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1.0 INTRODUCTION

The procedures contained in this manual include all the specifications, instructions, and graphics needed to diagnose the DR Chassis system problems: TRW EBC 125 Rear Wheel Antilock (RWAL) and EBC 325 Antilock Braking System (ABS) and the Adjustable Pedals System (APS). The diagnostics in this manual are based on the failure condition or symptom being present at time of diagnosis.

Please follow the recommendations below when choosing your diagnostic path.

1. First make sure the DRBIII® is communicating with the vehicle system being diagnosed. 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 system.

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 asterisk (*) placed before the symptom description indicates a customer complaint.

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 DIAGNOSTIC TROUBLE CODE.** It is recommended that you review the entire manual to become familiar with all new and changed diagnostic procedures.

This manual reflects many suggested changes from readers of past issues. After using this manual, 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

There are two antilock systems used on these trucks: the TRW EBC 125 and EBC 325. EBC 125 (RWAL) is standard, two-wheel rear wheel antilock braking system.

EBC 325 (ABS) is optional, four-wheel antilock braking system.

Diagnosis of certain Front Control Module (FCM) diagnostic trouble code (DTC) related to the Adjustable Pedals System (APS) relay (if equipped) is covered in this manual.

1.2 SIX-STEP TROUBLESHOOTING PROCEDURE

Diagnosis of the antilock brake systems and the adjustable pedal system is done in six basic steps:

- Verification of complaint
- Verification of any related symptoms
- Symptom analysis
- Problem isolation
- Repair of isolated problem
- Verification of proper operation

2.0 IDENTIFICATION OF SYSTEM

The EBC 125 is a one channel, one HCU, to control hydraulic pressure to both REAR brakes during antilock braking, and one rear wheel speed sensor. EBC 125 for 5.7L will have pins for left front sensor and second vehicle speed signals to NGC. However there is no diagnostics provided for this signal in the EBC 125 module. A CAB mounted on top of the HCU controls the solenoids/valves.

The EBC 325 is a three channel, one HCU to control the FRONT and REAR brakes, two front wheel speed sensors, and one rear wheel speed sensor. The CAB mounted on the top of the HCU controls the solenoids/values.

Vehicles equipped with the Adjustable Pedal System (APS) can be identified by the presence of the Adjustable Pedals switch located to the left of the steering column below the headlamp switch.

3.0 SYSTEM DESCRIPTION AND FUNCTIONAL OPERATION

3.1 ABS

The controller-antilock (CAB) is used to monitor wheel speeds and modulates (control) hydraulic pressure in each brake channel. The modulated hydraulic pressure is used to prevent wheel lock up during braking and maintain vehicle stability. The CAB also provides a vehicle speed signal (VSS) to the powertrain control module.

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.

The CAB has a special software program called Electronic Variable Brake Proportioning (EVBP), that monitors the wheel speed(s) and when certain criteria are met the software will enable the HCU to

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perform the same brake fluid management control as the combination/proportioning valves.

The EBC 125 (RWAL) system uses Electronic Brake Apportioning (EBA). The HCU replaces the conventional proportioning valve as a means of balancing the front-to-rear braking effort under normal braking conditions.

EBA makes more effective use of the rear brakes when the truck is lightly loaded, balancing front-to-rear lining wear and minimizing instances of rear wheel antilock action. As with a proportioning valve, EBA uses the rear axle speed sensor to determine how much, if any, to reduce the rear brake hydraulic pressure based on the deceleration of the rear wheels. EBA automatically adapts to variations in the vehicle loading and road surface, where as a proportioning valve is fixed.

The EBC 325 (ABS) system uses Dynamic Rear Proportioning (DRP). Like EBA on the RWAL system, the HCU replaces the conventional proportioning valve as means of balancing the front-to-rear braking effort under normal braking conditions. Unlike EBA, DRP adjusts hydraulic pressure to the rear brakes based on the amount of slip indicated by the wheel speed sensors when in activation.

Both EBC 125 (RWAL) and EBC 325 (ABS) use the CAB and HCU to make an integral electronic/hydraulic unit which shares data with other electronic modules on the vehicle via the PCI BUS network.

During an RWAL stop, the system still uses the front/rear hydraulic split; however, the brake system pressure is further split into one control channel. During RWAL operation, the front wheels are not assisted and brake pressure is applied from the master cylinder, while the rear wheels are controlled together through one channel by the HCU.

During an ABS stop, the system still uses the front/rear hydraulic split; however, the brake system pressure is further split into three controls 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 channel. By using separate control channels for the front wheels, more steering control is maintained during maximum braking.

During an antilock stop, "wheel lock-up" doesn't 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 wheel is locked. The antilock system maintains an average of approximately 20% wheel slip.

3.1.1 TRW EBC 125 SYSTEM DESCRIPTION

The EBC 125 (RWAL) system can be identified by the controller-antilock brake (CAB) and hydraulic control unit (HCU) being an integral electronic/hydraulic unit. One 14 way connector and mounted near the master cylinder next to the battery tray.

SYSTEM COMPONENTS - TRW EBC 125

- Controller antilock brake (CAB)
- Hydraulic control unit (HCU)
- One wheel speed sensor/tone wheel assembly in rear axle
- Left front wheel speed sensor (5.7L only)
- ABS warning indicator (amber)
- Brake warning indicator (red)
- Brake fluid level switch
- 4WD input (if equipped)
- Brake lamp switch
- Fuses and wiring

3.1.2 TRW EBC 325 SYSTEM DESCRIPTION

The EBC 325 (ABS) system can be identified by the controller-antilock brake (CAB) and hydraulic control unit (HCU) being an integral electronic/hydraulic unit with a pump/motor unit. One 14-way connector, one 4 way connector and mounted under the hood in close proximity to the master cylinder next to the battery tray.

SYSTEM COMPONENTS - TRW EBC 325

- Controller antilock brake (CAB)
- Hydraulic control unit (HCU)
- Three wheel speed sensor/tone wheel assemblies
- ABS warning indicator (amber)
- Brake warning indicator (red)
- Brake fluid level switch
- 4WD input (if equipped)
- Brake lamp switch
- Fuses and wiring

3.1.3 TRW EBC 125 CONTROLLER ANTILOCK BRAKE (CAB)

The CAB is mounted directly to the hydraulic control unit (HCU) that includes a microprocessor and two solenoids that control the valves that control brake pressure during RWAL braking and circuits that:

- Monitor the brake switch input to tell whether or not to prepare for possible antilock braking
- Monitor the brake fluid level switch input to tell whether or not the state of the hydraulics has a problem
- Monitor the wheel speed sensor input to determine when a rear wheel is tending to lock up
- Operate the integral hydraulic control unit (HCU) during antilock braking based on comparing the speed sensor to information programmed in memory
- Detect RWAL system related problems and take diagnostic action
- Able to execute self-tests and output control commands

3.1.4 TRW EBC 325 CONTROLLER ANTILOCK BRAKE (CAB)

The CAB is mounted directly to the hydraulic control unit (HCU) that includes a microprocessor and six solenoids that control brake pressure during antilock braking. The CAB also has circuits that monitor the following:

- Brake switch input is monitored to determine whether or not to prepare for possible ABS braking
- Monitor the brake fluid level switch input to tell whether or not the state of the hydraulics has a problem
- Wheel speed sensors are monitored to determine when a wheel is tending to lock up. The CAB will operate the valves in the HCU to control braking pressure during ABS braking
- Detect ABS system related problems and take diagnostic action
- Able to execute self-tests and output control commands

3.1.5 ABS WARNING INDICATOR AND RED BRAKE WARNING INDICATOR (EBC 125 AND EBC 325)

The system is equipped with an amber ABS and a red Brake warning indicator to alert the driver of a malfunction it has detected. The CAB can signal the operation of both the amber ABS warning indicator and the red Brake warning indicator via PCI BUS.

The CAB controls the ABS warning indicator by making it do one of three things:

- Light steady for 3.4 seconds during an initial test at the beginning of an ignition cycle to function as a bulb check.
- Light steady when a system malfunction exists.

- Flash if a vehicle tooth or tire parameter is faulty or missing.

The Instrument Cluster controls the amber antilock Brake system-warning indicator. All Dodge Truck Instrument Clusters have direct control over the ABS warning indicator and Brake warning indicator. The Instrument Cluster transmits a message over the PCI BUS relating to diagnostics and current lamp status for the ABS and Brake indicator. The Instrument Cluster will expect a PCI BUS message back from the CAB indicating whether the indicator should be turned on or off. In the event that no signal is received from the CAB for a certain number of time, the Instrument Cluster will illuminate the ABS warning indicator. The indicator provides notice of ABS system-related problems and the need to take diagnostic action.

The vehicle Instrument Cluster has a red Brake warning indicator to alert the driver to the following conditions:

- Brake fluid level low
- Parking Brake applied
- ABS system malfunction

The Instrument Cluster controls the red Brake warning indicator. There is a parallel path to chassis ground that will illuminate the red Brake warning indicator:

- Through the parking Brake switch contacts
- Through the Brake fluid level switch
- Through the CAB via PCI BUS

The CAB can control the operation of both the amber ABS warning indicator and the red Brake warning indicator:

- If the CAB is disconnected, the amber ABS warning indicator and red Brake warning indicator will be illuminated
- If the axle type or tire size are not programmed properly, the amber indicator will blink
- If any Foundation Brake system problem exists
- If any ABS system DTC is set, both the amber and red indicators will be illuminated

The ABS Enabling Strategy (FMVSS105) is for vehicles above 10,000-lbs. gross vehicle weight. This allows different operators to be alerted that an ABS fault existed in the last ignition cycle. When the ignition is cycled to the ON position the ABS system will be disabled if the vehicle speed was zero on the last ignition cycle. The disabled ABS system will illuminate the amber ABS and red BRAKE warning lamps until the vehicle speed reaches 7 km/h (4 mph) then the amber ABS and red BRAKE warning lamps will extinguish. If an ABS fault exists; the ABS is still disabled, the amber ABS and red BRAKE warning lamps will still be illuminated, and a CAB DTC is then set.

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3.1.6 BRAKE LAMP SWITCH CIRCUIT

This switch prepares the CAB for a possible antilock stop.

The antilock system uses an input signal from the brake pedal switch when activated. A released brake pedal will close the switch circuit and read 0 volts. When the driver applies the brake pedal, the circuit voltage is 12 volts. This signal tells the CAB that the pedal is depressed. The brake lamp switch is located on the brake pedal under the driver dash.

3.1.7 BRAKE FLUID LEVEL SWITCH CIRCUIT

The switch signals the CAB for a hydraulic fluid problem. The antilock system uses input from the brake fluid level switch when activated. A low brake fluid condition in the master cylinder will close the switch circuit and read 0 volts. When the brake fluid level is at specifications, the switch will open and circuit sense voltage will read 5 volts. This signal tells the CAB if there is enough brake fluid in the master cylinder to have an antilock operation. The brake fluid level switch is located in the master cylinder with 10k resistor. The switch is a Hall effect design and uses a float to determine level.

3.1.8 HYDRAULIC CONTROL UNIT

The HCU on the EBC 125 has an integral valve body for controlling the front and rear Brakes. The HCU on the EBC 325 has an integral valve body for controlling the front and rear Brakes.

Within the HCU are solenoids, valves, check valves, and a reset switch necessary to apply and release brake pressure as required to avoid wheel lockup, keep the wheels rolling, and maintain optimum deceleration.

The Isolation Valve(s) is/are normally open, allowing unrestricted flow from the master cylinder to the wheels. When the CAB determines antilock intervention is required, the valve(s) close to isolate the master cylinder hydraulic circuit(s). Fluid is trapped in the circuit(s) and then prevented from reaching the wheels.

The Dump Valve(s) is/are pulsed on and off by the CAB. The valve(s) cycles only if the isolation valve is closed. When dump is on, it allows fluid to the low-pressure accumulator for temporary storage. This causes the pressure to the wheel to decrease. When the dump valve is off, fluid is allowed to the wheel.

The Brake Return Check Valve allows the HCU to drain faster after the antilock activation, when the brake is released.

The Reset Switch is used in the EBC 125 (RWAL) system only. The switch is positioned in the HCU to monitor the master cylinder (input), rear brake

(output) and accumulator pressure. During normal braking, pressure is equal for input and output and the switch remains open. During an antilock stop the switch will close as the isolation valve is cycled and pressure becomes unequal between input and output. At the end of an antilock stop the isolation valve will open as master cylinder pressure and rear pressure equalize. The switch is used to monitor correct operation of the HCU and to set a DTC if incorrect pressure is detected on the EBC 125 (RWAL) antilock system when not in an ABS event.

When the brakes are applied, fluid is forced from the master cylinder outlet port(s) to the HCU inlet ports(s). This pressure is transmitted through normally open isolation valve(s) inside the HCU, then through the outlet port(s) of the HCU to the wheels. If the CAB senses that a wheel is about to lock based on wheel speed sensor data, it pulls the normally open isolation valve closed for that circuit. This prevents any more fluid from entering that circuit. The CAB continues to look at the wheel speed sensor(s) signal to determine if the wheel is still decelerating. If deceleration is still taking place, the normally closed dump valve for that circuit is opened. This action dumps any pressure that is trapped between the normally open valve and the brake back into an accumulator. Once the affected wheel comes back up to speed, the CAB returns the valves to their normal condition allowing the affected brake to be reapplied. On the EBC 325 system, there is a pump/motor unit, two accumulators, three isolated valves, and three dump valves which are used to provide rapid response during the reapply sequence and to minimize pedal feedback due to the increased hydraulic circuits.

3.1.9 WHEEL SPEED SENSORS

The EBC 125 (RWAL) system uses only one speed sensor mounted in the rear axle for the rear wheels.

The EBC 325 (ABS) system uses one wheel speed sensor on each front wheel, and one mounted in the rear axle for the rear wheels.

The sensor measures the wheel speed by monitoring a rotating tone wheel. The signal generated by the sensor and tone wheel is transmitted to the CAB.

Each sensor has:

- A magnetic/coil pick-up (speed sensor) that is mounted to a fixed component
- An air gap between the tone wheel and the speed sensor assembly

As the teeth of the tone wheel move through the magnetic field of the sensor, an AC voltage is generated. This signal frequency increases or decreases proportionally to the speed of the wheel. The CAB monitors this signal to check for a sudden change in single or multiple wheel decelerations. If

the deceleration of one or more wheels is not within a predetermined amount, the CAB takes control for antilock action through the HCU.

