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1.0 INTRODUCTION

The procedures contained in this manual include all the specifications, instructions, and graphics needed to diagnose the 2003 Jeep Liberty Mark 20e Antilock Braking System (ABS) problems. The diagnostics in this manual are based on the failure condition or symptom being present at time of diagnosis.

Follow the recommendations below when choosing your diagnostic path.

1. First make sure the DRBIII® is communicating with the CAB. If the DRBIII® displays a "No Response" condition, you must diagnose that first.
2. Read DTC's (diagnostic trouble codes) with the DRBIII®.
3. If no DTC's are present, identify the customer complaint.
4. Once the DTC or customer complaint is identified, locate the matching test in the Table of Contents and begin to diagnose the symptom.

All component location views are in Section 8.0. All connector pinouts are in Section 9.0. All schematics are in Section 10.0.

An * placed before the symptom description indicates a symptom with no associated DTC.

When repairs are required, refer to the appropriate service manual for the proper removal and repair procedure.

Diagnostic procedures change every year. New diagnostic systems may be added; carryover systems may be enhanced. **READ THIS MANUAL BEFORE TRYING TO DIAGNOSE A VEHICLE CODE.** It is recommended that you review the entire manual to become familiar with all new and changed diagnostic procedures.

After using this book, if you have any comments or recommendations, please fill out the form at the back of the book and mail it back to us.

1.1 SYSTEM COVERAGE

This diagnostic manual covers the Teves Mark 20e Antilock Braking System (ABS) found on the Jeep Liberty.

1.2 SIX-STEP TROUBLESHOOTING PROCEDURE

Diagnosis of the antilock brake system is done in six basic steps:

- verification of symptom
- verification of any related symptoms
- symptom analysis
- problem isolation

- repair of isolated problem
- verification of proper operation

2.0 IDENTIFICATION OF SYSTEM

Vehicles equipped with the Teves Mark 20e antilock brake system can be identified by the presence of the combined Controller Antilock Brake (CAB) and Hydraulic Control Unit (HCU)/Pump Motor assembly mounted by the master cylinder.

3.0 SYSTEM DESCRIPTION AND FUNCTIONAL OPERATION

3.1 TEVES MARK 20e SYSTEM DESCRIPTION

A Controller Antilock Brake (CAB) is used to monitor wheel speeds and to modulate (control) hydraulic pressure in each brake channel to prevent wheel lock-up during braking. The CAB also provides a vehicle speed signal (VSS) to the Body Control Module (BCM).

During a non-ABS stop, the system functions as a standard front/rear split configuration. The primary supplies brake fluid pressure to the front brakes, and the secondary supplies the rear brakes. A conventional combination/proportioning valve is not used. This system uses the existing ABS solenoids to replace and perform the same functions that the combination and proportioning valves do. The CAB has a special software program called Electronic Variable Brake Proportioning (EVBP), that monitors the wheel speeds so that when certain criteria are met the software will enable the solenoids to perform the same brake fluid management control as the combination/proportioning valves.

During an ABS stop, the system still uses the front/rear hydraulic split; however, the brake system pressure is further split into three control channels. During ABS operation, the front wheels are controlled independently and are on two separate control channels. The rear wheels are controlled together through one control channel. By using separate control channels for each front wheel, more steering control is maintained during maximum braking.

During an antilock stop, "wheel lock-up" does not necessarily mean that the wheel has locked, it means only that the wheel is turning slower than the vehicle speed. This is called "wheel slip" and is indicated as a percentage. 0% slip means that the wheel is rolling free and 100% slip means that the

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wheel is locked. The antilock system maintains an average of approximately 20% wheel slip.

It is important to remember that the antilock brake system does not shorten the vehicle stopping distance under all driving conditions, but provides improved control of the vehicle while stopping. Vehicle stopping distance is still dependent on vehicle speed, weight, tires, road surface, and other factors.

3.1.1 PEDAL FEEL/VEHICLES CHARACTERISTICS

There are several pedal feel/vehicle characteristics that are considered normal for antilock braking that may require further explanation.

When stopping conditions activate the antilock brakes, the driver may feel some vibrations/pulsations in the brake pedal and may hear the solenoid valves clicking and the pump motor running. The vibrations/pulsations are caused by the isolating, building and decaying of brake fluid pressure within the brake lines. The ABS prevents complete wheel lock-up, but some wheel slip is required for the best braking performance. This slip may result in some tire chirping, depending on the road surface. The chirping should not be interpreted as total wheel lock-up. Total wheel lock-up leaves black tire marks on dry pavement, antilock braking may leave some light marks.

At the end of an ABS stop, the ABS may function all the way down to near 0 km/h (0 mph). There may be a slight brake pedal drop anytime the ABS is deactivated.

In case of braking on a bumpy surface, the ABS module may activate the ABS function when it detects wheel locking tendencies due to wheel hop. In that event, the brake pedal may pulsate with a perceived loss of deceleration. ABS braking may also be activated at times while on dry pavement with sand, gravel, or other loose debris on the road.

It should be noted that the pulsating pedal feel characteristic will not illuminate the brake warning lamps or set a trouble code that is stored in the Controller Antilock Brake (CAB). When investigating a hard pedal feel, inspect the sensor and tone wheel teeth for chips/broken teeth, damaged sensor pole tips, excessive runout of the tone wheel, or excessive air gap.

3.1.2 SYSTEM COMPONENTS

ANTILOCK BRAKE SYSTEM

- controller antilock brake (CAB)
- vacuum booster
- master cylinder (w/center valves)
- hydraulic control unit (HCU)

- valve block assembly: 6 valve solenoids (3 inlet valves, 3 outlet valves)
3 accumulators
- pump/motor assembly:
1 motor
2 pumps
- internal G (acceleration) sensor
- 1 internal proportioning valve
- 3 wheel speed sensor/tone wheel assemblies
- ABS warning indicator
- fuses and wiring harness

3.1.3 ABS AND RED BRAKE WARNING INDICATOR

The amber ABS warning indicator is located in the instrument cluster. It is used to inform the driver that the antilock function has been turned off due to a system malfunction. On the KJ, the CAB controls the lamp indirectly. The CAB monitors its own functions. If the CAB determines that the ABS indicator should be on, the CAB sends a message via the PCI BUS to the instrument cluster and the cluster turns on the indicator. The instrument cluster sends an "are you there" message over the PCI BUS, if the CAB does not respond the instrument cluster will illuminate the ABS indicator.

The red brake warning indicator is located in the instrument cluster. It can be activated by application of the parking brake, a leak in the front or rear wheel brake hydraulic circuit which causes the master cylinder reservoir to be low on fluid, or by turning the ignition switch to the start position. The red brake warning indicator can also be turned on if the brake fluid level switch circuit becomes open or shorted to ground.

3.1.4 CONTROLLER ANTILOCK BRAKE (CAB)

The antilock brake controller (CAB) is a microprocessor-based device that monitors wheel speeds and controls the antilock functions.

The primary functions of the CAB are:

- monitor wheel speeds
- detect wheel locking tendencies
- control fluid pressure modulations to the brakes during antilock stop operation
- control the ABS warning indicator
- monitor the system for proper operation
- provide communication to the DRBIII® while in diagnostic mode
- store diagnostic information in non-volatile memory

The CAB continuously monitors the wheel speed sensors. When a wheel locking tendency is detected, the CAB will command the appropriate HCU valve to modulate brake fluid pressure to that wheel. Brake pedal position is maintained during an antilock stop by being a closed system with the use of 3 accumulators. The CAB continues to control pressure in individual hydraulic circuits until a wheel locking tendency is no longer present. The CAB turns on the pump/motor during an antilock stop.

The antilock brake system is constantly monitored by the CAB for the proper operation. If the CAB detects a system malfunction, it can disable the antilock system and activate the ABS warning indicator. If the antilock function is disabled, the system will revert to standard base brake system operation.

The CAB inputs include the following:

- three wheel speed sensors
- brake lamp switch
- ignition switch
- battery voltage
- diagnostic communication (PCI BUS)
- G-sensor (internal acceleration sensor)

The CAB outputs include the following:

- six valve/solenoid drivers
- pump/motor actuation
- ABS warning indicator actuation
- diagnostic communication (PCI BUS)

3.1.5 HYDRAULIC CONTROL UNIT

The hydraulic control unit (HCU) contains the valve block assembly, and the pump/motor assembly.

Valve Block Assembly: The valve block assembly contains 6 valves with three inlet valves and three outlet valves. The inlet valves are spring-loaded in the open position and the outlet valves are spring loaded in the closed position. During an antilock stop, these valves are cycled to maintain the proper slip ratio for each channel. The CAB monitors wheel speeds. If the CAB detects a wheel deceleration that is disproportionate to the other wheels, it will close the inlet valve to that wheel. This prevents any increase in fluid pressure. If the wheel continues to decelerate disproportionately, the CAB opens the outlet valve for that wheel to release fluid pressure from that channel. The released fluid is routed to the accumulators. When the wheel speed is no longer disproportionate to the other wheels, the inlet valve will return to its normally open position and the outlet valve will return to the normally closed position.

Pump/Motor Assembly: The pump/motor assembly provides the extra amount of fluid needed

during antilock braking. The pump is supplied fluid that is released to the accumulators when the outlet valve is opened during an antilock stop. The pump is also used to drain the accumulator circuits after the antilock stop is complete. The pump is operated by an integral electric motor. This motor is controlled by the CAB. The CAB turns on the motor when an antilock stop is detected. The pump continues to run during the antilock stop and is turned off approximately 3-5 seconds after the stop is complete. The CAB monitors the pump/motor operation internally.

