ANTILOCK BRAKE SYSTEM

04–13  ANTILOCK BRAKE SYSTEM

ABS LOCATION INDEX ................................. 04–13–1
ABS SYSTEM DIAGRAM .............................. 04–13–2
ABS HYDRAULIC UNIT (HU)/
CONTROL MODULE (CM)
SYSTEM INSPECTION ............................ 04–13–3
Using the SSTs ..................................... 04–13–3
Without using the SSTs ............................ 04–13–4
ABS HYDRAULIC UNIT (HU)/
CONTROL MODULE (CM)
REMOVAL/INSTALLATION ........................ 04–13–5
Connector Removal Note ......................... 04–13–6
ABS HU/CM Removal/Installation Note ........ 04–13–6
Connector Installation Note ...................... 04–13–6
ABS HYDRAULIC UNIT (HU)/
CONTROL MODULE (CM)
INSPECTION ........................................ 04–13–6
Terminal Voltage Table (Reference) ............ 04–13–6
Inspection Using An Oscilloscope (Reference) 04–13–8
FRONT ABS WHEEL-SPEED SENSOR
REMOVAL/INSTALLATION ...................... 04–13–9
SENSOR INSPECTION ............................ 04–13–9
FRONT/REAR ABS WHEEL-SPEED
SENS OR Inspection ............................. 04–13–9
Visual Inspection .................................. 04–13–9
Clearance Inspection ......................... 04–13–9
Resistance Inspection ......................... 04–13–9
Voltage Inspection ............................... 04–13–10
Voltage Pattern Inspection ..................... 04–13–10
REAR ABS WHEEL-SPEED SENSOR
REMOVAL/INSTALLATION ..................... 04–13–10

ABS LOCATION INDEX

1 ABS HU/CM
(See 04–13–3 ABS HYDRAULIC UNIT (HU)/
CONTROL MODULE (CM) SYSTEM INSPECTION)
(See 04–13–5 ABS HYDRAULIC UNIT (HU)/
CONTROL MODULE (CM) REMOVAL/
INSTALLATION)
(See 04–13–6 ABS HYDRAULIC UNIT (HU)/
CONTROL MODULE (CM) INSPECTION)

2 ABS wheel-speed sensor (front)
(See 04–13–9 FRONT ABS WHEEL-SPEED
SENSOR REMOVAL/INSTALLATION)
(See 04–13–9 FRONT/REAR ABS WHEEL-SPEED
SENSOR INSPECTION)

3 ABS wheel-speed sensor (rear)
(See 04–13–10 REAR ABS WHEEL-SPEED
SENSOR REMOVAL/INSTALLATION)
(See 04–13–9 FRONT/REAR ABS WHEEL-SPEED
SENSOR INSPECTION)
ANTILOCK BRAKE SYSTEM

ABS SYSTEM DIAGRAM

BRAKE SYSTEM WARNING LIGHT
INSTRUMENT CLUSTER
ABS WARNING LIGHT

IG SWITCH
METER 10 A
PARKING BRAKE SWITCH
FLUID LEVEL SENSOR

ENGINE 10 A
ABS 60 A
ABS MOTOR RELAY

ABS MOTOR
SOLENOID VALVE

STOP 15 A
BATTERY
ABS WHEEL-SPEED SENSOR

BRACKET SWITCH
BRACKET LIGHT

ABS CM
ABS HU
FAILSAFE RELAY

PCM
ATX ONLY
DATA LINK CONNECTOR-2
(DLC-2)

KLN
TBS
BUS B
GND
DATA LINK CONNECTOR (DLC)

04–13–2
ANTILOCK BRAKE SYSTEM

ABS HYDRAULIC UNIT (HU)/CONTROL MODULE (CM) SYSTEM INSPECTION

System Inspection
Preparation
1. Verify that the battery is fully charged. With the ignition switch on, verify that the ABS and BRAKE system warning lights goes out after 3 seconds.
2. If the lights stays on after 3 seconds, the ABS HU/CM detects a failure. Follow the troubleshooting procedures.
3. Turn the ignition switch off.
4. On level ground, jack up the vehicle and support it evenly on safety stands. Shift the transaxle to N position.
5. Release the parking brake.
6. Rotate the wheels by hand, and inspect for brake drag.

Using the SSTs
1. Perform the “Preparation.”
2. Connect the SSTs (WDS or equivalent) to the data link connector-2 (DLC-2).
3. Set up an active command mode inspection according to the combination of commands below. (See 04–02–3 ABS ON-BOARD DIAGNOSTIC.)