Diagnostically, the coils of the wheel speed sensors have different amounts of resistance based upon the location. When measured across the connector two terminals, the resistance should be:

Front sensor:

- 90°C (194°F) 2259-2761 Ohms
- 25°C (77°F) 1800-2200 Ohms
- 40°C (-40°F) 1332-1628 Ohms

Rear sensor:

- 90°C (194°F) 2900-3500 Ohms
- 25°C (77°F) 1600-2300 Ohms
- 40°C (-40°F) 1000-1400 Ohms

NOTE: For all resistance ranges add 30% to the value for extreme heat, subtract 30% for extreme cold.

On a EBC 325 (ABS) system each front wheel speed is monitored through the speed sensor mounted at the wheel end of the hub. On the EBC 125 (RWAL) and EBC 325 (ABS) systems the rear wheel speed is monitored through the speed sensor mounted in the rear axle assembly.

The CAB will disable antilock control, illuminate the amber ABS warning indicator circuit via the PCI BUS, and store diagnostic trouble codes if it detects a problem with any or all of the wheel speed sensors:

- Incorrect circuit resistance when checked with no vehicle movement
- Incorrect sensor output during vehicle movement
- Erratic sensor output during vehicle movement

3.1.10 4WD INPUT

Vehicles equipped with four wheel drive (4WD) have an input to the CAB, which tells whether or not the vehicle is in 4WD. This input comes from the 4WD switch status which is sent to the CAB via PCI Bus. While in four-wheel drive, the front and rear axles will operate together. With this input, the CAB is able to modify its operation to allow for 4WD operation. Should a need for antilock operation occur while in four-wheel drive, the CAB will extend the amount of allowable dump valve cycles.

3.1.11 DIAGNOSTIC COMMAND MODES

The system software includes several self-tests that are performed every time the ignition is turned on and the vehicle is driven. Some of the self-tests occur immediately, while the pump motor active test occurs under normal driving while not in antilock operation with speeds above 15 MPH. Also, when over 8 MPH the CAB checks continuously for a missing or erratic wheel speed sensor signal.

3.1.12 SELF-TEST AT IGNITION TURN ON

RAM AND ROM CHECKS

RAM and ROM are major parts of the CAB in the EBC 125 and EBC 325 systems. Read-Only-Memory (ROM) is a permanent memory that contains the instructions that perform all calculations and decisions that make up antilock braking. Random-Access-Memory (RAM) is an erasable, re-written memory that is used to keep track of all numeric computations and decisions. RAM and ROM are both verified at ignition turn on.

WATCHDOG CHECK

The external watchdog circuit is coupled to the valve power relay. If the external signal is not active, the valve power relay cannot be operated. The watchdog circuit is checked by disabling the external watchdog signal. The relay command is issued with the watchdog signal turned off, and if the relay does turn on, then the watchdog circuit is not functioning properly, and a ignition-on DTC (fault) is issued.

BULB CHECKS

The CAB is not responsible for the diagnosis of any lamp failures, no explicit checks are made on the lamps at ignition turn-on other than requesting the Instrument Cluster to illuminate the amber ABS and the red Brake indicators for a few seconds. The bulb check test confirms correct CAB and bulb operation.

VALVE, POWER RELAY, AND PUMP MOTOR TEST

After completion of the bulb check, an active test of the power relay and the solenoid valve coils occur. Tests are made for shorted relay contacts, open relay, and shorted isolation and dump valve solenoids (open valves take somewhat longer to diagnose; open valve checks are made during normal operation while not in antilock mode). The pump motor works on Pulse Width Modulation (PWM). During self-test mode and during antilock state, you will not be able to hear the pump motor operation. The pump motor self-test will happen when vehicle speed is over 15 MPH.

PEDAL STUCK IN THE APPLIED POSITION CHECK

In order to minimize the possibility for false activation of the antilock system, the antilock mode cannot be entered until a brake-applied signal is received from the brake pedal switch. If the brake pedal is stuck in the applied position, the safeguard is defeated. The CAB will attempt to diagnose this condition by only enabling antilock if the brake pedal switch indicates the brake is off.

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SELF-TEST AT INITIAL IGNITION ON

The system undergoes a power-up self-test when the vehicle has its initial ignition turn-on. The power-up self-tests are abbreviated if the vehicle ignition switch is turned from some other position to RUN, as might occur in restarting a stalled engine with a vehicle rolling.

3.1.12 DRBIII® DIAGNOSTIC COMMANDS

RESET MODULE

This command resets the EBC 125 and EBC 325 systems as follows:

- Turns off both warning indicators
- Clears all DTC's and counters in the NVRAM
- Reactivates the system

The CAB accepts the reset module command only if the vehicle's wheels are not rotating

OUTPUT CONTROL COMMAND

Provisions have been made to allow actuation of all valves, power relay, and pump motor (325).

3.1.13 THE ON-BOARD DIAGNOSTIC SYSTEM

The CAB monitors the antilock system. The CAB monitors critical input and output circuits for correct operation.

Some circuits are tested continuously; others are checked only under certain circumstances.

Each circuit malfunction detected by the CAB has a corresponding trouble code:

- If the CAB diagnostic system senses that one of the circuits is malfunctioning, it stores the corresponding trouble code in memory
- If the malfunction goes away after the trouble code is stored, the trouble code will be erased after 50 key cycles, so long as no other DTC's were set within these 50 cycles

Refer to the Table of Contents for a list of the system malfunctions diagnosed in this manual.

3.2 ADJUSTABLE PEDALS SYSTEM

3.2.1 GENERAL

For this vehicle, the adjustable pedal system has no dedicated module controller. The brake, clutch, and accelerator pedal position is controlled by a manual switch located on the instrument panel.

3.2.2 ADJUSTABLE PEDALS RELAY

The adjustable pedals relay is located in the Integrated Power Module (IPM). The relay, when

not activated, supplies fused battery power to the Adjustable Pedals Switch. If the Front Control Module (FCM) receives a bus message that the vehicle is in reverse or that the cruise control is engaged, it will apply a ground to the adjustable pedals relay control circuit. The ground will activate the relay which will open the power circuit to the adjustable pedals switch. The relay control circuit is continuously monitored for malfunctions which the FCM will report as DTCs. For diagnosis of Adjustable Pedal DTCs, refer to the Table of Contents for the symptom test location.

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 AND BLANK SCREEN

If any of the following error messages appear on the DRBIII® screen, refer to the Vehicle Communications Manual for diagnosis and repair.

- cartridge error
- low battery
- ram result failure
- high battery
- keypad test failure

If the DRBIII® has a blank screen, do the following:

- Ensure there is a good body ground at the data link connector
- Use the process of elimination. Sequentially substitute another cable, cartridge, and DRBIII® until the condition is corrected

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

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

If the DRBIII® should display any other message, record the entire display and call the STAR Center. 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.

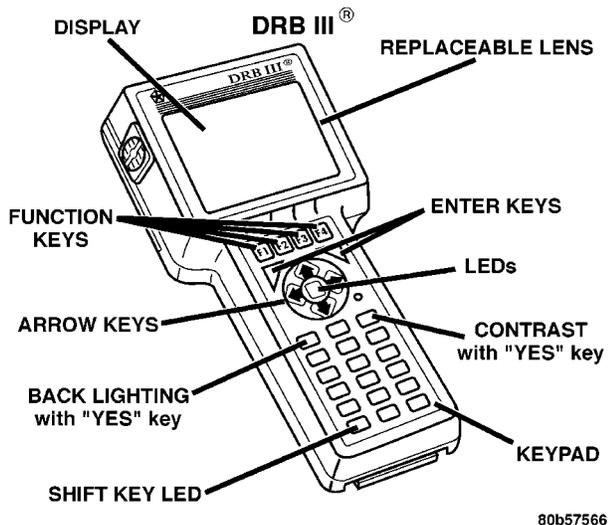
3.4.1 DRBIII® DOES NOT POWER UP

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 and grounds to Data Link connector. A minimum of 11 volts is required to adequately power the DRBIII®.

If all connections are proper, 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.



80b57566

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 drive wheels.

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

When diagnosing an antilock brake system problem, it is important to follow approved procedures where applicable. These procedures can be found in service manual procedures. Following these procedures is very important to the safety of individuals performing 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 and adjustable pedals systems are intended to be serviced in assembly only. Attempting to remove or repair certain system 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 SPECIFICATION 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 the 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
- Do not exceed the limits shown in the table below:

GENERAL INFORMATION

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 the load
- Disconnect the live test lead before disconnecting the common 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 WARNINGS

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.

WARNING: 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 system components for damage and for disconnected connectors. A visual inspection consists of physically looking for the possible cause of a malfunction. A careful and thorough visual inspection of components may quickly identify the cause of a malfunction and eliminate the need for diagnostic testing.

PERFORM THE FOLLOWING VISUAL INSPECTIONS BEFORE DOING ANY DIAGNOSTIC TESTING. If a malfunction is not resolved by the visual inspection, proceed with diagnostic testing according to the instructions in the manual.

See Section 8.0 (Component Locations) for pictures identifying the location of system components.

Brake Fluid Level	Visually inspect for the proper fluid level within the fluid reservoir.
Hydraulic Control Unit	Visually inspect the hydraulic assemblies for leaks and for damaged or disconnected connectors.
Fuses	Visually inspect that all fuses are properly installed.
Wheel Speed Sensor Connectors	Visually inspect both front wheel speed sensor connectors for damage or disconnection. Inspect the rear axle speed sensor connectors.
Brake Fluid Lines	Visually inspect brake fluid lines for any leaks or damage.
Wheel Speed Sensors	Visually inspect all wheel speed sensor(s) and tone wheel(s) for any damage.
Controller Antilock Brake (CAB)	Visually inspect the CAB for a secure mounting and the CAB connector for damage or loose connection.
Base Brake System	Visually inspect the condition of the parking brake, rotors, drums, and calipers.

Adjustable Pedals Motor	Visually inspect connections and mounting for damage and misalignment.
Adjustable Pedals	Visually inspect the mechanical components of the adjustable pedals system for damage and misalignment.
Adjustable Pedals Switch	Visually inspect the Adjustable Pedals Switch for damage and disconnection.

2. Connect the DRBIII® to the Data Link Connector (DLC).

3. With the DRBIII®, read active and stored trouble codes and **record them**. If you encounter a “NO RESPONSE” message on the DRBIII® while accessing diagnostic menu, perform DRBIII® No Response Message test. For other DRBIII® related communication problems, refer to the Vehicle Communications test in the Body Diagnostic manual. Using the DRBIII®, either reset the module to erase all stored trouble codes or use the erase command after reading all diagnostic trouble codes.

4. Turn ignition off, then on. If the diagnostic trouble code doesn't come back, refer to the diagnostic trouble code description. If the DRBIII® displays diagnostic trouble codes, proceed to the appropriate diagnostic test(s). If no diagnostic trouble codes are present at the time, perform the System Verification Test. **WARNING: BEFORE PERFORMING ANY ROAD TEST, VERIFY THAT FULL BRAKING CAPABILITY IS PRESENT.**

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
AC	alternating current
APS	adjustable pedals system
CAB	controller antilock brake
DLC	data link connector
DRP	dynamic rear proportioning
DTC	diagnostic trouble code
EBA	electronic brake apportioning
EBC	electronic brake controller
EVBP	electronic variable brake proportioning
4WD	four wheel drive
FCM	front control module
HCU	hydraulic control unit
IC	integrated circuit
IPM	integrated power module
LF	left front
NGC	next generation control
NVRAM	non-volatile random access memory
PCI	programmable communication interface (vehicle communication bus)
PWM	pulse width modulation
R	rear
RAM	random access memory
RF	right front
ROM	read only memory
RWAL	rear wheel antilock
WSS	wheel speed sensor

7.0

DIAGNOSTIC INFORMATION AND
PROCEDURES

ADJUSTABLE PEDALS

Symptom:

APS RELAY CONTROL CIRCUIT HIGH

When Monitored and Set Condition:

APS RELAY CONTROL CIRCUIT HIGH

When Monitored: Ignition on.

Set Condition: When the Front Control Module detects a short to voltage on the Adjustable Pedals Relay Control circuit.

POSSIBLE CAUSES

ADJUSTABLE PEDALS RELAY

FRONT CONTROL MODULE INTERNAL FAULT

INTERMITTENT DTC

ADJUSTABLE PEDAL CONTROL CIRCUIT SHORT TO VOLTAGE

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, record and erase DTC's. Turn the ignition on. With the DRBIII®, read DTC's. Does the DRBIII® display APS RELAY CONTROL CIRCUIT DTC active? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition off. Replace the Adjustable Pedals Relay with a known good relay. Turn the ignition on. With the DRBIII®, read DTC's. Does the DRBIII® display APS RELAY CONTROL CIRCUIT HIGH DTC active? Yes → Go To 3 No → Replace the Adjustable Pedals Relay in accordance with the Service Information. Perform ADJUSTABLE PEDALS VERIFICATION TEST - VER 1.	All

APS RELAY CONTROL CIRCUIT HIGH — Continued

TEST	ACTION	APPLICABILITY
3	<p>Turn the ignition off. Remove the Front Control Module from the IPM. Remove the Adjustable Pedals Relay. Turn the ignition ON. Measure the voltage between Adjustable Pedal Relay Control circuit and ground. Is there any voltage present?</p> <p>Yes → Repair the Adjustable Pedal Relay Control circuit for a short to voltage. Perform ADJUSTABLE PEDALS VERIFICATION TEST - VER 1.</p> <p>No → Replace the Front Control Module in accordance with the Service Information. Perform ADJUSTABLE PEDALS VERIFICATION TEST - VER 1.</p>	All
4	<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. Were any problems found?</p> <p>Yes → Repair as necessary. Perform ADJUSTABLE PEDALS VERIFICATION TEST - VER 1.</p> <p>No → Test Complete.</p>	All

ADJUSTABLE PEDALS

Symptom:

APS RELAY CONTROL CIRCUIT LOW

When Monitored and Set Condition:

APS RELAY CONTROL CIRCUIT LOW

When Monitored: Ignition on.

Set Condition: When the Front Control Module detects a short to ground on the Adjustable Pedals Relay Control circuit.

