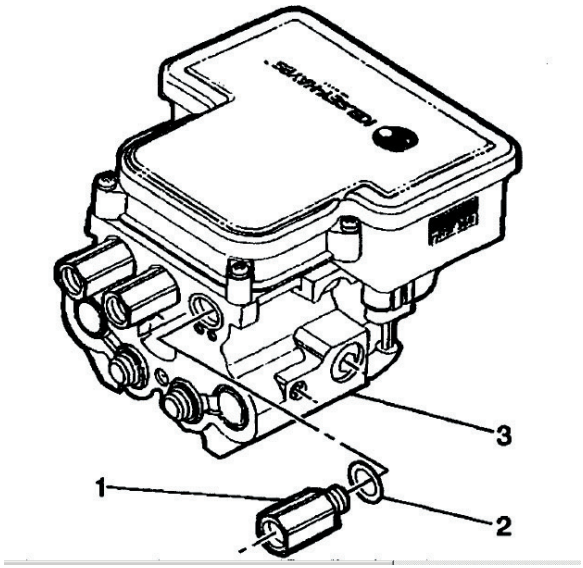
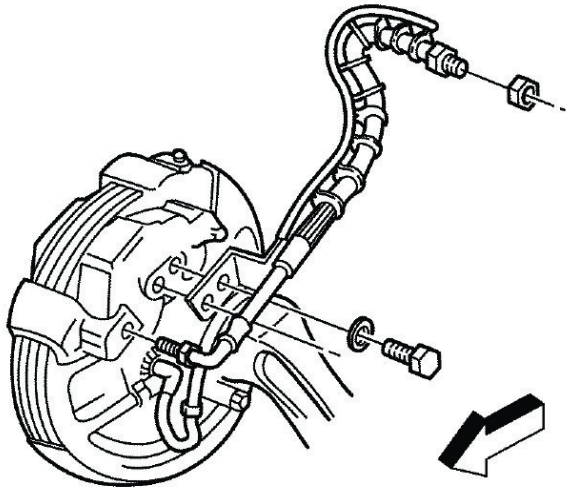
2006/2007
KELSEY-HAYES ANTILOCK BRAKE SYSTEM
(W22 CHASSIS ONLY)





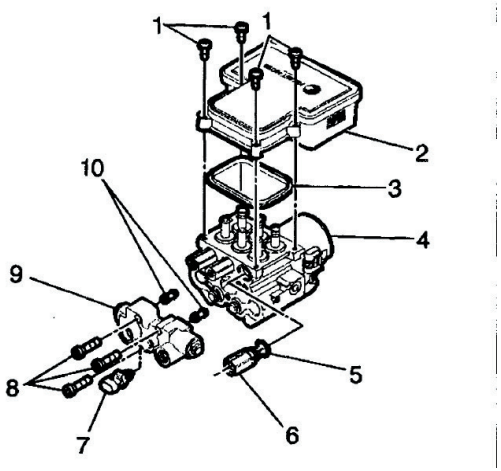


TABLE OF CONTENTS

ANTILOCK BRAKE SYSTEM

FASTENER TIGHTENING SPECIFICATIONS

Application	Specifications	
	Metric	English
EBCM Bracket Mounting Bolts	36 N•m	28 lb ft
Combination Valve to BPMV	16 N•m	12 lb ft
EBCM to BPMV	5 N•m	44 lb in
EHCU to Bracket	9 N•m	7 lb ft
Front Brake Line to Combination Valve	24 N•m	18 lb ft
Front Wheel Speed Sensor Mounting Bolts	26 N•m	19 lb ft
Rear Brake Line to Combination Valve	24 N•m	18 lb ft
Splash Shield Mounting Bolts	11 N•m	9 lb ft
Tube Adapters to BPMV	31 N•m	23 lb ft
Wheel Speed Sensor Harness Clip to Shock Tower	11 N•m	9 lb ft
EHCU Crossmember Bolts	36 N•m	28 lb ft
Hydraulic Lines to Tube Adapters	30 N•m	22 lb ft

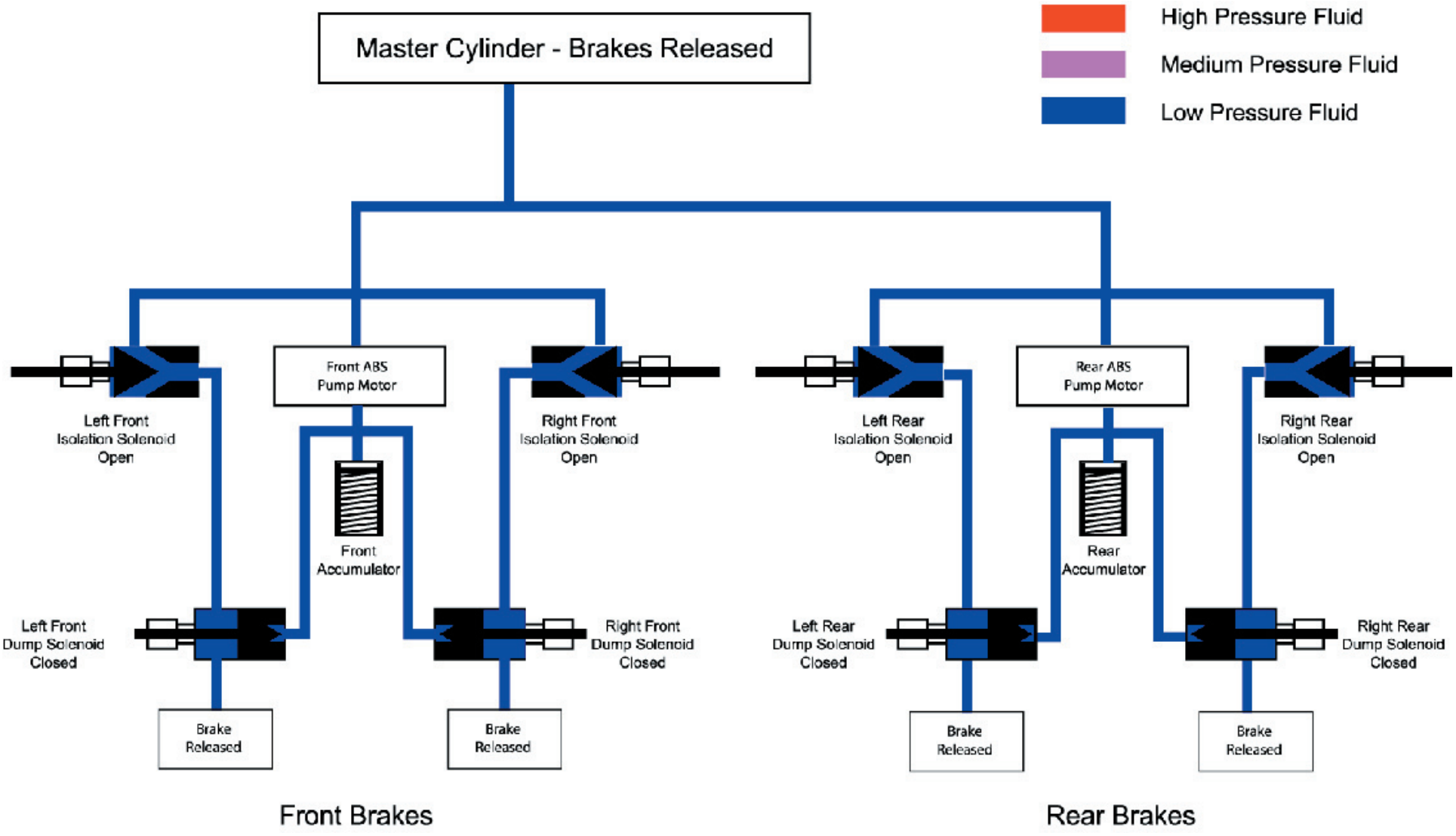
Service Parts Group Numbers

Application	Service Parts Group Number
Brake Pressure Modulator Valve	4.730
Electronic Brake Control Module	4.720
Stoplamp Switch	2.447
Wheel Speed Sensor	4.710

