

# WORKSHOP MANUAL

NKR · NPR · NQR

## ANTI-LOCK BRAKE SYSTEM (ABS)

SECTION 5A4

# ISUZU

**ISUZU**



International Service & Parts  
*Tokyo, Japan*

## SECTION 5A4

# ANTI-LOCK BRAKE SYSTEM (ABS)

### Service Precaution

**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.

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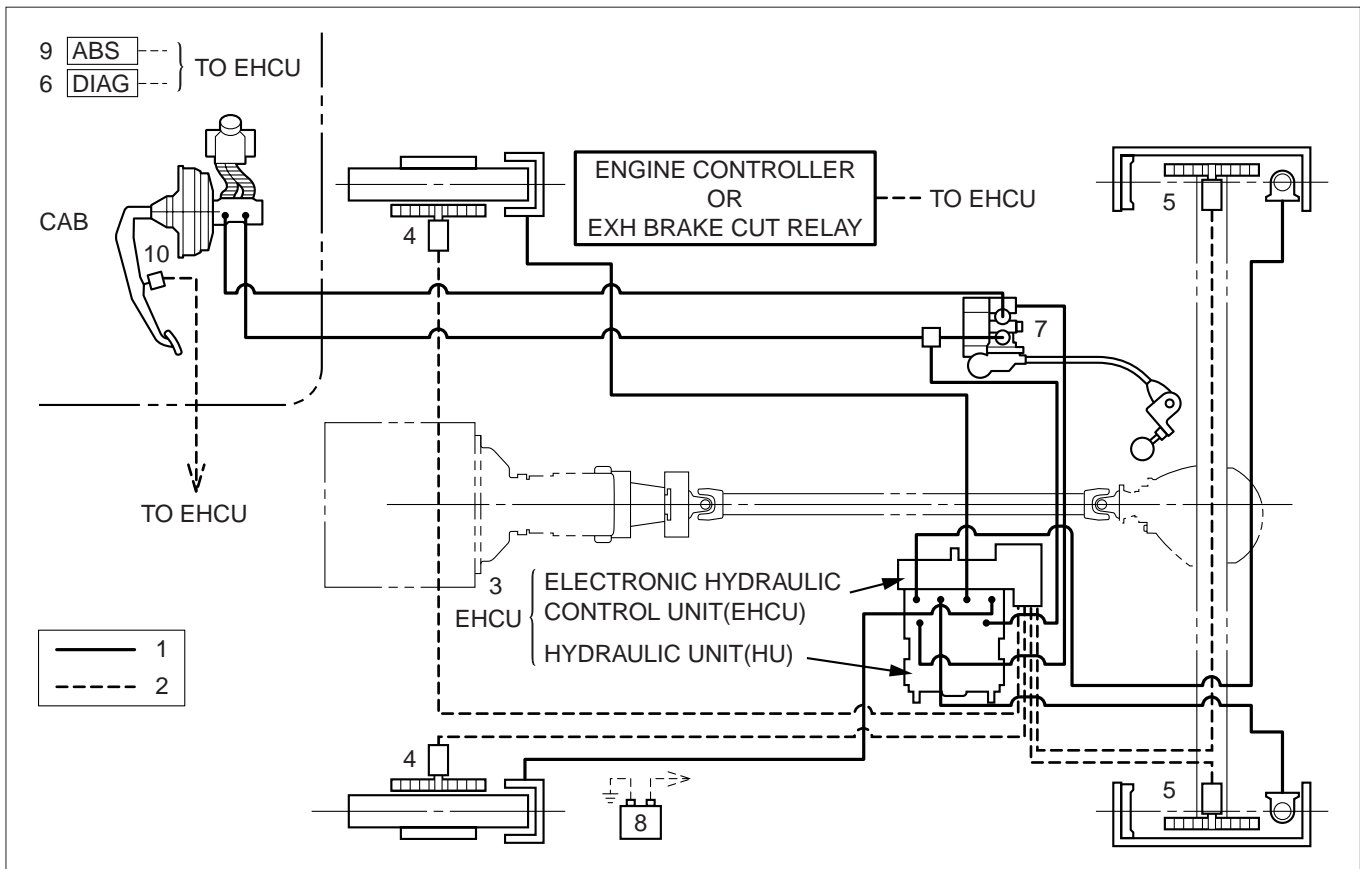
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### General Description

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.



### Legend

- |   |   |
|---|---|
| (1) Hydraulic Line                            | (7) Load Sensing Proportioning Valve (LSPV) |
| (2) Electronic Line                           | (8) Battery                                 |
| (3) Electronic Hydraulic Control Unit (EHCUC) | (9) ABS Warning Light                       |
| (4) Front Wheel Speed Sensor                  | (10) Brake Switch                           |
| (5) Rear Wheel Speed Sensor                   |   |
| (6) Diagnosis Connector                       |   |

## System Components

The Anti-lock Brake System consists of a Electronic Hydraulic Control Unit (EHCUC), four Wheel Speed Sensors and Warning Light.

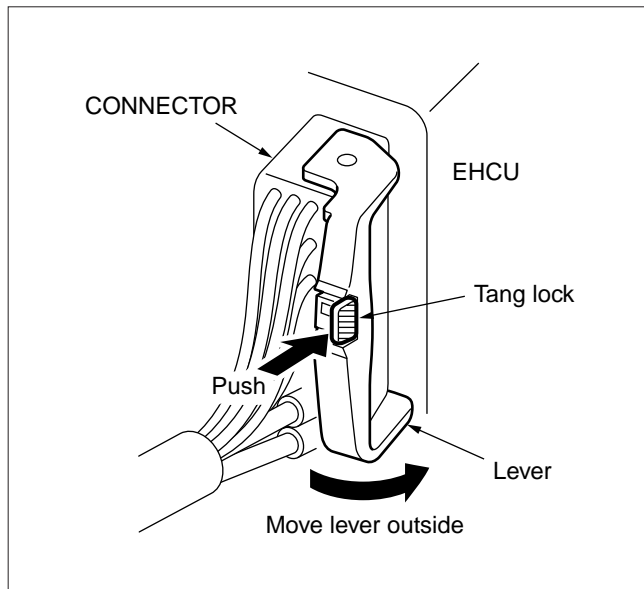
## Electronic Hydraulic Control Unit (EHCUC)

The EHCUC consists of Electronic Brake Control Module (EBCM) and Hydraulic Unit (HU).

The EHCUC is located at the frame side, in front of rear spring bracket.

The EHCUC 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 EHCUC is self-diagnosing function which can indicate faulty circuits during diagnosis.



### NOTE:

When disconnecting harness connector from EHCUC, push the tang lock of the connector (□ portion) and release the tang lock. Then move the lever.

## Hydraulic Unit (HU)

It consists of a Motor, Plunger Pump, Solenoid Valves and Check Valve.

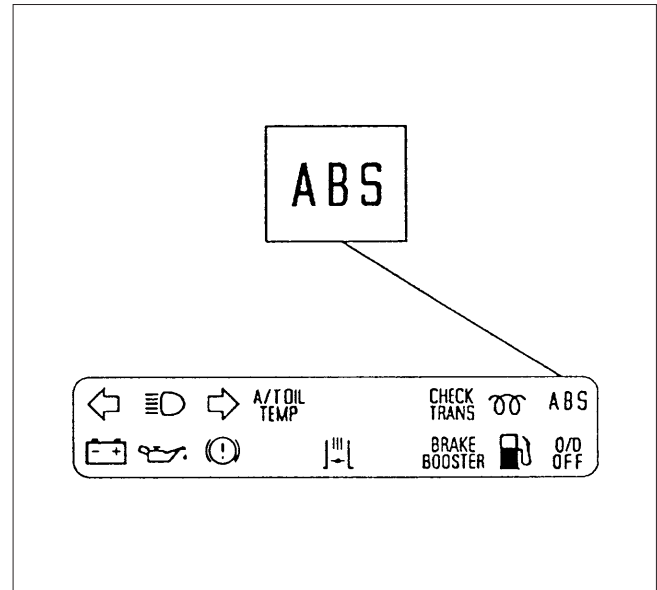
**Solenoid Valves:** Reduces or holds the caliper fluid pressure for each front disc brake or both rear drum brakes according to the signal sent from the EHCUC.

**Reservoir:** Temporarily holds the brake fluid that returns from the front and rear wheel brake so that pressure of front wheel brake 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 EHCUC. **Check Valve:** Controls the brake fluid flow.

## ABS Warning Light



Vehicles equipped with the Anti-lock Brake System has 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 (EHCUC). In case of an electronic malfunction, the EHCUC will turn “ON” the “ABS” warning light and disable the Anti-lock braking function.

The “ABS” light will turn “ON” for 2 seconds after the ignition switch is to the “ON” position, and then will go out.

If the “ABS” light 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 bracket on the brake back plate on the rear wheels. The front speed sensor is coil type and rear is Hall IC type.

The sensor rotors press-fitted to front and rear wheel hubs output pulse frequency depending on wheel rotation.

The speed sensors find vehicle speed from its frequency.

## 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 consist 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

**CKT**

Circuit

**DLC**

Data Link Connector

**DTC**

Diagnostic Trouble Code

**DVM**

Digital Volt Meter (High Impedance Multimeter)

**EHCUC**

Electronic Hydraulic Control Unit

**FL**

Front Left

**FR**

Front Right

**GEN**

Generator

**HU**

Hydraulic Unit

**MV**

Millivolts

**RL**

Rear Left

**RR**

Rear Right

**RPS**

Revolution per Second

**SW**

Switch

**VDC**

Volts DC

**VAC**

Volts AC

**W/L**

Warning Light

**WSS**

Wheel Speed Sensor

## General Diagnosis

### General Information

ABS malfunction 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 5A 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.

#### 5-8840-0285-0 (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 (EHCUC) which is a control computer that is similar in some regards to the Engine 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 EHCUC 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 5-8840-0285-0 (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 EHCUC connector should be disconnected before the welding operation begins.
- The EHCUC connector should never be connected or disconnected with the ignition "ON".
- The EHCUC is not separately serviceable and must be replaced as assemblies. Do not disassemble any component which is designated as non-serviceable in this Section.
- 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. 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 malfunction 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.
2. Start the vehicle and accelerate to about 30km/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 little 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 and actuates when possible the "ABS" warning light, the trouble code corresponding to the trouble is stored in the EHCUC. Only the ordinary brake system is available when the ABS is turned OFF. When the "ABS" warning light is actuated, if the starter switch is set ON after setting it OFF once, the EHCUC checks up on the entire system and, if there is no abnormality, judges ABS to work currently and the warning light works 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 "ON", the amber "ABS" warning light will turn "ON" for 2 seconds and will turn "OFF".

### Basic Diagnostic Flow Chart

Step	Action	Yes	No
1	1. Customer complaint. 2. Questioning to customer. 3. Basic inspection (Refer to "Basic inspection procedure") Using TECH 2?	Go to Step 2	Go to Step 3
2	Make sure of DTC by TROUBLE CODE. Is EHCUC including DTC?	Go to Step 5	Go to Step 4
3	Check if the DTC is stored. Is EHCUC including DTC?	Go to Step 5	Go to Step 4
4	Test drive. Is W/L lit?	Go to Step 5	Trouble diagnosis based on symptom (Refer to "SYMPTOM DIAGNOSIS") Go to Step 5
5	1. Repair of faulty part. 2. Elimination of DTC. 3. Inspection of "ABS" W/L illumination pattern with ignition SW "ON". 4. Test drive. Does repeat trouble?	Repeat the diagnosis of the symptom or DTC appears again Go to Step 1	Go to Step 6
6	1. Reconnect all components and ensure all components are properly mounted. 2. Clear diagnostic trouble code. Was this step finished?	Finished	Go to Step 6

### 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. Go to Step 2
2	Does fluid leak?	Repair. Go to Step 3	Go to Step 3
3	Is the booster functioning normal?	Go to Step 4	Repair. Go to Step 4
4	Is the pad and rotor normal?	Go to Step 5	Repair. Go to Step 5
5	Reconnect all components and ensure all components are properly mounted. Was this step finished?	Finished	Go to Step 5

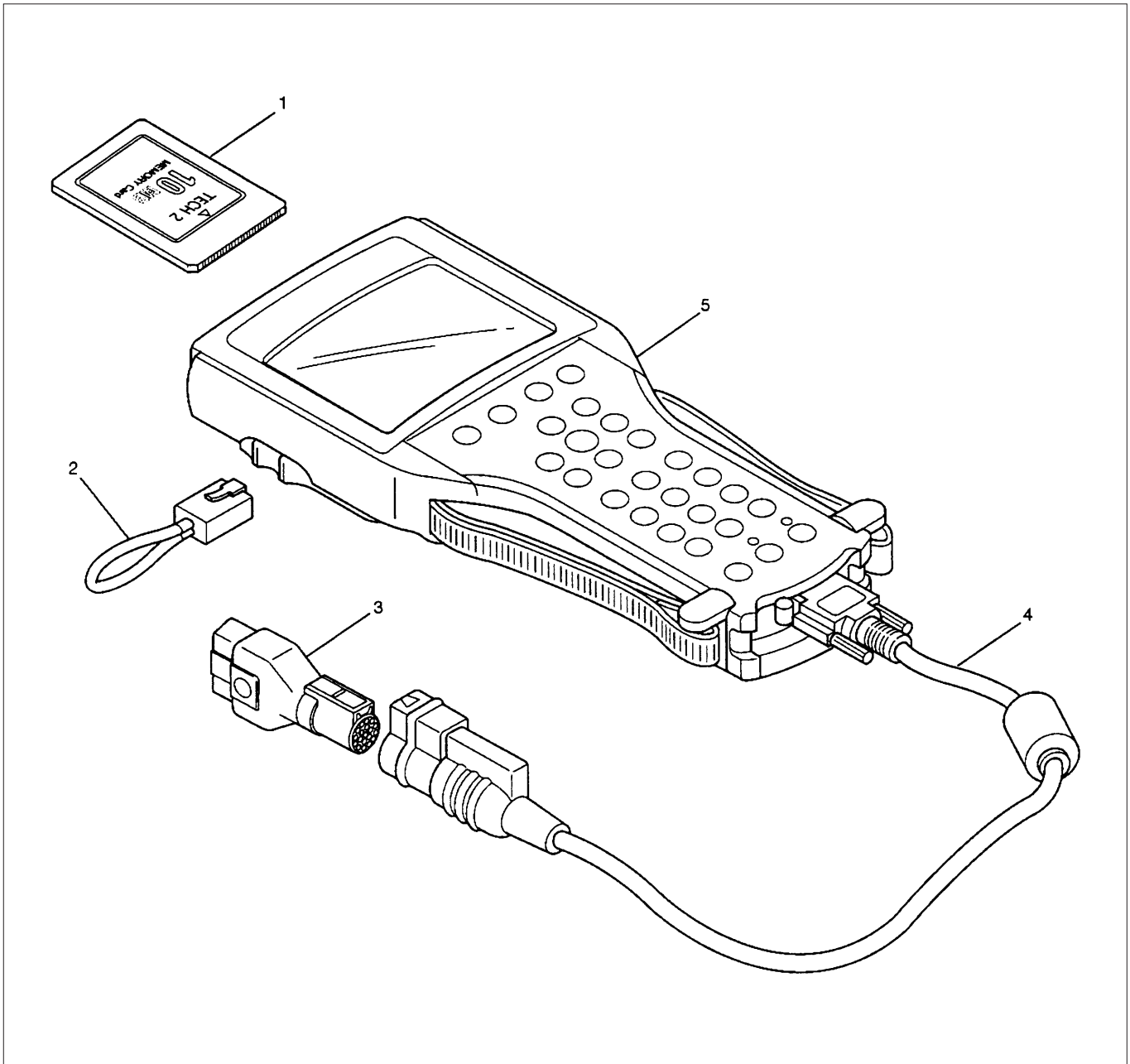
#### 2. Ground Inspection

Step	Action	Yes	No
1	Are ABS-related ground points ok?	Go to Step 2	Repair. Go to Step 2
2	Reconnect all components and ensure all components are properly mounted. Was this step finished?	Finished	Go to Step 2

## 5A4-10 ANTI-LOCK BRAKE SYSTEM (ABS)

### 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.



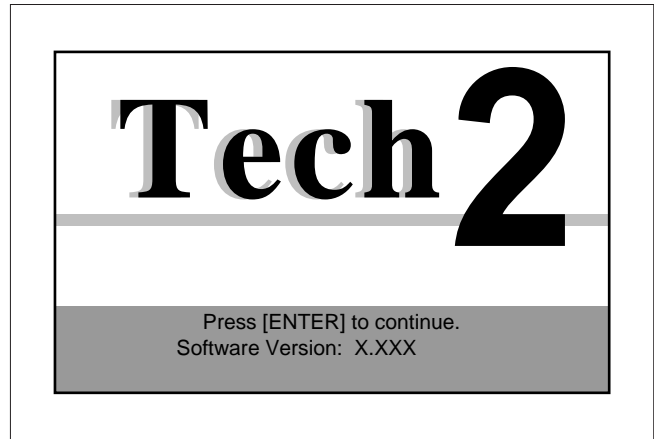
#### Legend

- |                                |               |
|--------------------------------|---------------|
| (1) PCMCIA Card                | (4) DLC Cable |
| (2) RS 232 Loop Back Connector | (5) Tech-2    |
| (3) SAE 16/19 Adapter          |               |

## Tech 2 Features

1. Tech 2 is a 12 volt system. Do not apply 24 volt.
2. After connecting and/or installing the Vehicle Communications Interface (VCI) module, PCMCIA card and DLC connector to the Tech 2, connect the tool to the vehicle DLC.
3. Make sure the Tech 2 is powered OFF when removing or installing the PCMCIA card.
4. The PCMCIA card has a capacity of 10 Megabytes which is 10 times greater than the memory of the Tech 1 Mass Storage Cartridge.
5. The Tech 2 has the capability of two snapshots.
6. The PCMCIA card is sensitive to magnetism and static electricity, so care should be taken in the handling of the card.
7. The Tech 2 can plot a graph when replaying a snapshot.
8. Always return to the Main Menu by pressing the EXIT key several times before shutting down.
9. To clear Diagnostic Trouble Codes (DTCs), open Application Menu and press "F1: Clear DTC Info".

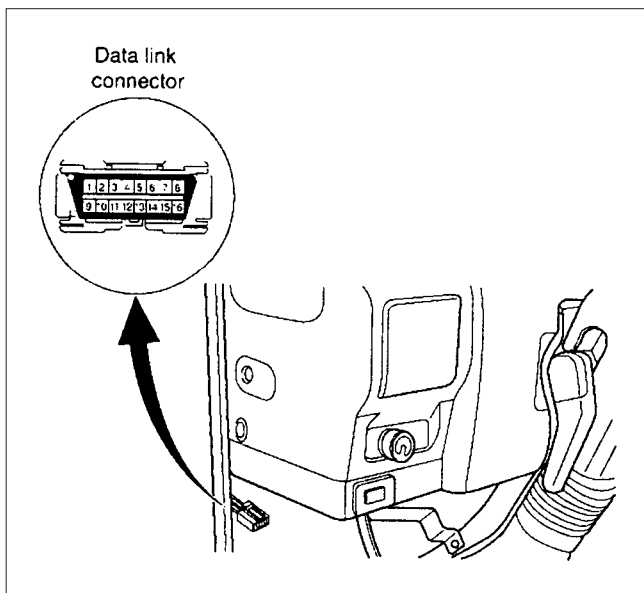
6. Turn on the vehicle ignition.
7. Power the Tech 2 ON and verify the Tech 2 power up display.



NOTE: The RS232 Loop back connector is only to use for diagnosis of Tech 2. Refer to user guide of the Tech 2.

