing the brake components.
- When only rear wheels are rotated using dram tester or jack-upped for inspection, the ABS judges it as sensor fault and illuminates the ABS warning lamp. This indicates no fault in the system. Erase the ABS diagnosis code after repair. Turn the starter switch to ON again, to make sure that the ABS warning lamp does not come on.

When servicing computer system

Extreme care is required to avoid overcurrent to the EHCUC circuit. Do not ground to or apply voltage to the EHCUC without careful consideration while checking open/short circuit. Use only the circuit tester having high internal resistance or the special tool described in this section to check those circuit. Do not connect/disconnect the power supply to the EHCUC when the starter

switch is ON. Be sure to turn the starter switch to OFF before disconnecting/connecting the battery cable, the fuse, or the connector.

When replacing EHCUC

The EHCUC body fault rarely occurs, but more cases are falsely identified as EHCUC trouble, as it happened to be corrected when replacing the EHCUC but the fact is mostly secondary failure caused by the harness-side trouble (such as short circuit) or undetectable cause due to intermittent trouble. Therefore, before replacing the EHCUC, check if overcurrent is applied to the EHCUC as well as improper connection of the connectors.

Intermittent trouble

Intermittent troubles are mostly caused by temporally disconnection of the harnesses and connectors. If a trouble occurs, check the related circuit in the following procedure.

1. Check for misconnection of the connector. Also check for improper connection of the connector terminal.
2. Check for deformation and damage of the terminal. If deformed or damaged, correct and reconnect it securely.
3. Simulated open circuit is also suspected. Check the circuit by shaking the harness in a degree that does not damage the harness.

Test run of vehicle with ABS problem

Trouble cause of the problem appeared as ABS warning lamp illumination, can be identified with "Diagnostic procedure with illumination pattern". However for the problem that can solely be identified by the driver as trouble

symptoms, the following procedure is necessary to identify the trouble cause by reproducing the trouble symptom with test run the vehicle.

1. Start the engine, and make sure that the ABS warning lamp goes off. (If the lamp does not go off, read the DTC and identify the trouble part.)
2. Slowly start the vehicle and run at 30 km/h (19 mph) or more for three minutes, then apply the brake to stop the vehicle completely. Start the vehicle again and accelerate to 30 km/h (19 mph) or more. Repeat this operation a least three times.
3. Next, start the vehicle and accelerate to 40 km/h (25 mph) or more, and then abruptly apply the brake to activate the ABS, till stop the vehicle.

4. If the warning lamp comes on during the test run, check the DTC and inspect the vehicle according to the DTC. If no DTC appeared, or the warning light does not come on, reproduce the condition of the trouble occurrence claimed by the customer as much as possible.
5. If DTC appeared or trouble symptom is found, perform the appropriate inspection according to the diagnostic procedure.

Check after repair

Upon completion of repair, turn the starter switch to OFF and then start the engine to make sure each lamp goes off. Next, run the vehicle at 30 km/h (19 mph) or more for 1 minute, and check that the lamp does not come on.

Brake basic inspection

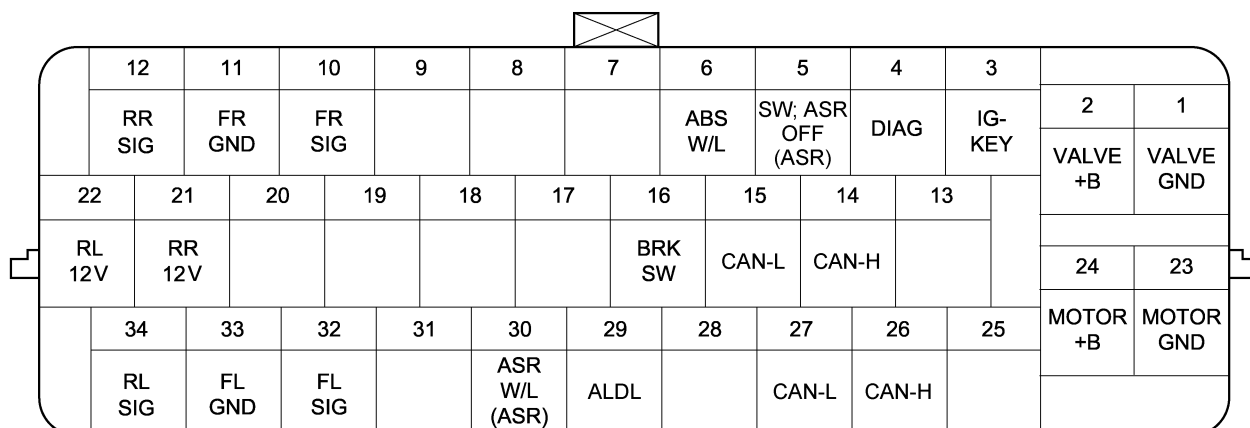
Step	Action	Value	YES	NO
1	Is the brake fluid level correct?	—	Go to Step2	Replenish fluid. Go to Step2
2	Is fluid leaked?	—	Go to Step3	Repair. Go to Step3
3	Does the vacuum booster operate normally?	—	Go to Step4	Repair. Go to Step4
4	Is the brake pad and rotor normal?	—	Go to Step5	Repair. Go to Step5
5	Install all the components, and check that those are installed properly. Is this step completed?	—	End.	Go to Step5

Ground check

Step	Action	Value	YES	NO
1	Are all the ground point related to ABS OK?	—	Go to Step2	Repair. Go to Step2
2	Install all the components, and check that those are installed properly. Is this step completed?	—	End.	Go to Step2

Diagnostic basic flow

Step	Action	Value	YES	NO
1	1. Complaint from the customer 2. Interview to the customer. 3. Perform the basic inspection. (Refer to "Brake basic inspection".) Is Tech 2 required?	—	Go to Step2	Go to Step3
2	Check DTC. Is DTC appeared?	—	Go to Step5	Go to Step4
3	Check DTC (with warning lamp illumination pattern). Is DTC appeared?	—	Go to Step5	Go to Step4
4	Test run the vehicle. Does the warning lamp come on?	—	Go to Step5	Refer to "List of trouble symptom".Go to Step5
5	1. Repair the trouble part. 2. Clear the DTC. 3. Check the ABS warning lamp for illumination pattern with the ignition switch ON. 4. Test run the vehicle. Is the trouble appeared again?	—	Repeat the "Diagnostic basic flow" if the trouble appeared again (with trouble symptom or DTC). Go to Step1	Go to Step6
6	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	End.	Go to Step6

Function Check**EHCU Connector Pin Arrangement**

Terminal	Mark	Signal name	Wire color
1	VALVE GND	ECU system ground (body ground 0V)	BLK
2	VALVE+B	Solenoid valve power supply	RED
3	IG-KEY	ECU system power supply	BLK/YEL
4	DIAG	Diagnosis entry	WHT/GRN
5	SW; ASR OFF	ASR cut switch (ASR only)	BLU
6	ABS W/L	ABS warning lamp output	WHT/VIOLET
7	NC	Not available	—
8	NC	Not available	—
9	NC	Not available	—
10	FR SIG	FR wheel speed signal (magnetic pickup sensor)	PNK
11	FR GND	FR wheel speed signal GND	BLU
12	RR GND	RR wheel speed signal GND	WHT
13	NC	Not available	—
14	CAN-H	CAN Hi input	BLU/WHT
15	CAN-L	CAN Lo input	BLU
16	BRK SW	Brake switch input signal	GRN
17	NC	Not available	—
18	NC	Not available	—
19	NC	Not available	—
20	NC	Not available	—
21	RR SIG	RR wheel speed signal	RED
22	RL SIG	RL wheel speed signal	BLU
23	MOTOR GND	Motor ground (body ground 0V)	BLK
24	MOTOR+B	Motor power supply	RED
25	NC	Not available	—
26	CAN-H	CAN Hi input	BLU/WHT
27	CAN-L	CAN Lo input	BLU
28	NC	Not available	—
29	ALDL	J1850 Class 2 communication	WHT/BLK
30	ASR W/L	ASR warning lamp output (ASR only)	WHT/BLU
31	NC	Not available	—
32	FL SIG	FL wheel speed signal (magnetic pickup sensor)	VIOLET
33	FL GND	FL wheel speed signal GND	RED/BLK
34	RL GND	RL wheel speed signal GND	YEL

Check List of EHCU Connector Terminal**1. EHCU power supply**

Starter Switch	Tester scale/ range	Connector terminal No. to be measured	Standard value	Remarks
OFF	VDC	J-177,3(+)-J-177,1(-)	0-0.3V	
ON	VDC	J-177,3(+)-J-177,1(-)	16.5-34V	
OFF	VDC	J-177,2(+)-J-177,1(-)	16.5-34V	
OFF	VDC	J-177,24(+)-J-177,1(-)	16.5-34V	

2. EHCU ground

Starter Switch	Tester scale/ range	Connector terminal No. to be measured	Standard value	Remarks
OFF	Ω	J-177,1(+)-GND	0-1 Ω	
OFF	Ω	J-177,23(+)-GND	0-1 Ω	

3. Brake switch signal circuit

Starter Switch	Tester scale/ range	Connector terminal No. to be measured	Standard value	Remarks
OFF	VDC	J-177,16(+)-J-177,1(-)	0-0.3V	
OFF	VDC	J-177,16(+)-J-177,1(-)	16.5-34V	Brake pedal depressed

4. ABS warning lamp

Starter Switch	Tester scale/ range	Connector terminal No. to be measured	Standard value	Remarks
ON	VDC	J-177,6(+)-J-177,1(-)	16.5-34V	
OFF	VDC	J-177,6(+)-J-177,1(-)	0-0.3V	

5. Front LH speed sensor

Starter Switch	Tester scale/ range	Connector terminal No. to be measured	Standard value	Remarks
OFF	k Ω	J-177,32(+)-J-177,33(-)	1-2k Ω	
OFF	k Ω	J-177,32(+)-J-177,1(-)	1000k Ω or more	
OFF	VDC	J-177,32(+)-J-177,33(-)	200mV or more	Tire half-turn/sec

6. Front RH speed sensor

Starter Switch	Tester scale/ range	Connector terminal No. to be measured	Standard value	Remarks
OFF	k Ω	J-177,10(+)-J-177,11(-)	1-2k Ω	
OFF	k Ω	J-177,10(+)-J-177,1(-)	1000k Ω or more	
OFF	VDC	J-177,10(+)-J-177,11(-)	200mV or more	Tire half-turn/sec

7. Rear LH speed sensor

Starter Switch	Tester scale/ range	Connector terminal No. to be measured	Standard value	Remarks
ON	VDC	J-177,22(+)-J-177,34(-)	0.2-4.5V	Tire half-turn/sec

8. Rear RH speed sensor

Starter Switch	Tester scale/ range	Connector terminal No. to be measured	Standard value	Remarks
ON	VDC	J-177,21(+)-J-177,12(-)	0.2-4.5V	Tire half-turn/sec

9. ASR cut switch (ASR only)

Starter Switch	Tester scale/ range	Connector terminal No. to be measured	Standard value	Remarks
ON	VDC	J-177,5(+)-J-177,1(-)	16.5-34V (switch pressed) 0-0.3V (switch released)	

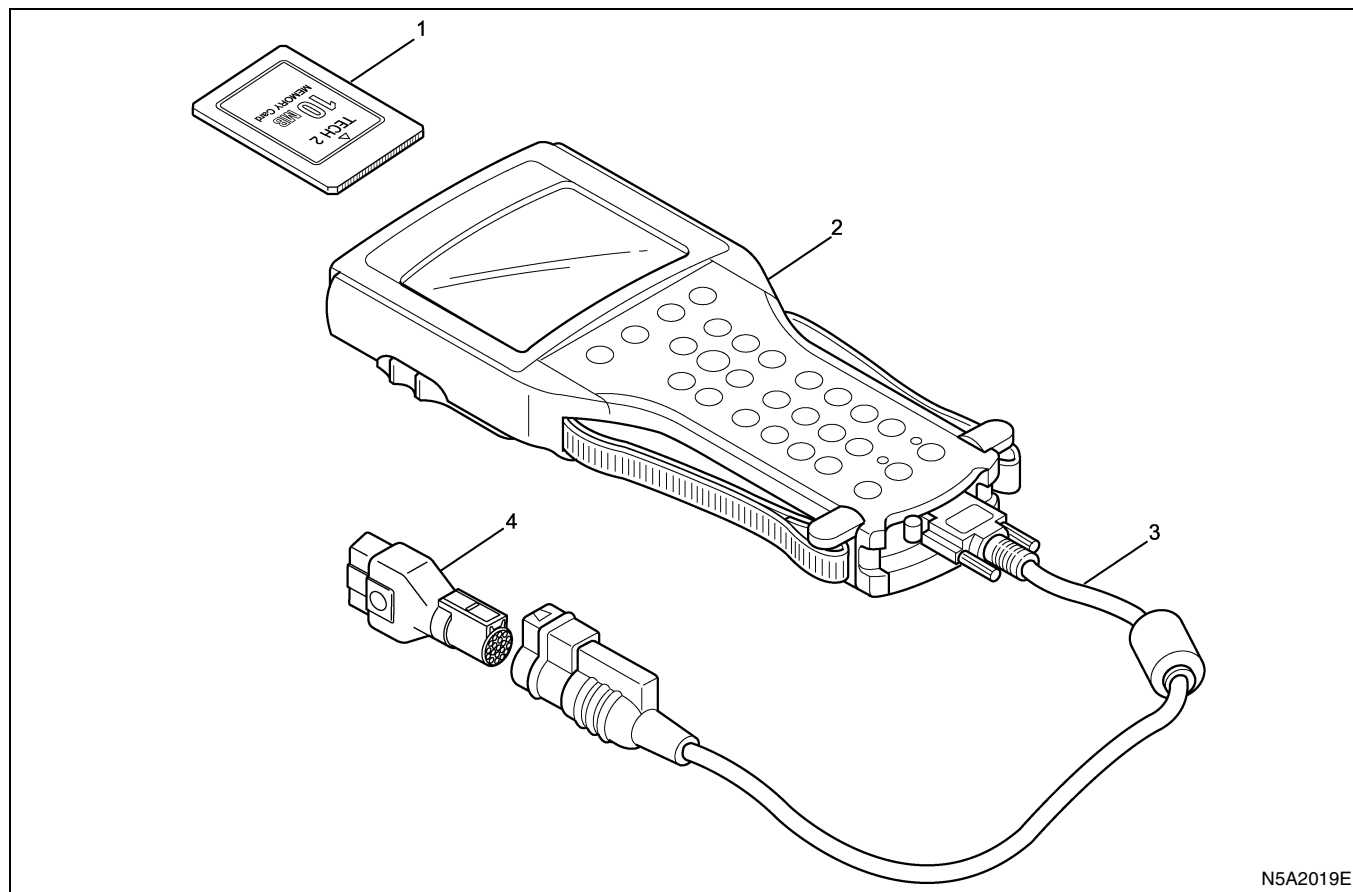
10. ASR warning lamp (ASR only)

Starter Switch	Tester scale/ range	Connector terminal No. to be measured	Standard value	Remarks
ON	VDC	J-177,30(+)-J-177,1(-)	16.5-34V	
OFF	VDC	J-177,30(+)-J-177,1(-)	0-0.3V	

Trouble Diagnosis with Scan Tool

Tech 2

Tech 2 is useful to diagnose the electric fault and the system check of the ABS control system. The Tech 2 is small and light tester. It can communicate with the ECM to perform various types of the diagnosis and the test by connecting the self-diagnosis connector equipped to the vehicle.



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Legend

- | | |
|----------------|-------------------------|
| 1. PCMCIA card | 3. DLC cable |
| 2. TECH 2 | 4. SAE16/19 pin adapter |

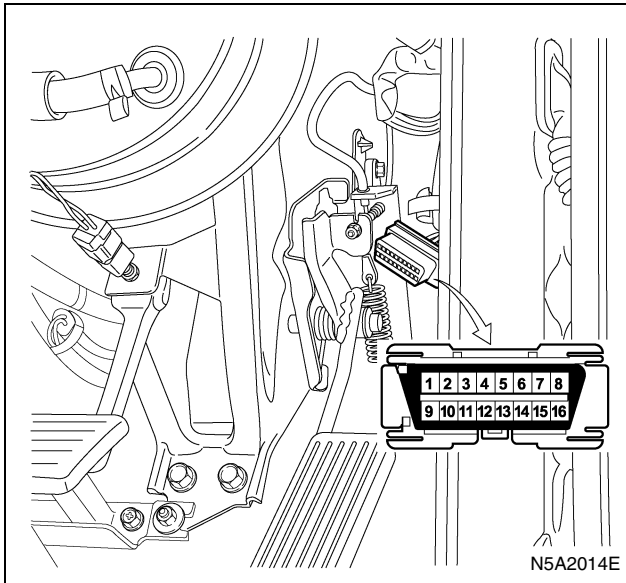
Feature of Tech 2

1. Tech 2 (2) is a 12-V power supply system. Do not use a 24-V power supply. If the vehicle system is equipped with a 24-V power supply, use a 12-V battery with an adapter for power distribution. Power distribution is not available from the cigar lighter.
2. Set the PCMCIA card (1) to the Tech 2 (2), and attach the VCI (Vehicle Communication Interface) (3)(4), and connect to the DLC in the vehicle.
3. Turn the power switch off before installing/removing the PCMCIA card.
4. The capacity of the PCMCIA card for Tech 2 is 10MB. It is ten times as large as Tech1 (1) mass storage.
5. Tech 2 has a capacity of equivalent to two snapshots.
6. The PCMCIA card is sensitive to magnetic and electrostatic. Please handle it with care.
7. Tech 2 can plot a graph of snapshots.
8. Pressing the EXIT key can bring back to the main menu anytime.
9. Open the application menu and press the "F1:Clear DTCInfo" or the DTC clear to erase the diagnosis trouble codes (DTCs).

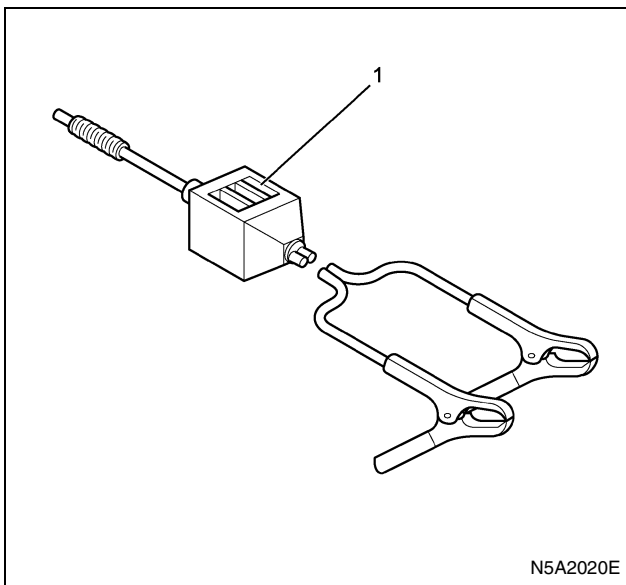
How to Connect Tech 2

1. Insert the PCMCIA card for ISUZU system to the Tech 2 body.
2. Install the SAE 16/19 adapter to the DLC cable.
3. Install the DLC cable to the Tech 2 body.
4. Make sure that the ignition is "OFF".