3.1.6 SENSORS

Wheel Speed Sensors and Tone Wheels: One wheel speed sensor (WSS) is located at each front wheel and another mounted to the rear axle. Each sensor sends a small digital signal to the control module (CAB). The CAB sends 12 volts to the sensor. The sensor has an internal magneto resistance bridge that alters the voltage and amperage of the signal circuit. This voltage and amperage is changed by magnetic induction when a toothed sensor ring (tone wheel) passes by a stationary magnetic sensor (wheel speed sensor). The CAB measures the voltage and amperage of the digital signals for each wheel.

The front wheel sensor is attached to the hub housing. The tone wheel is an integral part of the front hub. The rear speed sensor is mounted to the axle housing. The rear tone wheel is bolted to the ring gear inside the rear differential housing. **The wheel speed sensor air gap is NOT adjustable. Because of internal circuitry, a resistance check of wheel speed sensors will not determine correct or incorrect function.**

Correct antilock system operation is dependent on wheel speed signals from the wheel speed sensors. The vehicle's wheels and tires should all be the same size and type to generate accurate signals. In addition, the tires should be inflated to the recommended pressures for optimum system operation. Variations in wheel and tire size or significant variations in inflation pressure can produce inaccurate wheel speed signals; however, the system will continue to function when using the mini-spare. When driven over rough road surfaces, the rear wheel speed sensor signals may be erratic and cause a false trouble code.

G (Acceleration) Sensor: The CAB monitors the acceleration sensor at all times. The sensor assembly contains three mercury sensors that monitor vehicle deceleration rates (G-force). Sudden rapid changes in vehicle and wheel deceleration rate trigger the sensor, sending a signal to the CAB. The sensor assembly provides three deceleration rates; two for forward braking and one for rearward

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braking. The G-Sensor is mounted inside the CAB and is not separately serviceable.

3.2 ABS DIAGNOSTIC TROUBLE CODES

The Teves Mark 20e Antilock Brake System (ABS) module may report any of the diagnostic trouble codes (DTCs) listed in this book's table of contents.

Diagnostic trouble codes are retained in memory until erased using the DRBIII®, or automatically erased after 255 key cycles or 3,500 miles.

3.2.1 SYSTEM INITIALIZATION

System initialization starts when the key is turned to "RUN". At this point, the CAB performs a complete self-check of all electrical components in the antilock brake systems.

At 20 km/h (12 mph) a dynamic test may be performed. If the brake lamp switch is activated the test will be run at 40 km/h (24 mph) regardless of the brake lamp switch state. This will momentarily run the pump/motor. If during the dynamic test, the driver has his/her foot on the brake pedal, he/she may feel the test through brake pedal pulsations. This is a normal condition.

If any component causes a diagnostic trouble code during system initialization or dynamic check, the CAB will illuminate the ABS warning indicator.

3.2.2 DIAGNOSTIC MODE

For a Mark 20e system to enter a diagnostic mode, vehicle speed must be below 10 km/h (6 mph) and no ABS condition present. If vehicle speed is not below 10 km/h (6 mph), a "No Response" message could be displayed by the DRBIII®. The following are characteristics of diagnostic mode:

- The amber ABS warning indicator will blink rapidly. If a hard trouble code is present, such as a CAB Power Feed Circuit diagnostic trouble code, the ABS warning indicator will be illuminated without blinking until the diagnostic trouble code condition is corrected.
- Antilock operation is disabled.

3.2.3 INTERMITTENT DIAGNOSTIC TROUBLE CODES

If the malfunction is not present while performing a test procedure, the diagnostic procedures will not locate the problem. In this case, the code can only suggest an area to inspect. Check for the following:

- loose or corroded conditions
- damaged components (sensors, tone wheels)
- damaged wiring

- excessive axle shaft runout
 - hydraulic system leaks
 - regular brake system problems, non-ABS related
- If no obvious problems are found, erase diagnostic trouble codes and with the key on, wiggle the wire harness and connectors. Recheck for codes periodically as you work through the system. This procedure may uncover a difficult to locate malfunction.

3.2.4 FREEZE FRAME

Freeze Frame takes a "snapshot" of specific vehicle information the instant an ABS failure is recognized and stores this information into the CAB memory. This information can be accessed using the DRBIII® to help diagnose the fault. Freeze Frame will capture the first time failure or only a new failure that occurs during the current ignition cycle.

3.3 USING THE DRBIII®

Refer to the DRBIII® user's guide for instructions and assistance with reading diagnostic trouble codes, erasing diagnostic trouble codes and other DRBIII® functions.

3.4 DRBIII® ERROR MESSAGES

Under normal operation, the DRBIII® will display one of only two error messages:

— User-Requested WARM Boot or User-Requested COLD Boot

If the DRBIII® should display any other error message, record the entire display and call the STAR Center for information and assistance. This is a sample of such an error message display:

```
ver: 2.14
date: 26 Jul93
file: key_itf.cc
date: Jul 26 1993
line: 548
err: 0x1
User-Requested COLD Boot
```

```
Press MORE to switch between this display
and the application screen.
Press F4 when done noting information.
```

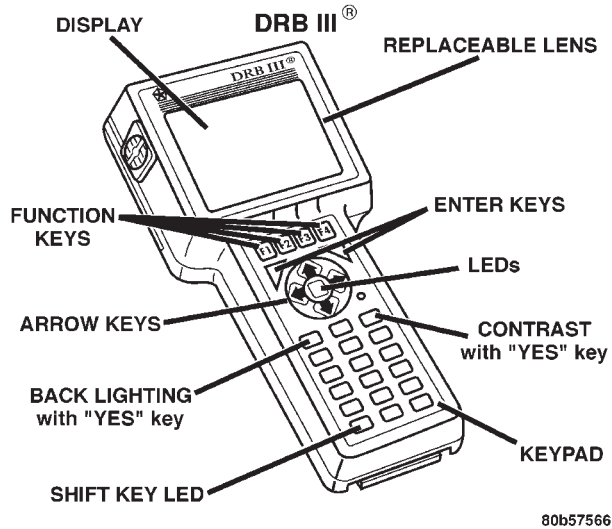
3.4.1 DRBIII® DOES NOT POWER UP (BLANK SCREEN)

If the LED's do not light or no sound is emitted at start up, check for loose cable connections or a bad cable. Check the vehicle battery voltage (data link 16-way connector cavity 16). A minimum of 11 volts is required to adequately power the DRBIII®. Also check for a good ground at the DLC.

If all connections are proper between the DRBIII® and the vehicle or other devices, and the vehicle battery is fully charged, an inoperative DRBIII® may be the result of faulty cable or vehicle wiring.

3.4.2 DISPLAY IS NOT VISIBLE

Low temperatures will affect the visibility of the display. Adjust the contrast to compensate for this condition.



4.0 DISCLAIMERS, SAFETY, WARNINGS

4.1 DISCLAIMERS

All information, illustrations, and specifications contained in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

4.2 SAFETY

4.2.1 TECHNICIAN SAFETY INFORMATION

WARNING: ENGINES PRODUCE CARBON MONOXIDE THAT IS ODORLESS, CAUSES SLOWER REACTION TIME, AND CAN LEAD TO SERIOUS INJURY. WHEN THE ENGINE IS OPERATING, KEEP SERVICE AREAS WELL VENTILATED OR ATTACH THE VEHICLE EXHAUST SYSTEM TO THE SHOP EXHAUST REMOVAL SYSTEM.

Set the parking brake and block the wheels before testing or repairing the vehicle. It is especially

important to block the wheels on front-wheel drive vehicles; the parking brake does not hold the front drive wheels.

When servicing a vehicle, always wear eye protection, and remove any metal jewelry such as watchbands or bracelets that might make an inadvertent electrical contact.

When diagnosing an antilock brake problem, it is important to follow approved procedures where applicable. These procedures can be found in the service manual. Following these procedures is very important to the safety of individuals diagnostic tests.

4.2.2 VEHICLE PREPARATION FOR TESTING

Make sure the vehicle being tested has a fully charged battery. If it does not, false diagnostic codes or error messages may occur.

4.2.3 SERVICING SUB-ASSEMBLIES

Some components of the antilock brake system are intended to be serviced in assembly only. Attempting to remove or repair certain sub-components may result in personal injury and/or improper system operation. Only those components with approved repair and installation procedures in the service manual should be serviced.

4.2.4 DRBIII® SAFETY INFORMATION

WARNING: EXCEEDING THE LIMITS OF THE DRBIII® MULTIMETER IS DANGEROUS. IT CAN EXPOSE YOU TO SERIOUS OR POSSIBLY FATAL INJURY. CAREFULLY READ AND UNDERSTAND THE CAUTIONS AND THE SPECIFICATIONS LIMITS.

Follow the vehicle manufacturer's service specifications at all times.

- Do not use the DRBIII® if it has been damaged.
- Do not use the test leads if insulation is damaged or if metal is exposed.
- To avoid electrical shock, do not touch the test leads, tips, or the circuit being tested.
- Choose the proper range and function for the measurement. Do not try voltage or current measurements that may exceed the rated capacity.

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Do not exceed the limits shown in the table below:

FUNCTION	INPUT LIMIT
Volts	0 - 500 peak volts AC 0 - 500 volts DC
Ohms (resistance)*	0 - 1.12 megohms
Frequency Measured Frequency Generated	0 - 10 kHz
Temperature	-58 - 1100°F -50 - 600°C

* Ohms cannot be measured if voltage is present. Ohms can be measured only in a non-powered circuit.

- Voltage between any terminal and ground must not exceed 500v DC or 500v peak AC.
- Use caution when measuring voltage above 25v DC or 25v AC.
- Use the low current shunt to measure circuits up to 10A. Use the high current clamp to measure circuits exceeding 10A.
- When testing for the presence of voltage or current, make sure the meter is functioning correctly. Take a reading of a known voltage or current before accepting a zero reading.
- When measuring current, connect the meter in series with test lead.
- When using the meter function, keep the DRBIII® away from spark plug or coil wires to avoid measuring error from outside interference.

