

RODEO

# BRAKES

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## Brake Control System

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## 5A-2 BRAKE CONTROL SYSTEM

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|                                                                                                                             |       |                                                                                                                                |       |
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### Service Precaution

**WARNING: THIS VEHICLE HAS A SUPPLEMENTAL RESTRAINT SYSTEM (SRS). REFER TO THE SRS COMPONENT AND WIRING LOCATION VIEW IN ORDER TO DETERMINE WHETHER YOU ARE PERFORMING SERVICE ON OR NEAR THE SRS COMPONENTS OR THE SRS WIRING. WHEN YOU ARE PERFORMING SERVICE ON OR NEAR THE SRS COMPONENTS OR THE SRS WIRING, REFER TO THE SRS SERVICE INFORMATION. FAILURE TO FOLLOW WARNINGS COULD RESULT IN POSSIBLE AIR BAG DEPLOYMENT, PERSONAL INJURY, OR OTHERWISE UNNEEDED SRS SYSTEM REPAIRS.**

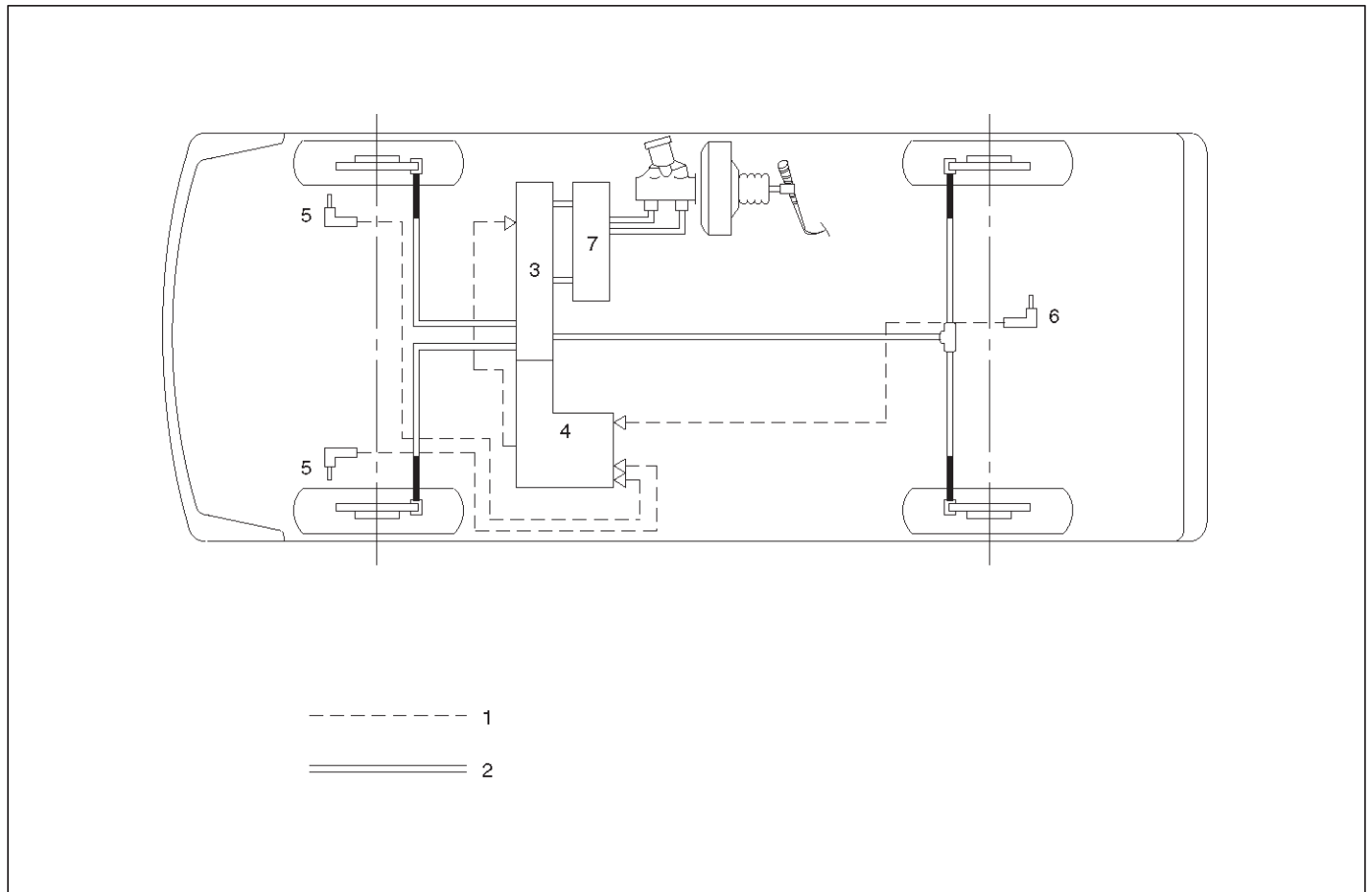
**CAUTION:** Always use the correct fastener in the proper location. When you replace a fastener, use **ONLY** the exact part number for that application. ISUZU will call out those fasteners that require a replacement after removal. ISUZU will also call out the fasteners that require thread lockers or thread sealant. **UNLESS OTHERWISE SPECIFIED, do not use supplemental coatings (Paints, greases, or other corrosion inhibitors) on threaded fasteners or fastener joint interfaces. Generally, such coatings adversely affect the fastener torque and the joint clamping force, and may damage the fastener. When you install fasteners, use the correct tightening sequence and specifications. Following these instructions can help you avoid damage to parts and systems.**

## General Description

The Anti-lock Brake System (ABS) works on all four wheels. A combination of wheel speed sensor and Electronic Hydraulic Control Unit (EHCUC) can determine when a wheel is about to stop turning and adjust brake pressure to maintain best braking.

This system helps the driver maintain greater control of the vehicle under heavy braking conditions.

NOTE: The Electronic Hydraulic Control Unit (EHCUC) comprises the Hydraulic Unit (H/U) and the coil Integrated Module.



C05RW004

### Legend

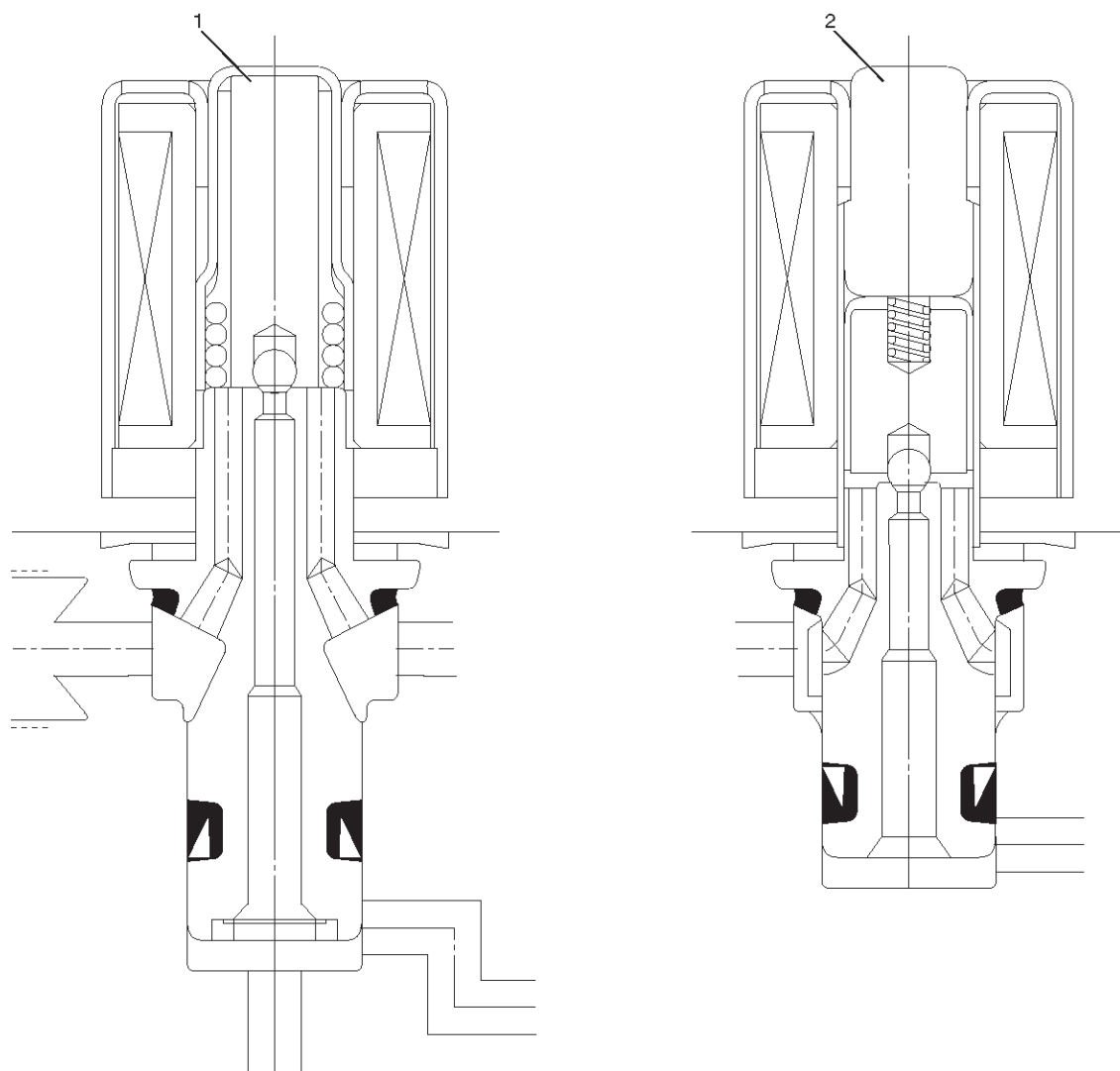
- |                          |                                          |
|--------------------------|------------------------------------------|
| (1) Electronic           | (4) Coil Integrated Module               |
| (2) Hydraulic            | (5) Front Wheel Speed Sensor             |
| (3) Hydraulic Unit (H/U) | (6) Rear Wheel Speed Sensor              |
|                          | (7) Proportioning and Bypass (P&B) Valve |

## 5A-4 BRAKE CONTROL SYSTEM

### Functional Description

Hydraulic Unit (H/U)

Solenoid Valve



C05RW012

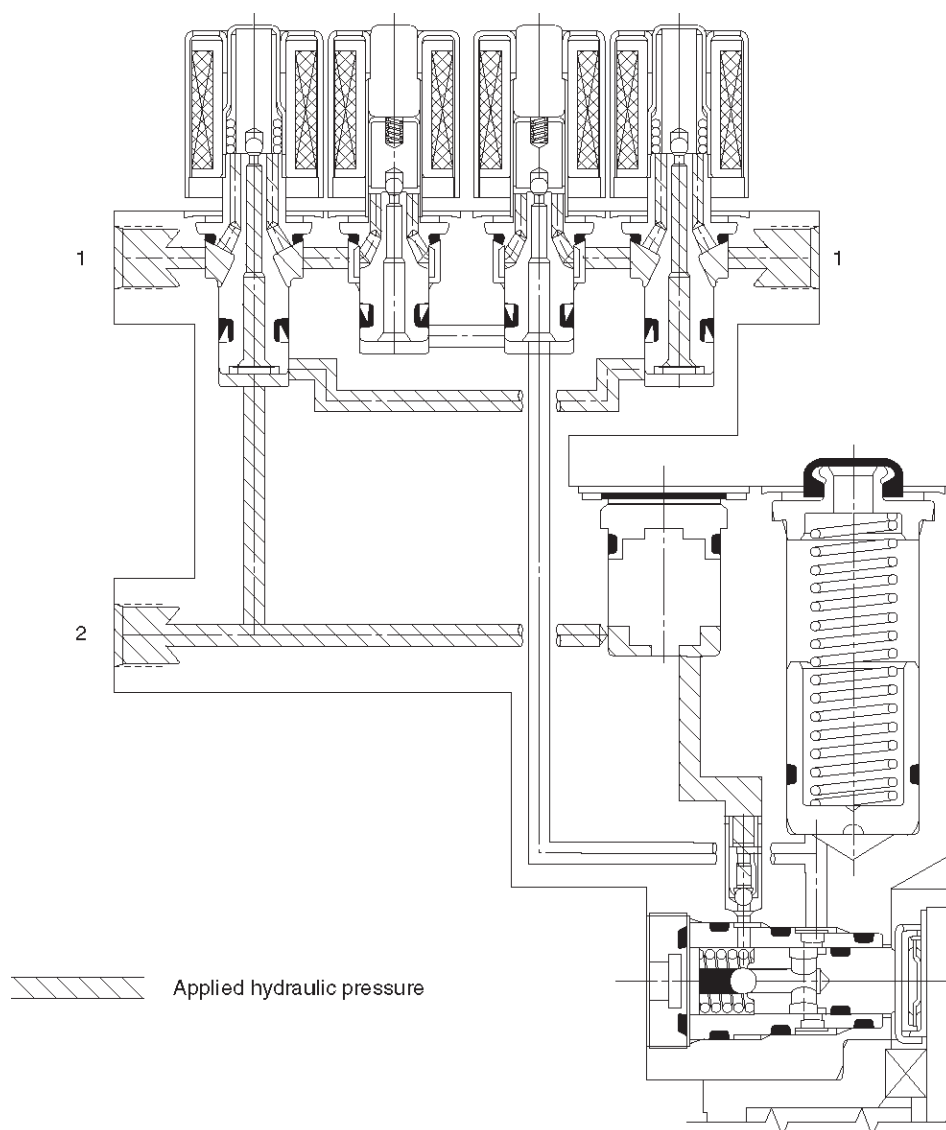
### Legend

- (1) Isolation Valve
- (2) Dump valve

### Normal Braking

During normal (non anti-lock) braking, the solenoid valves are without current and closed due to spring force.

Brake fluid travels through the centre of the normally open isolation valve around the normally closed dump valve and on to the brake pistons.



C05RW010

### Legend

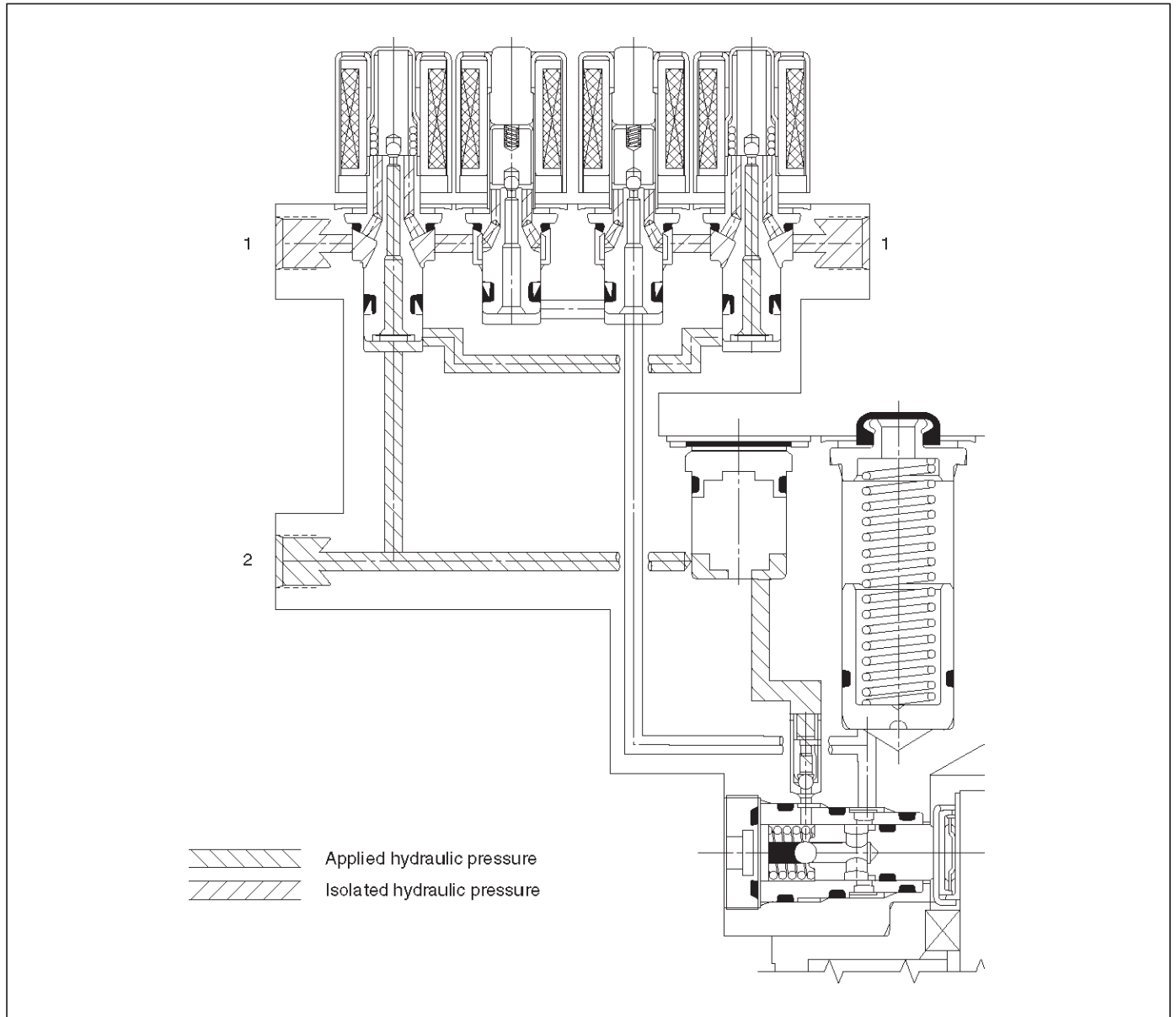
- (1) Brake
- (2) Master Cylinder

## 5A-6 BRAKE CONTROL SYSTEM

### Pressure Isolation (Pressure Maintain)

The electro-hydraulic control unit is activated when the brakes are applied which sends a signal to the coil integrated module to prepare for a possible anti-lock stop. If the information from the wheel speed sensors indicates excessive wheel deceleration (imminent lockup), the first step in the anti-lock sequence is to isolate the brake pressure being applied by the brake pedal.

The microprocessor in the coil integrated module sends a voltage to the coil to energize and close the isolation valve. This prevents any additional fluid pressure applied by the brake pedal from reaching the wheel. With the isolation valves closed, further unnecessary increase in the brake pressure is therefore prevented.