POSSIBLE CAUSES

ADJUSTABLE PEDALS RELAY

ADJUSTABLE PEDAL CONTROL CIRCUIT SHORT TO GROUND

FRONT CONTROL MODULE INTERNAL FAULT

INTERMITTENT DTC

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, record and erase DTC's. Turn the ignition on. With the DRBIII®, read DTC's. Does the DRBIII® display APS RELAY CONTROL CIRCUIT DTC active? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition off. Replace the Adjustable Pedals Relay with a known good relay. Turn the ignition on. With the DRBIII®, read DTC's. Does the DRBIII® display APS RELAY CONTROL CIRCUIT LOW DTC active? Yes → Go To 3 No → Replace the Adjustable Pedals Relay in accordance with the Service Information. Perform ADJUSTABLE PEDALS VERIFICATION TEST - VER 1.	All

APS RELAY CONTROL CIRCUIT LOW — Continued

TEST	ACTION	APPLICABILITY
3	<p>Turn the ignition off. Remove the Front Control Module from the IPM. Remove the Adjustable Pedals Relay. Measure the resistance between ground and the Adjustable Pedal Relay Control circuit. Is the resistance open?</p> <p>Yes → Replace the Front Control Module in accordance with the Service Information. Perform ADJUSTABLE PEDALS VERIFICATION TEST - VER 1.</p> <p>No → Repair the Adjustable Pedal Relay Control circuit for a short to ground. Perform ADJUSTABLE PEDALS VERIFICATION TEST - VER 1.</p>	All
4	<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. Were any problems found?</p> <p>Yes → Repair as necessary. Perform ADJUSTABLE PEDALS VERIFICATION TEST - VER 1.</p> <p>No → Test Complete.</p>	All

ADJUSTABLE PEDALS

Symptom:

APS RELAY CONTROL CIRCUIT OPEN

When Monitored and Set Condition:

APS RELAY CONTROL CIRCUIT OPEN

When Monitored: Ignition on.

Set Condition: When the Front Control Module detects an open on the Adjustable Pedals Relay Control circuit.

POSSIBLE CAUSES

ADJUSTABLE PEDALS RELAY
 APS RELAY CONTROL CIRCUIT OPEN
 FRONT CONTROL MODULE INTERNAL FAULT
 INTERMITTENT DTC

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, record and erase DTC's. Turn the ignition on. With the DRBIII®, read DTC's. Does the DRBIII® display APS RELAY CONTROL CIRCUIT DTC active? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition off. Replace the Adjustable Pedals Relay with a known good relay. Turn the ignition on. With the DRBIII®, read DTC's. Does the DRBIII® display APS RELAY CONTROL CIRCUIT OPEN DTC active? Yes → Go To 3 No → Replace the Adjustable Pedals Relay in accordance with the Service Information. Perform ADJUSTABLE PEDALS VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Remove the Front Control Module from the IPM. Remove the Adjustable Pedals Relay. Measure the resistance of the Adjustable Pedal Relay Control circuit. Is the resistance open? Yes → Repair the Adjustable Pedal Relay Control circuit for an open. Perform ADJUSTABLE PEDALS VERIFICATION TEST - VER 1. No → Replace the Front Control Module in accordance with the Service Information. Perform ADJUSTABLE PEDALS VERIFICATION TEST - VER 1.	All

APS RELAY CONTROL CIRCUIT OPEN — 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>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 ADJUSTABLE PEDALS VERIFICATION TEST - VER 1.</p> <p> No → Test Complete.</p>	All

Symptom:

BODY STYLE MISMATCH - 85

When Monitored and Set Condition:

BODY STYLE MISMATCH - 85

When Monitored: Ignition on.

Set Condition: When both the traceability code number and body style can not be read from the NVRAM or they are invalid.

POSSIBLE CAUSES

WRONG CAB OR CAB NOT PROGRAMMED FROM FACTORY

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTC's. Does the DRBIII® display BODY STYLE MISMATCH? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:
BRAKE SWITCH CIRCUIT - 81

When Monitored and Set Condition:

BRAKE SWITCH CIRCUIT - 81

When Monitored: Ignition on.

Set Condition: Continuous brake applied signal after ignition turn-on and remaining with sensed speed above 37.5 MPH (RWAL) or 15 MPH (ABS) for over 10 seconds and/or ABS active for at least a second with brake switch released and never sensed brake applied since power up.

POSSIBLE CAUSES

VERIFY THE CONCERN
 CAB BRAKE STATUS
 BRAKE SWITCH OPEN
 BRAKE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
 BRAKE SWITCH SENSE CIRCUIT OPEN
 BRAKE SWITCH GROUND CIRCUIT OPEN
 CAB -- INTERNAL CONCERN

TEST	ACTION	APPLICABILITY
1	<p>NOTE: IF DRIVER "RIDES" THE BRAKES, A BRAKE CIRCUIT DIAGNOSTIC CODE MAYBE SET. Turn the ignition off. Ensure all accessories are turned off and the battery is fully charged. Turn the ignition on. With the DRBIII®, erase DTCs. CAUTION: Ensure braking capability is available before road testing. Road test the vehicle for at least 5 minutes over 40 MPH. Perform several antilock braking stops. Monitor the Input/Output status of the brake switch while driving. With the DRBIII®, read DTCs. Does the original DTC recur and/or intermittent brake switch operation occur?</p> <p>Yes → Go To 2</p> <p>No → Brake Switch circuit is operating correctly at this time. Check for operator error. Inspect for intermittent condition using the wiring diagram/schematic as a guide, inspect the wiring and connectors for damage. Perform ABS VERIFICATION TEST - VER 1.</p>	All

BRAKES (CAB)

BRAKE SWITCH CIRCUIT - 81 — Continued

TEST	ACTION	APPLICABILITY
2	<p>Turn ignition on. With the DRBIII® in Inputs/Outputs, read the Brake Switch status. Press and release the brake pedal. Does the Brake Switch status match that of the Brake Switch?</p> <p>Yes → Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for damage. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 3</p>	All
3	<p>Disconnect the Brake Lamp Switch harness connector. With the DRBIII® in Inputs/Outputs, read the Brake Switch state. Connect and disconnect a jumper wire between the Brake Switch Ground and Sense circuits. Does the DRBIII® display OPEN and CLOSED (jumper connected)?</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>Turn the ignition off. Disconnect the CAB harness connector. Disconnect the Brake Lamp Switch harness connector. Measure the voltage of the Brake Switch Sense circuit. Is there any voltage present?</p> <p>Yes → Repair the Brake Switch Sense circuit for a short to voltage. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 5</p>	All
5	<p>Turn the ignition off. Disconnect the CAB harness connector. Disconnect the Brake Lamp Switch harness connector. Measure the resistance of the Brake Switch Sense circuit between the CAB connector and the Brake Lamp Switch connector. Is the Brake Switch Sense circuit open?</p> <p>Yes → Repair the Brake Switch Sense circuit for an open circuit. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 6</p>	All
6	<p>Turn the ignition off. Disconnect the Brake Lamp Switch harness connector. Measure the resistance of the Ground circuit. Is the resistance below 5.0 ohms?</p> <p>Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Repair the Brake Switch Ground circuit for an open circuit. Perform ABS VERIFICATION TEST - VER 1.</p>	All

Symptom:

ECU INTERNAL FAILURE - 75

When Monitored and Set Condition:

ECU INTERNAL FAILURE - 75

When Monitored: Ignition ON.

Set Condition: When the CAB internal microprocessor has an open/short in the status line which fails to transmit at the correct frequency.

POSSIBLE CAUSES

WHEEL SPEED SENSOR FAILURE

CAB INTERNAL FAILURE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. NOTE: Ensure Wheel Speed Sensors are working properly. With the DRBIII®, read DTC's. Does the DRBIII® display ECU INTERNAL FAILURE and WHEEL SPEED SENSOR DTC's? Yes → Refer to the Table of Contents information in this manual for the related Wheel Speed Sensor DTC's. Perform ABS VERIFICATION TEST - VER 1. No → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1.	All

BRAKES (CAB)

Symptom:

EXCESSIVE DUMP TIME - 69

When Monitored and Set Condition:

EXCESSIVE DUMP TIME - 69

When Monitored: Ignition on.

Set Condition: Antilock mode is active. Wheel speed is below 4 MPH (RWAL) and above 4 MPH (ABS). Vehicle is in two wheel drive mode. Wheel speed history ruling out any unusual events during the proceeding 15 seconds (RWAL) and 9 seconds (ABS). Need for more than maximum allowable dump cycles.

POSSIBLE CAUSES

BRAKE SYSTEM MECHANICAL CONCERN
 TONE WHEEL CONCERN
 WHEEL BEARING FAULT
 WHEEL SPEED WIRING HARNESS CONCERN
 HCU INTERNAL CONCERN
 LOADED WHEEL BEARING/SUSPENSION CONCERN

TEST	ACTION	APPLICABILITY
1	Inspect the front and rear brakes for anything that would cause the wheel(s) to lock during braking. Is there anything mechanically wrong with the Braking System? Yes → Repair the mechanical braking system as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition off. Inspect the Tone Wheel for damaged, missing teeth or looseness. Note: The Tone Wheel Teeth should be perfectly square, not bent or nicked. Is the Tone Wheel OK? Yes → Go To 3 No → Replace the Tone Wheel in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Inspect the wheel bearings for excessive run out or clearance. Is the bearing clearance OK? Yes → Go To 4 No → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.	All

EXCESSIVE DUMP TIME - 69 — Continued

TEST	ACTION	APPLICABILITY
4	<p>Engine Running. Raise and support the vehicle. With the DRBIII® in Sensors, read the Wheel Speed Sensor signals. WARNING: BE SURE TO KEEP HANDS, FEET AND CLOTHING CLEAR OF ROTATING COMPONENTS. Allow the drive wheels to rotate. Rotate the non-driven wheels by hand. Wiggle Wheel Speed wiring harnesses. With the DRBIII® in Sensors, read the Wheel Speed Sensor outputs. Is there a wheel speed dropout when a wiring harness is wiggled?</p> <p>Yes → Repair the Wheel Speed wiring harness as necessary. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 5</p>	All
5	<p>CAUTION: Ensure vehicle has braking capability before road test. Engine Running. With the DRBIII® in Sensors, read the Wheel Speed Sensor outputs. NOTE: Have an assistant drive the vehicle, while monitoring the DRBIII®. Road test vehicle so wheel bearings and suspension are loaded. With the DRBIII® in Sensors, read the Wheel Speed Sensor outputs. Is there a Wheel Speed Sensor dropout?</p> <p>Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Replace the Hydraulic Control Unit in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p>	All

BRAKES (CAB)

Symptom:

FOUNDATION BRAKE - 78

When Monitored and Set Condition:

FOUNDATION BRAKE - 78

When Monitored: Ignition on.

Set Condition: Low feedback voltage from the Brake Fluid Level Switch Sense circuit.

POSSIBLE CAUSES

LOW BRAKE FLUID LEVEL
 BRAKE FLUID LEVEL SWITCH SENSE CIRCUIT SHORT TO GROUND
 BRAKE FLUID LEVEL SWITCH OPEN/SHORT
 BRAKE FLUID LEVEL SWITCH GROUND CIRCUIT OPEN
 CAB - INTERNAL CONCERN
 FOUNDATION BRAKE INTERMITTENT DTC

TEST	ACTION	APPLICABILITY
1	Release the Parking Brake. Turn the ignition off. Turn the ignition on. Watch the Instrument Cluster. Does the Red Brake Warning Indicator come on and then stay on? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Inspect the Brake Fluid Level in the Master Cylinder Reservoir. Is the Brake Fluid Level Low? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Go To 3	All
3	Turn the ignition off. Disconnect the Brake Fluid Level Switch connector Note: Check connector - Clean/repair as necessary. Disconnect the CAB connector. Note: Check connector - Clean/repair as necessary. Measure the resistance between ground and the Brake Fluid Level Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the Brake Fluid Level Switch Sense circuit for a short to ground. Perform ABS VERIFICATION TEST - VER 1. No → Go To 4	All

FOUNDATION BRAKE - 78 — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Brake Fluid Level Switch connector. Note: Check connector - Clean/repair as necessary. NOTE: Ensure Master Cylinder float switch is not stuck in down position. On the switch, measure the resistance between both of the Brake Fluid Level Switch terminals. NOTE: Resistance should be 10,000 ohms with a full Master Cylinder Reservoir. Is the resistance below 9,500 ohms or over 10,500 ohms? Yes → Replace the Brake Fluid Level Switch in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Go To 5	All
5	Turn the ignition off. Disconnect the Brake Fluid Level Switch connector. Note: Check connector - Clean/repair as necessary. Measure the resistance of the Brake Fluid level Switch Ground circuit. Is the resistance below 5.0 ohms? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1. No → Repair the Brake Fluid Level Switch ground 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 wiring harness/connectors as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom List:

INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR - 27
INTERMITTENT SIGNAL FROM REAR SENSOR - 37
INTERMITTENT SIGNAL FROM RIGHT FRONT SENSOR - 23
LEFT FRONT SENSOR OPEN - 25
LEFT FRONT SENSOR SHORTED - 90
NO SIGNAL FROM LEFT FRONT SENSOR - 26
NO SIGNAL FROM REAR SENSOR - 36
NO SIGNAL FROM RIGHT FRONT SENSOR - 22
REAR SENSOR OPEN - 35
REAR SENSOR SHORTED - 93
RIGHT FRONT SENSOR OPEN - 21
RIGHT FRONT SENSOR SHORTED - 91

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR - 27.

When Monitored and Set Condition:

INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR - 27

When Monitored: Ignition turned on for at least 3.5 seconds. Average filtered speed for the two front wheels above 6 km/h (4 mph). Speed for each suspect sensor above 32 km/h (20 mph) (brake applied or ABS active) or 19 km/h (12 mph) (brake released or ABS inactive).

Set Condition: When there is a sudden change of output signal from the sensor.

INTERMITTENT SIGNAL FROM REAR SENSOR - 37

When Monitored: Ignition turned on for at least 3.5 seconds. Average filtered speed for the wheels above 19 km/h (12 mph) (brake released or ABS inactive) or 32 km/h (20 mph) (brake applied or ABS active).

Set Condition: When there is a sudden change of output signal from the sensor.

INTERMITTENT SIGNAL FROM RIGHT FRONT SENSOR - 23

When Monitored: Ignition turned on for at least 3.5 seconds. Average filtered speed for the two front wheels above 6 km/h (4 mph). Speed for each suspect sensor above 32 km/h (20 mph) (brake applied or ABS active) or 19 km/h (12 mph) (brake released or ABS inactive).

Set Condition: When there is a sudden change of output signal from the sensor.