4.3 WARNING

4.3.1 VEHICLE DAMAGE WARNINGS

Before disconnecting any control module, make sure the ignition is "off". Failure to do so could damage the module.

When testing voltage or continuity at any control module, use the terminal side (not the wire end) of the connector. Do not probe a wire through the insulation; this will damage it and eventually cause it to fail because of corrosion.

Be careful when performing electrical tests so as to prevent accidental shorting of terminals. Such mistakes can damage fuses or components. Also, a second code could be set, making diagnosis of the original problem more difficult.

4.3.2 ROAD TESTING A COMPLAINT VEHICLE

Some complaints will require a test drive as part of the repair verification procedure. The purpose of the test drive is to try to duplicate the diagnostic code or symptom condition.

CAUTION: Before road testing a vehicle, be sure that all components are reassembled. During the test drive, do not try to read the DRBIII® screen while in motion. Do not hang the DRBIII® from the rear view mirror or operate it yourself. Have an assistant available to operate the DRBIII®.

4.4 DIAGNOSIS

1. Your diagnostic test procedure must begin with a thorough visual inspection of the ABS system for damaged components or disconnected connectors. The brake lamps must be operational, and if they are not, repair them prior to continuing.
2. Connect the DRBIII® to the data link connector located under the dash. If the DRBIII® does not power up, check the power and ground supplies to the connector.
3. Select "Antilock Brakes". Turn the ignition on. If the DRBIII® displays "No Response", refer to Communication in the Body Diagnostic Procedures manual to diagnose the symptom.
4. Read and record all ABS diagnostic trouble codes. If the "CAB Power Feed Circuit" diagnostic trouble code is present, it must be repaired prior to addressing any other DTC's. If any additional codes are present, proceed to the appropriate test.
5. If there are no diagnostic trouble codes present, select "Inputs/Outputs" and read the brake switch input as you press and release the brake pedal. If the display does not match the state of the pedal, perform the proper test. Read the "G-Sensor" status, with the vehicle on a level surface, both switches should read "CLOSED". If the status is not correct, perform the proper test. If a problem with the amber "ABS" warning indicator exists, refer to the proper test.
6. If no other problems are found, it will be necessary to road test the vehicle. **THE DRBIII® MUST NOT BE CONNECTED TO THE DATA LINK CONNECTOR WHEN ROAD TESTING FOR PROPER ANTILOCK OPERATION. THE SYSTEM IS DISABLED WHILE IN DIAGNOSTIC MODE.** Perform several antilock stops from above 50 Km/h (30 mph) and then repeat steps 2, 3, and 4. If any diagnostic trouble codes are present, proceed to the appropriate test.
7. The following conditions should be considered "NORMAL" operation, and no repairs should be attempted to correct them.
 - Brake pedal feedback during an ABS stop (clicking, vibrating)

- Clicking, groaning or buzzing at 10 Km/h (6 mph) (drive off self test)
- Groaning noise during an ABS stop
- Slight brake pedal drop and pop noise when ignition is initially turned on
- Brake pedal ratcheting down at the end of an ABS stop

8. If the complaint is ABS “cycling” at the end of a stop at low speeds, it may be caused by a marginal wheel speed sensor signal. The sensor air gap, tone wheel condition, and/or brakes hanging up are possible causes of this condition.
9. After a road test in which no problems were found, refer to any Technical Service Bulletins that may apply.

5.0 REQUIRED TOOLS AND EQUIPMENT

DRBIII® (diagnostic read-out box)
 jumper wires
 ohmmeter
 voltmeter
 test light

6.0 GLOSSARY OF TERMS

ABS	antilock brake system
BCM	Body Control Module
CAB	controller antilock brake
DC	direct current
DLC	data link connector
DRB	diagnostic read-out box
EMI	electro magnetic interference
EVBP	Electronic Variable Brake Proportioning
HCU	hydraulic control unit
J/B	junction block
JTEC	Jeep and Truck Engine Controller
LF	left front
LR	left rear
PCI	Programmable Communication Interface
PCM	Powertrain Control Module
PDC	power distribution center
P/M	pump motor
RF	right front
RR	right rear
RFI	radio frequency interference
SOL	solenoid
WSS	wheel speed sensor

NOTES

7.0

DIAGNOSTIC INFORMATION AND PROCEDURES

Symptom: BUS SYSTEM COMMUNICATION FAILURE

When Monitored and Set Condition:

BUS SYSTEM COMMUNICATION FAILURE

When Monitored: Ignition on. Continuously monitors.

Set Condition: When the CAB detects a short on the PCI Bus circuit.

POSSIBLE CAUSES

INTERMITTENT CONDITION

ELECTRO-MECHANICAL INSTRUMENT CLUSTER DTC PRESENT

BUS CIRCUIT OPEN

CAB - INTERNAL FAILURE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. With the DRBIII®, read Freeze Frame information. With the DRBIII®, erase DTCs. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTCs. Does the DRBIII® display BUS SYSTEM COMMUNICATION FAILURE? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition on. With the DRBIII®, read EMIC DTCs. Does the DRBIII® display NO ABS BUS MESSAGES RECEIVED? Yes → Refer to symptom NO ABS BUS MESSAGES RECEIVED in the BODY/INSTRUMENT CLUSTER category. Perform ABS VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the negative (-) battery cable. Disconnect the CAB harness connector. NOTE: check connector - Clean/repair as necessary. Measure the resistance of the Bus circuit between the CAB connector and the Data Link Connector (DLC). Is the resistance below 5.0 ohms? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Repair the Bus circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All

BUS SYSTEM COMMUNICATION FAILURE — Continued

TEST	ACTION	APPLICABILITY
4	<p>Turn the ignition off.</p> <p>Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.</p> <p>Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.</p> <p>Were any problems found?</p> <p>Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Test Complete.</p>	All

BRAKES (CAB)

Symptom: CAB INTERNAL FAILURE

When Monitored and Set Condition:

CAB INTERNAL FAILURE

When Monitored: Ignition on. The CAB monitors its internal microprocessors for correct operation.

Set Condition: If the CAB detects an internal fault, the DTC is set.

POSSIBLE CAUSES

INTERMITTENT DTC
DAMAGED CAB/CAB HARNESS CONNECTOR
CAB - GROUND CIRCUIT OPEN
ABS VALVE FUSED B(+) CIRCUIT OPEN
ABS PUMP FUSED B(+) CIRCUIT OPEN
CAB - INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. With the DRBIII®, erase DTCs. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTCs. Does the DRBIII® display CAB INTERNAL FAILURE? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the CAB harness connector. Inspect the CAB/CAB harness connector for damage. Is there any broken, bent, pushed out, corroded or spread terminals? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the CAB harness connector. Using a 12-volt test light connected to 12-volts, probe the CAB harness connector ground circuits. Did the test light illuminate? Yes → Go To 4 No → Repair the CAB Ground circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All

CAB INTERNAL FAILURE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Using a 12-volt test light connected to ground, probe the ABS Valve Fused B(+) circuit at the CAB harness connector. Did the test light illuminate? Yes → Go To 5 No → Repair the ABS Valve Fused B(+) circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
5	Turn the ignition off. Using a 12-volt test light connected to ground, probe the ABS Pump Fused B(+) circuit at the CAB harness connector. Did the test light illuminate? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Repair the ABS Pump Fused B(+) circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Refer to any Hotline letters or Technical Service Bulletins that may apply. Were any problems found? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom: **CLUSTER LAMP FAILURE**

When Monitored and Set Condition:

CLUSTER LAMP FAILURE

When Monitored: Ignition on. Continuous.

Set Condition: When the CAB receives a bus message from the Instrument Cluster that the Cluster cannot illuminate the ABS Warning Indicator.

POSSIBLE CAUSES

INSTRUMENT CLUSTER OR ABS DTC PRESENT
INSTRUMENT CLUSTER
CAB--NO DTC SIGNAL TO THE INSTRUMENT CLUSTER
CAB -- PERMANENT FAULT SIGNAL
CAB--NO KEY-ON BULB CHECK SIGNAL

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. Are there any Instrument Cluster or ABS DTCs present? Yes → Refer to the appropriate category for the related symptom(s). Perform ABS VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition off. Perform the Key-on Bulb Check. Does the ABS Warning Indicator light and then go out after a few seconds? Yes → Go To 3 No. Light remains after bulb check. Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No. Indicator never comes on. Go To 4	All

CLUSTER LAMP FAILURE — Continued

TEST	ACTION	APPLICABILITY
3	<p>NOTE: The DRBIII® communication with the CAB must be operational for the result of this test to be valid.</p> <p>Turn the ignition off. Remove ABS Valve fuse from the PDC. Perform the Key-on Bulb Check. Does the ABS Indicator remain on after the bulb check?</p> <p>Yes → Test Complete.</p> <p>No → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p>	All
4	<p>NOTE: The following steps will initiate the Instrument Cluster self test.</p> <p>Turn the ignition off. Press and hold the odometer reset button. Turn the ignition to RUN. Observe the Instrument Cluster indicators. Release the odometer reset button. Did the ABS Indicator illuminate during the Instrument Cluster self test?</p> <p>Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Replace the Instrument Cluster in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p>	All

Symptom: **G-SENSOR FAILURE**

When Monitored and Set Condition:

G-SENSOR FAILURE

When Monitored: Ignition ON. Continuously monitored when speed is greater than 2 km/h (1 mph) and there is no Brake Lamp Switch input.

Set Condition: When the CAB detects a condition outside programmed parameters from the internal G-Sensor.

POSSIBLE CAUSES

CAB - INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, record and erase DTC's. With the DRBIII®, read DTCs. Does the DRBIII® display G-SENSOR FAILURE? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom List:

LEFT FRONT SENSOR CIRCUIT FAILURE
REAR SENSOR CIRCUIT FAILURE
RIGHT FRONT SENSOR CIRCUIT FAILURE

Test Note: All symptoms listed above are diagnosed using the same tests.
 The title for the tests will be **LEFT FRONT SENSOR CIRCUIT FAILURE**.