C05RW011

### Legend

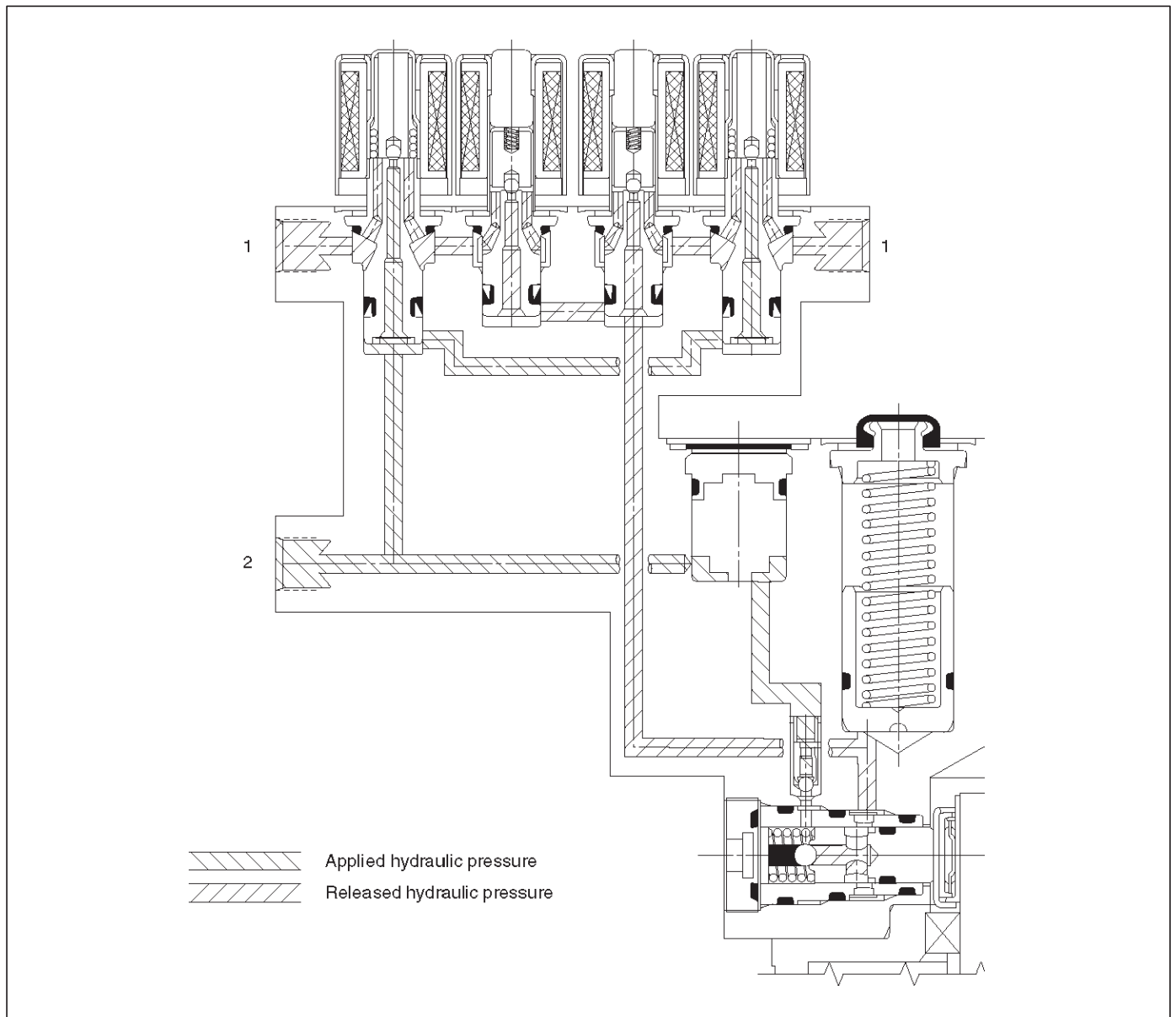
- (1) Brake
- (2) Master Cylinder

### Pressure Reduction

Once the brake pressure is isolated, it must be reduced to allow the wheels to unlock. This is accomplished by dumping a portion of the brake fluid pressure into a low pressure accumulator.

The microprocessor activates the normally closed dump valve to open, allowing fluid from the wheels to be dumped into the accumulator. This is done with very short activation pulses opening and closing the dump valve passageway. Brake pressure is reduced at the wheel and allows the wheel to begin rotating again. The fluid from the brake piston is stored in the accumulator against spring pressure and a portion of this fluid also primes the pump.

The dump valves are operated independently to control the deceleration of the wheel. At this point, the brake pedal is isolated from the base brake system, the hydraulic control unit pumps are primed and the attenuators are ready to pump fluid.



C05RW009

### Legend

- (1) Brake
- (2) Master Cylinder

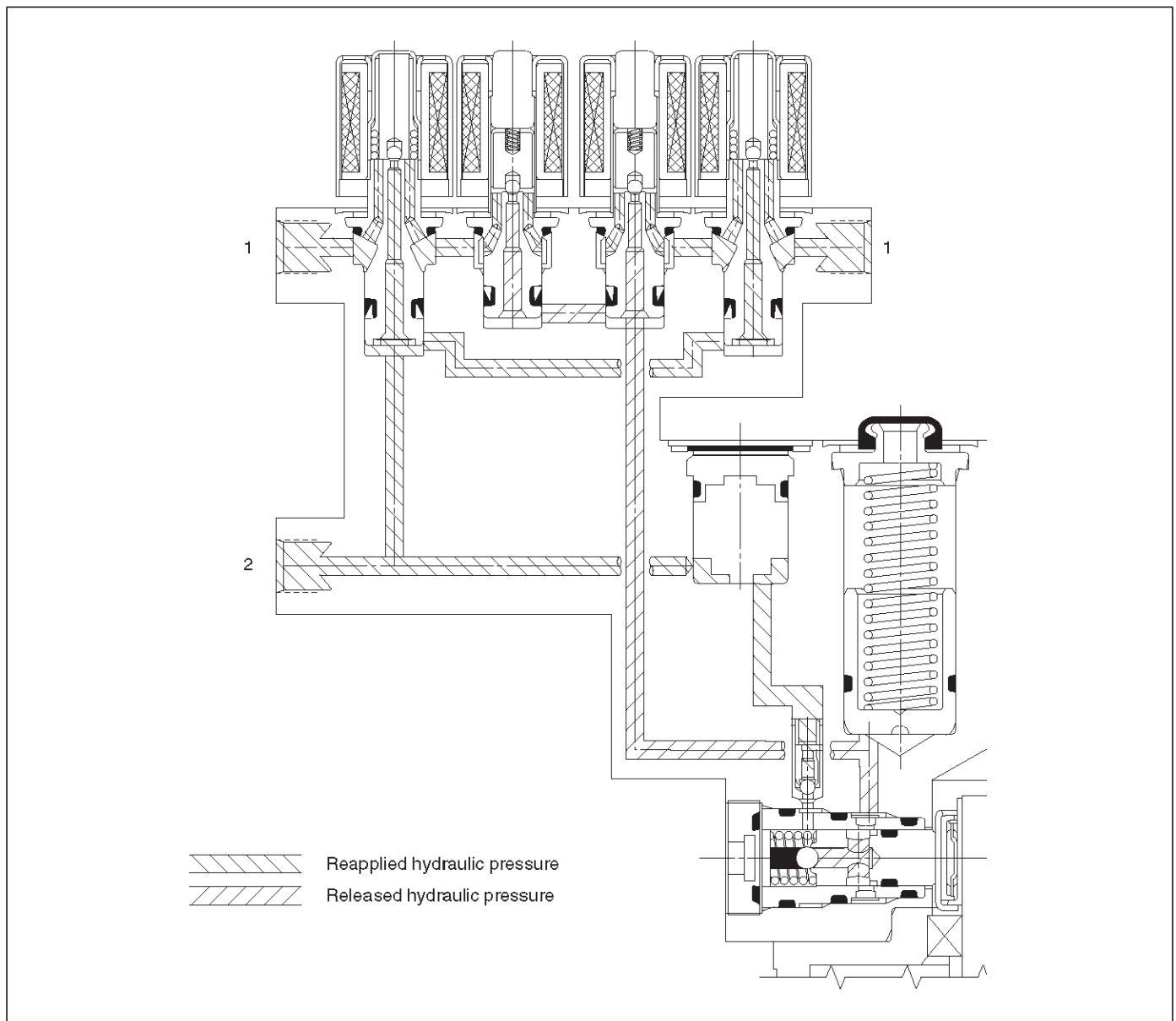
## 5A-8 BRAKE CONTROL SYSTEM

### Pressure Increase (Re-apply)

The re-apply sequence is initiated to achieve optimum braking. The isolation valve is momentarily opened to allow master cylinder and pump pressure to reach the brakes. This controlled pressure rise continues until the wheel is at optimum brake output or until the brake pressure is brought up to the master cylinder output pressure.

If more pressure is required, more fluid is drawn from the master cylinder and applied to the brakes. The driver may feel slight pedal pulsations, or pedal drop, this is normal and expected.

As fluid is re-applied to the brakes, the wheel speed will reduce. If the wheels approach imminent lockup again, the module will isolate, dump and re-apply again. This cycle occurs in millisecond intervals, allowing several cycles to occur each second. It is a much faster and more controlled way of "pumping the pedal".



C05RW014

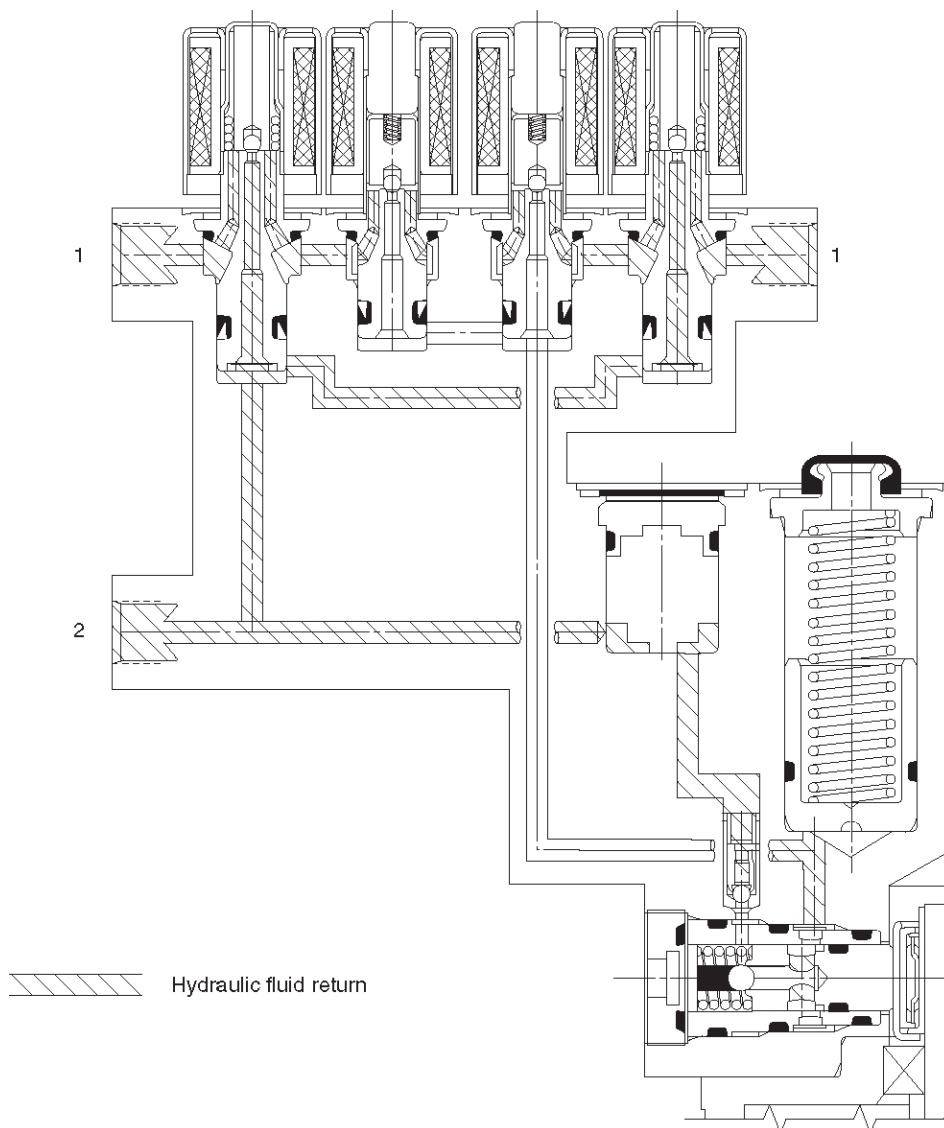
### Legend

- (1) Brake
- (2) Master Cylinder

**Brake Release**

At the end of the anti-lock stop, when the brake pedal is released, the pump will remain running for a short time to help drain any fluid from the accumulators. As this fluid returns into the system, the spring forces the piston back to its original position.

The isolation valve opens and fluid may return to the master cylinder. Conventional braking is then resumed.



C05RW013

**Legend**

- (1) Brake
- (2) Master Cylinder

## System Components

Electronic Hydraulic Control Unit (EHCU), three Wheel Speed Sensors, Warning Light, and G-sensor.

### Electronic Hydraulic Control Unit (EHCU)

The EHCU consists of ABS control circuits, fault detector, and a fail-safe. It drives the hydraulic unit according to the signal from each sensor, cancelling ABS to return to normal braking when a malfunction has occurred in the ABS.

The EHCU has a self-diagnosing function which can indicate faulty circuits during diagnosis.

The EHCU is mounted on the engine compartment rear right side. It consists of a Motor, Plunger Pump, Solenoid Valves.

**Solenoid Valves:** Reduces or holds the caliper fluid pressure for each front disc brake or both rear disc brakes according to the signal sent from the EHCU.

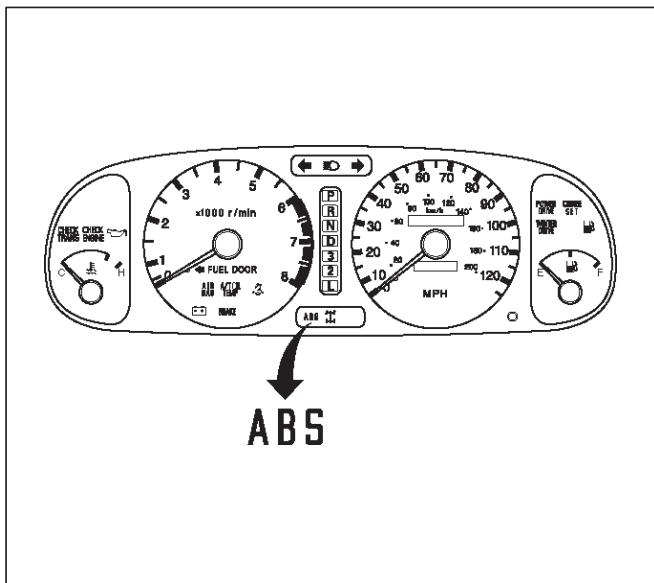
**Reservoir:** Temporarily holds the brake fluid that returns from the front and rear disc brake caliper so that pressure of front disc brake caliper can be reduced smoothly.

**Plunger Pump:** Feeds the brake fluid held in the reservoir to the master cylinder.

**Motor:** Drives the pump according to the signal from EHCU.

**Check Valve:** Controls the brake fluid flow.

### ABS Warning Light



821RW093

Vehicles equipped with the Anti-lock Brake System have an amber “ABS” warning light in the instrument panel. The “ABS” warning light will illuminate if a malfunction in the Anti-lock Brake System is detected by the Electronic Hydraulic Control Unit (EHCU). In case of an electronic malfunction, the EHCU will turn “ON” the “ABS” warning light and disable the Anti-lock braking function.

The “ABS” light will turn “ON” for approximately three seconds after the ignition switch is to the “ON” position. If the “ABS” light stays “ON” after the ignition switch is the “ON” position, or comes “ON” and stays “ON” while driving, the Anti-lock Brake System should be inspected for a malfunction according to the diagnosis procedure.

### Wheel Speed Sensor

It consists of a sensor and a rotor. The sensor is attached to the knuckle on the front wheels and to the rear axle case on the rear differential.

The rotor is press-fit in the axle shaft.

The flux generated from electrodes magnetized by a magnet in the sensor varies due to rotation of the rotor, and the electromagnetic induction generates alternating voltage in the coil. This voltage draws a “sine curve” with the frequency proportional to rotor speed and it allows detection of wheel speed.

### G-Sensor

The G-sensor installed inside the EHCU detects the vehicle deceleration speed and sends a signal to the EHCU. In 4WD operation, all four wheels may be decelerated in almost the same phase, since all wheels are connected mechanically.

This tendency is noticeable particularly on roads with low friction coefficient, and the ABS control is adversely affected.

The G-sensor judges whether the friction coefficient of road surface is low or high, and changes the EHCU's operating system to ensure ABS control.

### Normal and Anti-lock Braking

Under normal driving conditions, the Anti-lock Brake System functions the same as a standard power assisted brake system. However, with the detection of wheel lock-up, a slight bump or kick-back will be felt in the brake pedal. This pedal “bump” will be followed by a series of short pedal pulsations which occurs in rapid succession. The brake pedal pulsation will continue until there is no longer a need for the anti-lock function or until the vehicle is stopped. A slight ticking or popping noise may be heard during brake applications when the Anti-lock features is being used.

When the Anti-lock feature is being used, the brake pedal may rise even as the brakes are being applied. This is also normal. Maintaining a constant force on the pedal will provide the shortest stopping distance.

### Brake Pedal Travel

Vehicles equipped with the Anti-lock Brake System may be stopped by applying normal force to the brake pedal. Although there is no need to push the pedal beyond the point where it stops or holds the vehicle, by applying more force the pedal will continue to travel toward the floor.

This extra brake pedal travel is normal.

### Acronyms and Abbreviations

Several acronyms and abbreviations are commonly used throughout this section:

#### ABS

Anti-lock Brake System

#### CIM

Coil Integrated Module

#### CKT

Circuit

**DLC**

Data Link Connector

**EHC**

Electronic Hydraulic Control Unit

**FL**

Front Left

**FR**

Front Right

**GEN**

Generator

**H/U**

Hydraulic Unit

**MV**

Millivolts

**RR**

Rear

**RPS**

Revolution per Second

**VDC**

DC Volts

**VAC**

AC Volts

**W/L**

Warning Light

**WSS**

Wheel Speed Sensor

## General Diagnosis

### General Information

ABS troubles can be classified into two types, those which can be detected by the ABS warning light and those which can be detected as a vehicle abnormality by the driver.

In either case, locate the fault in accordance with the "BASIC DIAGNOSTIC FLOWCHART" and repair.

Please refer to Section 5C for the diagnosis of mechanical troubles such as brake noise, brake judder (brake pedal or vehicle vibration felt when braking), uneven braking, and parking brake trouble.

### ABS Service Precautions

Required Tools and Items:

- Box Wrench
- Brake Fluid
- Special Tool

Some diagnosis procedures in this section require the installation of a special tool.

#### J-39200 High Impedance Multimeter

When circuit measurements are requested, use a circuit tester with high impedance.

### Computer System Service Precautions

The Anti-lock Brake System interfaces directly with the Electronic Hydraulic Control Unit (EHC) which is a control computer that is similar in some regards to the

Powertrain Control Module. These modules are designed to withstand normal current draws associated with vehicle operation. However, care must be taken to avoid overloading any of the EHC circuits. In testing for opens or shorts, do not ground or apply voltage to any of the circuits unless instructed to do so by the appropriate diagnostic procedure. These circuits should only be tested with a high impedance multimeter (J-39200) or special tools as described in this section. Power should never be removed or applied to any control module with the ignition in the "ON" position.