5. Connect the SAE-16/19 adapter of the Tech 2 to the self-diagnosis cord (black) in the body side.



Connect an adapter cable between the Tech 2 and 12-V battery. (When connecting the adapter cable, start with the negative side.)



Legend

1. 3A-fuse

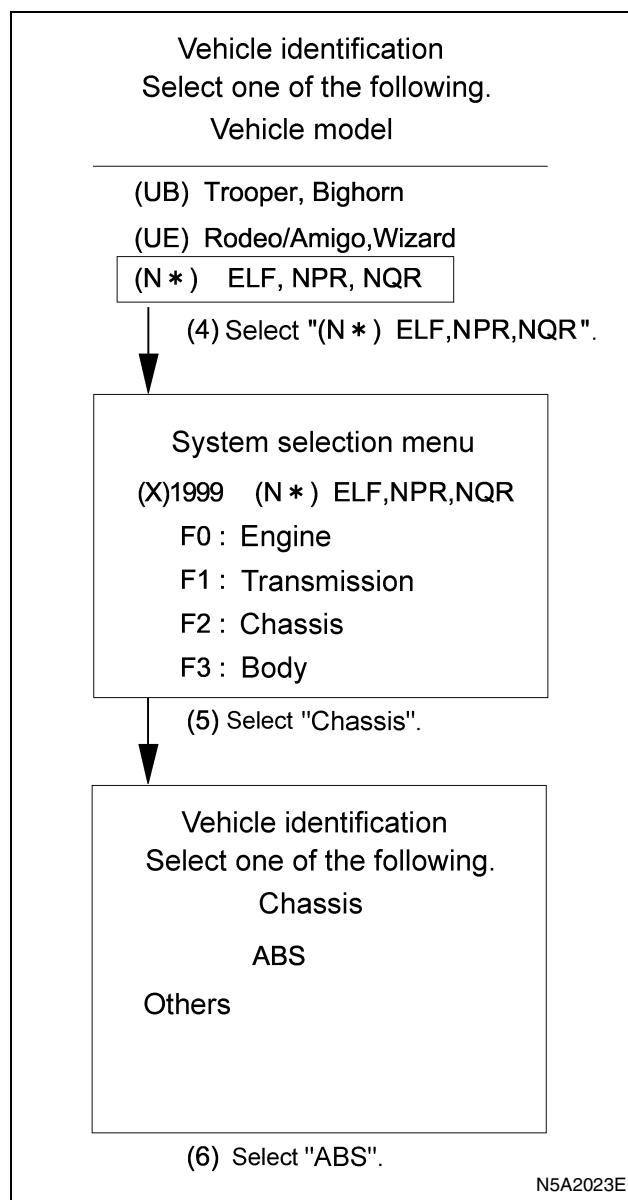
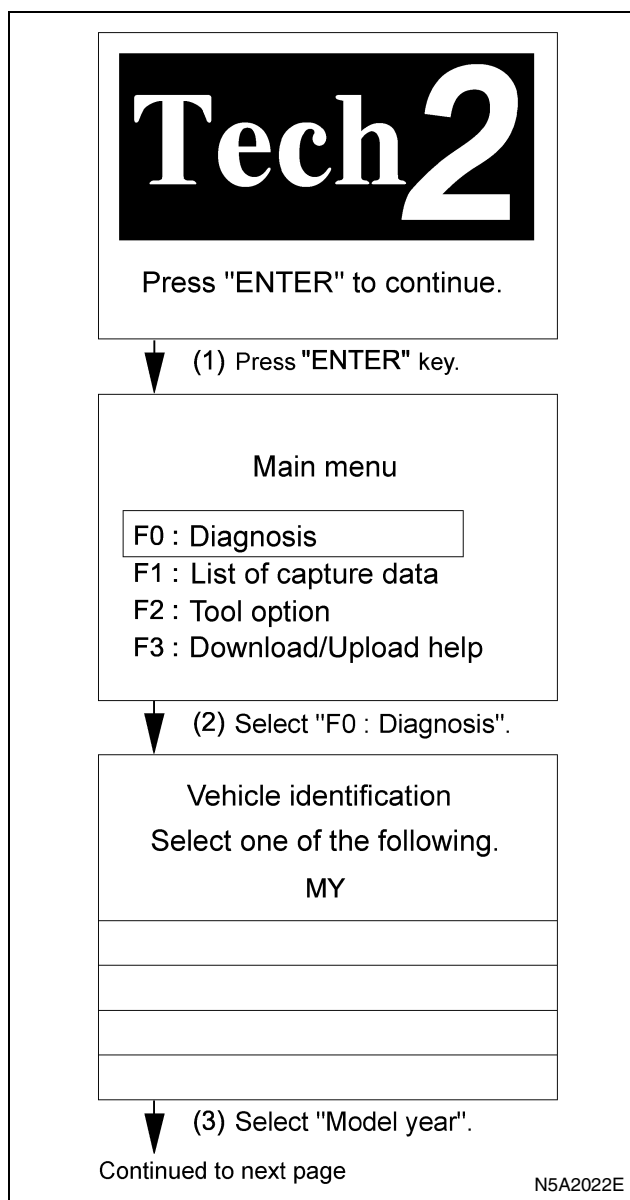
6. Turn the ignition switch to "ON" and press the "PWR" key of the Tech 2.
7. Check the display of the Tech 2.



CAUTION:

Make sure that no power is supplied to the Tech 2 when installing/removing the PCMCIA card.

Tech 2 Operation Procedure



The following chart shows the functions used by the current Tech 2 software.

Menu

F0:	Diagnostic trouble code
	F0: Read the DTC in the order of priority. F1: Clear the DTC.
F1:	Data display
F2:	Snapshot
F3:	Actuator test

DTC (diagnostic trouble code) mode

Two options are available for Tech 2 DTC mode. After selecting the DTC, the following menu is displayed.

- DTC Info (DTC information)
- Clear Info (DTC clear)

Application menu

F0 : Read the DTC in the order of priority.

F1 : Clear the DTC.

F2 : Read DTC information in the order
as ABS/ASR control unit records.

F3 : Clear vehicle model code.

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DTC is the language for technicians to communicate with the ECM on the vehicle.

DTC can roughly be classified into past DTC and current DTC.

- Current DTC: Trouble (fault) occurred current ignition cycle
- Past DTC: Trouble (fault) occurred previous ignition cycle or that in the past
- Multiple DTC: More than one DTC may be displayed in a time. It is called as multiple DTC. This happens when multiple troubles (faults) occurred in a time. Further this happens to the sensors and switches sharing same power source or ground. When such power source or ground is open or shorted, the DTCs of relevant sensors or switches are displayed.

In this case, the power source or ground shared must be checked for open/short circuit.

Use of DTC clear mode can erase the DTC memory stored in the vehicle.

Data display

Example

ABS data

Left Front Wheel Speed	2 km/h
Right Front Wheel Speed	2 km/h
Left Rear Wheel Speed	2 km/h
Right Rear Wheel Speed	2 km/h
Brake Switch Status	OFF
ABS Lamp Command	OFF
ABS Pump Motor	OFF
LR Release Valve Command	OFF
LR Hold Valve Command	OFF
RR Release Valve Command	OFF
RR Hold Valve Command	OFF
LF Release Valve Command	OFF
LF Hold Valve Command	OFF
RF Release Valve Command	OFF
RF Hold Valve Command	OFF
LR Release Valve Feed back	OFF
LR Hold Valve Feed back	OFF
RR Release Valve Feed back	OFF
RR Hold Valve Feed back	OFF
LF Release Valve Feed back	OFF
LF Hold Valve Feed back	OFF
RF Hold Valve Feed back	OFF
RF Release Valve Feed back	OFF
Battery Voltage	23~25V

Selection
item

DTC

Quick
snapshot

More

N5A2025E

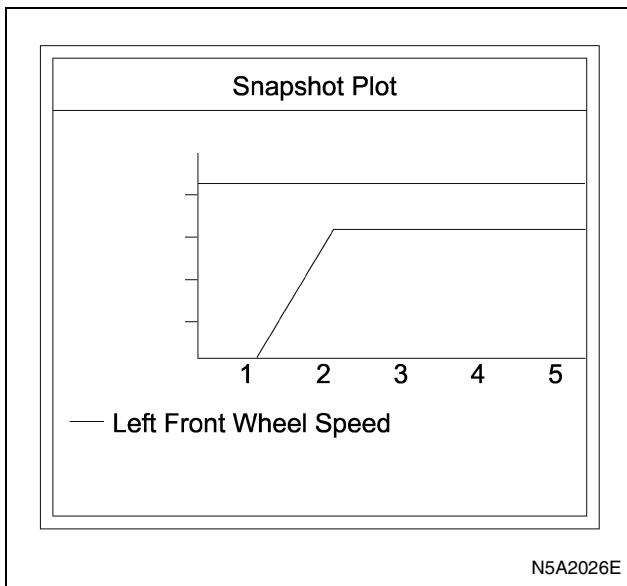
Use of this menu can display the current data.

Note that menu is subject to change.

CAUTION:

On the vehicle that the rear tires have smaller diameter, the rear wheel speed may be indicated a little higher than the front wheel speed. Check the speed after driving a while at a constant speed.

Snapshot (graph plotting)



- The snapshot can record the data list menu and plot a graph.
- Utilizing this mode, reproduce and record the conditions claimed by the customer to identify the engine data fault.
- The stored data can be replayed with a domestic power supply.

Confirm "Data display" in application menu after confirming flow "Main menu diagnosis" -ID.

Select item after it is displayed in screen.

Determine trigger type after snapshot option screen is displayed,
and select "Review data" in lower portion of screen.

Data which is triggered in vehicle is displayed, and select the data.
(Multiple data are displayed according to times of trigger.)

Data is displayed in screen. Select "Plot" to display graph.

In item selection screen, press enter key at items to select by three items,
and select "Accept" in lower portion of screen.

Graph is displayed in screen.

List of Diagnostic Trouble Code

DTC		Description	Check flow
Flash out code (warning lamp blinking pattern)	Tech 2 code		
12	C0212	Normal	—
13	C0213	Model type identification fault due to wrong assembly of control unit	B-2
14	C0214	EHCUC fault	B-3
15	C0215	ECU power supply fault	B-4
16	C0216	CAN Communication fault	B-5
26	C0226	ECM Communication fault	B-6
33	C0233	Motor drive circuit fault	B-7
34	C0234	Motor rotation fault	B-8
35	C0235	ASR communication fault (ASR only) ASR continuous operation	B-9
41	C0241	Fail-safe relay fault	B-10
43	C0243	Solenoid drive circuit fault	B-11
45	C0245	Solenoid monitor circuit fault	B-12
51	C0251	Speed sensor open/short circuit; FL	B-13
52	C0252	Speed sensor open/short circuit; FR	B-14
53	C0253	Speed sensor open/short circuit; RL	B-15
54	C0254	Speed sensor open/short circuit; RR	B-16
61	C0261	Speed sensor signal fault/wrong tire size; FL	B-17
62	C0262	Speed sensor signal fault/wrong tire size; FR	B-18
63	C0263	Speed sensor signal fault/wrong tire size; RL	B-19
64	C0264	Speed sensor signal fault/wrong tire size; RR	B-20

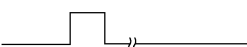
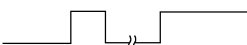
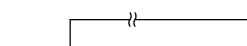
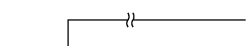
Diagnosis with Blinking Pattern

If the ABS/ASR warning lamp blinking pattern is found to be faulty with the ignition switch ON, or when the warning lamp comes on during the test run, perform the diagnosis according to the chart shown below depending on the blinking pattern.

No.	Lamp condition	Warning lamp illumination pattern	Diagnostic flow
1	Warning lamp shows normal.	ABS Warning lamp Light on Light off ASR Warning lamp Light on Light off Starter switch ON OFF It does not illuminate after engine starts. N5A2029E	Normal
2	Warning lamp remains off.	ABS Warning lamp Light on Light off ASR Warning lamp Light on Light off Starter switch ON OFF ※ Non illumination may occur for “ABS” or “ASR” each. N5A2030E	ABS ABS warning lamp illumination circuit is faulty. Go to check flow B-1-1. ASR ASR warning lamp illumination circuit is faulty.

No.	Lamp condition	Warning lamp illumination pattern	Diagnostic flow
3	Warning lamp remains on.	ABS Warning lamp Light on Light off ASR Warning lamp Light on Light off Starter switch ON OFF N5A2031E	DTC is stored. Display the DTC and perform the diagnosis for each code according to the diagnostic flow. If DTC is not stored, warning lamp illumination circuit or meter may be faulty. Check the meter itself or harness between the meter and EHCU connector terminal 6.
4	Warning lamp comes on when driving.	ABS Warning lamp Light on Light off ASR Warning lamp Light on Light off Starter switch ON OFF At driving ※ Either "ABS" or "ASR" is faulty, one of two illuminates. System without faulty can operate. N5A2032E	DTC is stored. Display the DTC and perform the diagnosis for each code according to the diagnostic flow.
5	Warning lamp repeats blinking after turning the starter switch ON, and then turns on when driving the vehicle.	ABS Warning lamp Light on Light off ASR Warning lamp Light on Light off Starter switch ON OFF At driving N5A2033E	Self-diagnosis circuit is faulty. Go to check flow B-1-2.

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No.	Lamp condition	Warning lamp illumination pattern	Diagnostic flow
6	ASR lamp only comes on when driving.	ABS Warning lamp Light on Light off  ASR Warning lamp Light on Light off  Starter switch ON OFF  At driving N5A2034E	Normal if ASR off switch has been operated. If not, the ASR off switch circuit is faulty. Check the ASR off switch itself, and the harness between the ASR off switch and the EHCU connector terminal 5.
7	ASR lamp only blinks when driving.	ABS Warning lamp Light on Light off  ASR Warning lamp Light on Light off  Starter switch ON OFF  At driving N5A2035E	ASR is in operation. It is normal.

ABS Warning Lamp does not Come on with the Starter Switch ON.**Check flow B-1-1**

Step	Action	Value	YES	NO
1	Is the F-16 meter backup lamp fuse blown?	—	Go to Step5	Go to Step2
2	Is the warning lamp bulb blown?	—	Go to Step6	Go to Step3
3	1. Turn the starter switch OFF. 2. Disconnect the connector of the EHCU. 3. Turn the starter switch ON. 4. Measure the voltage between the B-51 connector terminal 18 and the J-177 connector terminal 1,23. Is the voltage within specified value?	16.5 — 34V	Go to Step4	Go to Step7
4	Check for continuity between the J-177 connector terminal 1,23 and the body ground. Is there continuity?	—	Go to Step9	Go to Step8
5	Replace the fuse. Is this step completed?	—	Go to Step10	—
6	Replace the warning lamp. Is this step completed?	—	Go to Step10	—
7	Repair the circuit for open/short circuit, and the connector for improper connection. Is this step completed?	—	Go to Step10	—
8	Repair the circuit for open/short circuit, and the connector for improper connection. Is this step completed?	—	Go to Step10	—
9	1. Check the suspicious circuit for improper connection. 2. If the connection is normal, replace the EHCU. Is this step completed?	—	Go to Step10	—
10	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to “Diagnostic basic flow”.	—

ABS Warning Lamp Repeats Blinking After Turning the Starter Switch to ON.**Check flow B-1-2**

Step	Action	Value	YES	NO
1	Is anything connected to the self-diagnosis connector?	—	Go to Step2	Go to Step3
2	Disconnect the connection. Is this step completed?	—	Go to Step7	—
3	1. Turn the starter switch OFF. 2. Disconnect the connector of the EHCU. Check for continuity between the J-177 connector terminal 4 and the J-177 connector terminal 1,23. Is there continuity?	—	Go to Step4	Go to Step5
4	Repair the circuit of the diagnosis connector J-177 terminal 4 and the B-79 connector terminal 12. Is this step completed?	—	Go to Step7	—
5	Is there any other trouble symptom?	—	Check according to the check flow of such symptom.	Go to Step6
6	Replace the EHCU. Is this step completed?	—	Go to Step7	—
7	Install all the components, and check that those are installed properly. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step7

ABS Warning Lamp Repeats Blinking After Turning the Starter Switch to ON.**Check flow B-1-3**

Step	Action	Value	YES	NO
1	Is anything connected to the self-diagnosis connector?	—	Go to Step2	Go to Step3
2	Disconnect the connection. Is this step completed?	—	Go to Step7	—
3	1. Turn the starter switch OFF. 2. Disconnect the connector of the EHCU. Is there continuity between the J-177 connector terminal 4 and the J-177 connector terminal 1, 23?	—	Go to Step4	Go to Step5
4	Repair the circuit between the diagnosis connector J-177 terminal 4 and the B-79 connector terminal 12. Is this step completed?	—	Go to Step7	—
5	Is there any other trouble symptom?	—	Check according to the check flow of such symptom.	Go to Step6
6	Replace the EHCU. Is this step completed?	—	Go to Step7	—
7	Install all the components, and check that those are installed properly. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step7

DTC:C0213 (Flash Code 13) Model Type Identification Fault Due to Wrong Assembly of Control Unit

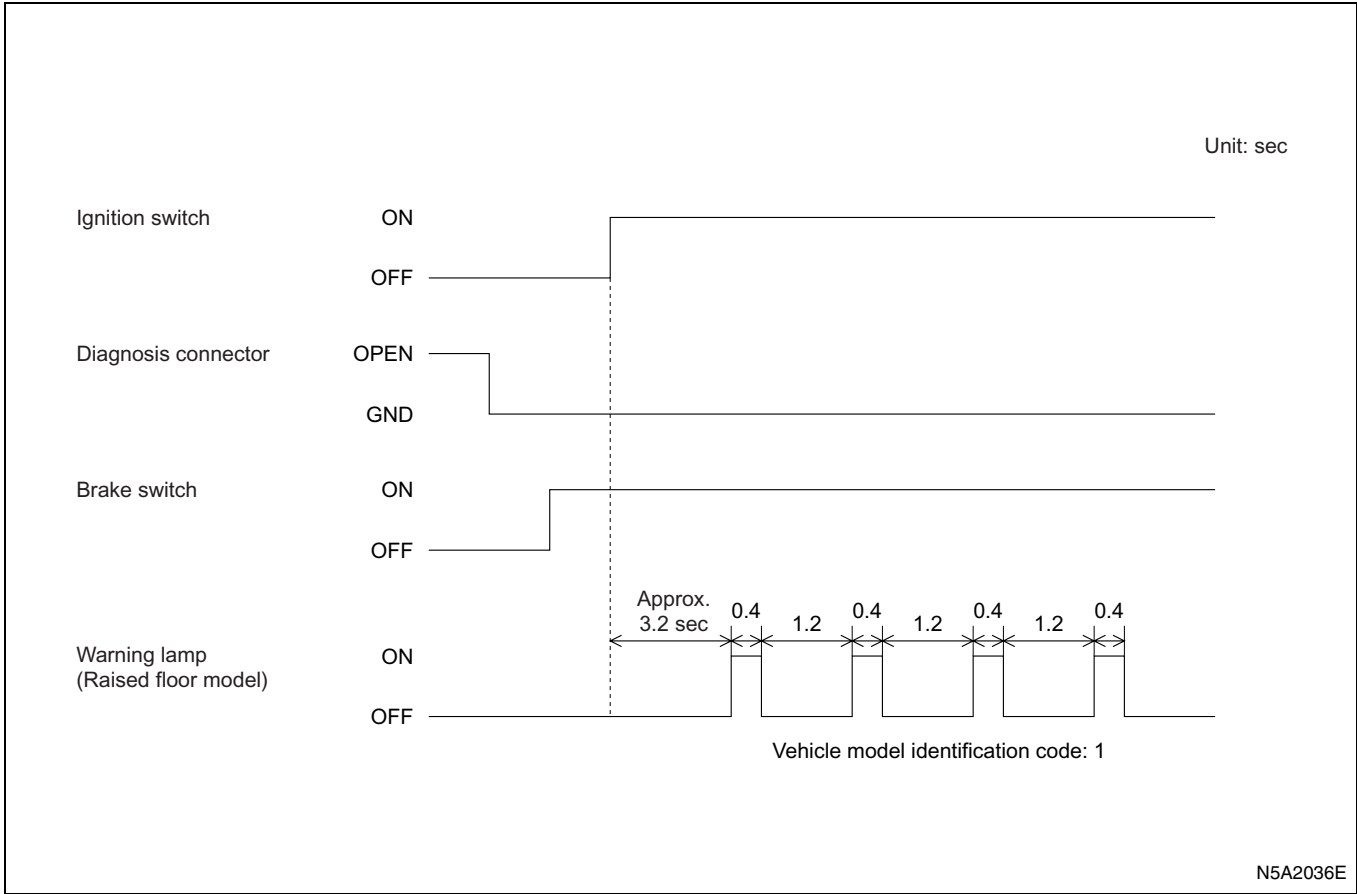
Step	Action	Value	YES	NO
1	1. Turn the starter switch OFF. 2. Disconnect the J-177 connector of the EHCU. 3. Turn the starter switch ON. Measure the voltage between the J-177 connector terminal 18 and the 1,23. Is the voltage within the specified value?	0.5 — 4.5V	Go to Step2	Go to Step3
2	Repair the short circuit and improper connection in J-177 connector terminal 18. Measure the voltage between the J-177 connector terminal 18 and 1,23. Is the voltage within the specified value?	0.5 — 4.5V	Go to Step3	Go to Step4
3	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. 3. With Tech 2: • Connect the J-177 connector of the EHCU. Check the model type code. Is this step completed?	—	Go to “Diagnostic basic flow”.	Go to Step4
4	Replace the EHCU with a new one. Is this step completed?	—	Go to “Diagnostic basic flow”.	Go to Step3

Model Type Identification by Control Unit

EHCU (ABS control unit) is exclusively installed for each vehicle type, based the drive system, brake type, tire, etc. Also, you can use the warning lamp blinking pattern to identify the type of control unit (for which vehicle type).