## Getting Started

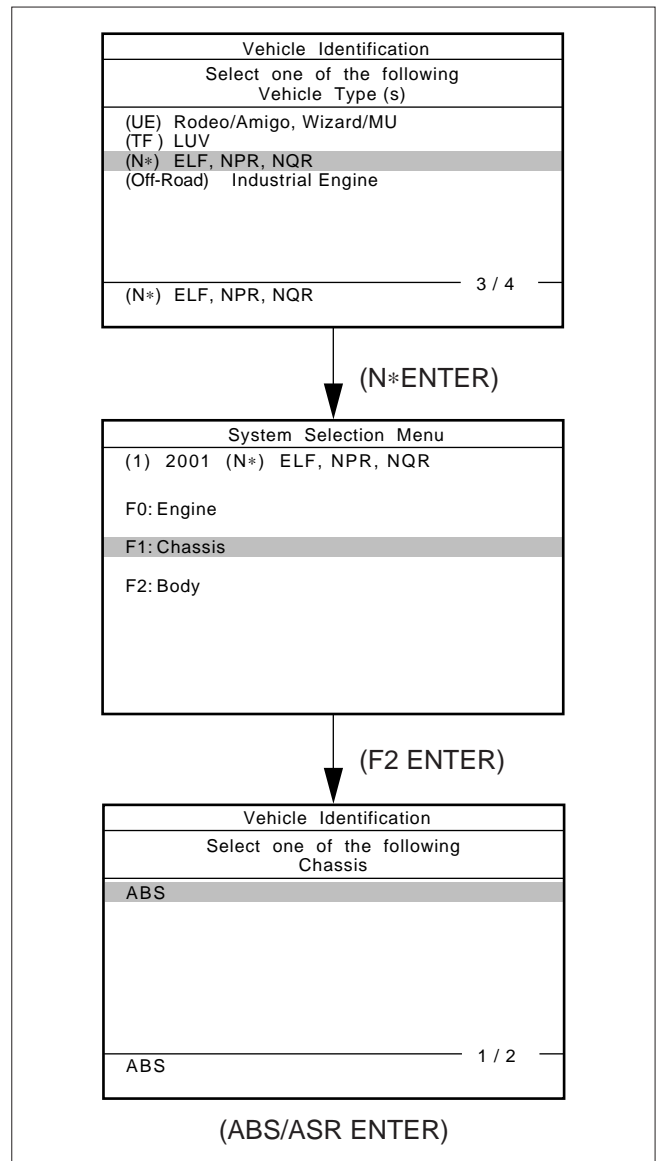
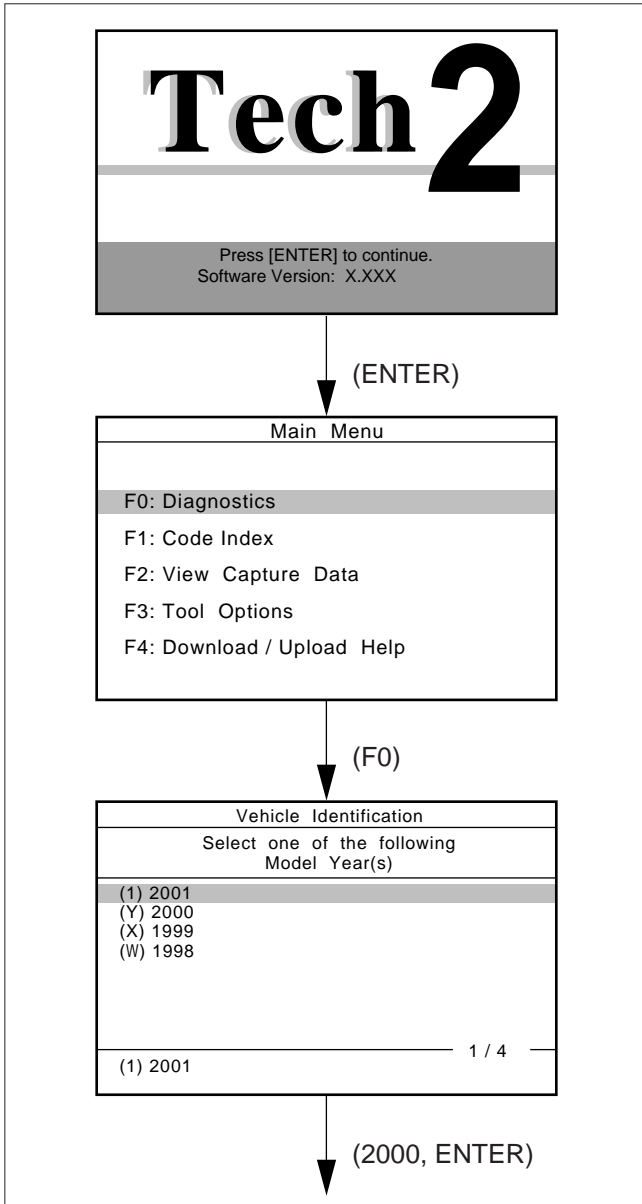
- Before operating the Isuzu PCMCIA card with the Tech 2, the following steps must be performed:
  1. The Isuzu 2000 Model Year System PCMCIA card (1) inserts into the Tech 2 (5).
  2. Connect the SAE 16/19 adapter (3) to the DLC cable (4).
  3. Connect the DLC cable to the Tech 2 (5).
  4. Make sure the vehicle ignition is off.
  5. Connect the Tech 2 SAE 16/19 adapter to the vehicle DLC.



## 5A4-12 ANTI-LOCK BRAKE SYSTEM (ABS)

### Operating Procedure (For Example)

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



**Menu**

- The following table shows which functions are used for the available equipment versions.

Chassis	
(Y) 2000 (N*) ELF, NPR, NQR Electronic System: ABS	
Partnumber	8972521653
Identifier	00(2WD) 20(4WD) 40(ABS/ASR) 60(12V vehicle)
Partnumber	
Confirm	

Diagnostic Trouble Codes	
F0: Read DTC Info Ordered By Priority	
F1: Clear DTC Information	
F2: DTC Information	
F3: Clear & Reset Vehicle Type	

The following is a brief description of each of the sub menus in DTC Info and DTC. The order in which they appear here is alphabetical and not necessarily the way they will appear on the Tech 2.

**DTC Modes**

Chassis	
F0: Diagnostic Trouble Codes	
F1: Data Display	
F2: Snapshot	
F3: Actuator Test	

**DTC Information Mode**

Use the DTC info mode to search for a specific type of stored DTC information. There are two choices. The service manual may instruct the technician to test for DTCs in a certain manner. Always follow published service procedures.

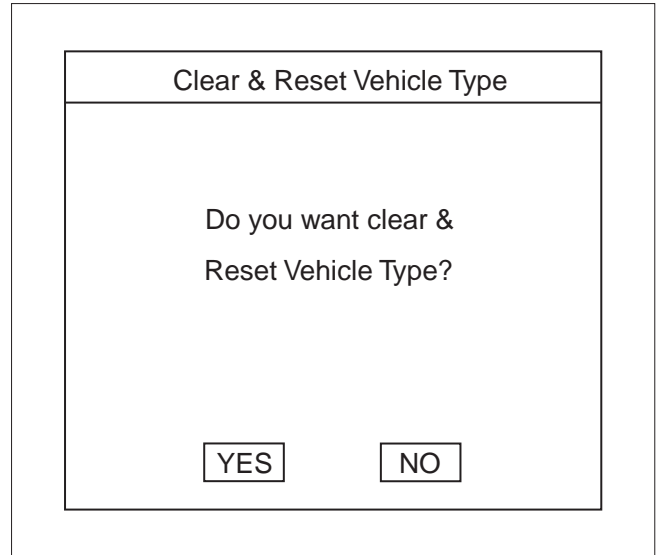
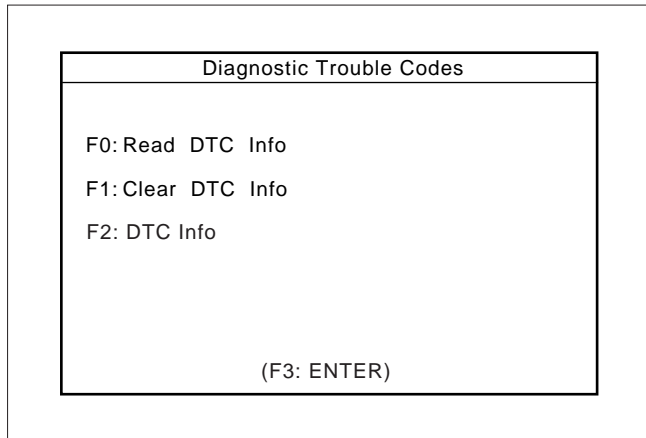
There are two options available in Tech 2 DTC mode to display the enhanced information available. After selecting DTC, the following menu appears.

- DTC Info
- Clear Info

**5A4-14 ANTI-LOCK BRAKE SYSTEM (ABS)**

**When CODE “13” is displayed (Vehicle Type Error)**

Step	Action	Value(s)	Yes	No
1	Check harness. Is it okay?	-	Erase vehicle type with TECH 2 and reread harness information.	Replace the harness.



YES: Clear vehicle type and reread vehicle harness information.

NO: Return

**DTC Status**

**Current Diagnostic Trouble Codes**

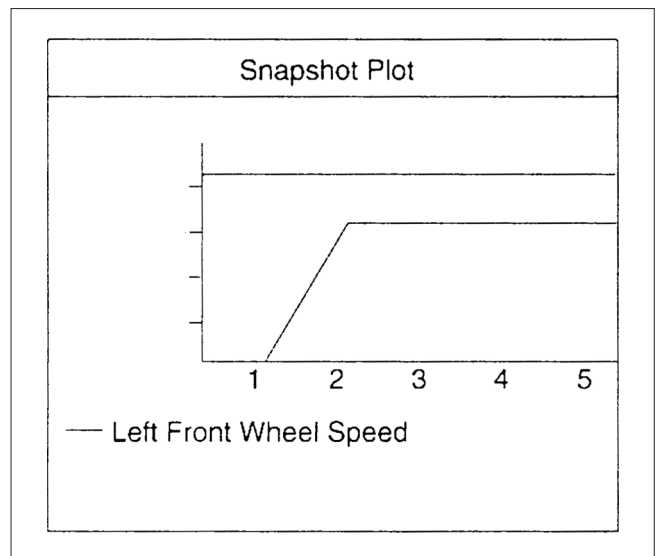
This selection will display all DTCs that have failed during the present ignition cycle.

**History Diagnostic Trouble Codes**

This selection will display only DTCs that are stored in the EHCU's history memory.

**Plotting Snapshot Graph**

This test selects several necessary items from the data list to plot graphs and makes data comparison on a long term basis. This test can check ABS performance and defect by graphing wheel speed differences between right and left sides, and front and rear sides obtained from the ABS data list menu.

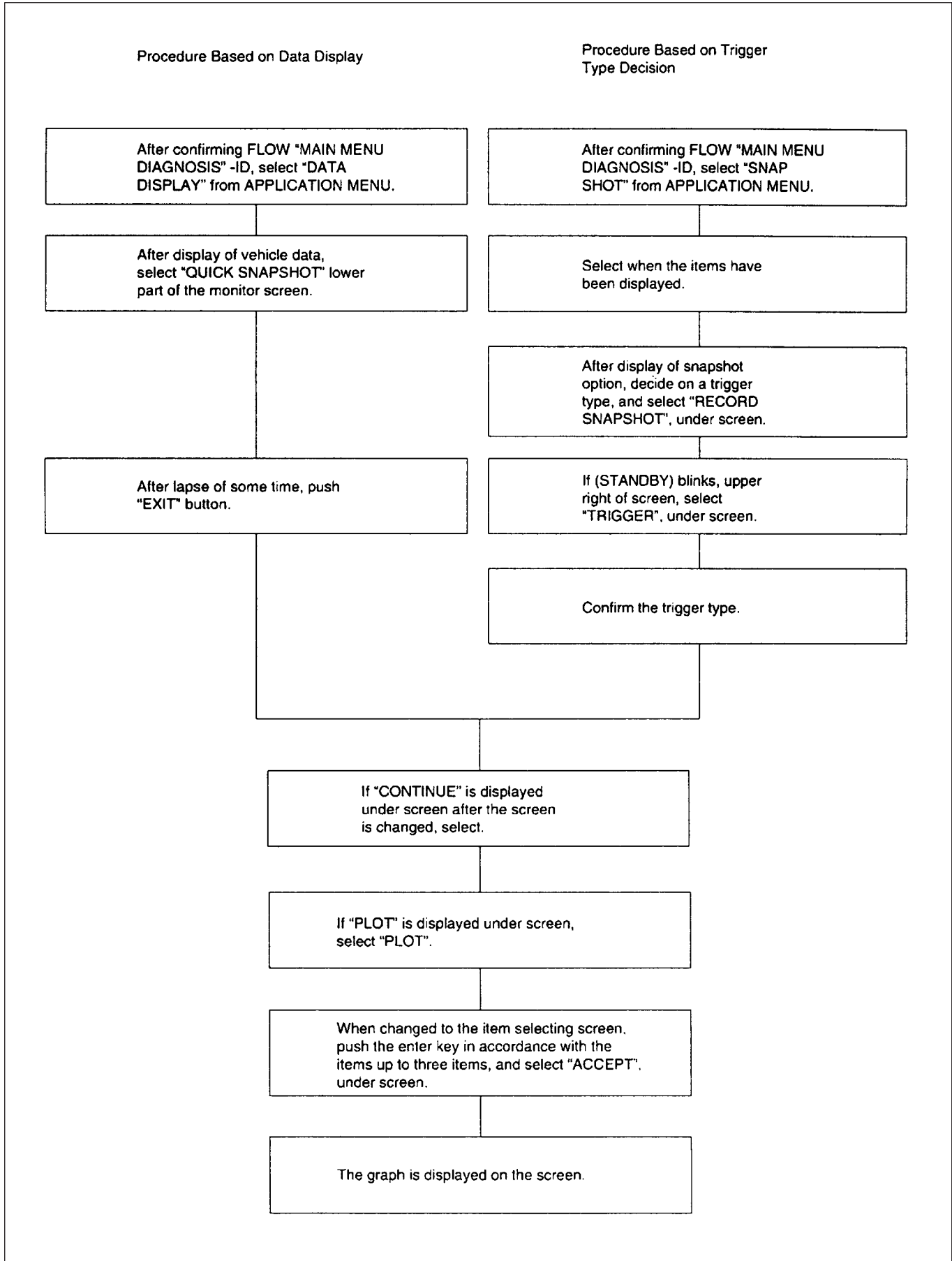


For trouble diagnosis, you can collect graphic data (snap shot) directly from the vehicle.

You can replay the snapshot data as needed.

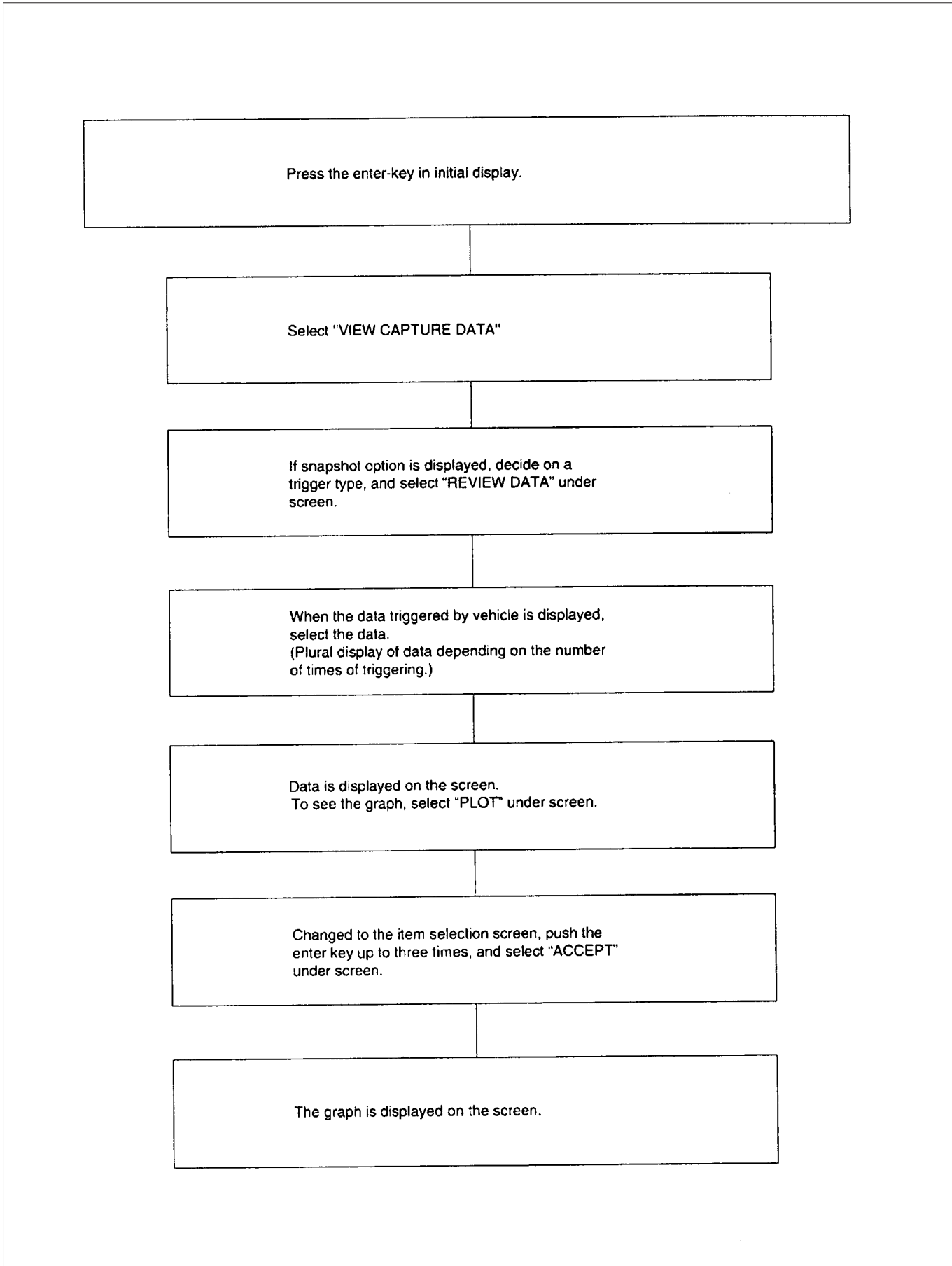
Therefore, accurate diagnosis is possible, even though the vehicle is not available.

**Plotting Graph Flow Chart (Plotting graph after obtaining vehicle information)**





### Flow Chart for Snapshot Replay (Plotting Graph)



## Tech 2 Data Display

Use the Tech 2 data Values only after the ABS Diagnostic System Check has been completed, no DTC(s) were noted, and you have determined that the on-board diagnostics are functioning properly. Tech 2 values from a properly-running engine may be used for comparison with the engine you are diagnosing.

### ABS Data

Ignition SW is "ON" position.

(For example)

F1: ABS DATA

Left Front Wheel Speed	2 mph
Right Front Wheel Speed	2 mph
Left Rear Wheel Speed	2 mph
Right Rear Wheel Speed	2 mph
Brake Switch Status	OFF
ABS Lamp Command	OFF
ABS Pump Motor	OFF
LR Release Valve Command	OFF
LR Hold Valve Command	OFF
RR Release Valve Command	OFF
RR Hold Valve Command	OFF
LF Release Valve Command	OFF
LF Hold Valve Command	OFF
RF Release Valve Command	OFF
RF Hold Valve Command	OFF
LR Release Valve Feed back	OFF
LR Hold Valve Feed back	OFF
RR Release Valve Feed back	OFF
RR Hold Valve Feed back	OFF
LF Release Valve Feed back	OFF
LF Hold Valve Feed back	OFF
RF Hold Valve Feed back	OFF
RF Release Valve Feed back	OFF
Battery Voltage	12~16V

Select  
Items

DTC

Quick  
Snapshot

More

## Special Function

There are 12 different menus available for this test. The state of each circuit can be tested by using these menus. Especially when DTC cannot be detected, a faulty circuit can be diagnosed by testing each circuit by means of these menus.

Even when DTC has been detected, the circuit tests using these menus could help discriminate between a mechanical trouble and an electrical trouble.

In all cases test condition; Engine stops with the key turned to the "ON" position. To be more specific, the test is conducted with the brake pedal stepped on after stepping once and releasing.

- Engine: Stop
- Ignition SW: ON
- Brake Pedal: ON-OFF-ON

If the Ignition SW was turned OFF or communication was lost, make sure to apply the brake pedal ON-OFF-ON once again and then continue the test.

Actuator Test

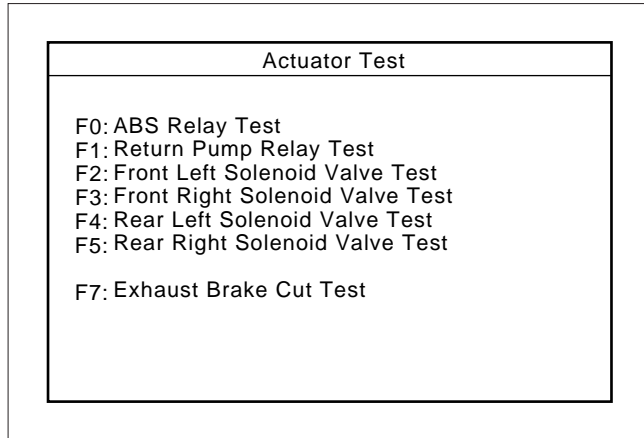
F0: ABS Relay Test  
 F1: Return Pump Relay Test  
 F2: Front Left Solenoid Valve Test  
 F3: Front Right Solenoid Valve Test  
 F4: Rear Left Solenoid Valve Test  
 F5: Rear Right Solenoid Valve Test  
 F6: ABS Check Light Test  
 F7: Exhaust Brake Cut Test

## 5A4-18 ANTI-LOCK BRAKE SYSTEM (ABS)

### ABS Warning Lamp

Test condition: Engine stops with the key turned to the "ON" position. To be more specific, the test is conducted with the brake pedal stepped on after stepping once and releasing.

- The circuit is normal if the warning light in the meter panel comes on and goes out in accordance with Tech 2's instruction.

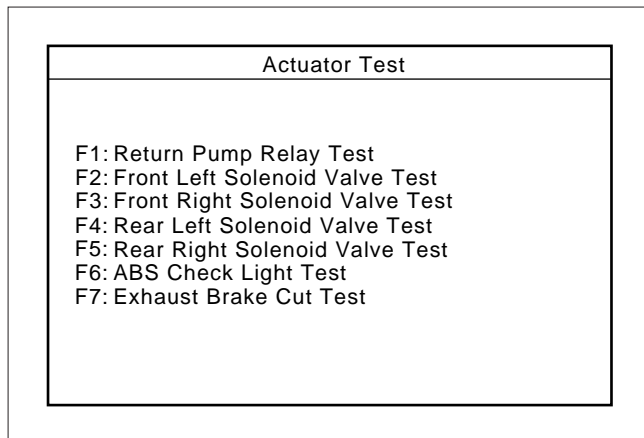


### ABS Relay

Test condition: Engine stops with the key turned to the "ON" position. To be more specific, the test is conducted with the brake pedal stepped on after stepping once and releasing.

Make sure of the working sound of the ABS relay.

The circuit is normal if the working sound of the ABS relay is made in accordance with Tech 2's instruction.

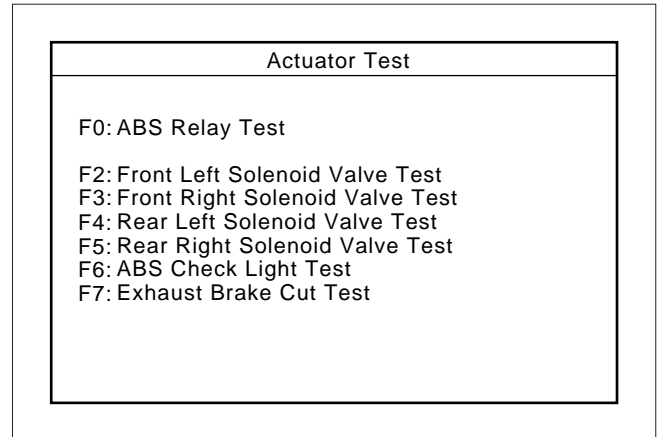


### ABS Motor

Test condition: Engine stops with the key turned to the "ON" position. To be more specific, the test is conducted with the brake pedal stepped on after stepping once and releasing.