Before removing or connecting battery cables, fuses or connectors, always turn the ignition switch to the "OFF" position.

### General Service Precautions

The following are general precautions which should be observed when servicing and diagnosing the Anti-lock Brake System and/or other vehicle systems. Failure to observe these precautions may result in Anti-lock Brake System damage.

- If welding work is to be performed on the vehicle using an electric arc welder, the EHC and valve block connectors should be disconnected before the welding operation begins.
- The EHC and valve block connectors should never be connected or disconnected with the ignition "ON".
- If only rear wheels are rotated using jacks or drum tester, the system will diagnose a speed sensor malfunction and the "ABS" warning light will illuminate. But actually no trouble exists. After inspection stop the engine once and re-start it, then make sure that the "ABS" warning light does not illuminate.

#### If the battery has been discharged

The engine may stall if the battery has been completely discharged and the engine is started via jumper cables. This is because the Anti-lock Brake System (ABS) requires a large quantity of electricity. In this case, wait until the battery is recharged, or set the ABS to a non-operative state by removing the fuse for the ABS (60A). After the battery has been recharged, stop the engine and install the ABS fuse. Start the engine again, and confirm that the ABS warning light does not light.

### Note on Intermittents

As with virtually any electronic system, it is difficult to identify an intermittent failure. In such a case duplicating the system malfunction during a test drive or a good description of vehicle behavior from the customer may be helpful in locating a "most likely" failed component or circuit. The symptom diagnosis chart may also be useful in isolating the failure. Most intermittent problems are caused by faulty electrical connections or wiring. When an intermittent failure is encountered, check suspect circuits for:

- Suspected harness damage.
- Poor mating of connector halves or terminals not fully seated in the connector body (backed out).
- Improperly formed or damaged terminals.

### Test Driving ABS Complaint Vehicles

In case that there has been an abnormality in the lighting pattern of "ABS" warning light, the fault can be located in accordance with the "DIAGNOSIS BY "ABS" WARNING LIGHT ILLUMINATION PATTERN" . In case of such trouble as can be detected by the driver as a vehicle symptom, however, it is necessary to give a test drive following the test procedure mentioned below, thereby reproducing the symptom for trouble diagnosis on a symptom basis:

1. Start the engine and make sure that the "ABS" W/L goes OFF. If the W/L remains ON, it means that the Diagnostic Trouble Code (DTC) is stored. Therefore, read the code and locate the fault.

NOTE: The DTC cannot be cleared if the vehicle speed does not exceed 12 km/h (8 mph) at DTC, even though the repair operation is completed.

2. Start the vehicle and accelerate to about 30 km/h (19 mph) or more.
3. Slowly brake and stop the vehicle completely.
4. Then restart the vehicle and accelerate to about 40 km/h (25 mph) or more.
5. Brake at a time so as to actuate the ABS and stop the vehicle.
6. Be cautious of abnormality during the test. If the W/L is actuated while driving, read the DTC and locate the fault.
7. If the abnormality is not reproduced by the test, make best efforts to reproduce the situation reported by the customer.
8. If the abnormality has been detected, repair in accordance with the "SYMPTOM DIAGNOSIS" .

NOTE:

- Be sure to give a test drive on a wide, even road with a small traffic.
- If an abnormality is detected, be sure to suspend the test and start trouble diagnosis at once.

### "ABS" Warning Light

When ABS trouble occurs to actuate "ABS" warning light, the trouble code corresponding to the trouble is stored in the EHCU. Only ordinary brake is available with ABS being unactuated. Even when "ABS" warning light is actuated, if the starter switch is set ON after setting it OFF once, the EHCU checks up on the entire system and, if there is no abnormality, judges ABS to work currently and the warning light is lit normally even though the trouble code is stored.

NOTE: Illumination of the "ABS" warning light indicates that anti-lock braking is no longer available. Power assisted braking without anti-lock control is still available.

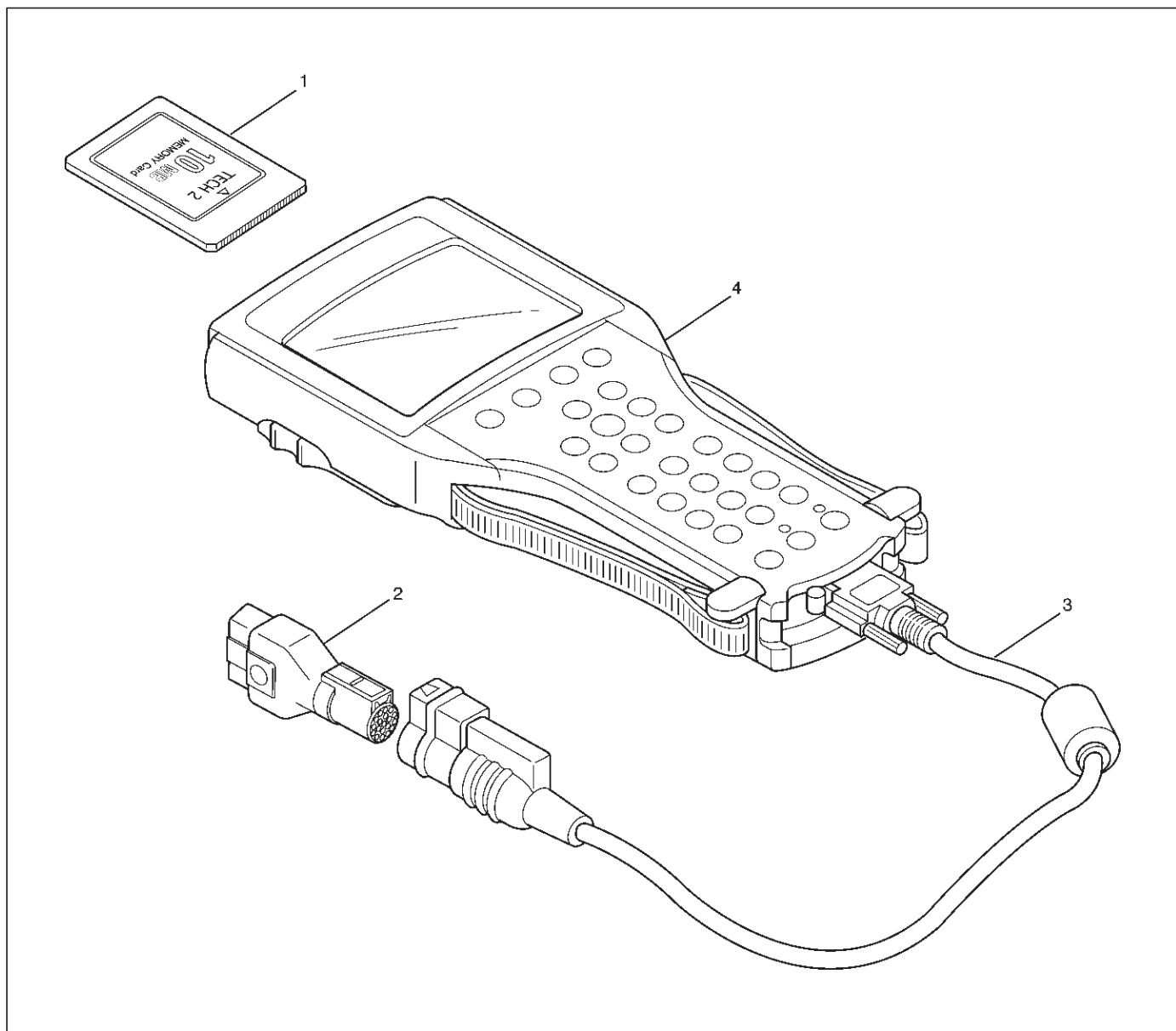
### Normal Operation

#### "ABS" Warning Light

When the ignition is first moved from "OFF" to "RUN" , the amber "ABS" warning light will turn "ON" . The "ABS" warning light will turn "ON" during engine starting and will usually stay "ON" for approximately three seconds after the ignition switch is returned to the "ON" position. The warning light should remain "OFF" at all other times.

## Tech 2 Scan Tool

From 98 MY, Isuzu dealer service departments are recommended to use Tech 2. Please refer to Tech 2 scan tool user guide.



901RW257

### Legend

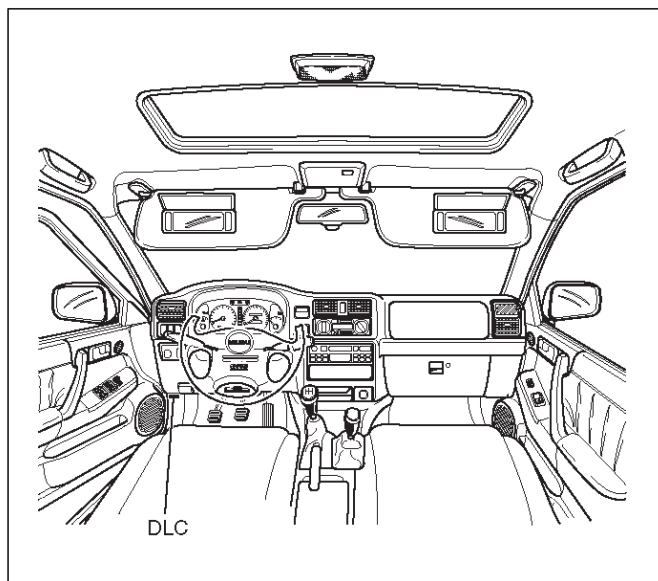
- (1) PCMCIA Card
- (2) SAE 16/19 Adaptor

- (3) DLC Cable
- (4) Tech-2

## 5A-14 BRAKE CONTROL SYSTEM

### Getting Started

- Before operating the Isuzu PCMCIA card with the Tech 2, the following steps must be performed:
  - The Isuzu 98 System PCMCIA card (1) inserts into the Tech 2 (4).
  - Connect the SAE 16/19 adapter (2) to the DLC cable (3).
  - Connect the DLC cable to the Tech 2 (4).
  - Make sure the vehicle ignition is off.
  - Connect the Tech 2 SAE 16/19 adapter to the vehicle DLC.

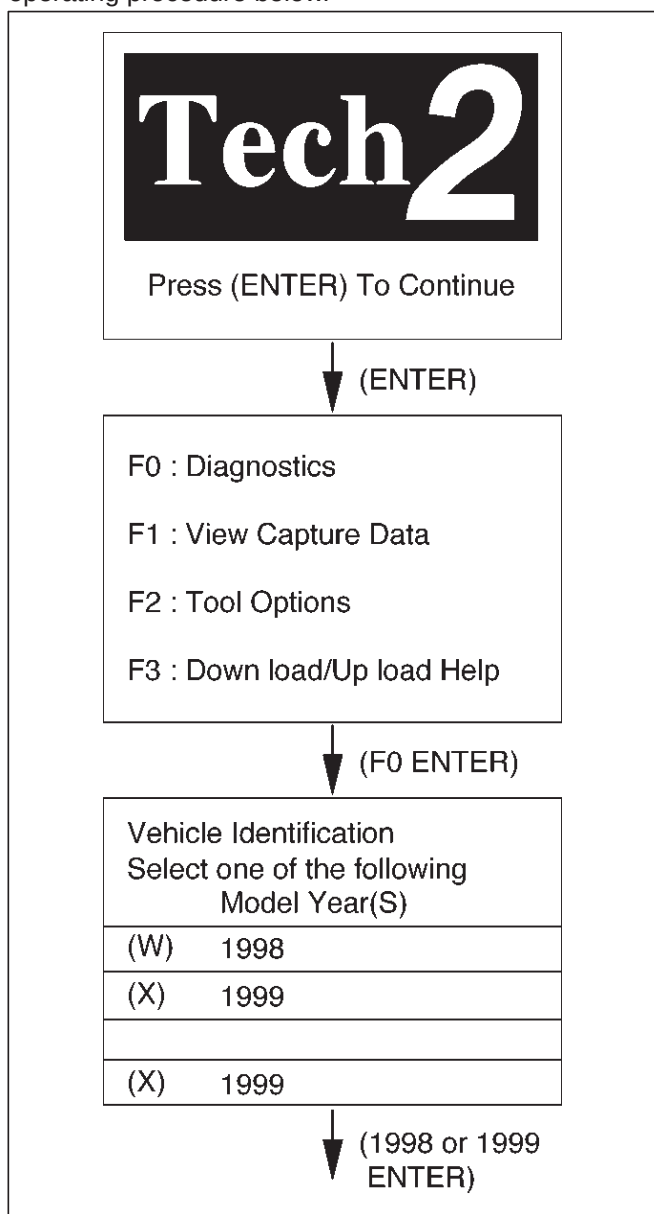


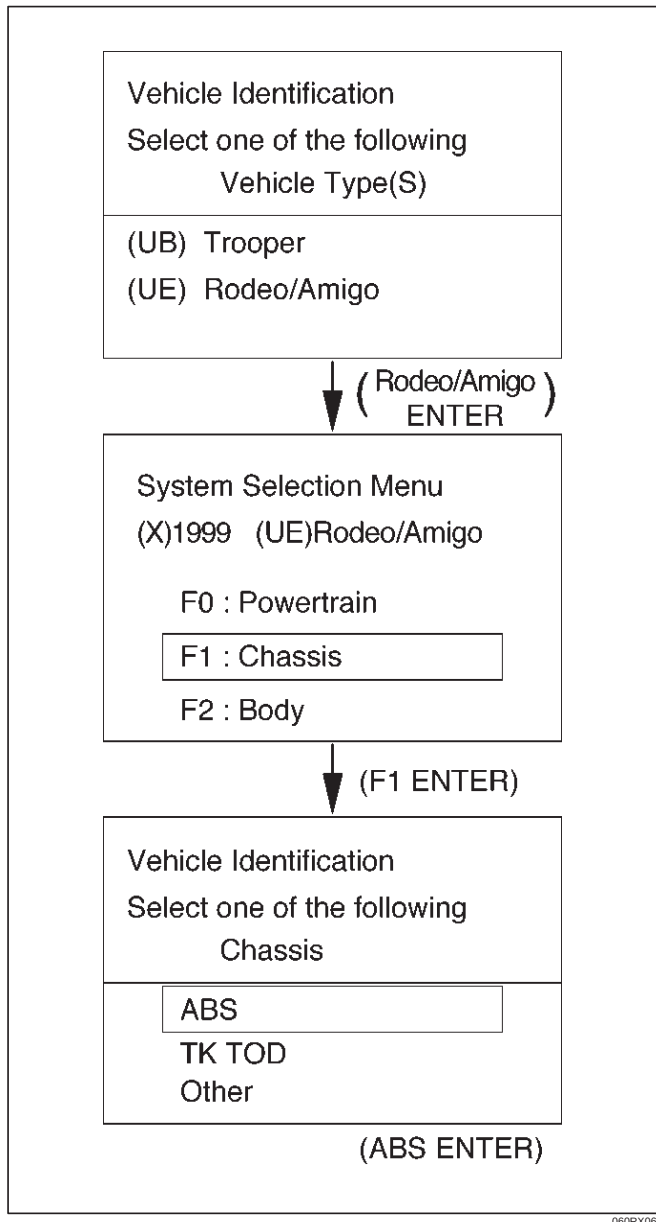
- The vehicle ignition turns on.
- Power up the Tech 2.
- Verify the Tech 2 power up display.



### Operating Procedure

The power up screen is displayed when you power up the tester with the Isuzu systems PCMCIA card. Follow the operating procedure below.





## 5A-16 BRAKE CONTROL SYSTEM

### DATA LIST

The data displayed by DATA LIST are as follows:

| Display                                                                | Content         | OK/NG Criteria for Data                                                                                                                                                                              |
|------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Front Left Wheel Speed<br>Front Right Wheel Speed<br>Rear Wheel Speeds | km/h (MPH)      | <ul style="list-style-type: none"><li>● Start the vehicle and make sure of linear change in each wheel speed.</li><li>● Turn each wheel by hand and make sure that each speed data change.</li></ul> |
| Warning Lamp                                                           | ON/OFF          | <ul style="list-style-type: none"><li>● To be OFF usually</li></ul>                                                                                                                                  |
| ABS State                                                              | ON/OFF          | <ul style="list-style-type: none"><li>● To be OFF usually</li></ul>                                                                                                                                  |
| ABS Relay                                                              | Active/Inactive | <ul style="list-style-type: none"><li>● To be Active usually</li></ul>                                                                                                                               |
| 4 Wheel Drive                                                          | Active/Inactive | <ul style="list-style-type: none"><li>● 2WD: Inactive</li><li>● 4WD: Active</li></ul>                                                                                                                |
| Brake Switch                                                           | Active/Inactive | <ul style="list-style-type: none"><li>● Inactive (Released)</li><li>● Active (Pressed)</li></ul>                                                                                                     |
| Brake Fluid Level                                                      | Normal or not   | <ul style="list-style-type: none"><li>● To be Normal usually</li></ul>                                                                                                                               |
| Return Pump                                                            | Active/Inactive | <ul style="list-style-type: none"><li>● To be Inactive usually</li></ul>                                                                                                                             |
| DRP (Dynamic Rear Proportioning)                                       | Active/Inactive | <ul style="list-style-type: none"><li>● To be Inactive usually</li></ul>                                                                                                                             |
| Rear Dump Valve Commanded                                              | Active/Inactive | <ul style="list-style-type: none"><li>● To be Inactive usually</li></ul>                                                                                                                             |
| Rear Dump Valve Feedback                                               |                 |                                                                                                                                                                                                      |
| Rear Isolation Valve Commanded                                         |                 |                                                                                                                                                                                                      |
| Rear Isolation Valve Feedback                                          |                 |                                                                                                                                                                                                      |
| FL Dump Valve Commanded                                                | Active/Inactive | <ul style="list-style-type: none"><li>● To be Inactive usually</li></ul>                                                                                                                             |
| FL Dump Valve Feedback                                                 |                 |                                                                                                                                                                                                      |
| FL Isolation Valve Commanded                                           |                 |                                                                                                                                                                                                      |
| FL Isolation Valve Feedback                                            |                 |                                                                                                                                                                                                      |
| FR Dump Valve Commanded                                                | Active/Inactive | <ul style="list-style-type: none"><li>● To be Inactive usually</li></ul>                                                                                                                             |
| FR Dump Valve Feedback                                                 |                 |                                                                                                                                                                                                      |
| FR Isolation Valve Commanded                                           |                 |                                                                                                                                                                                                      |
| FR Isolation Valve Feedback                                            |                 |                                                                                                                                                                                                      |
| G-Sensor                                                               | Voltage         | <ul style="list-style-type: none"><li>● 0.00V when vehicle is stopped</li></ul>                                                                                                                      |
| Battery Voltage                                                        | Voltage         | <ul style="list-style-type: none"><li>● Between 10-16.9V</li></ul>                                                                                                                                   |

## ACTUATOR TEST

This mode is used to exercise the ABS actuators and make sure they operate normally. Prior to the test, pay attention to the cautions below. (When checking the solenoid valve system, be sure to jack up the vehicle.)