When Monitored and Set Condition:**LEFT FRONT SENSOR CIRCUIT FAILURE**

When Monitored: Ignition on. The CAB monitors the wheel speed circuit continuously.

Set Condition: If the CAB detects an open or shorted wheel speed sensor circuit, the Diagnostic Trouble Code (DTC) will set.

REAR SENSOR CIRCUIT FAILURE

When Monitored: Ignition on. The CAB monitors the wheel speed circuit continuously.

Set Condition: If the CAB detects an open or shorted wheel speed sensor circuit, the Diagnostic Trouble Code (DTC) will set.

RIGHT FRONT SENSOR CIRCUIT FAILURE

When Monitored: Ignition on. The CAB monitors the wheel speed circuit continuously.

Set Condition: If the CAB detects an open or shorted wheel speed sensor circuit, the Diagnostic Trouble Code (DTC) will set.

POSSIBLE CAUSES

INTERMITTENT CONDITION

WHEEL SPEED SENSOR OR CONNECTOR DAMAGE

WHEEL SPEED SENSOR SIGNAL CIRCUIT FAULT

WHEEL SPEED SENSOR 12 VOLT SUPPLY CIRCUIT SHORT TO GROUND

WHEEL SPEED SENSOR 12 VOLT SUPPLY CIRCUIT OPEN

WHEEL SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND

WHEEL SPEED SENSOR SIGNAL CIRCUIT OPEN

CAB - 12 VOLT SUPPLY CIRCUIT FAULT

CAB - SIGNAL CIRCUIT FAULT

WHEEL SPEED SENSOR 12 VOLT SUPPLY SHORT TO GROUND

WHEEL SPEED SENSOR SIGNAL CIRCUIT INOPERATIVE

LEFT FRONT SENSOR CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
1	<p>Turn the ignition on.</p> <p>With the DRBIII®, read DTCs.</p> <p>With the DRBIII®, read the Freeze Frame information.</p> <p>With the DRBIII®, erase DTCs.</p> <p>Turn the ignition off.</p> <p>Turn the ignition on.</p> <p>With the DRBIII®, read DTCs.</p> <p>NOTE: The CAB must sense all four wheels at 25km/h (15 mph) before it will extinguish the ABS indicators.</p> <p>Does the DRBIII® display SENSOR CIRCUIT FAILURE?</p> <p>Yes → Go To 2</p> <p>No → Go To 13</p>	All
2	<p>Turn the ignition off.</p> <p>Inspect the CAB connector, affected Wheel Speed Sensor, and affected Wheel Speed Sensor connector.</p> <p>Is the affected Wheel Speed Sensor or any of the connectors damaged?</p> <p>Yes → Repair as necessary.</p> <p>Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 3</p>	All
3	<p>Turn the ignition off.</p> <p>Disconnect the affected Wheel Speed Sensor connector.</p> <p>Note: Check connector - Clean/repair as necessary.</p> <p>Turn the ignition on.</p> <p>Measure the voltage between affected Wheel Speed Sensor 12 Volt Supply circuit and ground.</p> <p>Is the voltage above 10 volts?</p> <p>Yes → Go To 6</p> <p>No → Go To 4</p>	All
4	<p>Turn the ignition off.</p> <p>Disconnect the CAB harness connector.</p> <p>Disconnect the affected Wheel Speed Sensor connector.</p> <p>Using a 12-volt test light connected to 12-volts, probe the affected Wheel Speed Sensor 12 Volt Supply circuit.</p> <p>Does the test light illuminate?</p> <p>Yes → Repair the affected Wheel Speed Sensor 12 Volt Supply circuit for a short to ground.</p> <p>Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 5</p>	All

LEFT FRONT SENSOR CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
5	<p>Turn the ignition off. Disconnect the CAB harness connector. Disconnect the affected Wheel Speed Sensor connector. Connect a jumper wire between affected Wheel Speed Sensor 12 Volt Supply circuit and ground. Using a 12-volt test light connected to 12-volts, probe the affected Wheel Speed Sensor 12 Volt Supply circuit. Does the test light illuminate?</p> <p>Yes → Go To 6</p> <p>No → Repair the affected Wheel Speed Sensor 12 Volt Supply circuit for an open. Perform ABS VERIFICATION TEST - VER 1.</p>	All
6	<p>Turn the ignition off. Disconnect the affected Wheel Speed Sensor connector. NOTE: Check connector - Clean/repair as necessary. Turn the ignition on. Measure the voltage between affected Wheel Speed Sensor Signal circuit and ground. Is the voltage above 1 volt?</p> <p>Yes → Repair the affected Wheel Speed Sensor Signal circuit for a short to voltage. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 7</p>	All
7	<p>Turn the ignition off. Disconnect the CAB harness connector. Disconnect the affected Wheel Speed Sensor connector. Using a 12-volt test light connected to 12-volts, probe the affected Wheel Speed Sensor Signal circuit. Does the test light illuminate?</p> <p>Yes → Repair the affected Wheel Speed Sensor Signal circuit for a short to ground. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 8</p>	All
8	<p>Turn the ignition off. Disconnect the CAB harness connector. Disconnect the affected Wheel Speed Sensor connector. Connect a jumper wire between affected Wheel Speed Sensor Signal circuit and ground. Using a 12-volt test light connected to 12-volts, probe the affected Wheel Speed Sensor Signal circuit. Does the test light illuminate?</p> <p>Yes → Go To 9</p> <p>No → Repair the affected Wheel Speed Sensor Signal circuit for an open. Perform ABS VERIFICATION TEST - VER 1.</p>	All

LEFT FRONT SENSOR CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
9	<p>Turn the ignition off. Remove the CAB harness strain relief to access wires. Reconnect the CAB harness connector. Turn the ignition on. Measure the voltage between affected Wheel Speed Sensor 12 Volt Supply circuit and ground. Is the voltage above 10 volts?</p> <p>Yes → Go To 10</p> <p>No → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p>	All
10	<p>Turn the ignition off. Remove the CAB harness strain relief to access wires. Reconnect the CAB harness connector. Turn the ignition on. Measure the voltage between affected Wheel Speed Sensor 12 Volt Supply circuit and affected Wheel Speed Sensor Signal circuit. Is the voltage above 10 volts?</p> <p>Yes → Go To 11</p> <p>No → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p>	All
11	<p>Turn the ignition off. Reconnect ALL affected Wheel Speed Sensor circuit connectors. Disconnect the affected Wheel Speed Sensor connector. Turn the ignition on. Measure the voltage of the affected Wheel Speed Sensor 12 Volt Supply circuit in the affected Wheel Speed Sensor connector while reconnecting the sensor connector. Did the affected Wheel Speed Sensor 12 Volt Supply circuit drop voltage to 0 DC volts?</p> <p>Yes → Replace the affected Wheel Speed Sensor in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 12</p>	All
12	<p>Turn the ignition off. Reconnect ALL affected Wheel Speed Sensor circuit connectors. Turn the ignition on. Measure the DC voltage of the Wheel Speed Sensor Signal circuit in the affected Wheel Speed Sensor connector. Slowly rotate the wheel. Does the DC voltage toggle between 1.6 volts to .8 volts?</p> <p>Yes → Go To 13</p> <p>No → Replace the affected Wheel Speed Sensor in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p>	All

LEFT FRONT SENSOR CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
13	<p>Turn the ignition off.</p> <p>Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.</p> <p>Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.</p> <p>Refer to any Hotline letters or Technical Service Bulletins that may apply.</p> <p>Were any problems found?</p> <p>Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Test Complete.</p>	All

Symptom List:

LEFT FRONT WHEEL SPEED SIGNAL FAILURE

REAR WHEEL SPEED SIGNAL FAILURE

RIGHT FRONT WHEEL SPEED SIGNAL FAILURE

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be LEFT FRONT WHEEL SPEED SIGNAL FAILURE.

When Monitored and Set Condition:

LEFT FRONT WHEEL SPEED SIGNAL FAILURE

When Monitored: Ignition on. Wheel speeds are checked and verified at drive off and continuously thereafter.

Set Condition: If, during an ABS stop, the CAB commands any valve solenoid on for an extended length of time, and does not see a corresponding wheel speed change, the Diagnostic Trouble Code (DTC) is set. The DTC can also set if the signal is missing or erratic.

REAR WHEEL SPEED SIGNAL FAILURE

When Monitored: Ignition on. Wheel speeds are checked and verified at drive off and continuously thereafter.

Set Condition: If, during an ABS stop, the CAB commands any valve solenoid on for an extended length of time, and does not see a corresponding wheel speed change, the Diagnostic Trouble Code (DTC) is set. The DTC can also set if the signal is missing or erratic.

RIGHT FRONT WHEEL SPEED SIGNAL FAILURE

When Monitored: Ignition on. Wheel speeds are checked and verified at drive off and continuously thereafter.

Set Condition: If, during an ABS stop, the CAB commands any valve solenoid on for an extended length of time, and does not see a corresponding wheel speed change, the Diagnostic Trouble Code (DTC) is set. The DTC can also set if the signal is missing or erratic.