LEFT FRONT SENSOR OPEN - 25

When Monitored: Ignition on.

Set Condition: When the CAB detects an open wheel speed sensor circuit.

INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR - 27 — Continued

LEFT FRONT SENSOR SHORTED - 90

When Monitored: Ignition on.

Set Condition: When no output signal and continuously excessive sensor resistance is detected.

NO SIGNAL FROM LEFT FRONT SENSOR - 26

When Monitored: Ignition on.

Set Condition: When one sensors signal is prevented above 4 mph while one or more other sensors are indicating that the vehicle is moving above 8 mph.

NO SIGNAL FROM REAR SENSOR - 36

When Monitored: Ignition on.

Set Condition: When one sensors signal is prevented above 4 mph while one or more other sensors are indicating that the vehicle is moving above 8 mph.

NO SIGNAL FROM RIGHT FRONT SENSOR - 22

When Monitored: Ignition on.

Set Condition: When one sensors signal is prevented above 4 mph while one or more other sensors are indicating that the vehicle is moving above 8 mph.

REAR SENSOR OPEN - 35

When Monitored: Ignition on.

Set Condition: When the CAB detects an open wheel speed sensor circuit.

REAR SENSOR SHORTED - 93

When Monitored: Ignition on.

Set Condition: When no output signal and continuously excessive sensor resistance is detected.

RIGHT FRONT SENSOR OPEN - 21

When Monitored: Ignition on.

Set Condition: When the CAB detects an open wheel speed sensor circuit.

RIGHT FRONT SENSOR SHORTED - 91

When Monitored: Ignition on.

Set Condition: When no output signal and continuously excessive sensor resistance is detected.

INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR - 27 — Continued

POSSIBLE CAUSES	
WHEEL SPEED SENSOR OR CONNECTOR DAMAGE, LOOSENESS OR METAL CHIPS	
INTERMITTENT DTC - TOWING WITH IGNITION ON	
WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO GROUND	
WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO GROUND	
WHEEL SPEED SENSOR SHORTED TO GROUND	
CAB - INTERNAL SHORT OR OPEN	
WHEEL SPEED SENSOR (+) CIRCUIT OPEN	
WHEEL SPEED SENSOR (-) CIRCUIT OPEN	
WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE	
WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE	
WHEEL SPEED SENSOR CIRCUITS SHORT TOGETHER	
TONE WHEEL DAMAGED/MISSING	
EXCESSIVE WHEEL SPEED SENSOR AIR GAP	
WHEEL BEARING LOOSE/BINDING	
WHEEL SPEED SENSOR RESISTANCE OUT OF SPECIFICATION	

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 the appropriate Wheel Speed Sensor circuit failure DTC right now? Yes → Go To 2 No → Go To 15	All
2	Turn the ignition off. Inspect the appropriate Wheel Speed Sensor for looseness. Inspect the appropriate Wheel Speed Sensor harness connector. Check connectors - Clean/repair as necessary. Inspect the appropriate Wheel Speed Sensor for metal chips on sensor. Is the Sensor or Connector damaged, loose, or metal chips on sensor present? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Go To 3	All

INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR - 27 — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the appropriate CAB harness connector for the effected Wheel Speed Sensor. Note: Check connector - Clean/repair as necessary. Measure the resistance across the appropriate Wheel Speed Sensor (+) and (-) circuits at the CAB connector at 77°F. Is the resistance 1800 - 2200(Front) OR 1600 - 2300(Rear) ohms? Yes → Go To 4 No → Go To 7	All
4	Turn the ignition off. Disconnect the appropriate Wheel Speed Sensor connector. Disconnect the appropriate CAB harness connector for the effected Wheel Speed Sensor. Measure the resistance between the appropriate Wheel Speed Sensor (+) Circuit and ground. Is the resistance open? Yes → Go To 5 No → Repair the appropriate Wheel Speed Sensor (+) Circuit Short to Ground. Perform ABS VERIFICATION TEST - VER 1.	All
5	Turn the ignition off. Disconnect the appropriate Wheel Speed Sensor connector. Note: Check connector - Clean/repair as necessary. Disconnect the appropriate CAB harness connector for the effected Wheel Speed Sensor. Note: Check connector - Clean/repair as necessary. Measure the resistance between the appropriate Wheel Speed Sensor (-) circuit and ground. Is the resistance open? Yes → Go To 6 No → Repair the appropriate Wheel Speed Sensor (-) Circuit Short to Ground. Perform ABS VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Disconnect the appropriate Wheel Speed Sensor connector. Note: Check connector - Clean/repair as necessary. On the component, measure the resistance between both of the appropriate Wheel Speed Sensor terminals and ground. Is the resistance open? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1. No → Replace the appropriate Wheel Speed Sensor in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All

INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR - 27 — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the appropriate Wheel Speed Sensor connector. Note: Check connector - Clean/repair as necessary. Disconnect the appropriate CAB harness connector for the effected Wheel Speed Sensor. Note: Check connector - Clean/repair as necessary. Measure the resistance of the appropriate Wheel Speed Sensor (+) circuit. Is the resistance below 5 ohms? Yes → Go To 8 No → Repair the appropriate Wheel Speed Sensor (+) Circuit Open. Perform ABS VERIFICATION TEST - VER 1.	All
8	Turn the ignition off. Disconnect the appropriate Wheel Speed Sensor connector. Note: Check connector - Clean/repair as necessary. Disconnect the appropriate CAB harness connector for the effected Wheel Speed Sensor. Note: Check connector - Clean/repair as necessary. Measure the resistance of the appropriate Wheel Speed Sensor (-) circuit. Is the resistance below 5 ohms? Yes → Go To 9 No → Repair the appropriate Wheel Speed Sensor (-) Circuit Open. Perform ABS VERIFICATION TEST - VER 1.	All
9	Turn the ignition off. Disconnect the appropriate Wheel Speed Sensor harness connector. Note: Check connector - Clean/repair as necessary. Disconnect the appropriate CAB harness connector for the effected Wheel Speed Sensor. Note: Check connector - Clean/repair as necessary. Turn the ignition on. Measure the voltage of the appropriate Wheel Speed Sensor (+) Circuit. Is there any voltage present? Yes → Repair appropriate Wheel Speed Sensor (+) Circuit Shorted to Voltage. Perform ABS VERIFICATION TEST - VER 1. No → Go To 10	All
10	Turn the ignition off. Disconnect the appropriate Wheel Speed Sensor connector. Note: Check connector - Clean/repair as necessary. Disconnect the appropriate CAB harness connector for the effected Wheel Speed Sensor. Note: Check connector - Clean/repair as necessary. Turn the ignition on. Measure the voltage of the appropriate Wheel Speed Sensor (-) Circuit. Is there any voltage present? Yes → Repair the appropriate Wheel Speed Sensor (-) Circuit Short to Voltage. Perform ABS VERIFICATION TEST - VER 1. No → Go To 11	All

INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR - 27 — Continued

TEST	ACTION	APPLICABILITY
11	Turn the ignition off. Disconnect the appropriate CAB harness connector for the effected Wheel Speed Sensor. Disconnect the appropriate Wheel Speed Sensor harness connector. Measure the resistance through the appropriate Wheel Speed Sensor (+) and (-) circuits at the CAB harness connector. Is the resistance open? Yes → Go To 12 No → Repair the appropriate Wheel Speed Sensor shorted together circuits . Perform ABS VERIFICATION TEST - VER 1.	All
12	Turn the ignition off. Inspect for damaged or missing Tone Wheel. NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked. Is the appropriate Tone Wheel ok? Yes → Go To 13 No → Replace the appropriate Tone Wheel(s) in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All
13	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? Yes → Go To 14 No → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.	All
14	Turn the ignition off. Inspect the wheel bearings for excessive run out or clearance. NOTE: Refer to the appropriate service information, as necessary, for procedures or specifications. Is the bearing clearance OK? Yes → Replace the appropriate Wheel Speed Sensor in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.	All
15	Turn the ignition off. NOTE: Ensure vehicle has not been towed with ignition ON 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

BRAKES (CAB)

Symptom:

INTERNAL MAIN RELAY OPEN - 65

When Monitored and Set Condition:

INTERNAL MAIN RELAY OPEN - 65

When Monitored: Ignition on.

Set Condition: When all solenoid feedback voltages are low when they are expected to be high(no solenoids energized).

POSSIBLE CAUSES

INTERMITTENT DTC
 OPEN FUSED B(+) AND FUSED IGNITION SWITCH OUTPUT (RUN)
 OPEN GROUND CIRCUITS
 CAB - INTERNAL CONCERN

TEST	ACTION	APPLICABILITY
1	<p>NOTE: Ensure the battery is fully charged. Turn the ignition on. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTC's. Is the INTERNAL MAIN RELAY OPEN DTC present?</p> <p>Yes → Go To 2 No → Go To 4</p>	All
2	<p>NOTE: CHECK FOR OPEN FUSES. Turn the ignition off. Disconnect the CAB harness connector. Check connectors - Clean/repair as necessary. Turn the ignition on. Measure the voltage of the Fused B(+) and Fused Ignition Switch Output (RUN) circuits. Is the voltage above 11 volts?</p> <p>Yes → Go To 3 No → Repair the appropriate circuit(s) for an open. Perform ABS VERIFICATION TEST - VER 1.</p>	All

INTERNAL MAIN RELAY OPEN - 65 — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the CAB harness connector. Check connectors - Clean/repair as necessary. Measure the resistance of the Ground circuits in the CAB harness connector. Is the resistance below 5.0 ohms? Yes → Replace and program the CAB Module in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Repair the Ground circuit(s) for an open. Perform ABS VERIFICATION TEST - VER 1.	All
4	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:

INTERNAL MAIN RELAY SHORTED - 66

When Monitored and Set Condition:

INTERNAL MAIN RELAY SHORTED - 66

When Monitored: Ignition on.

Set Condition: When the relay feedback voltage is high when the power relay is supposed to be open.

POSSIBLE CAUSES

INTERMITTENT DTC

OPEN FUSED B(+) AND FUSED IGNITION SWITCH OUTPUT (RUN)

OPEN GROUND CIRCUITS

CAB - INTERNAL CONCERN

TEST	ACTION	APPLICABILITY
1	<p>NOTE: Ensure the battery is fully charged. Turn the ignition on. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTC's. Is the INTERNAL MAIN RELAY SHORTED DTC present?</p> <p>Yes → Go To 2 No → Go To 4</p>	All
2	<p>NOTE: CHECK FOR OPEN FUSES. Turn the ignition off. Disconnect the CAB harness connector. Check connectors - Clean/repair as necessary. Turn the ignition on. Measure the voltage of the Fused B(+) and Fused Ignition Switch Output (RUN) circuits. Is the voltage above 11 volts?</p> <p>Yes → Go To 3 No → Repair the appropriate circuit(s) for an open. Perform ABS VERIFICATION TEST - VER 1.</p>	All

INTERNAL MAIN RELAY SHORTED - 66 — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the CAB harness connector. Check connectors - Clean/repair as necessary. Measure the resistance of the Ground circuits in the CAB harness connector. Is the resistance below 5.0 ohms? Yes → Replace and program the CAB Module in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Repair the Ground circuit(s) for an open. Perform ABS VERIFICATION TEST - VER 1.	All
4	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 List:

LEFT FRONT DUMP SOLENOID OPEN - 46
LEFT FRONT DUMP SOLENOID SHORTED - 48
LEFT FRONT ISOLATION SOLENOID OPEN - 45
LEFT FRONT ISOLATION SOLENOID SHORTED - 47
REAR DUMP SOLENOID OPEN - 52
REAR DUMP SOLENOID SHORTED - 54
REAR ISOLATION SOLENOID OPEN - 51
REAR ISOLATION SOLENOID SHORTED - 53
RIGHT FRONT DUMP SOLENOID OPEN - 42
RIGHT FRONT DUMP SOLENOID SHORTED - 44
RIGHT FRONT ISOLATION SOLENOID OPEN - 41
RIGHT FRONT ISOLATION SOLENOID SHORTED - 43

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be LEFT FRONT DUMP SOLENOID OPEN - 46.

When Monitored and Set Condition:

LEFT FRONT DUMP SOLENOID OPEN - 46

When Monitored: Ignition on.

Set Condition: When there is low logic feedback voltage from the solenoid when it is expected to be high (solenoid not energized).

LEFT FRONT DUMP SOLENOID SHORTED - 48

When Monitored: Ignition on.

Set Condition: When there is high logic feedback voltage from the solenoid when it is supposed to be low (solenoid energized).

LEFT FRONT ISOLATION SOLENOID OPEN - 45

When Monitored: Ignition on.

Set Condition: When there is low logic feedback voltage from the solenoid when it is expected to be high (solenoid not energized).

LEFT FRONT ISOLATION SOLENOID SHORTED - 47

When Monitored: Ignition on.

Set Condition: When there is high logic feedback voltage from the solenoid when it is supposed to be low (solenoid energized).

LEFT FRONT DUMP SOLENOID OPEN - 46 — Continued

REAR DUMP SOLENOID OPEN - 52

When Monitored: Ignition on.

Set Condition: When there is low logic feedback voltage from the solenoid when it is expected to be high (solenoid not energized).

REAR DUMP SOLENOID SHORTED - 54

When Monitored: Ignition on.

Set Condition: When there is high logic feedback voltage from the solenoid when it is supposed to be low (solenoid energized).

REAR ISOLATION SOLENOID OPEN - 51

When Monitored: Ignition on.

Set Condition: When there is low logic feedback voltage from the solenoid when it is expected to be high (solenoid not energized).

REAR ISOLATION SOLENOID SHORTED - 53

When Monitored: Ignition on.

Set Condition: When there is high logic feedback voltage from the solenoid when it is supposed to be low (solenoid energized).

RIGHT FRONT DUMP SOLENOID OPEN - 42

When Monitored: Ignition on.

Set Condition: When there is low logic feedback voltage from the solenoid when it is expected to be high (solenoid not energized).

RIGHT FRONT DUMP SOLENOID SHORTED - 44

When Monitored: Ignition on.

Set Condition: When there is high logic feedback voltage from the solenoid when it is supposed to be low (solenoid energized).

RIGHT FRONT ISOLATION SOLENOID OPEN - 41

When Monitored: Ignition on.

Set Condition: When there is low logic feedback voltage from the solenoid when it is expected to be high (solenoid not energized).

RIGHT FRONT ISOLATION SOLENOID SHORTED - 43

When Monitored: Ignition on.