### CAUTION:

- Before testing, be sure that the brakes work normally.
- Make sure that the battery is fully charged. Conduct the test by two persons (A TECH 2 operator and a vehicle checker).

- Be sure to start ACTUATOR TEST with the engine stopped.
- Before testing, make sure that electrical trouble, if any, has been completely repaired. Conducting tests of ABS solenoid with electrical circuit problem remaining uncorrected could damage the control unit.

| Application Menu             |
|------------------------------|
| F0: Diagnostic Trouble Codes |
| F1: Data Display             |
| F2: Snapshot                 |
| <b>F3: Actuator Test</b>     |
| F4: Miscellaneous Tests      |

Select "F3: Actuator Test" by function key from Application Menu, and push enter key.

| Application Menu                    |
|-------------------------------------|
| <b>F0: Return Pump Relay Test</b>   |
| F1: Front Left Solenoid Valve Test  |
| F2: Front Right Solenoid Valve Test |
| F3: Rear Left Solenoid Valve Test   |
| F4: Rear Left Solenoid Valve Test   |

Return Pump Relay Test:  
Select "F0: Return Pump Relay Test" and push enter key.

| Return Pump Relay Test    |                      |
|---------------------------|----------------------|
| {X} 1999 (UE) Rodeo/Amigo |                      |
| Electronic System: ABS    |                      |
| Front Left Wheel Speed    | 0 km/h               |
| Front Right Wheel Speed   | 0 km/h               |
| Rear Wheel Speeds         | 0 km/h               |
| Warning Lamp              | Off                  |
| ABS State                 | Off                  |
| ABS Relay                 | Active               |
| 4 Wheel Drive             | Inactive             |
| Return Pump               | Inactive             |
| <b>Quit</b>               | <b>On</b> <b>Off</b> |

Using soft key, check the return pump function.

Application Menu

F0: Return Pump Relay Test  
F1: Front Left Solenoid Valve Test  
F2: Front Right Solenoid Valve Test  
F3: Rear Left Solenoid Valve Test  
F4: Rear Right Solenoid Valve Test

Solenoid Valve Test:  
Select required Solenoid Valve Test and  
push the enter key.

Front Left Solenoid Valve Test

(X) 1999 (UE) Rodeo/Amigo  
Electronic System: ABS  
  
Before Running this Test  
See Checking Procedure !

Confirm

Push the soft key under "Confirm" box.

Release brake pedal.

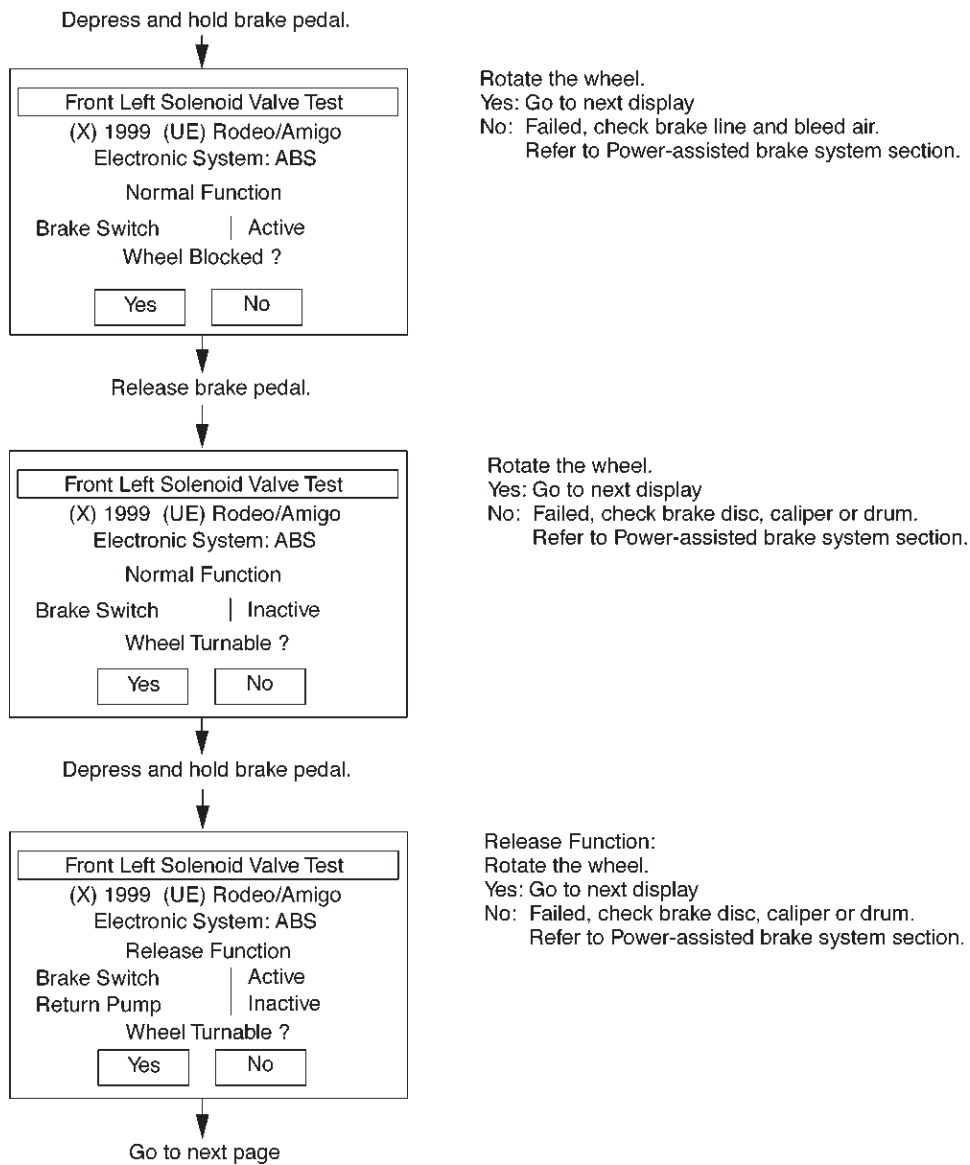
Front Left Solenoid Valve Test

(X) 1999 (UE) Rodeo/Amigo  
Electronic System: ABS  
  
Normal Function  
Brake Switch | Inactive  
Wheel Turnable ?

Yes No

Normal Function:  
Rotate the wheel.  
Yes: Go to next display  
No: Failed, check hydraulic brake system.  
Refer to Power-assisted brake system section.

Go to next page



Depress and hold brake pedal.

Front Left Solenoid Valve Test

(X) 1999 (UE) Rodeo/Amigo  
Electronic System: ABS

Normal Function

Brake Switch | Active

Wheel Blocked?

Yes
No

Reapply Function:  
Rotate the wheel.  
Yes: Go to next display  
No: Failed, check brake line and bleed air.  
Refer to Power-assisted brake system section.

Front Left Solenoid Valve Test

(X) 1999 (UE) Rodeo/Amigo  
Electronic System: ABS

Test passed successfully !

Confirm

Test completed.  
To return Application Menu, push the soft key under "Confirm" box.

## Tech 2 Service Bleed

|                              |
|------------------------------|
| Application Menu             |
| F0: Diagnostic Trouble Codes |
| F1: Data Display             |
| F2: Snapshot                 |
| F3: Actuator Test            |
| F4: Miscellaneous Tests      |

Select "F4: Miscellaneous Tests" by function key

NOTE: Apply parking brake firmly while servicing.  
When operate EHCU by using Tech 2,  
start the engine.

|                  |
|------------------|
| Application Menu |
| F0: Brake Bleed  |

Push enter key.

|                                                                          |
|--------------------------------------------------------------------------|
| Brake Bleed                                                              |
| (X) 1999 (UE) Rodeo/Amigo                                                |
| Electronic System: ABS                                                   |
| 1st Time                                                                 |
| Perfome Manual Bleed Procedure Until<br>Fluid Flows With No Air Present. |
| Continue                                                                 |

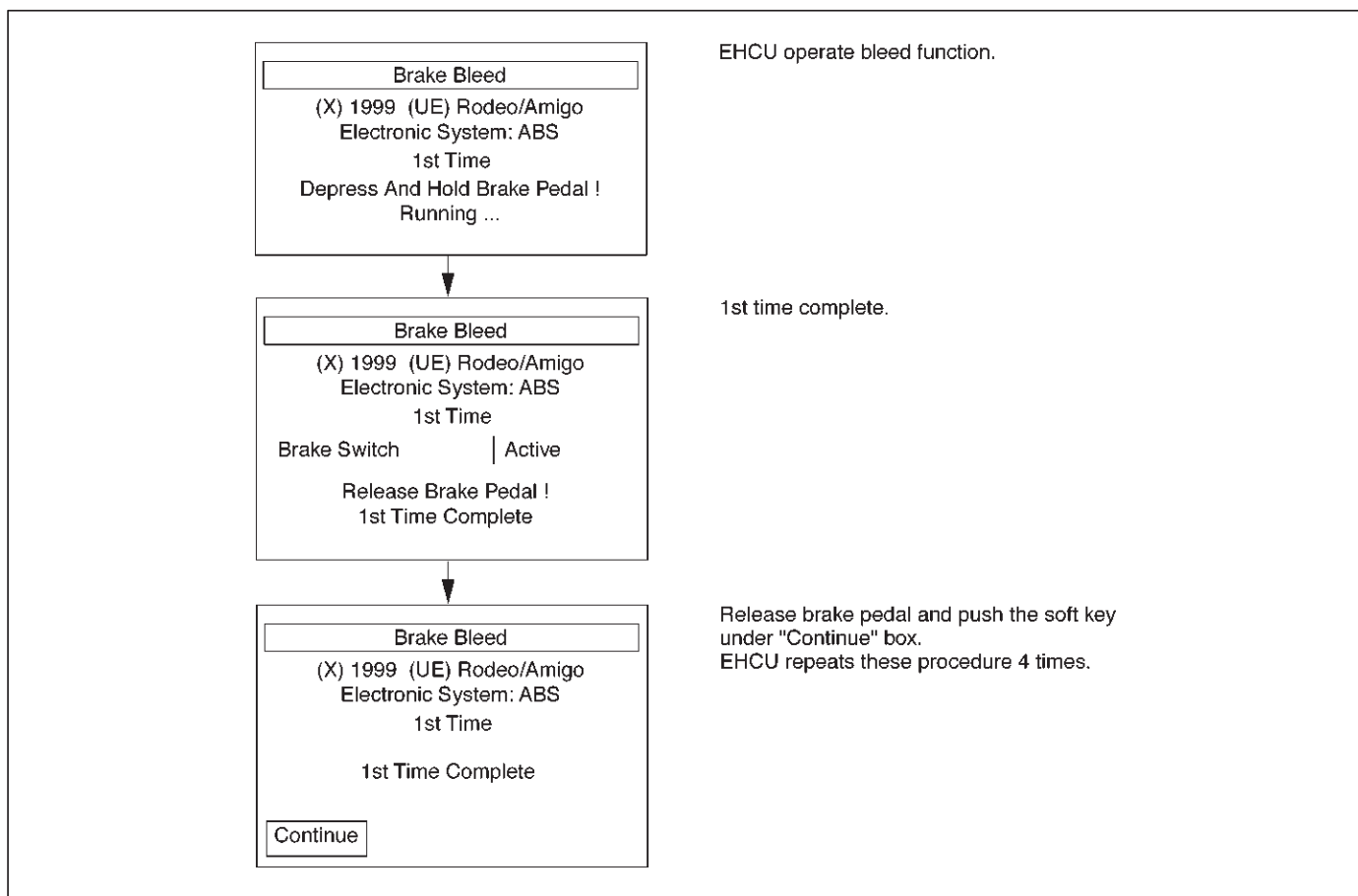
Push the soft key under "Continue" box.

Depress and hold brake pedal.

|                                            |
|--------------------------------------------|
| Brake Bleed                                |
| (X) 1999 (UE) Rodeo/Amigo                  |
| Electronic System: ABS                     |
| 1st Time                                   |
| Depress And Hold Brake Pedal !<br>Activate |
| Yes No                                     |

To start brake bleed, push the soft key  
under "Yes" box.

## 5A-22 BRAKE CONTROL SYSTEM



F05RX006

### Basic Diagnostic Flow Chart

| Step | Action                                                                                                                                                                  | Yes                                                                      | No                                                                                |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| 1    | 1. Customer complaint.<br>2. Questioning to customer.<br>3. Basic inspection (Refer to "Basic inspection procedure")<br>Using TECH 2?                                   | Go to Step 2                                                             | Go to Step 4                                                                      |
| 2    | Make sure of DTC by mode "F0: Diagnostic Trouble Codes".<br>Is EHCUC including DTC?                                                                                     | Clear code and check for repeatability.<br>Go to Step 3                  | Go to Step 5                                                                      |
| 3    | 1. Repair of faulty part.<br>2. Elimination of DTC.<br>3. Inspection of "ABS" W/L Illumination pattern with ignition SW "ON".<br>4. Test drive.<br>Does trouble repeat? | Repeat the diagnosis if the symptom or DTC appears again<br>Go to Step 1 | Go to Step 5                                                                      |
| 4    | Check if the DTC is stored or not.<br>Is EHCUC including DTC?                                                                                                           | Clear code and check for repeatability<br>Go to Step 3                   | Trouble diagnosis based on symptom (Refer to "SYMPTOM DIAGNOSIS")<br>Go to Step 3 |
| 5    | 1. Reconnect all components. Ensure all component are properly mounted.<br>2. Clear diagnostic trouble code.<br>Was this step finished?                                 | Finished                                                                 | Go to Step 5                                                                      |

## Basic Inspection Procedure

### 1. Basic Inspection of Service Brake

| Step | Action                                                                                          | Yes                    | No                                   |
|------|-------------------------------------------------------------------------------------------------|------------------------|--------------------------------------|
| 1    | Is the fluid level normal?                                                                      | Go to Step 2           | Replenish with fluid<br>Go to Step 2 |
| 2    | Does fluid leak?                                                                                | Repair<br>Go to Step 3 | Go to Step 3                         |
| 3    | Is the booster function normal?                                                                 | Go to Step 4           | Repair<br>Go to Step 4               |
| 4    | Is the pad and rotor normal?                                                                    | Go to Step 5           | Repair<br>Go to Step 5               |
| 5    | Reconnect all components. Ensure all component are properly mounted.<br>Was this step finished? | Finished               | Go to Step 5                         |

### 2. Ground Inspection

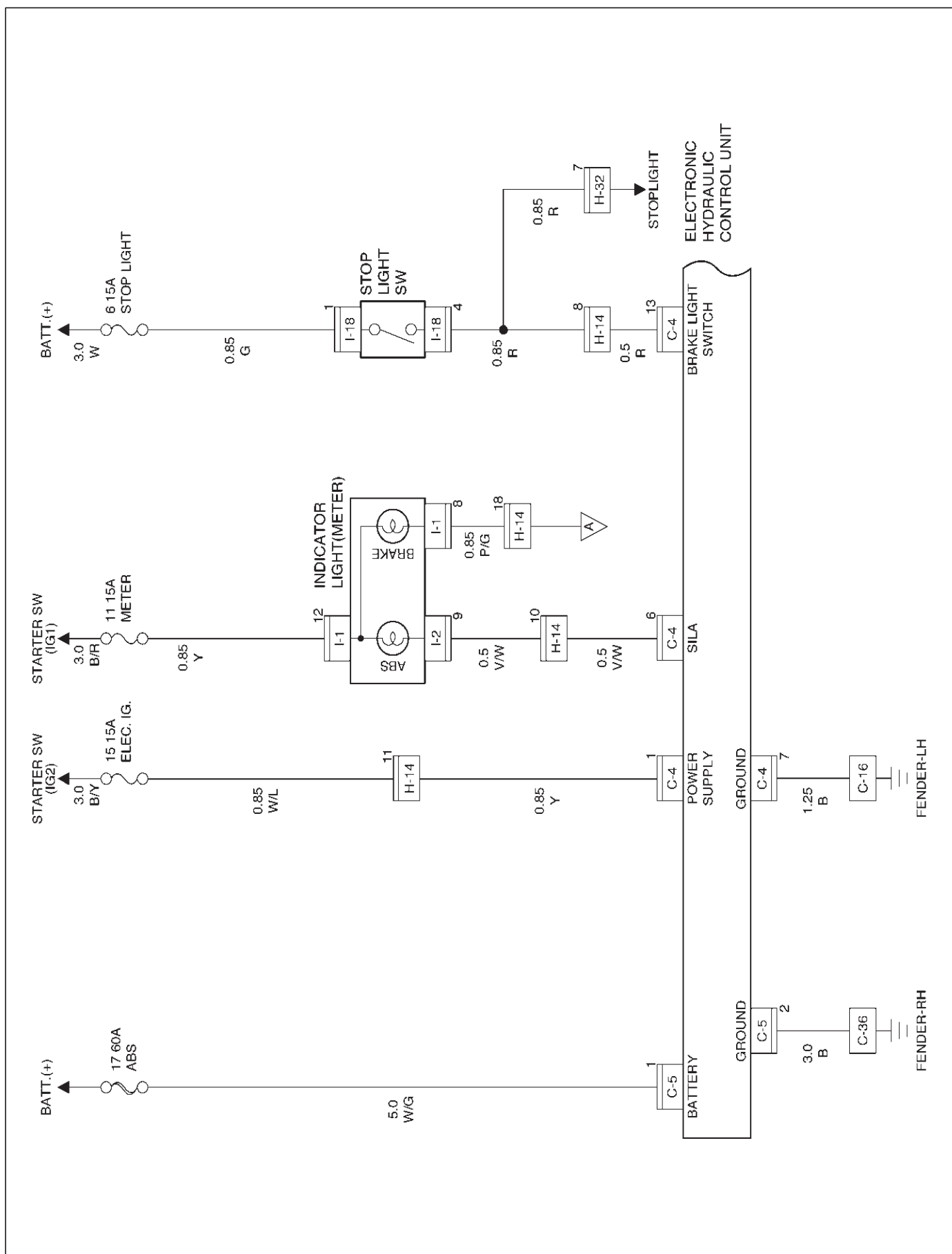
| Step | Action                                                                                          | Yes          | No                     |
|------|-------------------------------------------------------------------------------------------------|--------------|------------------------|
| 1    | Does ABS—related ground points normally?                                                        | Go to Step 2 | Repair<br>Go to Step 2 |
| 2    | Reconnect all components. Ensure all component are properly mounted.<br>Was this step finished? | Finished     | Go to Step 2           |