POSSIBLE CAUSES

WHEEL SPEED SIGNAL FAILURE DTC PRESENT

AFFECTED WHEEL SPEED SENSOR SIGNAL INOPERATIVE

AFFECTED WHEEL SPEED SENSOR CONNECTOR DAMAGED

AFFECTED WHEEL SPEED SENSOR TONE WHEEL DAMAGED

AFFECTED WHEEL SPEED SENSOR AIR GAP FAULT

WHEEL BEARING FAULT

LEFT FRONT WHEEL SPEED SIGNAL FAILURE — Continued

POSSIBLE CAUSES		
BRAKE LINING FAULT		
AFFECTED WHEEL SPEED SENSOR CIRCUIT ELECTRICAL FAULT		
TEST	ACTION	APPLICABILITY
1	<p>Turn the ignition on. With the DRBIII®, read DTCs. With the DRBIII®, read Freeze Frame information. NOTE: The CAB must sense ALL 4 wheels at 25 km/h (15 mph) before it will extinguish the ABS indicators. Does the DRBIII® display WHEEL SPEED/SIGNAL FAILURE and SENSOR CIRCUIT FAILURE?</p> <p>Yes → Refer to the affected Wheel Speed SENSOR CIRCUIT FAILURE for the related symptom(s). Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 2</p>	All
2	<p>Turn the ignition on. With the DRBIII® in Sensors, monitor ALL the Wheel Speed Sensor Signals while an assistant drives the vehicle. Slowly accelerate as straight as possible from a stop to 24 km/h (15 mph). Is the affected Wheel Speed Signal showing 0 km/h (0 mph)?</p> <p>Yes → Go To 3</p> <p>No → The condition is not present at this time. Monitor DRBIII® parameters while wiggling the related wiring harness. Refer to any Technical Service Bulletins(TSB) that may apply. Visually inspect the related wiring harness and connector terminals. Perform ABS VERIFICATION TEST - VER 1.</p>	All
3	<p>Turn the ignition off. Inspect the CAB connector, affected Wheel Speed Sensor, and affected Wheel Speed Sensor connector. Is the Wheel Speed Sensor or any connector damaged?</p> <p>Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 4</p>	All
4	<p>Turn ignition off. Inspect the affected Tone Wheel for damaged, missing teeth, cracks, or looseness NOTE: The Tone Wheel teeth should be perfectly square, not bend, or nicked. Is the affected Tone Wheel OK?</p> <p>Yes → Go To 5</p> <p>No → Replace the Tone Wheel in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p>	All

LEFT FRONT WHEEL SPEED SIGNAL FAILURE — Continued

TEST	ACTION	APPLICABILITY
5	<p>Turn the ignition off. Using a Feeler Gauge, measure the affected Wheel Speed Sensor Air Gap. NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications. Is the Air Gap OK?</p> <p>Yes → Go To 6</p> <p>No → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p>	All
6	<p>Turn the ignition off. Inspect the wheel bearings for excessive runout or clearance. NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications. Is the bearing clearance OK ?</p> <p>Yes → Go To 7</p> <p>No → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p>	All
7	<p>Turn the ignition off. Visually inspect brakes for locking up due to lining contamination or overheating. Inspect all Components for defects which may cause a Signal DTC to set. Is any Component Damaged?</p> <p>Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Refer to symptom SENSOR CIRCUIT FAILURE for further diagnostics. Perform ABS VERIFICATION TEST - VER 1.</p>	All

Symptom:

PUMP CIRCUIT FAILURE

When Monitored and Set Condition:

PUMP CIRCUIT FAILURE

When Monitored: Ignition on. The CAB commands the pump on at 20 km/h (12 mph) to check its operation, if the brake switch is not applied. If the brake is applied, the test will run at 40 km/h (25 mph). The CAB monitors pump voltage continuously.

Set Condition: The DTC is stored when the CAB detects: 1) Improper voltage decay after the pump was turned off. 2) Pump not energized by the CAB, but voltage is present for 3.5 seconds. 3) Pump is turned on by the CAB, but without sufficient voltage to operate it.

POSSIBLE CAUSES

CAB - PUMP MOTOR RUNNING CONTINUOUSLY
 ABS PUMP FUSE
 ABS PUMP MOTOR INTERMITTENT DTC
 DAMAGED CAB/CAB HARNESS CONNECTOR
 ABS PUMP FUSED B(+) CIRCUIT INTERMITTENT SHORT TO GROUND
 ABS PUMP FUSED B(+) CIRCUIT SHORT TO GROUND
 CAB - INTERNAL FAULT
 ABS PUMP MOTOR INOPERATIVE
 ABS PUMP MOTOR OPEN
 ABS PUMP MOTOR B(+) CIRCUIT OPEN
 ABS PUMP MOTOR GROUND CIRCUIT OPEN
 CAB - INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Turn the ignition on. Monitor the ABS Pump Motor for continuous operation. NOTE: The CAB must sense ALL wheels at 25 km/h (15 mph) before it will extinguish the ABS indicators. Is the ABS Pump Motor running continuously? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Go To 2	All

PUMP CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
2	<p>Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTCs. With the DRBIII®, erase DTCs. Turn the ignition off. Turn the ignition on. With the DRBIII®, actuate the ABS Pump Motor. Did the ABS Pump Motor operate?</p> <p>Yes → Go To 3 No → Go To 4</p>	All
3	<p>Turn the ignition off. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Make sure the Pump Motor connector is secure. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Refer to any Hotline letters or Technical Service Bulletins that may apply. Were any problems found?</p> <p>Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.</p>	All
4	<p>Turn the ignition off. Remove and inspect the ABS Pump fuse. Is the ABS Pump fuse open?</p> <p>Yes → Go To 5 No → Go To 8</p>	All
5	<p>Turn the ignition off. Visually inspect the ABS Pump Fused B(+) circuit in the wiring harness. Look for any sign of an intermittent short to ground. Is the wiring harness OK?</p> <p>Yes → Go To 6 No → Repair the ABS Pump Fused B(+) circuit for a short to ground. Perform ABS VERIFICATION TEST - VER 1.</p>	All
6	<p>Turn the ignition off. Disconnect the CAB harness connector. Check connectors - Clean/repair as necessary. Using a 12-volt test light connected to 12-volts, probe the ABS Pump Fused B(+) circuit fuse terminal. Does the test light illuminate?</p> <p>Yes → Repair the ABS Pump Fused B(+) circuit for a short to ground. Perform ABS VERIFICATION TEST - VER 1. No → Go To 7</p>	All

PUMP CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
7	<p>Turn the ignition off. Reconnect the CAB harness connector. Using a 12-volt test light connected to 12-volts, probe the ABS Pump Fused B(+) circuit fuse terminal. Does the test light illuminate?</p> <p>Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Replace the ABS Pump fuse. If the fuse is open make sure to check for a short to ground. Perform ABS VERIFICATION TEST - VER 1.</p>	All
8	<p>Turn the ignition off. Disconnect the CAB harness connector. Inspect the CAB and CAB harness connector for damage. Is there any broken, bent, pushed out, corroded, or spread terminals?</p> <p>Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 9</p>	All
9	<p>Turn the ignition off. Reinstall the ABS Pump fuse. Disconnect the ABS Pump Motor connector. Check connectors - Clean/repair as necessary. Connect a 10 gauge 40 amp fused jumper wire between the ABS Pump Fused B(+) terminal in the CAB harness connector to the ABS Pump Motor connector RED wired terminal. Connect a 10 gauge jumper wire between the Ground circuit terminal in the CAB harness connector to the ABS Pump Motor connector BLACK wired terminal. Did the ABS Pump Motor operate?</p> <p>Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 10</p>	All
10	<p>Turn the ignition off. Disconnect the ABS Pump Motor connector. Check connectors - Clean/repair as necessary. Connect a 10 gauge 40 amp fused jumper wire between the ABS Pump Motor connector RED wired terminal and an alternate 40 amp capable B(+) source. Connect a 10 gauge jumper wire between the ABS Pump Motor connector BLACK wired terminal and ground Did the ABS Pump Motor operate?</p> <p>Yes → Go To 11</p> <p>No → Replace the Hydraulic Control Unit in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p>	All

PUMP CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
11	<p>Turn the ignition off. Disconnect the ABS Pump Motor connector. Check connectors - Clean/repair as necessary. Connect a 10 gauge 40 amp fused jumper wire between the ABS Pump Fused B(+) terminal in the CAB harness connector to the ABS Pump Motor connector RED wired terminal. Connect a 10 gauge jumper wire between the ABS Pump Motor connector BLACK wired terminal and ground. Did the ABS Pump Motor operate?</p> <p>Yes → Repair the ABS Pump Motor Fused B(+) circuit for an open. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Repair the ABS Pump Motor Ground circuit for an open. Perform ABS VERIFICATION TEST - VER 1.</p>	All

Symptom:
SYSTEM OVER VOLTAGE

When Monitored and Set Condition:

SYSTEM OVER VOLTAGE

When Monitored: Ignition on. The CAB monitors the Fused B(+) circuit at all times for proper system voltage.

Set Condition: If the voltage is above 16.5 volts, the Diagnostic Trouble Code (DTC) is set.

POSSIBLE CAUSES

INTERMITTENT DTC
 BATTERY CHARGER CONNECTED
 FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT HIGH
 DAMAGED CAB/CAB HARNESS CONNECTOR
 CAB - GROUND CIRCUIT OPEN
 CAB - INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTC's. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. Start the engine. With the DRBIII®, read DTC's. Does the DRBIII® display SYSTEM OVER VOLTAGE? Yes → Go To 2 No → Go To 7	All
2	Is a battery charger connected to the vehicle? Yes → Ensure the battery is fully charged. Perform ABS VERIFICATION TEST - VER 1. No → Go To 3	All

SYSTEM OVER VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
3	<p>Turn the ignition off. Disconnect the CAB connector. Note: Check connector - Clean/repair as necessary. Start the engine. Raise engine speed above 1,800 RPM's Measure the voltage between Fused Ignition Switch Output (RUN) circuit and ground. Is the voltage above 16.5 volts ?</p> <p>Yes → Refer to appropriate service information for Charging System testing and repair. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 4</p>	All
4	<p>Turn the ignition off. Disconnect the CAB connector. Note: Check connector - Clean/repair as necessary. Inspect the CAB and CAB harness connector for damage. Is there any broken, bent, pushed out, corroded, or spread terminals?</p> <p>Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 5</p>	All
5	<p>Turn the ignition off. Disconnect the CAB connector. Note: Check connector - Clean/repair as necessary. Using a 12-volt test light connected to 12-volts, probe the Ground circuits. Does the test light illuminate?</p> <p>Yes → Go To 6</p> <p>No → Repair the Ground circuit for an open. Perform ABS VERIFICATION TEST - VER 1.</p>	All
6	<p>Turn the ignition off. Reconnect the CAB harness connector. Turn the ignition on. With the DRBIII® in Sensors, read the ignition voltage. Does the DRBIII® display ignition voltage above 16 volts?</p> <p>Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 7</p>	All

SYSTEM OVER VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
7	<p>Turn the ignition off.</p> <p>Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.</p> <p>Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.</p> <p>Refer to any Hotline letters or Technical Service Bulletins that may apply.</p> <p>Ensure the battery is fully charged.</p> <p>Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.</p> <p>Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.</p> <p>Were any problems found?</p> <p>Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Test Complete.</p>	All

Symptom: SYSTEM UNDER VOLTAGE

When Monitored and Set Condition:

SYSTEM UNDER VOLTAGE

When Monitored: Ignition on. The CAB monitors the Fused Ignition Switch Output circuit voltage above 10 km/h (6 mph) continuously for proper system voltage.