Set Condition: When there is high logic feedback voltage from the solenoid when it is supposed to be low (solenoid energized).

LEFT FRONT DUMP SOLENOID OPEN - 46 — Continued

POSSIBLE CAUSES
INTERMITTENT DTC OPEN FUSED B(+) AND FUSED IGNITION SWITCH OUTPUT (RUN) OPEN GROUND CIRCUITS CAB - INTERNAL CONCERN

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTC's. Is there a OPEN SOLENOID or SHORTED SOLENOID DTC present? Yes → Go To 2 No → Go To 4	All
2	NOTE: CHECK FOR OPEN FUSES. Turn the ignition off. Disconnect the CAB harness connector. Check connectors - Clean/repair as necessary. Turn the ignition on. Measure the voltage of the Fused B(+) and Fused Ignition Switch Output (RUN) circuits. Is the voltage above 11 volts? Yes → Go To 3 No → Repair the appropriate circuit(s) for an open. Perform ABS VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the CAB harness connector. Check connectors - Clean/repair as necessary. Measure the resistance of the Ground circuits in the CAB harness connector. Is the resistance below 5.0 ohms? Yes → Replace and program the CAB Module in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Repair the Ground circuit(s) for an open. Perform ABS VERIFICATION TEST - VER 1.	All

LEFT FRONT DUMP SOLENOID OPEN - 46 — Continued

TEST	ACTION	APPLICABILITY
4	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

BRAKES (CAB)

Symptom:

MISMATCHED VIN - 84

When Monitored and Set Condition:

MISMATCHED VIN - 84

When Monitored: Ignition on.

Set Condition: Vehicle line or vehicle series information transmitted from PCM does not match the expected values for ten seconds and/or vehicle line or series information not transmitted by the PCM for ten seconds.

POSSIBLE CAUSES

INTERMITTENT DTC
 WRONG VIN PROGRAMMED IN PCM/ WRONG PCM
 INCORRECT CAB FOR VEHICLE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. Wait ten seconds. Did the ABS Warning Indicator come on after ten seconds? Yes → Go To 2 No → Go To 3	All
2	Turn the ignition on. With the DRBIII®, read the VIN status. Compare programmed VIN with vehicle VIN. Is the correct VIN programmed in the correct PCM for the vehicle line? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1. No → Program the correct VIN into the correct PCM for the vehicle line. Perform ABS VERIFICATION TEST - VER 1.	All
3	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:

NUMBER OF TONE RING TEETH OUT OF RANGE - 82

When Monitored and Set Condition:

NUMBER OF TONE RING TEETH OUT OF RANGE - 82

When Monitored: Ignition on.

Set Condition: When the teeth value is not in the range between 90 and 130.

POSSIBLE CAUSES

CAB - SETTING FALSE CODE

TONE RING/AXLE SIZE MISMATCH

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read the axle size programmed into the CAB. Inspect and identify the vehicle axle size. Compare the axle size programmed into the CAB, and the actual axle size installed into the vehicle. Does the programmed axle size match the installed axle? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1. No → Using the DRBIII®, reprogram the CAB for the correct axle. Perform ABS VERIFICATION TEST - VER 1.	All

Symptom List:

PUMP MOTOR CIRCUIT OPEN - 67

PUMP MOTOR STALLED - 68

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be PUMP MOTOR CIRCUIT OPEN - 67.

When Monitored and Set Condition:

PUMP MOTOR CIRCUIT OPEN - 67

When Monitored: Ignition on.

Set Condition: Ignition on for at least 3.5 seconds. ABS pump motor command never given during the current ABS command. Low feedback voltage from the low side of the motor.

PUMP MOTOR STALLED - 68

When Monitored: Ignition on.

Set Condition: When vehicle speed is above 15 mph without ABS active. Vehicle speed above 4 mph with a fault from the previous ignition cycle. ABS pump motor command given and then turned off. High feedback voltage from the low side of the motor continuously.

POSSIBLE CAUSES

ABS PUMP MOTOR INTERMITTENT DTC
FUSED B(+) CIRCUIT INTERMITTENTLY SHORTED TO GROUND
FUSED B(+) CIRCUIT SHORTED TO GROUND
CAB - FUSED B(+) CIRCUIT SHORTED TO GROUND
FUSE OPEN - PUMP MOTOR CIRCUIT
NO B+ SUPPLY TO FUSE
ABS PUMP MOTOR INOPERATIVE
FUSED B(+) CIRCUIT OPEN
GROUND CIRCUIT OPEN
GROUND CIRCUIT HIGH RESISTANCE
CAB - INTERNAL FAULT

PUMP MOTOR CIRCUIT OPEN - 67 — Continued

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. Turn the ignition off. With the DRBIII®, actuate the ABS pump motor. Did the Pump Motor operate when actuated? No → Go To 2 Yes → Go To 11	All
2	Turn the ignition off. Remove and inspect the ABS Pump Motor fuse. Is the Fuse open? Yes → Go To 3 No → Go To 6	All
3	Turn the ignition off. Make sure the Pump Motor connector is secure. Visually inspect the Fused B(+) circuit in the wiring harness from the ABS PUMP fuse to the CAB harness connector. Look for any sign of an intermittent short to ground. Is the wiring harness OK? Yes → Go To 4 No → Repair the Fused B(+) circuit short to ground. Perform ABS VERIFICATION TEST - VER 1.	All
4	Turn the ignition off. Remove the ABS PUMP Fuse. Disconnect the CAB harness connector. Make sure the ABS Pump Motor connector is secure. Note: Check connector - Clean/repair as necessary. Measure the resistance of the Fused B(+) circuit to ground. Is the resistance above 5.0 ohms? Yes → Go To 5 No → Repair the Fused B(+) circuit short to ground. Perform ABS VERIFICATION TEST - VER 1.	All
5	Turn the ignition off. Make sure the Pump Motor connector is secure. Remove the ABS PUMP Fuse. NOTE: The CAB must be connected for the results of this test to be valid. Measure the resistance between Fused (B)+ circuit and ground. Is the resistance open? Yes → Replace the ABS Pump Motor Fuse. If the fuse is open make sure to check for a short to ground. Perform ABS VERIFICATION TEST - VER 1. No → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1.	All

PUMP MOTOR CIRCUIT OPEN - 67 — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Remove the ABS PUMP Fuse. Disconnect the CAB harness connector. Note: Check connector - Clean/repair as necessary. Measure the resistance of the Fused B (+) circuit between the ABS PUMP Fuse Terminal and the CAB harness connector. Is the resistance below 5 ohms? Yes → Go To 7 No → Repair the Fused B(+) circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
7	Turn the ignition on. Measure the voltage of the B(+) supply at the ABS PUMP Fuse terminal. Is the voltage above 11 volts? Yes → Go To 8 No → Repair the B+ supply for an open. Perform ABS VERIFICATION TEST - VER 1.	All
8	Turn the ignition off. Disconnect the ABS Pump Motor connector. Connect a 10 gauge jumper wire between ABS Pump Motor Fused B (+) circuit and a 40 Amp Fused B (+) circuit. Connect a 10 gauge jumper wire between ABS Pump Motor ground circuit and ground. Monitor ABS Pump Motor operation. Is the ABS Pump Motor operating? Yes → Go To 9 No → Replace the ABS Pump Motor/Hydraulic Control Unit assembly. Perform ABS VERIFICATION TEST - VER 1.	All
9	Turn the ignition off. Disconnect the CAB harness connector. Note: Check connector - Clean/repair as necessary. Measure the resistance of the CAB Ground circuits. Is the resistance below 5.0 ohms? Yes → Go To 10 No → Repair the ground circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
10	Make sure the ABS Pump Motor connector is secure. Turn the ignition on. With the DRBIII®, enable ABS Pump Motor actuation. NOTE: ABS Pump Motor will not operate, but voltage will be applied. Measure the voltage drop across the ABS Ground circuit connection, with ABS Pump Motor actuation enabled. Is the voltage below 0.1 volt? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Repair the Ground circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All

PUMP MOTOR CIRCUIT OPEN - 67 — Continued

TEST	ACTION	APPLICABILITY
11	<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>Make sure the Pump Motor connector is secure.</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:

RAM READ/WRITE - 71

When Monitored and Set Condition:

RAM READ/WRITE - 71

When Monitored: Ignition on.

Set Condition: Inability to set and subsequently recognize as being set, any bit in the RAM and/or inability to clear, and subsequently recognize as being cleared, any bit in the RAM.

POSSIBLE CAUSES

RAM READ/WRITE DTC CONDITION PRESENT
INTERMITTENT DTC

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTC's. Is the RAM READ/WRITE DTC present? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1. No → Go To 2	All
2	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:**REAR RESET SWITCH CLOSED - 63****When Monitored and Set Condition:****REAR RESET SWITCH CLOSED - 63**

When Monitored: Ignition on.

Set Condition: When not in antilock control mode and reset switch voltage is low.

POSSIBLE CAUSES

REAR RESET SWITCH CLOSED DTC CONDITION PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTC's. Is the REAR RESET SWITCH CLOSED DTC present? Yes → Replace the Hydraulic Control Unit in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

BRAKES (CAB)

Symptom:

ROM CHECKSUM - 72

When Monitored and Set Condition:

ROM CHECKSUM - 72

When Monitored: Ignition on.

Set Condition: Sum of all the storage bytes in the CAB's ROM not equal to the original sum stored in ROM.

POSSIBLE CAUSES

ROM CHECKSUM DTC CONDITION PRESENT
INTERMITTENT DTC

TEST	ACTION	APPLICABILITY
1	<p>Turn the ignition on. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTC's. Is the ROM CHECKSUM DTC set?</p> <p>Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 2</p>	All
2	<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. 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 CONTROL MODE TIMEOUT - 74

When Monitored and Set Condition:

SYSTEM CONTROL MODE TIMEOUT - 74

When Monitored: Ignition on.

Set Condition: When vehicle is in antilock control mode. Vehicle speed is above 4 mph for 2 seconds. ABS mode is in continuous pressure control mode for an excessive period of time (two minutes.)

POSSIBLE CAUSES	
TONE WHEEL DAMAGE/MISSING	
FOUNDATION BRAKE FAULTS	
WHEEL BEARING LOOSE/BINDING	
WHEEL SPEED SENSOR CONCERN	
CAB - NO RESPONSE TO INPUT	
BRAKE LAMP SWITCH	
BRAKE SWITCH SENSE CIRCUIT	
CAB - INTERNAL FAULT	

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Inspect the affected Tone Wheel(s) for damage, missing teeth, cracks, or looseness. NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked. Is the affected Tone Wheel(s) OK? Yes → Go To 2 No → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Visually inspect brakes for locking up due to lining contamination or overheating. Visually inspect all brake components for defects which may cause the brakes to apply unequally. Is any base brake component/hardware damaged? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Go To 3	All

SYSTEM CONTROL MODE TIMEOUT - 74 — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Inspect the wheel bearings for excessive run out or clearance. NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications. Is the wheel bearing clearance OK? Yes → Go To 4 No → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.	All
4	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. NOTE: Repair Wheel Speed Sensor concerns even if no active DTCs are present before diagnosing. Does the DRBIII® display any Wheel Speed Sensor circuit failure DTC's right now? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Go To 5	All
5	NOTE: IF THE DRIVER "RIDES" THE BRAKES A "SYSTEM CONTROL MODE TIMEOUT" DTC MAYBE SET. NOTE: DTC must be "active" With the DRBIII® in Inputs/Outputs, read the Brake Switch state. Apply and release the brake pedal. Does the DRBIII® follow the pedal position? Yes → Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for damage. Inform driver that DTC can be set by riding the brakes OR when they have had a very long braking maneuver down a grade. Perform ABS VERIFICATION TEST - VER 1. No → Go To 6	All
6	Turn the ignition off. Apply and release the brake pedal. Observe the brake lamps. Do the brake lamps operate OK? Yes → Go To 7 No → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.	All

SYSTEM CONTROL MODE TIMEOUT - 74 — Continued

TEST	ACTION	APPLICABILITY
7	<p>NOTE: DTC must be "active" Turn the ignition off. Disconnect the CAB connector. Note: Check connector - Clean/repair as necessary. Turn the ignition on. Apply and release the brake pedal. Check Brake Switch Sense for ground with pedal released and open with pedal applied. Does the Brake Switch Sense circuit change state as specified?</p> <p>Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Repair the Brake Switch Sense circuit for a short to battery, ground or for an open. Perform ABS VERIFICATION TEST - VER 1.</p>	All

BRAKES (CAB)

Symptom:

SYSTEM OVER / UNDER VOLTAGE - 96

When Monitored and Set Condition:

SYSTEM OVER / UNDER VOLTAGE - 96

When Monitored: Ignition on.

Set Condition: When the CAB voltage drops below 9.5 volts or if the voltage rises above 17 volts. ABS will be disabled for the duration of the out of range voltage. If voltage rises above 10 volts or drops below 16.5 volts, the code will reset if steady state of voltage is present.

POSSIBLE CAUSES

CAB VOLTAGE CHECK
INTERMITTENT DTC

TEST	ACTION	APPLICABILITY
1	<p>NOTE: Ensure the battery is fully charged.</p> <p>Turn the ignition on. With the DRBIII®, record and erase DTC's. Turn the ignition off. Start the engine. Measure the voltage of the Fused B+ and Fused Ignition Switch Output (RUN) circuits in the CAB connector. Is the voltage between 10 volts and 16.5 volts and code is present?</p> <p>Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom * Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Go To 2</p>	All
2	<p>Turn the ignition off. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Check connectors - Clean/repair as necessary. Inspect the vehicle for aftermarket accessories that may exceed the Generator System output. 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.</p> <p>No → Test Complete.</p>	All

Symptom:**TIRE REVS PER MILE OUT OF RANGE - 83****When Monitored and Set Condition:****TIRE REVS PER MILE OUT OF RANGE - 83**

When Monitored: Ignition on.

Set Condition: Tire revolutions per mile not in the range between 400 and 900.

POSSIBLE CAUSES

INCORRECT TIRES PROGRAMMED INTO CAB
 INTERMITTENT DTC
 CAB INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. Observe the ABS Warning Indicator. Is the ABS Warning Indicator Flashing? Yes → Go To 2 No → Go To 3	All
2	Inspect all four of the tire sizes on the vehicle. NOTE: Non-production size tire cannot be programmed into the CAB. The production Powertrain, with the production size tires is the only emissions certified configuration that is available for reprogramming. Turn the ignition on. With the DRBIII®, read the tire size that is programmed into the CAB. Does the DRBIII® displayed tire size match the actual tire size on the vehicle? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1. No → Reprogram the tire size. Make sure that the ignition is on throughout the entire reprogramming procedure. Perform ABS VERIFICATION TEST - VER 1.	All
3	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

BRAKES (CAB)

Symptom:

WATCHDOG - 73

When Monitored and Set Condition:

WATCHDOG - 73

When Monitored: Ignition on.