How to Indicate Model Type Identification Result

With the ignition switch OFF, short the terminal 12 with the terminal 4 or 5 (ground) of the self-diagnosis connector, and depress the brake pedal and then turn the starter switch to ON. The ABS warning lamp will blink to indicate the result.



Model type identification code	2WD ABS
1	Raised floor model with front wheel disc brake
2	Flat low model with front wheel disc brake
3	Raised floor model with four wheel drum brake
7	NQR model for EC
8	NQR model for Australia

DTC:C0214 (Flash Code 14) EHCUC Fault**Check flow B-3**

Step	Action	Value	YES	NO
1	1. Turn the starter switch OFF. 2. Disconnect the connector of the EHCUC. 3. Check for continuity between the J-177 connector terminal 1,23 and the body ground. Is there continuity?	—	Go to Step2	Go to Step3
2	1. Connect the connector of the EHCUC. 2. Clear the DTC. 3. Perform the self-diagnosis after turning the starter switch from OFF to ON. Is DTC displayed repeatedly?	—	Go to Step4	Go to Step5
3	Repair the circuit for open/short circuit, and the connector for improper connection. Is this step completed?	—	Go to Step5	—
4	Replace the EHCUC. Is this step completed?	—	Go to Step5	—
5	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step5

DTC:C0215 (Flash Code 15) ECU Power Supply Fault**Check flow B-4**

Step	Action	Value	YES	NO
1	Is the battery voltage normal?	—	Go to Step2	Go to Step5
2	1. Turn the starter switch OFF. 2. Disconnect the connector of the EHCU. 3. Start the engine. 4. Measure the voltage between the J-177 connector terminal 2 and the J-177 connector terminal 1,23. Is the value within specified value?	17 — 33.5V	Go to Step3	Go to Step6
3	Look for the circuit with improper connection. Is improper connection found?	—	Go to Step4	Go to Step8
4	Repair and perform the self-diagnosis. Is DTC displayed repeatedly?	—	Go to Step7	Go to Step8
5	Charge or replace the battery. Is this step completed?	—	Go to Step8	—
6	Repair the circuit for open/short circuit, and the connector for improper connection between the J-177 connector terminal 2 and the fusible link FL-9. Is this step completed?	—	Go to Step8	—
7	Replace the control unit. Is this step completed?	—	Go to Step8	—
8	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step8

DTC:C0216 (Flash Code 16) CAN Communication Fault**Check flow B-5**

Step	Action	Value	YES	NO
1	1. Turn the starter switch OFF. 2. Remove the harnesses from all the control units (engine, ABS, Smoother, etc.) connected to the CAN communication circuit. 3. Check for short circuit (shorts with ground, power supply, lines, and circuits) in the CAN communication circuit harnesses. Is the harness normal?	—	Go to Step3	Go to Step2
2	Repair the CAN communication circuit. Is the procedure completed?	—	Go to Step3	—
3	1. Turn the starter switch OFF. 2. Remove the harness from the EHCU. 3. Measure the circuit resistance between the terminals 14 and 15, and between terminals 26 and 27 in EHCU harness-side connector. Is the resistance within specified value?	100 —140Ω	Go to Step5	Go to Step4
4	Inspect the CAN communication circuit, terminating resistor, and connectors for faulty contact, the pin terminals for looseness, etc., and repair as necessary. Is the procedure completed?	—	Go to Step5	—
5	1. Turn the starter switch OFF. 2. Check the CAN communication (engine, ABS, Smoother, etc.) circuit harnesses for open circuit. Is the harness normal?	—	Go to Step7	Go to Step6
6	Repair the CAN communication circuit. Is the procedure completed?	—	Go to Step7	—
7	1. Turn the starter switch OFF. 2. Install the harnesses to all the control units connected to the CAN communication circuit. 3. Turn the starter switch ON. 4. Check each system (engine, Smoother, etc) for DTC. 5. If any DTC is detected in any system, repair it. Is the procedure completed?	—	Go to Step8	—
8	1. Clear the DTC. 2. Perform the test drive. 3. Check for DTC. Was DTC C0216 detected?	—	Go to Step9	Go to Step10

Step	Action	Value	YES	NO
9	Replace the EHCU. Is this step completed?	—	Go to Step10	—
10	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to “Diagnostic basic flow”.	Go to Step10

DTC:C0226 (Flash Code 26) ECM Communication Fault**Check flow B-6**

Step	Action	Value	YES	NO
1	Inspect the engine control, and repair or replace any faulty parts. Is this step completed?	—	Go to Step2	Go to Step1
2	Perform the check flow B-5. Is this step completed?	—	Go to Step3	Go to Step2
3	1. Clear the DTC. 2. Perform the test drive. 3. Check for DTC. Was DTC C0226 detected?	—	Go to Step4	Go to Step5
4	Replace the EHCU. Is this step completed?	—	Go to Step5	—
5	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step5

DTC:C0233 (Flash Code 33) Motor Drive Circuit Fault**Check flow B-7**

Step	Action	Value	YES	NO
1	1. Turn the starter switch OFF. 2. Disconnect the connector of the EHCU. 3. Turn the starter switch ON. 4. Measure the voltage between the J-177 connector terminal 24 and the J-177 connector terminal 23. Is the value within specified value?	20 — 32V	Go to Step5	Go to Step2
2	Repair the circuit between the J-177 connector terminal 24 and the FL-9, or replace the FL-9. Is this step completed?	—	Go to Step3	Go to Step2
3	Measure the voltage between the J-177 connector terminals 24 and 23. Is the value within specified value?	20 — 32V	Go to Step6	Go to Step4
4	Repair the harness between the J-177 connector terminal 23 and the chassis ground. Is this step completed?	—	Go to Step6	Go to Step4
5	Replace the EHCU. Is this step completed?	—	Go to Step6	Go to Step5
6	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. 3. Test run the vehicle. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step6

DTC:C0234 (Flash Code 34) Motor Rotation Fault**Check flow B-8**

Step	Action	Value	YES	NO
1	Replace the EHCU. Is this step completed?	—	Go to Step2	Go to Step1
2	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. 3. Test run the vehicle. Is this step completed?	—	Go to “Diagnostic basic flow”.	Go to Step2

DTC:C0235 (Flash Code 35) ASR Communication Line Fault/ASR Continuous Operation**Check flow B-9**

Step	Action	Value	YES	NO
1	1. Check the tire. 2. Check if specified tires are attached. 3. Check for abnormal wear on the tire outer surface. Are the tires normal?	—	Go to Step2	Replace with the specified tire, and Go to Step2
2	Check the speed sensor. (Check the sensor output by referring to the check flow C-1-1-C-1-4, or TC-1.) Is the sensor output normal?	100 — 140Ω	Go to Step3	Repair the faulty speed sensor, and Go to Step5
3	Check the engine control. Is the engine control normal?	“Diagnosis with Blinking Pattern” No.1	Go to Step4	Repair the engine control, and Go to Step5
4	Replace the EHCUC. Is this step completed?	—	Go to Step5	Go to Step4
5	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to “Diagnostic basic flow”.	Go to Step5

DTC:C0241 (Flash Code 41) Fail-Safe Relay Fault**Check flow B-10**

Step	Action	Value	YES	NO
1	1. Turn the starter switch OFF. 2. Disconnect the connector of the EHCU. 3. Turn the starter switch ON. 4. Measure the voltage between the J-177 connector terminal 2 and the J-177 connector terminal 1. Is the value within specified value?	16.5 — 34V	Go to Step6	Go to Step2
2	Repair the circuit between the J-177 connector terminal 2 and the FL-9. Is this step completed?	—	Go to Step3	Go to Step2
3	Measure the voltage between the J-177 connector terminals 2 and 1. Is the value within specified value?	16.5 — 34V	Go to Step7	Go to Step4
4	Repair the harness between the J-177 connector terminal 1 and the chassis ground. Is this step completed?	—	Go to Step5	Go to Step4
5	Measure the voltage between the J-177 connector terminals 2 and 1. Is the value within specified value?	16.5 — 34V	Go to Step7	Go to Step5
6	Replace the EHCU. Is this step completed?	—	Go to Step7	Go to Step6
7	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. 3. Test run the vehicle. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step7

DTC:C0243 (Flash Code 43) Solenoid Drive Circuit Fault**Check flow B-11**

Step	Action	Value	YES	NO
1	Replace the EHCU. Is this step completed?	—	Go to Step2	Go to Step1
2	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. 3. Test run the vehicle. Is this step completed?	—	Go to “Diagnostic basic flow”.	Go to Step2

DTC:C0245 (Flash Code 45) Solenoid Monitor Circuit Fault**Check flow B-12**

Step	Action	Value	YES	NO
1	Replace the EHCU. Is this step completed?	—	Go to Step2	Go to Step1
2	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. 3. Test run the vehicle. Is this step completed?	—	Go to “Diagnostic basic flow”.	Go to Step2

DTC:C0251 (Flash Code 51) Speed Sensor Open/Short Circuit; FL**Check flow B-13**

Step	Action	Value	YES	NO
1	1. Turn the starter switch OFF. 2. Disconnect the connector of the EHCJ. 3. Measure the resistance between the J-177 connector terminals 32 and 33. Is the value within specified value?	1 — 2kΩ	Go to Step2	Go to Step3
2	Measure the resistance between the J-177 connector terminals 32 and the ground. Is the value within specified value?	1000kΩ or more	Go to Step7	Go to Step4
3	1. Disconnect the FL wheel speed sensor connector. 2. Measure the resistance between the J-75 connector terminals 1 and 2 (sensor side). Is the value within specified value?	1 — 2Ω	Go to Step5	Go to Step6
4	1. Disconnect the FL wheel speed sensor connector. 2. Measure the resistance between the J-75 connector terminal 1 (sensor side) and the ground. Is the value within specified value?	1000kΩ or more	Go to Step5	Go to Step6
5	Repair the circuit for open/short circuit between the control unit connector and the sensor connector. Is this step completed?	—	Go to Step8	—
6	Replace the FL wheel speed sensor. Is this step completed?	—	Go to Step8	—
7	Replace the control unit. Is this step completed?	—	Go to Step8	—
8	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step8

DTC:C0252 (Flash Code 52) Speed Sensor Open/Short Circuit; FR**Check flow B-14**

Step	Action	Value	YES	NO
1	1. Turn the starter switch OFF. 2. Disconnect the connector of the EHCJ. 3. Measure the resistance between the J-177 connector terminals 10 and 11. Is the value within specified value?	1 — 2kΩ	Go to Step2	Go to Step3
2	Measure the resistance between the J-177 connector terminals 10 and the ground. Is the value within specified value?	1000kΩ or more	Go to Step7	Go to Step4
3	1. Disconnect the FR wheel speed sensor connector. 2. Measure the resistance between the J-74 connector terminals 1 and 2 (sensor side). Is the value within specified value?	1 — 2kΩ	Go to Step5	Go to Step6
4	1. Disconnect the FR wheel speed sensor connector. 2. Measure the resistance between the J-74 connector terminal 1 (sensor side) and the ground. Is the value within specified value?	1000kΩ or more	Go to Step5	Go to Step6
5	Repair the circuit for open/short circuit between the control unit connector and the sensor connector. Is this step completed?	—	Go to Step8	—
6	Replace the FR control unit. Is this step completed?	—	Go to Step8	—
7	Replace the control unit. Is this step completed?	—	Go to Step8	—
8	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step8

DTC:C0253 (Flash Code 53) Speed Sensor Open/Short Circuit; RL**Check flow B-15**

Step	Action	Value	YES	NO
1	1. Turn the starter switch OFF. 2. Disconnect the connector of the EHCU and the RL wheel speed sensor connector J-149. 3. Check for continuity between the J-177 connector terminal 34 and the J-149 sensor connector terminal 2. Is there continuity?	—	Go to Step2	Go to Step7
2	Check for continuity between the J-177 connector terminals 34 and 1. Is there continuity?	—	Go to Step7	Go to Step3
3	Check for continuity between the J-177 connector terminal 22 and the J-149 sensor connector terminal 1. Is there continuity?	—	Go to Step4	Go to Step7
4	Check for continuity between the J-177 connector terminals 22 and 1. Is there continuity?	—	Go to Step7	Go to Step5
5	1. Connect the connector of the EHCU. 2. Turn the starter switch ON. 3. Measure the voltage between the J-149 sensor connector terminal 1 and the ground. Is the value within specified value?	9 — 16V	Go to Step6	Go to Step7
6	Check the RL wheel speed sensor output. (Refer to the check flow C-1-3.) Is the fail corrected?	—	Go to Step9	Go to Step8
7	Repair the circuit for open/short circuit, and the connector for improper connection between the connector of EHCU and the speed sensor connector. Is this step completed?	—	Go to Step9	Go to Step7
8	Replace the control unit. Is this step completed?	—	Go to Step9	Go to Step8
9	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step9

DTC:C0254 (Flash Code 54) Speed Sensor Open/Short Circuit; RR**Check flow B-16**

Step	Action	Value	YES	NO
1	1. Turn the starter switch OFF. 2. Disconnect the connector of EHCUC and the RR wheel speed sensor connector J-148. 3. Check for continuity between the J-177 connector terminal 12 and the J-148 sensor connector terminal 2. Is there continuity?	—	Go to Step2	Go to Step7
2	Check for continuity between the J-177 connector terminals 12 and 1. Is there continuity?	—	Go to Step7	Go to Step3
3	Check for continuity between the J-177 connector terminal 21 and the J-148 sensor connector terminal 1. Is there continuity?	—	Go to Step4	Go to Step7
4	Check for continuity between the J-177 connector terminals 21 and 1. Is there continuity?	—	Go to Step7	Go to Step5
5	1. Connect the connector of the EHCUC. 2. Turn the starter switch ON. 3. Measure the voltage between the J-148 sensor connector terminal 1 and the ground. Is the value within specified value?	9 — 16V	Go to Step6	Go to Step7
6	Check the RR wheel speed sensor output. (Refer to the check flow C-1-4.) Is the fail corrected?	—	Go to Step8	Go to Step8
7	Repair the circuit for open/short circuit, and the connector for improper connection between the connector of EHCUC and the speed sensor connector. Is this step completed?	—	Go to Step9	Go to Step7
8	Replace the control unit. Is this step completed?	—	Go to Step9	Go to Step8
9	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step9

DTC:C0261 (Flash Code 61) Speed Sensor Signal Fault/Wrong Tire Size; FL**Check flow B-17**

Step	Action	Value	YES	NO
1	Check the tire. Is the tire specification correct? Is abnormal wear found in the outer surface?	—	Go to Step2	Replace with the specified tire without wear. Go to Step21
2	Has certain tire been rotated alone by performing for jack-up or roller tester?	—	DTC may be set if certain tire is rotated alone. Go to Step21	Go to Step3
3	Is the FL wheel bearing rattling?	—	Go to Step12	Go to Step4
4	Is the FL wheel speed sensor/sensor rotor rattling?	—	Go to Step13	Go to Step5
5	Is iron powder attached to the FL wheel speed sensor/sensor rotor?	—	Go to Step14	Go to Step6
6	Check the FL wheel speed sensor. (Refer to the check flow C-1-1 or TC-1.) Is the FL sensor output normal?	—	Go to Step7	Go to Step10
7	Does the sensor rotor have missing tooth or saw-toothed?	—	Go to Step15	Go to Step8
8	Measure the resistance between the B-177 connector terminals 33 and the ground. Is the value within specified value?	1000kΩ or more	Go to Step9	Go to Step11
9	1. Clear the DTC. 2. Test run the vehicle, and perform the self-diagnosis. Is DTC displayed repeatedly?	—	Go to Step20	Go to Step18
10	Is the speed sensor damaged or saw-toothed?	—	Go to Step16	Go to Step17
11	1. Disconnect the FL sensor connector. 2. Measure the resistance between the J-75 connector terminal 2 (sensor side) and the ground. Is the value within specified value?	1000kΩ or more	Go to Step19	Go to Step16
12	Adjust the preload of the wheel bearing. Is this step completed?	—	Go to Step21	—
13	Repair or replace the speed sensor/sensor rotor. Is this step completed?	—	Go to Step21	—
14	Repair the speed sensor/sensor rotor. Is this step completed?	—	Go to Step21	—
15	Replace the sensor rotor. Is this step completed?	—	Go to Step21	—
16	Replace the FL wheel speed sensor. Is this step completed?	—	Go to Step21	—