Set Condition: If the voltage is below 9.5 volts, the Diagnostic Trouble Code (DTC) is set.

POSSIBLE CAUSES

INTERMITTENT DTC
DAMAGED CAB/CAB HARNESS CONNECTOR
RUNNING BATTERY VOLTAGE LOW
CAB - GROUND CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT (RUN) CIRCUIT OPEN
CAB - INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTC's. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. Start the engine. Drive the vehicle above 16 km/h (10 mph) for at least 20 seconds. Stop the vehicle With the DRBIII®, read DTC's. Does the DRBIII® display SYSTEM UNDER VOLTAGE ? Yes → Go To 2 No → Go To 6	All
2	Engine Running. Measure the battery voltage. Is the battery voltage below 10 volts? Yes → Refer to appropriate service information for charging system testing and repair. Perform ABS VERIFICATION TEST - VER 1. No → Go To 3	All

SYSTEM UNDER VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
3	<p>Turn the ignition off. Disconnect the CAB harness connector. Inspect the CAB and CAB harness connector for damage. Is there any broken, bent, pushed out, corroded, or spread terminals?</p> <p>Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 4</p>	All
4	<p>Turn the ignition off. Disconnect the CAB harness connector. Using a 12-volt test light connected to 12-volts, probe the Ground circuits. Does the test light illuminate?</p> <p>Yes → Go To 5</p> <p>No → Repair the Ground circuit for an open. Perform ABS VERIFICATION TEST - VER 1.</p>	All
5	<p>Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output (RUN) circuit. Does the test light illuminate?</p> <p>Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Repair the Fused Ignition Switch Output (RUN) circuit for an open. Perform ABS VERIFICATION TEST - VER 1.</p>	All
6	<p>Turn the ignition off. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Refer to any Hotline letters or Technical Service Bulletins that may apply. Ensure the battery is fully charged. Inspect the vehicle for aftermarket accessories that may exceed the Generator System output. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Were any problems found?</p> <p>Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Test Complete.</p>	All

Symptom: **VALVE POWER FEED FAILURE**

When Monitored and Set Condition:

VALVE POWER FEED FAILURE

When Monitored: Ignition ON. The CAB monitors the Valve Fused B(+) circuit at all times for proper system voltage.

Set Condition: If the Valve Fused B(+) is missing, the DTC will be set.

POSSIBLE CAUSES

INTERMITTENT DTC
 ABS VALVE FUSE
 ABS VALVE FUSED B(+) SUPPLY CIRCUIT OPEN
 ABS VALVE FUSED B(+) CIRCUIT OPEN
 ABS VALVE FUSED B(+) CIRCUIT INTERMITTENT SHORT TO GROUND
 ABS VALVE FUSED B(+) CIRCUIT SHORT TO GROUND
 DAMAGED CAB/CAB HARNESS CONNECTOR
 CAB - GROUND CIRCUIT OPEN
 CAB - INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTC's. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTC's. Does the DRBIII® display VALVE POWER FEED FAILURE? Yes → Go To 2 No → Go To 10	All
2	Turn the ignition off. Remove and Inspect the ABS Valve fuse. Is the ABS Valve fuse open? Yes → Go To 3 No → Go To 6	All

VALVE POWER FEED FAILURE — Continued

TEST	ACTION	APPLICABILITY
3	<p>Turn the ignition off. Visually inspect the ABS Valve Fused B(+) circuit in the wiring harness. Look for any sign of an intermittent short to ground. Is the wiring harness OK?</p> <p>Yes → Go To 4</p> <p>No → Repair the ABS Valve Fused B(+) circuit for a short to ground. Perform ABS VERIFICATION TEST - VER 1.</p>	All
4	<p>Turn the ignition off. Disconnect the CAB harness connector. Note: Check connector - Clean/repair as necessary. Using a test light connected to 12 volts, probe the ABS Valve Fused B(+) circuit fuse terminal. Did the test light illuminate?</p> <p>Yes → Repair the ABS Valve Fused B(+) circuit for a short to ground. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 5</p>	All
5	<p>Turn the ignition off. Reconnect the CAB harness connector. NOTE: The CAB harness connector must be reconnected for the results of this test to be valid. Using a test light connected to 12 volts, probe the ABS Valve Fused B(+) circuit fuse terminal. Did the test light illuminate?</p> <p>Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Replace the ABS Valve Fused B(+) fuse. If the fuse is open make sure to check for a short to ground. Perform ABS VERIFICATION TEST - VER 1.</p>	All
6	<p>Turn the ignition off. Disconnect the CAB harness connector. Inspect the CAB and CAB harness connector for damage. Is there any broken, bent, pushed out, corroded or spread terminals?</p> <p>Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 7</p>	All
7	<p>Turn the ignition off. Using a 12-volt test light connected to ground, probe the B(+) supply at the ABS Valve fuse terminal. Did the test light illuminate?</p> <p>Yes → Go To 8</p> <p>No → Repair the ABS Valve Fused B(+) supply circuit for an open. Perform ABS VERIFICATION TEST - VER 1.</p>	All

VALVE POWER FEED FAILURE — Continued

TEST	ACTION	APPLICABILITY
8	Reinstall the ABS Valve fuse. Disconnect the CAB harness connector. Using a 12-volt test light connected to ground, probe the ABS Valve Fused B(+) circuit at the CAB harness connector. Did the test light illuminate? Yes → Go To 9 No → Repair the ABS Valve Fused B(+) circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
9	Turn the ignition off. Using a 12-volt test light connected to 12-volts, probe the ground circuits at the CAB harness connector. Did the test light illuminate? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Repair the CAB Ground circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
10	Turn the ignition off. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Refer to any Hotline letters or Technical Service Bulletins that may apply. Were any problems found? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:***BRAKE LAMP SWITCH FAILURE****POSSIBLE CAUSES**

CHECK BRAKE LAMP SWITCH OUTPUT

BRAKE LAMP SWITCH B+ OPEN

BRAKE LAMP SWITCH OPEN

BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORT OR OPEN

CAB -- INTERNAL OPEN

TEST	ACTION	APPLICABILITY
1	<p>With the DRBIII® in Inputs/Outputs, read the Brake Lamp Switch state. Press and release the brake pedal. Does the DRBIII® display PRESSED and RELEASED?</p> <p>Yes → The Brake Lamp Switch is OK. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 2</p>	All
2	<p>Disconnect the Brake Lamp Switch harness connector. Using a 12-volt test light connected to ground, check the Brake Lamp Switch Fused B+ circuit. Does the test light illuminate brightly ?</p> <p>Yes → Go To 3</p> <p>No → Repair the Brake Lamp Switch Fused B+ circuit for an open. Perform ABS VERIFICATION TEST - VER 1.</p>	All
3	<p>Disconnect the Brake Lamp Switch harness connector. Connect a jumper wire between the Brake Lamp Switch B+ and Brake Lamp Switch Output circuits. With the DRBIII® in Inputs/Outputs, read the Brake Lamp Switch state. Does the DRBIII® display PRESSED?</p> <p>Yes → Replace the Brake Lamp Switch in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 4</p>	All
4	<p>Disconnect the CAB harness connector. Disconnect the Brake Lamp Switch harness connector. Check the Brake Lamp Switch Output circuit for a short to voltage and for an open. Is the Brake Lamp Switch Output circuit shorted or open?</p> <p>Yes → Repair the Brake Lamp Switch Output circuit for a short to voltage or an open. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p>	All

Symptom:

***NO RESPONSE FROM CONTROLLER ANTILOCK BRAKE**

POSSIBLE CAUSES
NO RESPONSE FROM CAB
GROUND CIRCUIT OPEN
OPEN FUSED IGNITION SWITCH OUTPUT CIRCUIT
OPEN PCI BUS CIRCUIT
CONTROLLER ANTILOCK BRAKE

TEST	ACTION	APPLICABILITY
1	<p>Turn the ignition on.</p> <p>Note: As soon as one or more module communicates with the DRB, answer the question.</p> <p>With the DRB, attempt to communicate with the Airbag Control Module.</p> <p>With the DRB, attempt to communicate with the Body Control Module (BCM).</p> <p>Was the DRB able to I/D or establish communications with either of the modules?</p> <p>Yes → Go To 2</p> <p>No → Refer to the Communications category and perform the symptom PCI Bus Communication Failure.</p> <p>Perform ABS VERIFICATION TEST - VER 1.</p>	All
2	<p>Turn the ignition off.</p> <p>Disconnect the CAB harness connector.</p> <p>Using a 12-volt test light connected to 12-volts, probe both ground circuits.</p> <p>Is the test light illuminated for both circuits?</p> <p>Yes → Go To 3</p> <p>No → Repair the ground circuit(s) for an open.</p> <p>Perform ABS VERIFICATION TEST - VER 1.</p>	All
3	<p>Turn the ignition off.</p> <p>Disconnect the CAB harness connector.</p> <p>Turn the ignition on.</p> <p>Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.</p> <p>Is the test light illuminated?</p> <p>Yes → Go To 4</p> <p>No → Repair the Fused Ignition Switch Output circuit for an open.</p> <p>Perform ABS VERIFICATION TEST - VER 1.</p>	All