Set Condition: When there is a deviation from the expected result of a CAB internal self check.

POSSIBLE CAUSES

INTERMITTENT DTC

OPEN FUSED B(+) AND FUSED IGNITION SWITCH OUTPUT (RUN)

OPEN GROUND CIRCUITS

CAB - INTERNAL CONCERN

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTC's. Is the WATCHDOG DTC present? Yes → Go To 2 No → Go To 4	All
2	NOTE: CHECK FOR OPEN FUSES. Turn the ignition off. Disconnect the CAB harness connector. Check connectors - Clean/repair as necessary. Turn the ignition on. Measure the voltage of the Fused B(+) and Fused Ignition Switch Output (RUN) circuits in the CAB harness connector. Is the voltage above 11 volts? Yes → Go To 3 No → Repair the appropriate circuit(s) for an open. Perform ABS VERIFICATION TEST - VER 1.	All

WATCHDOG - 73 — Continued

TEST	ACTION	APPLICABILITY
3	<p>Turn the ignition off. Disconnect the CAB harness connector. Check connectors - Clean/repair as necessary. Measure the resistance of the Ground circuit(s) in the CAB harness connector. Is the resistance below 5.0 ohms?</p> <p>Yes → Replace and program the CAB Module in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Repair the Ground circuit(s) for an open. Perform ABS VERIFICATION TEST - VER 1.</p>	All
4	<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. Were any problems found?</p> <p>Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Test Complete.</p>	All

Symptom:
WHEEL SPEED MISMATCH - 38

When Monitored and Set Condition:

WHEEL SPEED MISMATCH - 38

When Monitored: Ignition on.

Set Condition: When rotational wheel speed differing from the average wheel speed for the vehicle by more than 13%. Average wheel speeds less than 40 MPH and greater than 10 MPH (no more than 1/2 MPH difference in the front wheel speeds). Average wheel speeds less than 40 MPH and greater than 25 MPH (front wheel speed variance greater than 1/2 MPH). No wheel slippage detected, not in antilock mode, system not disabled, and no open sensor code.

POSSIBLE CAUSES
WHEEL SPEED MISMATCH DTC CONDITION PRESENT INCORRECT TONE WHEEL CAB INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Inspect all four tire sizes and measure tire circumferences on vehicle. Are any of the tires/wheels/tire circumferences significantly different in size? Yes → Correct as necessary. All of the tires and wheels must be of uniform size and circumference.. Perform ABS VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition off. Count number of teeth on the suspect Tone Wheel. Does the suspect Tone Wheel match the non-suspect Tone Wheels? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1. No → Replace the Tone Wheel in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All

Symptom:

***REPLACING THE CONTROLLER ANTILOCK BRAKE**

POSSIBLE CAUSES
REPLACING THE CAB ABS VERIFICATION TEST

TEST	ACTION	APPLICABILITY
1	<p>Note: You must call STAR to receive a new CAB.</p> <p>Note: Failure to properly program the replacement CAB will result in a blinking ABS indicator.</p> <p>Turn the ignition off. Replace the CAB. With the DRBIII®, check the Tire Size and Rear Axle Type. If the DRBIII® display's the Tire size and Axle ratio, use the DRBIII® select: MISC then MODULE REPLACEMENT. If the DRBIII® does not display Tire Size and Rear Axle Type, use the DRBIII® select: MISC then SET PINION FACTOR. Inspect rear tires to determine tire sizes. Note: If the vehicle does not have production size tires listed on the DRBIII® menu screen, install Production Size tires on the vehicle. Determine which rear axle type, not the axle ratio, is used on this vehicle. NOTE: To identify the proper axle on the vehicle, refer to Component Location in Chassis Diagnostic Procedures or Service Information on MDS2. Ignition on, engine not running. With the DRBIII®, program the correct tire size and rear axle type. Road test the vehicle above 40 mph for at least two minutes. Check for any DTC's. Did any DTC's set during the road test?</p> <p style="padding-left: 40px;">Yes → Refer to the Symptom List for further diagnostic tests. Perform ABS VERIFICATION TEST - VER 1.</p> <p style="padding-left: 40px;">No → Go To 2</p>	All

***REPLACING THE CONTROLLER ANTILOCK BRAKE — Continued**

TEST	ACTION	APPLICABILITY
2	<p>Turn the ignition off. Connect all previously disconnected components and connectors. Ensure all accessories are turned off and the battery is fully charged. 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. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the DRBIII, read DTC's from ALL modules. If any Diagnostic Trouble Codes are present, return to Symptom list and troubleshoot new or recurring symptom. 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. Caution: Ensure braking capability is available before road testing. Again, with the DRBIII® read DTC's. If any DTC's are present, return to Symptom list. If there are no Diagnostic Trouble Codes (DTC's) present, and the customer's concern can no longer be duplicated, the repair is complete. Are any DTC's present or is the original concern still present?</p> <p style="padding-left: 40px;">Yes → Refer to symptom list for problems related to active DTCs. Perform ABS VERIFICATION TEST - VER 1.</p> <p style="padding-left: 40px;">No → Test Complete.</p>	All

Symptom:

***VEHICLE SPEED SIGNAL OUTPUT**

POSSIBLE CAUSES
<p>CONTROLLER ANTILOCK BRAKE DTC'S PRESENT</p> <p>INTERMITTENT VEHICLE SPEED SIGNAL</p> <p>VEHICLE SPEED SIGNAL CIRCUIT SHORTED OR OPEN</p> <p>CAB- NO SPEED SIGNAL OUTPUT</p> <p>PCM - CAN'T READ VEHICLE SPEED SIGNAL</p>

TEST	ACTION	APPLICABILITY
1	<p>Turn the ignition on.</p> <p>With the DRBIII®, read DTC's.</p> <p>Is the Good Trip Counter for P-0500 displayed and Equal to 0?</p> <p style="padding-left: 40px;">Yes → Go To 2</p> <p style="padding-left: 40px;">No → Go To 5</p>	All
2	<p>Turn the ignition on.</p> <p>With the DRBIII®, read DTCs.</p> <p>Check for Controller Antilock Brake DTC's.</p> <p>Are any CAB DTC's present?</p> <p style="padding-left: 40px;">Yes → Repair all Controller Antilock Brake DTC's before proceeding. Perform ABS VERIFICATION TEST - VER 1.</p> <p style="padding-left: 40px;">No → Go To 3</p>	All
3	<p>Turn the ignition off.</p> <p>Disconnect the Powertrain Control Module harness connectors.</p> <p>Disconnect the CAB connector.</p> <p>Ignition on, engine not running.</p> <p>Check the Vehicle Speed Signal circuit for a short to B+, short to ground and for an open.</p> <p>Is the Vehicle Speed Signal circuit OK?</p> <p style="padding-left: 40px;">Yes → Go To 4</p> <p style="padding-left: 40px;">No → Repair the open Vehicle Speed Signal circuit for a short or an open. Perform ABS VERIFICATION TEST - VER 1.</p>	All

BRAKES (CAB)

*VEHICLE SPEED SIGNAL OUTPUT — Continued

TEST	ACTION	APPLICABILITY
4	<p>Turn ignition off. Disconnect the CAB connector. Connect a jumper wire to the Vehicle Speed Signal circuit in the CAB harness connector. Turn ignition on. Quickly and repeatedly tap the jumper wire to ground. With the DRBIII® read the Vehicle Speed Signal display. Is the DRBIII® reading Vehicle Speed above 0 MPH?</p> <p>Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Replace the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.</p>	All
5	<p>At this time, the conditions required to set the DTC are not present. NOTE: Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load. Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Note: Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Note: Refer to any technical service bulletins that may apply. Were any problems found?</p> <p>Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.</p> <p>No → Test Complete.</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	Turn the ignition on. Note: As soon as one or more module communicates with the DRB, answer the question. With the DRB, attempt to communicate with the Airbag Control Module (ACM). With the DRB, attempt to communicate with the Instrument Cluster. Was the DRB able to I/D or establish communications with either of the modules? Yes → Go To 2 No → Refer to the Communications category and perform the symptom PCI Bus Communication Failure. Perform ABS VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Disconnect the CAB C1 harness connector. Using a 12-volt test light connected to 12-volts, probe both ground circuits. Is the test light illuminated for both circuits? Yes → Go To 3 No → Repair the ground circuit(s) for an open. Perform ABS VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the CAB C1 harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit. Is the test light illuminated? Yes → Go To 4 No → Check IPM fuse #35 for an open. If OK, repair the Fused Ignition Switch Output circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	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 C1 harness connector. Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes. 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. With the DRBIII® select Pep Module Tools. Select lab scope. Select Live Data. Select 12 volt square wave. Press F2 for Scope. Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10. Press F2 again when complete. Connect the Black lead to the chassis ground. Connect the Red lead to the PCI Bus circuit in the CAB connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts?</p> <p style="padding-left: 40px;">Yes → Go To 5</p> <p style="padding-left: 40px;">No → Repair the PCI Bus circuit for an open. Perform ABS VERIFICATION TEST - VER 1.</p>	All
5	<p>If there are no possible causes remaining, view repair.</p> <p style="padding-left: 40px;">Repair</p> <p style="padding-left: 80px;">Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.</p>	All

Verification Tests

ABS VERIFICATION TEST - VER 1	APPLICABILITY
<p>1. Turn the ignition off.</p> <p>2. Connect all previously disconnected components and connectors.</p> <p>3. Ensure all accessories are turned off and the battery is fully charged.</p> <p>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.</p> <p>5. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the DRBIII, read DTC's from ALL modules.</p> <p>6. If any Diagnostic Trouble Codes are present, return to Symptom list and troubleshoot new or recurring symptom.</p> <p>7. 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.</p> <p>8. Caution: Ensure braking capability is available before road testing.</p> <p>9. Again, with the DRBIII® read DTC's. If any DTC's are present, return to Symptom list.</p> <p>10. 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> <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>	<p>All</p>

ADJUSTABLE PEDALS VERIFICATION TEST - VER 1	APPLICABILITY
<p>1. Activate the Adjustable Pedals through the full range of movement.</p> <p>2. Verify that the Adjustable Pedals system is disabled with the vehicle in Reverse.</p> <p>3. Road test the vehicle to verify that the Adjustable Pedals system is disabled with Speed Control activated.</p> <p>4. With the DRBIII®, erase DTCs.</p> <p>5. With the DRBIII®, read DTCs.</p> <p>Are any DTC's present or is the original complaint still present?</p> <p>Yes → Repair is not complete, refer to appropriate symptom.</p> <p>No → Repair is complete.</p>	<p>All</p>

VERIFICATION TESTS

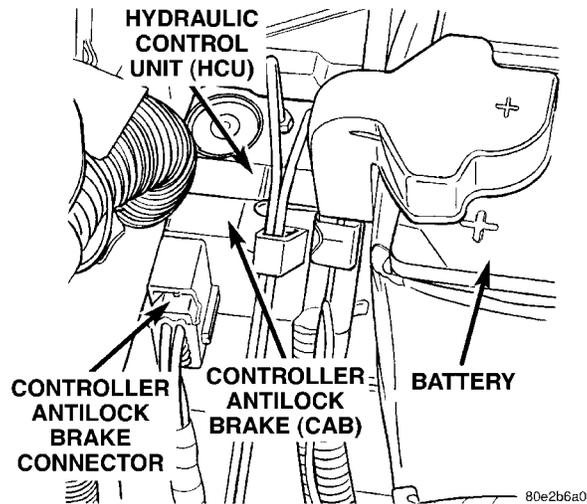
Verification Tests — Continued

POWERTRAIN VERIFICATION TEST VER - 5	APPLICABILITY
<p>1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.</p> <p>2. If any existing diagnostic trouble codes have not been repaired, go to the appropriate Symptom List and follow path specified.</p> <p>3. Connect the DRBIII® to the data link connector.</p> <p>4. Ensure the fuel tank has at least a quarter tank of fuel. Turn off all accessories.</p> <p>5. If the PCM was not replaced skip steps 6 through 8 and continue the verification.</p> <p>6. If the PCM was replaced, the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable start.</p> <p>7. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules.</p> <p>8. For SKIM theft alarm: Connect DRBIII® to data link connector to Theft Alarm, SKIM, Misc. and place SKIM in secured access mode by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM.</p> <p>9. If the Catalyst was replaced, with the DRBIII® go to the miscellaneous Menu Option "Catalyst Replaced" and press enter.</p> <p>10. If a Comprehensive Component DTC was repaired, perform steps 10-13. If a Major OBDII Monitor DTC was repaired skip those steps and continue verification.</p> <p>11. After the ignition has been off for at least 10 seconds, restart the vehicle and run 2 minutes.</p> <p>12. With the DRBIII®, monitor the appropriate pre-test enabling conditions until all conditions have been met. Once the conditions have been met, switch screen to the appropriate OBDII monitor, (Audible beeps when the monitor is running).</p> <p>13. If the conditions cannot be duplicated, erase all DTC with the DRBIII®.</p> <p>Did the OBD II Monitor run successfully and has the Good Trip Counter changed to one or more?</p> <p>Yes → Repair is complete.</p> <p>No → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptoms list (Diagnostic Procedure).</p>	<p>All</p>