Make sure of the working sound of the ABS motor.

The circuit is normal if the working sound of the ABS motor is made in accordance with Tech 2's instruction.

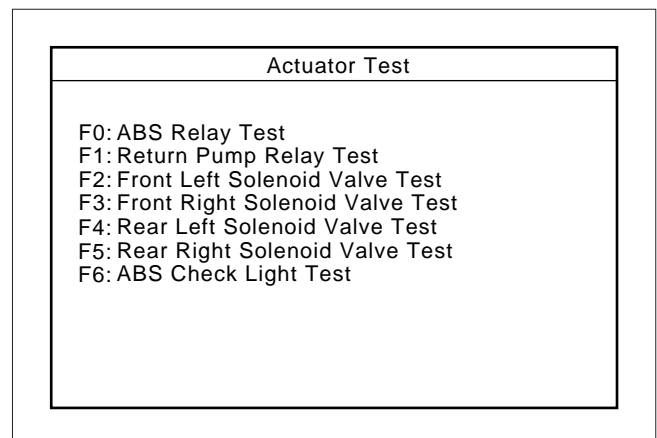


### Exhaust Brake Cut Relay

Test condition: Engine stops with the key turned to the "ON" position. To be more specific, the test is conducted with the brake pedal stepped on after stepping once and releasing.

Make sure of the working sound of the exhaust brake cut relay.

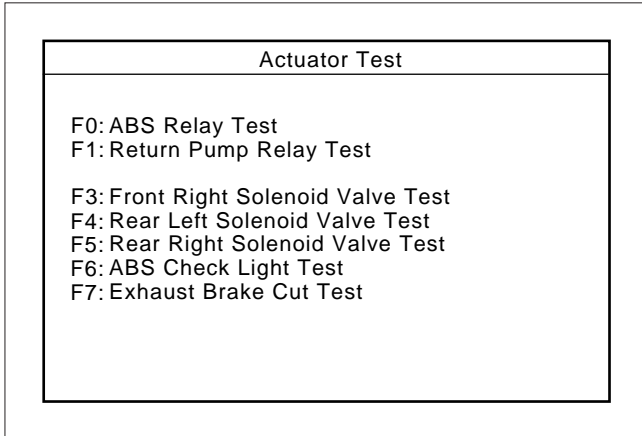
The circuit is normal if the working sound of the exhaust brake cut relay is made in accordance with Tech 2's instruction.



**Hold Valve Test**

Purpose: The purpose of this test is to detect brake pipe and valve line harness wire wrong connections and valve trouble.

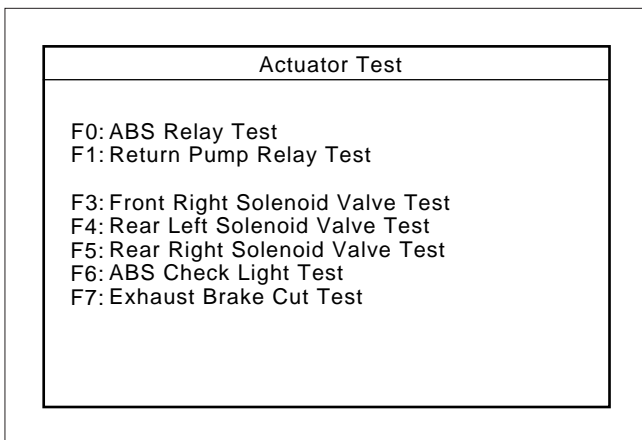
This test will help you confirm the result of your repair service including the removal/reinstallation of brake pipe, valve line harness and valve.



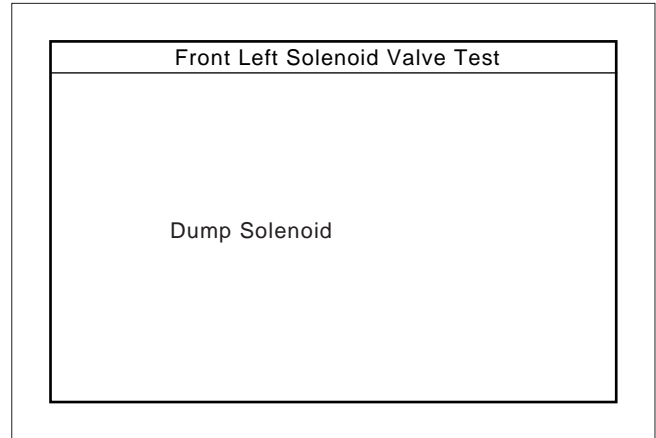
Test conditions: The ignition key is the "ON" position with the four wheels lifted up. The brake pedal is stepped on, released and stepped on again with the parking brake released.

Test procedure:

1. Connect Tech 2 with the vehicle, and select Special Function from the menus.
2. Select a Hold Valve Menu from the Special Function Menus.



Select a Iso Solenoid from the Front Left Solenoid Valve Test Function Menus.



3. Press the Hold Valve "ON" Soft Key with the brake pedal stepped on.
4. Release the brake pedal.
5. Make sure that the Hold Valve "ON" aimed at by Tech 2 and the wheel locked position are the same. If different, check brake pipe, valve line harness wiring and H/UNIT. Repair is needed if abnormality is found.
6. Conduct Step 2 through Step 5 above on all the four wheels.

**CAUTION: When conducting this test, please observe the following cautions.**

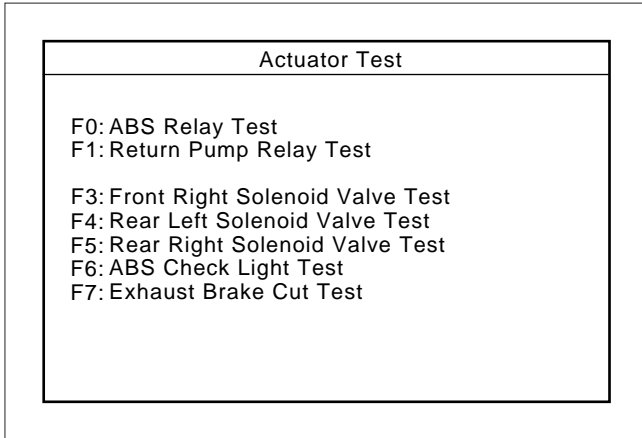
1. Do not start the engine without fail.
2. Lift up the vehicle at the level floor.
  - Secure a clearance from the floor surface enough to allow the lifted tire to rotate.
3. Maintain the lift up.
4. Wipe the floor surface to remove water and oil so that the surface may become unslippery.
5. Do not load the vehicle.
  - When lifting up the vehicle, be sure to observe the lifting up points. Refer to vehicle lifting points in 0A section.

## 5A4-20 ANTI-LOCK BRAKE SYSTEM (ABS)

### Release Valve Test

Purpose: The purpose of this test is to detect brake pipe and valve line harness wire wrong connections and valve trouble.

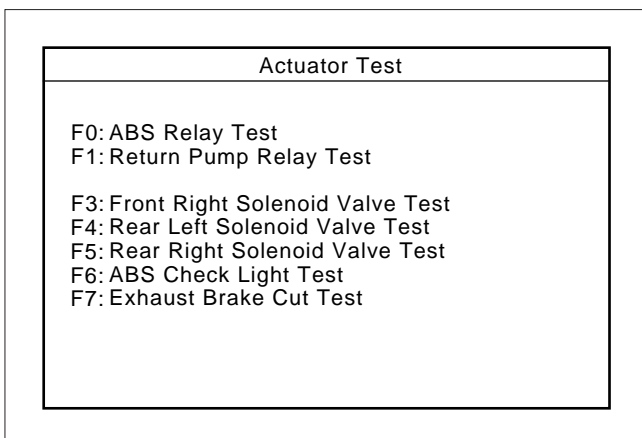
This test will help you confirm the result of your repair service including the removal/reinstallation of brake pipe, valve line harness and valve.



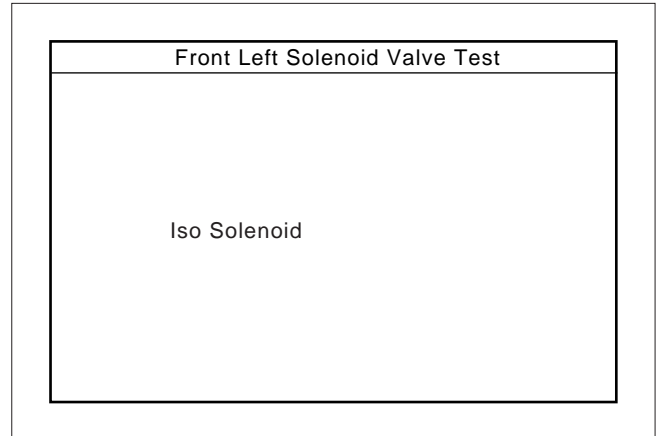
Test conditions: The ignition key is in the "ON" position with the four wheels lifted up. The brake pedal is stepped on, released and stepped on again with the parking brake released.

Test procedure:

1. Connect Tech 2 with the vehicle, and select Special Function from the menus.
2. Select a Release Valve Menu from the Special Function Menus.



### Select a Dump Solenoid from the Front Left Solenoid Valve Test Function Menus.



3. Press the Release Valve "ON" Soft Key with the brake pedal stepped on.
4. Make sure that the Release Valve "ON" aimed at by Tech 2 and the wheel released position are the same. If different, check brake pipe, valve line harness wiring and H/UNIT. Repair is needed if abnormality is found.
5. Conduct Step 2 through Step 5 above on all the four wheels.

**CAUTION: When conducting this test, please observe the following cautions.**

1. Do not start the engine without fail.
2. Lift up the vehicle at the level floor.
  - Secure a clearance from the floor surface enough to allow the lifted tire to rotate.
3. Maintain the lift up.
4. Wipe the floor surface to remove water and oil so that the surface may become unslippery.
5. Do not load the vehicle.
  - When lifting up the vehicle, be sure to observe the lifting up points. Refer to vehicle lifting points in 0A section.

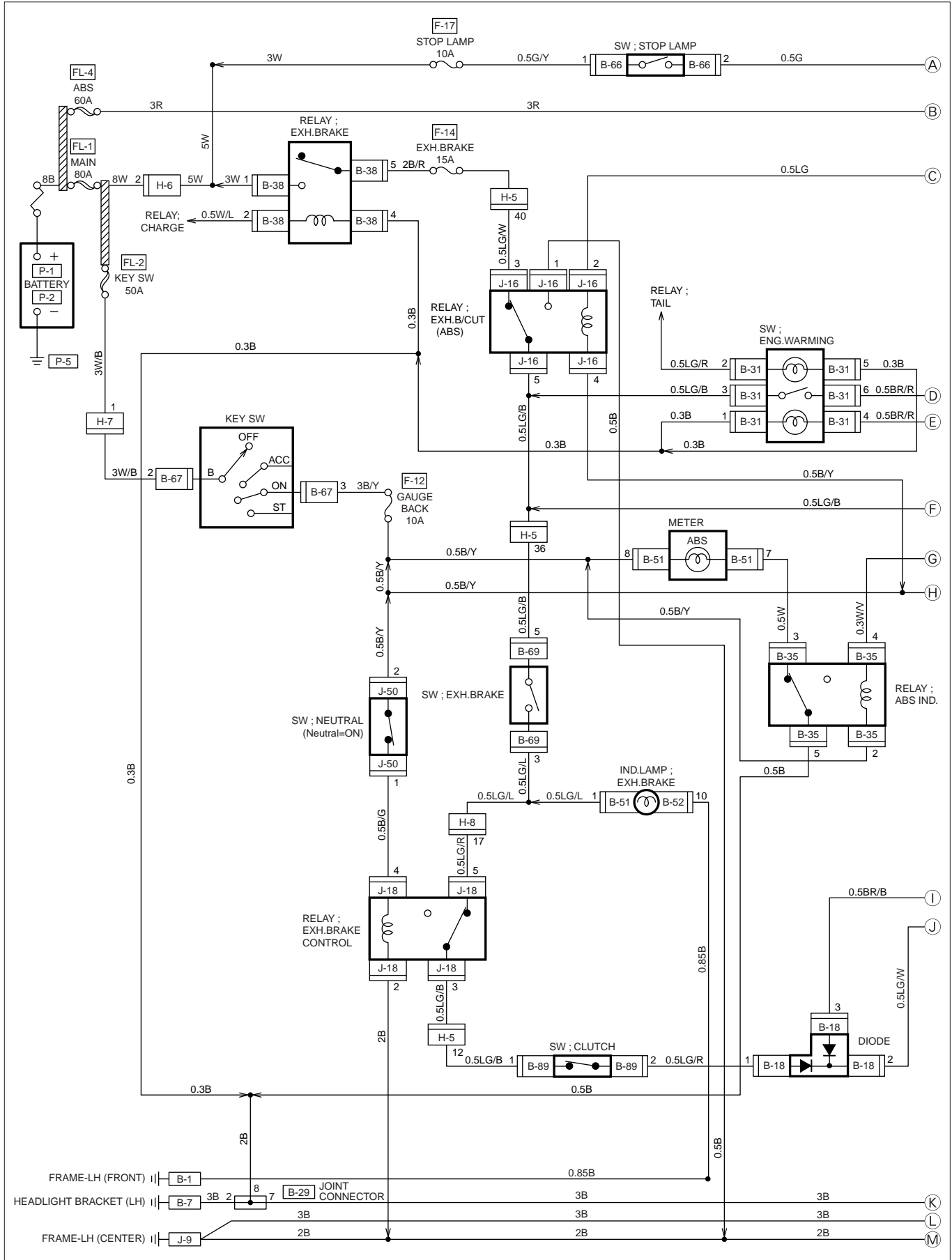
**EHCU Connector Pin-out Checks**

- Disconnect EHCU.
- Perform checks with high impedance digital multimeter 5-8840-0285-0 (J-39200) or equivalent.

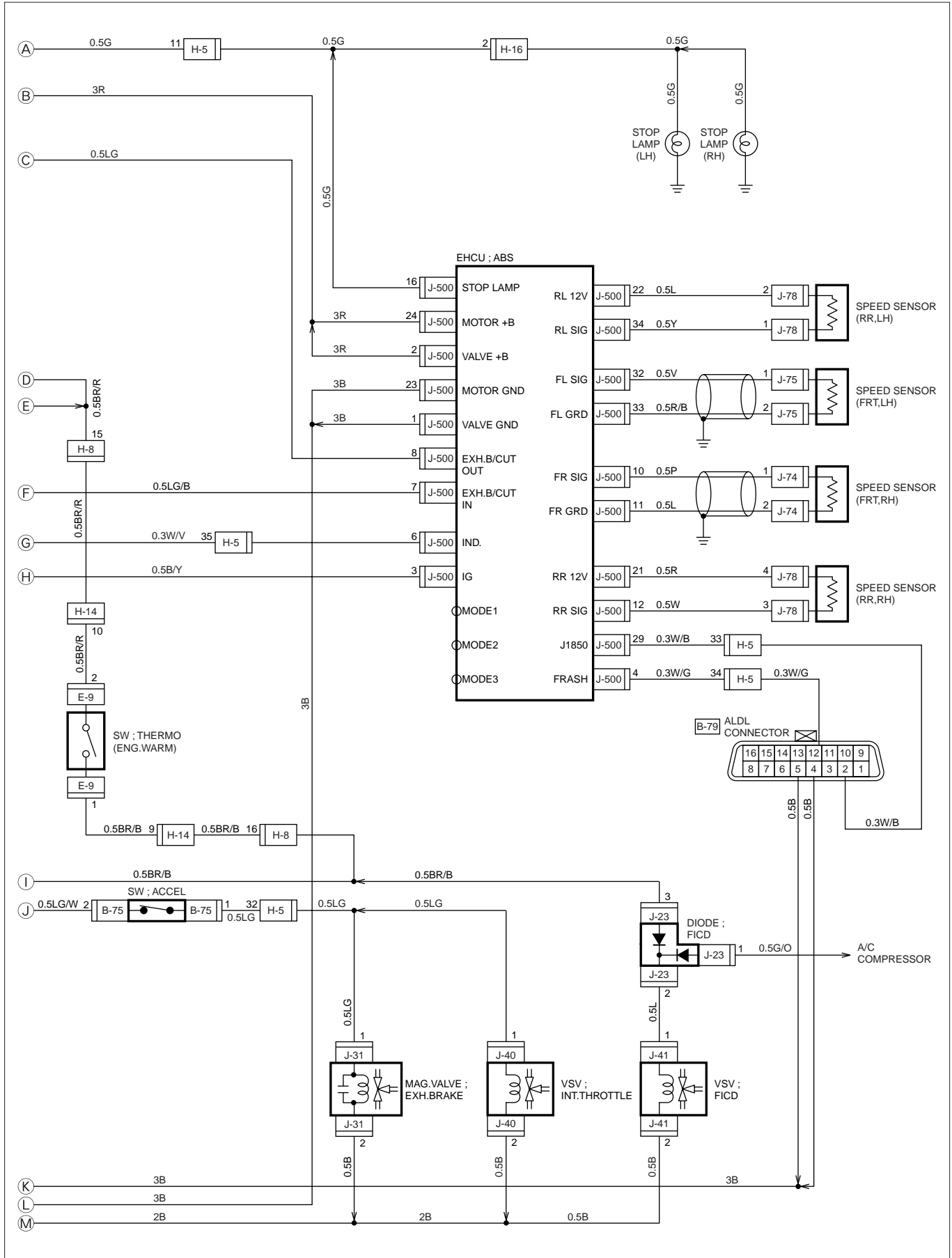
No.	Circuit to be Tested	Key Switch Position	Multimeter Scale/Range	Measure between Pin	Nominal Value (24V Battery Vehicle)	Note
1	EHCU Power Circuit	OFF	VDC	3(+)-1(-)	0-0.3V	
		ON	VDC	3(+)-1(-)	9.5-16.5V (16.5-34V)	
		OFF	VDC	2(+)-1(-)	9.5-16.5V (16.5-34V)	
		OFF	VDC	24(+)-1(-)	9.5-16.5V (16.5-34V)	
2	EHCU Ground Circuit	OFF	$\Omega$	1(+)-GND	Less than 0.01 $\Omega$	
		OFF	$\Omega$	23(+)-GND	Less than 0.01 $\Omega$	
3	EXHIN Circuit	ON	VDC	7(+)-1(-)	9.5-16.5V (16.5-34V)	Engine Run
4	EXHOUT Circuit	ON	VDC	8(+)-1(-)	9.5-16.5V (16.5-34V)	
		OFF	VDC	8(+)-1(-)	0-0.3V	
5	Brake Switch Signal Circuit	OFF	VDC	16(+)-1(-)	0-0.3V	
		OFF	VDC	16(+)-1(-)	9.5-16.5V (16.5-34V)	
6	ABS W/L Circuit	ON	VDC	6(+)-1(-)	9.5-16.5V (16.5-34V)	
		OFF	VDC	6(+)-1(-)	0-0.3V	
7	FL Speed Sensor	OFF	k $\Omega$	10(+)-11(-)	1-2k $\Omega$	
		OFF	k $\Omega$	10(+)-1(-)	More than 1000k $\Omega$	
		OFF	VDC	10(+)-11(-)	More than 200mV	
8	FR Speed Sensor	OFF	k $\Omega$	32(+)-33(-)	1-2k $\Omega$	
		OFF	k $\Omega$	32(+)-1(-)	More than 1000k $\Omega$	
		OFF	VDC	32(+)-33(-)	More than 200mV	

5A4-22 ANTI-LOCK BRAKE SYSTEM (ABS)