***NO RESPONSE FROM CONTROLLER ANTILOCK BRAKE — Continued**

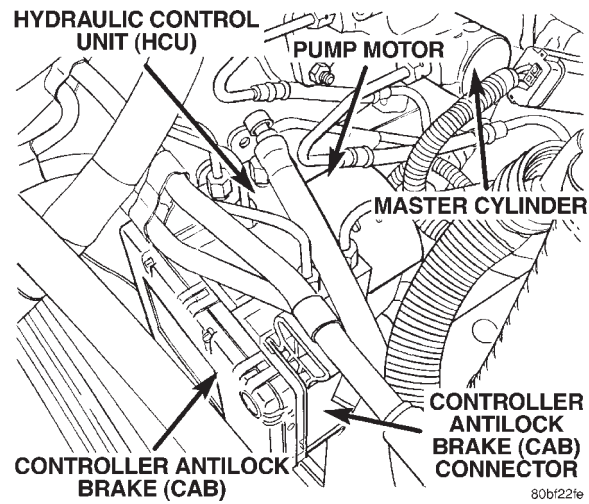
TEST	ACTION	APPLICABILITY
4	<p>Note: Ensure there is PCI Bus communication with other modules on the vehicle before proceeding. If not, refer to the symptom list from the menu and repair as necessary.</p> <p>Disconnect the CAB harness connector.</p> <p>Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes.</p> <p>Connect the scope input cable to the channel one connector on the DRB. Attach the red and black leads and the cable to probe adapter to the scope input cable.</p> <p>With the DRBIII® select Pep Module Tools.</p> <p>Select lab scope.</p> <p>Select Live Data.</p> <p>Select 12 volt square wave.</p> <p>Press F2 for Scope.</p> <p>Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10.</p> <p>Press F2 again when complete.</p> <p>Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the CAB connector.</p> <p>Turn the ignition on.</p> <p>Observe the voltage display on the DRB Lab Scope.</p> <p>Does the voltage pulse from 0 to approximately 7.5 volts?</p> <p>Yes → Go To 5</p> <p>No → Repair the PCI Bus circuit for an open.</p> <p>Perform ABS VERIFICATION TEST - VER 1.</p>	All
5	<p>If there are no possible causes remaining, view repair.</p> <p>Repair</p> <p>Replace the Controller Antilock Brake in accordance with the Service Information.</p> <p>Perform ABS VERIFICATION TEST - VER 1.</p>	All

Verification Tests

ABS VERIFICATION TEST - VER 1	APPLICABILITY
<ol style="list-style-type: none"> 1. Turn the ignition off. 2. Connect all previously disconnected components and connectors. 3. Ensure all accessories are turned off and the battery is fully charged. 4. Ensure that the Ignition is on, and with the DRBIII, erase all Diagnostic Trouble Codes from ALL modules. Start the engine and allow it to run for 2 minutes and fully operate the system that was malfunctioning. 5. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the DRBIII, read DTC's from ALL modules. 6. If any Diagnostic Trouble Codes are present, return to Symptom list and troubleshoot new or recurring symptom. 7. NOTE: For Sensor Signal and Pump Motor faults, the CAB must sense all 4 wheels at 25 km/h (15 mph) before it will extinguish the ABS Indicator. 8. If there are no DTC's present after turning ignition on, road test the vehicle for at least 5 minutes. Perform several antilock braking stops. 9. Caution: Ensure braking capability is available before road testing. 10. Again, with the DRBIII® read DTC's. If any DTC's are present, return to Symptom list. 11. If there are no Diagnostic Trouble Codes (DTC's) present, and the customer's concern can no longer be duplicated, the repair is complete. <p>Are any DTC's present or is the original concern still present?</p> <p>Yes → Repair is not complete, refer to appropriate symptom.</p> <p>No → Repair is complete.</p>	All