ABS HYDRAULIC FLOW CHARTS

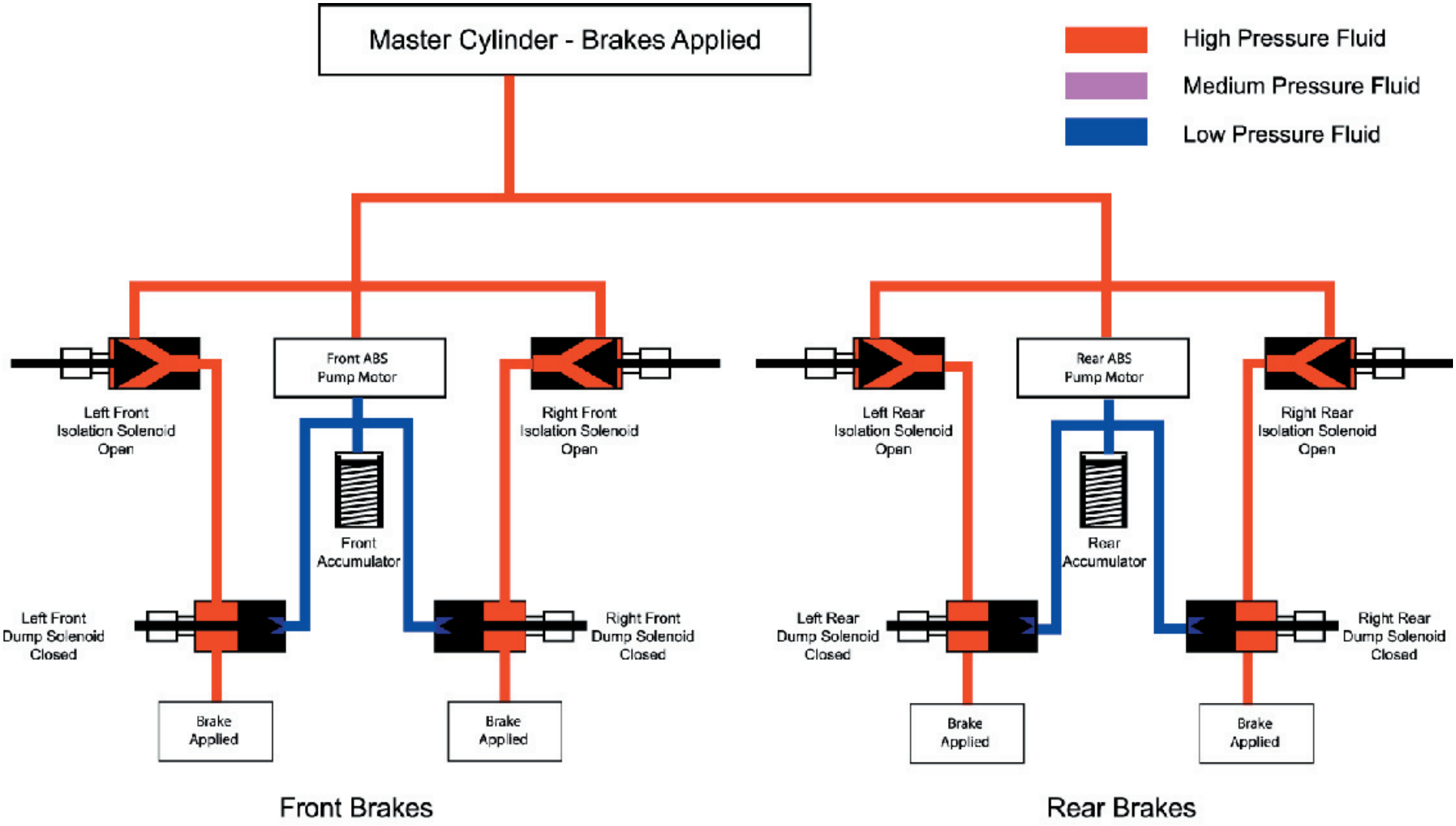
BPMV Hydraulic Flow Chart (Brakes Released)

The following graphic shows fluid flow with the brakes released. The system is at low pressure, all solenoids are in their default positions.



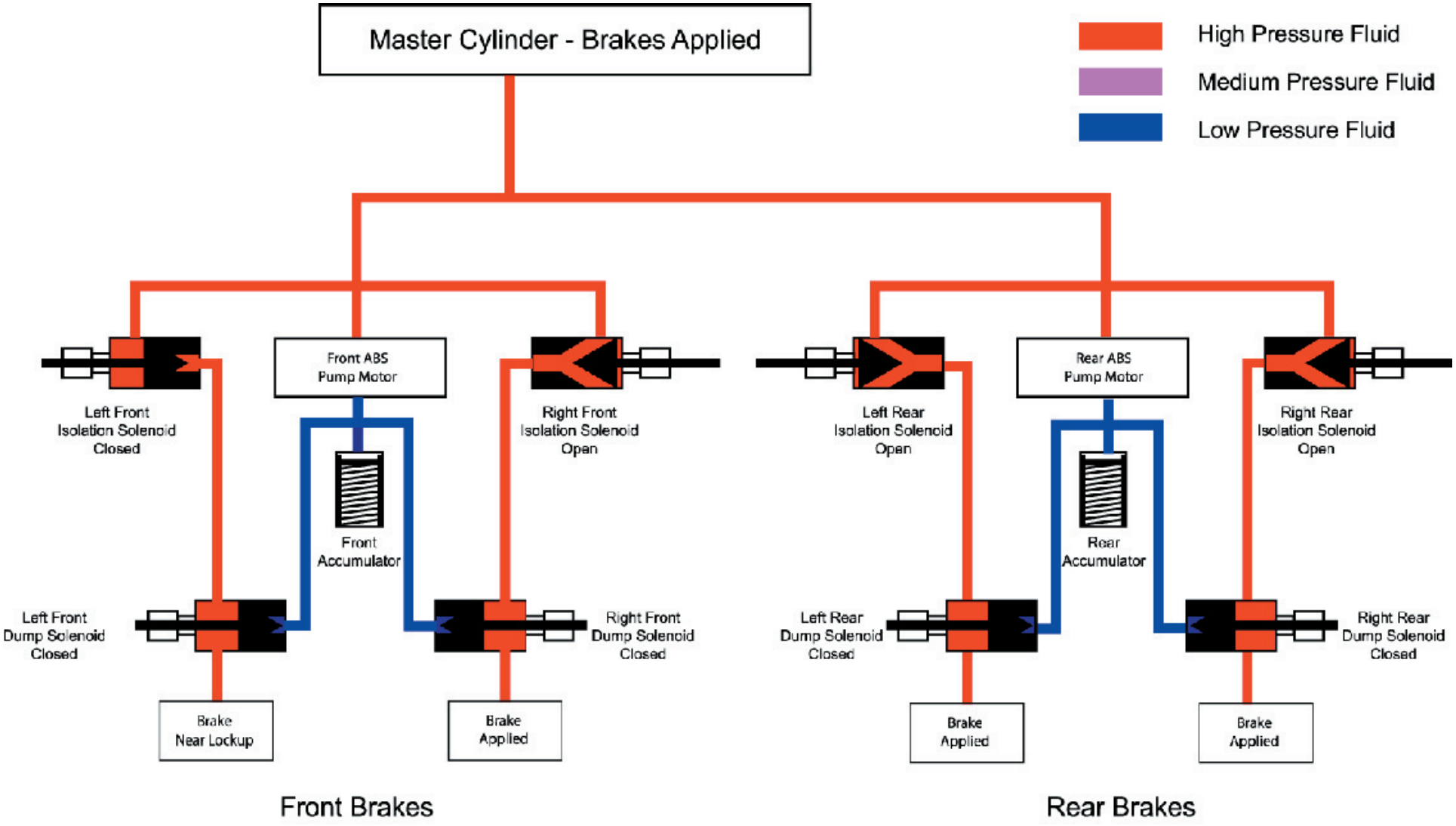
BPMV Hydraulic Flow Chart (Brakes Applied)

This graphic shows that with the brakes applied, high pressure fluid flows through the normally open isolation solenoids and the normally closed dump solenoids to apply the brakes at each wheel.



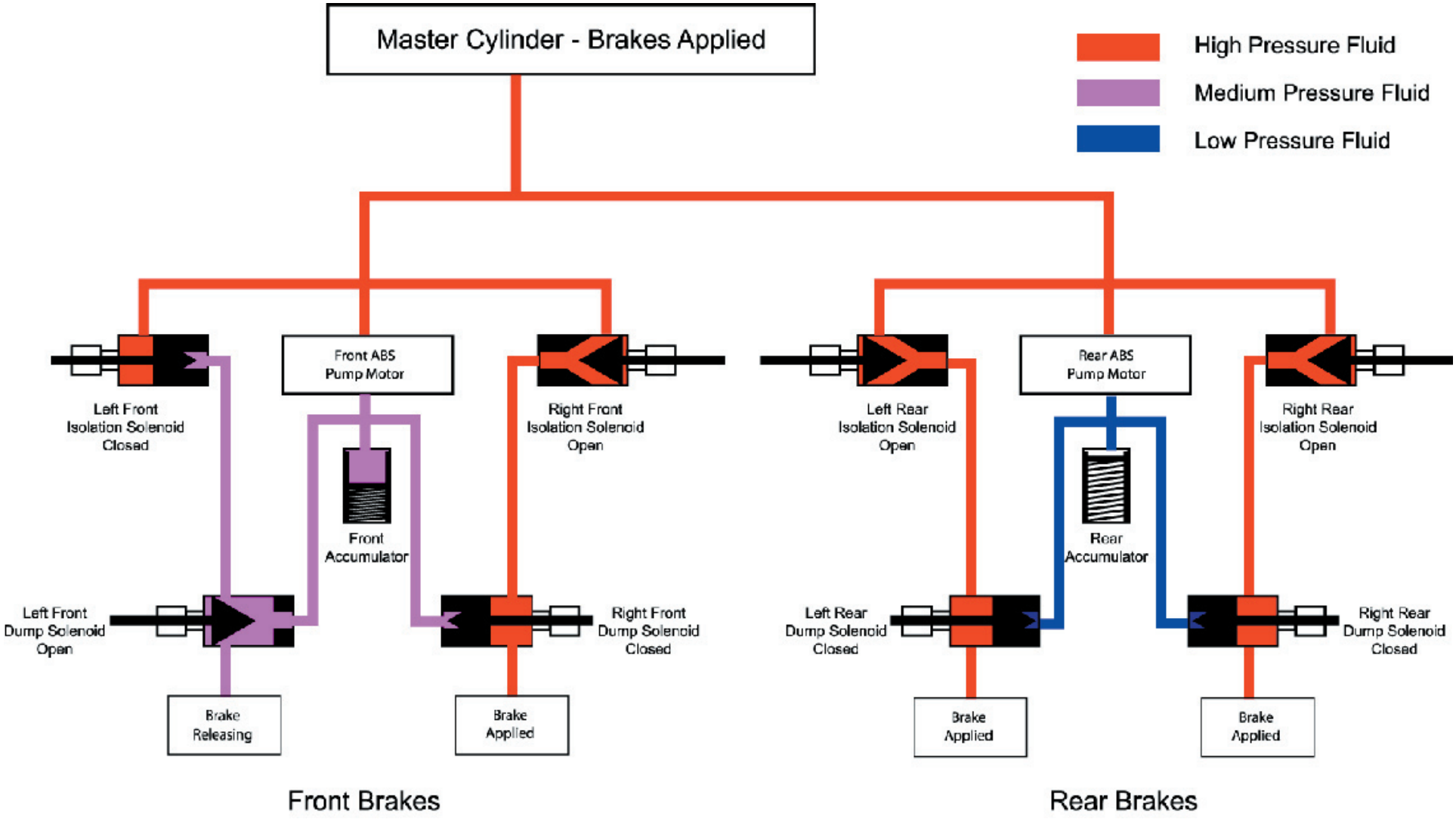
BPMV Hydraulic Flow Chart (Brakes Applied, ABS Active – Isolation Mode)

This graphic shows that the left front wheel is nearing lockup. The EBCM reacts by closing the isolation solenoid to prevent the driver from being able to apply more pressure to that circuit.



