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1.0 INTRODUCTION

The procedures contained in this manual include all the specifications, and graphics needed to diagnose the 2004 300M, Intrepid, and Concorde Teves Mark20e Antilock Braking System (ABS) and the Mark20e with Traction Control. 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 CAB. If the DRBIII® displays a "No Response" condition, you must diagnose that first.
2. Read DTC's (diagnostic trouble codes) with the DRBIII®.
3. If no DTC's are present, identify the customer complaint.
4. Once the DTC or customer complaint is identified, locate the matching test in the Table of Contents and begin to diagnose the symptom.

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

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

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

1.1 SYSTEM COVERAGE

This diagnostic procedure manual covers the antilock braking system (ABS) and traction control system found on: Chrysler Concord, 300M and Dodge Intrepid.

1.2 SIX-STEP TROUBLESHOOTING PROCEDURE

Diagnosis of the controller antilock brake module 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

Vehicles equipped with the Teves Mark20e antilock brake system can be identified by the presence of the controller antilock brake module located along with HCU. The CAB and HCU are behind the left front bumper on the left side of the engine cradle.

3.0 SYSTEM DESCRIPTION AND FUNCTIONAL OPERATION

3.1 TEVES MARK20e SYSTEM DESCRIPTION

The controller antilock brake module is used to monitor wheel speeds and to modulate (control) hydraulic pressure in each brake channel. The modulated hydraulic pressure is used to prevent wheel lock-up during braking.

The Teves Mark20e system uses a diagonal split hydraulic brake system. In the standard brake mode the master cylinder primary circuit supplies pressure to the right front and left rear wheel brakes, and the secondary master cylinder circuit supplies pressure to the left front and right rear wheel brakes.

All vehicles equipped with ABS use Electronic Variable Brake Proportioning (EVBP) to balance front-to-rear braking when brakes are applied in the partial braking range.

During an antilock stop the Mark20e system uses four-channel operation. This means that during antilock operation each wheel brake is independently controlled. By using a separate hydraulic channel for each wheel, the system is able to retain directional stability and steering control while applying maximum braking. The system provides maximum braking even when road conditions vary.

3.2 TRACTION CONTROL SYSTEM (TCS) DESCRIPTION (IF EQUIPPED)

The Traction Control System is available on this vehicle. The main purpose of traction control is to reduce wheel slip and maintain traction at the driven wheels when road surfaces are wet or snow covered. The traction control system reduces wheel slip by braking the wheel that is losing traction. The system is designed to operate at speeds below 56 km/h (35 mph).

The controller antilock brake (CAB) monitors wheel speed. If during acceleration the CAB detects front (drive) wheel slip and the brakes are not applied, it will enter traction control mode. The CAB performs the traction control function in the following sequence:

1. Closes the (normally open) isolation valves.
2. Starts pump/motor to supply volume/pressure to front hydraulic circuits (pump runs continuously during traction control).
3. Opens and closes build and decay valves to maintain minimum wheel slip and maximum traction.

The cycling of the build and decay valves works similarly to ABS except that they work to control wheel spin by applying brakes. ABS function is to control wheel skid by releasing brakes.

Two pressure relief valves allow pressure/volume to return to the reservoir when not consumed by the build/decay cycles. These are required because the pump supplies more volume than the system requires.

If at any time the brakes are applied during a traction control cycle, the brake switch will trigger the CAB to switch off the traction control.

The traction control system will be enabled at each ignition cycle. It may be turned off by depressing the traction control switch. The traction control system function lamp will illuminate “TRAC OFF” immediately upon depressing the traction control switch button. The lamp will display “TRAC ON” during a traction control cycle. If the controller calculates that the brake temperatures are high, the traction control system will become inoperative until a time-out period has elapsed. When in this thermo protection mode, the traction control “TRAC OFF” lamp will illuminate; however, a fault will not be registered.

3.3 SYSTEM COMPONENTS

- controller antilock brake (CAB)
- vacuum booster
- master cylinder
- ABS integrated control unit hydraulic control unit (HCU), valve block assembly: 8 valve solenoids (4 inlet valves, 4 outlet valves, 2 accumulators) 1 motor, 2 pumps.
- ABS integrated control unit with traction control same as above but has 10 valve solenoids. 2 valves are isolation valves.
- 4 wheel speed sensor/tone wheel assemblies
- ABS warning indicator
- fuses and wiring harness
- fluid reservoir

3.3.1 ABS AND BRAKE WARNING INDICATORS

The amber ABS warning indicator is located in the instrument cluster. It is used to inform the driver that the antilock function has been turned off. The ABS warning indicator is indirectly controlled by the CAB. The CAB will send a message across the PCI Bus that informs the instrument cluster to turn the ABS warning indicator ON or OFF. If the 24-way CAB connector is not connected, the instrument cluster will not receive a message from the CAB via the PCI BUS circuit. The instrument cluster will then turn on the ABS warning indicator.

The ABS Warning Indicator will remain lit during every key cycle until a circuit or component fault is repaired and the CAB no longer detects the fault. After repair of a sensor signal fault or a pump motor fault, the CAB must sense all four wheels at 25 km/h (15 mph) before it will extinguish the ABS Indicator.

The Instrument Cluster will illuminate the ABS Warning Indicator if it loses communication with the CAB.

The red BRAKE warning indicator is also located in the instrument cluster. It can be activated in several ways. Application of the parking brake or a low fluid signal from the fluid level switch located in the master cylinder reservoir will cause the indicator to come on. The status of the red BRAKE warning indicator is not monitored by the CAB.

3.3.2 CONTROLLER ANTILOCK BRAKE (CAB)

The Controller Antilock Brake (CAB) is a microprocessor-based device that monitors wheel speeds and controls the antilock functions. The CAB contains two microprocessors that receive identical sensor signals and then independently process the information. The results are then compared to make sure that they agree. Otherwise, the CAB will turn off the antilock and turn on the ABS amber warning indicator.

The primary functions of the CAB are to:

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

The CAB continuously monitors the speed of each wheel. When a wheel locking tendency is detected, the CAB will command the appropriate valve to modulate brake fluid pressure in its hydraulic unit. Brake pedal position is maintained during an antilock stop by being a closed system with the use of 2 accumulators. The CAB continues to control pressure in individual hydraulic circuits until a wheel locking tendency is no longer present. The CAB turns on the pump motor during an antilock stop.

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

The CAB inputs include the following:

- diagnostic communication
- four wheel speed sensors
- ignition switch
- fused B+
- brake lamp switch
- traction control switch (if equipped)

The CAB outputs include the following:

- ABS warning indicator actuation
- valve actuation
- diagnostic communication
- traction control lamp illumination (if equipped)

3.3.3 HYDRAULIC CONTROL UNIT

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

Valve Block Assembly: The valve block assembly contains valves with four inlet valves and four outlet valves. The inlet valves are spring-loaded in the open position and the outlet valves are spring loaded in the closed position. During an antilock stop, these valves are cycled to maintain the proper slip ratio for each wheel. The CAB monitors wheel speeds. If the CAB detects a wheel deceleration that is disproportionate to the other wheels, it will close the inlet valve to that wheel. This prevents any increase in fluid pressure. If the wheel continues to decelerate disproportionately, the CAB opens the outlet valve for that wheel to release fluid pressure from that channel. The released fluid is routed to the accumulators. When the wheel speed is no longer disproportionate to the other wheels, the inlet valve will return to its normally open position and the outlet valve will return to the normally closed position. On LH Bodies which are equipped with a traction control system, there are two additional valves that isolate the master cylinder and rear wheels. During a traction control situation the brakes are applied at a slipping drive wheel to reduce wheel slippage.

Pump Motor Assembly: The pump motor assembly provides the extra amount of fluid needed during antilock braking. The pump is supplied fluid that is released to the accumulators when the outlet valve is opened during an antilock stop. The pump is also used to drain the accumulator circuits after the antilock stop is complete. The pump is operated by an integral electric motor. This motor is controlled by the CAB. The CAB may turn on the pump motor when an antilock stop is required. The pump continues to run during the antilock stop and is turned off after the stop is complete. Under some conditions, the pump/motor will run to drain the accumulators during the next drive off. The CAB monitors the pump/motor operation internally.

3.3.4 SWITCHES / SENSORS

Master Cylinder: All vehicles including Traction control vehicles use a dual center port master cylinder.

A fluid level switch is located in the master cylinder fluid reservoir. The switch closes when a low fluid level is detected. The fluid level switch turns on the brake warning indicator by grounding the indicator circuit. This switch does not disable the ABS system.

Wheel Speed Sensors and Tone Wheels: One active Wheel Speed Sensor (WSS) is located at each wheel and sends a small DC voltage signal to the Controller Antilock Brake (CAB). The CAB sends 12 volts down to the sensor. The sensor has an internal magneto resistance bridge that alters the voltage and amperage of the signal circuit. This voltage and amperage is changed by magnetic induction when a toothed sensor ring (tone wheel) passes by a stationary magnetic sensor (wheel speed sensor). The CAB measures the voltage and amperage of the DC signals for each wheel.

The front wheel speed sensor is attached to a boss in the steering knuckle. The tone wheel is an integral part of the front axle shaft. On LH Bodies the rear sensors are mounted to the rear brake backing plates or rear disc adapters. The rear tone wheels are pressed on the rear hub. The wheel

speed sensor air gap is not adjustable. Refer to Service Manual for wheel speed sensor air gap and resistance specifications.

The four wheel speed sensors are serviced individually. The front tone wheels are serviced as an assembly with the outer C.V. joint housing. The rear tone wheels are serviced as an assembly.