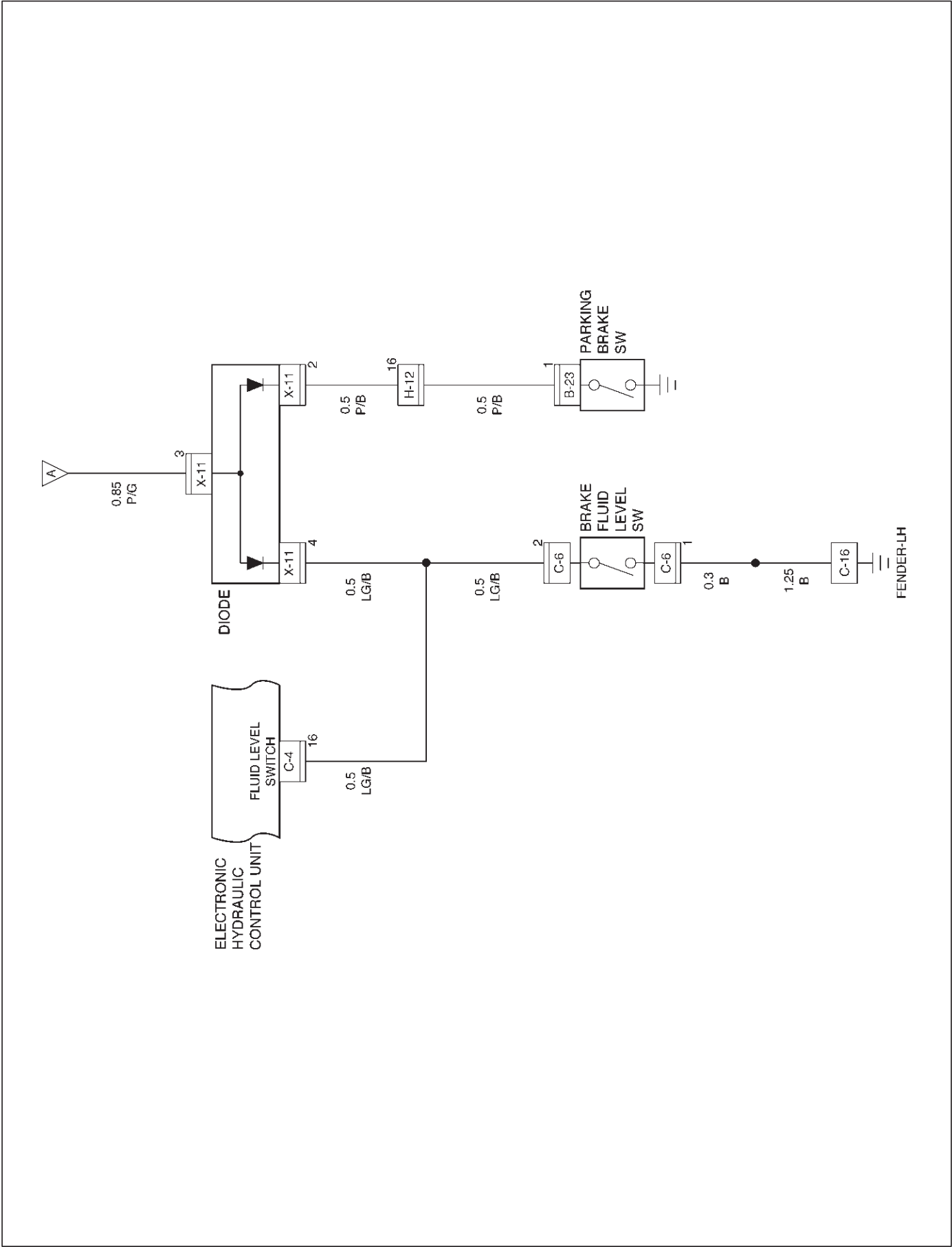
## 5A-24 BRAKE CONTROL SYSTEM

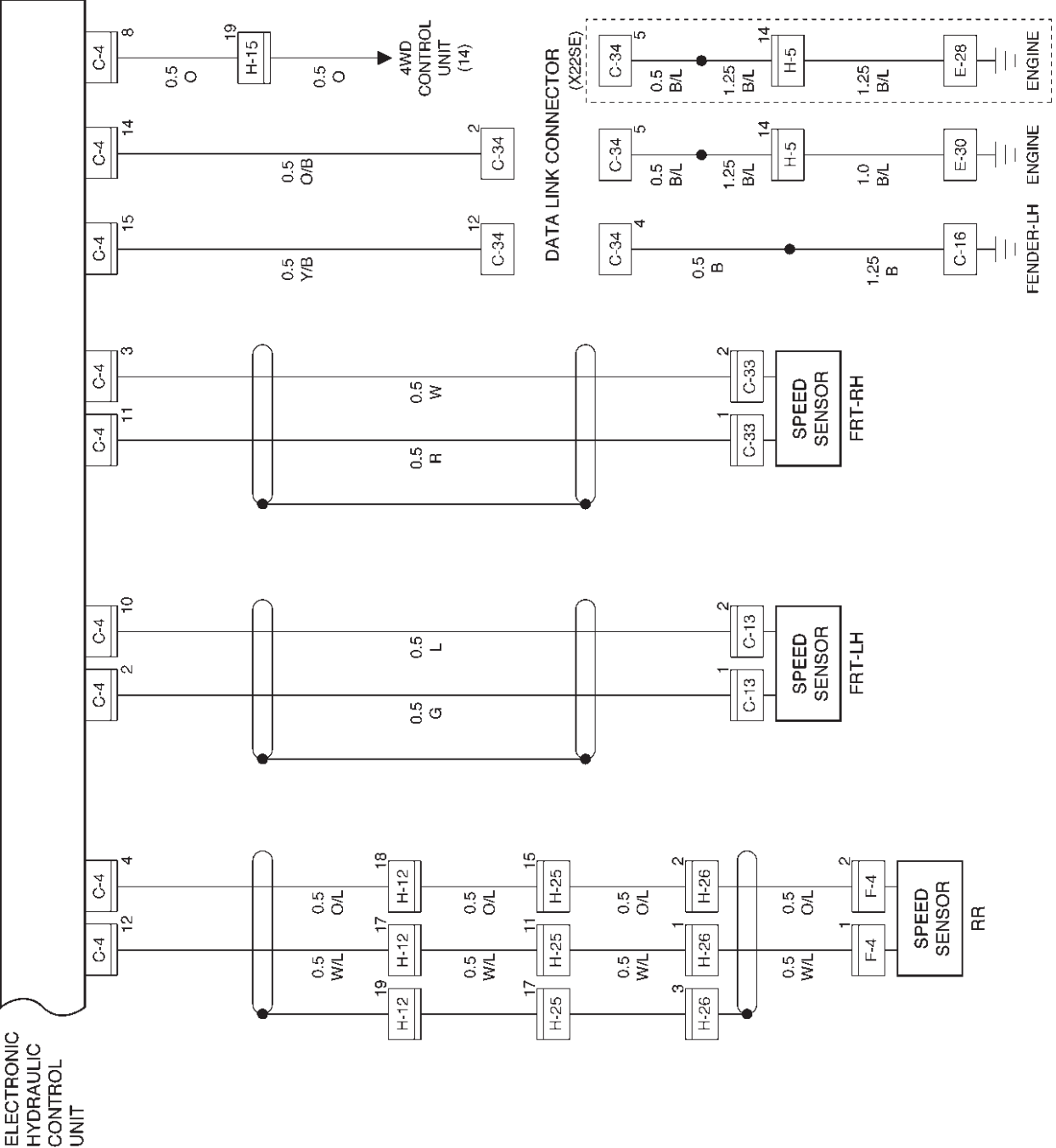
### EHCUC Connector Pin-out Checks

- Disconnect Electronic Hydraulic Control Module.
- Perform checks with high impedance digital multimeter J-39200 or equivalent.

| No. | Circuit to be Tested | Ignition Switch Position | Multimeter Scale/Range | Measure between Pin Number | Nominal Value                  | Note                  |
|-----|----------------------|--------------------------|------------------------|----------------------------|--------------------------------|-----------------------|
| 1   | Power supply         | OFF                      | 20DCV                  | 1 (C-5)<br>2 (C-5)         | 11.5V to 14.5V                 |                       |
| 2   | Ignition enable      | OFF                      | 20DCV                  | 1 (C-4)<br>7 (C-4)         | 0V to 0.1V                     |                       |
|     |                      | ON                       | 20DCV                  | 1 (C-4)<br>7 (C-4)         | 11.5V to 14.5V                 |                       |
| 3   | Stoplight switch     | OFF                      | 20DCV                  | 13 (C-4)<br>7 (C-4)        | 10.5V to 14.5V                 | Press brake pedal     |
| 4   | Ground connection    | OFF                      | 200 $\Omega$           | 7 (C-4)<br>Ground          | Less than 2 $\Omega$           |                       |
|     |                      | OFF                      | 1 $\Omega$             | 2 (C-5)<br>Ground          | Less than 0.2 $\Omega$         |                       |
| 5   | FL speed sensor      | OFF                      | 2k $\Omega$            | 2 (C-4)<br>10 (C-4)        | 2.0k $\Omega$ to 2.8k $\Omega$ | Internal Resistance   |
|     |                      | OFF                      | 200k $\Omega$          | 2 (C-4)<br>7 (C-4)         | more than 100k $\Omega$        | Insulation Resistance |
|     |                      | OFF                      | 200mACV                | 2 (C-4)<br>10 (C-4)        | more than 200mV                | Turn wheel at 1RPS    |
| 6   | FR speed sensor      | OFF                      | 2k $\Omega$            | 3 (C-4)<br>11 (C-4)        | 2.0k $\Omega$ to 2.8k $\Omega$ | Internal Resistance   |
|     |                      | OFF                      | 200k $\Omega$          | 3 (C-4)<br>7 (C-4)         | more than 100k $\Omega$        | Insulation Resistance |
|     |                      | OFF                      | 200mACV                | 3 (C-4)<br>11 (C-4)        | more than 200mV                | Turn wheel at 1RPS    |
| 7   | RR speed sensor      | OFF                      | 2k $\Omega$            | 4 (C-4)<br>12 (C-4)        | 1.2k $\Omega$ to 2.0k $\Omega$ | Internal Resistance   |
|     |                      | OFF                      | 200k $\Omega$          | 4 (C-4)<br>7 (C-4)         | more than 100k $\Omega$        | Insulation Resistance |
|     |                      | OFF                      | 200mACV                | 4 (C-4)<br>12 (C-4)        | more than 200mV                | Turn wheel at 1RPS    |

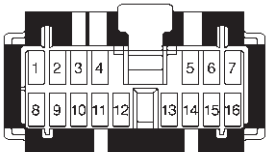
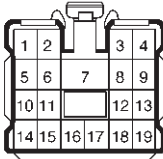
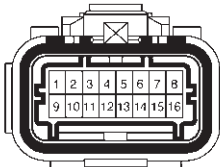
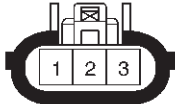
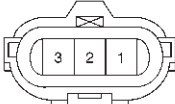
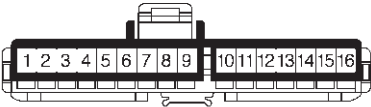
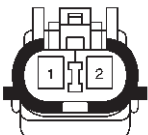
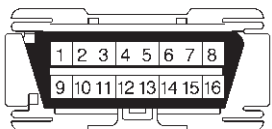
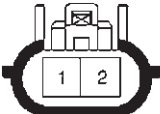
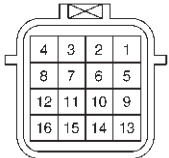
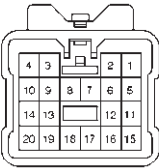
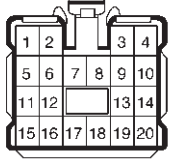




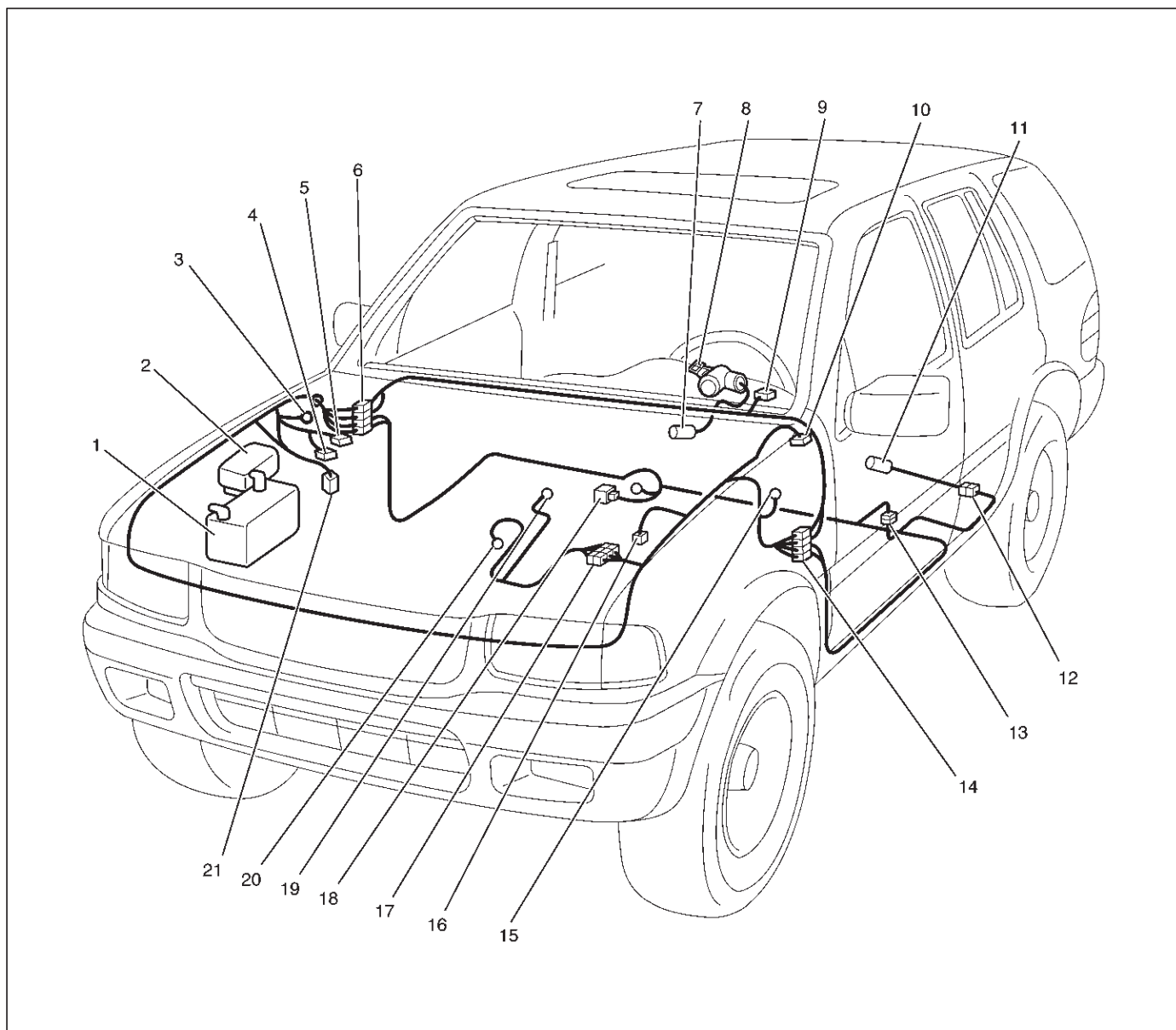


## 5A-28 BRAKE CONTROL SYSTEM

### Connector List

| No.                          | Connector face                                                                                                                                                          | No.          | Connector face                                                                                                                                                         |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| B-19                         |                                                                                        | H-13<br>H-14 |   |
| C-4                          |                                                                                        | H-26         |   |
| C-5                          |                                                                                        | I-1          |                                                                                      |
| C-13<br>C-33                 |                                                                                       | I-18         |                                                                                    |
| C-16<br>C-36<br>E-28<br>E-30 |                                                                                      |              |                                                                                                                                                                        |
| C-34                         |                                                                                      |              |                                                                                                                                                                        |
| F-4                          |                                                                                      |              |                                                                                                                                                                        |
| H-5                          |   |              |                                                                                                                                                                        |
| H-12<br>H-15<br>H-25         |   |              |                                                                                                                                                                        |

## Part Location



D08RX107

## Legend

- |                      |                   |
|----------------------|-------------------|
| (1) Battery          | (11) F-4          |
| (2) Fuse & Relay Box | (12) H-26         |
| (3) C-36             | (13) H-25         |
| (4) C-5              | (14) H-15         |
| (5) C-4              | (15) C-16         |
| (6) H-12, 13, 14     | (16) C-13         |
| (7) I-18             | (17) H-5          |
| (8) Starter Switch   | (18) B-19         |
| (9) I-1              | (19) E-30 (6VD1)  |
| (10) C-34            | (20) E-28 (X22SE) |
|                      | (21) C-33         |

## 5A-30 BRAKE CONTROL SYSTEM

### Symptom Diagnosis

The symptoms that cannot be indicated by warning light can be divided in the following five categories:

1. ABS works frequently but vehicle does not decelerate.
2. Uneven braking occurs while ABS works.
3. The wheels lock during braking.