Circuit Diagram-FOR 12VOLT



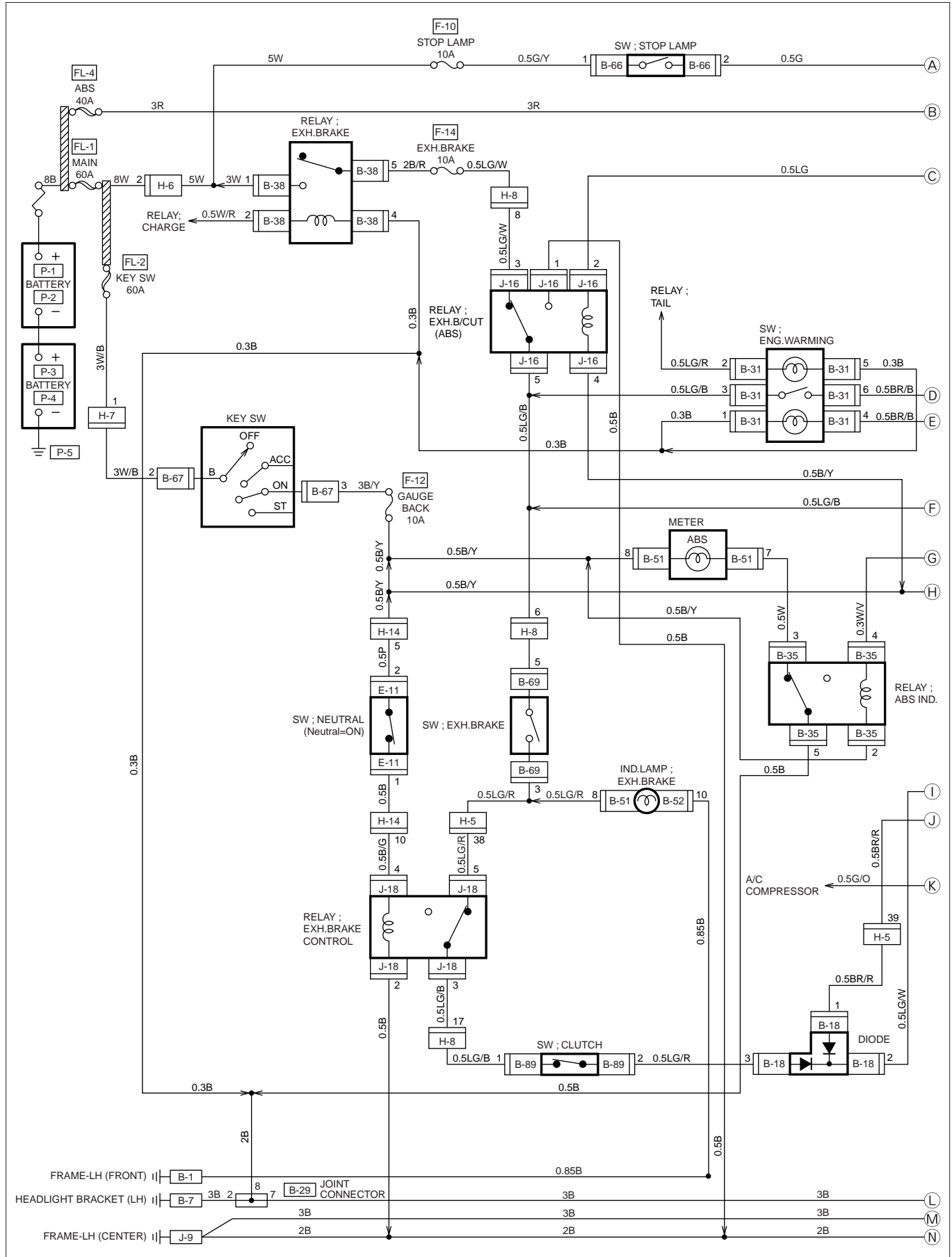
# ANTI-LOCK BRAKE SYSTEM (ABS) 5A4-23

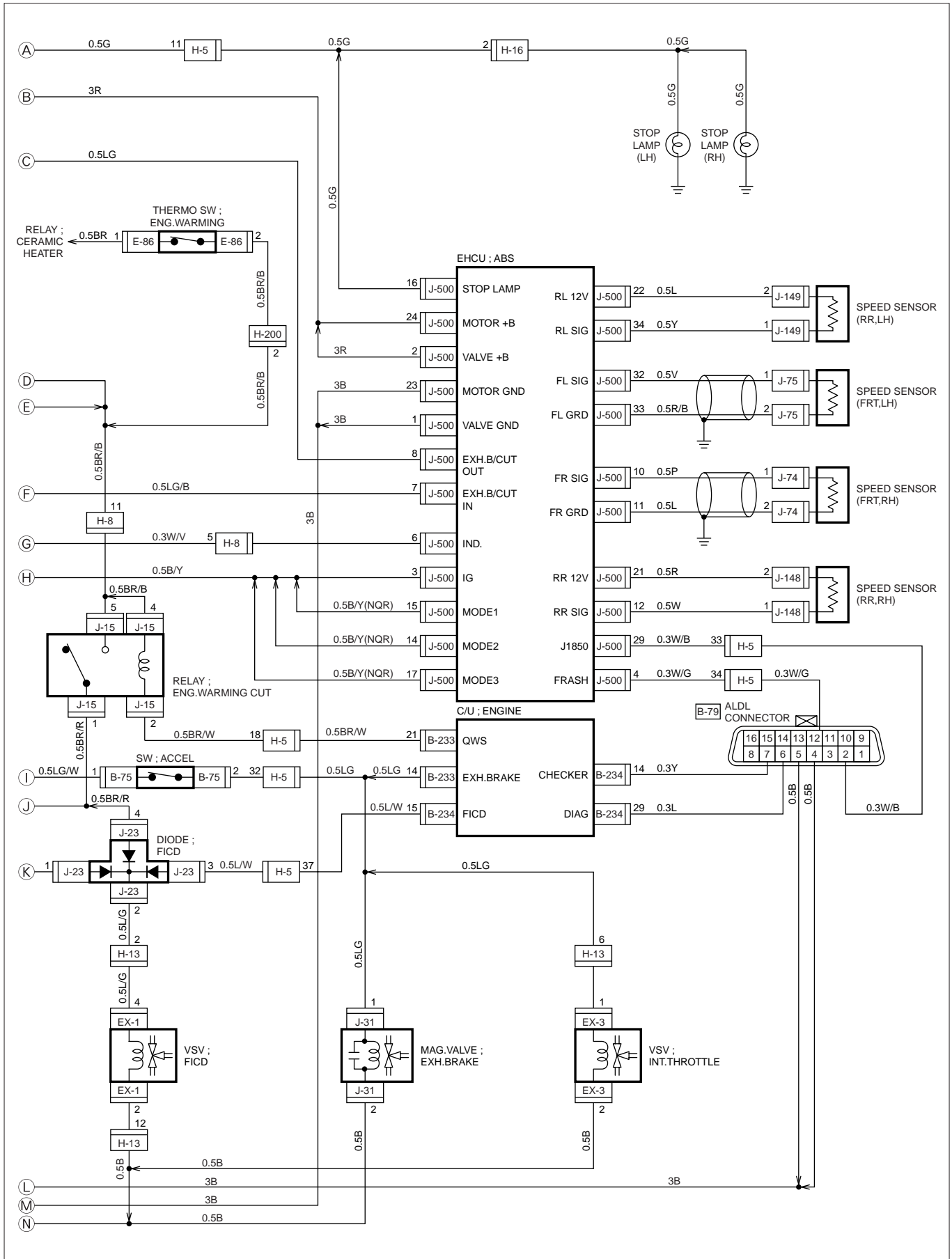




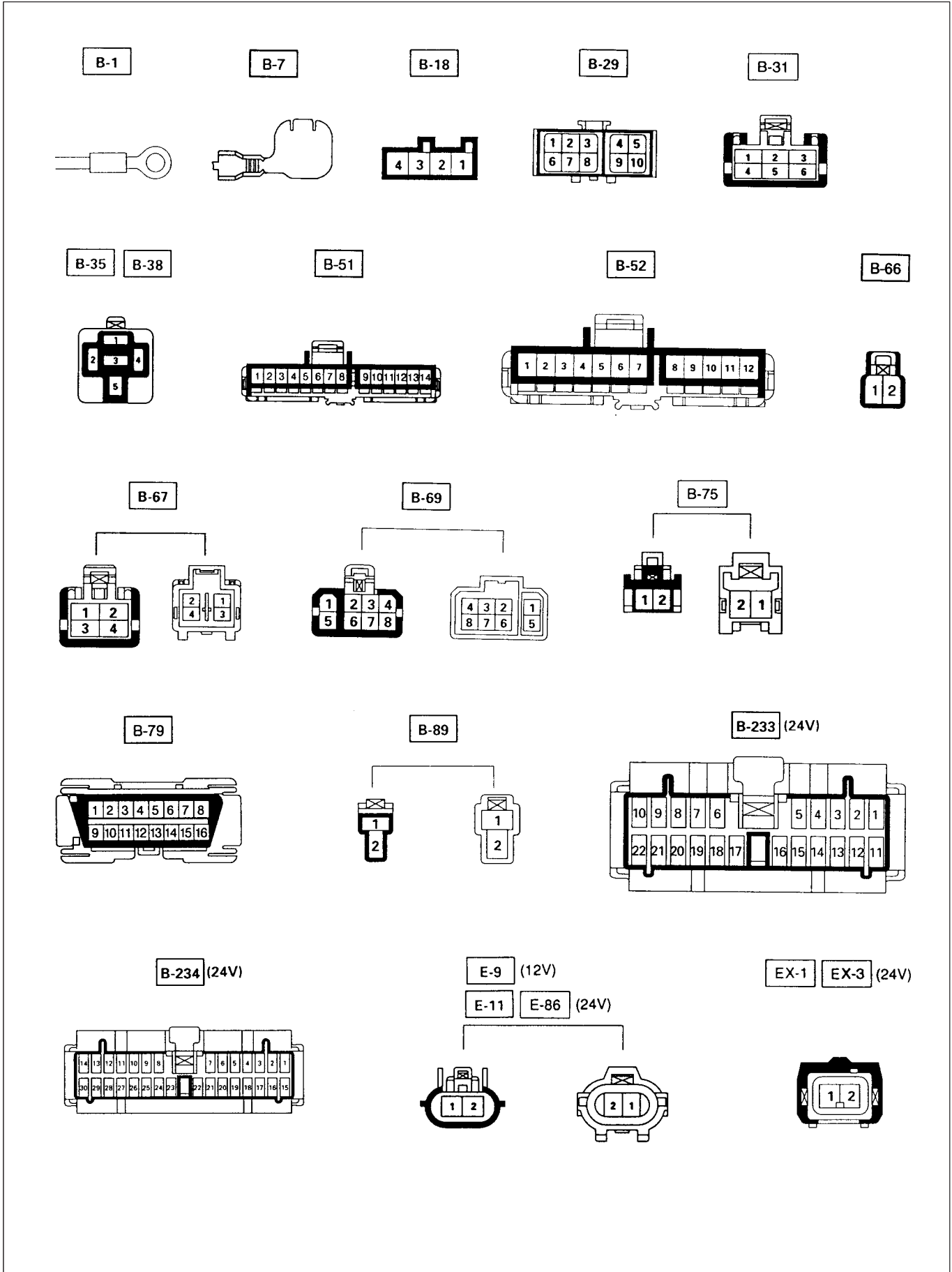
# 5A4-24 ANTI-LOCK BRAKE SYSTEM (ABS)

## Circuit Diagram-FOR 24VOLT

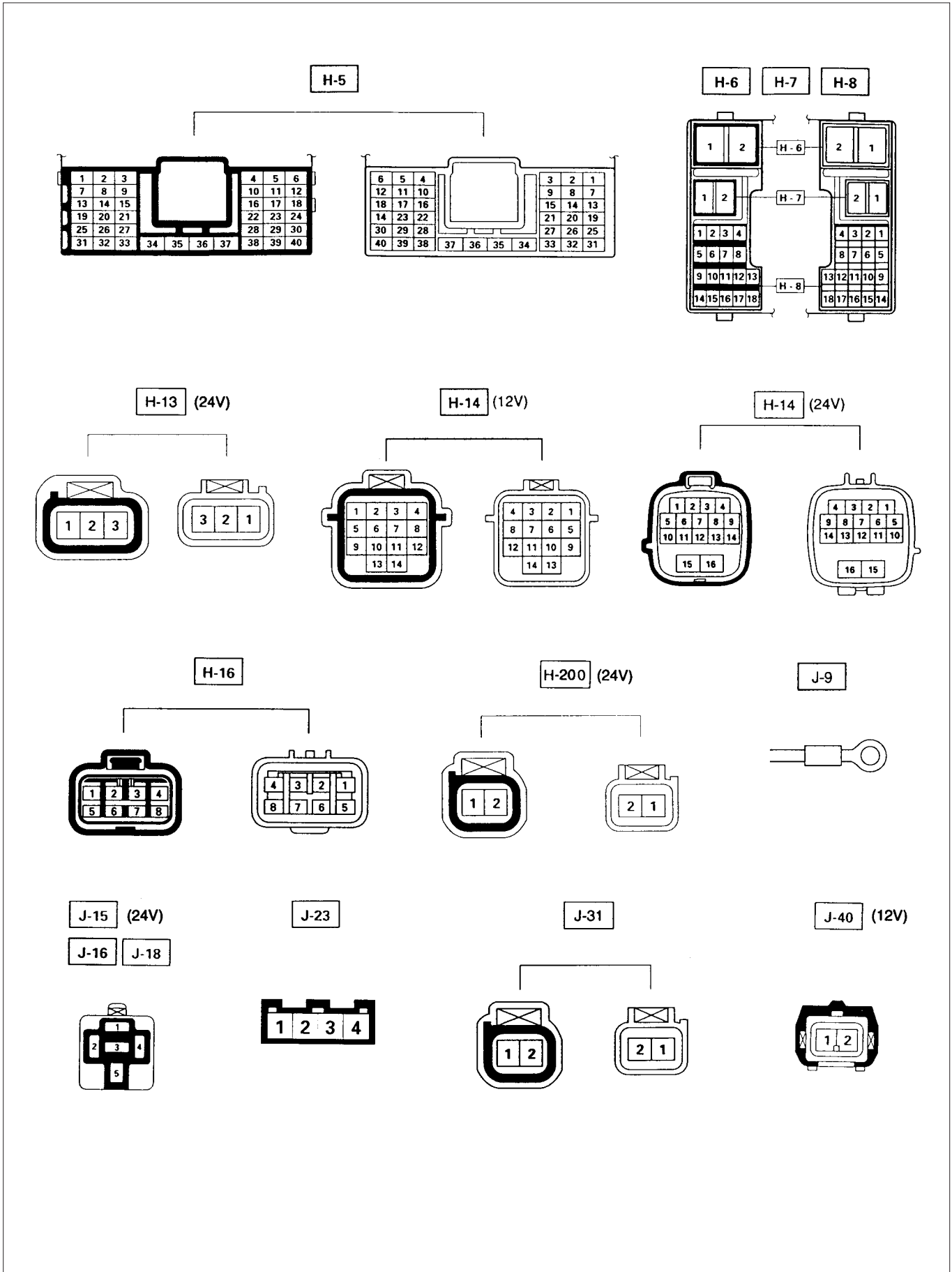




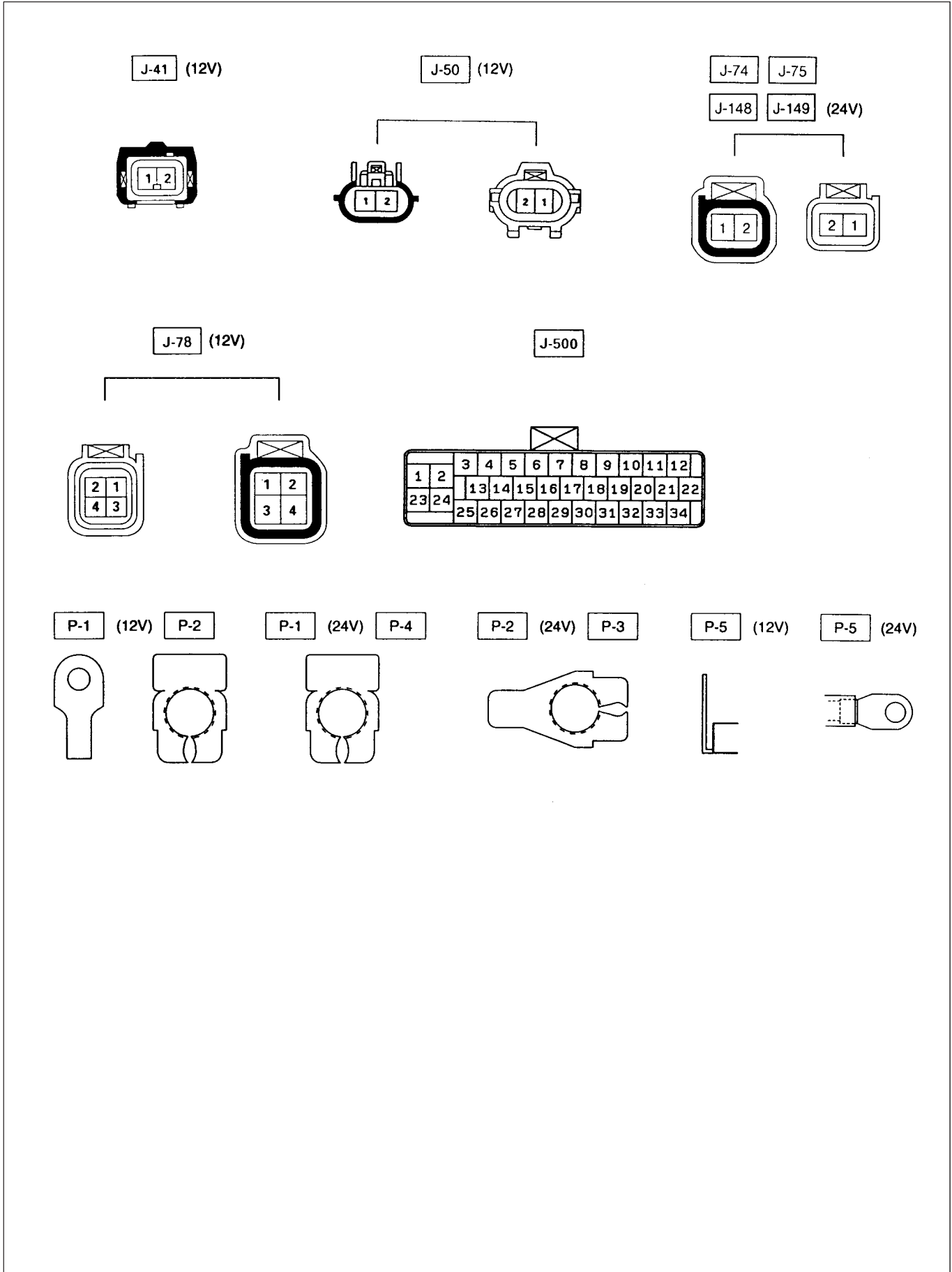
Connector List



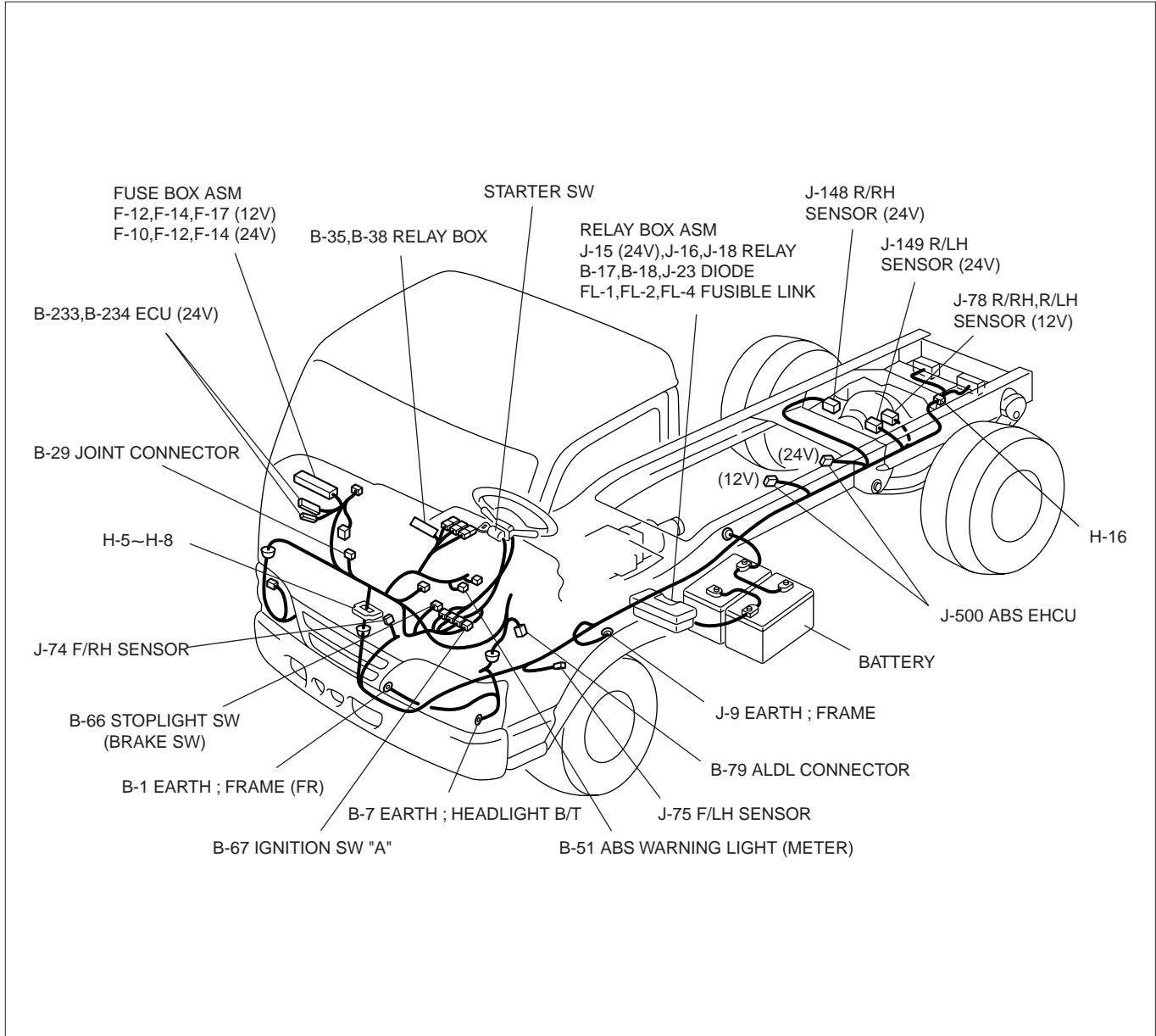
Connector List



Connector List



Part Location



## 5A4-30 ANTI-LOCK BRAKE SYSTEM (ABS)

### Symptom Diagnosis

The symptoms that cannot be indicated by the 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 Hydraulic Unit) 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 Hydraulic Unit) 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 the front and rear of the vehicle?	Go to Step 2	Repair brake parts. Go to Step 6
2	Are axle parts installed normally?	Go to Step 3	Repair axle parts. Go to Step 6
3	Is there play in each wheel speed sensor?	Go to Step 4	Repair wheel speed sensor. Go to Step 6
4	Is there damage, or powdered iron sticking to each wheel speed sensor/sensor rotor?	Go to Step 5	Replace sensor or sensor rotor. Go to Step 6
5	Is the output of each wheel speed sensor normal? (Refer to chart C-1 or TC-1)	Replace EHCUC. Go to Step 6	Replace wheel speed sensor or repair harness. Go to Step 6
6	Reconnect all components and ensure all components are properly mounted. Was this step finished?	Repeat the "Basic diagnostic flow chart."	Go to Step 6