Correct antilock system operation is dependent on accurate wheel speed signals from the wheel speed sensors. The vehicle's wheels and tires should all be the same size and type to generate accurate signals. In addition, the tires should be inflated to the recommended pressures for optimum system operation. Variation in wheel and tires size or significant variations in inflation pressure can produce inaccurate wheel speed signals; however, the system will continue to function when using the correct factory mini-spare.

3.3.5 SYSTEM INITIALIZATION

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

Between 8-17 km/h (5-10 mph}, a dynamic test is performed. This will momentarily cycle the inlet and outlet valves, check wheel speed sensor circuitry and run the pump motor at 25 km/h (15 mph), the CAB will try to test the pump motor. If the brake pedal is depressed the test will be run at 40 km/h (24 mph) regardless of brake switch state. If, during the dynamic test, the brake pedal is depressed the driver may feel the test through brake pedal pulsations. This is a normal condition.

If any component exhibits a trouble condition during system initialization or dynamic check, the CAB will illuminate the ABS warning indicator and TRAC OFF indicator (if equipped).

3.3.6 DIAGNOSTIC MODE

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

- The amber ABS warning indicator will blink rapidly. If a hard trouble code, such as CAB Power Feed Circuit Failure code is present, the indicator will be illuminated without blinking until the trouble condition is cleared.
- Antilock operation is disabled.
- Valve actuation with the DRBIII® is disabled when the vehicle speed is above 8 km/h (5 mph). If valve actuation is attempted above 8 km/h (5 mph), a "No Response" message will be displayed on the DRBIII®.

3.4 DIAGNOSTIC TROUBLE CODES

The Controller Antilock Brake may report any of several Diagnostic Trouble Codes (DTC)s. For a list of the DTC's diagnosed in this manual, refer to the Table of Contents.