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Step	Action	Value	YES	NO
17	Check the FL wheel speed sensor circuit. (Refer to the check flow B-13.) Is this step completed?	—	Check the repair.	—
18	Check the circuit for open circuit, and the connector for improper connection between the EHCU and the speed sensor connector. Refer to "Intermittent trouble". Is this step completed?	—	Go to Step21	—
19	Repair the circuit for open/short circuit, and the connector for improper connection between the EHCU connector and the speed sensor connector. Is this step completed?	—	Go to Step21	Go to Step21
20	Replace the EHCU. Is this step completed?	—	Go to Step21	—
21	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step21

DTC:C0262 (Flash Code 62) Speed Sensor Signal Fault/Wrong Tire Size; FR**Check flow B-18**

Step	Action	Value	YES	NO
1	Check the tire. Is the tire specification correct? Is abnormal wear found in the outer surface?	—	Go to Step2	Replace with the specified tire without wear. Go to Step21
2	Has certain tire been rotated alone by performing for jack-up or roller tester?	—	DTC may be set if certain tire is rotated alone. Go to Step21	Go to Step3
3	Is the FR wheel bearing rattling?	—	Go to Step12	Go to Step4
4	Is the FR wheel speed sensor/sensor rotor rattling?	—	Go to Step13	Go to Step5
5	Is iron powder attached to the FR wheel speed sensor/sensor rotor?	—	Go to Step14	Go to Step6
6	Check the FR wheel speed sensor. (Refer to the check flow C-1-2 or TC-1.) Is the FR sensor output normal?	—	Go to Step7	Go to Step10
7	Does the sensor rotor have missing tooth or saw-toothed?	—	Go to Step15	Go to Step8
8	Measure the resistance between the B-177 connector terminal 11 and the ground. Is the value within specified value?	1000k Ω or more	Go to Step9	Go to Step11
9	1. Clear the DTC. 2. Test run the vehicle, and perform the self-diagnosis. Is DTC displayed repeatedly?	—	Go to Step20	Go to Step18
10	Is the speed sensor damaged or saw-toothed?	—	Go to Step16	Go to Step17
11	1. Disconnect the FR sensor connector. 2. Measure the resistance between the J-74 connector terminal 2 (sensor side) and the ground. Is the value within specified value?	1000k Ω or more	Go to Step19	Go to Step16
12	Adjust the preload of the wheel bearing. Is this step completed?	—	Go to Step21	—
13	Repair or replace the speed sensor/sensor rotor. Is this step completed?	—	Go to Step21	—
14	Repair the speed sensor/sensor rotor. Is this step completed?	—	Go to Step21	—
15	Replace the sensor rotor. Is this step completed?	—	Go to Step21	—
16	Replace the FR wheel speed sensor. Is this step completed?	—	Go to Step21	—

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Step	Action	Value	YES	NO
17	Check the FR wheel speed sensor circuit. (Refer to the check flow B-14.) Is this step completed?	—	Check the repair.	—
18	Check the circuit for open circuit, and the connector for improper connection between the EHCUC and the speed sensor connector. Refer to "Intermittent trouble". Is this step completed?	—	Go to Step21	—
19	Repair the circuit for open/short circuit, and the connector for improper connection between the EHCUC connector and the speed sensor connector. Is this step completed?	—	Go to Step21	Go to Step21
20	Replace the EHCUC. Is this step completed?	—	Go to Step21	—
21	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step21

DTC:C0263 (Flash Code 63) Speed Sensor Signal Fault/Wrong Tire Size; RL**Check flow B-19**

Step	Action	Value	YES	NO
1	Check the tire. Is the tire specification correct? Is abnormal wear found in the outer surface?	—	Go to Step2	Replace with the specified tire without wear. Go to Step18
2	Has certain tire been rotated alone by performing for jack-up or roller tester?	—	DTC may be set if certain tire is rotated alone. Go to Step18	Go to Step3
3	Is the FL wheel bearing rattling?	—	Go to Step10	Go to Step4
4	Is the FL wheel speed sensor/sensor rotor rattling?	—	Go to Step11	Go to Step5
5	Is iron powder attached to the FL wheel speed sensor/sensor rotor?	—	Go to Step12	Go to Step6
6	Check the RL wheel speed sensor. (Refer to the check flow C-1-3.) Is the RL sensor output normal?	—	Go to Step7	Go to Step9
7	Does the sensor rotor have missing tooth or saw-toothed?	—	Go to Step13	Go to Step8
8	1. Clear the DTC. 2. Test run the vehicle, and perform the self-diagnosis. Is DTC displayed repeatedly?	—	Go to Step17	Go to Step16
9	Is the speed sensor damaged or saw-toothed?	—	Go to Step14	Go to Step15
10	Adjust the preload of the wheel bearing. Is this step completed?	—	Go to Step18	—
11	Repair or replace the speed sensor/sensor rotor. Is this step completed?	—	Go to Step18	—
12	Repair the speed sensor/sensor rotor. Is this step completed?	—	Go to Step18	—
13	Replace the sensor rotor. Is this step completed?	—	Go to Step18	—
14	Replace the RL wheel speed sensor. Is this step completed?	—	Go to Step18	—
15	Check the RL wheel speed sensor circuit. (Refer to the check flow B-15.) Is this step completed?	—	Check the repair.	—
16	Check the circuit for open circuit, and the connector for improper connection the EHCU connector and the speed sensor connector. Refer to "Intermittent trouble". Is this step completed?	—	Go to Step18	—

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Step	Action	Value	YES	NO
17	Replace the EHCU. Is this step completed?	—	Go to Step18	—
18	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to “Diagnostic basic flow”.	Go to Step18

DTC:C0264 (Flash Code 64) Speed Sensor Signal Fault/Wrong Tire Size; RR**Check flow B-20**

Step	Action	Value	YES	NO
1	Check the tire. Is the tire specification correct? Is abnormal wear found in the outer surface?	—	Go to Step2	Replace with the specified tire without wear. Go to Step18
2	Has certain tire been rotated alone by performing for jack-up or roller tester?		DTC may be set if certain tire is rotated alone. Go to Step18	Go to Step3
3	Is the RR wheel bearing rattling?	—	Go to Step10	Go to Step4
4	Is the RR wheel speed sensor/sensor rotor rattling?	—	Go to Step11	Go to Step5
5	Is iron powder attached to the RR wheel speed sensor/sensor rotor?	—	Go to Step12	Go to Step6
6	Check the RR wheel speed sensor. (Refer to the check flow C-1-4.) Is the RR sensor output normal?	—	Go to Step7	Go to Step9
7	Does the sensor rotor have missing tooth or saw-toothed?	—	Go to Step13	Go to Step8
8	1. Clear the DTC. 2. Test run the vehicle, and perform the self-diagnosis. Is DTC displayed repeatedly?	—	Go to Step17	Go to Step16
9	Is the speed sensor damaged or saw-toothed?	—	Go to Step14	Go to Step15
10	Adjust the preload of the wheel bearing. Is this step completed?	—	Go to Step18	—
11	Repair or replace the speed sensor/sensor rotor. Is this step completed?	—	Go to Step18	—
12	Repair the speed sensor/sensor rotor. Is this step completed?	—	Go to Step18	—
13	Replace the sensor rotor. Is this step completed?	—	Go to Step18	—
14	Replace the RR wheel speed sensor. Is this step completed?	—	Go to Step18	—
15	Check the RR wheel speed sensor circuit. (Refer to the check flow B-16.) Is this step completed?	—	Check the repair.	—
16	Check the circuit for open circuit, and the connector for improper connection the EHCU connector and the speed sensor connector. Refer to "Intermittent trouble". Is this step completed?	—	Go to Step18	—

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Step	Action	Value	YES	NO
17	Replace the EHC. U. Is this step completed?	—	Go to Step18	—
18	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to “Diagnostic basic flow”.	Go to Step18

List of Trouble Symptom

Troubles not appeared as warning lamp indication can be classified into the following five categories.

1. The ABS operates frequently but brake force is insufficient, or the ASR operates frequently.
2. The ABS operates but pulling to one side.
3. Wheels are locked during brake operation.
4. Feeling of brake pedal is faulty.

5. Brake operating noise comes from the EHC. U. though the brake pedal is not depressed.

Self-diagnosis function is unable to detect these symptoms.

Check the trouble symptom by reproducing the condition through interviewing customer with the test run, and perform the diagnosis according to each trouble symptom.

No.	Trouble symptom	Diagnostic check flow	
		Without Tech 2	With Tech 2
1	The ABS operates frequently but brake force is insufficient, or the ASR operates frequently.	Check flow A-1	Check flow TA-1
2	The ABS operates but pulling to one side.	Check flow A-2	Check flow TA-2
3	Wheels are locked during brake operation.	Check flow A-3	Check flow TA-3
4	Feeling of brake pedal is faulty.	Check flow A-4	—
5	Brake operating noise comes from the hydraulic unit though the brake pedal is not depressed.	Check flow A-5	Check flow TA-5

Symptom: [The ABS Operates Frequently but Brake Force is Insufficient, or the ASR Operates Frequently.] (Check Flow A-1)
Check flow A-1

Step	Action	Value	YES	NO
1	Check the tire. Is the tire specification correct? Is abnormal wear found in the outer surface?	—	Go to Step2	Replace with the specified tire without wear. Go to Step7
2	Is the brake balance between front and rear wheels correct?	—	Go to Step3	Repair the brake components. Go to Step7
3	Are the axle-related parts correctly assembled?	—	Go to Step4	Repair the parts. Go to Step7
4	Is the speed sensor installation normal?	—	Go to Step5	Repair the wheel speed sensor. Go to Step7
5	Is the speed sensor/sensor rotor damaged? Or iron powder attached?	—	Go to Step6	Replace the sensor or sensor rotor. Go to Step7
6	Are all the wheel speed sensor outputs normal?	—	Replace the control unit. Go to Step7	Replace the wheel speed sensor, or repair the circuit. Go to Step7
7	Install all the components, and check that those are installed properly. Is this step completed?	—	Repeat "Diagnostic basic flow".	Go to Step7

Symptom: [The ABS Operates Frequently but Brake Force is Insufficient, or the ASR Operates Frequently.] (Check Flow TA-1)

Check flow TA-1

Step	Action	Value	YES	NO
1	1. Connect the Tech 2. 2. Check each sensor output from the "Wheel sensor". Is the lowest value of each wheel sensor reading 4 km/h (2 mph) or less? And is the value stable?	—	Go to Step2	Replace the wheel speed sensor.Go to Step3
2	Go back to the check flow A-1. Is the check flow A-1 completed?	—	Go to Step3	Go to Step2
3	Assemble all the components, and check that those are installed properly. Is this step completed?	—	Repeat "Diagnostic basic flow".	Go to Step3

CAUTION:

On the vehicle that the rear tires have smaller diameter, the rear wheel speed may be indicated a little higher than the front wheel speed. Check the speed after driving a while at a constant speed.

Symptom: [The ABS Operates but Pulling to One Side.] (Check Flow A-2)**Check flow A-2**

Step	Action	Value	YES	NO
1	Is the speed sensor installation normal?	—	Go to Step2	Repair.Go to Step5
2	Is the wheel speed sensor/sensor rotor damaged? Or iron powder attached?	—	Go to Step3	Repair or replace it.Go to Step5
3	Are the wheel speed sensor outputs normal? (Refer to the check flow C-1 or TC-1)	—	Go to Step4	Replace the sensor or repair the circuit. Go to Step5
4	Is the brake pipe connection correct?	—	Replace the control unit.Go to Step5	Correct the connection.Go to Step5
5	Assemble all the components, and check that those are installed properly. Is this step completed?	—	Repeat "Diagnostic basic flow".	Go to Step5

Symptom: [The ABS Operates but Pulling to One Side.] (Check Flow TA-2)**Check flow TA-2**

Step	Action	Value	YES	NO
1	1. Connect the Tech 2. 2. Check each wheel speed sensor output. Is each sensor output normal?	—	Go to Step2	Go to Step3
2	Check the brake pipe. Is the pipe normal?	—	Replace the EHCU.Go to Step4	Repair the pipe.Go to Step4
3	Repair and check the wheel speed sensor. (Refer to the check flow C-1 or TC-1.) Is this step completed?	—	Go to Step4	Go to Step3
4	Assemble all the components, and check that those are installed properly. Is this step completed?	—	Repeat "Diagnostic basic flow".	Go to Step4

CAUTION:

On the vehicle that the rear tires have smaller diameter, the rear wheel speed may be indicated a little higher than the front wheel speed. Check the speed after driving a while at a constant speed.

Symptom: [Wheels are Locked During Brake Operation.] (Check Flow A-3, TA-3)**Check flow A-3, TA-3**

Step	Action	Value	YES	NO
1	Does the ABS operate?	—	Go to Step2	Go to Step4
2	Is the vehicle speed 10km/h (6 mph) or less?	—	Go to Step3	Normal
3	Are the wheel speed sensor outputs normal? (Refer to the check flow C-1 or TC-1)	—	Go to Step4	Replace the sensor or repair the circuit. Go to Step5
4	Is the EHCU grounded properly?	—	Replace the EHCU.Go to Step5	Repair.Go to Step5
5	Assemble all the components, and check that those are installed properly. Is this step completed?	—	Repeat “Diagnostic basic flow”.	Go to Step5

Symptom: [Feeling of Brake Pedal is Faulty.] (Check Flow A-4)**Check flow A-4**

Step	Action	Value	YES	NO
1	Does the stop lamp come on when depressing the brake pedal?	—	Go to Step2	Go to Step3
2	1. Turn the starter switch OFF. 2. Disconnect the connector of the EHCU. 3. Measure the voltage between the J-177 connector terminal 16 and the J-177 connector terminal 1,23 with the brake pedal depressed. Is the power supply voltage supplied to it?	—	Go to Step4	Repair the circuit between the stop lamp switch and the control unit.Go to Step7
3	Is the stop lamp fuse F-5 normal?	—	Go to Step5	Replace the fuse.Go to Step7
4	Check for continuity between the J-177 connector terminal 1,23 and the body ground. Is there continuity?	—	Go to Step6	Repair the body ground circuit.Go to Step7
5	Is the stop lamp switch normal?	—	Repair the stop lamp circuit.Go to Step7	Replace the stop lamp switch.Go to Step7
6	Check the suspicious circuit/connector for improper connection. Is there improper connection?	—	Brake fluid line is leaked or air mixed. (Refer to Section 5A.)Go to Step7	Repair the circuit.Go to Step7
7	Assemble all the components, and check that those are assembled properly. Is this step completed?	—	Repeat "Diagnostic basic flow".	Go to Step7

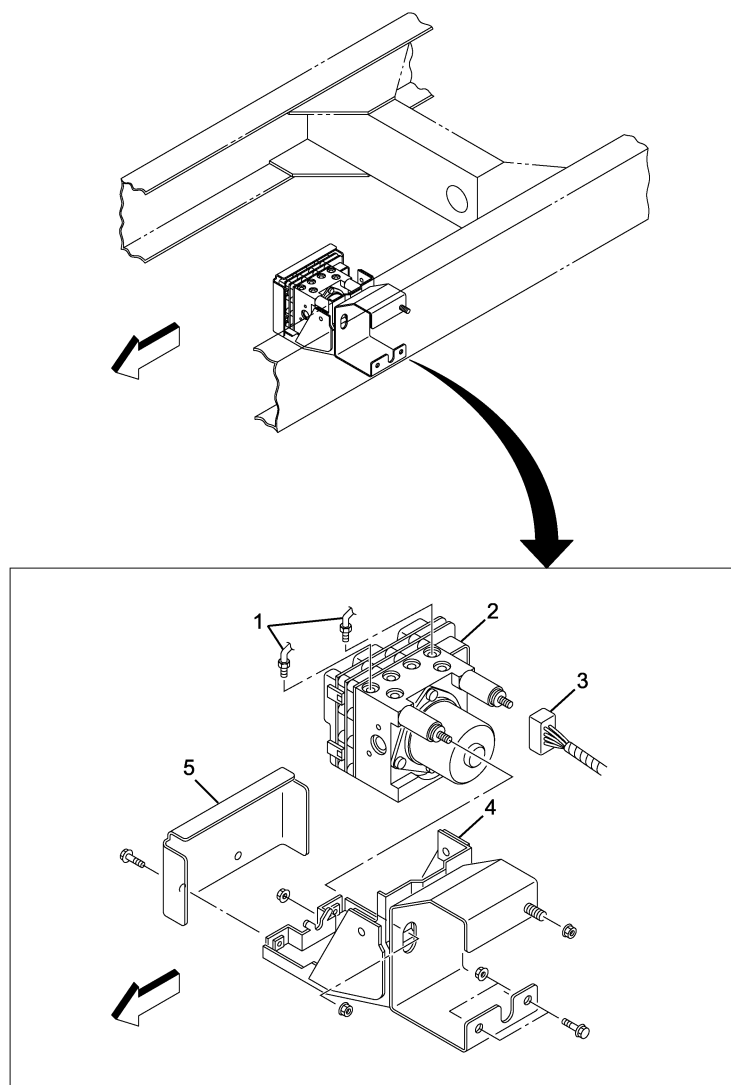
Symptom: [Brake Operating Noise Comes from the Hydraulic Unit Though the Brake Pedal is not Depressed.] (Check Flow A-5, TA-5)

Check flow A-5, TA-5

Step	Action	Value	YES	NO
1	Is this the first time operation since the engine is started?	—	Normal (It is a motor check operation noise of self-diagnosis function.)	Go to Step2
2	Is the vehicle speed 10km/h (6 mph) or less?	—	Normal (It is a motor check operation noise of self-diagnosis function.)	Go to Step3
3	Check for noise in the following conditions: • When shifting down, or when operating the clutch • When driving a slippery low-temperature road (iced or snow-covered), or when driving a rough road • While turning with high speed • When driving over a bump (such as curb-stone) • When operating electrical switches • When running the engine high speed Is noise generated in any of the above conditions?	—	Normal (ABS may operate without depressing the brake pedal.)	Go to Step4
4	Do all the speed sensor/sensor rotor operate normally?	—	Go to Step5	Repair.Go to Step7
5	Is the wheel speed sensor/sensor rotor damaged? Or iron powder attached?	—	Go to Step7	Repair or replace it.Go to Step6
6	Are all the sensor outputs normal? (Refer to the check flow C-1 or TC-1)	—	Check the suspicious circuit/connector for improper connection. If the connection is normal, replace the EHCU.Go to Step7	Repair.Go to Step7
7	Assemble all the components, and check that those are installed properly. Is this step completed?	—	Repeat "Diagnostic basic flow".	Go to Step7

Electronic Hydraulic Control Unit (EHCU)

Components



N5A2039E

Legend

- | | |
|--------------|------------|
| 1. Pipe | 4. Bracket |
| 2. EHCU | 5. Cover |
| 3. Connector | |

Removal

CAUTION:

- When performing electric-arc welding on the vehicle, remove the EHCU before starting welding work.
- When removing the EHCU from the vehicle, disconnect the battery cable first, and then disconnect the connector. Connect in the reverse order of disconnection.
- Do not place intense radio emission equipment such as radio device near the EHCU.
- Do not pour water to the EHCU directly.
- Never loosen the screw of the EHCU body. Nor apply paint to the EHCU body.
- Do not let metal products directly contact with the connector pin terminals, including screwdriver and or tester probe.
- Use special care for electrostatic.
- Do not directly apply external voltage to the terminals.