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>COMMAND NAME</th>
<th>COMMAND TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure retention</td>
<td>PMP_MOTOR OFF, RF_OUTLET OFF, RF_INLET ON, ABS_POWER ON</td>
<td>Manual</td>
</tr>
<tr>
<td>Pressure reduction</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>

The chart above shows an example of a right wheel inspection.

Note
- When working with two people, one should press on the brake pedal, the other should attempt to rotate the wheel being inspected.

4. Send the command while pressing on the brake pedal and attempting to rotate the wheel being inspected.
5. When pressure is being maintained, and click sound indicating the solenoid is operating comes from the ABS HU/CM, confirm that the wheel does not rotate. When pressure is being reduced, and click sound indicating the solenoid is operating comes from the ABS HU/CM, confirm that the wheel rotates, even though the brake pedal is being depressed.

Note
- To protect the ABS HU/CM, the solenoid valve used for simulations and the ABS motor stay on for 10 seconds each time they are switched on.
- Performing the inspections above determines the following.
  - The ABS HU/CM brake lines are normal.
  - The ABS HU/CM hydraulic system is not significantly abnormal.
  - The ABS HU/CM wiring is normal.
- However, the following items cannot be checked.
  - ABS HU/CM input system harness and parts
  - Extremely small leaks in the ABS HU/CM internal hydraulic system
  - Unusual intermittent occurrences in the above items
ANTILOCK BRAKE SYSTEM

Without using the SSTs
1. Perform the “Preparation.”

Caution
- Connecting the wrong data link connector (DLC) terminal may possibly cause a malfunction.

Carefully connect the specified terminal only.

2. Use a jumper wire to short terminal TBS of the DLC to body GND.

3. Depress the brake pedal, and have an assistant verify that the right front wheel does not turn.

4. With the brake pedal still depressed, turn the ignition switch on and verify that the brake is released momentarily (approx. 0.5 sec.) and that the wheel turns when pressure-reduction operates.

5. Inspect the operation of the remaining wheels in order: right front, left front, right rear, left rear.
   - Replace the ABS HU/CM if wheels do not rotate.
   - Inspect brake piping to ABS HU/CM if operation of the remaining wheel order is not within specified.

Note
- If Steps 4 and 5 show correct operation, the following systems are okay:
  - Brake piping to ABS HU/CM
  - Braking system, including ABS HU/CM
  - Electrical system in ABS HU/CM (solenoid, ABS motor, etc.)
- The following are not inspected with above steps:
  - Input system and harness of ABS HU/CM
  - Intermittent failure
  - Fluid leakage from brake including the ABS HU/CM and master cylinder

6. Turn the ignition switch off and remove the jumper wire.
Caution

- Do not drop the ABS hydraulic unit (HU) /control module (CM). Replace it if it is subjected to an impact.

1. Remove the battery and battery tray.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.

---

| 1 | Brake pipe |
| 2 | Connector |
|    | (See 04–13–6 Connector Removal Note) |
|    | (See 04–13–6 Connector Installation Note) |
| 3 | ABS HU/CM |
|    | (See 04–13–6 ABS HU/CM Removal/Installation Note) |
| 4 | Stud |

---

*SST*

---

* 49 0259 770B

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Nm (kgf·cm, in·lbf)
ANTILOCK BRAKE SYSTEM

Connector Removal Note
1. Pull the lock lever up and make it unlock.
2. Remove the connector.

ABS HU/CM Removal/Installation Note
1. When removing/installing the ABS HU/CM from/to the vehicle, attach a strip of protective tape on the ABS HU/CM connector to prevent brake fluid from entering.

Connector Installation Note
1. Verify that the lock lever of the harness connector is completely pulled up.

ABS HYDRAULIC UNIT (HU)/CONTROL MODULE (CM) INSPECTION
1. Disconnect the negative battery cable.
2. Connect the SST between the ABS HU/CM and harness connector with the ignition switch off.
3. Attach the tester leads to the SST and inspect voltage referring the table below.