4. Brake pedal feel is abnormal.

5. Braking sound (from EHCUC) is heard while not braking.

These are all attributable to problems which cannot be detected by EHCUC self-diagnosis. Use the customer complaint and a test to determine which symptom is present. Then follow the appropriate flow chart listed below.

| No. | Symptom                                                | Diagnostic Flow Charts |             |
|-----|--------------------------------------------------------|------------------------|-------------|
|     |                                                        | Without TECH 2         | With TECH 2 |
| 1   | ABS works frequently but vehicle does not decelerate.  | Chart A-1              | Chart TA-1  |
| 2   | Uneven braking occurs while ABS works.                 | Chart A-2              | Chart TA-2  |
| 3   | The wheels are locked.                                 | Chart A-3              | Chart TA-3  |
| 4   | Brake pedal feel is abnormal.                          | Chart A-4              | —           |
| 5   | Braking sound (from EHCUC) is heard while not braking. | Chart A-5              | Chart TA-5  |

### Chart A-1 ABS Works Frequently But Vehicle Does Not Decelerate

| Step | Action                                                                                           | Yes                                            | No                                                            |
|------|--------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------|
| 1    | Is braking force distribution normal between front and rear of vehicle?                          | Go to Step 2                                   | Repair brake parts.<br>Go to Step 8                           |
| 2    | Are axle parts installed normally?                                                               | Go to Step 3                                   | Repair axle parts.<br>Go to Step 8                            |
| 3    | Is there play in each or any wheel speed sensor?                                                 | Repair wheel speed sensor.<br>Go to Step 8     | Go to Step 4                                                  |
| 4    | Is there damage, or powered iron sticking to each or any wheel speed sensor/sensor ring?         | Replace sensor or sensor ring.<br>Go to Step 8 | Go to Step 5                                                  |
| 5    | Is the output of each wheel speed sensor normal? (Refer to chart C-1 or TC-1)                    | Go to Step 6                                   | Replace wheel speed sensor or repair harness.<br>Go to Step 7 |
| 6    | Is the input of 4WD controller normal?                                                           | Go to Step 7                                   | Replace controller or repair harness.<br>Go to Step 7         |
| 7    | Reconnect all components, ensure all components are properly mounted.<br>Was this step finished? | Repeat the "Basic diagnostic flow chart"       | Go to Step 7                                                  |

**Chart TA-1 ABS Works Frequently But Vehicle Does Not Decelerate (Use TECH 2)**

| Step | Action                                                                                                              | Yes                                      | No                                          |
|------|---------------------------------------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------------|
| 1    | 1. Connect TECH 2.<br>2. Make sure of the output conditions of each sensor.<br>Is the output of each sensor normal? | Go to Step 2                             | Replace wheel speed sensor.<br>Go to Step 3 |
| 2    | Return to Chart A-1.<br>Was the Chart A-1 finished?                                                                 | Go to Step 3                             | Go to Step 2                                |
| 3    | Reconnect all components, ensure all components are properly mounted.<br>Was this step finished?                    | Repeat the "Basic diagnostic flow chart" | Go to Step 3                                |

**Chart A-2 Uneven Braking Occurs While ABS Works**

| Step | Action                                                                                           | Yes                                      | No                                                |
|------|--------------------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------------------|
| 1    | Is there play in each or any sensor?                                                             | Repair.<br>Go to Step 5                  | Go to Step 2                                      |
| 2    | Damage or powdered iron sticking to each or any sensor/sensor ring?                              | Repair.<br>Go to Step 5                  | Go to Step 3                                      |
| 3    | Is the output of each sensor normal? (Refer to chart C-1 or TC-1)                                | Go to Step 4                             | Replace sensor or repair harness.<br>Go to Step 5 |
| 4    | Is brake pipe connecting order correct?                                                          | Replace H/U.<br>Go to Step 5             | Reconnect brake pipe correctly.<br>Go to Step 5   |
| 5    | Reconnect all components, ensure all components are properly mounted.<br>Was this step finished? | Repeat the "Basic diagnostic flow chart" | Go to Step 5                                      |

**Chart TA-2 Uneven Braking Occurs While ABS Works (Use TECH 2)**

| Step | Action                                                                                                               | Yes                                      | No                               |
|------|----------------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------------------|
| 1    | 1. Connect TECH 2.<br>2. Make sure of the output conditions of each sensor.<br>Is the output of each sensor normal?  | Go to Step 2                             | Go to Step 3                     |
| 2    | Check piping by TECH 2 ACTUATOR TEST<br>Is the piping normal?                                                        | Replace EHC. U.<br>Go to Step 4          | Repair the pipe.<br>Go to Step 4 |
| 3    | Repair and check the wheel speed sensor (Refer to chart B-20 to B-23 , C-1 or TC-1).<br>Was the each chart finished? | Go to Step 4                             | Go to Step 3                     |
| 4    | Reconnect all components, ensure all components are properly mounted.<br>Was this step finished?                     | Repeat the "Basic diagnostic flow chart" | Go to Step 4                     |

**5A-32 BRAKE CONTROL SYSTEM****Chart A-3, TA-3 The Wheels Are Locked**

| Step | Action                                                                                           | Yes                                      | No                                                        |
|------|--------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------|
| 1    | Is ABS working?                                                                                  | Go to Step 2                             | Go to Step 6                                              |
| 2    | Is vehicle speed under 10 km/h (6mph)?                                                           | Normal.                                  | Go to Step 3                                              |
| 3    | Is sensor output normal? (Chart C-1 or TC-1)                                                     | Go to Step 4                             | Replace sensor or repair harness.<br>Go to Step 6         |
| 4    | Is front 4WD controller normal?                                                                  | Go to Step 5                             | Replace 4WD controller or repair harness.<br>Go to Step 6 |
| 5    | Is hydraulic unit grounded properly?                                                             | Replace EHCU.<br>Go to Step 6            | Correct.<br>Go to Step 6                                  |
| 6    | Reconnect all components, ensure all components are properly mounted.<br>Was this step finished? | Repeat the "Basic diagnostic flow chart" | Go to Step 6                                              |

**Chart A-4 Brake Pedal Feed Is Abnormal**

| Step | Action                                                                                                                                                                                 | Yes                                        | No                                                     |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------|
| 1    | Is the stop light actuated when the brake pedal is depressed?                                                                                                                          | Go to Step 2                               | Go to Step 3                                           |
| 2    | 1. Turn the ignition switch off.<br>2. Disconnected EHCUC connector.<br><br>Is the check voltage EHCUC connector terminals 13 to 7 when brake pedal is depressed than battery voltage? | Go to Step 4                               | Harness NG between brake SW and EHCUC.<br>Go to Step 6 |
| 3    | Is stop light fuse normal?                                                                                                                                                             | Go to Step 5                               | Replace stop light fuse.<br>Go to Step 6               |
| 4    | Is the check continuity between EHCUC connector terminals, 7 to body grounded?                                                                                                         | Go to Step 6                               | Repair body grounded harness.<br>Go to Step 6          |
| 5    | Is brake SW normal?                                                                                                                                                                    | Repair stop light harness.<br>Go to Step 6 | Replace brake SW.<br>Go to Step 6                      |
| 6    | Reconnect all components, ensure all components are properly mounted.<br><br>Was this step finished?                                                                                   | Repeat the "Basic diagnostic flow chart"   | Go to Step 6                                           |

## 5A-34 BRAKE CONTROL SYSTEM

**Chart A-5, TA-5 Braking Sound (From EHCU) Is Heard While Not Braking**

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Yes                                                                                                                                  | No                      |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| 1    | Is this the first vehicle start after engine start?                                                                                                                                                                                                                                                                                                                                                                                                                                            | It is self checking sound<br>Normal.                                                                                                 | Go to Step 2            |
| 2    | Is vehicle speed under 10 km/h (6 mph)?                                                                                                                                                                                                                                                                                                                                                                                                                                                        | It is self checking sound<br>Normal.                                                                                                 | Go to Step 3            |
| 3    | Check for the following condition: <ul style="list-style-type: none"> <li>• At the time of shift down or clutch operation.</li> <li>• At the time of low road friction drive (ice or snow road) or rough road drive.</li> <li>• At the time of high-speed turn.</li> <li>• At the time of passing curb.</li> <li>• At the time of operating electrical equipment switches.</li> <li>• At the time of racing the engine (over 5000 rpm).</li> </ul> Did it occur under any one condition above? | ABS may sometime be actuated even when brake pedal is not applied.                                                                   | Go to Step 4            |
| 4    | Is there play in each or any sensor/wheel speed sensor rings?                                                                                                                                                                                                                                                                                                                                                                                                                                  | Repair.<br>Go to Step 7                                                                                                              | Go to Step 5            |
| 5    | Damage or powdered iron sticking to each or any sensor/wheel speed sensor ring?                                                                                                                                                                                                                                                                                                                                                                                                                | Repair.<br>Go to Step 7                                                                                                              | Go to Step 6            |
| 6    | Is each sensor output normal? (Refer to chart C-1 or TC-1).                                                                                                                                                                                                                                                                                                                                                                                                                                    | Check harness/connector for suspected disconnection<br>If no disconnection is found, replace Coil integrated module.<br>Go to Step 7 | Repair.<br>Go to Step 7 |
| 7    | Reconnect all components, ensure all components are properly mounted.<br>Was this step finished?                                                                                                                                                                                                                                                                                                                                                                                               | Repeat the "Basic diagnostic flow chart"                                                                                             | Go to Step 7            |

## Diagnostic Trouble Codes

Choose and trace an appropriate flowchart by the numbers listed below to find fault and repair.

| Code      |                       | Diagnosis                                          | Item                   | Chart No. |
|-----------|-----------------------|----------------------------------------------------|------------------------|-----------|
| Flash out | Serial Communications |                                                    |                        |           |
| 12        | —                     | —                                                  | —                      | —         |
| 13        | C0285                 | 2 WD Controller in 4WD Vehicle Controller          | Wiring                 | B-8       |
| 14        | C0271                 | RAM read/write error                               | Coil Integrated Module | B-2       |
|           | C0272                 | ROM checksum error                                 |                        |           |
|           | C0270                 | ALU function error                                 |                        |           |
|           | C0273                 | Inoperative isolation item                         |                        |           |
|           | C0284                 | Loop time overrun                                  |                        |           |
| 15        | C0277                 | Low ignition voltage                               | Wiring                 | B-3       |
|           | C0278                 | High ignition voltage                              |                        |           |
| 17        | C0269                 | Excessive dump time                                | Coil Integrated Module | B-4       |
| 18        | C0274                 | Excessive isolation time                           |                        | B-5       |
| 21        | C0276                 | G-Sensor Failure                                   |                        | B-6       |
| 22        | C0281                 | Brake switch Failure                               |                        | B-7       |
| 24        | C0282                 | Open or shorted 4×4 input signal (4WD only)        | Wiring                 | B-8       |
| 32        | C0267                 | Open motor circuit or shorted ECU output           | Motor                  | B-9       |
|           | C0268                 | Stalled motor or open ECU output                   |                        |           |
| 35        | C0265                 | Open relay circuit                                 | Relay                  | B-10      |
|           | C0266                 | Shorted relay circuit                              |                        |           |
| 41        | C0245                 | FL Open isolation solenoid or shorted ECU output   | Solenoid               | B-11      |
|           | C0247                 | FL Shorted isolation solenoid or open ECU output   |                        |           |
| 42        | C0246                 | FL Open dump solenoid or shorted ECU output        |                        | B-12      |
|           | C0248                 | FL Shorted dump solenoid or open ECU output        |                        |           |
| 43        | C0241                 | FR Open isolation solenoid or shorted ECU output   |                        | B-13      |
|           | C0243                 | FR Shorted isolation solenoid or open ECU output   |                        |           |
| 44        | C0242                 | FR Open dump solenoid or shorted ECU output        |                        | B-14      |
|           | C0244                 | FR Shorted dump solenoid or open ECU output        |                        |           |
| 45        | C0251                 | Rear Open isolation solenoid or shorted ECU output |                        | B-15      |
|           | C0253                 | Rear Shorted isolation solenoid or open ECU output |                        |           |
| 46        | C0252                 | Rear Open dump solenoid or shorted ECU output      |                        | B-16      |
|           | C0254                 | Rear Shorted dump solenoid or open ECU output      |                        |           |

## 5A-36 BRAKE CONTROL SYSTEM

| Code      |                       | Diagnosis                                   | Item              | Chart No. |
|-----------|-----------------------|---------------------------------------------|-------------------|-----------|
| Flash out | Serial Communications |                                             |                   |           |
| 51        | C0225                 | FL Open or shorted sensor                   | Sensor or Wiring  | B-17      |
| 52        | C0221                 | FR Open or shorted sensor                   |                   | B-18      |
| 53        | C0235                 | Rear Open or shorted sensor                 |                   | B-19      |
| 61        | C0226                 | FL Missing sensor signal                    |                   | B-20      |
|           | C0227                 | FL Sensor signal dropout                    |                   |           |
| 62        | C0222                 | FR Missing sensor signal                    |                   | B-21      |
|           | C0223                 | FR Sensor signal dropout                    |                   |           |
| 63        | C0236                 | Rear Missing sensor signal                  |                   | B-22      |
|           | C0237                 | Rear Sensor signal dropout                  |                   |           |
| 64        | C0229                 | Simultaneous dropout of front sensor signal |                   | B-23      |
| 65        | C0238                 | Wheel speed error                           | Vehicle or Sensor | B-24      |
| —         | C0286                 | Shorted indicator lamp                      | Wiring            | —         |

## Diagnosis By “ABS” Warning Light Illumination Pattern

In the event that there is abnormality in the “ABS” warning light illumination pattern while the key is in the ON position or if the warning light is actuated during driving, trouble should be diagnosed on a illumination pattern basis as follows:

| No. | Condition                                                                         | “ABS” Warning Light Illumination Pattern                                                                                                                                                                                            | Diagnostic                                                                                                                                                                                                                                            |
|-----|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Warning light is actuated normally                                                | <p>Warning light: ON during cranking, OFF during driving. Still not lit during driving.</p> <p>Starter SW: ON during cranking, OFF during driving.</p>                                                                              | Normal                                                                                                                                                                                                                                                |
| 2   | Warning light is not lit                                                          | <p>Warning light: OFF throughout.</p> <p>Starter SW: ON during cranking, OFF during driving.</p>                                                                                                                                    | Warning light lighting circuit trouble→Go to Chart B-1                                                                                                                                                                                                |
| 3   | Warning light remains ON                                                          | <p>Warning light: ON during cranking and remains ON during driving.</p> <p>Starter SW: ON during cranking, OFF during driving.</p>                                                                                                  | Diagnostic trouble codes are stored.<br>Display diagnostic trouble codes and diagnose on a code basis according to the flow charts.                                                                                                                   |
| 4   | Warning light is actuated while driving                                           | <p>Warning light: OFF during cranking, ON during driving, then OFF.</p> <p>Starter SW: ON during cranking, OFF during driving.</p> <p>During driving: Warning light is ON.</p>                                                      | Diagnostic trouble codes are stored.<br>Display diagnostic trouble codes and diagnose on a code basis according to the flow charts.                                                                                                                   |
| 5   | Warning light goes at 12 km/h (8 mph) or higher (After repairing the faulty part) | <p>Warning light: ON during cranking and remains ON during driving until 12 km/h (8 mph), then OFF.</p> <p>Starter SW: ON during cranking, OFF during driving.</p> <p>Speed: 0 kph until 12 km/h (8 mph), then 12 km/h (8 mph).</p> | Even after repairing the faulty part the warning light (W/L) does not go out if vehicle is at a stop.<br>Turn the ignition switch to the ON position and drive the vehicle at 12 km/h (8 mph) or higher to make sure that the warning light goes out. |

## 5A-38 BRAKE CONTROL SYSTEM

### Diagnostic Trouble Codes (DTCs)

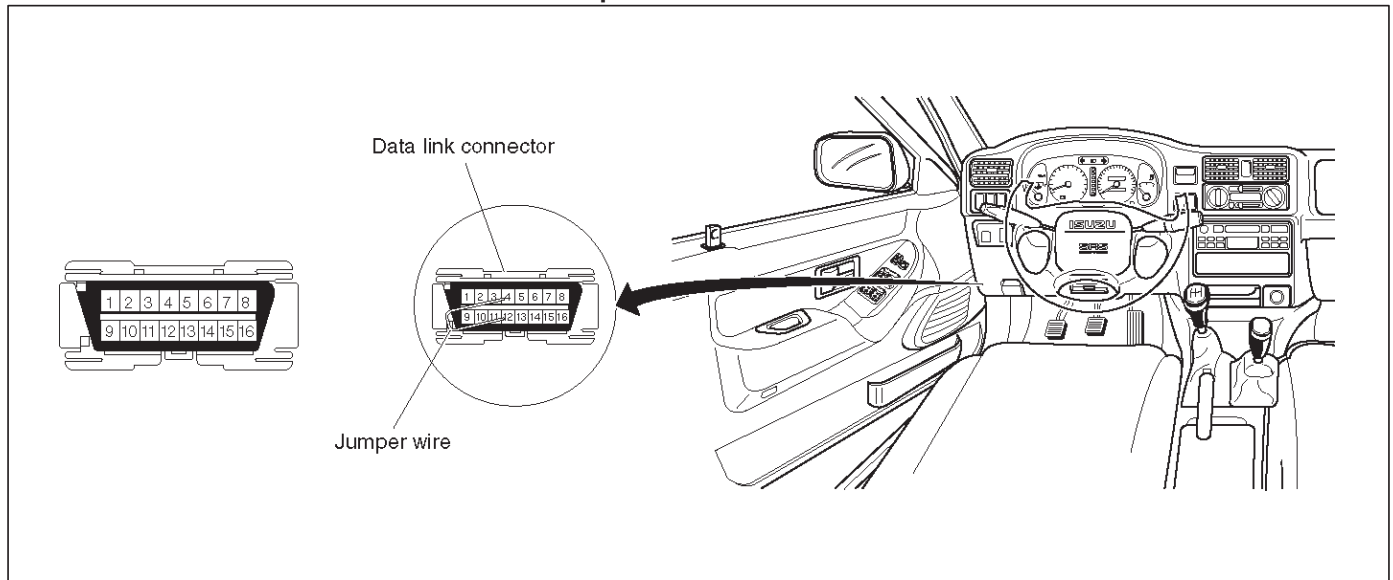
When the warning light in the meter remains ON, the EHCU stores the fault identification and disables the ABS.

#### How to display and erase DTCs:

NOTE:

- DTCs can be displayed also by TECH 2. Use "Diagnostic Trouble Codes" mode.

The DLC is located behind the driver side kick panel



350RW016

#### 1. How to start DTC display:

- Confirm that the vehicle has come to a complete stop (with the wheels standing still) and that the brake pedal is not depressed. (Unless these two condition are satisfied, DTC display cannot be started.)
- With IGN OFF, connect #12 terminal with #4 terminal or #5 terminal (GND). Then turn IGN ON.

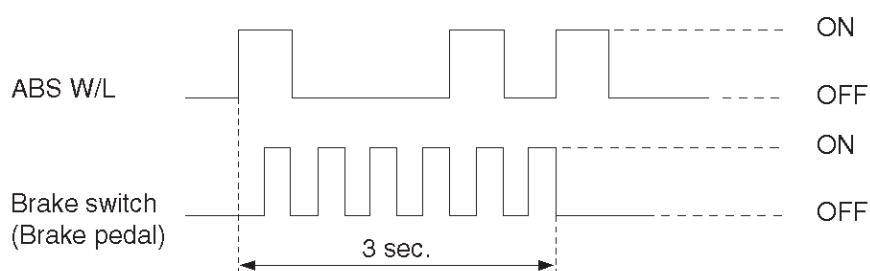
- Keep #12 terminal connected with #4 terminal or #5 terminal (GND) during DTC display. (If #12 terminal is separated from #4 terminal or #5 terminal (GND) during display, display will stop.)

#### 2. DTC display:

- DTC is displayed by blinking warning light.
- Double-digit display.
- First, normal DTC 12 is displayed three times and then any other DTCs are displayed three times. (If no other DTCs have been stored, the display of DTC 12 will be repeated.)

#### 3. How to erase code:

- Conduct brake switch ON/OFF operation 6 or more times within 3 seconds of self-diagnosis startup.
- The code cannot be erased if more than 3 seconds have passed since self-diagnosis startup, or if self-diagnosis has started with brake switched on (brake pedaled).