3.5 FREEZE FRAME

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

3.6 DRBIII® ERROR MESSAGES AND BLANK SCREEN

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

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

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.
```

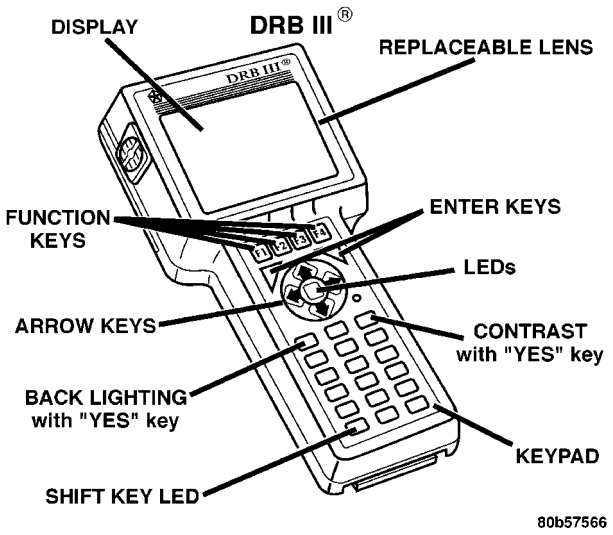
3.6.1 DRBIII® DOES NOT POWER UP

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 (data link connector cavity 16). 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.

3.6.2 DISPLAY IS NOT VISIBLE

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



3.7 TIRE PRESSURE MONITORING SYSTEM

If equipped with the Tire Pressure Monitoring System, each of the vehicle's five wheels will have a valve stem with a pressure sensor and radio transmitter built in. Signals from the tire pressure sensors are received and interpreted by the Electronic Vehicle Information Center (EVIC).

A sensor in a mounted wheel will broadcast its detected pressure once per minute when the vehicle is moving faster than 40 km/h (25 mph). The spare tire sensor will broadcast once every hour. Each sensor's broadcast is uniquely coded so that the EVIC can determine location. The individual tire pressures can be displayed graphically on the EVIC.

NOTE: The spare tire is only monitored when equipped with the 5-Tire TPM System.

3.7.1 TRAINING THE EVIC

The EVIC can be trained to recognize the source locations of pressure sensor signals. The training procedure is given below:

1. Locate "RETRAIN TIRE SENSORS" on the EVIC menu.
   When this mode is enabled by selecting "YES", the EVIC will initiate the following procedure.
2. A display will prompt the user to: "TRAIN LEFT FRONT TIRE". At this point the user must set the left front tire sensor to learn mode by positioning a magnet (Relearn Magnet special tool 8821) over the valve stem for at least 5 seconds. The Remote Tire Pressure Monitor (RTPM) in the front left tire will transmit a message indicating to the EVIC that it is in learn mode. When the EVIC has received this message and is assured that it has learned an ID, the EVIC will request a horn chirp via a bus message and then display the next train request.

Note: There is a 60 second timer for learning the first tire location and a 30 second timer between the remaining tires. If any of these timers expire the EVIC will abort the training procedure.

3. The EVIC will request the initiation of a training sequence for each tire, one-by-one in a clockwise direction around the vehicle (Left Front, Right Front, Right Rear, Left Rear and Spare). The EVIC will allow 30 seconds **(60 seconds for the first tire)** from the beginning of the train request display to the receipt of a unique learn ID message from the RTPM. If, during a training session, a 60 or 30 second timer expires before a unique learn sensor ID is received or the vehicle is not in park, the EVIC will keep the previous set of trained IDs and will display "TRAINING ABORTED" until a button is pressed. Any IDs learned during the current session will be discarded. The EVIC will not store one ID for multiple locations.

NOTE: The spare tire is only monitored when equipped with the 5-Tire TPM System.

4. Once all four (or five) tires are successfully trained, the previous set of stored IDs will be replaced by the new IDs, and the EVIC will display, "TRAINING COMPLETE" until a button is pressed.

If the vehicle is equipped with the Homelink feature and a Homelink button is pressed at any time during the training procedure, the EVIC module will immediately exit the training procedure, discard any IDs learned in the current session and perform the Homelink function. After the button is released, the module will display "RETRAIN TIRE SENSORS? NO".

The training procedure can be stopped at any time by pressing the C/T, STEP, RESET or MENU button. When any of these buttons are pressed the EVIC will display "TRAINING ABORTED."

Once training is complete, the EVIC can determine when the spare wheel has been mounted on the vehicle. The spare wheel sensor/transmitter is expected to transmit once per hour. If the sensor/transmitter ID for the spare wheel is received at a shorter interval, the EVIC will request a chime and display "SPARE SWAP DETECTED" for five seconds.

NOTE: The spare tire message is only available when equipped with the 5-Tire TPM System.

3.7.2 PRESSURE THRESHOLDS

The EVIC will monitor the tire pressure signals from the four (or five) tire sensors and determine if any tire has gone below the low pressure threshold or raised above the high pressure threshold. Refer to the table below.

LOW TIRE PRESSURE THRESHOLDS	
SYSTEM STATUS INDICATOR	TIRE PRESSURE
On	**172 kPa (25 PSI)**
Off	**193 kPa (28 PSI)**

HIGH TIRE PRESSURE THRESHOLDS	
SYSTEM STATUS INDICATOR	TIRE PRESSURE
On	**310 kPa (45 PSI)**
Off	**276 kPa (40 PSI)**

3.7.2.1 CRITICAL AND NON-CRITICAL PRESSURE ALERTS

A critical alert will be triggered when a tire pressure has gone below or above a set threshold pressure. Depending on what the condition is, the EVIC will request a chime and then display a LOW PRESSURE or HIGH PRESSURE message indicating the appropriate location. The alert message will display for three seconds and then switch to the tire pressure trip screen. The tire pressure for the tire that has exceeded its threshold will blink at one second intervals on the graphic display. The blinking pressure will continue for the rest of the ignition cycle or until an EVIC button is pressed. If the display is removed without correcting the condition, it will reappear without a chime after 60 seconds to warn the drive of the low/high pressure condition. A non-critical alert will be triggered when low or high pressure threshold has been exceeded in the spare tire. The “SPARE LOW PRESSURE” or “SPARE HIGH PRESSURE” alert will be displayed for 60 seconds during each ignition ON cycle. If the pressure threshold is exceeded while the ignition is OFF, the alert will be delayed 8-10 seconds after ignition ON.

NOTE: The spare tire is only monitored when equipped with the 5-Tire TPM System.

3.7.3 SYSTEM FAULTS

NOTE: The Remote Tire Pressure Monitors (RTPM) are not internally serviceable. For a Sensor Failure or Low Battery fault, the RTPM must be replaced.

There are four conditions which will cause a Tire Pressure Monitoring System fault to be set. All fault codes are associated with a specific wheel location.

1. If the EVIC detects a non-transmitting Sensor/Transmitter in a road wheel for ten consecutive minutes with vehicle speed above 25 MPH (40 kph), it will:
   a. Store an active fault code.
   b. Request a chime.
   c. Display “TIRE SENSOR BAD / MISSING”.
   d. Display a dashed line at the wheel location on the graphic display if the display is activated.

When the EVIC detects:

2. A low pressure sensor battery status,
3. All five sensors transmitting at a shorter than expected interval or,
4. No valid pressure sensor ID from the spare tire for 20 consecutive ignition cycles spaced at least one hour apart, it will:
   a. Store an active fault code.
   b. Request a chime.
   c. Display “TIRE SENSOR BAD / MISSING”.

Use the DRBIII® Input/Output function to further isolate the specific concern.

The DRBIII® can be queried to determine the Sensor/Transmitter status:

- “Invalid Pressure” - The Sensor/Transmitter is reporting a negative pressure or a pressure above 434 kPa (63 psi).
- “Low Batt” - The Sensor/Transmitter has reported a low battery status for seven consecutive ignition cycles.
- “Trained” - The Sensor/Transmitter ID code is recognized by the EVIC.
- “Active” - The vehicle is moving at 40 km/h (25 mph) and/or the Sensor/Transmitter is “awake” and transmitting as expected by the EVIC.

3.7.4 SPARE WHEEL AUTO-LOCATE (5-TIRE TPM SYSTEM ONLY)

If the spare tire is mounted on the vehicle, the EVIC will detect the move and determine from the sensor transmit intervals, which wheels are mounted and which one is now the spare. The spare tire sensor/transmitter transmits once per hour. The sensor/transmitters in the mounted wheels transmit once per minute when the vehicle is moving at 40 km/h (25 mph).

3.7.5 REMOVE MAGNET FROM SPARE (5-TIRE TPM SYSTEM ONLY)

A magnet is used to initiate a sensor ID transmission. In the EVIC training procedure, the spare wheel is the last in the sequence. If the magnet is

left on the wheel, the sensor/transmitter will continue its ID transmission. If the EVIC detects 20 transmissions from the spare wheel in 60 seconds and the vehicle speed is above 40 km/h (25 mph), it will:

- request a chime.
- display “REMOVE MAGNET FROM SPARE” for 60 seconds per ignition-ON cycle.

3.7.6 TIRE PRESSURE UNAVAILABLE

The EVIC can detect high radio noise interference. When the noise level is too high to distinguish a transmission from a sensor/transmitter, it will:

- display “TIRE PRESSURE UNAVAILABLE” for 5 seconds.
- request a chime
- switch back to previous screen.

3.7.7 TIRE PRESSURE NOW AVAILABLE

If the “TIRE PRESSURE UNAVAILABLE” message was displayed because of radio noise interference, the EVIC will:

- display “TIRE PRESSURE NOW AVAILABLE” for 5 seconds.
- request a chime when the noise level no longer interferes with sensor/transmitter transmissions.

3.7.8 DIAGNOSING AND CLEARING SYSTEM FAULTS

All Tire Pressure Monitoring System Faults are specific to one location. If a “LOW BATTERY” fault is detected, the “TIRE SENSOR BAD / MISSING” message will be displayed. The appropriate sensor/transmitter can then be replaced.

If a single sensor/transmitter cannot be detected by the EVIC, replace that sensor transmitter. If none of the sensors/transmitters can be detected, refer to symptoms in the EVIC section.

3.7.9 SYSTEM TEST

A test of the Tire Pressure Monitoring System can be initiated in the EVIC. The test sequence is as follows:

1. Scroll to the blank display by pressing the STEP button.
2. Press and hold the RESET button for five seconds.
3. The EVIC will emit a beep to indicate the start of the test.
4. The EVIC will clear the sensor signal counters
5. The vehicle icon will be displayed with transmission counters at each corner. (Same display as for pressures but with counters in place of pressures.)
6. Drive the vehicle at speeds above 40 km/h (25 mph) for 10 minutes.
7. The counters will increase by one each time a sensor signal is received by the EVIC (approximately 1/min from each wheel except the spare).
8. The test will continue until any EVIC button is pressed or until the ignition is cycled to OFF.

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 wheel 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 a chassis system problem, it is important to follow approved procedures where applicable. These procedures can be found in the service manual. Following these procedures is very important to 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 chassis system are intended to be serviced as an assembly only. Attempting to remove or repair certain system subcomponents 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 DRB 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 functions for the measurement. Do not try voltage or current measurement that may exceed the rated capacity.
- Do not exceed the limits shown in the table below:

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

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

- Voltage between any terminal and ground must not exceed 500v DC or 500v peak AC.
- Use caution when measuring voltage above 25v DC or 25v AC.
- Use the low current shunt to measure circuits up to 10A. Use the high current clamp to measure circuits exceeding 10A.
- When testing for the presence of voltage or current, make sure the meter is functioning correctly. Take a reading of a known voltage or current before accepting a zero reading.
- When measuring current, connect the meter in series with 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 complains 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 DRB.

4.4 DIAGNOSIS

1. Your diagnostic test procedure must begin with a thorough visual inspection of the ABS system for damaged components or disconnected connec-

tors. The brake lamps must be operational, and if they are not, repair them prior to continuing.

2. Connect the DRBIII® to the data link connector, which is located under the dash to the left of the steering column. If the DRBIII® does not power up, check the power and ground supplies to the connector.
3. Turn the ignition on. Select "Antilock Brakes". If the DRBIII® displays "No Response" condition you must diagnose that first.
4. Read and record all ABS Diagnostic Trouble Codes (DTC's). If the "CAB Power Feed Circuit" diagnostic trouble code is present, it must be repaired prior to addressing other DTC's. If any additional DTC's are present, proceed to the appropriate test by locating the matching test in the Table of Contents and begin to diagnose the symptom.
5. If there are no diagnostic trouble codes present, identify the customer complaint, select "Inputs/ Outputs" and read the brake switch input as you press and release the brake pedal. If the display does not match the state of the pedal, perform the proper test by locating the matching test in the Table of Contents and begin to diagnose the symptom. If a problem exists with the yellow "ABS" warning indicator or the red "Brake" indicator, perform the proper test by locating the matching test in the Table of Contents and begin to diagnose the symptom. On LH read the traction control switch input as you press and release the switch. If the display does not match the state of the indicator, locate the matching test in the Table of Contents and begin to diagnose the symptom.