Terminal Voltage Table (Reference)
(Engine is idling, and connector is connected unless otherwise indicated)
## ANTILOCK BRAKE SYSTEM

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Signal</th>
<th>Connected to</th>
<th>Test condition</th>
<th>Voltage (V)</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>RR wheel-speed</td>
<td>RR wheel-speed sensor</td>
<td>Vehicle is stopped 0 (AC)</td>
<td></td>
<td>• Inspect by using the wave profile. (See 04–13–8 Inspection Using An Oscilloscope (Reference))</td>
</tr>
<tr>
<td>B</td>
<td>LR wheel-speed</td>
<td>LR wheel-speed sensor</td>
<td>Vehicle is stopped 0 (AC)</td>
<td></td>
<td>• Inspect by using the wave profile. (See 04–13–8 Inspection Using An Oscilloscope (Reference))</td>
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<tr>
<td>C</td>
<td>RF wheel-speed</td>
<td>RF wheel-speed sensor</td>
<td>Vehicle is stopped 0 (AC)</td>
<td></td>
<td>• Inspect by using the wave profile. (See 04–13–8 Inspection Using An Oscilloscope (Reference))</td>
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<tr>
<td>D</td>
<td>LF wheel-speed</td>
<td>LF wheel-speed sensor</td>
<td>Vehicle is stopped 0 (AC)</td>
<td></td>
<td>• Inspect by using the wave profile. (See 04–13–8 Inspection Using An Oscilloscope (Reference))</td>
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<tr>
<td>E</td>
<td>Vehicle speed output</td>
<td>PCM</td>
<td>Vehicle is stopped 0</td>
<td></td>
<td>• Inspect related harness • Inspect ABS wheel-speed sensor</td>
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<tr>
<td>F</td>
<td>Vehicle speed output</td>
<td>Instrument cluster</td>
<td>Vehicle is stopped 0</td>
<td></td>
<td>• Inspect related harness • Inspect ABS wheel-speed sensor</td>
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<tr>
<td>G</td>
<td>Vehicle speed output</td>
<td>Instrument cluster</td>
<td>Vehicle is stopped 0</td>
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<td>• Inspect related harness • Inspect ABS wheel-speed sensor</td>
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</tbody>
</table>

*1: ATX only
*2: Use this terminal at factory only, not used for inspection and repair at field
ANTIILOCK BRAKE SYSTEM

Inspection Using An Oscilloscope (Reference)

Wheel speed
- ABS HU/CM terminal:
  RR : A (+) — B (-)
  LR : C (+) — F (-)
  RF : D (+) — G (-)
  LF : E (+) — I (-)
- Oscilloscope setting:
  1 V/DIV (Y), 2 ms/DIV (X), AC range
- Vehicle condition: Driving 30 km/h (18.6 mph)

Note
- As vehicle speed increases, period of wave shortens.
- If there is malfunctioning in the sensor rotor, wave profile warps.

Vehicle speed output (to PCM) (ATX only)
- ABS HU/CM terminal: J (+) — AA (-)
- Oscilloscope setting:
  1 V/DIV (Y), 5 ms/DIV (X), DC range
- Vehicle condition: Driving 30 km/h (18.6 mph)

Note
- As vehicle speed increases, period of wave shortens.

Vehicle speed output (to instrument cluster)
- ABS HU/CM terminal: Q (+) — AA (-)
- Oscilloscope setting:
  1 V/DIV (Y), 5 ms/DIV (X), DC range
- Vehicle condition: Driving 30 km/h (18.6 mph)

Note
- As vehicle speed increases, period of wave shortens.
FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.

FRONT/REAR ABS WHEEL-SPEED SENSOR INSPECTION

Visual Inspection
1. Remove the wheel and tire, and inspect the sensor for looseness and damage. Replace the sensor if necessary.

Clearance Inspection
1. Inspect the clearance between the wheel-speed sensor and the sensor rotor.
   - Clearance
     0.3—1.1 mm (0.012—0.043 in)

Resistance Inspection
1. Disconnect the ABS wheel-speed sensor connector.
2. Inspect the resistance at the ABS wheel-speed sensor.
   - If not as specified, replace the ABS wheel-speed sensor.
   - Resistance
     1.3—1.7 kilohm
ANTILock BRAKE SYSTEM

Voltage Inspection
1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Disconnect the ABS wheel-speed sensor connector.
3. Inspect each sensor by rotating each wheel one revolution per second.
   • If not as specified, replace the ABS wheel-speed sensor.

Voltage
0.25—1.2 V (AC)

Voltage Pattern Inspection
1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Disconnect the ABS wheel-speed sensor connector.
3. Using an oscilloscope, inspect voltage pattern for distortion and noise by rotating each wheel.
   • If there is distortion or noise, inspect the ABS sensor rotor.

REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION

1. For 4SD, remove the rear seat back. (See 09–13–5 REAR SEAT REMOVAL/INSTALLATION.)
   For 5HB, remove the trunk side trim. (See 09–17–15 5HB.)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.

<table>
<thead>
<tr>
<th>1</th>
<th>Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Bolt</td>
</tr>
<tr>
<td>3</td>
<td>Rear ABS wheel-speed sensor</td>
</tr>
</tbody>
</table>

04–13–10