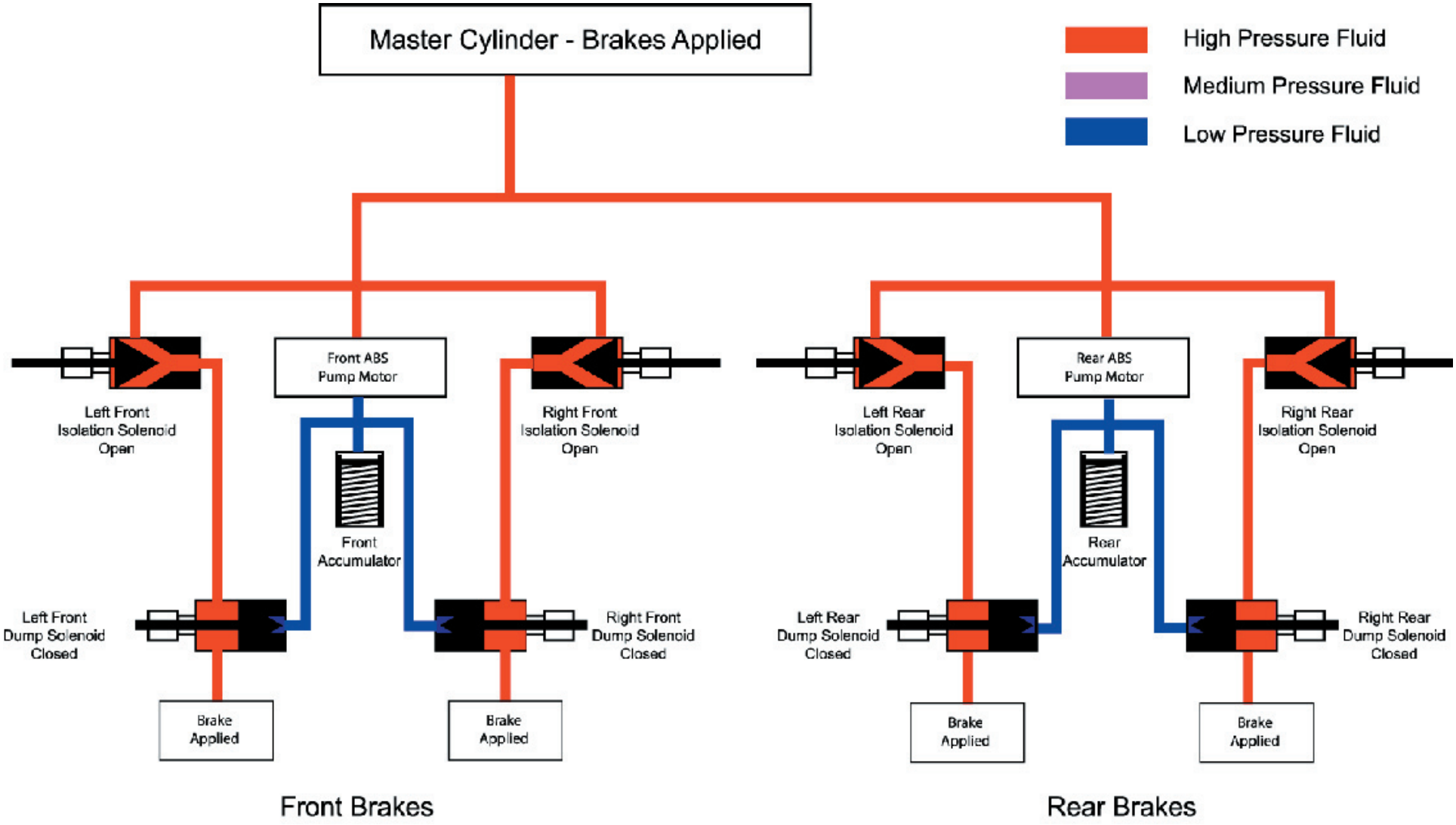
BPMV Hydraulic Flow Chart (Brakes Applied, ABS Active – Dump Mode)

This graphic shows that after the left front circuit was isolated, the EBCM sensed that the wheel was still nearing lockup. The EBCM reacted by opening the left front dump solenoid to relieve the pressure in that circuit and allow the wheel to roll freely. The fluid in this circuit is diverted from the dump solenoid to the low pressure accumulator where it is stored for later use.



BPMV Hydraulic Flow Chart (Brakes Applied, ABS Active – Reapply Mode)

The following graphic shows reapply mode. The left front wheel is rolling freely and the EBCM is going to reapply pressure to that brake circuit. It does this by returning the isolation and dump solenoids to their default position, allowing the driver to reapply pressure to the circuit.



Component Locator

Antilock Brakes System Components

Antilock Brakes System Components	
Name	**Location**
Battery Junction Block	On the forward LH side of the bulkhead above P100
Brake Pressure Differential Switch	Bolted to the brake pressure modulator valve below the radiator on the lower crossmember
Data Link Connector (DLC)	At the lower LH side of the steering column on the support bracket
Diode Network	On the IP harness located by the body builder
Electronic Brake Control Module (EBCM)	Below the radiator on the lower crossmember
Instrument Cluster	Body builder installed
IP Fuse Block	Located by the body builder
Powertrain Control Module (PCM)	Mounted on top of the radiator support
Torque Converter Clutch (TCC) and Stoplamps Switch	Above the brake pedal at the RH side of the steering column
Wheel Speed Sensor, LH Front	Mounted in the LH front wheel hub, connected at the front LH frame rail near the radiator
Wheel Speed Sensor, RH Front	Mounted in the RH front wheel hub, connected at the front RH frame rail near the radiator
C110	Engine harness to the ABS harness, at the front of the LH frame rail near the steering gearbox

Antilock Brakes System Components	
Name	**Location**
C111	Engine harness to the ABS harness, at the front of the LH frame rail near the brake master cylinder
C200	At the top front of the steering column support near the park brake pull button switch
G108	On top of the thermostat housing
G110	At the front, on the LH frame rail above the steering gearbox
G200	Mounted to the top front of the steering column support plate
P100	Main wiring pass through at the bulkhead
S102	In the engine harness, 25 cm (10 in) from the breakout for the windshield wiper and the forward lamp harness connectors, going away from passthrough P100
S116	In the engine harness, 31 cm (12 in) from the breakout for the MAF sensor toward P100
S143	In the engine harness, 5 cm (2 in) from the breakout for the ABS connectors C110 and C111 , toward P100
S160	Fusible link splice in the engine harness, 16 cm (6 in.) from the battery junction block
S165	In the ABS harness, 10 cm (4 in) from the breakout for C110
S167	In the ABS harness, 19 cm (7 in) from the breakout for the brake pressure differential switch

Antilock Brakes System Components	
Name	**Location**
S170	In the engine harness, 15 cm (6 in) from the breakout for the ABS connectors C110 and C111, toward passthrough P100
S205	In the IP harness breakout for the instrument cluster connector, 10 cm (4 in) from the main harness
S211	In the IP harness, 6 cm (2 in) from the dimmer switch and the IP cluster breakout, toward the IP fuse block

DESCRIPTION AND OPERATION

Service Precautions

When working on this system, observe the following precautions:

- Before welding on the vehicle with an electric welding unit, complete the following steps:
  – Turn the ignition switch OFF.
  – Disconnect the EBCM connectors.
- Do not use a fast charger for starting the engine.
- Disconnect the negative battery cable when fast charging.
- Never disconnect the battery from the vehicle electrical system while the engine is running.
- Connect all wiring harness connectors securely.
- Proper speed sensor wiring, routing and retaining are necessary in order to prevent false signals due to electrical noise. You can achieve proper system operation only by restoring the system to its original condition.

When servicing the ABS, note the routing, position, mounting and locations of the following items:

– All components
– The wiring
– The connectors
– The clips
– The brackets
– The brake pipes

Follow the above mentioned precautions when working on ABS. Familiarize yourself with ABS and its relationships with other components on the vehicle.