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

Step	Action	Yes	No
1	1. Connect TECH 2. 2. WHEEL SENSORS make sure of the output conditions of each sensor. Is the output of each sensor normal?	Go to Step 2	Replace wheel speed sensor. Go to Step 3
2	Return to Chart A-1. Was the Chart A-1 finished?	Go to Step 3	Go to Step 2
3	Reconnect all components, ensure all components are properly mounted. 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 sensor?	Go to Step 2	Repair. Go to Step 5
2	Damage or powdered iron sticking to each sensor/sensor rotor?	Go to Step 3	Repair. Go to Step 5
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. Go to Step 5
4	Is brake pipe connecting order correct?	Replace EHCU. Go to Step 5	Reconnect brake pipe correctly. Go to Step 5
5	Reconnect all components, ensure all components are properly mounted. Was this step finished?	Repeat the "Basic diagnostic flow chart."	Go to Step 5

**Chart A-3, TA-3 The Wheels Are Locked**

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



**5A4-32 ANTI-LOCK BRAKE SYSTEM (ABS)**

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

<b>Step</b>	<b>Action</b>	<b>Yes</b>	<b>No</b>
1	Is the stop light actuated when the brake pedal is depressed?	Go to Step 2	Go to Step 3
2	1. Turn the key off. 2. Disconnect EHCUC connector. 3. Measure the voltage between J-500 EHCUC connector terminals 16 and 1, when brake pedal is depressed. Is the voltage between 9 - 16 V?	Go to Step 4	Harness NG between brake SW and EHCUC. Go to Step 7
3	Is stop light fuse 12V: F-17, 24V: F-10 normal?	Go to Step 5	Replace fuse 12V: F-17, 24V: F-10. Go to Step 7
4	Is there continuity between J-500 EHCUC connector terminal 1 to body ground?	Go to Step 6	Repair body grounded harness. Go to Step 7
5	Is the brake SW normal?	Repair stop light harness. Go to Step 7	Replace brake SW. Go to Step 7
6	Is the check harness/connector for suspended disconnection?	Hydraulic system leakage or air entry Go to Step 7	Repair harness. Go to Step 7
7	Reconnect all components, ensure all components are properly mounted. Was this step finished?	Repeat the "Basic and diagnostic flow chart."	Go to Step 7

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

Step	Action	Yes	No
1	Is this the first time the vehicle is being driven after starting the engine?	It is self checking sound. Normal.	Go to Step 2
2	Is vehicle speed under 10 km/h (6 mph)?	It is self checking sound. 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 <math>\mu</math> 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.</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 sensor/wheel speed sensor rotor?	Go to Step 5	Repair. Go to Step 7
5	Damage or powdered iron sticking to each sensor/wheel speed sensor rotor?	Repair. 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. If no disconnection is found, replace EHCJ. Go to Step 7	Repair. Go to Step 7
7	Reconnect all components, ensure all components are properly mounted. Was this step finished?	Repeat the "Basic diagnostic flow chart."	Go to Step 7

**5A4-34 ANTI-LOCK BRAKE SYSTEM (ABS)**

**Diagnostic Trouble Codes**

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

Code		Diagnosis	Item (except Wiring)	Chart No.
Flash out	Serial Communications			
12	-	Normal	-	-
13	C0213	Vehicle Type Error	EHCUC	1
14	C0214	Low Power Voltage of Rear Sensor or ECU Abnormality	EHCUC	2
15	C0215	Low Power Voltage	EHCUC	3
25	C0225	Exhaust Brake Cut Circuit Abnormality	Relay or EHCUC	4
33	C0233	Motor Drive Circuit Abnormality	EHCUC	5
34	C0234	Abnormal Motor Rotation	EHCUC	6
41	C0241	Solenoid Valve Power Supply Abnormality	EHCUC	7
43	C0243	Solenoid Valve Circuit Abnormality	EHCUC	8
45	C0245	Solenoid Valve Circuit Abnormality		
51	C0251	FL Speed Sensor Circuit Abnormality	Sensor, EHCUC	9
52	C0252	FR Speed Sensor Circuit Abnormality		10
53	C0253	RL Speed Sensor Circuit Abnormality		11
54	C0254	RR Speed Sensor Circuit Abnormality		12
61	C0261	Abnormal FL Speed Sensor Signal		13
62	C0262	Abnormal FR Speed Sensor Signal		14
63	C0263	Abnormal RL Speed Sensor Signal		15
64	C0264	Abnormal RR Speed Sensor Signal		16
65	C0265	Tire Size Error	Tire, Sensor, EHCUC	17

\* **Important: DTC 20 (Reference Voltage High) cannot be indicated by Tech 2. DTC 20 can be indicated and confirmed by flashing using Diagnosis Switch.**

## 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		Normal
2	Warning light is not lit		Warning light lighting circuit trouble→Go to Chart B-1
3	Warning light is actuated while driving		Diagnostic trouble codes are stored. Display diagnostic trouble codes and diagnose on a code basis according to the flow charts.

## Diagnostic Trouble Codes (DTCs)

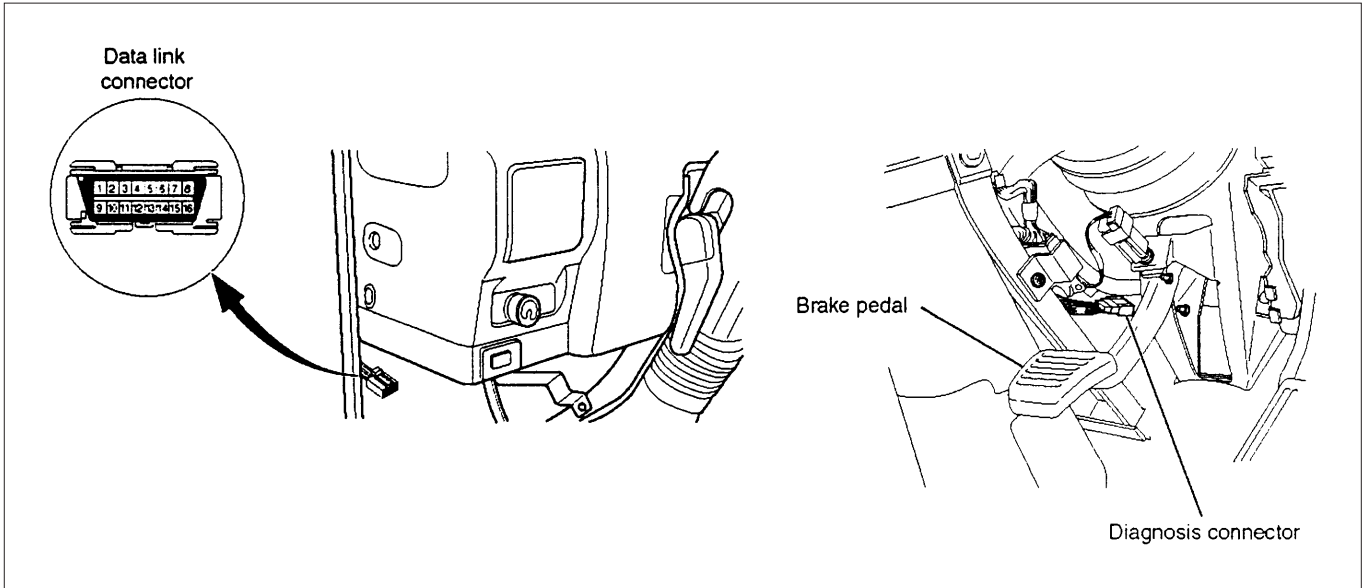
When the warning light in the meter remains ON, the EHCUC stores the fault identification and disables the ABS.

### 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 conditions are satisfied, DTC display cannot be started.)
- With the key switch OFF and short B-79 diagnosis connector terminal 12 to ground. Then turn the key switch ON.
- DTCs can be displayed also by TECH 2.

## 5A4-36 ANTI-LOCK BRAKE SYSTEM (ABS)

The DLC (for Tech 2) is located behind the driver side lower cluster panel

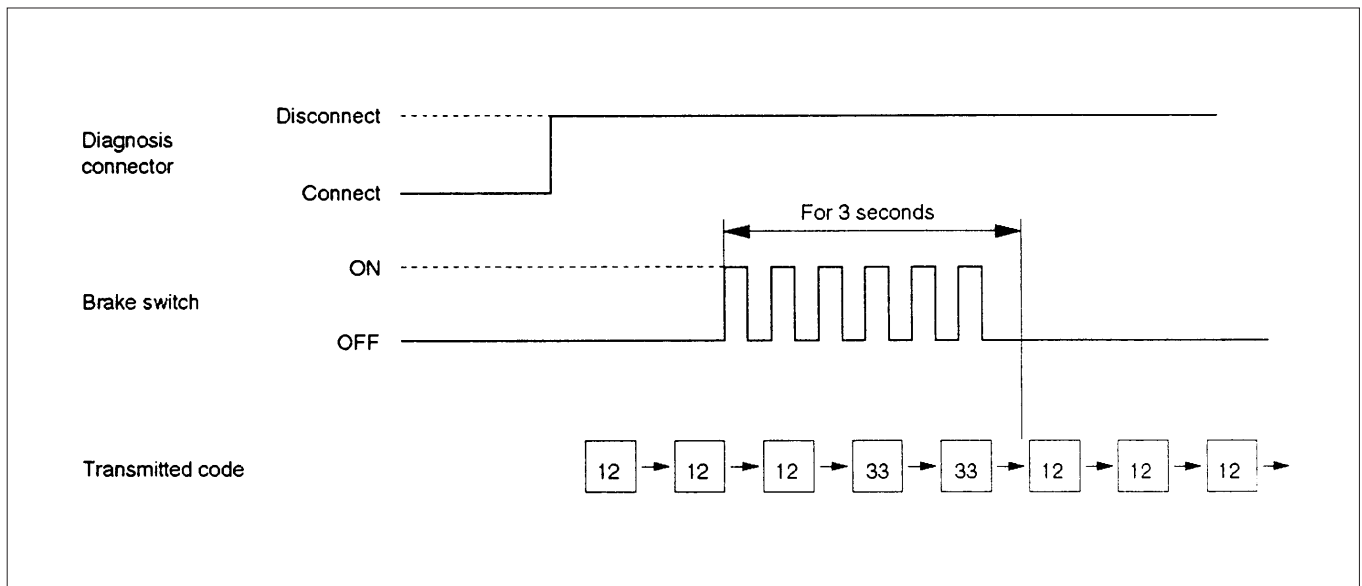


### 2. DTC display:

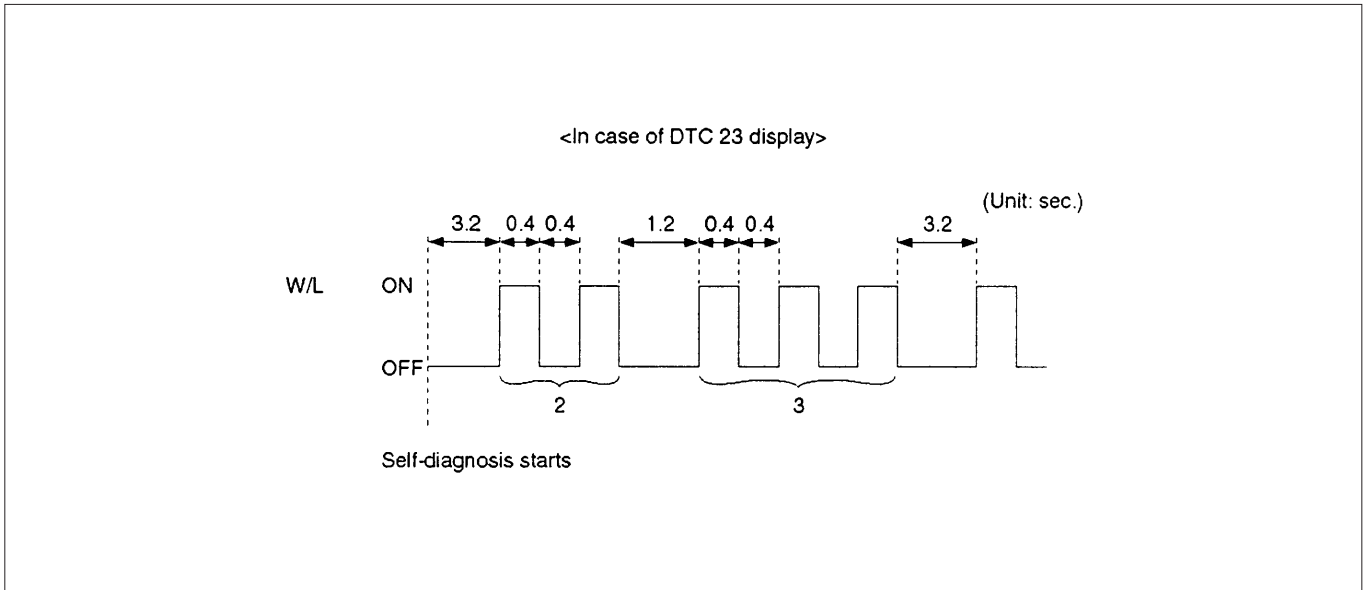
- DTC is displayed by blinking warning light.
- Double-digit display.
- First, normal DTC 12 is displayed three times and then any other DTCs are displayed three times. (If no other DTCs have been stored, the display of DTC 12 will be repeated.)

### 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 pedal depressed).
- DTCs can be erased also by Tech 2.

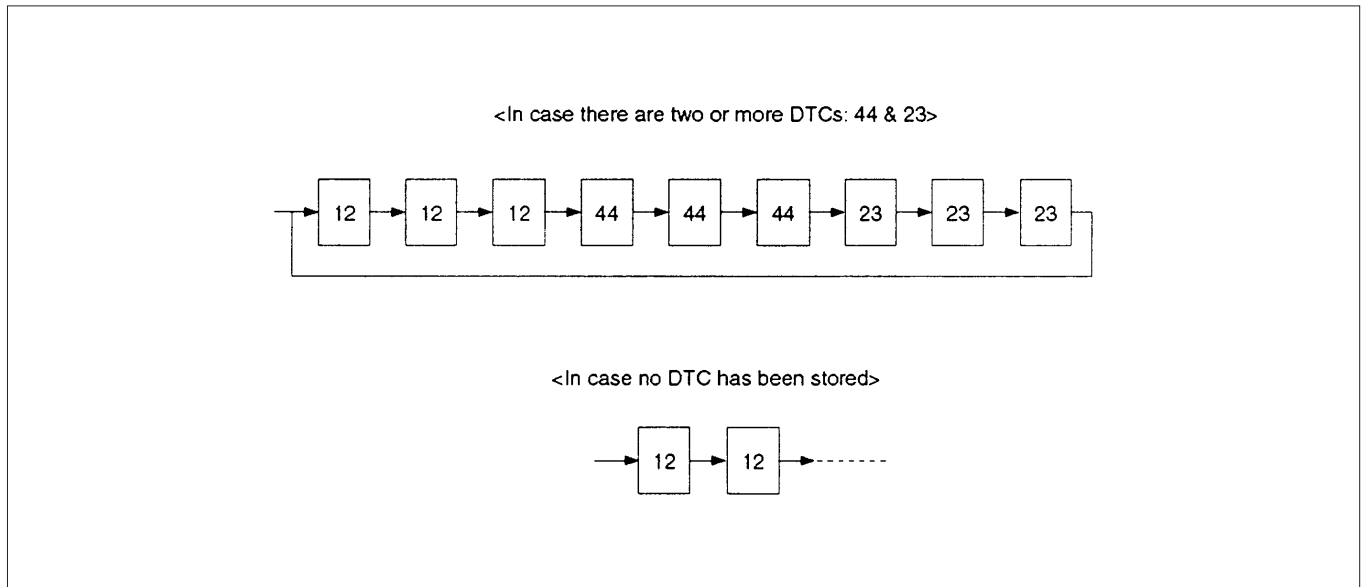


4. An example of DTC display  
 Display of DTC 23



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.)

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



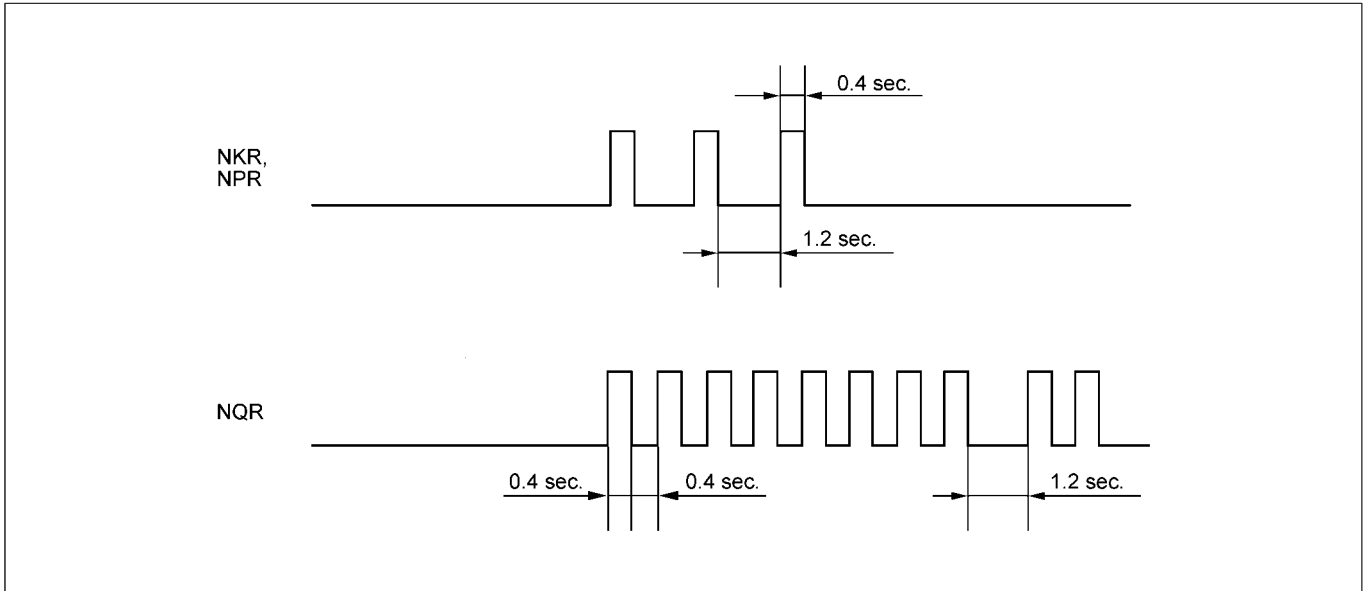
## 5A4-38 ANTI-LOCK BRAKE SYSTEM (ABS)

5. How to display vehicle model:

- 1) Turn the key switch OFF.
- 2) Short the diagnosis connector terminal 12 to ground.
- 3) Slightly push the brake pedal.
- 4) Turn the key switch ON.
- 5) ABS warning light illuminates.

6) Illuminating number of times indicates the vehicle model.