6. If no other problems are found, it will be necessary to road test the vehicle. Perform several antilock stops from above 50 Km/h (30 mph) and then repeat step 4. If any diagnostic trouble codes are present, proceed to the appropriate test.
7. The following conditions should be considered "NORMAL" operation, and no repairs should be attempted to correct them.
   - Brake pedal feedback during an ABS stop (clicking, vibrating)
   - Clicking, groaning or buzzing at 25 Km/h (15 mph) or 40 Km/h (24 mph) (drive off self test)
   - Groaning noise during an ABS stop
   - Slight brake pedal drop and pop noise when ignition is initially turned on
   - Brake pedal ratcheting down at the end of an ABS stop.
8. If the complaint is ABS "cycling" at the end of a stop at low speeds, it may be caused by a marginal wheel speed sensor signal. The sensor air gap, tone wheel condition, and/or brakes hanging up are possible causes of this condition.
9. After a road test and no problems were found, refer to any Technical Service Bulletins that may apply.

5.0 Required tools and equipment

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

6.0 Glossary of Terms

ABS	antilock brake system
CAB	controller antilock brake
DC	direct current
DLC	data link connector
DRB	diagnostic read-out box
EVBP	electronic variable brake proportioning
HCU	hydraulic control unit
JBLK	junction block
LF	left front
LR	left rear
PCI	programmable communications interface (communications bus)
PDC	power distribution center
P/M	pump motor
RF	right front
RR	right rear
WSS	wheel speed sensor

7.0

DIAGNOSTIC INFORMATION AND PROCEDURES

Symptom:

BUS SYSTEM COMMUNICATION FAILURE

When Monitored and Set Condition:

BUS SYSTEM COMMUNICATION FAILURE

When Monitored: Ignition ON, continuously.

Set Condition: When the CAB does not receive a message from the instrument cluster for 10 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ELECTRO-MECHANICAL INSTRUMENT CLUSTER DTC PRESENT
BUS CIRCUIT OPEN
CAB - INTERNAL FAILURE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. With the DRBIII®, read Freeze Frame information. With the DRBIII®, erase DTCs. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTCs. Does the DRBIII® display BUS SYSTEM COMMUNICATION FAILURE? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition on. With the DRBIII®, read EMIC DTCs. Does the DRBIII® display NO MESSAGES FROM ABS? Yes → Refer to symptom NO MESSAGES FROM ABS in the BODY/INSTRUMENT CLUSTER category. Perform ABS VERIFICATION TEST - VER 1. No → Go To 3	All

BUS SYSTEM COMMUNICATION FAILURE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the negative (-) battery cable. Disconnect the CAB harness connector. **NOTE: check connector - Clean/repair as necessary.** Measure the resistance of the Bus circuit between the CAB connector and the Data Link Connector (DLC). Is the resistance below 5.0 ohms? Yes → Replace the Controller Antilock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. No → Repair the Bus circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
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. Were any problems found? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom:

CAB INTERNAL FAILURE

When Monitored and Set Condition:

CAB INTERNAL FAILURE

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

Set Condition: If the Fused B(+) voltage is missing when the CAB detects that an internal main driver is not ″on″, the Diagnostic Trouble Code (DTC) is set.

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

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. With the DRBIII®, erase DTCs. Turn the ignition off. Turn the ignition on. With the DRBIII®, read DTCs. Does the DRBIII® display CAB INTERNAL FAILURE? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the CAB harness connector. Inspect the CAB/CAB harness connector for damage. Is ther any broken, bent, pushed out, corroded or spread terminals? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Go To 3	All

CAB INTERNAL FAILURE — Continued

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

Symptom:
CLUSTER LAMP FAILURE

When Monitored and Set Condition:

CLUSTER LAMP FAILURE

When Monitored: Key ON. After Key-ON bulb check

Set Condition: When the instrument cluster informs the CAB that the cluster cannot turn on the ABS Lamp.

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

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

CLUSTER LAMP FAILURE — Continued

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

Symptom:
INCORRECT TONE WHEEL FAILURE

When Monitored and Set Condition:

INCORRECT TONE WHEEL FAILURE

When Monitored: Ignition ON. Vehicle speed above 40 km/h (25 mph) for 2 minutes.

Set Condition: When the CAB detects an unexpected wheel speed condition caused by a tire size that does not meet vehicle specification.

POSSIBLE CAUSES
INCORRECT TIRES ON VEHICLE
INCORRECT TONE WHEEL ON VEHICLE

TEST	ACTION	APPLICABILITY
1	Inspect the tire sizes on the vehicle. Is a smaller than production tire, mini spare, or two mini spares installed on both front wheels? Yes → Replace the incorrect tire(s) size with production size tire(s). Perform ABS VERIFICATION TEST - VER 1. No → Go To 2	All
2	Count the number of tone wheel teeth on both of the front driveshafts. Does one or both tone wheel(s) have (56 or 40) teeth? Yes → Replace the front driveshaft(s) with the incorrect number of tone wheel teeth. Perform ABS VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom List:

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

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

When Monitored and Set Condition:

LEFT FRONT SENSOR CIRCUIT FAILURE

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

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

LEFT REAR SENSOR CIRCUIT FAILURE

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

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

RIGHT FRONT SENSOR CIRCUIT FAILURE

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

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

RIGHT REAR SENSOR CIRCUIT FAILURE

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

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

POSSIBLE CAUSES
INTERMITTENT CONDITION
WHEEL SPEED SENSOR OR CONNECTOR DAMAGE
WHEEL SPEED SENSOR SIGNAL CIRCUIT FAULT
WHEEL SPEED SENSOR 12 VOLT SUPPLY CIRCUIT SHORT TO GROUND
WHEEL SPEED SENSOR 12 VOLT SUPPLY CIRCUIT OPEN
WHEEL SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
WHEEL SPEED SENSOR SIGNAL CIRCUIT OPEN

LEFT FRONT SENSOR CIRCUIT FAILURE — Continued

POSSIBLE CAUSES
CAB - 12 VOLT SUPPLY CIRCUIT FAULT
CAB - SIGNAL CIRCUIT FAULT