General System Description

This section covers diagnostic and service procedures for the four wheel antilock brake system (ABS). These models use the three sensor ABS. Speed information is obtained using a wheel speed sensor (WSS) at each wheel for wheel speed information. ABS reduces the occurrence of wheel lockup during severe brake applications. The system regulates hydraulic pressure to all four wheels. The pressure is regulated by the brake pressure modulator valve (BPMV).

ABS is designed to provide the average driver with the following:

- Optimal steering control and stability when braking
- Optimal braking performance with available traction

Wheel Slip

The ability of a vehicle to stop is related to the friction of the road surface. At 0% slip, the tires rotate freely; at 100% slip, the tire and wheel are locked. Stopping distance increases and steering control is diminished.

With a 10%-20% slip, vehicle stopping distance will be as short as possible and steering control will be at its optimum. Some slip is necessary to stop the wheel and achieve maximum braking.

When ABS operation occurs, the driver of the vehicle should always continue to push hard on the brake pedal. Never pump the brakes. The ABS system will automatically modulate the brakes.

Steering Control

Steering control, like braking, also depends on tire traction. A locked tire in a 100% slip condition delivers less than optimum braking and directional control. Thus, some tire rotation is desirable for steering control. The tires must regain traction before steering control is restored to the vehicle.

Abbreviations and Definitions

BPMV: Brake Pressure Modulator Valve

CKT: Circuit

DLC: Data Link Connector

DMM: Digital Multimeter

DTC: Diagnostic Trouble Code

EBCM: Electronic Brake Control Module

EHCU: Electro-Hydraulic Control Unit

Infinite: Open Circuit/Unmeasurably High Resistance

LPA: Low Pressure Accumulator

OL: Open Circuit/Unmeasurably High Resistance

WSS: Wheel Speed Sensor

The EHCU is the entire ABS unit, including the BPMV and the EBCM. The BPMV is defined as the hydraulic control portion of the EHCU. The BPMV`includes the internal control valves, the electric motor and the pumps. The BPMV does not include the EBCM. The EBCM is the electronic control portion of the EHCU. The EBCM mounts to the top of the BPMV. The EBCM is housed in aluminum with a black plastic top.

Basic Knowledge Required

Basic Electrical Circuits

You should have a basic knowledge of electrical circuits or you will have difficulty using this section. If you need a review of the basic Electrical troubleshooting, see the introduction to Electrical Diagnosis. Electrical Diagnosis also contains information on the basic use of circuit testing tools.

You should understand the basic electrical theory. You should also know the meaning of basic electrical concepts and measurement: voltage (volts), current (amperes) and resistance (ohms). You should understand what happens in a circuit with an open or shorted wire. You should be able to read and understand a wiring diagram.

Use of Circuit Testing Tools

You should be familiar with the high impedance Digital Multimeter (DMM) J 39200. You should be familiar with the meter controls and how to use them correctly. You should be able to measure voltage, resistance and current. You should also know how to use jumper wires to bypass components in order to test circuits.

ABS System Description

Electro-Hydraulic Control Unit

The Electro-Hydraulic Control Unit (EHCU) is located on the front crossmember. The EHCU assembly includes the Electronic Brake Control module (EBCM) and the Brake Pressure Modulator Valve (BPMV).

The EHCU regulates hydraulic pressure in the brake system during an antilock stop.

Electronic Brake Control Module

The Electronic Brake Control Module (EBCM) is part of the EHCU. The EBCM is the electronic portion of the EHCU. The major function of the EBCM is to control the BPMV. Inputs to the EBCM include the following items:

- Four wheel speed signals
- Stop Lamp Switch
- Differential pressure switch
- Ignition switch voltage
- Unswitched battery voltage

Outputs of the EBCM include the following items:

- Four isolation solenoids (internal to the EBCM)
- Four dump solenoids (internal to the EBCM)
- The amber ABS indicator lamp
- The red BRAKE warning lamp
- The pump motor

A diagnostic serial data link (UART, ABS only) is also used for diagnostic service tools and assembly plant testing. A serial data circuit (Class 2) is used for transmitting a “rough road” signal to the PCM/ECM.

The EBCM monitors the speed of each wheel. If any wheel approaches lockup, the EBCM controls the solenoids (isolation solenoid and dump solenoid) in order to reduce brake pressure to the wheel approaching lockup. Once the wheel regains traction, brake pressure is increased until the wheel again approaches lockup. This cycle repeats until either the vehicle comes to a stop, the brake is released, or the

wheel is no longer approaching lockup. The EBCM also runs self diagnostics in order to check for any system malfunctions. Refer to Self-Diagnostics. If the EBCM detects a malfunction with the system, the EBCM will illuminate the amber ABS indicator in order to alert the driver of a malfunction.

Brake Pressure Modulator Valve

The Brake Pressure Modulator Valve (BPMV) is part of the EHCU. The BPMV is the hydraulic portion of the EHCU. The EBCM controls the BPMV. The BPMV is split into four hydraulic channels:

- Left front
- Right front
- Left rear
- Right rear

Each channel has an isolation valve and a dump valve. The front channels share a low pressure accumulator, attenuator, and a pump. The rear channels also share a low pressure accumulator, attenuator, and a pump.

Wheel Speed Sensors

The Wheel Speed Sensors (WSS) are a magnetic coil/ pickup type. Each WSS produces an AC voltage signal which is transmitted to the EBCM in order to indicate how fast the wheel is turning. The speed of the wheel is directly proportional to the frequency and amplitude of the wheel speed signal.

Wheel Speed Sensor Tone Wheels

Each Wheel Speed Sensor uses a tone wheel in order to produce an AC voltage signal. Tone wheels are metal rings with teeth on the outside diameter.

The AC voltage is produced as the teeth pass through the magnetic field of the WSS pole piece. The tone wheels are attached to the rotor. Any imperfections in the tone rings, such as a broken tooth or a missing tooth, can cause an inaccurate wheel speed signal.

Tire Size Calibration

The EBCM accepts wheel speed signals from several different sizes of tire and wheel combinations. All vehicles are pre-programmed from the factory with the proper tire size calibration. Whenever you replace the EBCM or change the tire size, you must reset the tire size calibration in the EBCM using the scan tool. Refer to Scan Tool Diagnosis. Once programmed, this calibration will remain, even if the battery is disconnected or if the EBCM is removed from the vehicle.

ABS Lamp Operation

ABS Indicator Lamp Operation

The system uses an amber ABS indicator lamp in the instrument cluster in order to show system operation and malfunctions. When this lamp is illuminated, the ABS system is disabled.

Normal Lamp Operation

A bulb check occurs each time the ignition switch is turned to the RUN position. The ANTILOCK and BRAKE lamps should turn on, remain on for about two seconds, then turn off. The ABS indicator lamp also indicates system malfunctions. When the EBCM detects a malfunction in the system, the EBCM turns the ANTILOCK and sometimes the BRAKE lamp on. The lamp may remain on or turn off depending on the malfunction. In order to determine the specific cause of the malfunction, refer to Diagnostic Starting Point.

Tires and ABS

Correct tire size, proper inflation, accurate alignment and even wear are needed for good brake performance. These items are essential for proper ABS performance.

Spare Tire

Use of the spare tire supplied with the vehicle will not affect the performance of the system.

Replacement Tires

If the replacement tires are not the same size as the original tires, the tire size calibration within the EBCM MUST be updated using a Scan Tool. Refer to Tire Size Calibration portion of ABS System Description.

Failure to change the tire calibration when replacing the original tires with a different size tire can affect the performance of the ABS.

Self-Tests

The ABS performs the following two system self-tests:

- The first self-test is performed when the ignition is turned to RUN. Both the ABS indicator lamp and the BRAKE warning lamp will turn on for 2 seconds, then they will turn off. This test confirms correct operation of the EBCM and the lamps. If one of the lamps remains on, either the ABS or the base brake system will require service.
- The second self-test is performed when the vehicle reaches a speed of greater than 4.8 km/h (3 mph). At this time the internal EBCM relay, six solenoid coils and BPMV pump motor are cycled and checked for shorts/opens. The BPMV pump will make a slight sound when this function occurs.

Normal Braking Mode

Refer to Normal Braking Mode in BPMV Hydraulic Flow Chart.

During normal braking, pressure is applied through the brake pedal. Fluid travels from the master cylinder, through the combination valve and into the BPMV. Once in the BPMV, the fluid travels through the normally-open isolation valves, through the normally closed dump valves and out into the brakes.

During normal braking, the pumps are not turned on. The low pressure accumulators are empty. Only residual pressure is stored in these accumulators.

The EBCM constantly monitors wheel speed sensor inputs for rapid deceleration. If the ABS becomes disabled for any reason, the driver will always have base brakes. The normally-open isolation valves and normally-closed dump valves will remain in these positions in order to allow normal fluid pressure to the wheels.

ABS will not operate without wheel slip. The vehicle must be going at least 13 km/h (8 mph) in order to begin ABS operation.

ABS Braking Mode

The ABS will monitor the four-wheel speed sensors and control the hydraulic pressure changes at each wheel until the vehicle has come to a complete stop or until the driver has released the brake pedal. The system operates through the following process:

1. Pressure isolation/maintain
2. Pressure decrease
3. Pressure increase
4. Brake release (fluid return)

Sequence Of Events

1. With the vehicle at 13 km/h (8 mph) or greater, the driver depresses the brake pedal.
2. The wheel speed begins to decrease as the master cylinder pressure and brake pressure increase.
3. As the wheel speed continues to decrease from vehicle speed, the normally-open isolation valve for the affected channel closes to stop additional pressure to the wheel. The master cylinder pressure continues to increase as the driver depresses the pedal, but the wheel brake pressure is now limited to the ABS system pressure.
4. When the EBCM determines that the wheel is about to lock-up, the normally-closed dump valve opens. This bleeds off some of the pressure at the wheel cylinder (or caliper) in order to allow the wheel to return to a speed closer to the speed of the vehicle.