Vehicle model	Illuminating number of times
NKR, NPR	1
NQR	8



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

Step	Action	Value(s)	Yes	No
1	Is W/L fuse F-12 disconnected?	-	Go to Step 5	Go to Step 2
2	Is W/L burnt out?	-	Go to Step 6	Go to Step 3
3	1. Turn the key off. 2. Disconnect EHCUC connectors. 3. Turn the key on. 4. Using DVM, measure the voltage between J-500 EHCUC connector terminals 6 and 1. Does the DVM display a voltage within the specified value?	12V: 9.5-16.5V 24V: 16.5-34V	Go to Step 4	Go to Step 7
4	Check the continuity between J-500 EHCUC connector terminal 1 and body ground. Is there continuity?	-	Go to Step 9	Go to Step 8
5	Replace the fuse. Is action complete?	-	Go to Step 10	-
6	Replace the W/L bulb. Is action complete?	-	Go to Step 10	-
7	Locate and repair open circuit, poor connection or short circuit in the ignition feed circuit. Is action complete?	-	Go to Step 10	-
8	Locate and repair open circuit, poor connection or short circuit in the ground circuit. Is action complete?	-	Go to Step 10	-
9	1. Check the harness for suspected disconnection. 2. If no fault found, replace the EHCUC. Is action complete?	-	Go to Step 10	-
10	1. Reconnect all components, ensure all components are properly mounted. 2. Clear diagnostic trouble code. Was this step finished?	-	Go to "Basic diagnostic flow chart."	-



**5A4-40 ANTI-LOCK BRAKE SYSTEM (ABS)**

**Chart 1 (DTC13/C0213) Vehicle Type Error**

Step	Action	Value(s)	Yes	No
1	1. Disconnect EHCUC connector. 2. Turn the key on. 3. Measure the voltage at terminal 14, 15, and 17.	NQR: All terminal battery voltage NKR, NPR: All terminal 0V	Go to Step 2	Go to Step 5
2	1. Turn the key off and connect EHCUC. 2. Connect the TECH 2. 3. Clear the vehicle type. 4. Does the warning light turn off?	-	Go to Step 3	Replace the EHCUC. Go to Step 3
3	Confirm the vehicle type. Is the vehicle type okay?	-	Go to Step 4	Replace the EHCUC. Repeat Step 3
4	Clear the DTC.	-	Troubleshooting completed.	-
5	Repair harness. Does the warning light turn off?	-	Go to Step 3	Replace the EHCUC. Go to Step 3

**Chart 2 (DTC14/C0214) Low Power Voltage of Rear Sensor or EHCUC Abnormality**

Step	Action	Value(s)	Yes	No
1	Perform chart 11 and 12.	-	Go to Step 2	Go to Step 1
2	1. Turn the key off. 2. Disconnect the EHCUC connector. 3. Measure continuity between the body ground and J-500 connector terminal 1, 23. Is there continuity?	-	Go to Step 3	Go to Step 4
3	1. Connect the EHCUC connector. 2. Clear DTC. 3. Turn the key from off to on and perform diagnosis procedure. Does the DTC repeat?	-	Go to Step 5	Go to Step 6
4	Repair the open/short circuit or malfunction at connection of connector. Is this step completed?	-	Go to Step 6	-
5	Replace the EHCUC. Is this step completed?	-	Go to Step 6	-
6	1. Install all parts. Verify each part is properly installed. 2. Clear DTC. Is this step completed?	-	Go to "Basic diagnostic flow chart".	Go to Step 6

**Chart 3 (DTC15/C0215) EHCUC Voltage OUT of Range**

Step	Action	Value(s)	Yes	No
1	Is the battery voltage okay?	-	Go to Step 2	Go to Step 5
2	1. Turn the key off. 2. Disconnect the EHCUC connector. 3. Start the engine. 4. Measure voltage between J-500 connector terminal 2 and J-500 connector terminal 1, 23. Is the voltage within the specified value?	12 V vehicle: 10-16 V 24 V vehicle: 17-33.5 V	Go to Step 3	Go to Step 6
3	Locate the malfunction of connection in the circuit. Is the circuit malfunction specified?	-	Go to Step 4	Go to Step 8
4	Repair the malfunction and perform diagnosis procedure. Does the DTC repeat?	-	Go to Step 7	Go to Step 8
5	Charge or replace the battery. Is this step completed?	-	Go to Step 8	-
6	Repair open/short circuit or malfunction at connection of connector between J-500 connector terminal 2 and fusible link FL-4. Is this step completed?	-	Go to Step 8	-
7	Replace the EHCUC. Is this step completed?	-	Go to Step 8	-
8	1. Install all parts. Verify each part is properly installed. 2. Clear DTC. Is this step completed?	-	Go to "Basic diagnostic flow chart".	Go to Step 8

## 5A4-42 ANTI-LOCK BRAKE SYSTEM (ABS)

### Chart 4 (DTC25/C0225) Exhaust Brake Cut Circuit Abnormality

Step	Action	Value(s)	Yes	No
1	1. Disconnect EHCUC connector. 2. Start the engine. 3. Measure voltage between EHCUC terminals 8 and 1. Is the voltage within the specified value?	12 V vehicle: More than 5 V 24 V vehicle: More than 10 V	Go to Step 2	Go to Step 4
2	Measure voltage between EHCUC terminals 7 and 1. Is the voltage within the specified value?	12 V vehicle: More than 5 V 24 V vehicle: More than 10 V	Go to Step 3	Go to Step 6
3	Short EHCUC terminal 8 to 1. Is the voltage at EHCUC terminal 7 less than 1.5 V?	-	Replace the EHCUC.	Replace the exhaust brake cut relay.
4	Measure resistance of the exhaust brake cut relay coil.	12 V vehicle: 60-120 ohms 24 V vehicle: 210-310 ohms	Go to Step 5	Replace the exhaust brake cut relay.
5	Measure voltage at coil power side of relay box connector. (key at on position) Is the voltage within the specified value?	12 V vehicle: 10-16 V 24 V vehicle: 20-32 V	Check harness between EHCUC terminal 8 and exhaust brake cut relay. Repair as necessary.	Repair harness and/or power line.
6	Turn the exhaust brake switch on. Does the exhaust brake indicator light turn on?	-	Repair harness of EHCUC terminal 7.	Go to exhaust brake diagnosis procedure.

### Chart 5 (DTC33/C0233) Motor Drive Circuit Abnormality

Step	Action	Value(s)	Yes	No
1	1. Disconnect EHCUC connector. 2. Measure voltage between EHCUC terminals 24 and 1. Is the voltage within the specified value?	12 V vehicle: 10-16 V 24 V vehicle: 20-32 V	Go to Step 2	Go to Step 3
2	Measure continuity between EHCUC terminals 23 and 1. Is there continuity?	-	Replace the EHCUC.	Repair the harness.
3	Check the ABS fusible link (12V: 60A, 24V: 40A). Is it okay?	-	Repair the harness.	Replace the ABS fusible link (12V: 60A, 24V: 40A).

### Chart 6 (DTC 34/C0234) Abnormal Motor Rotation

- Replace EHCUC.

**Chart 7 (DTC41/C0241) Solenoid Valve Power Supply Abnormality**

Step	Action	Value(s)	Yes	No
1	1. Disconnect EHCUC connector. 2. Measure voltage between EHCUC terminals 2 and 1. Is the voltage within the specified value?	12 V vehicle: 10-16 V 24 V vehicle: 20-32 V	Replace the EHCUC.	Go to Step 2
2	Check the ABS fusible link (12V: 60A, 24V: 40A). Is it okay?	-	Repair the harness.	Replace the ABS fusible link (12V: 60A, 24V: 40A).

**Chart 8 (DTC 43, 45/C0243, C0245) Solenoid Valve Circuit Abnormality**

- Replace EHCUC.

**Chart 9 (DTC51/C0251) FL Speed Sensor Circuit Abnormality**

Step	Action	Value(s)	Yes	No
1	1. Disconnect EHCUC connector. 2. Measure resistance between EHCUC terminals 32 and 33. Is the resistance within the specified value?	1-2 k ohms	Replace the EHCUC.	Go to Step 2
2	1. Disconnect the FL speed sensor connector. 2. Measure the FL speed sensor resistance. Is the resistance okay?	-	Repair the harness.	Replace the FL speed sensor.

**Chart 10 (DTC52/C0252) FR Speed Sensor Circuit Abnormality**

Step	Action	Value(s)	Yes	No
1	1. Disconnect EHCUC connector. 2. Measure resistance between EHCUC terminals 10 and 11. Is the resistance within the specified value?	1-2 k ohms	Replace the EHCUC.	Go to Step 2
2	1. Disconnect the FR speed sensor connector. 2. Measure the FR speed sensor resistance. Is the resistance okay?	-	Repair the harness.	Replace the FR speed sensor.

**5A4-44 ANTI-LOCK BRAKE SYSTEM (ABS)**

**Chart 11 (DTC53/C0253) RL Speed Sensor Circuit Abnormality**

<b>Step</b>	<b>Action</b>	<b>Value(s)</b>	<b>Yes</b>	<b>No</b>
1	1. Disconnect EHCUC connector. 2. Disconnect RL speed sensor connector. 3. Measure continuity between EHCUC terminal 22 and positive side of chassis harness connector connected to RL speed sensor. Is there continuity?	-	Go to Step 2	Repair the harness.
2	Measure continuity between EHCUC terminals 22 and 1. Is there continuity?	-	Go to Step 3	Repair the harness.
3	1. Start the engine. 2. Measure voltage between EHCUC terminals 22 and 1. Is the voltage within the specified value?	Less than 2 V	Go to Step 4	Repair the harness.
4	Measure continuity between EHCUC terminal 34 and positive side of chassis harness connector connected to RL speed sensor. Is there continuity?	-	Go to Step 5	Repair the harness.
5	Measure continuity between EHCUC terminals 34 and 1. Is there continuity?	-	Go to Step 6	Repair the harness.
6	1. Start the engine. 2. Measure voltage between EHCUC terminals 34 and 1. Is the voltage within the specified value?	Less than 2 V	Go to Step 7	Repair the harness.
7	Check the RL speed sensor (Refer to chart C-1-3 or TC-1). Does the DVM display a voltage within the specified value?	0.2-4.5 V	Replace the EHCUC.	Replace the RL speed sensor.

**Chart 12 (DTC54/C0254) RR Speed Sensor Circuit Abnormality**

Step	Action	Value(s)	Yes	No
1	1. Disconnect EHCUC connector. 2. Disconnect RR speed sensor connector. 3. Measure continuity between EHCUC terminal 21 and positive side of chassis harness connector connected to RR speed sensor. Is there continuity?	-	Go to Step 2	Repair the harness.
2	Measure continuity between EHCUC terminals 21 and 1. Is there continuity?	-	Go to Step 3	Repair the harness.
3	1. Start the engine. 2. Measure voltage between EHCUC terminals 21 and 1. Is the voltage within the specified value?	Less than 2 V	Go to Step 4	Repair the harness.
4	Measure continuity between EHCUC terminal 12 and positive side of chassis harness connector connected to RR speed sensor. Is there continuity?	-	Go to Step 5	Repair the harness.
5	Measure continuity between EHCUC terminals 12 and 1. Is there continuity?	-	Go to Step 6	Repair the harness.
6	1. Start the engine. 2. Measure voltage between EHCUC terminals 12 and 1. Is the voltage within the specified value?	Less than 2 V	Go to Step 7	Repair the harness.
7	Check the RR speed sensor (Refer to chart c-1-4 or TC-1). Does the DVM display a voltage within the specified value?	0.2-4.5 V	Replace the EHCUC.	Replace the RR speed sensor.

**5A4-46 ANTI-LOCK BRAKE SYSTEM (ABS)**

**Chart 13 (DTC 61/C0261) Abnormal FL Speed Sensor Signal**

Step	Action	Value(s)	Yes	No
1	Is there play in the FL wheel bearing?	-	Go to Step 10	Go to Step 2
2	Is there play in the FL speed sensor/sensor rotor?	-	Go to Step 11	Go to Step 3
3	Is there powdered iron sticking to FL speed sensor/sensor rotor?	-	Go to Step 12	Go to Step 4
4	Check the FL speed sensor. (Refer to Chart C-1-1 or TC-1) Is the FL sensor output normal?	-	Go to Step 5	Go to Step 8
5	Is there a broken tooth or indentation in the sensor rotor?	-	Go to Step 13	Go to Step 6
6	Using DVM, measure the resistance between J-500 EHCUC connector terminal 33 and ground. Does the DVM display a resistance within the specified value?	1000 k ohms or more	Go to Step 7	Go to Step 9
7	1. Clear diagnostic trouble code. 2. Test drive and perform system self-check. Does repeat trouble?	-	Go to Step 18	Go to Step 16
8	Is there damage or indentation in the speed sensor?	-	Go to Step 14	Go to Step 15
9	1. Disconnect FL sensor connector. 2. Using DVM, measure the resistance between J-75 sensor connector terminal 2 and ground. Does the DVM display a resistance within the specified value?	1000 k ohms or more	Go to Step 17	Go to Step 14
10	Adjust wheel bearing preload. Is action complete?	-	Go to Step 19	-
11	Repair or replace speed sensor/sensor rotor. Is action complete?	-	Go to Step 19	-
12	Repair speed sensor/sensor rotor. Is action complete?	-	Go to Step 19	-
13	Replace sensor rotor. Is action complete?	-	Go to Step 19	-
14	Replace FL speed sensor. Is action complete?	-	Go to Step 19	-
15	Check the FL speed sensor circuit. Refer to Chart 9. Is action complete?	-	Verify repair	
16	Check for a poor connection and an open circuit on the harness between EHCUC and sensor connectors. Refer to "Note on Intermittents" described in earlier this section. Is action complete?	-	Go to Step 19	-

**ANTI-LOCK BRAKE SYSTEM (ABS) 5A4-47**

<b>Step</b>	<b>Action</b>	<b>Value(s)</b>	<b>Yes</b>	<b>No</b>
17	1. Locate open circuit, poor connection or short circuit on the harness between EHCUC and sensor connectors. 2. Repair the harness. Is action complete?	-	Go to Step 19	Go to Step 19
18	Replace EHCUC. Is action complete?	-	Go to Step 19	-
19	1. Reconnect all components, ensure all components are properly mounted. 2. Clear diagnostic trouble code. Was this step finished?	-	Go to "Basic diagnostic flow chart."	Go to Step 19



**5A4-48 ANTI-LOCK BRAKE SYSTEM (ABS)**

**Chart 14 (DTC 62/C0262) Abnormal FR Speed Sensor Signal**

Step	Action	Value(s)	Yes	No
1	Is there play in the FR wheel bearing?	-	Go to Step 10	Go to Step 2
2	Is there play in the FR speed sensor/sensor rotor?	-	Go to Step 11	Go to Step 3
3	Is there powdered iron sticking to FR speed sensor/sensor rotor?	-	Go to Step 12	Go to Step 4
4	Check the FR speed sensor. (Refer to Chart C-1-2 or TC-1) Is the FR sensor output normal?	-	Go to Step 5	Go to Step 8
5	Is there a broken tooth or indentation in the sensor rotor?	-	Go to Step 13	Go to Step 6
6	Using DVM, measure the resistance between J-500 EHCUC connector terminal 11 and ground. Does the DVM display a resistance within the specified value?	1000 k ohms or more	Go to Step 7	Go to Step 9
7	1. Clear diagnostic trouble code. 2. Test drive and perform system self-check. Does repeat trouble?	-	Go to Step 18	Go to Step 16
8	Is there damage or indentation in the speed sensor?	-	Go to Step 14	Go to Step 15
9	1. Disconnect FR sensor connector. 2. Using DVM, measure the resistance between J-74 sensor connector terminal 2 and ground. Does the DVM display a resistance within the specified value?	1000 k ohms or more	Go to Step 17	Go to Step 14
10	Adjust wheel bearing preload. Is action complete?	-	Go to Step 19	-
11	Repair or replace speed sensor/sensor rotor. Is action complete?	-	Go to Step 19	-
12	Repair speed sensor/sensor rotor. Is action complete?	-	Go to Step 19	-
13	Replace sensor rotor. Is action complete?	-	Go to Step 19	-
14	Replace FR speed sensor. Is action complete?	-	Go to Step 19	-
15	Check the FR speed sensor circuit. Refer to Chart 10. Is action complete?	-	Verify repair	-
16	Check for a poor connection and an open circuit on the harness between EHCUC and sensor connectors. Refer to "Note on Intermittents" described in earlier this section. Is action complete?	-	Go to Step 19	-

**ANTI-LOCK BRAKE SYSTEM (ABS) 5A4-49**

<b>Step</b>	<b>Action</b>	<b>Value(s)</b>	<b>Yes</b>	<b>No</b>
17	1. Locate open circuit, poor connection or short circuit on the harness between EHCUC and sensor connectors. 2. Repair the harness. Is action complete?	-	Go to Step 19	Go to Step 19
18	Replace EHCUC. Is action complete?	-	Go to Step 19	-
19	1. Reconnect all components, ensure all components are properly mounted. 2. Clear diagnostic trouble code. Was this step finished?	-	Go to "Basic diagnostic flow chart."	Go to Step 19

**5A4-50 ANTI-LOCK BRAKE SYSTEM (ABS)**
**Chart 15 (DTC 63/C0263) Abnormal RL Speed Sensor Signal**

Step	Action	Value(s)	Yes	No
1	Is there play in the RL wheel bearing?	-	Go to Step 8	Go to Step 2
2	Is there play in the RL speed sensor/sensor rotor?	-	Go to Step 9	Go to Step 3
3	Is there powdered iron sticking to RL speed sensor/sensor rotor?	-	Go to Step 10	Go to Step 4
4	Check the RL speed sensor. (Refer to Chart C-1-3 or TC-1) Is the RL sensor output normal?	-	Go to Step 5	Go to Step 7
5	Is there a broken tooth or indentation in the sensor rotor?	-	Go to Step 11	Go to Step 6
6	1. Clear diagnostic trouble code. 2. Test drive and perform system self-check. Does repeat trouble?	-	Go to Step 15	Go to Step 14
7	Is there damage or indentation in the speed sensor?	-	Go to Step 12	Go to Step 13
8	Adjust wheel bearing preload. Is action complete?	-	Go to Step 16	-
9	Repair or replace speed sensor/sensor rotor. Is action complete?	-	Go to Step 16	-
10	Repair speed sensor/sensor rotor. Is action complete?	-	Go to Step 16	-
11	Replace sensor rotor. Is action complete?	-	Go to Step 16	-
12	Replace RL speed sensor. Is action complete?	-	Go to Step 16	-
13	Check the RL speed sensor circuit. Refer to Chart 11. Is action complete?	-	Verify repair	-
14	Check for a poor connection and an open circuit on the harness between EHCUC and sensor connectors. Refer to "Note on Intermittents" described in earlier this section. Is action complete?	-	Go to Step 16	-
15	Replace EHCUC. Is action complete?	-	Go to Step 16	-
16	1. Reconnect all components, ensure all components are properly mounted. 2. Clear diagnostic trouble code. Was this step finished?	-	Go to "Basic diagnostic flow chart."	Go to Step 16

**Chart 16 (DTC 64/C0264) Abnormal RR Speed Sensor Signal**

Step	Action	Value(s)	Yes	No
1	Is there play in the RR wheel bearing?	-	Go to Step 8	Go to Step 2
2	Is there play in the RR speed sensor/sensor rotor?	-	Go to Step 9	Go to Step 3
3	Is there powdered iron sticking to RR speed sensor/sensor rotor?	-	Go to Step 10	Go to Step 4
4	Check the RR speed sensor. (Refer to Chart C-1-4 or TC-1) Is the RR sensor output normal?	-	Go to Step 5	Go to Step 7
5	Is there a broken tooth or indentation in the sensor rotor?	-	Go to Step 11	Go to Step 6
6	1. Clear diagnostic trouble code. 2. Test drive and perform system self-check. Does repeat trouble?	-	Go to Step 15	Go to Step 14
7	Is there damage or indentation in the speed sensor?	-	Go to Step 12	Go to Step 13
8	Adjust wheel bearing preload. Is action complete?	-	Go to Step 16	-
9	Repair or replace speed sensor/sensor rotor. Is action complete?	-	Go to Step 16	-
10	Repair speed sensor/sensor rotor. Is action complete?	-	Go to Step 16	-
11	Replace sensor rotor. Is action complete?	-	Go to Step 16	-
12	Replace RR speed sensor. Is action complete?	-	Go to Step 16	-
13	Check the RR speed sensor circuit. Refer to Chart 12. Is action complete?	-	Verify repair	-
14	Check for a poor connection and an open circuit on the harness between EHCUC and sensor connectors. Refer to "Note on Intermittents" described in earlier this section. Is action complete?	-	Go to Step 16	-
15	Replace EHCUC. Is action complete?	-	Go to Step 16	-
16	1. Reconnect all components, ensure all components are properly mounted. 2. Clear diagnostic trouble code. Was this step finished?	-	Go to "Basic diagnostic flow chart."	Go to Step 16

**5A4-52 ANTI-LOCK BRAKE SYSTEM (ABS)****Chart 17 (DTC65/C0265) Tire Size Error**

<b>Step</b>	<b>Action</b>	<b>Value(s)</b>	<b>Yes</b>	<b>No</b>
1	Does the tire size match the vehicle specification?	-	Go to Step 2	Replace the abnormal tire.
2	Check wear and inflation of the tire. Are they okay?	-	Go to Step 3	Repair or replace the abnormal tire.
3	Are the sensor rotors normal?	-	Go to Step 4	Replace the abnormal sensor rotor.
4	Test run the vehicle. Does the malfunction repeat.	-	Replace the EHCU.	Recheck the DTC.