WHEEL SPEED SENSOR 12 VOLT SUPPLY SHORT TO GROUND
WHEEL SPEED SENSOR SIGNAL CIRCUIT INOPERATIVE

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

LEFT FRONT SENSOR CIRCUIT FAILURE — Continued

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

LEFT FRONT SENSOR CIRCUIT FAILURE — Continued

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

LEFT FRONT SENSOR CIRCUIT FAILURE — Continued

TEST	ACTION	APPLICABILITY
13	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 WHEEL SPEED SIGNAL FAILURE
LEFT REAR WHEEL SPEED SIGNAL FAILURE
RIGHT FRONT WHEEL SPEED SIGNAL FAILURE
RIGHT REAR WHEEL SPEED SIGNAL FAILURE

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

When Monitored and Set Condition:

LEFT FRONT WHEEL SPEED SIGNAL FAILURE

When Monitored: Wheel speed comparison is checked and verified at drive off and continuously thereafter.

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

LEFT REAR WHEEL SPEED SIGNAL FAILURE

When Monitored: Wheel speed comparison is checked and verified at drive off and continuously thereafter.

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

RIGHT FRONT WHEEL SPEED SIGNAL FAILURE

When Monitored: Wheel speed comparison is checked and verified at drive off and continuously thereafter.

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

RIGHT REAR WHEEL SPEED SIGNAL FAILURE

When Monitored: Wheel speed comparison is checked and verified at drive off and continuously thereafter.

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

LEFT FRONT WHEEL SPEED SIGNAL FAILURE — Continued

POSSIBLE CAUSES
WHEEL SPEED SIGNAL FAILURE DTC PRESENT
AFFECTED WHEEL SPEED SENSOR SIGNAL INOPERATIVE
AFFECTED WHEEL SPEED SENSOR CONNECTOR DAMAGED
AFFECTED WHEEL SPEED SENSOR TONE WHEEL DAMAGED
AFFECTED WHEEL SPEED SENSOR AIR GAP FAULT
WHEEL BEARING FAULT
BRAKE LINING FAULT
AFFECTED WHEEL SPEED SENSOR CIRCUIT ELECTRICAL FAULT

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

LEFT FRONT WHEEL SPEED SIGNAL FAILURE — Continued

TEST	ACTION	APPLICABILITY
4	Turn ignition off. Inspect the affected Tone Wheel for damaged, missing teeth, cracks, or looseness **NOTE: The Tone Wheel teeth should be perfectly square, not bent, or nicked.** Is the affected Tone Wheel OK? Yes → Go To 5 No → Replace the Tone Wheel in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All
5	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 6 No → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.	All
6	Turn the ignition off. Inspect the wheel bearings for excessive runout or clearance. **NOTE: Refer to the appropriate service information, if necessary, for procedures or specifications.** Is the bearing clearance OK ? Yes → Go To 7 No → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1.	All
7	Turn the ignition off. Visually inspect brakes for locking up due to lining contamination or overheating. Inspect all Components for defects which may cause a Signal DTC to set. Is any Component Damaged? Yes → Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. No → Refer to symptom SENSOR CIRCUIT FAILURE for further diagnostics. Perform ABS VERIFICATION TEST - VER 1.	All

Symptom:
PUMP CIRCUIT FAILURE

When Monitored and Set Condition:

PUMP CIRCUIT FAILURE

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

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

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

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

PUMP CIRCUIT FAILURE — Continued

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

PUMP CIRCUIT FAILURE — Continued

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

PUMP CIRCUIT FAILURE — Continued

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

Symptom:
SYSTEM OVER VOLTAGE

When Monitored and Set Condition:

SYSTEM OVER VOLTAGE

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

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

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

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

SYSTEM OVER VOLTAGE — Continued

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

SYSTEM OVER VOLTAGE — Continued

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

Symptom:
SYSTEM UNDER VOLTAGE

When Monitored and Set Condition:

SYSTEM UNDER VOLTAGE

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

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

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

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

SYSTEM UNDER VOLTAGE — Continued

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

Symptom:

VALVE POWER FEED FAILURE

When Monitored and Set Condition:

VALVE POWER FEED FAILURE

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

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

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

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

VALVE POWER FEED FAILURE — Continued

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

VALVE POWER FEED FAILURE — Continued

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

Symptom:
*BRAKE LAMP SWITCH INOPERATIVE

POSSIBLE CAUSES
CHECK BRAKE LAMP SWITCH OUTPUT
BRAKE LAMP SWITCH B+ OPEN
BRAKE LAMP SWITCH OPEN
BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORT OR OPEN
CAB -- INTERNAL OPEN

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

Symptom:

*TRAC OFF INDICATOR NEVER/ALWAYS ON

POSSIBLE CAUSES
INSTRUMENT CLUSTER FAILS BULB CHECK
TRAC OFF SWITCH GROUND OPEN
TRAC OFF SWITCH INOPERATIVE
CHECK TRAC OFF SWITCH
TRAC OFF SWITCH SENSE CIRCUIT SHORT TO B+, GROUND OR OPEN
INSTRUMENT CLUSTER INTERNAL FAULT

TEST	ACTION	APPLICABILITY
1	**Note: If any DTC's are present, they must be repaired prior to performing this test.** Turn the ignition off. Turn the ignition on. Observe the TRAC OFF indicator. Did the TRAC OFF indicator come on for several seconds then go out? Yes → Go To 2 No → Replace the Instrument Cluster in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All
2	Turn the headlamps ON. Depress the TRAC OFF switch. Does the TRAC OFF switch button illuminate? Yes → Go To 3 No → Go To 5	All
3	Turn the ignition off. Disconnect the TRAC OFF Switch harness connector. Turn the ignition on. Connect and disconnect a jumper wire between TRAC OFF Switch Ground and TRAC OFF Switch Sense circuits. Does the TRAC OFF Indicator light and then go out? Yes → Replace the TRAC OFF switch. Perform ABS VERIFICATION TEST - VER 1. No → Go To 4	All

*TRAC OFF INDICATOR NEVER/ALWAYS ON — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the TRAC OFF Switch harness connector. Disconnect the CAB harness connector. Check the TRAC OFF Switch Sense circuit for short to B+ or ground and for an open. Is the Sense circuit shorted or open? Yes → Repair the TRAC OFF Switch Sense circuit for a short to battery, ground or for an open. Perform ABS VERIFICATION TEST - VER 1. No → Replace the Instrument Cluster in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All