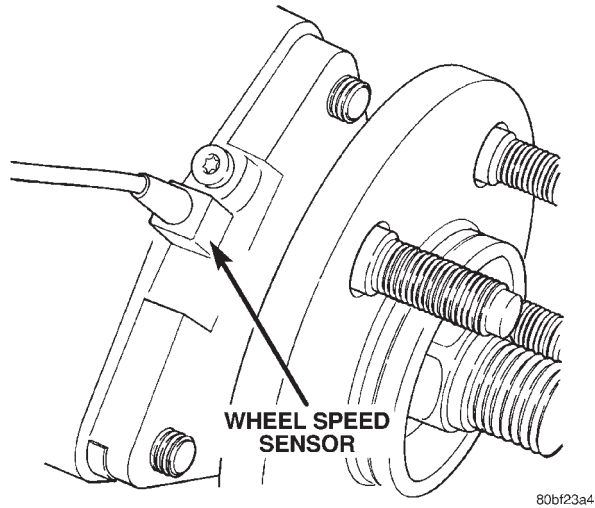
8.0 COMPONENT LOCATIONS

8.1 CONTROLLER ANTILOCK BRAKE, HYDRAULIC CONTROL UNIT, PUMP MOTOR

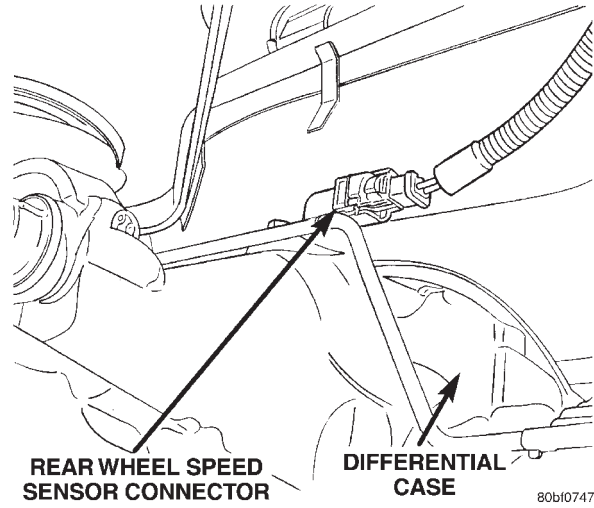


8.2 WHEEL SPEED SENSORS

FRONT



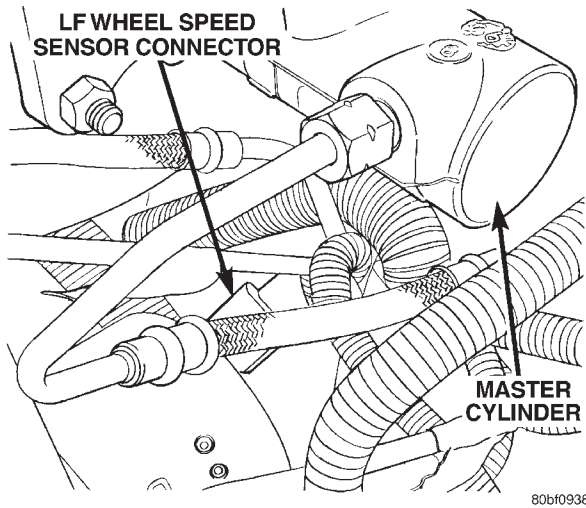
REAR



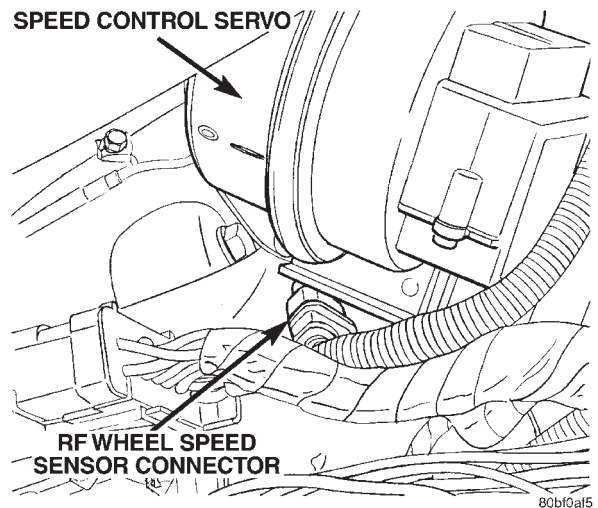
COMPONENT LOCATIONS

8.3 WHEEL SPEED SENSOR CONNECTORS

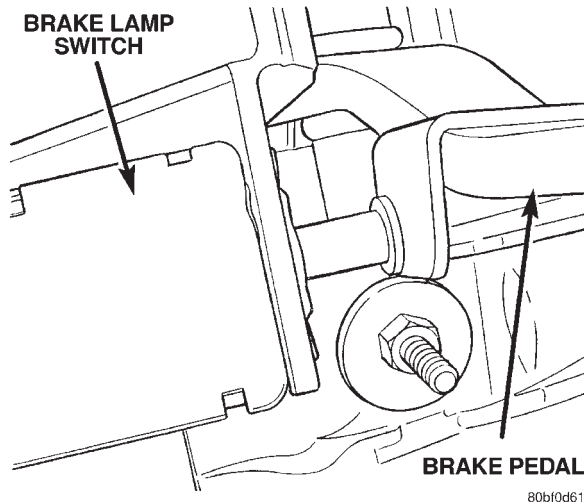
LEFT FRONT



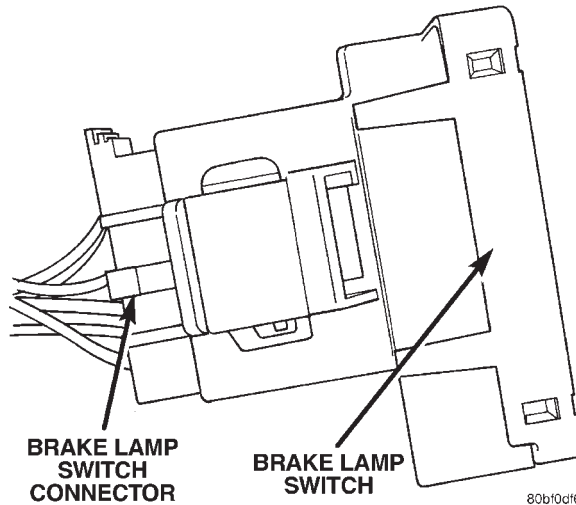
RIGHT FRONT



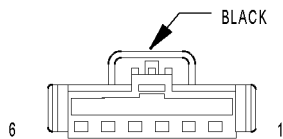
8.4 BRAKE LAMP SWITCH



8.5 BRAKE LAMP SWITCH CONNECTOR



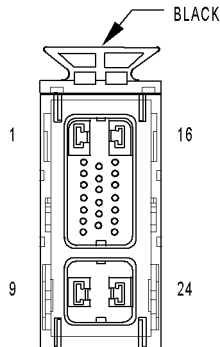
9.0 CONNECTOR PINOUTS



BRAKE
LAMP
SWITCH

BRAKE LAMP SWITCH

CAV	CIRCUIT	FUNCTION
1	F32 18PK/DB	FUSED B(+)
2	L50 18WT/TN (DIESEL)	PRIMARY BRAKE SWITCH SIGNAL
2	L50 18WT/TN (GAS)	BRAKE LAMP SWITCH OUTPUT
3	V30 18DB/RD	SPEED CONTROL BRAKE SWITCH OUTPUT
4	V32 18YL/RD	SPEED CONTROL SUPPLY
5	Z3 18BK/OR	GROUND
6	K29 18WT/PK (DIESEL)	SECONDARY BRAKE SWITCH SIGNAL
6	K29 18WT/PK (GAS)	BRAKE SWITCH SENSE

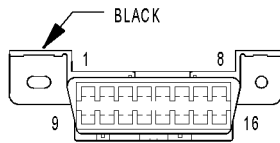


CONTROLLER
ANTILOCK
BRAKE

CONTROLLER ANTILOCK BRAKE

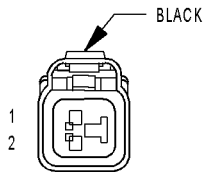
CAV	CIRCUIT	FUNCTION
1	Z101 12BK/OR	GROUND
2	-	-
3	-	-
4	-	-
5	D25 18YL/VT	PCI BUS
6	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL
7	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
8	D24 18WT/DG	FLASH ABS
9	A20 12RD/DB	FUSED B(+)
10	F22 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
11	-	-
12	-	-
13	B12 18DG/OR	VEHICLE SPEED SIGNAL
14	-	-
15	-	-
16	Z102 12BK/OR	GROUND
17	-	-
18	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
19	B1 18YL/DB	REAR WHEEL SPEED SENSOR SIGNAL
20	B2 18YL	REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
21	-	-
22	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR SIGNAL
23	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
24	A10 12RD/DG	FUSED B(+)

CONNECTOR PINOUTS



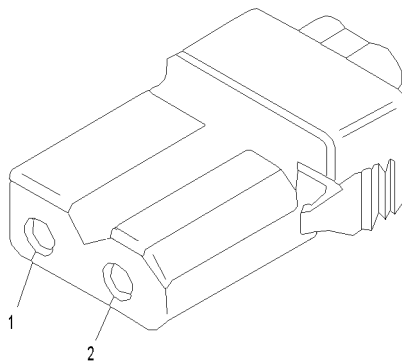
DATA
LINK
CONNECTOR

DATA LINK CONNECTOR		
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 18YL/VT	PCI BUS
3	-	-
4	Z252 18BK/GY	GROUND
5	Z252 18BK/GY	GROUND
6	D32 20LG/DG (GAS)	SCI RECEIVE
6	D32 20LG/DG (GAS)	SCI RECEIVE
7	D21 20PK/RD	SCI TRANSMIT
8	D24 18WT/DG	FLASH ABS
9	D19 20VT/OR	BODY CONTROL MODULE FLASH ENABLE
10	-	-
11	-	-
12	-	-
13	-	-
14	D20 20LG	SCI RECEIVE
15	-	-
16	F33 20PK/RD	FUSED B(+)



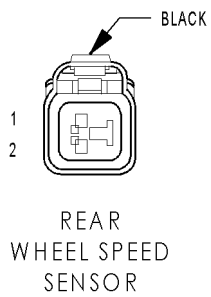
LEFT FRONT
WHEEL SPEED
SENSOR
(ABS)

LEFT FRONT WHEEL SPEED SENSOR (ABS)		
CAV	CIRCUIT	FUNCTION
1	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR SIGNAL

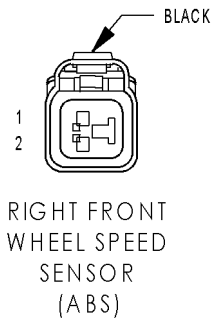


PUMP
MOTOR
CONNECTOR

PUMP MOTOR CONNECTOR		
CAV	CIRCUIT	FUNCTION
1	TN	GROUND
2	RD	PUMP/MOTOR RELAY OUTPUT



REAR WHEEL SPEED SENSOR		
CAV	CIRCUIT	FUNCTION
1	B2 18YL	REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B1 18YL/DB	REAR WHEEL SPEED SENSOR SIGNAL

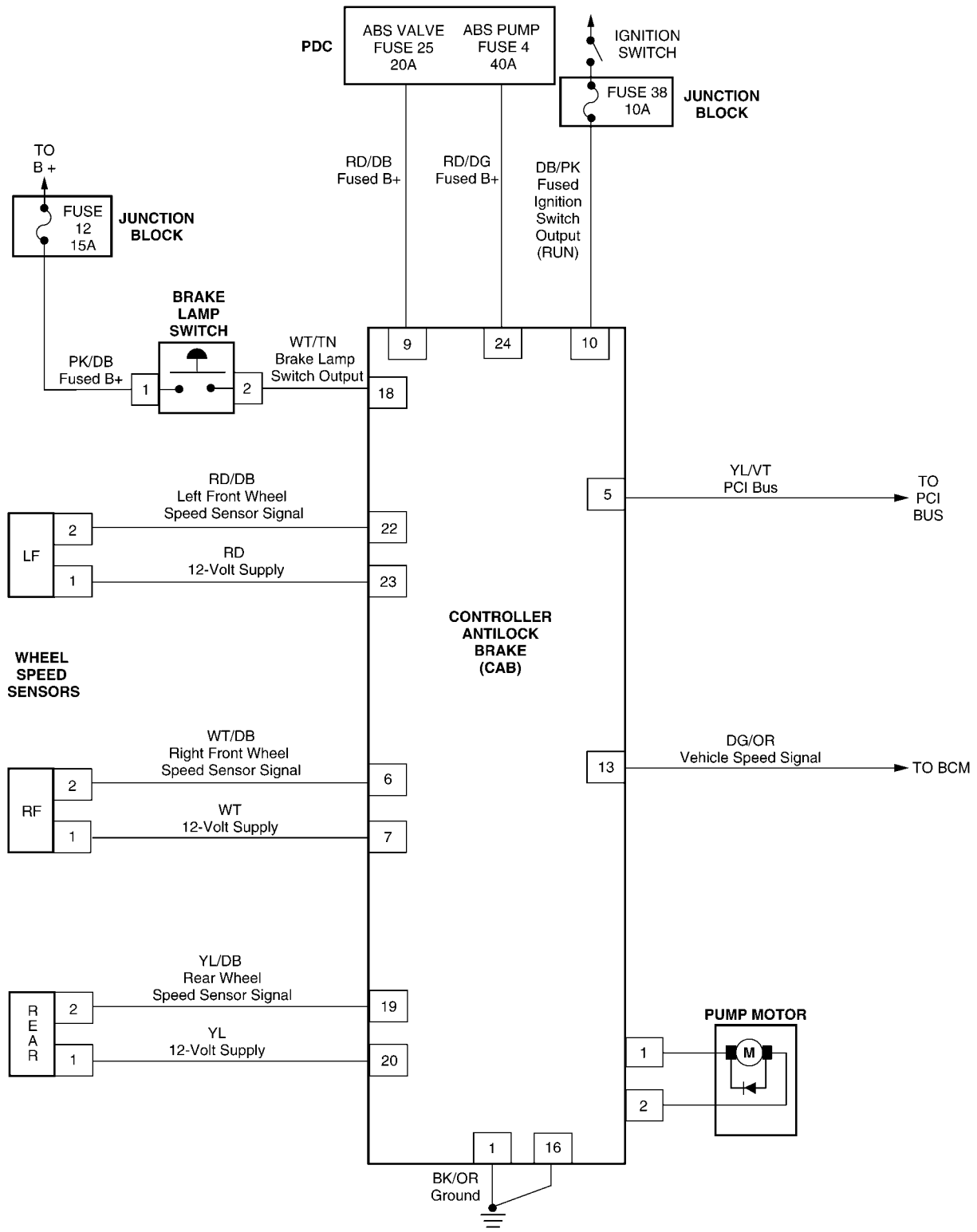


RIGHT FRONT WHEEL SPEED SENSOR (ABS)		
CAV	CIRCUIT	FUNCTION
1	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL

[illegible]

10.0 SCHEMATIC DIAGRAMS

TEVES MARK 20e CONTROLLER ANTILOCK BRAKE — ABS



This image shows a full page of white paper with horizontal grey ruling lines. At the top center, the word "NOTES" is printed in a bold, black, sans-serif font. The rest of the page is filled with evenly spaced horizontal lines, providing a template for writing.