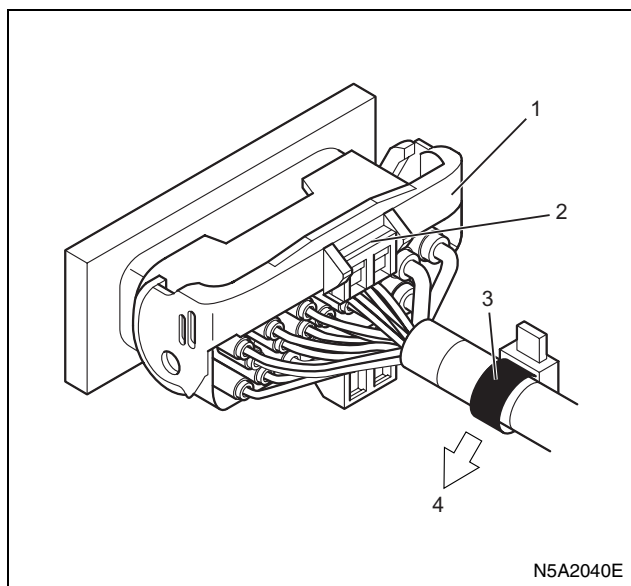
- When handling, do not hold the pipe of the upper EHCU.
- Never loosen the bolts and nuts of the EHCU body. If loosened, that EHCU must not be used anymore.

1. Cover

- Remove the cover.

2. Harness connector

- If the harness is fixed to the EHCU bracket, loosen the fixing clip.



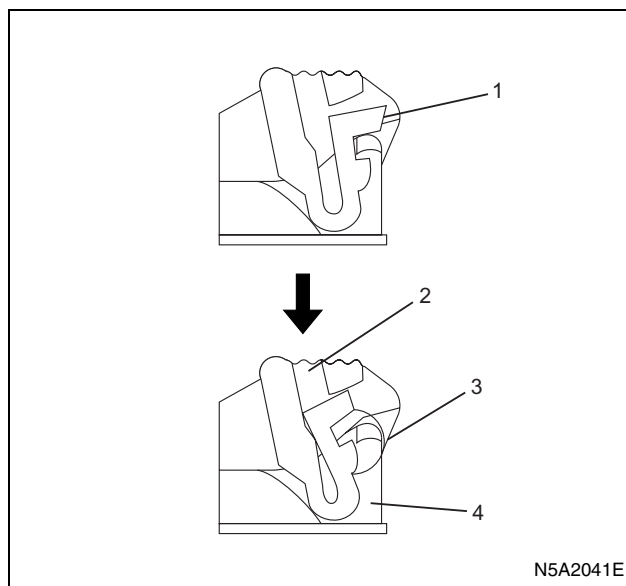
Legend

1. Lever
2. Lever lock
3. Clip
4. Fixed to EHCU bracket.

- Unlock the connector. Pull down the lever lock to the unlock position.

Notice:

Make sure the lock portion (A portion) is in the unlock position.



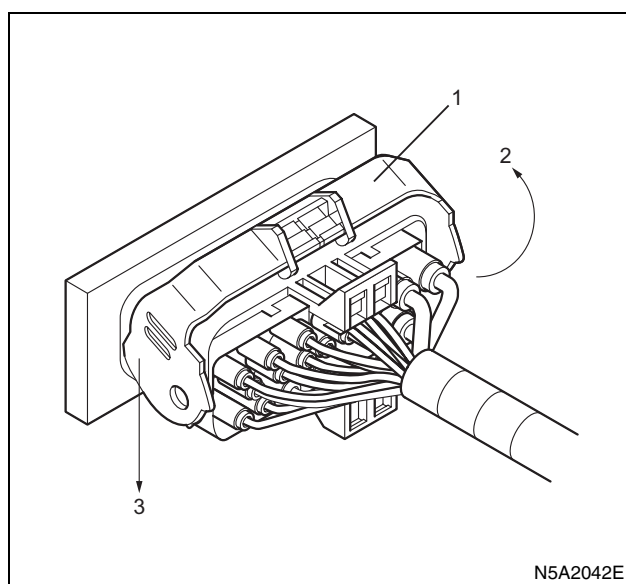
Legend

1. Lever lock
2. Lever
3. Lock portion (A portion)
4. Housing

- Operate the lever.

Notice:

Operate the lever till the lever becomes heavy. Then change the force direction to the downward of the connector. (See illustration.) Applying force to the EHCU-side may damage the connector.



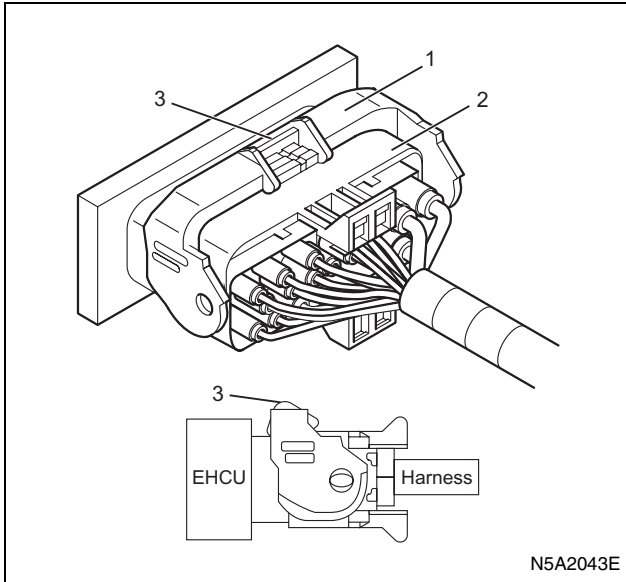
Legend

1. Lever
2. Lever operation (rotation direction)
3. Force applied direction when operating lever

- Move the connector to the opposite side of the EHCU to remove.

Notice:

With the lever in stop position, make sure that the lever surface (lock portion side) is almost perpendicular to the connector before removing the connector.


Legend

1. Lever
2. Connector
3. Lever lock

3. Brake pipe
 - Disconnect the six brake pipes.
4. EHCU fixing nut
 - Disconnect the three nuts fixing the EHCU.
5. EHCU
 - Remove the EHCU.
6. Bracket
 - Remove the bracket.

Installation
CAUTION:

- Be sure to use ground bolt to install the ground.
- Make sure there is no dust or foreign materials in and around the pipe connection.
- Be careful that the pipe is connect to correctly.
- After EHCU installation, bleed air from the brake system completely. Remove the fuse (FL-9 (40A)) of ABS to deactivate the ABS before air bleeding operation.
- Be sure to use fresh specified brake fluid.

1. Bracket
 - Install the bracket to the frame if it has been removed.
2. EHCU
 - Install the EHCU to the bracket.
3. EHCU fixing nut
 - Install the EHCU fixing nuts.

Tighten:

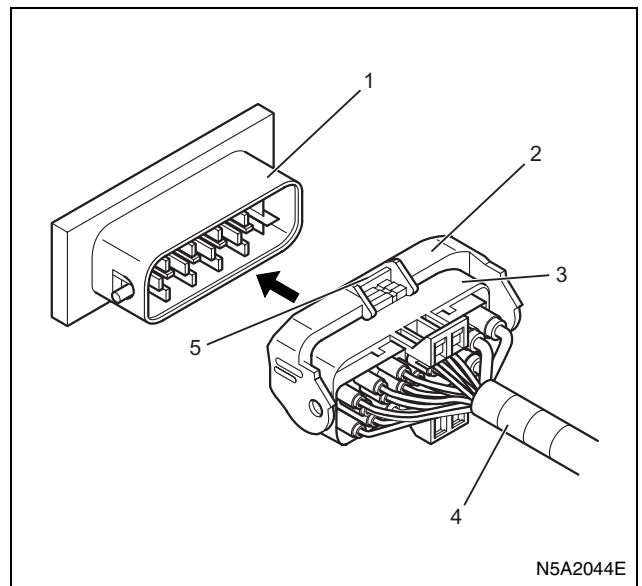
Nut to 22 N·m (2.2 kg·m / 16.2 lb·ft)

4. Brake pipe
 - Install the brake pipe.

Tighten:

Brake pipe to 16 N·m (1.6 kg·m / 11.8 lb·ft)

5. Harness connector
 - Align the harness-side connector with the EHCU-side connector.

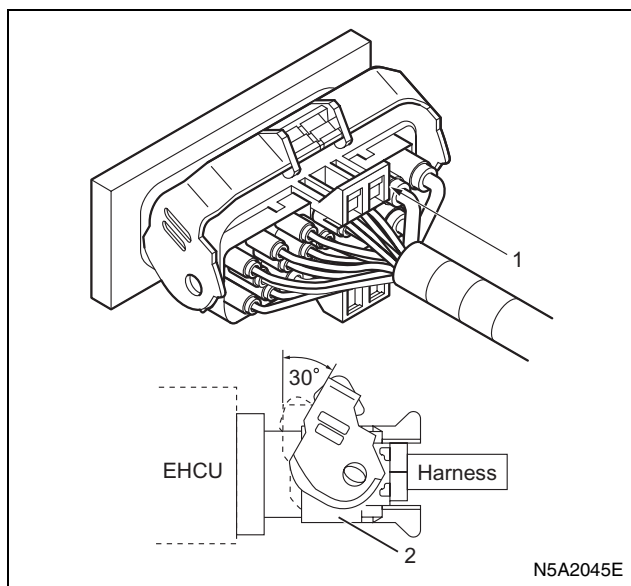

Legend

1. EHCU-side connector
2. Lever
3. Housing
4. Harness
5. Lever lock

- Insert the harness-side connector to the EHCU-side connector.

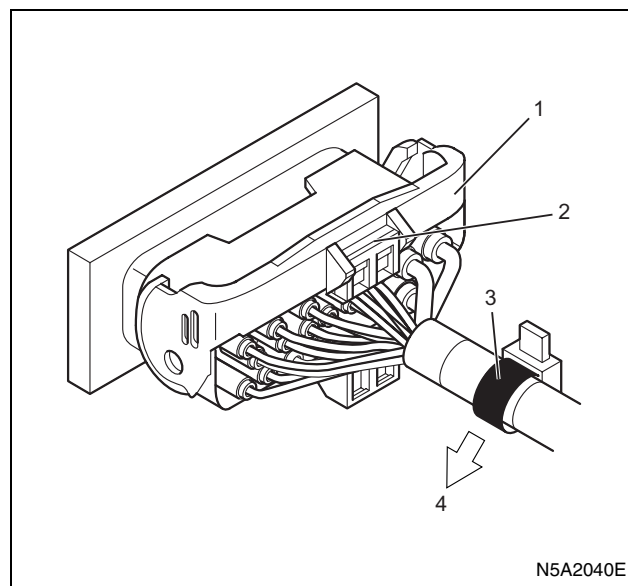
Notice:

The lever moves approx. 30° when the connector is inserted.

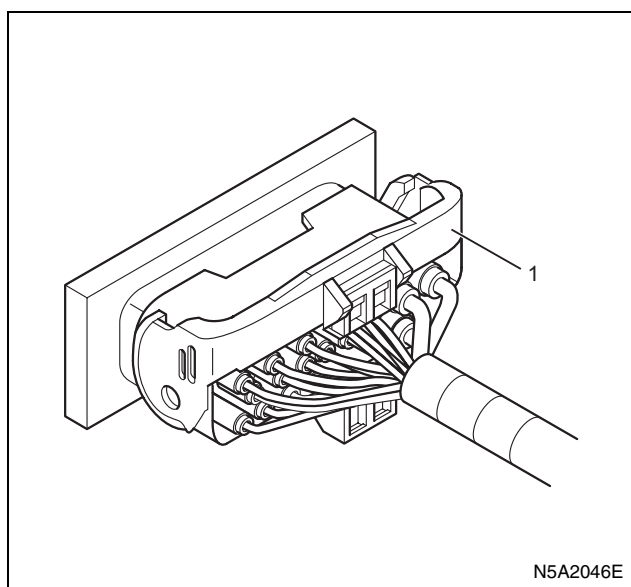
**Legend**

1. Pushing direction
2. Harness-side connector

- Operate the lever to lock the lever lock to the housing.

**Legend**

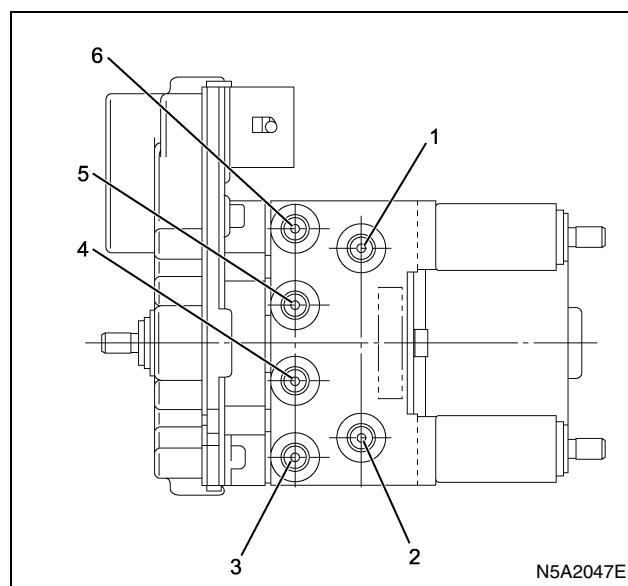
1. Lever
2. Lever lock
3. Clip
4. Fixed to EHCUs bracket.

**Legend**

1. Lever

- If the harness was fixed to the EHCUs bracket, fix the harness with the fixing clip.

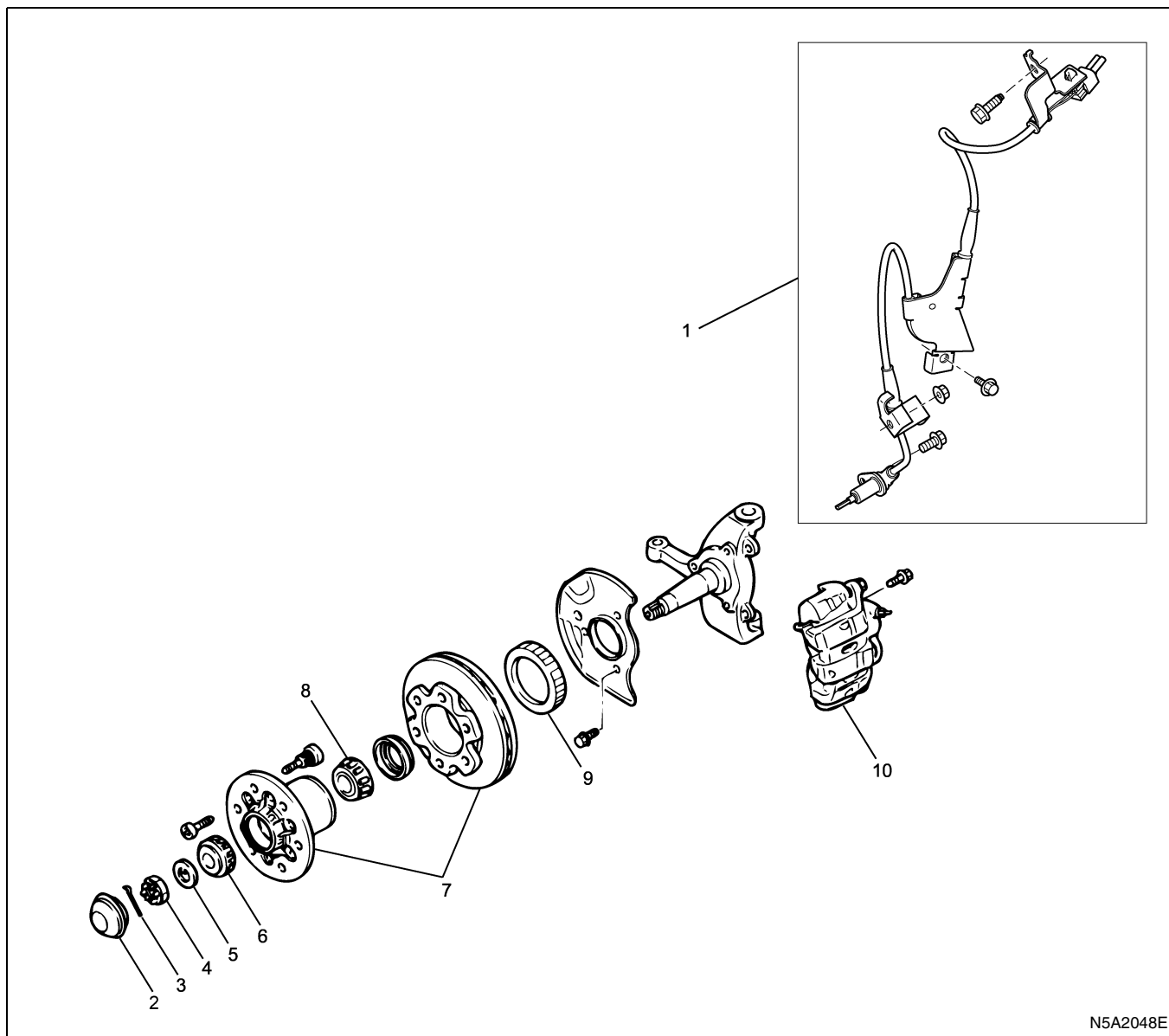
6. Cover
- Install the cover.

**Legend**

1. Master cylinder (front wheel)
2. Master cylinder (rear wheel)
3. RR wheel master cylinder
4. RL wheel master cylinder
5. FR wheel master cylinder
6. FL wheel master cylinder

Speed Sensor (Front)

Components



N5A2048E

Legend

- | | |
|---|---------------------------|
| 1. Speed sensor (model with rigid suspension) | 6. Outer bearing |
| 2. Hub cap | 7. Hub & rotor assembly |
| 3. Cotter pin | 8. Inner bearing |
| 4. Hub nut | 9. Sensor rotor |
| 5. Thrust washer | 10. Disc caliper assembly |

Removal

1. Harness connector
 - Disconnect the harness connector.
2. Harness fixing bolt
 - Remove the harness fixing bolt.
3. Sensor fixing bolt
 - Remove the sensor fixing bolt.
4. Speed sensor (front)

Installation

CAUTION:

- Do not let the speed sensor body contact with the sensor rotor during hub assembly. Otherwise the parts will be damaged.
- The speed sensor body has a built-in magnet. Be careful not to allow metallic materials attached to it.

- Remove the speed sensor before removing the hub & rotor assembly or the hub & drum assembly.
 - Remove the speed sensor before hammering to remove the knuckle etc.
 - Use the harness line as a reference to avoid the harness from twisting, when installing the sensor harness.
 - To install the sensor, press-fit the sensor until the sensor flange contacts closely with the installing surface by your hand, and then tighten with the bolt.
1. Speed sensor (front)
 - Install the speed sensor.
 2. Sensor fixing bolt
 - Install the sensor fixing bolt.

Tighten:

Bolt to 22 N·m (2.2 kg·m / 16.2 lb·ft)

3. Harness fixing bolt

- Install the harness fixing bolt.
Frame side

Tighten:

Bolt to 22 N·m (2.2 kg·m / 16.2 lb·ft)

Tighten together with the dust cover
(model with drum brake)**Tighten:**

Bolt to 15 N·m (1.5 kg·m / 11.1 lb·ft)

Tighten together with the brake support
(model with rigid disc brake)**Tighten:**

Bolt to 45 N·m (4.6 kg·m / 33.2 lb·ft)

4. Harness connector

- Connect the harness connector.