5. The dump valve is again closed and the isolation valve remains closed in order to allow the wheel speed to completely recover from the lock-up.
6. Once the vehicle has recovered from the lock-up tendency, the isolation valve is momentarily pulsed open in order to allow the master cylinder pressure and pump pressure to reach the brakes. This controlled pressure rise continues until the wheel is at optimum brake output or until the brake pressure is brought up to master cylinder output pressure. The ABS allows the brake fluid to flow to the wheel, build pressure and try to force another departure, repeating Step 3 through Step 6. The following paragraphs describe the various modes in detail.

Isolation Mode (Pressure Maintain)

Refer to Isolation Mode in BPMV Hydraulic Flow Chart. Isolation will occur when the driver applies excessive braking for the given road conditions, causing the wheels to decelerate at a rate which exceeds the vehicle's capability.

If the information from the wheel speed sensors indicate excessive wheel deceleration (imminent lock-up), the first step in the antilock sequence is to isolate the brake pressure being applied by the driver.

The EBCM applies a voltage to the isolation coil in order to close the isolation valve. This will prevent any additional brake pressure applied by the driver from reaching the wheel. With the isolation valve closed, further increases in brake pressure from the driver will be prohibited.

Dump Mode (Pressure Decrease)

Refer to Dump Mode in BPMV Hydraulic Flow Chart. Once the pressure is isolated, it must be reduced in order to get the wheels rolling once again. Reducing pressure is accomplished by dumping a portion of the brake fluid pressure into a low pressure accumulator (LPA).

The EBCM energizes the dump valve coil(s) in order to open the dump valve, allowing fluid from the wheels to be dumped into the LPA. Very short activation pulses open and close the dump valve passageway in order to control this action. Brake pressure is lowered at the wheel and allows the affected wheel to begin rolling again.

The fluid taken from the wheels forces a spring back. The fluid is stored in the LPA at approximately 1034 kPa (150 psi). A portion of the fluid also primes the pump so it can begin building reapply pressure. The dump valves are opened independently in order to control the deceleration of the wheel.

Reapply Mode (Pressure Increase)

Refer to Reapply Mode in BPMV Hydraulic Flow Chart. The reapply sequence is initiated in order to obtain optimum braking at each wheel. The isolation valve is momentarily pulsed open in order to allow the master cylinder and pump pressure to reach the brakes. This controlled pressure rise continues until the wheel is at optimum brake output or until the brake pressure is brought up to the master cylinder output pressure.

If more pressure is required, more fluid is drawn from the master cylinder and applied to the brakes. The driver will feel pedal pulsations or pedal drop. This is normal and expected when in the antilock mode.

As fluid is reapplied, the wheels begin to slow down at the optimum rate. If the wheels approach imminent lock-up again, the module will isolate, dump and reapply. These control cycles (isolation, dump and reapply) occur in millisecond intervals, allowing several cycles to occur each second.

Brake Release

At the end of the antilock stop, when the driver releases the brake pedal, the motor will remain on for a short time in order to help drain any fluid left in the LPA. As the fluid drains back into the system, the spring force in the LPA pushes the piston to the home position. The isolation valve is turned off and fluid returns through the isolation orifice.

DIAGNOSTIC INFORMATION AND PROCEDURES

Diagnostic Starting Point

The Diagnostic System Check will provide the following information:

- Identification of the control module(s) which command the system.
- The ability of the control module(s) to communicate through the serial data circuit.
- Identification of stored diagnostic trouble codes (DTCs) and their status.

The use of the ABS Diagnostic System Check will identify the correct procedure for diagnosing the system and where the procedure is located.

Self-Diagnostics

The EBCM performs self-diagnostics of the ABS, and detects and isolates system malfunctions. When a malfunction is detected, the EBCM sets a corresponding diagnostic trouble code (DTC).

Malfunction Response

ABS response to malfunctions falls into three classes:

Permanent Latched Malfunction Response: This means that the ABS is disabled and the ANTILOCK indicator lamp is requested on (whenever the ignition is turned on) even if the cause of the malfunction goes away. The only way to restore normal ABS operation is to take the vehicle to an authorized service center to have the cause of the malfunction corrected and the system reset by an electronic command sequence.

Ignition Latched Malfunction Response: This means that the ABS is disabled and the ANTILOCK indicator lamp is requested on until the ignition is turned off even if the cause of the malfunction goes away. When the ignition is turned on again, the ABS will not be disabled unless/ until a subsequent malfunction is detected.

Condition Latched Malfunction Response: This means that the ABS is disabled and the ANTILOCK indicator lamp is requested on only as long as the apparent malfunction condition persists. Normal ABS operation resumes automatically and the ANTILOCK indicator is requested off as soon as the problem goes away; no service is necessary. The vehicle operator may choose, without being prompted further by the ANTILOCK indicator lamp, to take the vehicle to an authorized service center.

Displaying DTCs

Read DTCs using a Scan Tool. No provisions are made for Flash Code DTCs.

Clearing DTCs

Use a Scan Tool in order to erase the DTCs in the EBCM memory. Verify proper system operation and absence of DTCs when the clearing procedure completes. DTCs cannot be cleared by unplugging the EBCM, by disconnecting the battery cables, or by turning the ignition OFF.

Intermittents and Poor Connections

Most intermittent faults are caused by a faulty electrical connection or faulty wiring. Occasionally a damaged EBCM can be the cause of an intermittent fault.

Scan Tool Diagnosis

Refer to the Scan Tool Manual for complete information on scan tool diagnostics.

F0 - Diagnostic Trouble Codes (DTC)

The Diagnostic Trouble Codes (DTC) function has three modes that are described below:

- DTC Information: In this mode, current or history DTC(s) stored by the EBCM can be displayed.
- History Data: In this mode, DTC data is stored for the last 12 DTC events. This data includes the following information at the time when the DTC(s) was set:
  - The DTC number
  - Number of occurrences of the DTC
  - Number of ignition cycles since last occurrence
  - Was EBCM in an ABS mode when the DTC occurred
  - Composite vehicle speed (4 speed sensor inputs, averaged) when the DTC occurred
  - Brake switch status
  - Differential Pressure switch status
- Clear DTC Information: In this mode, current and history DTCs are cleared. The EBCM does not clear History data.

F1 - Data Display

The Data Display function contains two special function “hot keys,” and a data list which details ABS parameters. The hot keys perform the following functions:

- DTCs - used to instantly read stored DTCs
- Quick Snap - used to record instant events

The following ABS parameters are viewable on the data list:

Parameter	Scan Tool Displays	Comment
Brake Switch Status	On/Off	
4WD Status (not used)	Two Wheel Drive or Four Wheel Drive	
Left Front Wheel Speed	km/h / mph	Display shows actual wheel speed. Default wheel speed is 3 mph.
Right Front Wheel Speed	km/h / mph	Display shows actual wheel speed. Default wheel speed is 3 mph.
Left Rear Wheel Speed	km/h / mph	Display shows actual wheel speed. Default wheel speed is 3 mph.
Right Rear Wheel Speed	km/h / mph	Display shows actual wheel speed. Default wheel speed is 3 mph.
ABS Lamp Command	On/Off	
Brake Warning Lamp Cmd.	On/Off	
Diff. Pressure Switch	Ok / Low	
DRP Active	Yes / No	

Parameter	Scan Tool Displays	Comment
ABS Stop State	On / Off	
ABS Pump Motor	On / Off	This parameter indicates the state of the ABS Pump Motor.
ABS Relay Command	On / Off	This parameter indicates the state of the ABS relay.
RF IS0 Valve Command	On / Off	This parameter indicates the state of the RF IS0 Valve.
RF IS0 Valve Feedback	On / Off	This parameter indicates the state of the RF IS0 Valve feedback.
LF IS0 Valve Command	On / Off	This parameter indicates the state of the LF IS0 Valve feedback.
LF IS0 Valve Feedback	On / Off	This parameter indicates the state of the LF IS0 Valve feedback.
LF IS0 Valve Feedback	On / Off	
Rear IS0 Valve Command	On / Off	This parameter indicates the state of the Rear IS0 Valve.
Rear IS0 Valve Feedback	On / Off	This parameter indicates the state of the Rear IS0 Valve feedback.
RF Dump Valve Command	On / Off	This parameter indicates the state of the RF Dump Valve.
RF Dump Valve Feedback	On / Off	This parameter indicates the state of the RF Dump Valve feedback.
LF Dump Valve Command	On / Off	This parameter indicates the state of the LF Dump Valve.
LF Dump Valve Feedback	On / Off	This parameter indicates the state of the LF Dump Valve feedback.
Rear Dump Valve Command	On / Off	This parameter indicates the state of the Rear Dump Valve.
Rear Dump Valve Feedback	On / Off	This parameter indicates the state of the Rear Dump Valve feedback.