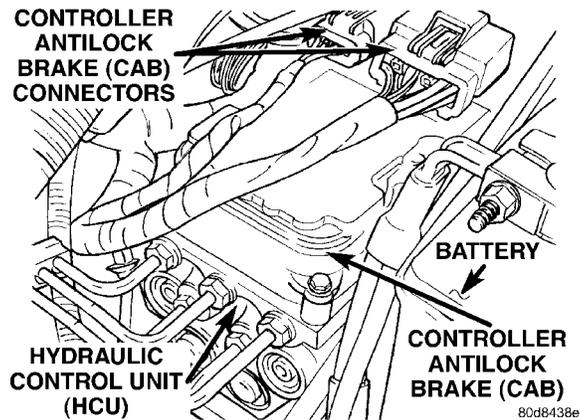
8.0 COMPONENT LOCATIONS

8.1 CONTROLLER ANTILOCK BRAKE (CAB)

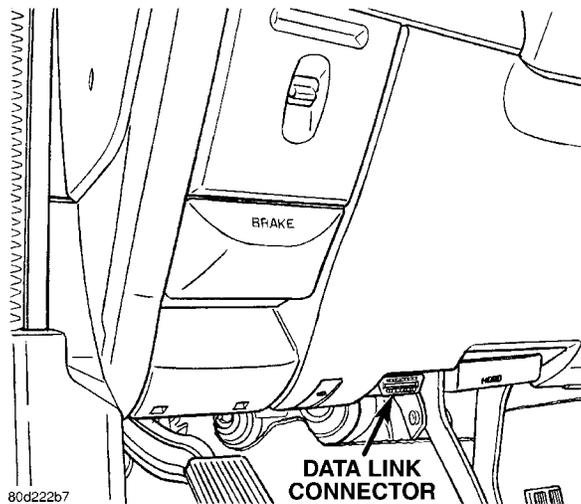
8.1.1 EBC 125 (RWAL)



8.1.2 EBC 325 (ABS)



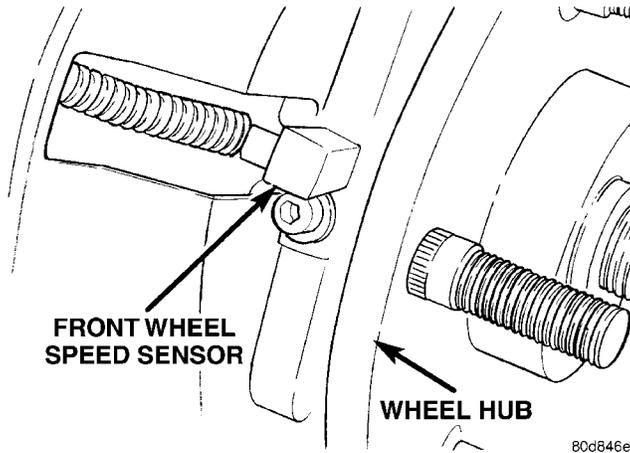
8.2 DATA LINK CONNECTOR



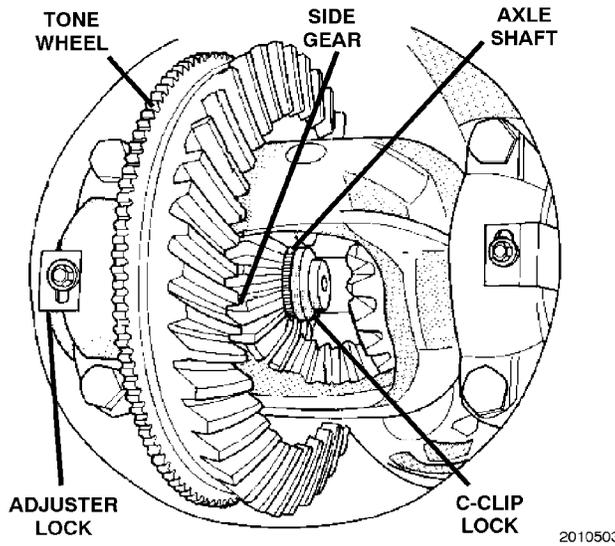
COMPONENT LOCATIONS

8.3 WHEEL SPEED SENSORS/TONE WHEELS

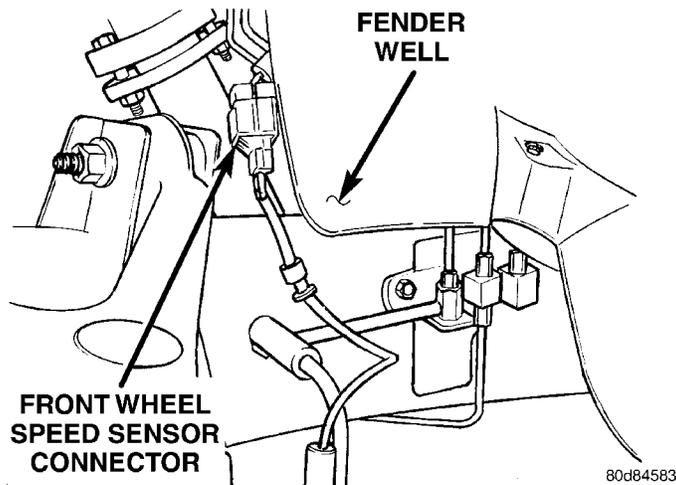
8.3.1 FRONT



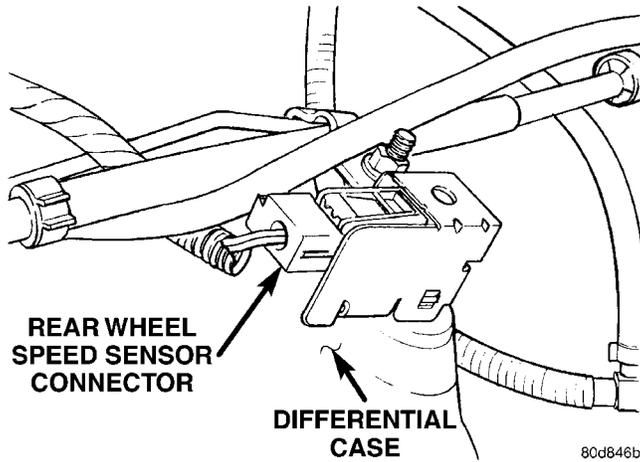
8.3.2 REAR



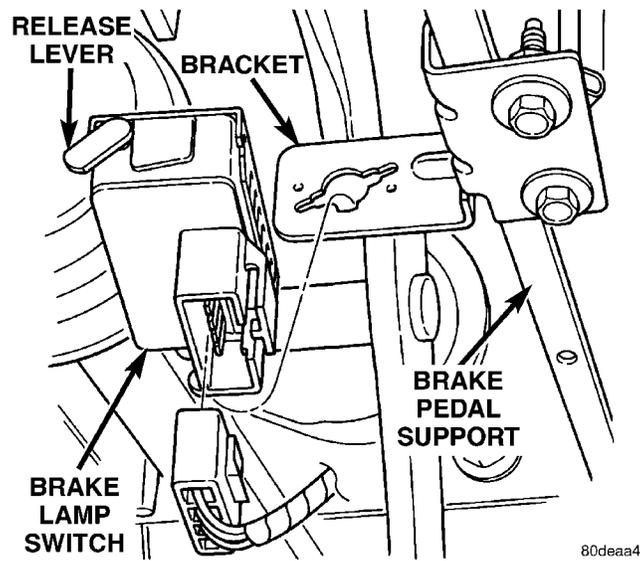
8.4 FRONT WHEEL SPEED SENSOR CONNECTOR



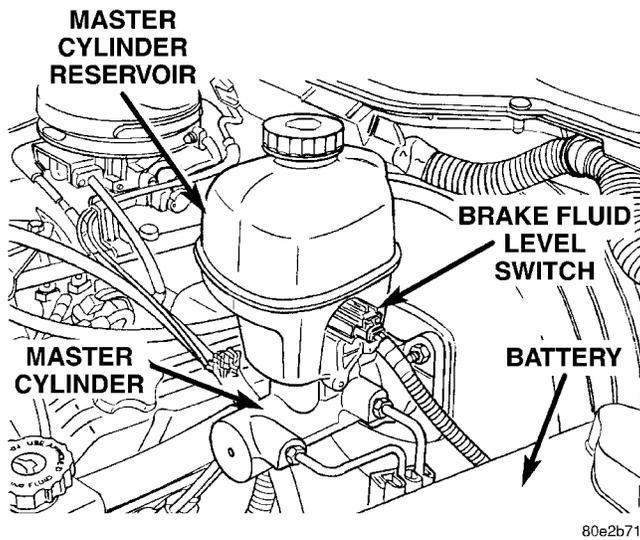
8.5 REAR WHEEL SPEED SENSOR CONNECTOR



8.6 BRAKE LAMP SWITCH

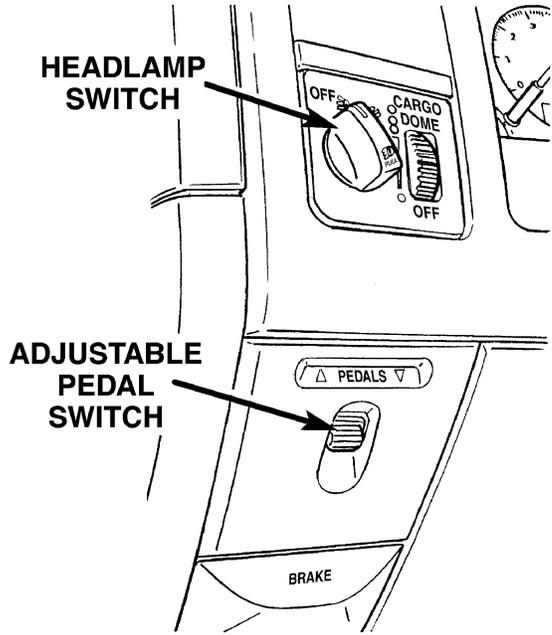


8.7 BRAKE FLUID LEVEL SWITCH



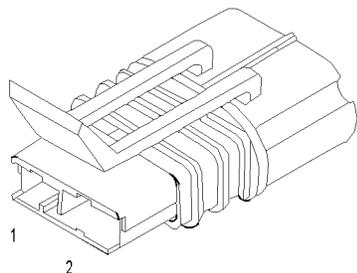
COMPONENT LOCATIONS

8.8 ADJUSTABLE PEDAL SWITCH



80e2b87d

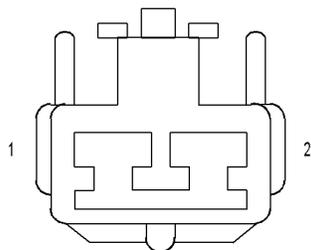
9.0 CONNECTOR PINOUTS



ABS PUMP MOTOR CONNECTOR

ABS PUMP MOTOR CONNECTOR - 2 WAY

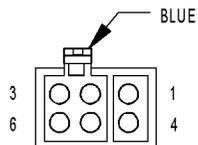
CAV	CIRCUIT	FUNCTION
1	RD	ABS PUMP CONTROL
2	BK	GROUND



ADJUSTABLE PEDAL MOTOR (EXCEPT MEMORY)

ADJUSTABLE PEDAL MOTOR (EXCEPT MEMORY) - 2 WAY

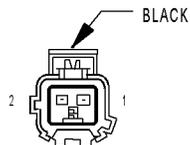
CAV	CIRCUIT	FUNCTION
1	P206 18LG/LB	ADJUSTABLE PEDALS MOTOR REVERSE
2	P205 18LG/WT	ADJUSTABLE PEDALS MOTOR FORWARD



ADJUSTABLE PEDAL SWITCH (EXCEPT MEMORY)

ADJUSTABLE PEDAL SWITCH (EXCEPT MEMORY) - BLUE 6 WAY

CAV	CIRCUIT	FUNCTION
1	P206 18LG/LB	ADJUSTABLE PEDALS MOTOR REVERSE
2	A72 18RD/OR	ADJUSTABLE PEDAL RELAY OUTPUT
3	-	-
4	Z146 18BK	GROUND
5	F504 20GY/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
6	P205 18LG/WT	ADJUSTABLE PEDALS MOTOR FORWARD

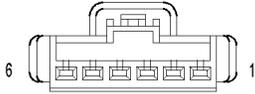


BRAKE FLUID LEVEL SWITCH

BRAKE FLUID LEVEL SWITCH - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	B20 20DG/OR	BRAKE FLUID LEVEL SWITCH SENSE
2	Z420 20BK/OR	GROUND

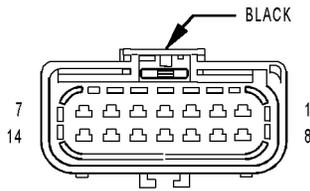
CONNECTOR PINOUTS



BRAKE
LAMP
SWITCH

BRAKE LAMP SWITCH - 6 WAY

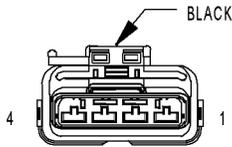
CAV	CIRCUIT	FUNCTION
1	A103 18GY/RD	FUSED B(+)
2	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
3	V30 20VT/WT	S/C BRAKE SWITCH OUTPUT
3	V30 20VT/WT (5.7L)	FUSED IGNITION SWITCH (RUN-START)
4	V32 20VT/YL	SPEED CONTROL SUPPLY
4	V32 20VT/YL (5.7L)	BRAKE SWITCH NO. 2 SIGNAL
5	Z429 20BK/OR	GROUND
6	B29 20DG/WT	BRAKE SWITCH SIGNAL
6	B29 20DG/WT (5.7L)	BRAKE SWITCH NO. 1 SIGNAL



CONTROLLER
ANTILOCK
BRAKE C1

CONTROLLER ANITLOCK BRAKE C1 - BLACK 14 WAY

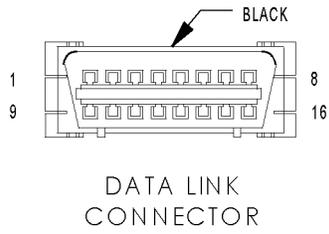
CAV	CIRCUIT	FUNCTION
1	B4 20DG/GY	REAR WHEEL SPEED SENSOR (+)
2	B222 20DG/WT (ETC)	VEHICLE SPEED SIGNAL NO. 2
3	D25 20WT/VT	PCI BUS
4	F500 20DG/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
5	B9 20DG/LG (ETC)	LEFT FRONT WHEEL SPEED SENSOR (+)
6	Z107 12BK/DG	GROUND
7	A111 14DG/RD	FUSED B(+)
8	B3 20DG/YL	REAR WHEEL SPEED SENSOR (-)
9	B29 20DG/WT	BRAKE SWITCH SIGNAL
10	B8 20DG/TN (ETC)	LEFT FRONT WHEEL SPEED SENSOR (-)
11	B20 20DG/OR	BRAKE FLUID LEVEL SWITCH SENSE
12	B22 20DG/YL	VEHICLE SPEED SIGNAL NO. 1
13	Z127 12BK/DG (ABS)	GROUND
14	A111 14DG/RD (ABS)	FUSED B(+)



CONTROLLER
ANTILOCK
BRAKE C2
(ABS)