Inspection

This section explores inspection procedures as the reference to perform "Diagnostics with symptom" and "Diagnosis with illumination pattern".

	Without Tech 2	With Tech 2
Speed sensor output check	Check flow C-1-1 — C-1-4	Check flow TC-1

FL Wheel Speed Sensor Output Check Procedure**Check flow C-1-1**

Step	Action	Value	YES	NO
1	1. Turn the starter switch OFF. 2. Disconnect the EHCUC connector. 3. Jack-up the vehicle to lift the front wheels off the floor. 4. Measure the AC voltage between the J-177 connector terminals 32 and 33 while turning the FL wheel half turn/sec. Is the value within specified value?	200mV or more	Go to Step5	Go to Step2
2	1. Disconnect the FL sensor connector J-75. 2. Measure the resistance between the J-75 connector terminals 1 and 2 (sensor side). Is the value within specified value?	1 — 2kΩ	Go to Step4	Go to Step3
3	Replace the FL sensor. Is this step completed?	—	Go to Step5	—
4	Repair the circuit for open/short circuit, and the connector for improper connection between the connector of EHCUC and the sensor connector. Is this step completed?	—	Go to Step5	—

5A4-76 ABS/ASR

Step	Action	Value	YES	NO
5	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to “Diagnostic basic flow”.	Go to Step5

FR Wheel Speed Sensor Output Check Procedure

Check flow C-1-2

Step	Action	Value	YES	NO
1	1. Turn the starter switch OFF. 2. Disconnect the EHCUC connector. 3. Jack-up the vehicle to lift the front wheels off the floor. 4. Measure the AC voltage between the J177 connector terminals 10 and 11 while turning the FR wheel half turn/sec. Is the value within specified value?	200mV or more	Go to Step5	Go to Step2
2	1. Disconnect the FR sensor connector J-74. 2. Measure the resistance between the J-74 connector terminals 1 and 2 (sensor side). Is the value within specified value?	1 — 2kΩ	Go to Step4	Go to Step3
3	Replace the FR sensor. Is this step completed?	—	Go to Step5	—
4	Repair the circuit for open/short circuit, and the connector for improper connection between the connector of EHCUC and the sensor connector. Is this step completed?	—	Go to Step5	—
5	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to “Diagnostic basic flow”.	Go to Step5

Speed Sensor Output Check Procedure (With Tech 2)

Check flow TC-1

Step	Action	Value	YES	NO
1	1. Connect the Tech 2. 2. Check each sensor lowest speed from the “Wheel sensor”. Is the sensor speed 4km/h (2mph) or more?	—	Go to Step2	Go to Step6
2	Check the suspicious sensor circuit for open circuit. (Check with shaking the wire and the connector.) Is the sensor circuit connection normal?	—	Replace the speed sensor. Go to Step3	Repair. Go to Step3

Step	Action	Value	YES	NO
3	Check each sensor lowest speed from the "Wheel sensor". Is the sensor speed 4km/h (2mph) or more?	—	Go to Step4	Go to Step6
4	Check the sensor rotor. Is the sensor rotor normal?	—	Go to Step5	Replace the sensor rotor.Go to Step5
5	Check each sensor lowest speed from the "Wheel sensor". Is the sensor speed 4km/h (2mph) or more?	—	Repair the circuit or circuit between the EHCU and the speed sensor. Go to Step6	Go to Step6
6	Install all the components, and check that those are installed properly. Is this step completed?	—	Repeat "Diagnostic basic flow".	Go to Step6

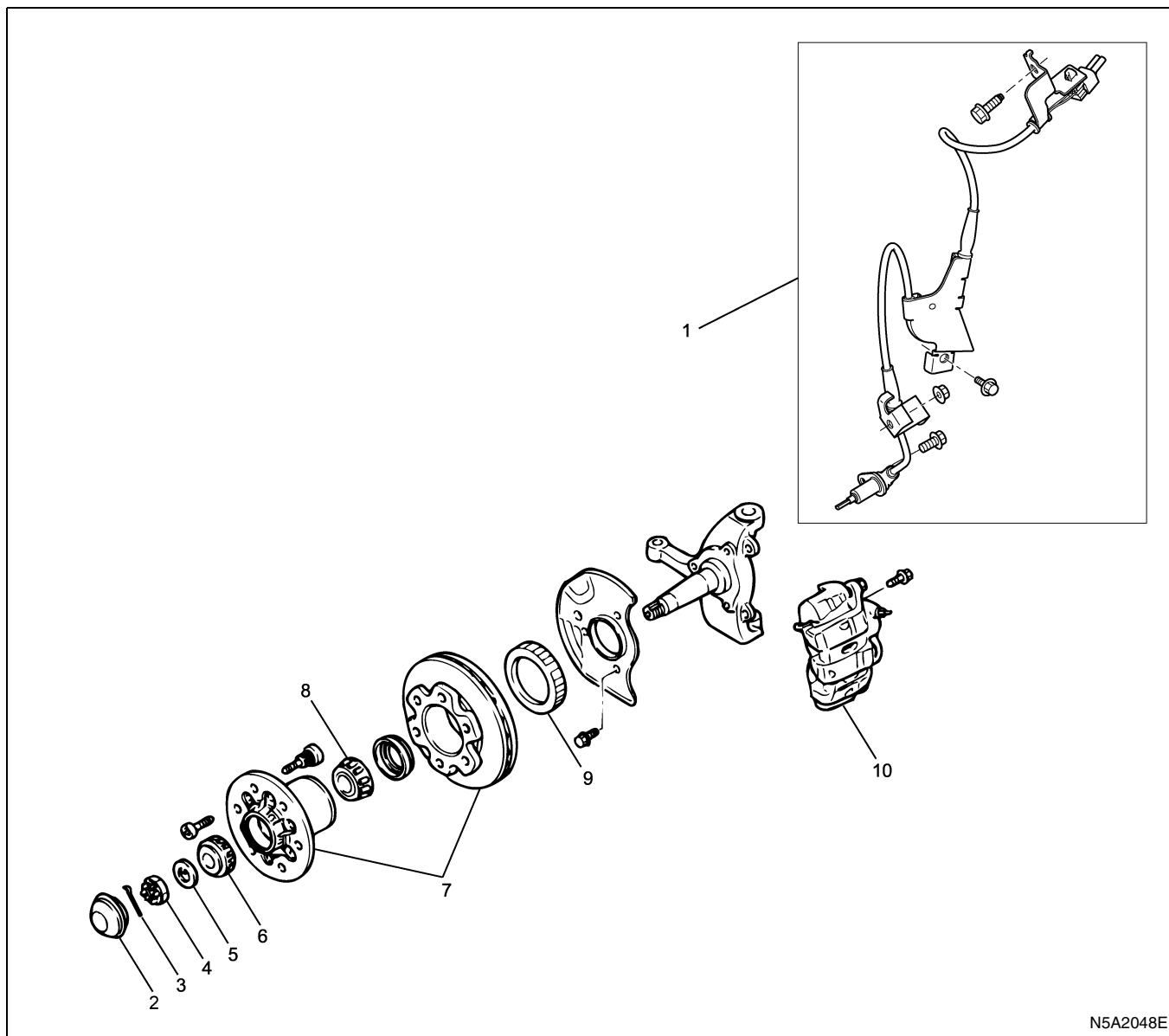
Used for checking the front speed sensor, or the rear speed sensor when no DTC is set.

CAUTION:

On the vehicle that the rear tires have smaller diameter, the rear wheel speed may be indicated a little higher than the front wheel speed. Check the speed after driving a while at a constant speed.

Sensor Rotor (Front Wheel)

Components



N5A2048E

Legend

- | | |
|---|---------------------------|
| 1. Speed sensor (model with rigid suspension) | 6. Outer bearing |
| 2. Hub cap | 7. Hub & rotor assembly |
| 3. Cotter pin | 8. Inner bearing |
| 4. Hub nut | 9. Sensor rotor |
| 5. Thrust washer | 10. Disc caliper assembly |

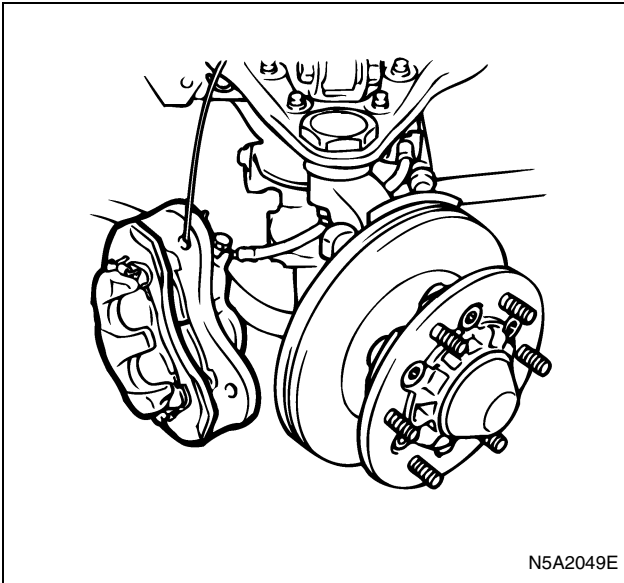
Removal

CAUTION:

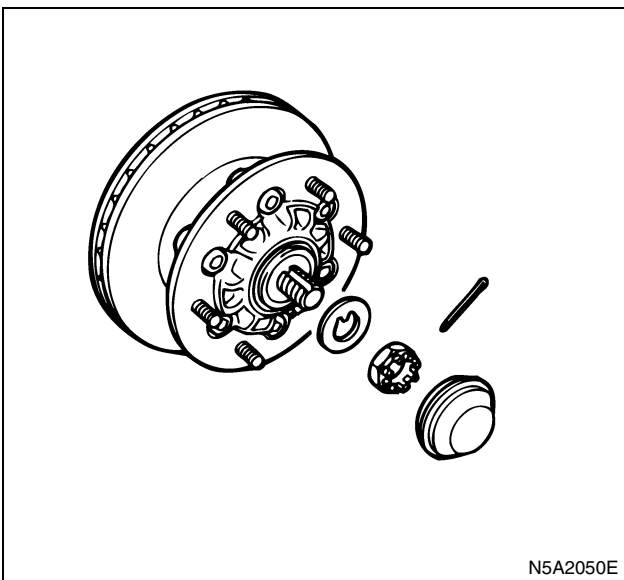
- Hold the brake hose and the caliper assembly with wire or the like to prevent them from dropping, to stand clear from the service work. Do not bend the hose sharply or stretch it to the limit.
- Remove the brake hose if necessary. If to be removed, be careful to prevent the brake fluid from

flowing out and protect it from intrusion of foreign materials.

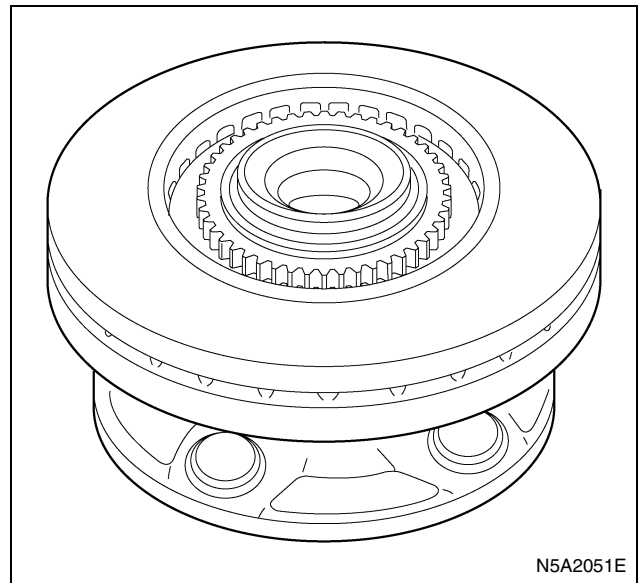
1. Remove the disc brake caliper. (Model with disc brake)



2. Guard (NPR with disc brake)
 - Remove the guard.
3. Speed sensor (NPS)
 - Remove the head section of the speed sensor from the knuckle.
4. Hub cap (NPR)
 - Remove the hub cap.
5. Free wheel hub assembly (NPS)
 - Remove the free wheel hub assembly.
6. Cotter pin (NPR)
 - Remove the cotter pin.
7. Lock washer (NPS)
 - Remove the lock washer and the fixing screw.
8. Hub nut
 - Remove the hub nut.
9. Thrust washer (NPR)
 - Remove the thrust washer.
10. Hub & rotor assembly



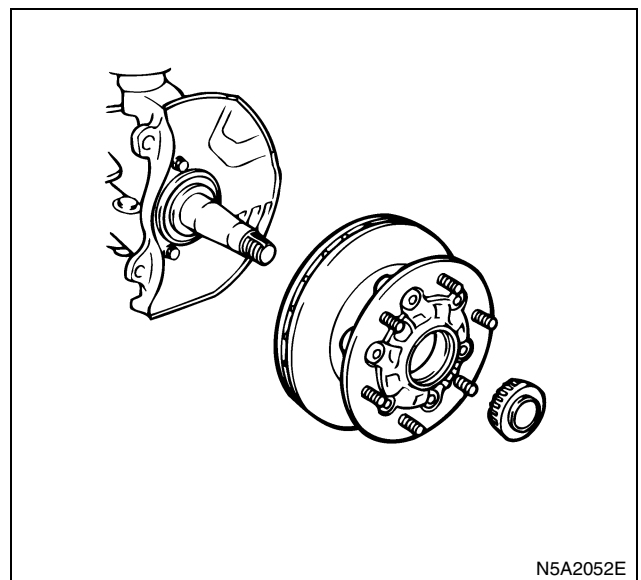
11. Outer bearing inner race
12. Sensor rotor (front wheel)
 - Use a puller to take out the sensor rotor.



Installation

1. Sensor rotor (front wheel)
 - Press-fit the new sensor rotor with a bench press around the circumference until it contacts.
2. Hub & rotor assembly
 - Fill the outer bearing with grease (Besco L-2), and install it to the hub.

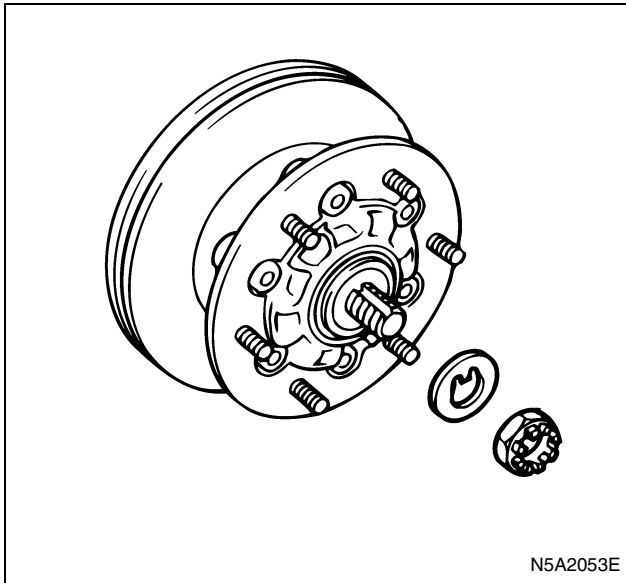
CAUTION:
Use new oil seal.



3. Outer bearing inner race
4. Thrust washer (NPR)
 - Install the thrust washer.
5. Hub nut
 - Install the hub nut.

CAUTION:

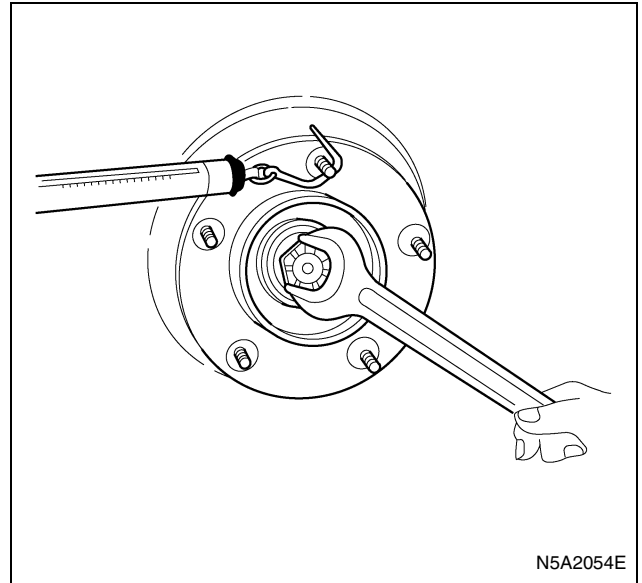
After installing the thrust washer and the hub nut, adjust the hub bearing preload.


Hub bearing preload adjustment

- Tighten the hub nut till the hub no longer be turned, and then loosen it completely.
 - Turn the hub to make the bearing seated.
 - Attach a spring balance to the wheel pin. While pulling the it tangentially, tighten the hub nut so that the hub rotates with the specified value.
 - For hub bearing preload, refer to "FRONT AXLE" in Section 4C.
6. Cotter pin (NPR)
 - After preload adjustment, install the cotter pin. If the pin hole does not match the groove on the nut, adjust them by turning minimum to the tightening direction.
 7. Lock washer (NPS)
 - Install the pawl to the cutout of the spindle securely, and tighten with the screw.

Tighten:

Lock washer to 10 N·m (1.0 kg·m / 7.4 lb·ft)


8. Hub cap

- Fill the hub cap with grease (Besco L-2), and drive it in to the hub.

9. Free wheel hub assembly (NPS)

- Install the free wheel hub assembly.

CAUTION:

Be sure to adjust the drive shaft axial play.

10. Speed sensor (NPS)

- Install the head section of the speed sensor to the knuckle and tighten the bolt to the specified torque.

Tighten:

Speed sensor to 22 N·m (2.2 kg·m / 16.2 lb·ft)

11. Guard (NPR with disc brake)

- Install the guard.

Tighten:

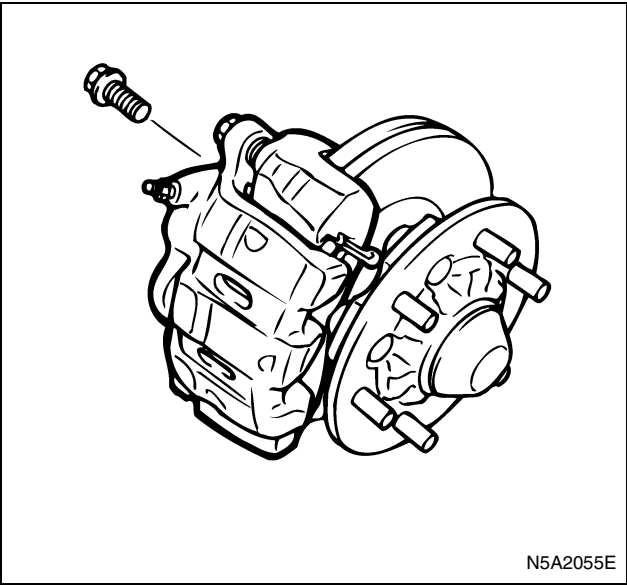
Guard to 37 N·m (3.7 kg·m / 27.3 lb·ft)

12. Disc brake caliper assembly (Model with disc brake)

- Install the disc brake caliper assembly.