## 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
Speed Sensor Output Inspection	Chart C-1-1 to C-1-4	Chart TC-1

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

Step	Action	Value(s)	Yes	No
1	<ol style="list-style-type: none"> <li>1. Turn the key off.</li> <li>2. Disconnect EHCUC connector.</li> <li>3. Jack up the vehicle, with all wheels off the ground.</li> <li>4. Measure the AC voltage between J-500 EHCUC connector terminals 32 and 33 while turning FL wheel at a speed of 0.5 RPS.</li> </ol> Does the DVM display a voltage within the specified value?	200 mV or more	Go to Step 5	Go to Step 2
2	<ol style="list-style-type: none"> <li>1. Disconnect FL sensor connector.</li> <li>2. Using DVM, measure the resistance between J-75 sensor connector terminals 1 and 2.</li> </ol> Does the DVM display a resistance within the specified value?	1.0-2.0 k ohms	Go to Step 4	Go to Step 3
3	<ol style="list-style-type: none"> <li>1. Locate open circuit, poor connection or short circuit on the harness between EHCUC and sensor connectors.</li> <li>2. Repair the harness.</li> </ol> Is action complete?	-	Go to Step 5	-
4	Replace FL sensor. Is action complete?	-	Go to Step 5	-
5	<ol style="list-style-type: none"> <li>1. Reconnect all components, ensure all components are properly mounted.</li> <li>2. Clear diagnostic trouble code.</li> </ol> Was this step finished?	-	Go to "Basic diagnostic flow chart."	Go to Step 5

**5A4-54 ANTI-LOCK BRAKE SYSTEM (ABS)**

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

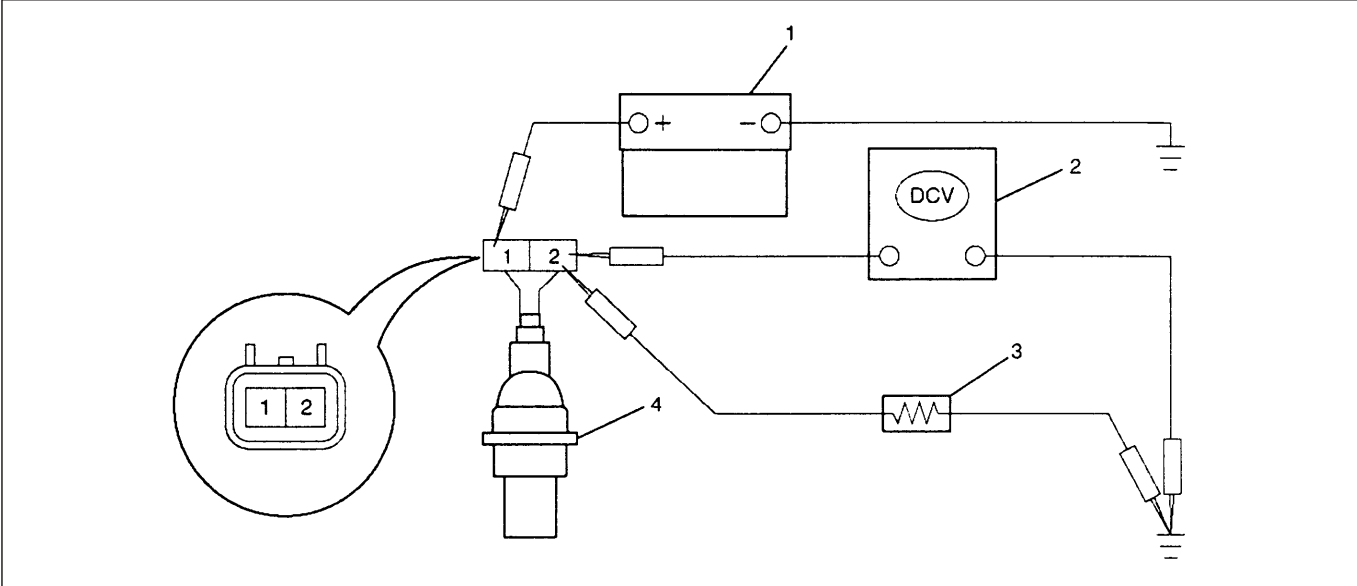
<b>Step</b>	<b>Action</b>	<b>Value(s)</b>	<b>Yes</b>	<b>No</b>
1	1. Turn the key off. 2. Disconnect EHCU connector. 3. Jack up the vehicle, with all wheels off the ground. 4. Measure the AC voltage between J-500 EHCU connector terminals 10 and 11 while turning FR wheel at a speed of 0.5 RPS. Does the DVM display a voltage within the specified value?	200 mV or more	Go to Step 5	Go to Step 2
2	1. Disconnect FR sensor connector. 2. Using DVM, measure the resistance between J-74 sensor connector terminals 1 and 2. Does the DVM display a resistance within the specified value?	1.0-2.0 k ohms	Go to Step 4	Go to Step 3
3	1. Locate open circuit, poor connection or short circuit on the harness between EHCU and sensor connectors. 2. Repair the harness. Is action complete?	-	Go to Step 5	-
4	Replace FR sensor. Is action complete?	-	Go to Step 5	-
5	1. Reconnect all components, ensure all components are properly mounted. 2. Clear diagnostic trouble code. Was this step finished?	-	Go to "Basic diagnostic flow chart."	Go to Step 5

**Chart C-1-3 RL Speed Sensor Output Inspection Procedure**

Step	Action	Value(s)	Yes	No
1	<ol style="list-style-type: none"> <li>1. Turn the key off.</li> <li>2. Disconnect EHCUC connector.</li> <li>3. Jack up the vehicle, with all wheels off the ground.</li> <li>4. Connect a 120 ohms resistor between J-500 EHCUC connector terminal 22 and ground. Apply voltage of 12V to EHCUC connector terminal 22.</li> <li>5. Using DVM, measure the DC voltage between J-500 connector terminal 22 and ground while turning RL wheel at a speed of 0.5 RPS.</li> </ol> <p>Does the DVM display a voltage within the specified value?</p>	0.2-4.5V	Go to Step 5	Go to Step 2
2	<ol style="list-style-type: none"> <li>1. Turn the key off.</li> <li>2. Disconnect RL sensor connector.</li> <li>3. Connect a 120 ohms resistor between sensor connector terminal 2 (sensor side) and ground.</li> <li>4. Apply 12V voltage at sensor connector terminal 1 (sensor side).</li> <li>5. Using DVM, measure the DC voltage between sensor connector terminal 2 (sensor side) and ground while turning RL wheel at a speed of 0.5 RPS.</li> </ol> <p>Does the DVM display a voltage within the specified value?</p>	0.2-4.5V	Go to Step 3	Go to Step 4
3	<ol style="list-style-type: none"> <li>1. Locate open circuit, poor connection short circuit on the harness between EHCUC and sensor connectors.</li> <li>2. Repair the harness.</li> </ol> <p>Is action complete?</p>	-	Go to Step 5	-
4	<p>Replace RL sensor.</p> <p>Is action complete?</p>	-	Go to Step 5	-
5	<ol style="list-style-type: none"> <li>1. Reconnect all components, ensure all components are properly mounted.</li> <li>2. Clear diagnostic trouble code.</li> </ol> <p>Was this step finished?</p>	-	Go to "Basic diagnostic flow chart."	Go to Step 5



5A4-56 ANTI-LOCK BRAKE SYSTEM (ABS)



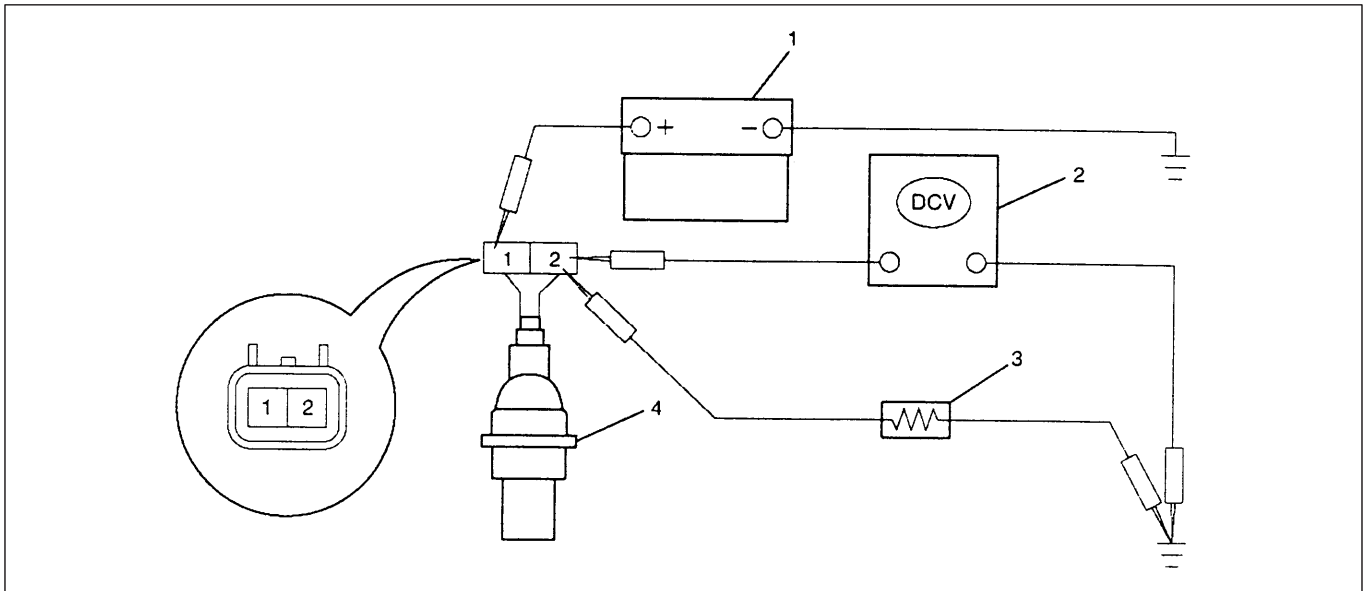
Legend

- (1) Battery
- (2) DVM
- (3) Resistor
- (4) Speed Sensor

**Chart C-1-4 RR Speed Sensor Output Inspection Procedure**

Step	Action	Value(s)	Yes	No
1	<ol style="list-style-type: none"> <li>1. Turn the key off.</li> <li>2. Disconnect EHCUC connector.</li> <li>3. Jack up the vehicle, with all wheels off the ground.</li> <li>4. Connect a 120 ohms resistor between J-500 EHCUC connector terminal 21 and ground.</li> <li>5. Using DVM, measure the DC voltage between J-500 connector terminal 21 and ground while turning RR wheel at a speed of 0.5 RPS.</li> </ol> <p>Does the DVM display a voltage within the specified value?</p>	0.2-4.5V	Go to Step 5	Go to Step 3
2	<ol style="list-style-type: none"> <li>1. Turn the key off.</li> <li>2. Disconnect RR sensor connector.</li> <li>3. Connect a 120 ohms resistor between sensor connector terminal 2 (sensor side) and ground.</li> <li>4. Apply 12V voltage at sensor connector terminal 1 (sensor side).</li> <li>5. Using DVM, measure the DC voltage between sensor connector terminal 2 (sensor side) and ground while turning RR wheel at a speed of 0.5 RPS.</li> </ol> <p>Does the DVM display a voltage within the specified value?</p>	0.2-4.5V	Go to Step 3	Go to Step 4
3	<ol style="list-style-type: none"> <li>1. Locate open circuit, poor connection short circuit on the harness between EHCUC and sensor connectors.</li> <li>2. Repair the harness.</li> </ol> <p>Is action complete?</p>	-	Go to Step 5	-
4	<p>Replace RR sensor.</p> <p>Is action complete?</p>	-	Go to Step 5	-
5	<ol style="list-style-type: none"> <li>1. Reconnect all components, ensure all components are properly mounted.</li> <li>2. Clear diagnostic trouble code.</li> </ol> <p>Was this step finished?</p>	-	Go to "Basic diagnostic flow chart."	Go to Step 5

**5A4-58 ANTI-LOCK BRAKE SYSTEM (ABS)**



**Legend**

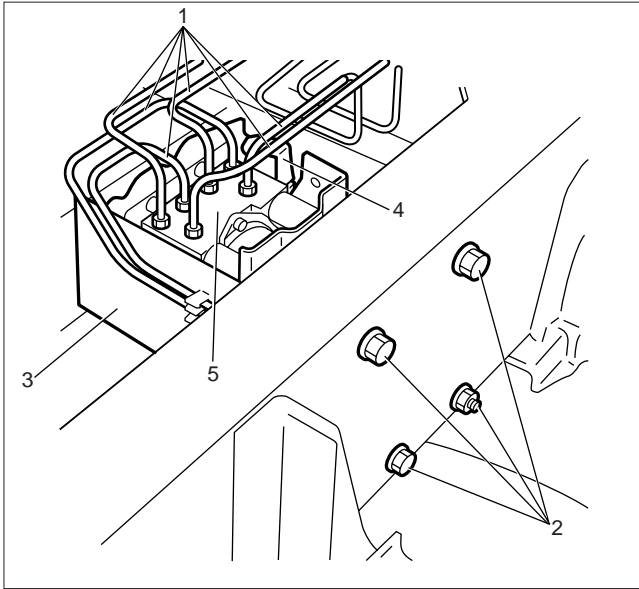
- (1) Battery
- (2) DVM
- (3) Resistor
- (4) Speed Sensor

**Chart TC-1 Sensor Output Inspection Procedure (Use TECH 2)**

Step	Action	Yes	No
1	1. Connect TECH 2. 2. Check the minimum speed of each sensor by WHEEL SENSORS. Is the sensor speed more than 5km/h (3mph)?	Go to Step 2	Go to Step 6
2	Check the sensor harness for suspected disconnection (check while shaking harness/connector). Is the sensor harness connection normal?	Replace speed sensor. Go to Step 3	Repair. Go to Step 3
3	Check the minimum speed of each sensor by WHEEL SENSORS. Is the sensor speed more than 5 km/h (3mph)?	Go to Step 4	Go to Step 6
4	Check the sensor rotor. Is the sensor rotor normal?	Go to Step 5	Replace sensor rotor. Go to Step 5
5	Check the minimum speed of each sensor by WHEEL SENSORS. Is sensor speed more than 5 km/h (3 mph)?	Repair harness or connector between EHCU and speed sensor. Go to Step 6	Go to Step 6
6	Reconnect all components, ensure all components are properly mounted. Was this step finished?	Repeat the "Basic diagnostic flow chart."	Go to Step 6

## Electronic Hydraulic Control Unit (EHCUC)

### Removal



### Legend

- (1) Brake Pipe
- (2) EHCUC Bracket Fix Bolt & Nut
- (3) EHCUC Bracket
- (4) Harness Connector
- (5) EHCUC

### Installation

To install, follow the removal steps in the reverse order, noting the following points.

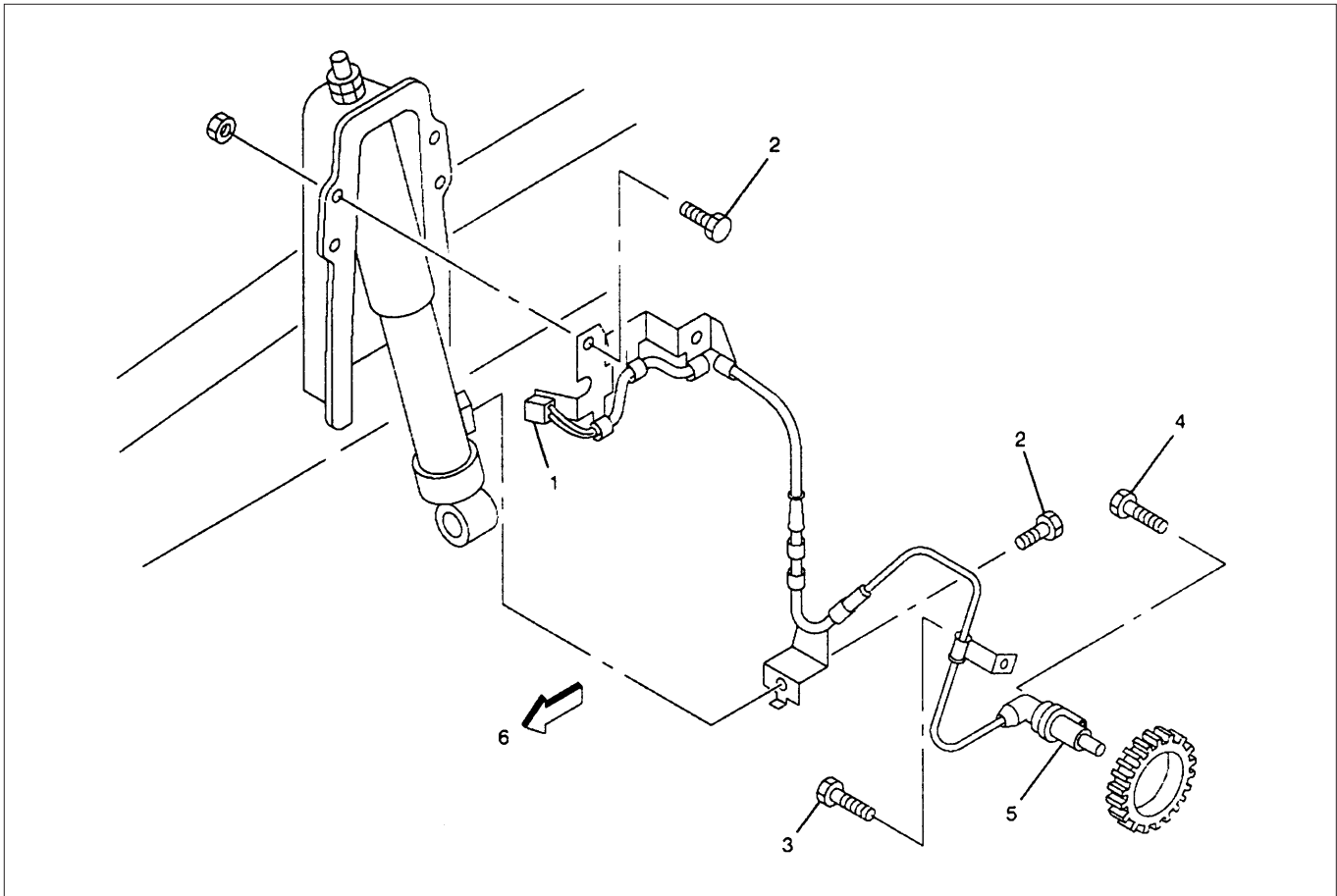
#### NOTE:

- If welding work is to be performed on the vehicle using an electric arc welder, the EHCUC should be removed from the vehicle before the welding operation begins.
- Do not put a radio equipment etc, that emits strong radio wave near the EHCUC.
- Do not wet the control unit. If wetted, wipe off water immediately and dry it fully.
- Never loosen any screw on the control unit.
- Do not paint the control unit.
- Prevent possible electrostatic discharge damage.
- Do not touch the control unit pin type terminal with a metallic tip of a screwdriver or tester.
- Do not apply voltage to the terminal.

1. Disconnect battery ground cable.
2. Disconnect brake pipes.
3. Remove EHCUC bracket fix bolts & nut.
4. Remove EHCUC bracket.
5. Remove EHCUC.

## Front Speed Sensor

### Front Speed Sensor and Associated Parts



#### Legend

- |                              |                        |
|------------------------------|------------------------|
| (1) Speed Sensor Connector   | (4) Sensor Fixing Bolt |
| (2) Sensor Cable Fixing Bolt | (5) Speed Sensor       |
| (3) Sensor Cable Fixing Bolt | (6) Front              |

### Removal

1. Remove speed sensor connector.
2. Remove sensor cable fixing bolts.
3. Remove the speed sensor fixing bolt.
4. Remove speed sensor.

### Inspection and Repair

1. Check the speed sensor pole piece for presence of foreign materials; remove any dirt, etc.
2. Check the pole piece for damage; replace speed sensor if necessary.
3. Check the speed sensor cable for short or open circuit, and replace with a new one if necessary. To check for cable short or open, bend or stretch the cable while checking for continuity.

### Installation

1. Install speed sensor and take care not to hit the speed sensor pole piece during installation.
2. Install speed sensor fixing bolt and tighten the fixing bolt to the specified torque.  
**Torque: 22 N·m (2.2kgf·m/16lb·ft)**
3. Install speed sensor cable fixing bolts and tighten the fixing bolt to the specified torque.

#### Torque

**Bolts (2): 22 N·m (2.2kgf·m/16lb·ft)**

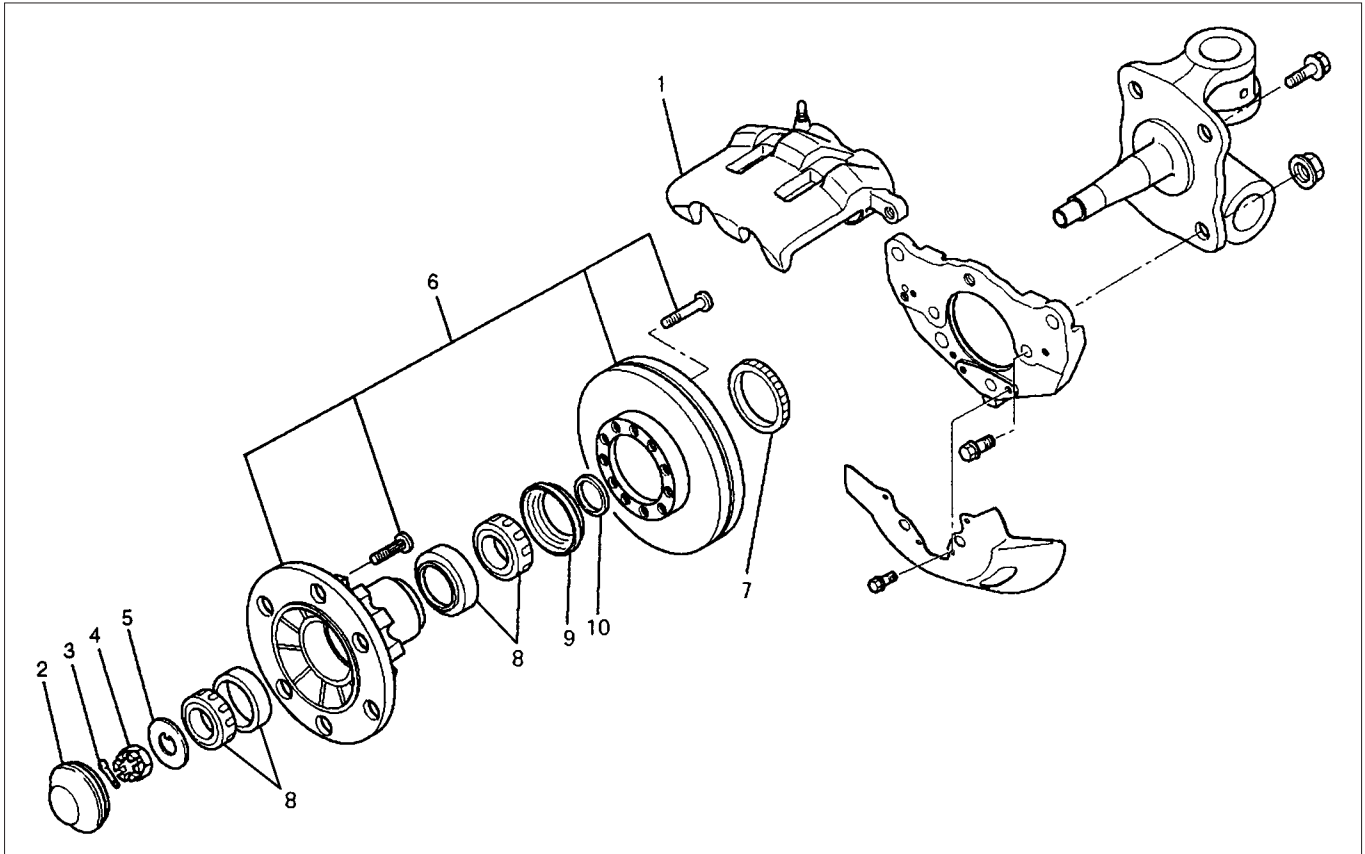
**Bolts (3): 45 N·m (4.6kgf·m/33lb·ft)**

NOTE: Confirm that a white or yellow line marked on the cable is not twisted when connecting the speed sensor cable.