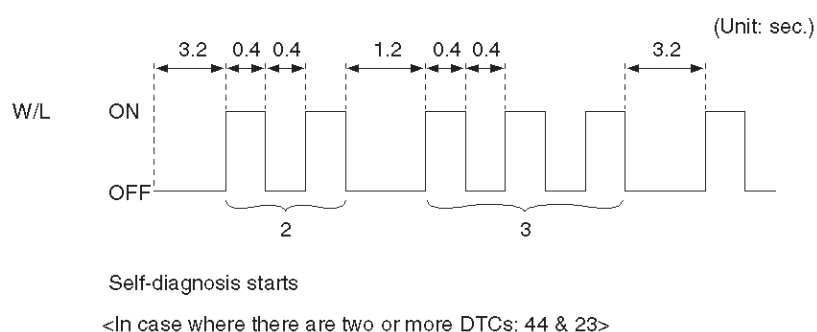
B05RW005

#### 4. Notes

- If the following should occurs during Diagnostic Trouble Code (DTC) display the display will be discontinued. After initial check, the status that is under the control of ABS will be returned :
  - The vehicle starts (The wheels turn) or the brake pedal is depressed.
- Up to 3 different codes can be stored.
- If the ABS should turn OFF due to an intermittent defect, the system will be restored at the next key cycle, if the initial check finds no abnormality (when IGN is switched from OFF to ON).

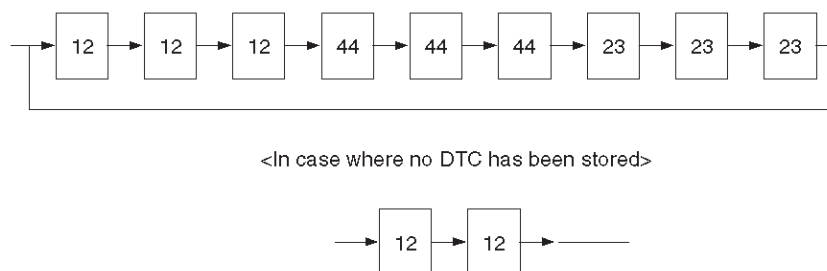
#### 5. An example of DTC display

Display of DTC 23



B05RW006

After displaying DTC 12 three times, one DTC after another is displayed, starting with the most recent one. (However, display is discontinued after about 5 minutes.)



B05RS005

The DTC 12 is displayed repeatedly. (display is discontinued after about 5 minutes after)

**Chart B-1 With the key in the ON position (Before starting the engine). Warning light (W/L) is not activated.**

| Step | Action                                                                                                                                                                                                                  | Yes                                                                                             | No                                            |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------|
| 1    | Is W/L fuse disconnected?                                                                                                                                                                                               | Replace fuse.<br>Go to Step 5                                                                   | Go to Step 2                                  |
| 2    | Is W/L burnt out?                                                                                                                                                                                                       | Replace W/L bulb.<br>Go to Step 5                                                               | Go to Step 3                                  |
| 3    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector (C-4).<br>3. Turn the key ON.<br><br>Is the check voltage between coil integrated module connector (C-4) terminals 6 and 7 than battery voltage? | Go to Step 4                                                                                    | Repair harness and connector.<br>Go to Step 5 |
| 4    | Is the check continuity coil integrated module connector (C-4) terminals, 1 and 7 and body ground.                                                                                                                      | Check harness for suspected disconnection<br><br>No fault found: Replace EHCUC.<br>Go to Step 5 | Repair harness and connector.<br>Go to Step 5 |
| 5    | Reconnect all components, ensure all components are properly mounted.<br><br>Was this step finished?                                                                                                                    | Repeat the "Basic diagnostic flow chart"                                                        | Go to Step 5                                  |

**Chart B-2 CPU Error (DTC 14 (Flash out) / C0271, C0272, C0273, C0284 (Serial communications))**

| Step | Action                                                                                                                                                                                                                                                                                                                                      | Yes                                      | No                                              |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------------------------------------|
| 1    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector.<br>3. Inspect coil integrated module ground.<br><br>Is the check resistance between the coil integrated module connector terminals, 2 (C-5) and 7 (C-4) and body ground?                                                                                            | Go to Step 2                             | Repair the body ground harness.<br>Go to Step 3 |
| 2    | 1. Turn the key off, connect the coil integrated module connector.<br>2. Erase the trouble code.<br>3. Turn Ignition off, then on, to perform system self-check.<br>4. If warning light remains on, display trouble codes once again.<br><br>Is the check trouble code 14 (Flash out) / C0271, C0272, C0273, C0284 (Serial communications)? | Replace EHCU.<br>Go to Step 3            | Inspect in accordance with the DTC displayed.   |
| 3    | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br><br>Was this step finished?                                                                                                                                                                                                | Repeat the "Basic diagnostic flow chart" | Go to Step 3                                    |

**Chart B-3 Low or High Ignition Voltage (DTC 15 (Flash out) / C0277, 0278 (Serial communications))**

| Step | Action                                                                                                                                                                                                        | Yes                                                                                                                                                                  | No                                           |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| 1    | Is the check battery voltage normal? (Battery capacity check)                                                                                                                                                 | Go to Step 2                                                                                                                                                         | Charge or replace battery.<br>Go to Step 2   |
| 2    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector.<br>3. Turn the key on.<br><br>Is the check voltage between coil integrated module connector (C-4) terminals 1 and 7, higher than 10V? | Check harness connector for suspected disconnection<br>Fault found:<br>Repair, and perform system self-check<br><br>No fault found:<br>replace EHCU.<br>Go to Step 3 | Repair harness or connector.<br>Go to Step 3 |
| 3    | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br><br>Was this step finished?                                                                  | Repeat the "Basic diagnostic flow chart"                                                                                                                             | Go to Step 3                                 |

**Chart B-4 Excessive Dump Time (DTC 17 (Flash out) / C0269 (Serial communications))**

| Step | Action                                                                                                                                                | Yes                                      | No           |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------|
| 1    | Check for anything causing extended ABS activation, such as locked brakes or an erratic speed sensor signal.<br><br>Was a problem found?              | Repair or Replace                        | Go to Step 2 |
| 2    | 1. The key turned off.<br>2. Replace EHCU.<br>3. Reconnect all components, ensure all components are properly mounted.<br><br>Was this step finished? | Repeat the "Basic diagnostic flow chart" | Go to Step 2 |

**Chart B-5 Excessive Isolation Time (DTC 18 (Flash out) / C0274 (Serial communications))**

| Step | Action                                                                                                                                             | Yes                                      | No           |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------|
| 1    | Check for anything causing extended ABS activation, such as locked brakes or an erratic speed sensor signal.<br>Was a problem found?               | Repair or Replace                        | Go to Step 2 |
| 2    | 1. The key turned off.<br>2. Replace EHCUC.<br>3. Reconnect all components, ensure all components are properly mounted.<br>Was this step finished? | Repeat the "Basic diagnostic flow chart" | Go to Step 2 |

**Chart B-6 G-Sensor Output Failure (DTC 21 (Flash out) / C0276 (Serial communications))**

| Step | Action                                                                                                                                           | Yes                                      | No           |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------|
| 1    | 1. Turn the key off.<br>2. Replace EHCUC.<br>3. Reconnect all components, ensure all components are properly mounted.<br>Was this step finished? | Repeat the "Basic diagnostic flow chart" | Go to Step 1 |

**Chart B-7 Brake Switch Failure (DTC 22 (Flash out) / C0281 (Serial communications))**

| Step | Action                                                                                                                                                                                                         | Yes                                                                                                                                                        | No                                                                             |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| 1    | Is the stop light actuated when the brake pedal is depressed?                                                                                                                                                  | Go to Step 2                                                                                                                                               | Go to Step 4                                                                   |
| 2    | 1. Turn the key off.<br>2. Disconnected coil integrated module connector.<br>Is the check voltage coil integrated module connector (C-4) terminals 13 to 7 when brake pedal is depressed than battery voltage? | Go to Step 3                                                                                                                                               | Harness between brake SW and coil integrated module is faulty.<br>Go to Step 6 |
| 3    | Is the check that pins C-5 connector 2, and C-4 connector 7 have good ground?                                                                                                                                  | Check harness / connector for disconnection<br>Fault found:<br>Repair, and perform system self-check.<br>No fault found:<br>replace EHCUC.<br>Go to Step 6 | Repair.<br>Go to Step 6                                                        |
| 4    | Is stop light fuse normal?                                                                                                                                                                                     | Go to Step 5                                                                                                                                               | Replace.<br>Go to Step 6                                                       |
| 5    | Is brake SW normal?                                                                                                                                                                                            | Abnormal harness in stop light circuit.<br>Repair the harness.<br>Go to Step 6                                                                             | Replace.<br>Go to Step 6                                                       |
| 6    | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br>Was this step finished?                                                                       | Repeat the "Basic diagnostic flow chart"                                                                                                                   | Go to Step 6                                                                   |

**Chart B-8 2WD Controller in 4WD Vehicle Controller (DTC 13 (Flash out) / C0285 (Serial communications)), 4WD State Input Signal Failure (DTC 24 (Flash out) / C0282 (Serial communications))**

| Step | Action                                                                                                                                   | Yes                                      | No                                      |
|------|------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------|
| 1    | Remove coil integrated module connector.<br>Is the coil integrated module connector (C-4) terminal 8 line normally?                      | Go to Step 2                             | Repair.<br>Go to Step 3                 |
| 2    | Is the 4WD controller normally?                                                                                                          | Replace EHCU.<br>Go to Step 3            | Replace 4WD controller.<br>Go to Step 3 |
| 3    | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br>Was this step finished? | Repeat the "Basic diagnostic flow chart" | Go to Step 3                            |

**Chart B-9 Pump Motor Failure (DTC 32 (Flash out) / C0267, C0268 (Serial communications))**

| Step | Action                                                                                                                                                                                                                              | Yes                                      | No                                                                                                         |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------------------|
| 1    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector.<br>3. Measure the voltage between terminal 1 of the coil integrated module connector (C-5) and body ground.<br>Is the voltage equal to the battery voltage? | Go to Step 2                             | Repair fuse/harness between battery and coil integrated module connector (C-5) terminal 1.<br>Go to Step 5 |
| 2    | Is the harness from the hydraulic unit connected to the coil integrated module connector?                                                                                                                                           | Go to Step 3                             | Connect to the connector.<br>Go to Step 3                                                                  |
| 3    | Is the harness from the hydraulic unit normally?                                                                                                                                                                                    | Go to Step 4                             | Replace EHCU.<br>Go to Step 5                                                                              |
| 4    | Is the check resistance of hydraulic unit connector terminals 1 and 2 between 0.2 and 1.0 ohms?                                                                                                                                     | Replace EHCU.<br>Go to Step 5            | Replace EHCU.<br>Go to Step 5                                                                              |
| 5    | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br>Was this step finished?                                                                                            | Repeat the "Basic diagnostic flow chart" | Go to Step 5                                                                                               |

**5A-44 BRAKE CONTROL SYSTEM****Chart B-10 EHCUC Valve Relay Failure (DTC 35 (Flash out) / C0265, C0266 (Serial communications))**

| Step | Action                                                                                                                                                                                                                                  | Yes                                      | No                                                                                                     |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------------------------------------------|
| 1    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector.<br>3. Measure the voltage between terminal 1 of the coil integrated module connector (C-5) and body ground.<br><br>Is the voltage equal to the battery voltage? | Replace EHCUC.<br>Go to Step 2           | Repair fuse and harness coil integrated module connector (C-5) terminal 1 and battery.<br>Go to Step 2 |
| 2    | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br><br>Was this step finished?                                                                                            | Repeat the "Basic diagnostic flow chart" | Go to Step 2                                                                                           |

**Chart B-11 FL Isolation Solenoid Coil Failure (DTC 41 (Flash out) / C0245, C0247 (Serial communications))**

| Step | Action                                                                                                                                                                                                      | Yes                                      | No                                                                 |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------|
| 1    | Was the "EHCUC Connector Pin-out Checks" performed?                                                                                                                                                         | Go to Step 2                             | Go to "EHCUC Connector Pin-out Checks."                            |
| 2    | 1. Turn the key switch to off.<br>2. Disconnect the 2-way EHCUC connector (C-5) from the EHCUC.<br>3. Inspect the connector for damage or corrosion.<br><br>Is the connector free from damage or corrosion? | Go to Step 3                             | Repair the connector.<br>Repeat the "Basic Diagnostic Flow Chart." |
| 3    | 1. Replace the Coil Integrated Module.<br>2. Reconnect all component, ensure all components are properly mounted.<br><br>Was this step finished?                                                            | Repeat the "Basic diagnostic flow chart" | Go to Step 3                                                       |

**Chart B-12 FL Dump Solenoid Coil Failure (DTC 42 (Flash out) / C0246, C0248 (Serial communications))**

| Step | Action                                                                                                                                                                                                      | Yes                                      | No                                                                 |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------|
| 1    | Was the "EHCUC Connector Pin-out Checks" performed?                                                                                                                                                         | Go to Step 2                             | Go to "EHCUC Connector Pin-out Checks."                            |
| 2    | 1. Turn the key switch to off.<br>2. Disconnect the 2-way EHCUC connector (C-5) from the EHCUC.<br>3. Inspect the connector for damage or corrosion.<br><br>Is the connector free from damage or corrosion? | Go to Step 3                             | Repair the connector.<br>Repeat the "Basic Diagnostic Flow Chart." |
| 3    | 1. Replace the Coil Integrated Module.<br>2. Reconnect all component, ensure all components are properly mounted.<br><br>Was this step finished?                                                            | Repeat the "Basic diagnostic flow chart" | Go to Step 3                                                       |

**Chart B-13 FR Isolation Solenoid Coil Failure (DTC 43 (Flash out) / C0241, C0243 (Serial communications))**

| Step | Action                                                                                                                                                                                                | Yes                                      | No                                                                 |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------|
| 1    | Was the "EHCU Connector Pin-out Checks" performed?                                                                                                                                                    | Go to Step 2                             | Go to "EHCU Connector Pin-out Checks."                             |
| 2    | 1. Turn the key switch to off.<br>2. Disconnect the 2-way EHCU connector (C-5) from the EHCU.<br>3. Inspect the connector for damage or corrosion.<br>Is the connector free from damage or corrosion? | Go to Step 3                             | Repair the connector.<br>Repeat the "Basic Diagnostic Flow Chart." |
| 3    | 1. Replace the Coil Integrated Module.<br>2. Reconnect all component, ensure all components are properly mounted.<br>Was this step finished?                                                          | Repeat the "Basic diagnostic flow chart" | Go to Step 3                                                       |

**Chart B-14 FR Dump Solenoid Coil Failure (DTC 44(Flash out) / C0242, C0244 (Serial communications))**

| Step | Action                                                                                                                                                                                                | Yes                                      | No                                                                 |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------|
| 1    | Was the "EHCU Connector Pin-out Checks" performed?                                                                                                                                                    | Go to Step 2                             | Go to "EHCU Connector Pin-out Checks."                             |
| 2    | 1. Turn the key switch to off.<br>2. Disconnect the 2-way EHCU connector (C-5) from the EHCU.<br>3. Inspect the connector for damage or corrosion.<br>Is the connector free from damage or corrosion? | Go to Step 3                             | Repair the connector.<br>Repeat the "Basic Diagnostic Flow Chart." |
| 3    | 1. Replace the Coil Integrated Module.<br>2. Reconnect all component, ensure all components are properly mounted.<br>Was this step finished?                                                          | Repeat the "Basic diagnostic flow chart" | Go to Step 3                                                       |

**Chart B-15 Rear Isolation Solenoid Coil Failure (DTC 45 (Flash out) / C0251, C0253 (Serial communications))**

| Step | Action                                                                                                                                                                                                | Yes                                      | No                                                                 |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------|
| 1    | Was the "EHCU Connector Pin-out Checks" performed?                                                                                                                                                    | Go to Step 2                             | Go to "EHCU Connector Pin-out Checks."                             |
| 2    | 1. Turn the key switch to off.<br>2. Disconnect the 2-way EHCU connector (C-5) from the EHCU.<br>3. Inspect the connector for damage or corrosion.<br>Is the connector free from damage or corrosion? | Go to Step 3                             | Repair the connector.<br>Repeat the "Basic Diagnostic Flow Chart." |
| 3    | 1. Replace the Coil Integrated Module.<br>2. Reconnect all component, ensure all components are properly mounted.<br>Was this step finished?                                                          | Repeat the "Basic diagnostic flow chart" | Go to Step 3                                                       |

**5A-46 BRAKE CONTROL SYSTEM****Chart B-16 Rear Dump Solenoid Coil Failure (DTC 46 (Flash out) / C0252, C0254 (Serial communications))**

| Step | Action                                                                                                                                                                                                | Yes                                      | No                                                                 |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------|
| 1    | Was the "EHCU Connector Pin-out Checks" performed?                                                                                                                                                    | Go to Step 2                             | Go to "EHCU Connector Pin-out Checks."                             |
| 2    | 1. Turn the key switch to off.<br>2. Disconnect the 2-way EHCU connector (C-5) from the EHCU.<br>3. Inspect the connector for damage or corrosion.<br>Is the connector free from damage or corrosion? | Go to Step 3                             | Repair the connector.<br>Repeat the "Basic Diagnostic Flow Chart." |
| 3    | 1. Replace the Coil Integrated Module.<br>2. Reconnect all component, ensure all components are properly mounted.<br>Was this step finished?                                                          | Repeat the "Basic diagnostic flow chart" | Go to Step 3                                                       |

**Chart B-17 FL Speed Sensor Open or Shorted (DTC 51 (Flash out) / C0225 (Serial communications))**

| Step | Action                                                                                                                                                                                                                   | Yes                                                                                                                                                                                                                      | No                              |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 1    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector.<br>3. Measure the resistance between coil integrated module connector (C-4) terminals 2 and 10.<br>Is the resistance between 2.0k and 2.8k ohms? | Check for faults in harness between speed sensor and coil integrated module.<br><br>Fault found:<br>Repair, and perform system self-check.<br><br>No fault found:<br>Replace coil integrated module.<br><br>Go to Step 3 | Go to Step 2                    |
| 2    | Measure the FL speed sensor resistance at the sensor connector.<br>Is the resistance between 2.0k and 2.8k ohms?                                                                                                         | Repair harness abnormality between sensors and coil integrated module.<br><br>Go to Step 3                                                                                                                               | Replace sensor.<br>Go to Step 3 |
| 3    | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br>Was this step finished?                                                                                 | Repeat the "Basic diagnostic flow chart"                                                                                                                                                                                 | Go to Step 3                    |

**Chart B-18 FR Speed Sensor Open or Shorted (DTC 52 (Flash out) / C0221 (Serial communications))**

| Step | Action                                                                                                                                                                                                                       | Yes                                                                                                                                                                                                                      | No                              |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 1    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector.<br>3. Measure the resistance between coil integrated module connector (C-4) terminals 3 and 11.<br><br>Is the resistance between 2.0k and 2.8k ohms? | Check for faults in harness between speed sensor and coil integrated module.<br><br>Fault found:<br>Repair, and perform system self-check.<br><br>No fault found:<br>Replace coil integrated module.<br><br>Go to Step 3 | Go to Step 2                    |
| 2    | Measure the FR speed sensor resistance at the sensor connector.<br><br>Is the resistance between 2.0k and 2.8k ohms?                                                                                                         | Repair harness abnormality between sensors and coil integrated module.<br><br>Go to Step 3                                                                                                                               | Replace sensor.<br>Go to Step 3 |
| 3    | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br><br>Was this step finished?                                                                                 | Repeat the "Basic diagnostic flow chart"                                                                                                                                                                                 | Go to Step 3                    |