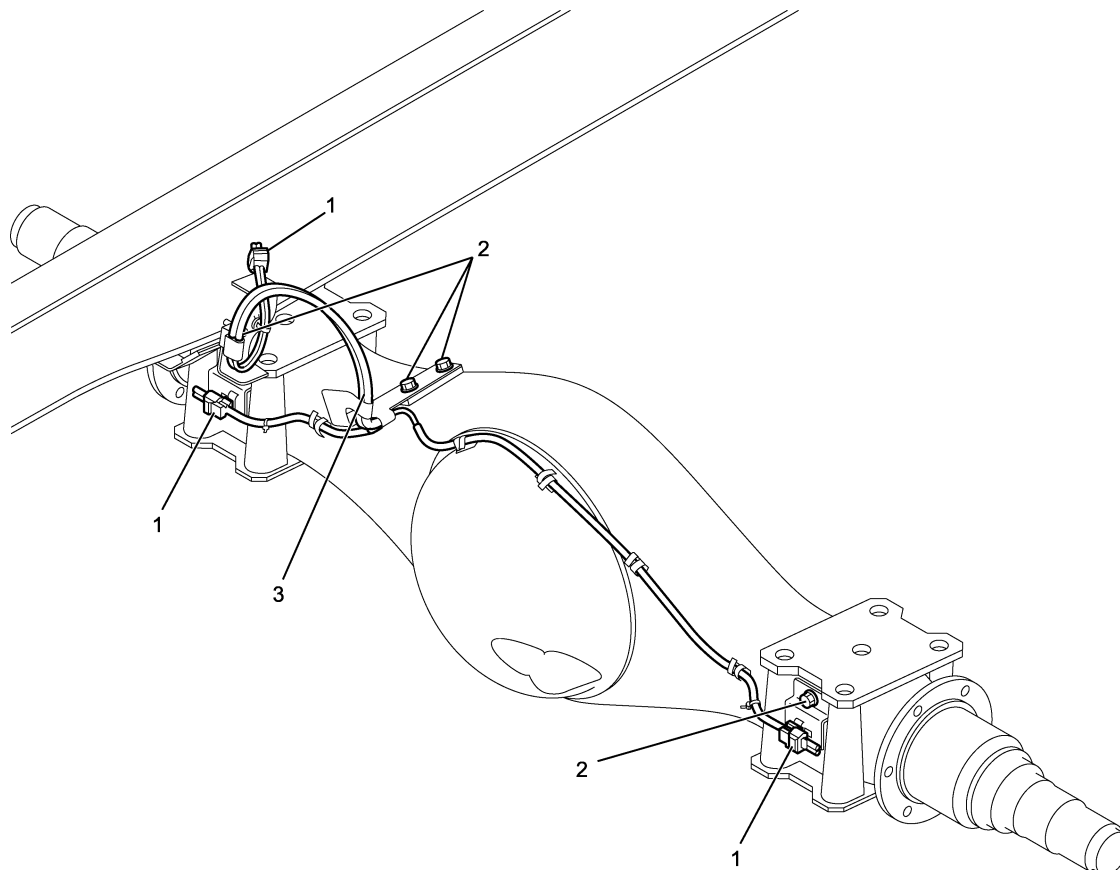
Tighten:

Disc brake calper to 220 N·m (22.5 kg·m / 162.3 lb·ft)



Sensor Harness (Rear Axle)

Components



N5A2056E

Legend

- | | |
|--------------------------------|-------------------|
| 1. Harness connector | 3. Sensor harness |
| 2. Harness bracket fixing bolt | |

Removal

1. Harness connector
 - Disconnect the harness connector.
2. Harness bracket fixing bolt
 - Remove the harness bracket fixing bolt.
3. Sensor harness
 - Remove the sensor harness.

Installation

CAUTION:
Take care not to twist the harness during installation.

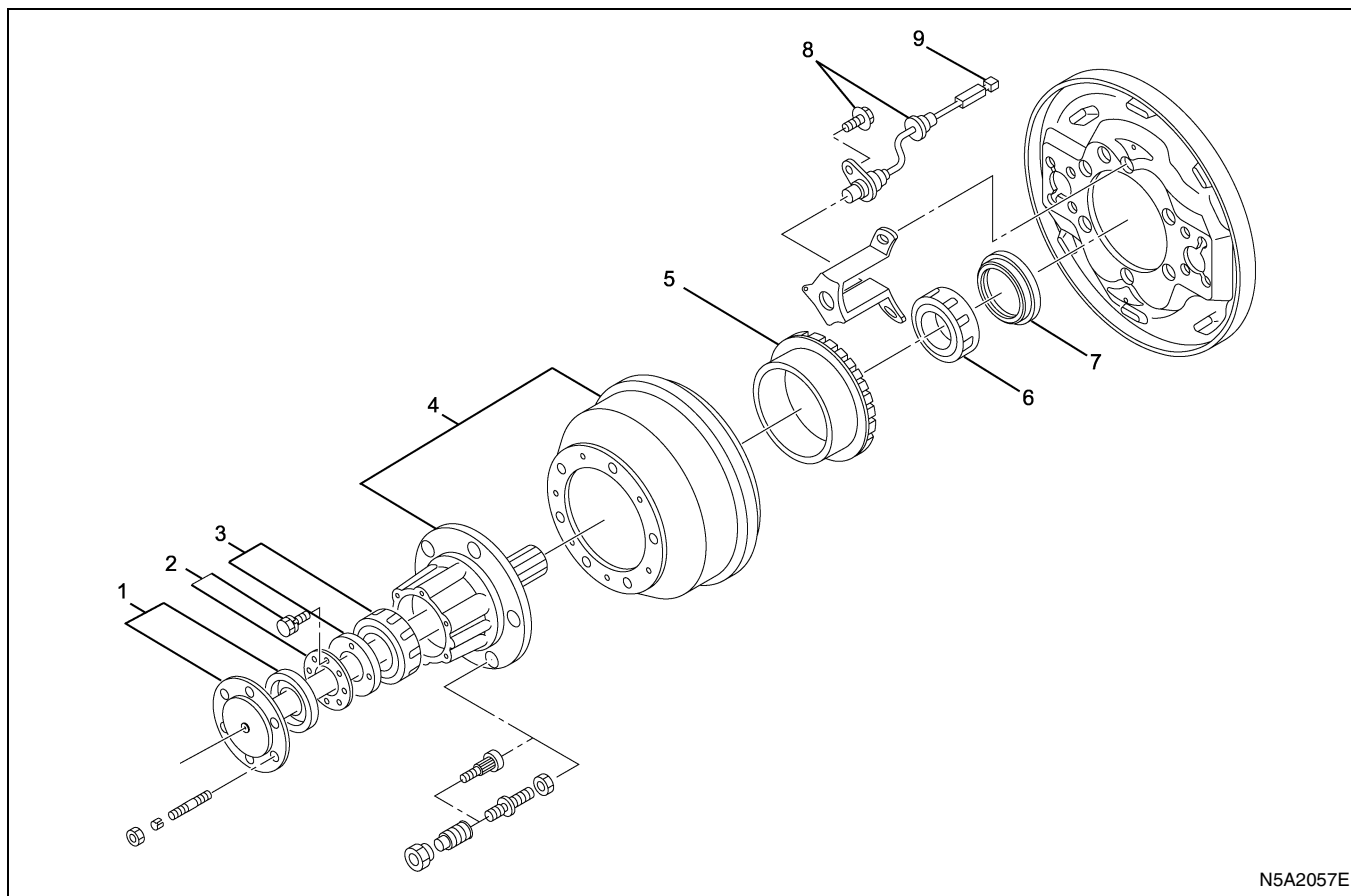
1. Sensor harness
 - Install the sensor harness.
2. Harness bracket fixing bolt
 - Install the harness bracket fixing bolt.

Tighten:

- Flange bolt (except below) to 22 N·m (2.2 kg·m / 16.2 lb·ft)
 - SEMS bolt (2 points on the axle case upper face) to 13 N·m (1.3 kg·m / 9.6 lb·ft)
3. Harness connector
- Connect the harness connector.

Rear Speed Sensor

Components



N5A2057E

Legend

- | | |
|------------------------------------|----------------------|
| 1. Axle shaft, outer oil seal | 6. Inner bearing |
| 2. Bearing lock washer, lock nut | 7. Inner oil seal |
| 3. Outer bearing, bearing lock nut | 8. Rear speed sensor |
| 4. Hub and drum | 9. Harness connector |
| 5. Sensor rotor | |

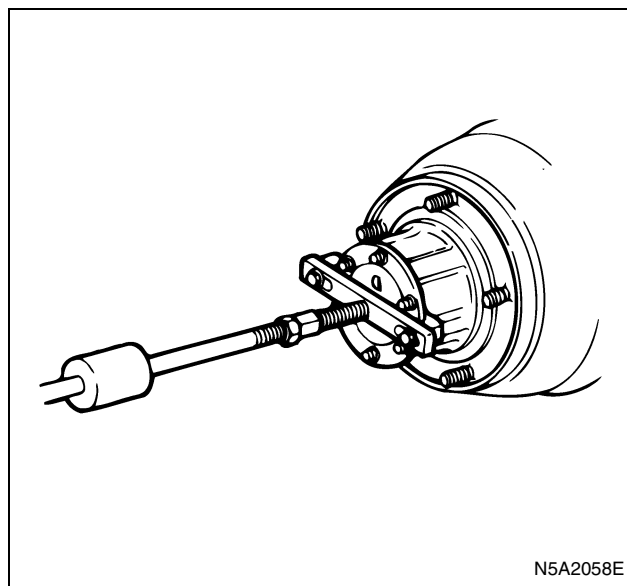
Removal

1. Rear axle shaft, outer oil seal, lock washer
 - Remove the axle shaft installing nut, and remove the rear axle shaft.

Special tool:

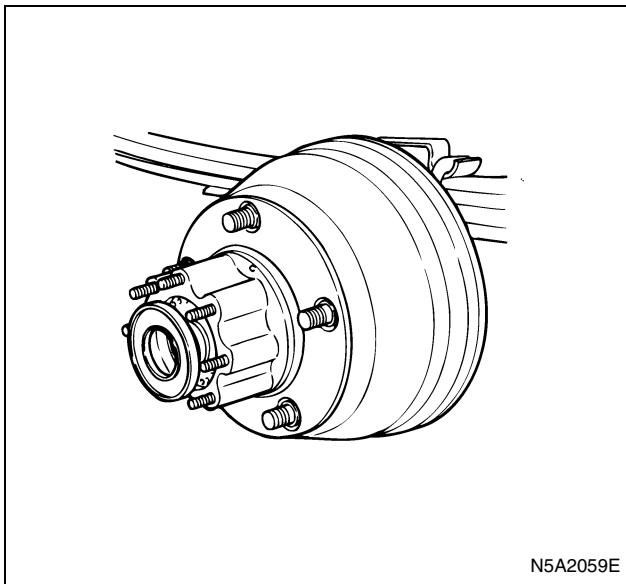
Universal puller: 5-8840-2027-0

Slide hammer: 5-8840-0084-0

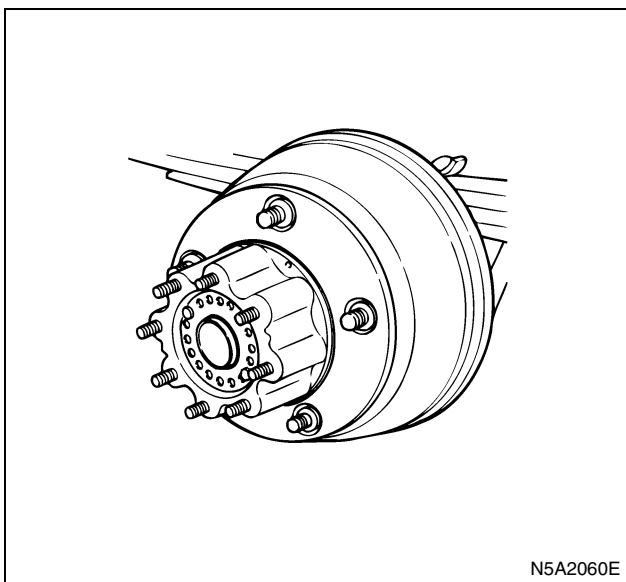


N5A2058E

- Remove the outer oil seal.



- Remove the lock washer installing bolt.



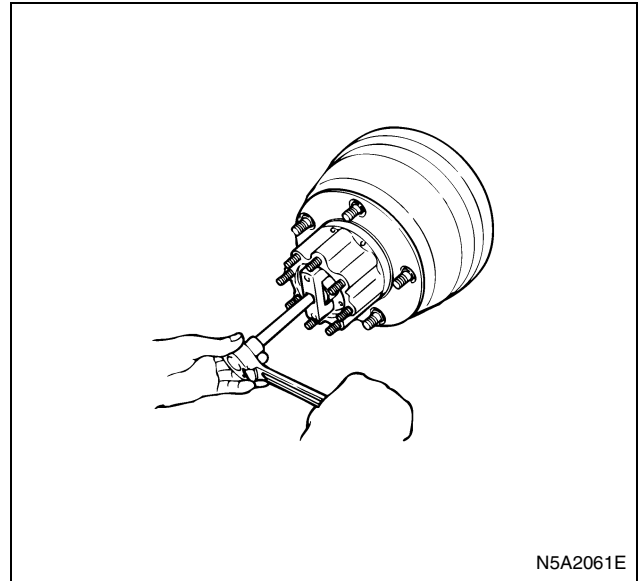
2. Bearing lock nut, outer bearing, hub

- Remove the bearing nut.

Special tool:

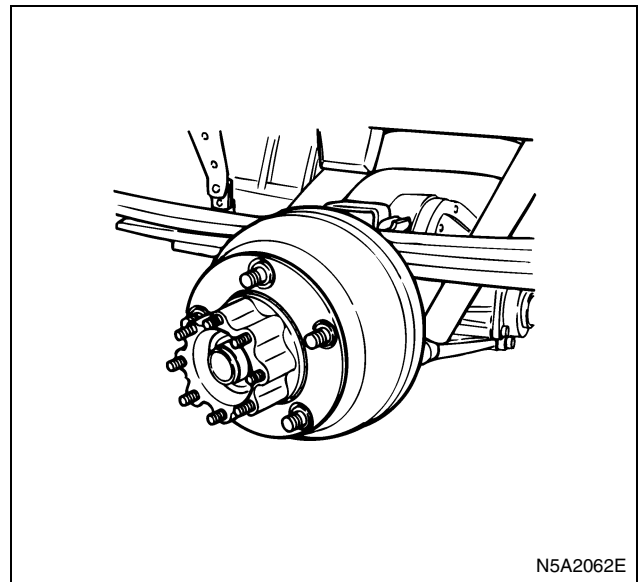
Wrench: 9-8522-1188-0

- Remove the outer bearing.



3. Hub and drum assembly

- Remove the hub and drum assembly.



4. Inner oil seal

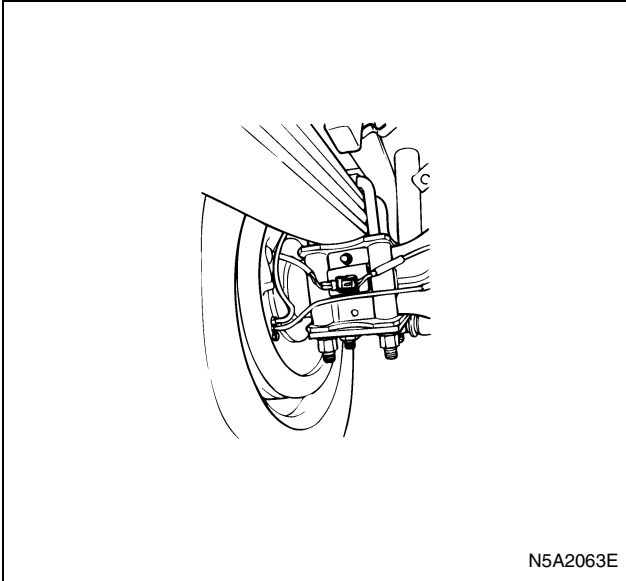
- Remove the inner oil seal.

5. Inner bearing

- Remove the inner bearing.

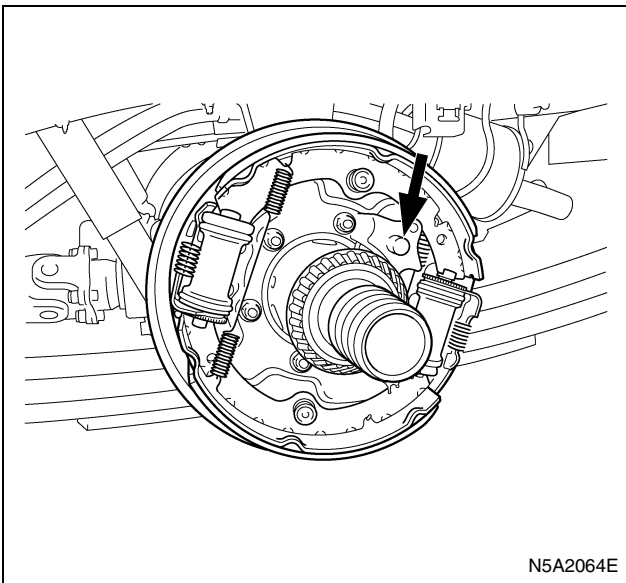
6. Harness connector

- Disconnect the connection of the harness connector.



7. Rear speed sensor

- Remove the speed sensor installing bolt, and take out from the sensor bracket.



Installation

CAUTION:

- Grommet in the back plate must be installed securely.
- Bearing lock nut must be installed with its slit surface facing outside.

1. Rear speed sensor

- Tighten the speed sensor installing bolt.

Tighten:

Bolt to 22 N·m (2.2 kg·m / 16.2 lb·ft)

2. Harness connector

- Connect the harness connector.

3. Inner bearing

- Install the inner bearing.

4. Inner oil seal

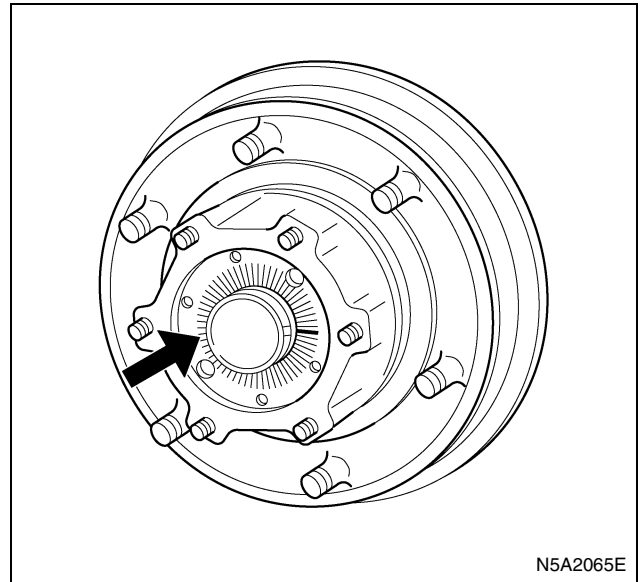
- Install the inner oil seal.