4. Connect speed sensor connector.

## Front Speed Sensor Rotor

### Front Speed Sensor Rotor and Associated Parts

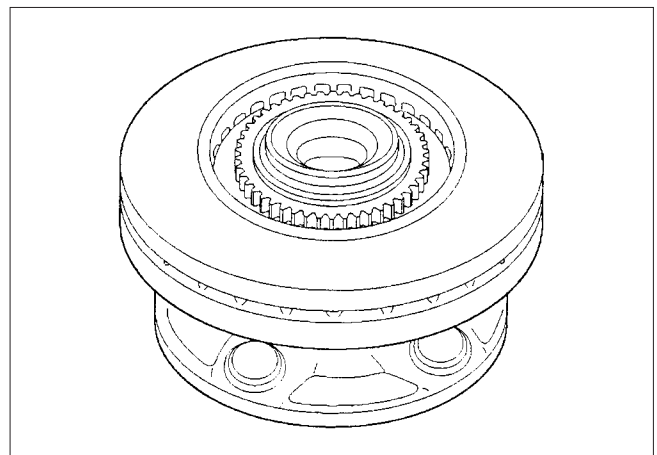


#### Legend

- |                         |                                     |
|-------------------------|-------------------------------------|
| (1) Disk Brake Assembly | (6) Hub and Disc Assembly           |
| (2) Hub Cap             | (7) Speed Sensor Rotor              |
| (3) Cotter Pin          | (8) Inner Bearing and Outer Bearing |
| (4) Hub Nut             | (9) Oil Seal                        |
| (5) Washer              | (10) Spacer                         |

#### Removal

1. Remove disc brake assembly and support the caliper assembly so that the brake hose is not stretched or damaged.
2. Remove hub cap.
3. Remove cotter pin and hub nut.
4. Remove washer.
5. Remove hub and disc assembly.



6. Remove speed sensor rotor.
7. Remove inner bearing, oil seal spacer.

## Inspection and Repair

1. Check the speed sensor rotor for damage including tooth chipping, and if damaged, replace the speed sensor rotor.

## Installation

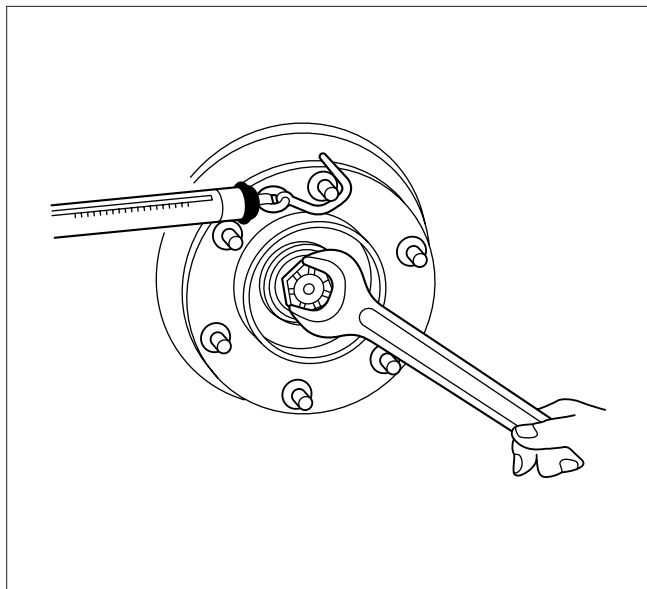
1. Using a bench press, install speed sensor rotor.
2. Install spacer onto the knuckle spindle.
3. Apply grease into the outer and inner bearings and install bearings in the hub.
4. Install oil seal into hub and disc assembly and install hub and disc assembly on to the knuckle spindle.

## Preload Adjustment

Adjust the wheel bearing as follows:

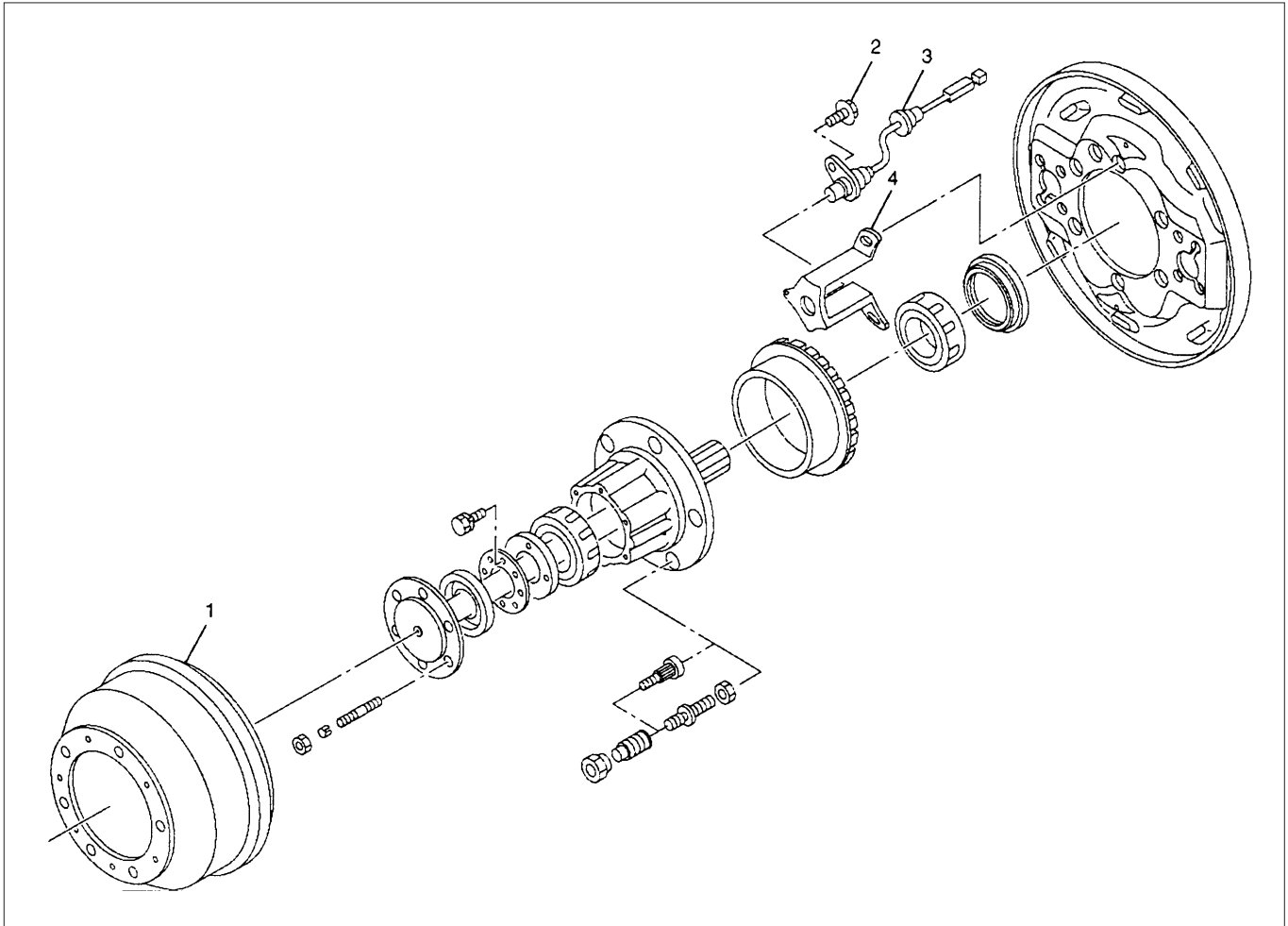
1. Tighten the nut until you are unable to manually rotate the hub and disc assembly.
  2. Loosen the nut.
  3. Attach a spring balancer to one stud. Gradually retighten the nut until the hub and disc assembly bearing is adjusted to the specified preload.
- Hub bearing preload  
**New Hub Bearing 9.8-24.5N (1-2.5kgf/2.2-5.5lbf)**  
**Reused Hub Bearing 4.9-19.6N (0.5-2kgf/1.1-4.4lbf)**

4. Install a cotter pin through the nut and knuckle and bend it over.
  - If the notch in the nut does not line up with the cotter pin hole in the knuckle, tighten the nut until it does. Do not loosen the nut to line up a notch and the knuckle hole.
5. Apply grease into the hub cap and install it.
  - 0.4N (40g/0.09lbf)
6. Install the disc brake assembly and tighten two bolts to the specified torque.
  - **Torque: 221 N·m (22.5kgf·m/163lb·ft)**



## Rear Speed Sensor

### Rear Speed Sensor and Associated Parts



#### Legend

(1) Brake Drum

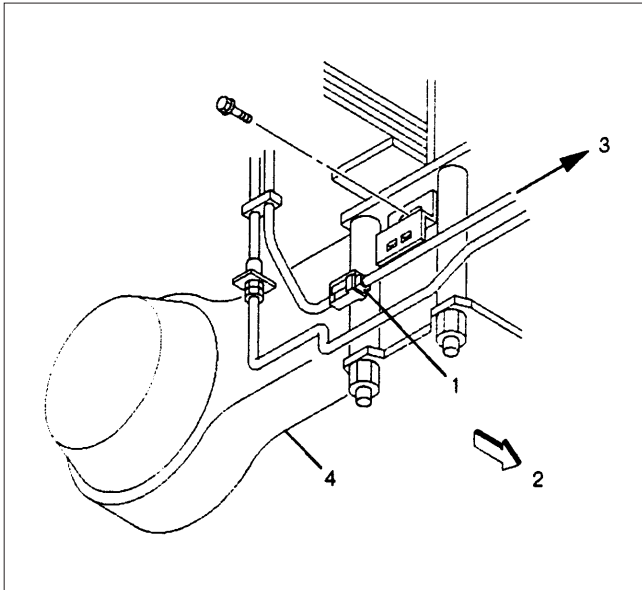
(2) Speed Sensor Fixing Bolt

(3) Speed Sensor

(4) Speed Sensor Bracket



## Removal



### Legend

- (1) Speed Sensor Connector
- (2) Front
- (3) Speed Sensor
- (4) Rear Axle

1. Disconnect speed sensor connector.
2. Remove brake drum.
3. Remove speed sensor fixing bolt.
4. Remove speed sensor.
5. Remove speed sensor bracket.

## Inspection and Repair

1. Check the speed sensor for presence of foreign materials; remove any dirt, etc.
2. Check the speed sensor for damage, and replace the speed sensor if necessary.
3. Check the speed sensor harness for a short or an open, and replace with a new one if necessary. To check for harness short or open, bend or stretch the cable while checking for continuity.

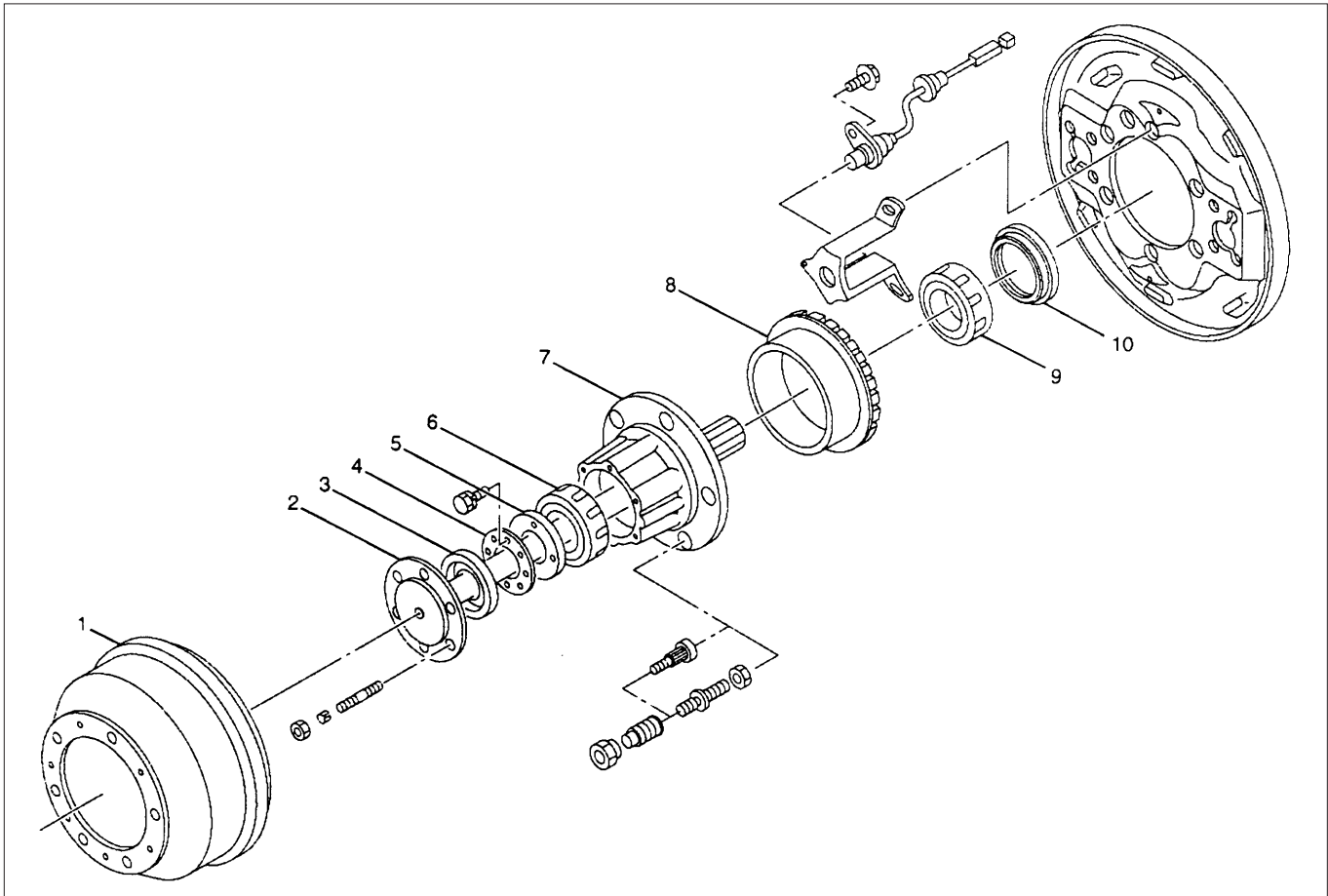
## Installation

1. Install speed sensor bracket and tighten the nut to the specified torque.  
**Torque:**  
**GVW Range 12,000 lbs. and 14,500 lbs. model**  
**108 N·m (11kgf·m/80lb·ft)**  
**GVW Range 17,950 lbs. model**  
**157 N·m (16kgf·m/116lb·ft)**
2. Install the speed sensor and take care not to hit the speed sensor during installation.
3. Install the speed sensor fixing bolt and tighten it to the specified torque.  
**Torque: 18 N·m (1.8kgf·m/13lb·ft)**
4. Install brake drum and tighten bolts to the specified torque.  
**Torque: 13 N·m (1.3kgf·m/9.5lb·ft)**
5. Connect speed sensor connector.

NOTE: Confirm that the harness is not twisted when connecting the speed sensor connector.

## Rear Speed Sensor Rotor

### Rear Speed Sensor Rotor and Associated Parts



#### Legend

- |                    |                        |
|--------------------|------------------------|
| (1) Brake Drum     | (6) Outer Bearing      |
| (2) Axle Shaft     | (7) Rear Hub           |
| (3) Outer Oil Seal | (8) Speed Sensor Rotor |
| (4) Lock Washer    | (9) Inner Bearing      |
| (5) Bearing Nut    | (10) Inner Oil Seal    |

#### Removal

1. Remove brake drum.
2. Remove axle shaft.
3. Remove outer oil seal, using a screwdriver.
4. Remove lock washer.
5. Remove bearing nut with a hub bearing nut wrench.
6. Remove hub assembly from axle case.
7. Remove outer bearing from hub assembly.
8. Remove speed sensor rotor from hub assembly.
9. Remove inner bearing and inner oil seal from axle case.

#### Inspection and Repair

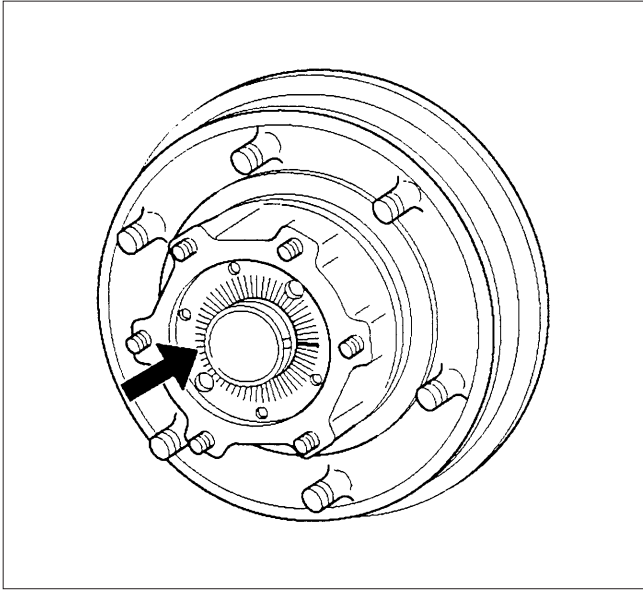
1. Check the speed sensor rotor for damage including tooth chipping. If damaged, replace speed sensor rotor.

#### Installation

1. Using a bench press, install speed sensor rotor.
- NOTE: Do not reuse the sensor rotor.
2. Install spacer on to the axle case.
  3. Apply grease into the outer and inner bearings and install bearings in the hub.
  4. Install outer oil seal into hub.

## 5A4-66 ANTI-LOCK BRAKE SYSTEM (ABS)

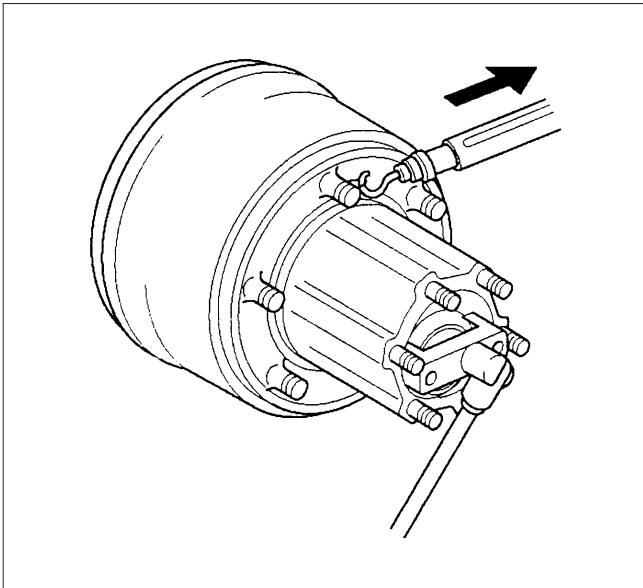
5. Install hub assembly onto the axle case.



6. Set the lock nut with the notched line facing out.

### Preload Adjustment

- 1) Turn the hub to the left and right several times to establish bearing conformity.
- 2) Use the bearing nut wrench to tighten the bearing nut until the hub can not be manually rotated.
- 3) Loosen the bearing nut until hub rotates easily.

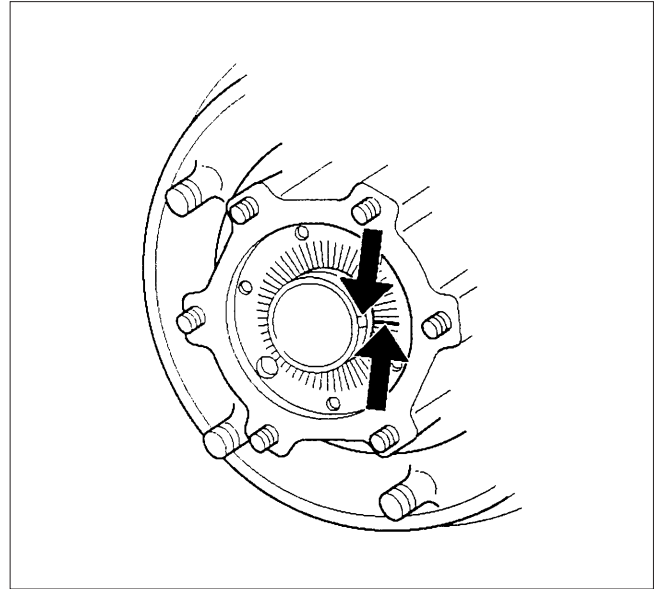


- 4) Set the spring balancer to the wheel pin in the position shown in the illustration.
- 5) Measure the hub bearing preload by carefully pulling on the spring balancer and noting the indicator reading.

**Hub Bearing Preload (At Wheel Pin)**  
**42-52 N (4.3-5.3kgf/9.4-11.6lbf)**

6) Rotate the hub several times to the right and left.

7) Measure the bearing preload a second time.


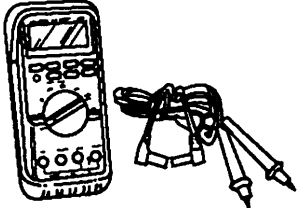
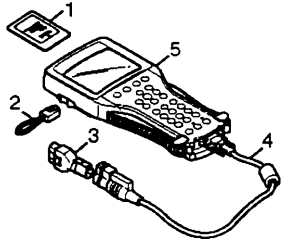


8) Align the axle case groove with the closest bearing nut slit.

**NOTE:** If it is difficult to align the axle case and bearing nut, slightly tighten the bearing nut.

7. Install the lock washer with the lock washer tabs inserted to the axle case grooves. Install the lock bolts to prevent the bearing nut from loosening. Check that the lock washer tabs are inserted to the axle case grooves.
8. Apply grease to the outer oil seal lip inner and outer circumferences and install outer oil seal.
9. Clean the axle shaft. Apply gear oil to the axle shaft spline. Insert the axle shaft into the axle case. Take care not to damage the oil seal.
10. Tighten the axle shaft nuts to the specified torque a little at a time.  
**Torque: 46 N·m (4.7kgf·m/34lb·ft)**
11. Install brake drum.

## Special Tools

ILLUSTRATION	TOOL NO. TOOL NAME
	<p><b>5-8840-0385-0</b>  <b>(J-35616)</b>                      Connector test adapter kit</p>
	<p><b>5-8840-0285-0</b>  <b>(J-39200)</b>                      High impedance multimeter</p>
	<p>(1) PCMCIA Card                      (2) RS232 Loop Back Connector                      (3) SAE 16/19 Adapter                      (4) DLC Cable                      (5) Tech 2</p>

## **LGBRK-WE-0101**

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