F2 - Special Functions

In this test mode, the scan tool can be used to perform functional tests on the ABS which help verify proper operation. Malfunction conditions can be further identified by testing and observing the test results. DTCs must be cleared before any tests in Special Functions can be performed. In a vehicle equipped with ABS, the Special Functions are grouped as following:

- Function Test
- Automated Bleed
- ABS Motor
- System Identification
- Tire Size Calibration
- ABS Lamp
- Solenoid Tests (for all Dump and Isolation solenoid valves)
- ABS Relay
- Brake Lamp

Function Test

The Function Test cycles each valve solenoid and the pump motor (as well as the necessary relays) to check component operation. If a malfunction is detected, the EBCM will set DTC(s), which will be displayed upon completion of the test. Perform the test as follows:

1. Ignition OFF.
2. Install the scan tool.
3. Turn ignition to RUN.
4. Select the scan tool's Special Functions.
5. Select the Function Test.
6. Run the Function Test.
7. Note any DTCs set.

Automated Bleed

Automated Bleed cycles each valve solenoid and the pump motor in a special sequence (as well as the necessary relays) in order to bleed air out of the BPMV after removal or installation of brake lines, or BPMV replacement. Perform the test as follows:

1. Ignition OFF.
2. Install the scan tool.
3. Turn ignition to RUN.
4. Select the scan tool's Special Functions.
5. Select the Automated Bleed function.
6. Run the Automated Bleed function.

ABS Motor

This function tests the ABS pump motor to check component operation. If a malfunction is detected, the EBCM will set DTC(s), and the ABS indicator lamp will turn on. Perform the test as follows:

1. Ignition OFF.
2. Install the scan tool.
3. Turn ignition to RUN.
4. Select the scan tool's Special Functions.
5. Select the ABS Motor Test.
6. Run the ABS Motor Test.

System Identification

This function is used to identify the hardware and software revision of the EHCU.

1. Ignition OFF.
2. Install the scan tool.
3. Turn ignition to RUN.
4. Select the scan tool's Special Functions.
5. Select System Identification.
6. Make note of the relevant information.

Tire Size Calibration

This function allows the EBCM tire size to be set or changed when a new EBCM is installed, or different tires/wheels are installed on the vehicle.

1. Turn ignition OFF.
2. Install the scan tool.
3. Turn ignition to RUN.
4. Select the scan tool's Special Functions.
5. Select the Tire Size Calibration.
6. Make the necessary changes to existing tire size setting.

ABS Lamp

This test allows activation of the ABS indicator. The ABS Lamp test aids in diagnosing indicator malfunctions. The test allows the operator to turn the indicator on and off manually.

BRAKE Lamp

This test allows activation of the BRAKE indicator. The BRAKE Lamp test aids in diagnosing indicator malfunctions. The test allows the operator to flash the indicator on and off manually.

Solenoid Tests (Isolation Valves)

The Solenoid Test for isolation valves activates the selected wheel circuit Isolation valve, placing it in the pressure hold position. When in the pressure hold position, the valve will not allow master cylinder pressure to be delivered to the hydraulic wheel circuit.

This is done under ABS operating conditions because the EBCM has determined that the wheel is moving too slowly, so it holds additional master cylinder pressure from it in an attempt to allow it to rotate at an appropriate speed. The scan tool commands the valve to close, which should allow the technician to spin the wheel even though an assistant is applying pressure to the brake pedal.

Perform the test as follows:

1. Ignition OFF.
2. Install the scan tool.
3. Turn ignition to RUN.
4. Raise vehicle such that wheels are about 6 inches off the floor with the transmission in neutral.
5. Select the scan tool's Special Functions.
6. Select the desired Isolation Solenoid test. Have an assistant command the Isolation valve ON with the scan tool.
7. Have the assistant press and hold the brake pedal.
8. Attempt to move the wheel being tested by hand; it should move even though the assistant is applying pressure to the brake pedal. The wheels may be difficult to turn by hand, but can be moved if the system is working properly.

Solenoid Tests (Dump Valves)

The Solenoid Test for Dump valves activates the selected hydraulic wheel circuit Dump valve, placing it in the pressure release position. When in the pressure release position, the valve will allow wheel caliper pressure to be returned to the master cylinder circuit. This is done under ABS operating conditions because the EBCM has determined that the wheel is moving too slowly, and holding additional master cylinder pressure from it has not allowed it to rotate at an appropriate speed. The scan tool commands the valve to release hydraulic pressure to the affected brake caliper, which should allow the technician to spin the wheel even though an assistant is applying pressure to the brake pedal. Perform the test as follows:

1. Ignition OFF.
2. Install the scan tool.
3. Turn ignition to RUN.
4. Raise vehicle such that wheels are about 6 inches off the floor with the transmission in neutral.
5. Have an assistant press and hold the brake pedal.
6. Select the scan tools Special Functions.
7. Select the desired Dump Solenoid Test. Have the assistant command the Dump valve ON with the scan tool.
8. Attempt to move the wheel being tested by hand; it should move even though the assistant is applying pressure to the brake pedal. The wheels may be difficult to turn by hand, but can be moved if the system is working properly.

ABS Relay

This function allows.

1. Ignition OFF.
2. Install the scan tool.
3. Turn ignition to RUN.
4. Select the scan tool's Special Functions.
5. Select the ABS Relay.
6. Take note of the relay status as the relay is cycled.

F3 - Snapshot

In this test mode, the scan tool captures the data listed in the data displays before and after a snapshot. The following triggering conditions are available:

- DTC - In this mode, the snapshot will be triggered on a specific (operator selected) DTC.
- Any DTC - in this mode, the snapshot will trigger on any DTC
- Auto Trigger - will trigger a snapshot under two conditions:

1. Wheel speed out of range - Snapshot will trigger when a WSS input is +/- 7 mph out of range in relation to other WSS inputs.
2. ABS Stop - Snapshot will trigger when an ABS event occurs.

Self-Diagnostics

The EBCM performs self-diagnostics of the ABS. The EBCM detects and isolates system failures. When a malfunction is detected, the EBCM sets a corresponding diagnostic trouble code (DTC).

Diagnostic Trouble Code (DTC) List	
DTC	**Description**
DTC 21	DTC 21 RF Wheel Speed Sensor Circuit Open
DTC 22	DTC 22 RF Wheel Speed Signal Missing
DTC 23	DTC 23 RF Wheel Speed Signal Erratic
DTC 25	DTC 25 LF Wheel Speed Sensor Circuit Open
DTC 26	DTC 26 LF Wheel Speed Signal Missing
DTC 27	DTC 27 LF Wheel Speed Signal Erratic
DTC 31	DTC 31 RR Wheel Speed Signal Circuit Open
DTC 32	DTC 32 RR Wheel Speed Signal Missing
DTC 33	DTC 33 RR Wheel Speed Signal Erratic
DTC 35	DTC 35 LR Wheel Speed Signal Circuit Open
DTC 36	DTC 36 LR Wheel Speed Signal Circuit Missing
DTC 37	DTC 37 LR Wheel Speed Signal Erratic
DTC 38	DTC 38 Wheel Speed Mismatch
DTC 41	DTC 41-58 EBCM Control Valve Circuit
DTC 42	DTC 41-58 EBCM Control Valve Circuit
DTC 43	DTC 41-58 EBCM Control Valve Circuit
DTC 44	DTC 41-58 EBCM Control Valve Circuit
DTC 45	DTC 41-58 EBCM Control Valve Circuit
DTC 46	DTC 41-58 EBCM Control Valve Circuit
DTC 47	DTC 41-58 EBCM Control Valve Circuit
DTC 48	DTC 41-58 EBCM Control Valve Circuit
DTC 51	DTC 41-58 EBCM Control Valve Circuit
DTC 52	DTC 41-58 EBCM Control Valve Circuit

Diagnostic Trouble Code (DTC) List	
DTC	**Description**
DTC 53	DTC 41-58 EBCM Control Valve Circuit
DTC 54	DTC 41-58 EBCM Control Valve Circuit
DTC 55	DTC 41-58 EBCM Control Valve Circuit
DTC 56	DTC 41-58 EBCM Control Valve Circuit
DTC 57	DTC 41-58 EBCM Control Valve Circuit
DTC 58	DTC 41-58 EBCM Control Valve Circuit
DTC 65	DTC 65 or 66 EBCM Relay Circuit
DTC 66	DTC 65 or 66 EBCM Relay Circuit
DTC 67	DTC 67 or 68 Pump Motor Circuit Open/Shorted
DTC 68	DTC 67 or 68 Pump Motor Circuit Open/Shorted
DTC 69	DTC 69 or 74 Excessive Dump/Isolation Time
DTC 71	DTC 71 -73 EBCM Malfunction
DTC 72	DTC 71 -73 EBCM Malfunction
DTC 73	DTC 71 -73 EBCM Malfunction
DTC 74	DTC 69 or 74 Excessive Dump/Isolation Time
DTC 81	DTC 81 Brake Switch Circuit
DTC 86	DTC 86 ABS Indicator Lamp Circuit Shorted to B+

ABS Diagnostic System Check

System Description

The diagnostic system check is an organized approach to identifying an Antilock Brake System (ABS) malfunction. The diagnostic system check must be the starting point for any ABS complaint diagnosis. The diagnostic system check directs the service technician to the next logical step in diagnosing the complaint.

Diagnostic serial data is transmitted/received by the EBCM 10-way terminal F. The EBCM is supplied switched ignition voltage through the EBCM 10-way terminal A, and signal ground is provided through the EBCM 10-way terminal J.

Diagnostic Aids

Excessive resistance in the signal ground or ignition power circuit will not allow communication with the EBCM. If communication with the EBCM is not possible, ensure that the ABS signal ground connection is good and that there is no excessive resistance in the ignition power circuit.