5. Hub and drum assembly

- Install the hub and drum assembly.

6. Outer bearing, hub, bearing lock nut

- Install the outer bearing, hub, and bearing lock nut.

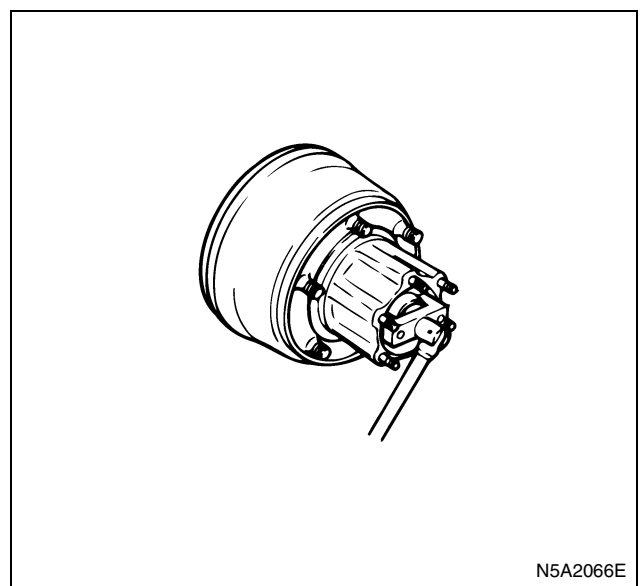


Rear hub bearing preload adjustment

- Rotate the hub to the left and right several times to make it seated.
- Tighten the bearing lock nut till the hub no longer be turned. Then, back off to a degree that the hub rotates easily.

Special tool:

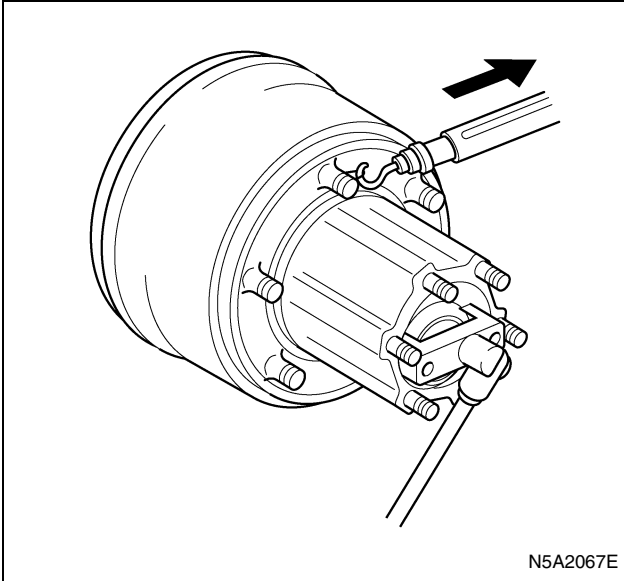
Wrench: 9-8522-1180-0



- Attach a spring balance to the wheel pin. While pulling it tangentially, tighten the bearing nut so that the spring balance reading shows the specified value when the hub starts rotation.

Tighten:

Starting to 42 — 52 N (4.3 — 5.3 kg / 9.4 — 11.7 lb)



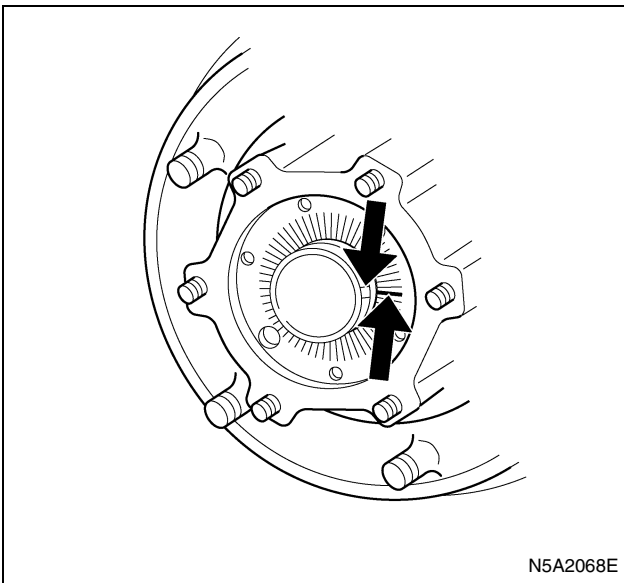
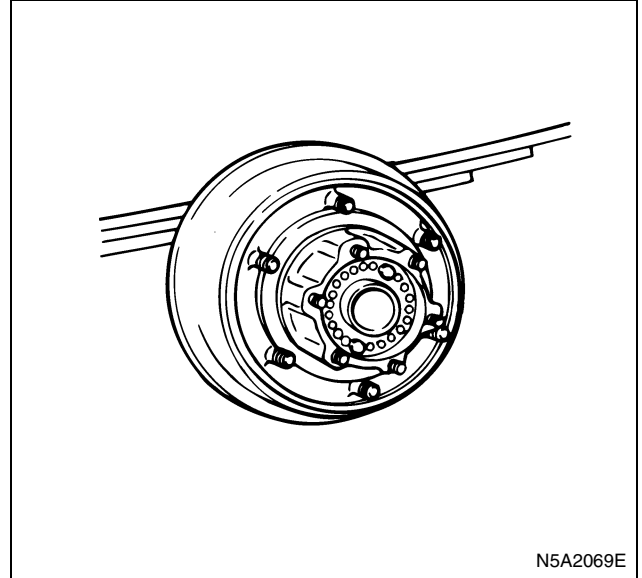
- After adjusting the starting torque, move the hub to the right and left side several times to make sure the value is correct.
- With the preload adjusted, match the lock cut-out center point of the axle case screw part with nearest ruling of the bearing lock nut. If it does not, rotate the nut in the tightening direction to match.

- Install the axle shaft.

Install to the rear hub stud part through the special washer with the flange nut.

Tighten:

Flange nut to 49 N·m (5.0 kg·m / 36.1 lb·ft)

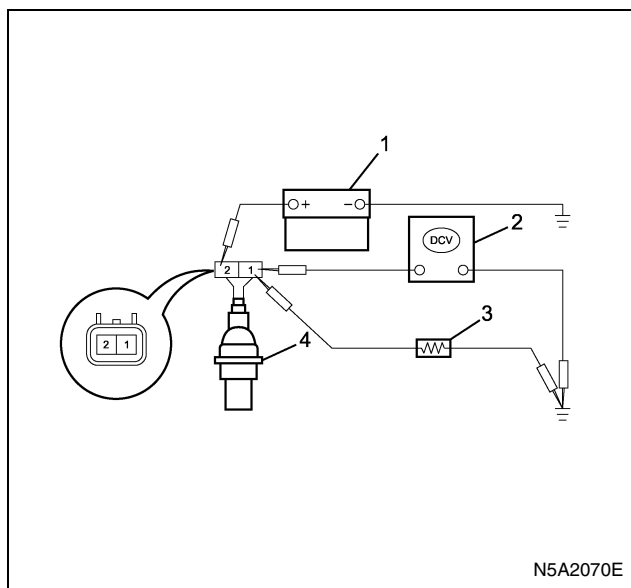


7. Lock washer, outer oil seal, axle shaft

- Install the pawl of the lock washer to the lock cutout of the axle case screw part securely, and tighten the bearing nut and the lock washer with the lock bolt.
- Apply grease to the circumference of the outer oil seal inner lip, and install the outer oil seal.

Inspection**RL Wheel Speed Sensor Output Check Procedure****Check flow C-1-3**

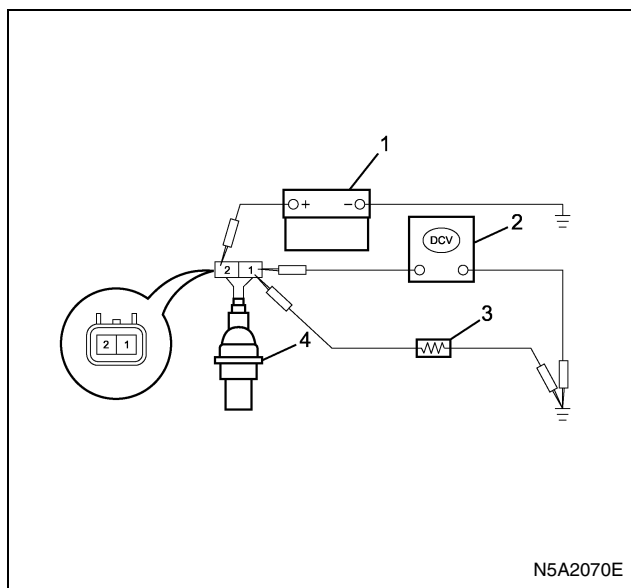
Step	Action	Value	YES	NO
1	1. Turn the starter switch OFF. 2. Disconnect the connector of the EHCU. 3. Jack-up the vehicle to lift the front wheels off the floor. 4. Connect a 120Ω resistance between the J-177 connector terminal 34 and the ground. 5. Apply a 9 — 16V voltage to the J-177 connector terminal 22. 6. Measure the DC voltage between the B-177 connector terminal 34 and the ground while turning the RL wheel half turn/sec. Is the value within specified value?	0.2 — 4.5V	Go to Step5	Go to Step2
2	1. Turn the starter switch OFF. 2. Disconnect the RL wheel speed sensor connector J-149. 3. Connect a 120Ω resistance between the J-149 connector terminal 2 and the ground. 4. Apply a 9 — 16V voltage to the J-149 connector terminal 1 (sensor side). 5. Measure the DC voltage between the J-149 connector terminal 2 and the ground while turning the RL wheel half turn/sec. Is the value within specified value?	0.2 — 4.5V	Go to Step3	Go to Step4
3	Repair the circuit for open/short circuit, and the connector for improper connection between the connector of EHCU and the sensor connector. Is this step completed?	—	Go to Step5	—
4	Replace the RL wheel speed sensor. Is this step completed?	—	Go to Step5	—
5	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step5

**Legend**

1. Battery (12V)
2. Tester
3. Resistance
4. Speed sensor

RR Wheel Speed Sensor Output Check Procedure**Check flow C-1-4**

Step	Action	Value	YES	NO
1	1. Turn the starter switch OFF. 2. Disconnect the connector of the EHCU. 3. Jack-up the vehicle to lift the front wheels off the floor. 4. Connect a 120Ω resistance between the J-177 connector terminal 12 and the ground. 5. Apply a 9 — 16V voltage to the J-177 connector terminal 21. 6. Measure the DC voltage between the J-177 connector terminal 1 and the ground while turning the RR wheel half turn/sec. Is the value within specified value?	0.2 — 4.5V	Go to Step5	Go to Step2
2	1. Turn the starter switch OFF. 2. Disconnect the RR wheel speed sensor connector J-148. 3. Connect a 120Ω resistance between the J-148 connector terminal 2 and the ground. 4. Apply a 9 — 16V voltage to the J-148 connector terminal 1 (sensor side). 5. Measure the DC voltage between the J-148 connector terminal 2 and the ground while turning the RR wheel half turn/sec. Is the value within specified value?	0.2 — 4.5V	Go to Step3	Go to Step4
3	Repair the circuit for open/short circuit, and the connector for improper connection between the connector of EHCU and the sensor connector. Is this step completed?	—	Go to Step5	—
4	Replace the RR wheel speed sensor. Is this step completed?	—	Go to Step5	—
5	1. Install all the components, and check that those are installed properly. 2. Clear the DTC. Is this step completed?	—	Go to "Diagnostic basic flow".	Go to Step5

**Legend**

1. Battery (12V)
2. Tester
3. Resistance
4. Speed sensor

Speed Sensor Output Check Procedure**Check flow TC-1**

Step	Action	Value	YES	NO
1	1. Connect the Tech 2. 2. Check each sensor lowest speed from the "Wheel sensor". Is the sensor speed 4km/h (2 mph) or more?	—	Go to Step2	Go to Step6
2	Check the suspicious sensor circuit for open circuit. (Check with shaking the wire and the connector.) Is the sensor circuit connection normal?	—	Replace the speed sensor.Go to Step3	Repair.Go to Step2
3	Check each sensor lowest speed from the "Wheel sensor". Is the sensor speed 4km/h (2 mph) or more?	—	Go to Step4	Go to Step6
4	Check the sensor rotor. Is the sensor rotor normal?	—	Go to Step5	Replace the sensor rotor. Go to Step5
5	Check each sensor lowest speed from the "Wheel sensor". Is the sensor speed 4km/h (2 mph) or more?	—	Repair the circuit or connector between the EHCU and the speed sensor. Go to Step6	Go to Step6
6	Install all the components, and check that those are installed properly. Is this step completed?	—	Repeat "Diagnostic basic flow".	Go to Step6

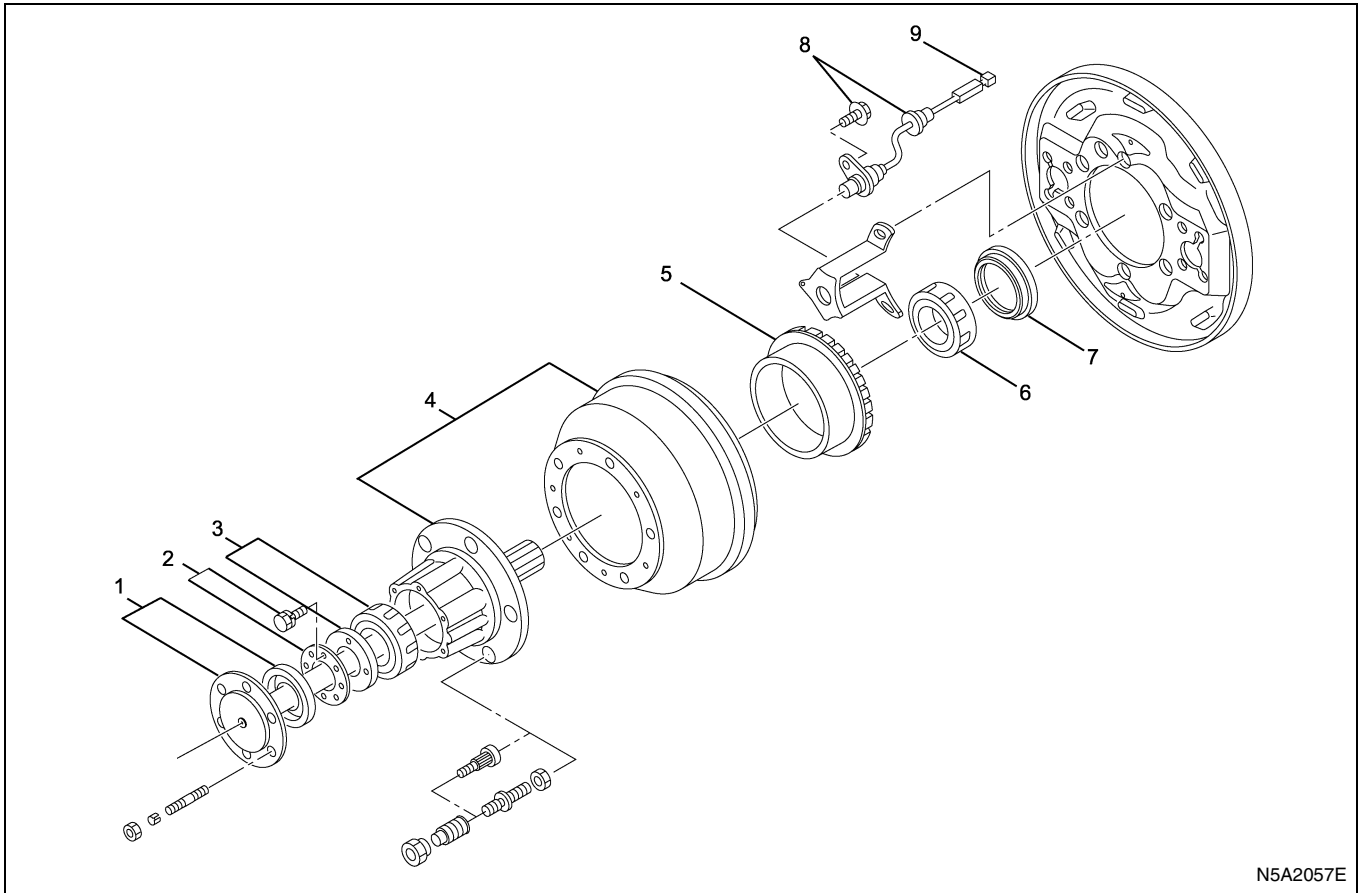
Used for checking the front speed sensor, or the rear speed sensor when no DTC is set.

CAUTION:

On the vehicle that the rear tires have smaller diameter, the rear wheel speed may be indicated a little higher than the front wheel speed. Check the speed after driving a while at a constant speed.

Rear Sensor Rotor

Components



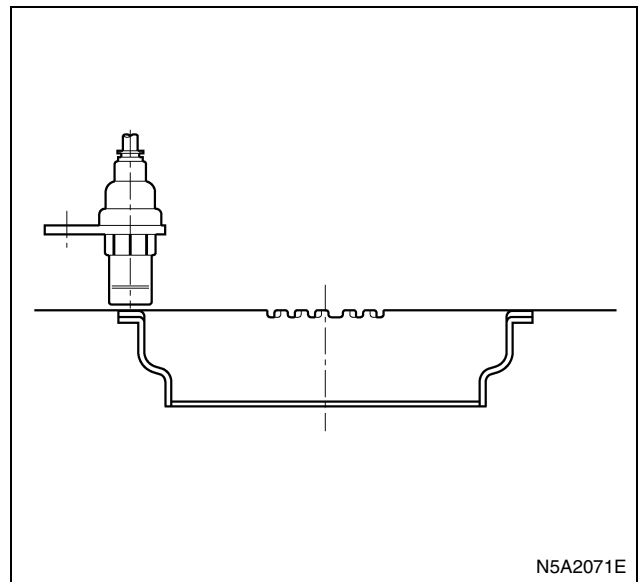
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Legend

- | | |
|------------------------------------|----------------------|
| 1. Axle shaft, outer oil seal | 6. Inner bearing |
| 2. Bearing lock washer, lock nut | 7. Inner oil seal |
| 3. Outer bearing, bearing lock nut | 8. Rear speed sensor |
| 4. Hub and drum | 9. Harness connector |
| 5. Sensor rotor | |

Removal

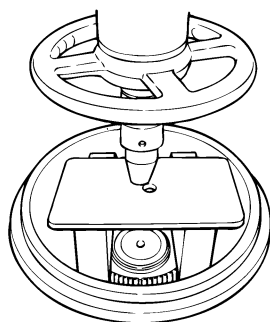
- Refer to the rear speed sensor removal procedure.
1. Rear sensor rotor
 - Use a puller to take out the sensor rotor.
 2. Inner oil seal
 - Remove the inner oil seal.
 3. Inner bearing
 - Remove the inner bearing.
 - Rotor runout must be ± 0.1 mm (0.004 in) or less with the rotor installed.



N5A2071E

Installation

1. Install the inner bearing to the hub.
2. Install the inner oil seal to the hub.
3. Install the new rear sensor rotor to the hub.
 - Press-fit with a bench press around the circumference until it contacts.
 - Refer to the rear speed sensor installation procedure step. 5 — 7.



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