5	Disconnect the TRAC OFF switch harness connector. Using a 12-volt test light connected to 12-volts, check the TRAC OFF Switch Ground circuit. Does the test light illuminate? Yes → Replace the TRAC OFF Switch. Perform ABS VERIFICATION TEST - VER 1. No → Repair the TRAC OFF Switch Ground circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All

Symptom:
*TRAC ON INDICATOR NEVER/ALWAYS ON

POSSIBLE CAUSES
FAILS KEY-ON BULB TEST
CHECK TRACTION CONTROL OPERATION
RECHECK TRAC ON INDICATOR
CAB - NO TRAC ON INDICATOR

TEST	ACTION	APPLICABILITY
1	**NOTE: The DRBIII® must be able to communicate with the CAB prior to performing this test.** **Note: If any CAB DTC's are present, they must be repaired prior to performing this test.** Perform the KEY-ON bulb test. Did the Trac On indicator illuminate and then go out? Yes → Go To 2 No → Refer to INSTRUMENT CLUSTER for the related symptom(s). Perform ABS VERIFICATION TEST - VER 1.	All
2	Make sure the Traction Control system has not been deactivated with the TRAC OFF switch. **NOTE: The purpose of this test is to determine if the Traction Control system is operating.** With the DRBIII® in Inputs/Outputs, read the ABS Pump Motor voltage state. Accelerate sufficient to cause drive wheel slip. Does the DRBIII® display approximately 9 volts? Yes → Go To 3 No → Replace the Controller Anti-Lock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All
3	Replace the Instrument Cluster in accordance with the Service Information. Make sure the Traction Control system has not been deactivated with the TRAC OFF switch. **NOTE: The purpose of this test is to determine if replacing the Instrument Cluster has corrected the problem.** Accelerate sufficient to cause drive wheel slip. Does the TRAC ON indicator illuminate during Traction Control activation? Yes → Repair is complete. Perform ABS VERIFICATION TEST - VER 1. No → Replace the Controller Anti-Lock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1.	All

Symptom:

***NO RESPONSE FROM CONTROLLER ANTILOCK BRAKE**

POSSIBLE CAUSES
NO RESPONSE FROM CAB
REPLACE FUSE #17
FUSED IGNITION SWITCH OUTPUT CIRCUIT SHORTED TO GROUND
GROUND CIRCUIT OPEN
OPEN FUSED IGNITION SWITCH OUTPUT CIRCUIT
CONTROLLER ANTILOCK BRAKE (CAB) MODULE
PCI BUS CIRCUIT OPEN
BODY CONTROL MODULE

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. With the DRB, attempt to communicate with the Body Control Module (BCM). 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. Remove and inspect fuse #17 in the junction block. Is the fuse open? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition off. Replace Fuse #17 in the junction block. Turn the ignition on. Remove and inspect fuse #17 in the junction block. Is the fuse open? Yes → Repair the Fused Ignition Switch Output circuit for a short to ground. Refer to the wiring diagrams located in the service information to help isolate the short to ground condition. Perform ABS VERIFICATION TEST - VER 1. No → Check the Fused Ignition Switch Output circuit for an intermittent short to ground, refer to the wiring diagrams located in the service information. Perform ABS VERIFICATION TEST - VER 1.	All

*NO RESPONSE FROM CONTROLLER ANTILOCK BRAKE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the CAB 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 5 No → Repair the ground circuit(s) for an open. Perform ABS VERIFICATION TEST - VER 1.	All
5	Turn the ignition off. **NOTE: Ensure fuse #17 is installed in the junction block.** Disconnect the CAB 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 6 No → Repair the Fused Ignition Switch Output circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All
6	**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.** Disconnect the CAB 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? Yes → Replace the Controller Antilock Brake (CAB) in accordance with the service information. Perform ABS VERIFICATION TEST - VER 1. No → Go To 7	All

*NO RESPONSE FROM CONTROLLER ANTILOCK BRAKE — Continued

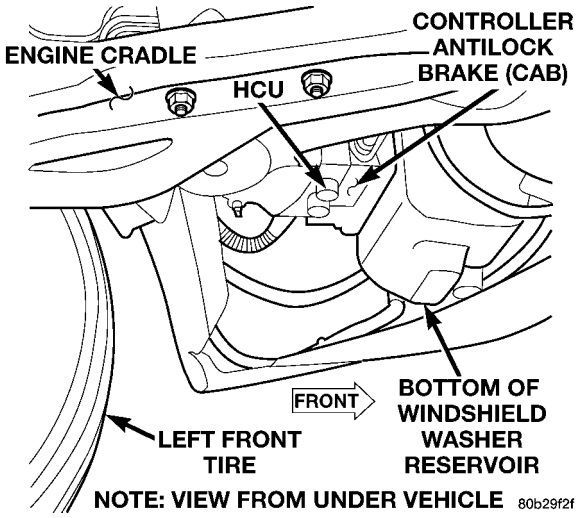
TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the CAB harness connector. Disconnect the BCM C3 harness connector. Measure the resistance of the PCI bus circuit between the CAB connector and the BCM C3 connector. Is the resistance below 5.0 ohms? Yes → Replace the Body Control Module in accordance with the service information. Perform ABS VERIFICATION TEST - VER 1. No → Repair the PCI Bus circuit for an open. Perform ABS VERIFICATION TEST - VER 1.	All

Verification Tests

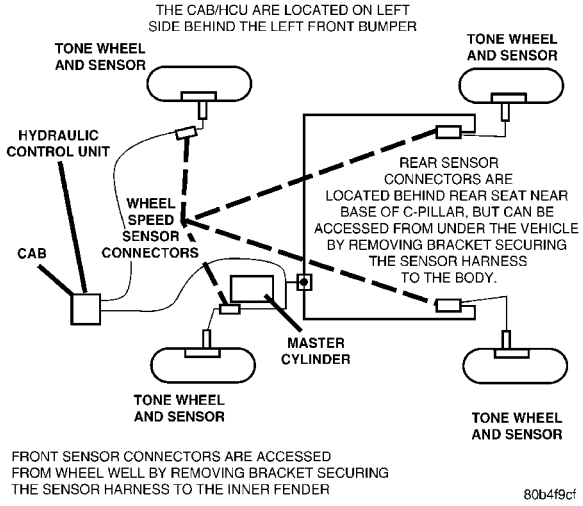
ABS VERIFICATION TEST - VER 1	APPLICABILITY
1. Turn the ignition off. 2. Connect all previously disconnected components and connectors. 3. Ensure all accessories are turned off and the battery is fully charged. 4. Ensure that the Ignition is on, and with the DRBIII, erase all Diagnostic Trouble Codes from ALL modules. Start the engine and allow it to run for 2 minutes and fully operate the system that was malfunctioning. 5. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the DRBIII, read DTC's from ALL modules. 6. If any Diagnostic Trouble Codes are present, return to Symptom list and troubleshoot new or recurring symptom. **7. NOTE: For Sensor Signal and Pump Motor faults, the CAB must sense all 4 wheels at 25 km/h (15 mph) before it will extinguish the ABS Indicator.** 8. If there are no DTC's present after turning ignition on, road test the vehicle for at least 5 minutes. Perform several antilock braking stops. **9. Caution: Ensure braking capability is available before road testing.** 10. Again, with the DRBIII® read DTC's. If any DTC's are present, return to Symptom list. 11. If there are no Diagnostic Trouble Codes (DTC's) present, and the customer's concern can no longer be duplicated, the repair is complete. Are any DTC's present or is the original concern still present? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

8.0 COMPONENT LOCATIONS

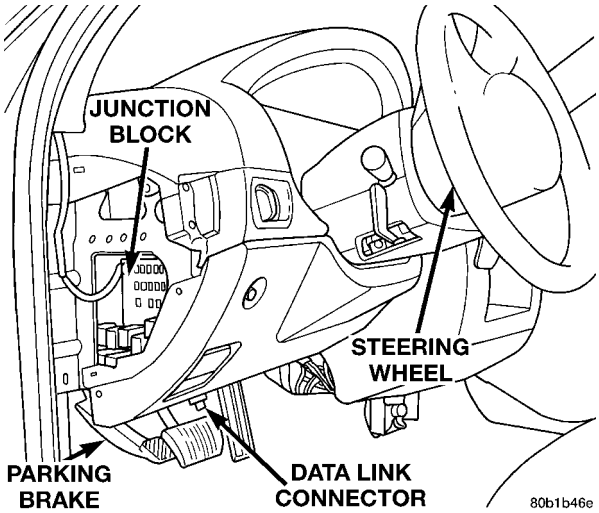
8.1 CONTROLLER ANTILOCK BRAKE (CAB)



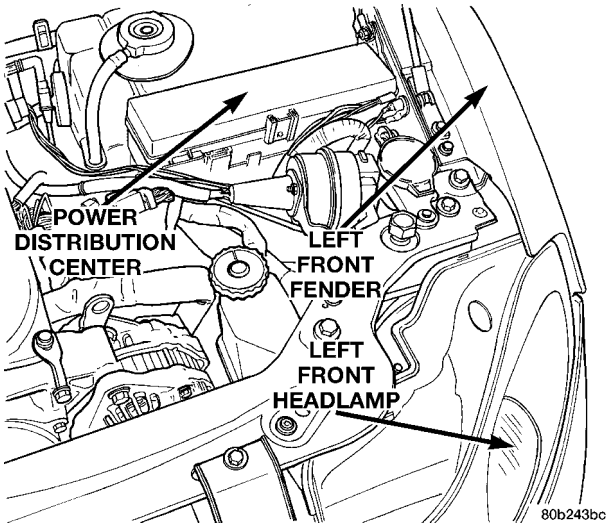
8.2 HARNESS ROUTING

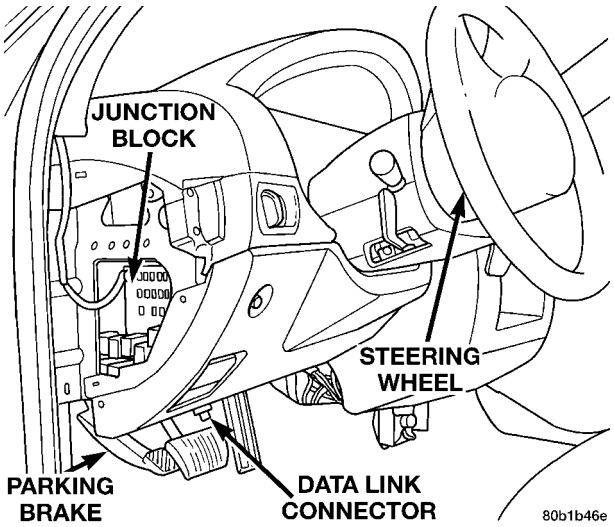


8.3 DATA LINK CONNECTOR

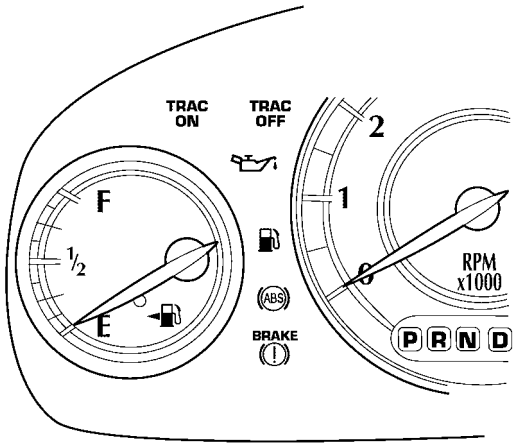


8.4 FUSES



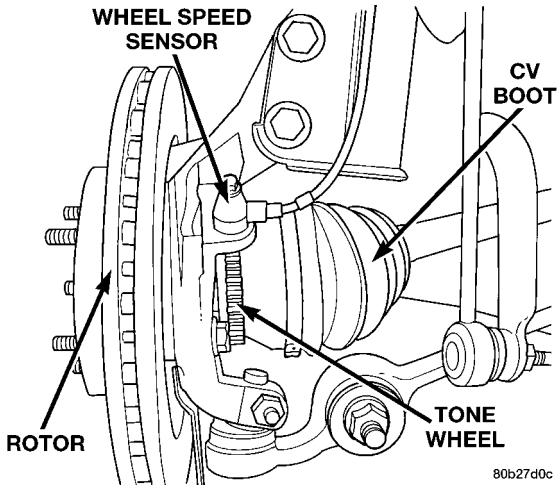


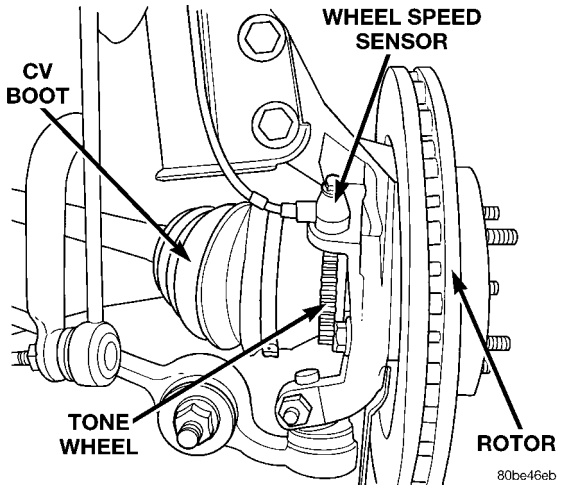
8.5 TRACTION CONTROL INDICATORS



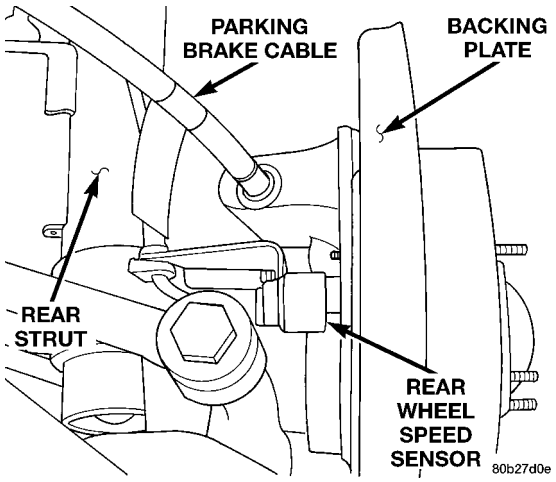
8.6 WHEEL SPEED SENSORS

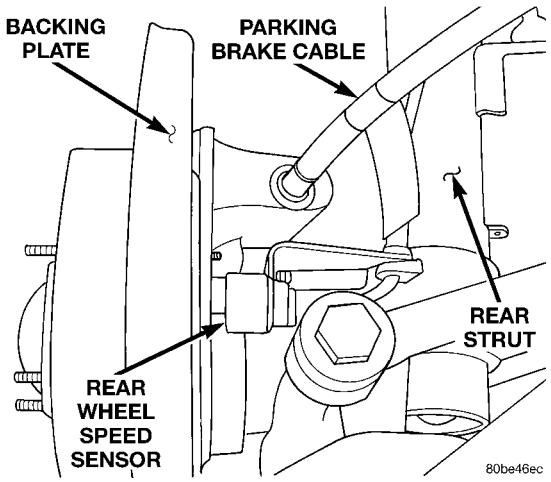
8.6.1 FRONT



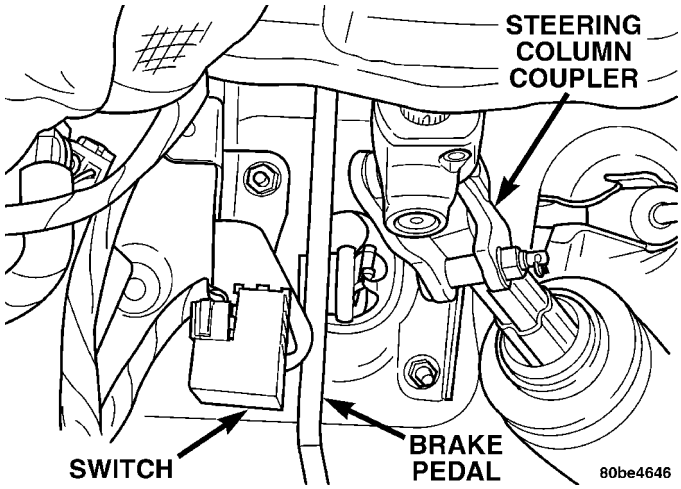


8.6.2 REAR

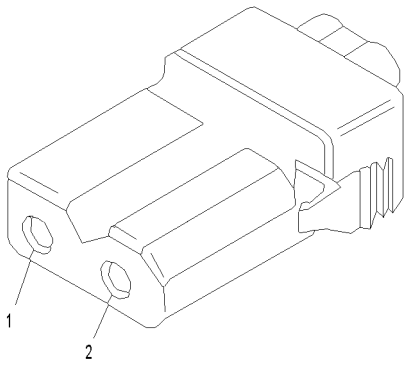




8.7 BRAKE LAMP SWITCH



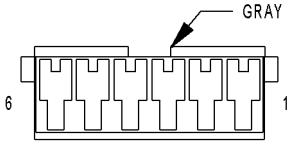