CONTROLLER ANTILOCK BRAKE C2 (ABS) - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	B9 20DG/LG	LEFT FRONT WHEEL SPEED SENSOR (+)
2	B8 20DG/TN	LEFT FRONT WHEEL SPEED SENSOR (-)
3	B6 20DG/WT	RIGHT FRONT WHEEL SPEED SENSOR (-)
4	B7 20DG/VT	RIGHT FRONT WHEEL SPEED SENSOR (+)

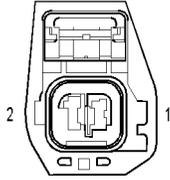


DATA LINK CONNECTOR - BLACK 16 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 20WT/VT	PCI BUS
3	-	-
4	Z11 18BK/LG	GROUND
5	Z111 18BK/WT	GROUND
6	-	-
7	D21 18WT/BR	SCI TRANSMIT (PCM)
8	-	-
9	D16 18WT/OR	SCI RECEIVE (TCM)
10	-	-
11	-	-
12	D20 20WT/LG	SCI RECEIVE (PCM)
13	-	-
14	-	-
15	D15 18WT/DG	SCI TRANSMIT (TCM)
16	A114 18GY/RD	FUSED B(+)

ADJUSTABLE PEDAL RELAY

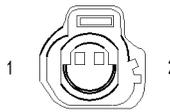
CAV	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	FUSED B(+)
86	INTERNAL	ADJUSTABLE PEDAL RELAY CONTROL
87	-	-
87A	A72 18RD/OR	ADJUSTABLE PEDAL RELAY OUTPUT



WHEEL-SPEED
SENSOR-LEFT
FRONT

WHEEL SPEED SENSOR-LEFT FRONT - 2 WAY

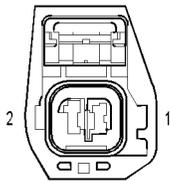
CAV	CIRCUIT	FUNCTION
1	B8 20DG/TN	LEFT FRONT WHEEL SPEED SENSOR (-)
2	B9 20DG/LG	LEFT FRONT WHEEL SPEED SENSOR (+)



WHEEL SPEED
SENSOR- REAR

WHEEL SPEED SENSOR-REAR - 2 WAY

CAV	CIRCUIT	FUNCTION
1	B3 18DG/YL	LEFT REAR WHEEL SPEED SENSOR SIGNAL
2	B4 18DG/GY	LEFT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY



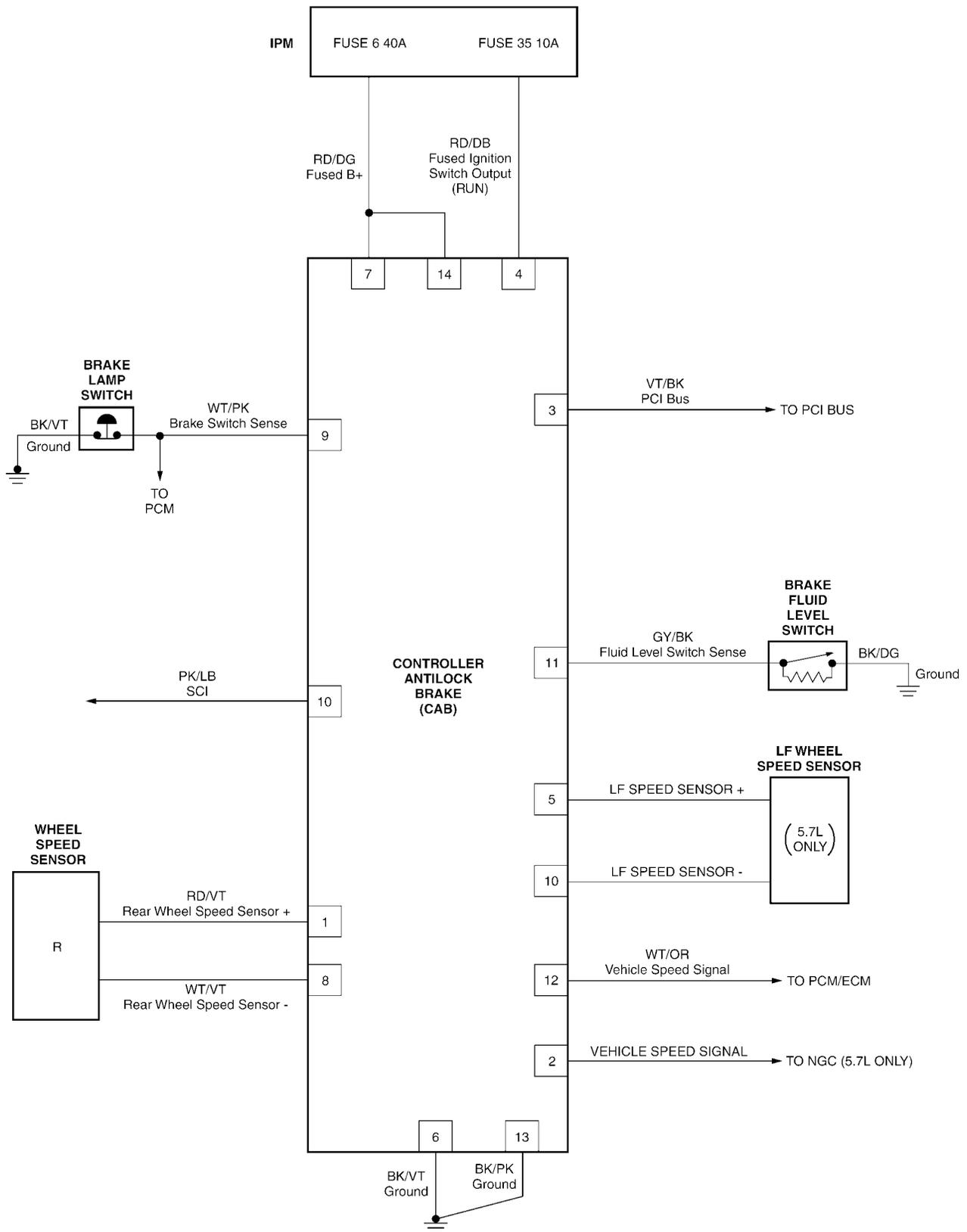
WHEEL-SPEED
SENSOR-RIGHT
FRONT

WHEEL SPEED SENSOR-RIGHT FRONT - 2 WAY

CAV	CIRCUIT	FUNCTION
1	B6 20DG/WT	RIGHT FRONT WHEEL SPEED SENSOR (-)
2	B7 20DG/VT	RIGHT FRONT WHEEL SPEED SENSOR (+)

10.0 SCHEMATIC DIAGRAMS

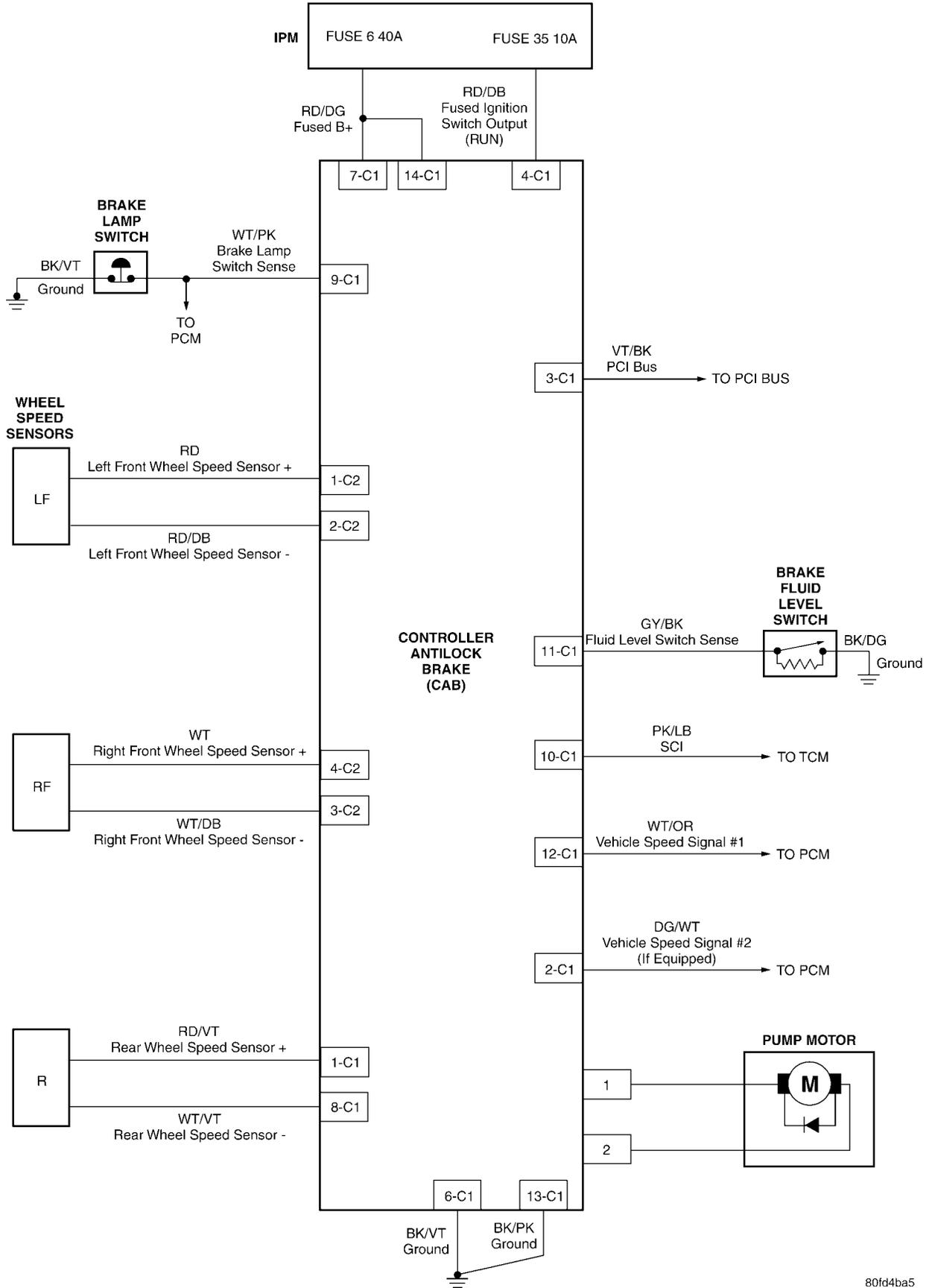
10.1 TRW EBC 125 – CONTROLLER ANTILOCK BRAKE



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SCHEMATIC DIAGRAMS

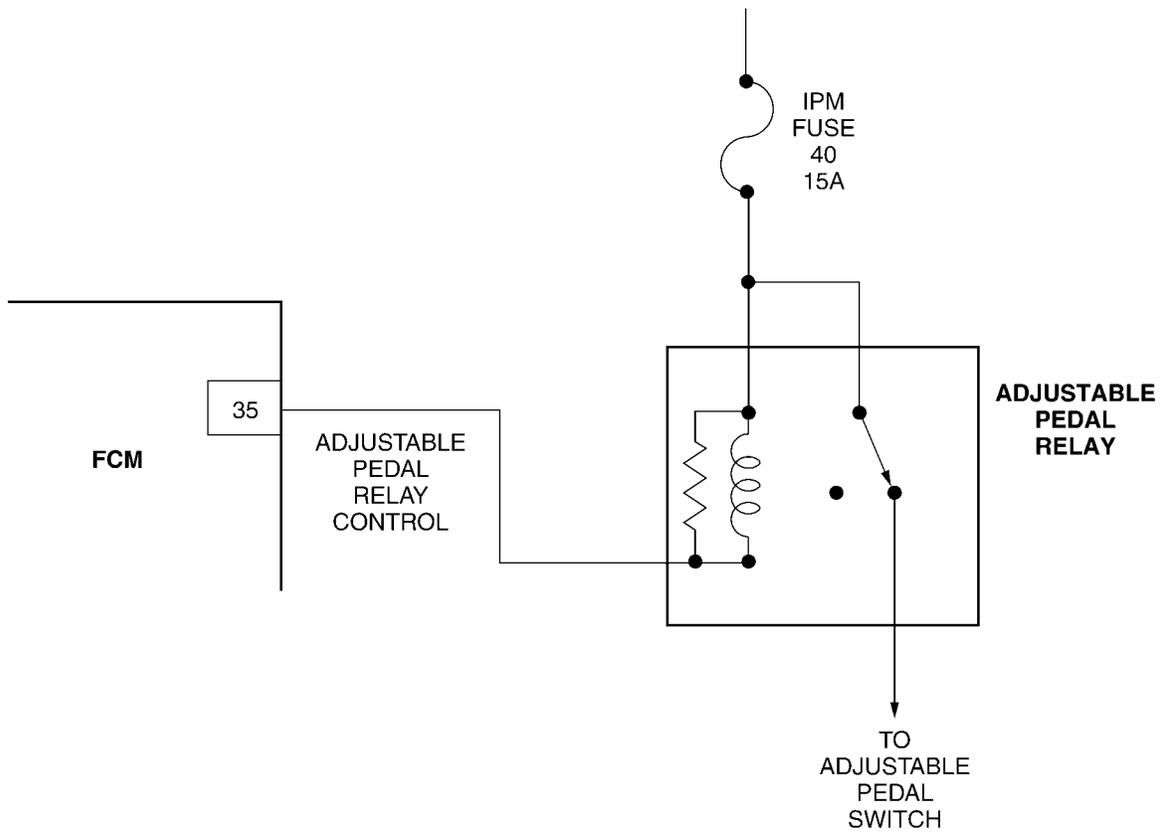
10.2 TRW EBC 325 – CONTROLLER ANTILOCK BRAKE



SCHEMATIC DIAGRAMS

80f4ba5

10.3 ADJUSTABLE PEDAL RELAY



80fd4f7d

DIAGNOSTIC TEST PROCEDURES — TELL US!

DaimlerChrysler Corporation is constantly working to provide the technician the best diagnostic manuals possible. Your comments and recommendations regarding the diagnostic manuals and procedures are appreciated.

To best understand your suggestion, please complete the form giving us as much detail as possible.

Model _____ **Year** _____ **Body Type** _____ **Engine** _____

Transmission _____ **Vehicle Mileage** _____ **MDH** _____

Diagnostic Procedure _____ **Book No.** _____ **Page** _____

Comments/recommendations (if necessary, draw sketch)

Name _____

Submitted by: _____

Address _____

City/State/Zip _____

Business Phone # _____

All comments become property of DaimlerChrysler Corporation and may be used without compensation.

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