Test Decription

The numbers below refer to the steps in the diagnostic table:

3. This step checks for normal ABS indicator lamp operation.
4. This step checks for ignition voltage at the EBCM.
5. This step checks for high resistance in the ground circuit.
9. This step checks for high resistance in the ignition voltage circuit.
10. This step checks for a short to ground in the ignition voltage circuit.

ABS Diagnostic System Check				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	1. Verify that all of the EBCM connectors are connected properly. 2. Install the Scan Tool. 3. Turn the ignition to RUN. 4. Attempt to communicate with the EBCM using the Scan Tool. Is data being received from the EBCM?	—	Go to Step 2	Go to Step 4
2	Using the Scan Tool, check for any DTCs. Are any current or history DTCs displayed?	—	Go to Appropriate DTC Table	Go to Step 3
3	1. Turn the ignition to OFF for 10 seconds. 2. Turn the ignition to RUN and observe the ABS indicator lamp. Did the ABS indicator lamp turn on for two seconds and then turn off?	—	Go to Diagnostic Aids	Go to Step 11
4	1. Turn the ignition to OFF. 2. Disconnect the 10-way EBCM harness connector. 3. Turn the ignition to RUN. 4. Measure the voltage between the 10-way EBCM harness connector terminal A and ground using the J 39200. Is the voltage measured within the specified range?	10-15 V	Go to Step 5	Go to Step 9
5	1. Turn the ignition to OFF. 2. Disconnect the negative battery cable. 3. Using the J39200, measure the resistance between the 10-way EBCM harness connector terminal J and the negative battery terminal. Is the resistance measured within the specified range?	0-2 ohms	Go to Step 6	Go to Step 12

ABS Diagnostic System Check				
Step	**Action**	**Value(s)**	**Yes**	**No**
6	1. Inspect the EBCM terminals and the EBCM harness connector terminals for poor terminal contact. 2. Inspect the battery terminals and the battery cable terminals for poor connection. Is the terminal contact or the connection poor?	—	Go to Step 7	Go to Step 8
7	Replace the terminals or repair the poor connection. Is the repair complete?	—	Go to Step 1	—
8	Reconnect the EBCM connectors and the battery cables. Are the EBCM connectors and the battery cables reconnected?	—	Diagnose Scan Tool to EBCM communication circuit.	—
9	1. Disconnect the positive battery cable. 2. Turn the ignition to RUN. (This is to provide circuit continuity.) 3. Using the J39200, measure the resistance between the 10-way EBCM connector terminal A and the positive battery cable. Is the resistance measured within the specified range.	0-2 ohms	Go to Step 10	Go to Step 13
10	1. Turn the ignition to OFF. 2. Remove Fuse 1-3. 3. Using the J39200, measure the resistance between the 10-way EBCM connector terminal A and ground. Is the resistance measurement equal to the specified value?	OL	Go to Step 15	Go to Step 14
11	Observe the ABS indicator lamp. Does the ABS indicator lamp stay on?	—	Go to ABS Indicator On No DTC Set	Go to ABS Indicator Off No DTC Set
12	Repair open or high resistance in CKT 451. Is the repair complete?	—	Go to Step 1	—

ABS Diagnostic System Check				
Step	**Action**	**Value(s)**	**Yes**	**No**
13	1. Repair open or high resistance in CKT 241. 2. Check for an open in Fuse 1-3. Is the repair complete?	—	Go to Step 1	—
14	1. Repair short to ground in CKT 241. 2. Check for an open in Fuse 1-3. Is the repair complete?	—	Go to Step 1	—
15	Inspect CKT 241 and the 10-way EBCM harness connector for physical damage which may result in a short to ground with the 10-way EBCM harness connector connected to the EBCM. Is there evidence of damage?	—	Go to Step 16	Go to Step 17
16	Repair the terminals which are damaged. Is the repair complete?	—	Go to Step 1	—
17	1. Replace the EBCM. Refer to Electronic Brake Control Module Replacement. 2. Check for an open in Fuse 1-3. Is the repair complete?	—	Go to Step 1	—

DTC 21 RF Wheel Speed Sensor Circuit Open

Circuit Description

The wheel speed sensor coil emits an electromagnetic field. A toothed ring on the wheel passes by the wheel speed sensor and disrupts this electromagnetic field. The disruption in the field causes the wheel speed sensor to produce a sinusoidal (AC) voltage signal. The frequency and amplitude of the sinusoidal (AC) voltage signal are proportional to the speed of the wheel. The amplitude of the wheel speed signal is also directly related to the distance between the wheel speed sensor coil and the toothed ring.

This distance is referred to as the air gap.

Conditions for Setting the DTC

- No output signal from the right front wheel speed sensor for 1.0 second
- Excessive right front wheel speed sensor resistance for 1.0 second

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled.

DTC C0221 is a Condition Latched DTC, which indicates that the above actions remain true only as long as the condition persists.

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool/Clear DTCs function

Diagnostic Aids

Any of the following conditions may cause an intermittent malfunction:

- A poor connection
- Wire insulation that is rubbed through
- A wire breaks inside the insulation

Thoroughly check any circuitry that is suspected of causing the intermittent complaint for the following conditions:

- Backed out terminals
- Improper mating
- Broken locks
- Improperly formed or damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

If the customer says that the ABS indicator lamp is on only during humid conditions such as rain, snow, or vehicle wash, then thoroughly inspect all wheel speed sensor circuits for signs of water intrusion. Use the following procedure:

1. Spray the suspected area with a 5 percent salt water solution (2 teaspoons of salt to 12 oz ofwater).
2. Drive the vehicle above 24 km/h (15 mph) for at least 30 seconds.

If the DTC returns, replace the suspected harness.

When inspecting a wheel speed sensor, inspect the sensor terminals and the harness connector for corrosion. If evidence of corrosion exists, replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Front.

Test Description

The numbers below refer to the steps in the diagnostic table:

2. This step checks the resistance of the right front wheel speed sensor circuit.
3. This step checks the resistance of the right front wheel speed sensor wiring.
4. This step checks the resistance of the right front wheel speed sensor.

DTC 21 RF Wheel Speed Sensor Circuit Open				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn the ignition OFF. 2. Disconnect the 24-way EBCM harness connector. 3. Using a J39200, measure the resistance between terminals 10 and 22 of the 24-way EBCM harness connector. Is the resistance measurement within the specified range?	1500-2500 ohms	Go to Step 5	Go to Step 3
3	1. Disconnect the right front wheel speed sensor harness connector from the wheel speed sensor pigtail. 2. Using a J 36169-A connect terminal A and terminal B of the 2-way wheel speed sensor harness connector (chassis harness side). 3. Using a J39200, measure the resistance between terminals 10 and 22 of the 24-way EBCM harness connector. Is the resistance measurement within the specified range?	0-2 ohms	Go to Step 4	Go to Step 7
4	Using a J 39200, measure the resistance between terminal A and terminal B of the right front wheel speed sensor pigtail. Is the resistance measurement within the specified range?	1500-2500 ohms	Go to Step 5	Go to Step 8
5	1. Inspect the 24-way EBCM harness connector terminals 10 and 22 for poor terminal contact or corrosion. 2. Inspect CKT 833 and CKT 872 for damage that could result in an open circuit. Repair damage if evident. 3. Replace the terminals if poor contact or corrosion exists. 4. Reconnect all the connectors. 5. Using the Scan Tool, clear all DTCs. 6. Test drive the vehicle above 16 km/h (10 mph). Does DTC 21 set as a current DTC?	—	Go to Step 8	Go to Diagnostic Aids

DTC 21 RF Wheel Speed Sensor Circuit Open				
Step	**Action**	**Value(s)**	**Yes**	**No**
6	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
7	Repair the open or high resistance in CKT 833 or CKT 872. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
8	Replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Front. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 22 RF Wheel Speed Signal Missing

Circuit Description

The wheel speed sensor coil emits an electromagnetic field. A toothed ring on the wheel passes by the wheel speed sensor and disrupts this electromagnetic field. The disruption in the field causes the wheel speed sensor to produce a sinusoidal (AC) voltage signal. The frequency and amplitude of the sinusoidal (AC) voltage signal are proportional to the speed of the wheel. The amplitude of the wheel speed signal is also directly related to the distance between the wheel speed sensor coil and the toothed ring. This distance is referred to as the air gap.

Conditions for Setting the DTC

- The right front wheel speed is less than 6 km/h (4 mph)
- All other wheel speeds are greater than 13 km/h (8 mph)
- No unexpected wheel acceleration/deceleration.
- Any condition that keeps the right front wheel speed sensor low while the vehicle is moving above 13 km/h (8 mph).

Action Taken When the DTC Sets

- The ABS indicator lamp turns on.
- ABS is disabled.

DTC 22 is an Ignition Latched DTC, which indicates that the above actions remain true until the ignition is turned to OFF (even if the cause of the DTC is intermittent).

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool/Clear DTCs function

Diagnostic Aids

Any of the following conditions may cause an intermittent malfunction:

- A poor connection
- Wire insulation that is rubbed through
- A broken wire inside the insulation

Thoroughly check any circuitry that is suspected of causing the intermittent complaint for the following conditions:

- Backed out terminals
- Improper mating
- Broken locks
- Improperly formed or damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

If the customer says that the ABS indicator lamp is on only during humid conditions such as rain, snow, or vehicle wash, then thoroughly inspect all wheel speed sensor circuits for signs of water intrusion. Use the following procedure:

1. Spray the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water).
2. Drive the vehicle above 24 km/h (15 mph) for at least 30 seconds.