9.0 CONNECTOR PINOUTS



ABS PUMP MOTOR

ABS PUMP MOTOR

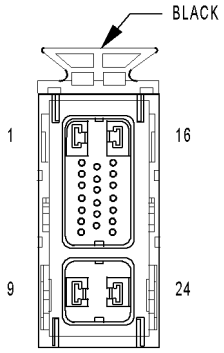
CAV	CIRCUIT	FUNCTION
1	TN	GROUND
2	RD	PUMP/MOTOR RELAY OUTPUT



BRAKE LAMP SWITCH

BRAKE LAMP SWITCH - GRAY 6 WAY

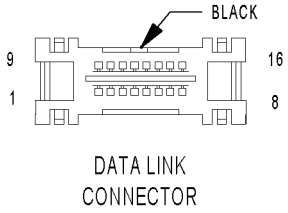
CAV	CIRCUIT	FUNCTION
1	K29 20WT/PK	BRAKE SWITCH SIGNAL
2	Z2 18BK/LG	GROUND
3	V32 20YL/RD	S/C SUPPLY
4	V30 20DB/RD	SPEED CONTROL BRAKE SWITCH OUTPUT
5	L50 16WT/TN	BRAKE LAMP SWITCH OUTPUT
6	F32 16PK/DB	FUSED B(+)



CONTROLLER ANTILOCK BRAKE

CONTROLLER ANTILOCK BRAKE - BLACK 24 WAY

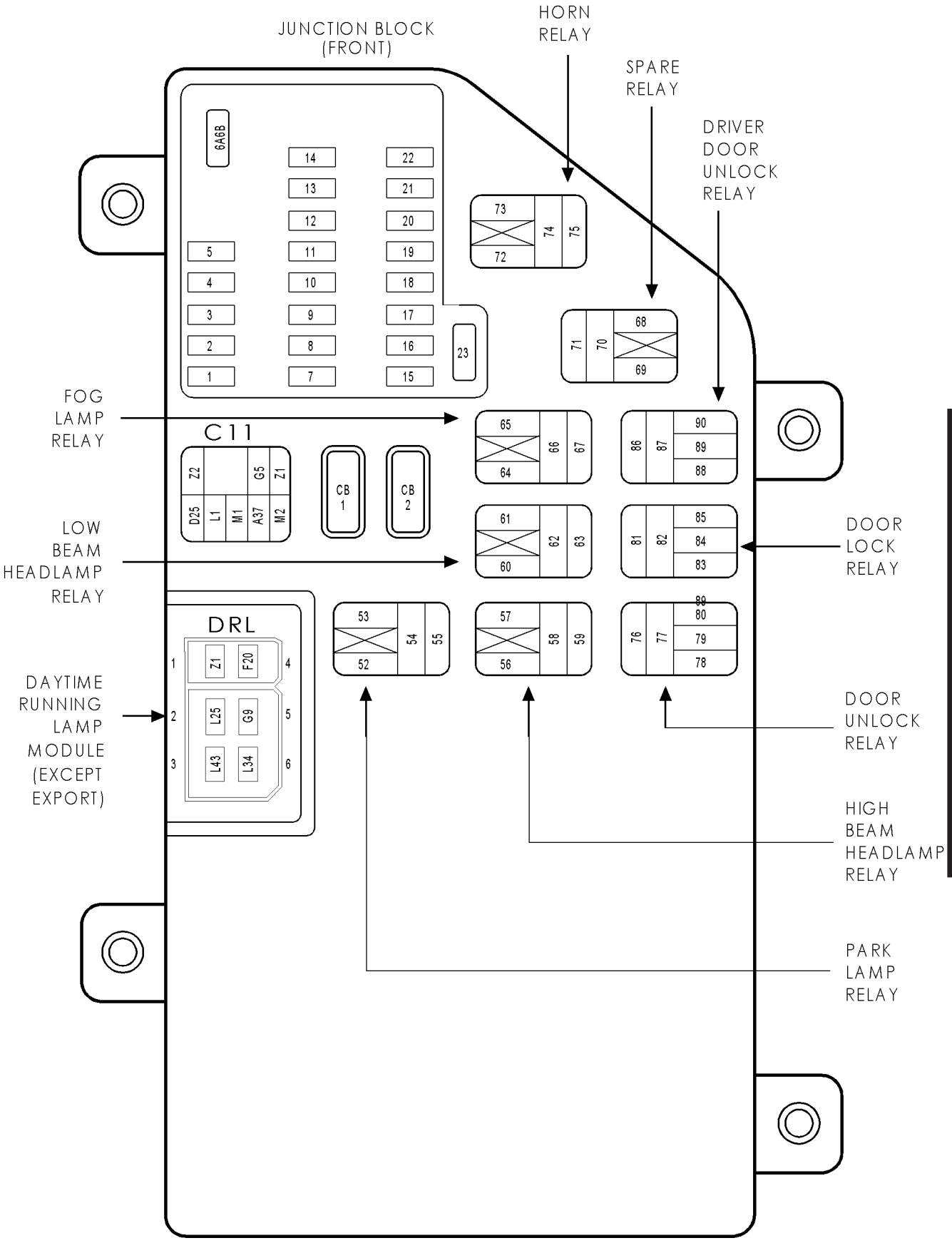
CAV	CIRCUIT	FUNCTION
1	Z1 12BK	GROUND
2	B1 18YL/DB	RIGHT REAR WHEEL SPEED SENSOR SIGNAL
3	B2 18YL	RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
4	-	-
5	D25 18VT/YL	PCI BUS
6	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL
7	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
8	-	-
9	A20 12RD/DB	FUSED B(+)
10	F20 18WT/VT	FUSED IGNITION SWITCH OUTPUT (RUN)
11	-	-
12	-	-
13	-	-
14	-	-
15	-	-
16	Z1 12BK	GROUND
17	-	-
18	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT
19	B3 18LG/DB	LEFT REAR WHEEL SPEED SENSOR SIGNAL
20	B4 18LG	LEFT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
21	-	-
22	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR SIGNAL
23	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
24	A10 12RD/DG	FUSED B(+)



DATA LINK
CONNECTOR

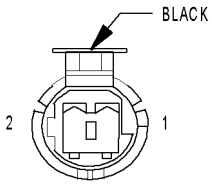
DATA LINK CONNECTOR - BLACK 16 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 20VT/YL	PCI BUS
3	-	-
4	Z1 20BK	GROUND
5	Z2 20BK/LG	GROUND
6	-	-
7	D21 20PK/TN	SCI TRANSMIT (PCM)
8	F11 20RD/WT	FUSED IGNITION SWITCH OUTPUT (OFF-RUN-START)
9	D19 20VT/OR	SCI RECEIVE (TCM)
10	-	-
11	-	-
12	D20 20LG	SCI RECEIVE (PCM)
13	-	-
14	-	-
15	D15 20WT/DG	SCI TRANSMIT (TCM)
16	F62 18RD	FUSED B(+)


JUNCTION BLOCK (FRONT)
HORN RELAY
SPARE RELAY
DRIVER DOOR UNLOCK RELAY
6A6B
14
13
12
11
10
9
8
7
22
21
20
19
18
17
16
15
5
4
3
2
1
23
73
74
75
72
68
71
70
69
FOG LAMP RELAY
C11
Z2
G5
Z1
D25
L1
M1
A37
M2
CB 1
CB 2
65
66
67
64
86
87
90
89
88
LOW BEAM HEADLAMP RELAY
61
62
63
60
81
82
85
84
83
DOOR LOCK RELAY
DRL
1
2
3
4
5
6
Z1
F20
L25
G9
L43
L34
53
54
55
52
57
58
59
56
76
77
89
80
79
78
DAYTIME RUNNING LAMP MODULE (EXCEPT EXPORT)
DOOR UNLOCK RELAY
HIGH BEAM HEADLAMP RELAY
PARK LAMP RELAY

FUSES (JB)

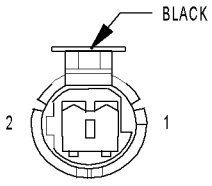
FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	10A	INTERNAL	IGNITION SWITCH OUTPUT (OFF-RUN-START)
2	10A	L34 20RD/OR	FUSED HIGH BEAM RELAY OUTPUT
3	10A	L33 20RD	FUSED HIGH BEAM RELAY OUTPUT
4	10A	X12 20RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
5	10A	F13 20DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
6	15A	F30 18RD (BATTERY POSITION)	FUSED B(+)
6	15A	F30 18RD (IGNITION POSITION)	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
7	20A	F33 18PK/RD	FUSED B(+)
8	10A	F23 18DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
9	10A	L5 22BK/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
10	10A	L44 16VT/RD	FUSED RIGHT LOW BEAM OUTPUT
11	20A	L40 18BR/WT	FUSED LOW BEAM RELAY OUTPUT
12	10A	L43 16VT	FUSED LEFT LOW BEAM OUTPUT
13	10A	F12 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
14	10A	G5 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
15	10A	INTERNAL	FUSED B(+)
16	20A	INTERNAL	FUSED B(+)
17	10A	F20 WT/VT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
18	20A	F62 16RD	FUSED B(+)
19	10A	M1 20PK	FUSED B(+)
20	20A	F32 16PK/DB	FUSED B(+)
21	10A	F18 20LG/BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
22	10A	F14 18LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
23	30A	C1 12DG	FUSED IGNITION SWITCH OUTPUT (RUN)



LEFT FRONT WHEEL SPEED SENSOR

LEFT FRONT WHEEL SPEED SENSOR - BLACK 2 WAY

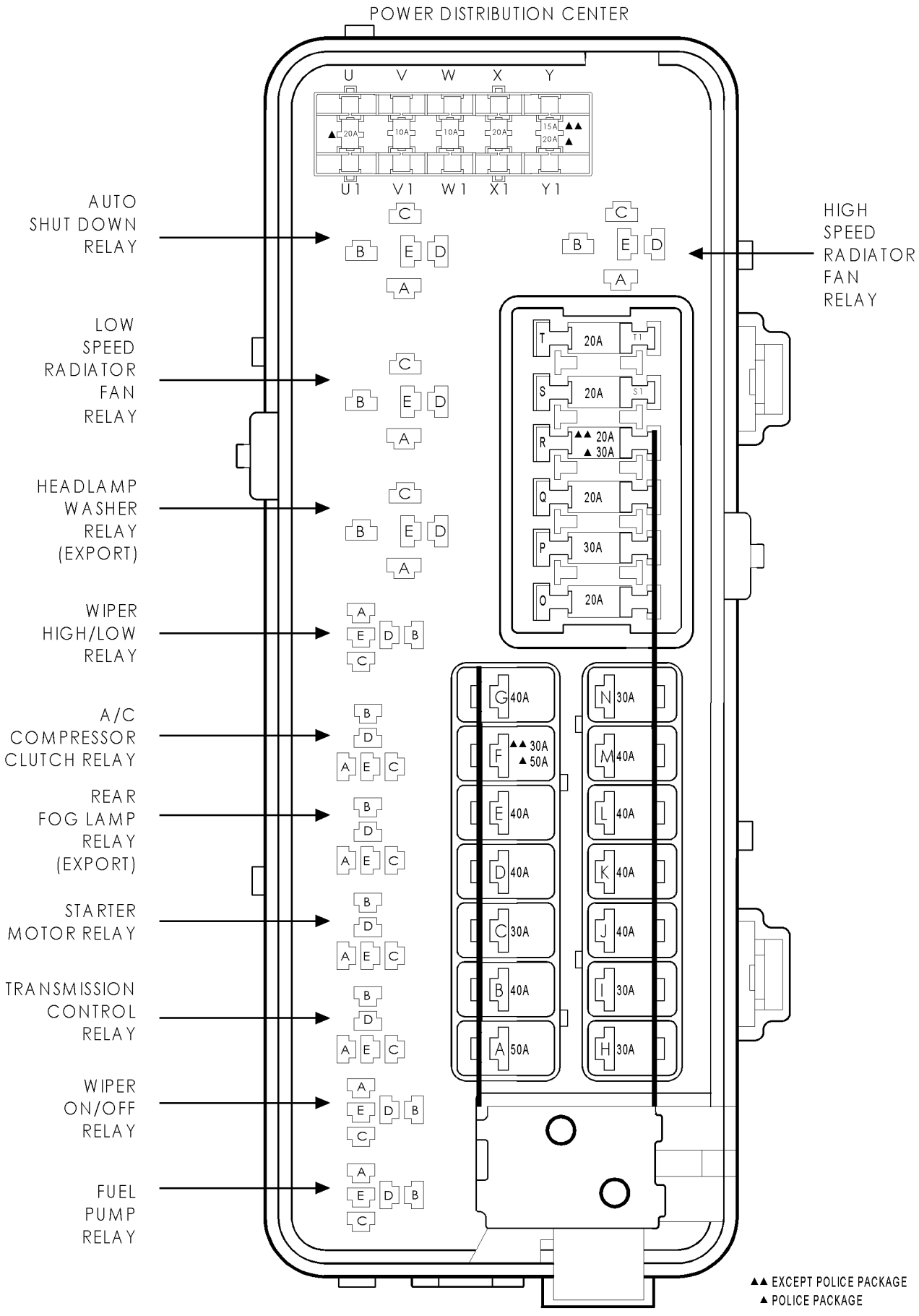
CAV	CIRCUIT	FUNCTION
1	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B9 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR SIGNAL



LEFT REAR WHEEL SPEED SENSOR

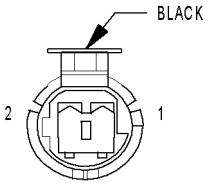
LEFT REAR WHEEL SPEED SENSOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	B4 18LG	LEFT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B3 18LG/DB	LEFT REAR WHEEL SPEED SENSOR SIGNAL


POWER DISTRIBUTION CENTER
U V W X Y
20A 10A 10A 20A 15A 20A
U1 V1 W1 X1 Y1
AUTO SHUT DOWN RELAY
HIGH SPEED RADIATOR FAN RELAY
LOW SPEED RADIATOR FAN RELAY
HEADLAMP WASHER RELAY (EXPORT)
WIPER HIGH/LOW RELAY
A/C COMPRESSOR CLUTCH RELAY
REAR FOG LAMP RELAY (EXPORT)
STARTER MOTOR RELAY
TRANSMISSION CONTROL RELAY
WIPER ON/OFF RELAY
FUEL PUMP RELAY
T 20A T1
S 20A S1
R ▲▲ 20A ▲ 30A
Q 20A
P 30A
O 20A
G 40A
F ▲▲ 30A ▲ 50A
E 40A
D 40A
C 30A
B 40A
A 50A
N 30A
M 40A
L 40A
K 40A
J 40A
I 30A
H 30A
▲▲ EXCEPT POLICE PACKAGE
▲ POLICE PACKAGE

FUSES (PDC)

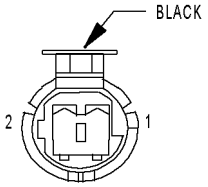
FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
A	50A	A4 10BK/PK	FUSED B(+)
B	40A	A17 12RD/BR	FUSED B(+)
C	30A	A3 14RD/TN	FUSED B(+)
D	40A	A34 12LB/RD	FUSED B(+)
E	40A	A16 12GY	FUSED B(+)
F	20A	A37 16WT/DB (DODGE/CONCORDE)	FUSED B(+)
F	30A	A37 16WT/DB (EXCEPT DODGE/CONCORDE)	FUSED B(+)
G	40A	A1 12RD	FUSED B(+)
H	30A	A20 12RD/DB (ABS)	FUSED B(+)
I	30A	A7 14RD/BK	FUSED B(+)
J	40A	A2 12PK/BK	FUSED B(+)
K	40A	A10 12RD/DG (ABS)	FUSED B(+)
L	40A	A13 12PK/WT	FUSED B(+)
M	40A	A5 12RD/OR	FUSED B(+)
N	30A	A14 14RD/WT	FUSED B(+)
O	20A	A15 18PK	FUSED B(+)
P	30A	A53 14RD/YL (EXPORT)	FUSED B(+)
P	30A	A101 16RD/TN (POLICE PACKAGE)	FUSED B(+)
Q	20A	A30 14RD/LB	FUSED B(+)
R	20A	A35 18DB (EXPORT)	FUSED B(+)
R	30A	A102 16RD/OR (POLICE PACKAGE)	FUSED AUTOMATIC SHUTDOWN RELAY OUTPUT
S	20A	F42 16DG/LG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
T	20A	F142 16OR/DG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
U	20A	A103 16RD/YL (POLICE PACKAGE)	FUSED AUTOMATIC SHUTDOWN RELAY OUTPUT
V	10A	A41 12YL	FUSED IGNITION SWITCH OUTPUT (START)
W	10A	A209 20RD	FUSED B(+)
X	20A	A130 16VT/RD (EXCEPT POLICE PACKAGE/DODGE)	FUSED B(+)
X	20A	SL1 18LB/WT (POLICE PACKAGE/LTD/300M)	FUSED B(+)
Y	15A	A105 18DB/RD (EXCEPT POLICE PACKAGE/DODGE)	FUSED B(+)
Y	20A	SL2 18DB/WT (POLICE PACKAGE)	FUSED B(+)



RIGHT FRONT WHEEL SPEED SENSOR

RIGHT FRONT WHEEL SPEED SENSOR - BLACK 2 WAY

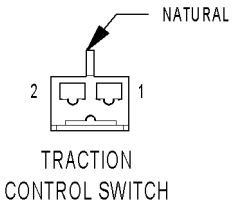
CAV	CIRCUIT	FUNCTION
1	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL



RIGHT REAR WHEEL SPEED SENSOR

RIGHT REAR WHEEL SPEED SENSOR - BLACK 2 WAY

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



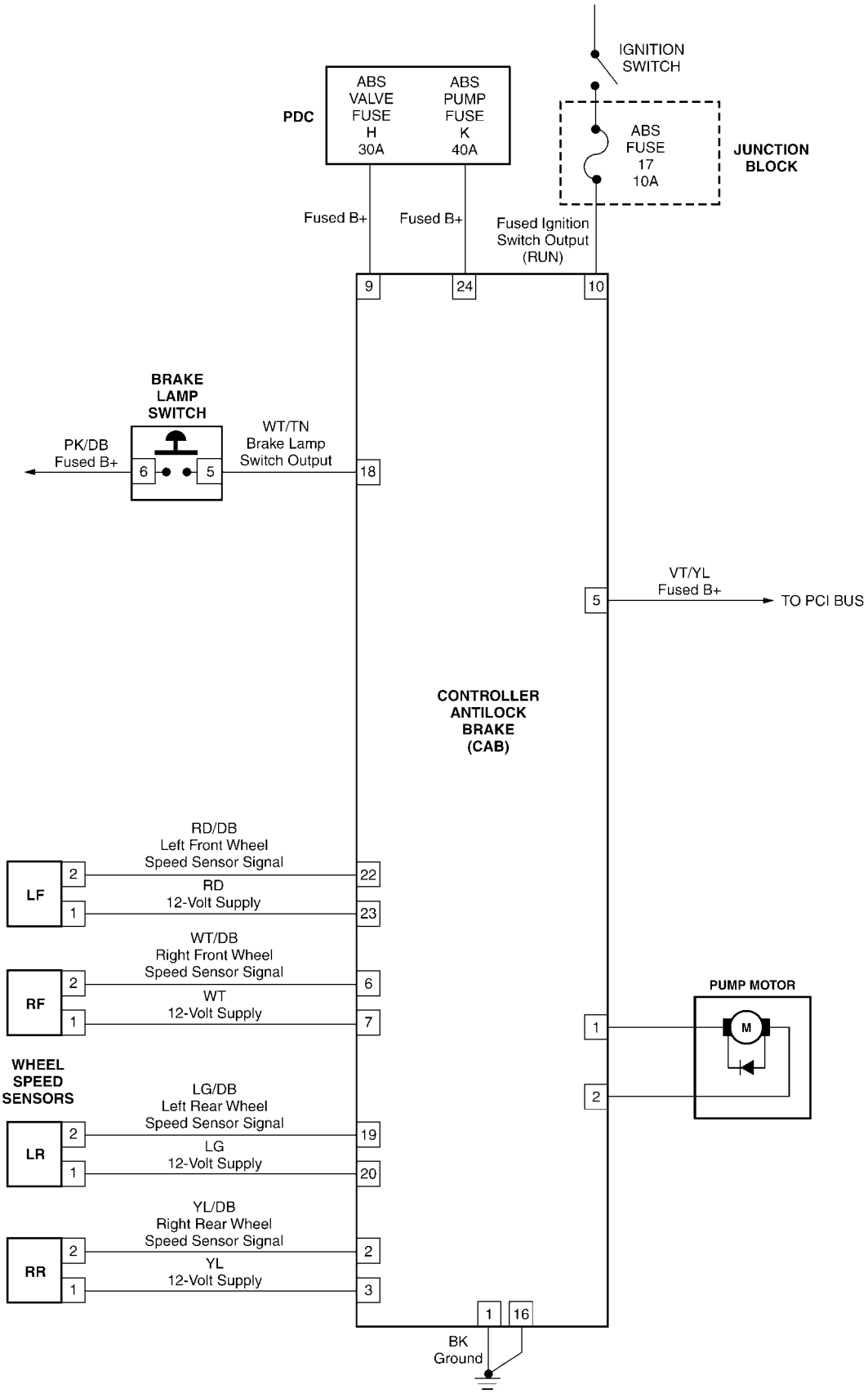
TRACTION
CONTROL SWITCH

TRACTION CONTROL SWITCH - NATURAL 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z2 22BK/LG	GROUND
2	B27 20RD/YL	TRACTION CONTROL SWITCH SENSE

10.0 SCHEMATIC DIAGRAMS

LH-TEVES MARK 20E CONTROLLER ANTILOCK BRAKE – ABS



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 # _____

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