**5A-48 BRAKE CONTROL SYSTEM****Chart B-19 Rear Speed Sensor Open or Shorted (DTC 53 (Flash out) / C0235 (Serial communications))**

| Step | Action                                                                                                                                                                                                                       | Yes                                                                                                                                                                                                | No                              |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 1    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector.<br>3. Measure the resistance between coil integrated module connector (C-4) terminals 4 and 12.<br><br>Is the resistance between 1.2k and 2.0k ohms? | Check for faults in harness between speed sensor and coil integrated module.<br><br>Fault found:<br>Repair, and perform system self-check.<br><br>No fault found:<br>Replace EHCU.<br>Go to Step 3 | Go to Step 2                    |
| 2    | Measure the Rear speed sensor resistance at the sensor connector.<br><br>Is the resistance between 1.2k and 2.0k ohms?                                                                                                       | Repair harness abnormality between sensors and coil integrated module.<br>Go to Step 3                                                                                                             | Replace sensor.<br>Go to Step 3 |
| 3    | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br><br>Was this step finished?                                                                                 | Repeat the "Basic diagnostic flow chart"                                                                                                                                                           | Go to Step 3                    |

**Chart B-20 FL Speed Sensor Missing (DTC 61 (Flash out) / C0226, C0227 (Serial communications))**

| Step | Action                                                                                                                                                                                                                                       | Yes                                                                                                                                                                                          | No                              |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 1    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector.<br>3. Measure the FL speed sensor resistance between coil integrated module connector (C-4) terminals 2 and 10.<br><br>Is the resistance between 2.0k and 2.8k ohms? | Go to Step 2                                                                                                                                                                                 | Go to Step 3                    |
| 2    | Is there play sensor/sensor rotor?                                                                                                                                                                                                           | Repair.<br>Go to Step 6                                                                                                                                                                      | Go to Step 4                    |
| 3    | Measure the FL speed sensor resistance at the sensor connector.<br>Is the resistance between 2.0k and 2.8k ohms?                                                                                                                             | Repair harness abnormality between sensors and coil integrated module.<br>Go to Step 6                                                                                                       | Replace sensor.<br>Go to Step 6 |
| 4    | Damage and powered iron sticking to sensor/sensor ring?                                                                                                                                                                                      | Repair.<br>Go to Step 6                                                                                                                                                                      | Go to Step 5                    |
| 5    | Is sensor output normal? (Chart C-1-1 or TC-1)                                                                                                                                                                                               | Check for faults in harness between speed sensor and coil integrated module.<br><br>Fault found: repair, and perform system self-check.<br><br>No fault found: replace EHCU.<br>Go to Step 6 | Replace sensor.<br>Go to Step 6 |
| 6    | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br><br>Was this step finished?                                                                                                 | Repeat the "Basic diagnostic flow chart"                                                                                                                                                     | Go to Step 6                    |

NOTE: Even after repairing the faulty part the warning light (W/L) does not go out if the vehicle is at a stop. Turn the ignition switch to the ON position and drive the vehicle at 12 km/h (8 mph) or higher to make sure that the warning light goes out.

## 5A-50 BRAKE CONTROL SYSTEM

**Chart B-21 FR Speed Sensor Missing (DTC 62 (Flash out) / C0222, C0223 (Serial communications))**

| Step | Action                                                                                                                                                                                                                                       | Yes                                                                                                                                                                                      | No                              |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 1    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector.<br>3. Measure the FR speed sensor resistance between coil integrated module connector (C-4) terminals 3 and 11.<br><br>Is the resistance between 2.0k and 2.8k ohms? | Go to Step 2                                                                                                                                                                             | Go to Step 3                    |
| 2    | Is there play sensor/sensor rotor?                                                                                                                                                                                                           | Repair.<br>Go to Step 6                                                                                                                                                                  | Go to Step 4                    |
| 3    | Measure the FR speed sensor resistance at the sensor connector.<br><br>Is the resistance between 2.0k and 2.8k ohms?                                                                                                                         | Repair harness abnormality between sensors and coil integrated module.<br>Go to Step 6                                                                                                   | Replace sensor.<br>Go to Step 6 |
| 4    | Damage and powered iron sticking to sensor/sensor ring?                                                                                                                                                                                      | Repair.<br>Go to Step 6                                                                                                                                                                  | Go to Step 5                    |
| 5    | Is sensor output normal? (Chart C-1-2 or TC-1)                                                                                                                                                                                               | Check for faults in harness between speed sensor and coil integrated module.<br><br>Fault found: repair, and perform system self-check.<br><br>No fault found: replace EHC. Go to Step 6 | Replace sensor.<br>Go to Step 6 |
| 6    | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br><br>Was this step finished?                                                                                                 | Repeat the "Basic diagnostic flow chart"                                                                                                                                                 | Go to Step 6                    |

NOTE: Even after repairing the faulty part the warning light (W/L) does not go out if the vehicle is at a stop. Turn the ignition switch to the ON position and drive the vehicle at 12 km/h (8 mph) or higher to make sure that the warning light goes out.

**Chart B-22 Rear Speed Sensor Missing (DTC 63 (Flash out) / C0236, C0237 (Serial communications))**

| Step | Action                                                                                                                                                                                                                                         | Yes                                                                                                                                                                                      | No                              |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 1    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector.<br>3. Measure the Rear speed sensor resistance between coil integrated module connector (C-4) terminals 4 and 12.<br><br>Is the resistance between 1.2k and 2.0k ohms? | Go to Step 2                                                                                                                                                                             | Go to Step 3                    |
| 2    | Is there play sensor/sensor rotor?                                                                                                                                                                                                             | Repair.<br>Go to Step 6                                                                                                                                                                  | Go to Step 4                    |
| 3    | Measure the rear speed sensor resistance at the sensor connector.<br><br>Is the resistance between 1.2k and 2.0k ohms?                                                                                                                         | Repair harness abnormality between sensors and coil integrated module.<br>Go to Step 6                                                                                                   | Replace sensor.<br>Go to Step 6 |
| 4    | Damage and powdered iron sticking to sensor/sensor ring?                                                                                                                                                                                       | Repair.<br>Go to Step 6                                                                                                                                                                  | Go to Step 5                    |
| 5    | Is sensor output normal? (Chart C-1-3 or TC-1)                                                                                                                                                                                                 | Check for faults in harness between speed sensor and coil integrated module.<br><br>Fault found: repair, and perform system self-check.<br><br>No fault found: replace EHC. Go to Step 6 | Replace sensor.<br>Go to Step 6 |
| 6    | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br><br>Was this step finished?                                                                                                   | Repeat the "Basic diagnostic flow chart"                                                                                                                                                 | Go to Step 6                    |

NOTE: Even after repairing the faulty part the warning light (W/L) does not go out if the vehicle is at a stop. Turn the ignition switch to the ON position and drive the vehicle at 12 km/h (8 mph) or higher to make sure that the warning light goes out.

## 5A-52 BRAKE CONTROL SYSTEM

**Chart B-23 Simultaneous Drop-out of Front Speed Sensor Signal (DTC 64 (Flash out) / C0229 (Serial communications))**

| Step | Action                                                                                                                                                                                                                                       | Yes                                                                                                                                                                                          | No                              |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 1    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector.<br>3. Measure the FL speed sensor resistance between coil integrated module connector (C-4) terminals 2 and 10.<br><br>Is the resistance between 2.0k and 2.8k ohms? | Go to Step 2                                                                                                                                                                                 | Go to Step 3                    |
| 2    | Measure the FR speed sensor resistance between coil integrated module connector (C-4) terminals 3 and 11.<br><br>Is the resistance between 2.0k and 2.8 k ohms?                                                                              | Go to Step 5                                                                                                                                                                                 | Go to Step 4                    |
| 3    | Measure the FL speed sensor resistance at the sensor connector.<br><br>Is the resistance between 2.0k and 2.8k ohms?                                                                                                                         | Repair harness abnormality between sensors and coil integrated module.<br>Go to Step 2                                                                                                       | Replace sensor.<br>Go to Step 2 |
| 4    | Measure the FR speed sensor resistance at the sensor connector.<br><br>Is the resistance between 2.0k and 2.8k ohms?                                                                                                                         | Repair harness abnormality between sensors and coil integrated module.<br>Go to Step 5                                                                                                       | Replace sensor.<br>Go to Step 5 |
| 5    | Damage and powered iron sticking to sensor/sensor ring?                                                                                                                                                                                      | Repair.<br>Go to Step 6                                                                                                                                                                      | Go to Step 6                    |
| 6    | Is there play sensor/sensor rotor?                                                                                                                                                                                                           | Repair.<br>Go to Step 7                                                                                                                                                                      | Go to Step 7                    |
| 7    | Is sensor output normal? (Chart C-1-1&C-1-2 or TC-1)                                                                                                                                                                                         | Check for faults in harness between speed sensor and coil integrated module.<br><br>Fault found: repair, and perform system self-check.<br><br>No fault found: replace EHCU.<br>Go to Step 8 | Replace sensor.<br>Go to Step 8 |
| 8    | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br><br>Was this step finished?                                                                                                 | Repeat "Basic diagnostic flow chart"                                                                                                                                                         | Go to Step 8                    |

NOTE: Even after repairing the faulty part the warning light (W/L) does not go out if the vehicle is at a stop. Turn the ignition switch to the ON position and drive the vehicle

at 12 km/h (8 mph) or higher to make sure that the warning light goes out.

**Chart B-24 Wheel Speed Input Abnormality (DTC 65 (Flash out) / C0238 (Serial communications))**

| Step | Action                                                                                                                                                                                                                                                                                 | Yes                                  | No                                                                                            |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------|
| 1    | Using TECH 2?                                                                                                                                                                                                                                                                          | Go to Step 2                         | Go to Step 3                                                                                  |
| 2    | 1. Connect TECH 2.<br>2. Select Snap shot manual trigger.<br>3. With wheel speed data displayed, run the vehicle when speed has arrived at 30 km/h (18 mph).<br>4. Check speed data on each wheel (refer to the criterion given below). * 1<br>Is the abnormal sensor condition found? | Replace.<br>Go to Step 8             | Go to Step 3<br>All the sensors should follow the following flowchart (without using TECH 2). |
| 3    | Is there play in sensor/sensor ring?                                                                                                                                                                                                                                                   | Repair.<br>Go to Step 8              | Go to Step 4                                                                                  |
| 4    | Is there powdered iron sticking to sensor/sensor ring?                                                                                                                                                                                                                                 | Repair.<br>Go to Step 8              | Go to Step 5                                                                                  |
| 5    | Is there a broken tooth or indentation in sensor ring?                                                                                                                                                                                                                                 | Replace sensor ring.<br>Go to Step 8 | Go to Step 6                                                                                  |
| 6    | Is there play in wheel bearing?                                                                                                                                                                                                                                                        | Adjust or repair.<br>Go to Step 8    | Go to Step 7                                                                                  |
| 7    | Is the check wiring between sensor and coil integrated module normal?                                                                                                                                                                                                                  | Replace EHCU.<br>Go to Step 8        | Repair, and perform system self-check.<br>Go to Step 8                                        |
| 8    | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br>Was this step finished?                                                                                                                                               | Repeat 'Basic diagnostic flow chart' | Go to Step 8                                                                                  |

**Sensor Signal Abnormality Criteria using TECH 2**

1. While driving, the speed of one or two wheels is 25% or more higher or lower than that of the other wheels.
2. The speed of one or two wheels is 10 km/h (6 mph) or more higher or lower than that of the other wheels.
3. During steady driving, wheel speed changes abruptly.

\*1 The vehicle must run on a level paved road.

NOTE: Even after repairing the faulty part the warning light (W/L) does not go out if the vehicle is at a stop.

Turn the ignition switch to the ON position and drive the vehicle at 12 km/h (8 mph) or higher to make sure that the warning light goes out.

It is important to verify that the correct tires are installed on vehicle.

## Unit Inspection Procedure

This section describes the following inspection procedures referred to during "SYMPTOM DIAGNOSIS" and "DIAGNOSIS BY 'ABS' WARNING LIGHT ILLUMINATION PATTERN":

|                          |                      |             |
|--------------------------|----------------------|-------------|
|                          | without TECH 2       | with TECH 2 |
| Sensor Output Inspection | Chart C-1-1 to C-1-3 | Chart TC-1  |

### Chart C-1-1 FL Sensor Output Inspection Procedure

| Step | Action                                                                                                                                                                                                                                                                                                                                                                | Yes                                                                                                                                                                                                | No                                                                                   |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector.<br>3. Jack up the vehicle with all four wheels off the ground. Measure the AC voltage between coil integrated module connector terminals while turning FL wheel at a speed of 1 RPS:<br><br>Is the check between coil integrated module connector (C-4) terminals 2 and 10 than under 200 mV? | Go to Step 2                                                                                                                                                                                       | OK.<br>Go to Step 3                                                                  |
| 2    | 1. Disconnect the wheel speed sensor.<br>2. Measure resistance between the wheel speed sensor connector terminals 1 and 2.<br><br>Is the check between connector (C-13) terminals 1 and 2 within 2.0k - 2.8k ohms?                                                                                                                                                    | Connector is faulty, or open or short circuit of harness between wheel speed sensor connector and coil integrated module.<br><br>Inspect and correct the connector or harness.<br><br>Go to Step 3 | Wheel speed sensor is faulty.<br>Replace the wheel speed sensor.<br><br>Go to Step 3 |
| 3    | Reconnect all components, ensure all components are properly mounted.<br><br>Was this step finished?                                                                                                                                                                                                                                                                  | Repeat the "Basic diagnostic flow chart"                                                                                                                                                           | Go to Step 3                                                                         |

**Chart C-1-2 FR Sensor Output Inspection Procedure**

| Step | Action                                                                                                                                                                                                                                                                                                                                                                | Yes                                                                                                                                                                                                | No                                                                                   |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector.<br>3. Jack up the vehicle with all four wheels off the ground. Measure the AC voltage between coil integrated module connector terminals while turning FR wheel at a speed of 1 RPS:<br><br>Is the check between coil integrated module connector (C-4) terminals 3 and 11 than under 200 mV? | Go to Step 2                                                                                                                                                                                       | OK.<br>Go to Step 3                                                                  |
| 2    | 1. Disconnect the wheel speed sensor.<br>2. Measure resistance between the wheel speed sensor connector terminals 1 and 2.<br><br>Is the check between connector (C-33) terminals 1 and 2 within 2.0k - 2.8k ohms?                                                                                                                                                    | Connector is faulty, or open or short circuit of harness between wheel speed sensor connector and coil integrated module.<br><br>Inspect and correct the connector or harness.<br><br>Go to Step 3 | Wheel speed sensor is faulty.<br>Replace the wheel speed sensor.<br><br>Go to Step 3 |
| 3    | Reconnect all components, ensure all components are properly mounted.<br><br>Was this step finished?                                                                                                                                                                                                                                                                  | Repeat the "Basic diagnostic flow chart"                                                                                                                                                           | Go to Step 3                                                                         |

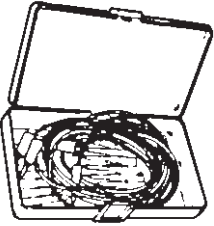
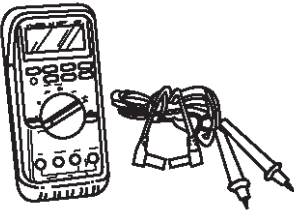
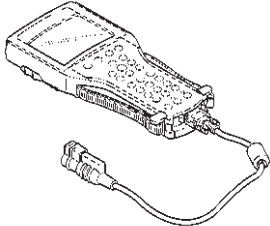
**Chart C-1-3 Rear Sensor Output Inspection Procedure**

| Step | Action                                                                                                                                                                                                                                                                                                                                                                 | Yes                                                                                                                                                                                                | No                                                                                   |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1    | 1. Turn the key off.<br>2. Disconnect coil integrated module connector.<br>3. Jack up the vehicle with all four wheels off the ground measure the AC voltage between coil integrated module connector terminals while turning Rear wheel at a speed of 1 RPS:<br><br>Is the check between coil integrated module connector (C-4) terminals 4 and 12 than under 200 mV? | Go to Step 2                                                                                                                                                                                       | OK.<br>Go to Step 3                                                                  |
| 2    | 1. Disconnect the wheel speed sensor.<br>2. Measure resistance between the wheel speed sensor connector terminals 1 and 2.<br><br>Is the check between connector (F-4) terminals 1 and 2 within 1.2k - 2.0k ohms?                                                                                                                                                      | Connector is faulty, or open or short circuit of harness between wheel speed sensor connector and coil integrated module.<br><br>Inspect and correct the connector or harness.<br><br>Go to Step 3 | Wheel speed sensor is faulty.<br>Replace the wheel speed sensor.<br><br>Go to Step 3 |
| 3    | Reconnect all components, ensure all components are properly mounted.<br><br>Was this step finished?                                                                                                                                                                                                                                                                   | Repeat the "Basic diagnostic flow chart"                                                                                                                                                           | Go to Step 3                                                                         |

**5A-56 BRAKE CONTROL SYSTEM****Chart TC-1 Sensor Output Inspection Procedure**

| Step | Action                                                                                                                                    | Yes                                      | No                                                                                           |
|------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------|
| 1    | 1. Connect TECH 2.<br>2. Check the wheel speed of each sensor by Data List.<br>Is the vehicle speed normal?                               | Go to Step 6                             | Go to Step 2                                                                                 |
| 2    | Check the sensor harness for suspected disconnection (check while shaking harness/connector).<br>Is the sensor harness connection normal? | Replace speed sensor.<br>Go to Step 4    | Repair.<br>Go to Step 3                                                                      |
| 3    | Check the wheel speed of each sensor by Data List.<br>Is the vehicle speed normal?                                                        | Go to Step 6                             | Go to Step 4                                                                                 |
| 4    | Check the sensor rotor.<br>Is the sensor rotor normal?                                                                                    | Replace speed sensor.<br>Go to Step 5    | Replace sensor rotor.<br>Go to Step 5                                                        |
| 5    | Check the harness between coil integrated module and speed sensor.<br>Is the harness connection normal?                                   | Go to Step 6                             | Repair harness or connector between coil integrated module and speed sensor.<br>Go to Step 6 |
| 6    | Reconnect all components, ensure all components are properly mounted.<br>Was this step finished?                                          | Repeat the "Basic diagnostic flow chart" | Go to Step 6                                                                                 |

## Special Tools

| ILLUSTRATION                                                                                  | TOOL NO.<br>TOOL NAME                                                                                       |
|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <br>901RW074 | <b>J-35616</b><br>Connector test adapter<br>kit                                                             |
| <br>901RS153 | <b>J-39200</b><br>High impedance<br>multimeter                                                              |
|             | <b>7000086-ISU</b><br>Tech 2 Set<br>(1) PCMCIA Card<br>(2) SAE 16/19 Adapter<br>(3) DLC Cable<br>(4) Tech 2 |