If the DTC returns, replace the suspected harness. When inspecting a wheel speed sensor, inspect the sensor terminals and the harness connector for corrosion. If evidence of corrosion exists, then replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Front.

Test Description

The numbers below refer to the steps in the diagnostic table:

2. This step checks the resistance of the right front wheel speed sensor circuit.
3. This step checks the resistance of the right front wheel speed sensor wiring.
4. This step checks the resistance of the right front wheel speed sensor.

DTC 22 RF Wheel Speed Signal Missing				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn ignition to OFF. 2. IDisconnect the 24-way EBCM harness connector. 3. Using a J 39200, measure the resistance between terminals 10 and 22 of the 24-way EBCM harness connector. Is the resistance measurement within the specific range?	1500-2500 ohms	Go to Step 5	Go to Step 3
3	1. Disconnect the right front wheel speed sensor harness connector from the wheel speed pigtail. 2. Using a J 36169-A, connect terminal A and terminal B of the 2-way wheel speed sensor harness connector (chasis harness side). 3. Using a J 39200, measure the resistance between terminals 10 and 22 of the 24-way EBCM harness connector. Is the resistance measurement within the specified range?	0-2 ohms	Go to Step 4	Go to Step 7
4	Using a J 39200, measure the resistance between terminal A and terminal B of the right front wheel speed sensor pigtail. Is the resistance measurement within the specified range?	1500-2500 ohms	Go to Step 5	Go to Step 8
5	1. Inspect the 24-way EBCM harness connector terminals 10 and 22 for poor terminal contact or corrosion. 2. Inspect CKT 833 and CKT 872 for damage that could result in an open circuit. Repair damage if evident. 3. Replace the terminal if poor contact or corrosion exists. 4. Reconnect all the connectors. 5. Using the Scan Tool, clear all DTCs. 6. Test drive the vehicle above 15 km/h (10 mph). Does DTC 22 set as a current DTC?	—	Go to Step 6	Go to Diagnostic Aids

DTC 22 RF Wheel Speed Signal Missing				
Step	**Action**	**Value(s)**	**Yes**	**No**
6	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
7	Repair the open or high resistance in CKT 833 or CKT 872. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
8	Replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Front. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 23 RF Wheel Speed Signal Erratic

Circuit Description

The wheel speed sensor coil emits an electromagnetic field. A toothed ring on the wheel passes by the wheel speed sensor and disrupts this electromagnetic field. The disruption in the field causes the wheel speed sensor to produce a sinusoidal (AC) voltage signal. The frequency and amplitude of the sinusoidal (AC) voltage signal are proportional to the speed of the wheel. The amplitude of the wheel speed signal is also directly related to the distance between the wheel speed sensor coil and the toothed ring. This distance is referred to as the air gap.

Conditions for Setting the DTC

- An average wheel speed for all wheel speed signals is greater than 40 km/h (25 mph).
- An average right front wheel speed greater than 40 km/h (25 mph).
- No speed signal input to the EBCM from the right front wheel speed sensor for 15 milliseconds.
- Anything which suddenly causes (intermittent) the right front wheel speed signal to drop to zero while the vehicle is moving greater than 40 km/h (25 mph).

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled.

DTC 23 is an Ignition Latched DTC, which indicates that the above actions remain true until the ignition is turned to OFF (even if the cause of the DTC is intermittent).

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

Any of the following conditions may cause an intermittent malfunction:

- A poor connection
- Wire insulation that is rubbed through
- A broken wire inside the insulation

Thoroughly check any circuitry that is suspected of causing the intermittent complaint for the following conditions:

- Backed out terminals
- Improper mating
- Broken locks
- Improperly formed or damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

If the customer says that the ABS indicator lamp is on only during humid conditions such as rain, snow, or vehicle wash, then thoroughly inspect all wheel speed sensor circuits for signs of water intrusion. Use the following procedure:

1. Spray the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water).
2. Drive the vehicle above 24 km/h (15 mph) for at least 30 seconds.

If the DTC returns, replace the suspected harness. When inspecting a wheel speed sensor, inspect the sensor terminals and the harness connector for corrosion. If evidence of corrosion exists, then replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Front.

Test Description

The numbers below refer to the steps in the diagnostic table:

3. This step checks the resistance of the right front wheel speed sensor.
4. This step checks the voltage output of the right front wheel speed sensor.
5. This step checks for a short in the wiring between the right front wheel speed sensor circuits.
6. This step checks for a short to ground in the right front wheel speed sensor circuits.

DTC 23 RF Wheel Speed Signal Erratic				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn ignition to OFF. 2. Disconnect the 24-way EBCM harness connector from the EBCM. 3. Inspect the EBCM harness connector for signs of damage or corrosion. 4. Inspect the wheel speed sensor harness and the sensor harness connector for signs of damage or corrosion. Are all connections clean and tight?	—	Go to Step 3	Go to Step 6
3	Using a J 39200, measure the resistance between terminals 10 and 22 of the 24-way EBCM harness connector. Is the resistance measurement within the specified range?	1500-2500 ohms	Go to Step 5	Go to Step 4
4	1. Disconnect the wheel speed sensor from the wheel speed sensor harness pigtail connector. 2. Using a J39200, measure the resistance between terminal A and terminal B of the right front wheel speed sensor pigtail connector. Is the resistance measurement within the specified range?	1500-2500 ohms	Go to Step 7	Go to Step 8
5	1. Reconnect all the connectors. 2. Verify that the right front wheel speed sensor is securely mounted and that the tone wheel is in good condition. Are the wheel speed sensor and tone wheel in good condition?	—	Go to Diagnostic Aids	—
6	Make necessary repairs to the 24-way EBCM harness connector. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 23 RF Wheel Speed Signal Erratic				
Step	**Action**	**Value(s)**	**Yes**	**No**
7	Repair the open, high resistance or short in CKT 833 or CKT 872. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
8	Replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Front. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 25 LF Wheel Speed Sensor Circuit Open

Circuit Description

The wheel speed sensor coil emits an electromagnetic field. A toothed ring on the wheel passes by the wheel speed sensor and disrupts this electromagnetic field. The disruption in the field causes the wheel speed sensor to produce a sinusoidal (AC) voltage signal. The frequency and amplitude of the sinusoidal (AC) voltage signal are proportional to the speed of the wheel. The amplitude of the wheel speed signal is also directly related to the distance between the wheel speed sensor coil and the toothed ring. This distance is referred to as the air gap

Conditions for Setting the DTC

- No output from the left front wheel speed sensor for 1.0 second
- Excessive left front wheel speed sensor resistance for 1.0 second

Action Taken When the DTC Sets

- The ABS indicator lamp turns on.
- The ABS is disabled.

DTC 25 is a Condition Latched DTC, which indicates that the above actions remain true only as long as the condition persists.

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool

Diagnostic Aids

Any of the following conditions may cause an intermittent malfunction:

- A poor connection
- Wire insulation that is rubbed through
- A broken wire inside the insulation

Thoroughly check any circuitry that is suspected of causing the intermittent complaint for the following conditions:

- Backed out terminals
- Improper mating
- Broken locks
- Improperly formed or damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

If the customer says that the ABS indicator lamp is on only during humid conditions such as rain, snow, or vehicle wash, then thoroughly inspect all wheel speed sensor circuits for signs of water intrusion. Use the following procedure:

1. Spray the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water).
2. Drive the vehicle above 24 km/h (15 mph) for at least 30 seconds.

If the DTC returns, replace the suspected harness.

When inspecting a wheel speed sensor, inspect the sensor terminals and the harness connector for corrosion. If evidence of corrosion exists, then replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Front. When inspecting a wheel speed sensor, inspect the sensor terminals and the harness connector for corrosion. If evidence of corrosion exists, then replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Front.

Test Description

The numbers below refer to the steps in the diagnostic table:

2. This step checks the resistance of the left front wheel speed sensor circuit.
3. This step checks the resistance of the left front wheel speed sensor wiring.
4. This step checks the resistance of the left front wheel speed sensor.

DTC 25 LF Wheel Speed Sensor Circuit Open				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn ignition to OFF. 2. Disconnect the 24-way EBCM harness connector. 3. Using a J 39200, measure the resistance between terminal D and terminal 11 and terminal 23 of the 24-way EBCM harness connector. Is the resistance measurement within the specified range?	1500-2500 ohms	Go to Step 5	Go to Step 3
3	1. Disconnect the left front wheel speed sensor harness connector from the wheel speed sensor pigtail. 2. Using a J 36169-A connect terminal A and terminal B of the 2-way wheel speed sensor harness connector (chassis harness side). 3. Using a J39200, measure the resistance between terminals 11 and 23 of the 24-way EBCM harness connector. Is the resistance measurement within the specified range?	0-2 ohms	Go to Step 4	Go to Step 7
4	Using a J 39200, measure the resistance between terminal A and terminal B of the left front wheel speed sensor pigtail. Is the resistance measurement within the specified range?	1500-2500 ohms	Go to Step 5	Go to Step 8
5	1. Inspect the 24-way EBCM harness connector terminals 11 and 23 for poor terminal contact or corrosion. 2. Inspect CKT 830 and CKT 873 for damage that could result in an open circuit. Repair damage if evident. 3. Replace the terminals if poor contact or corrosion exists. 4. Reconnect all the connectors. 5. Using the Scan Tool, clear all DTCs. 6. Test drive the vehicle above 16 km/h (10 mph). Does DTC 25 set as a current DTC?	—	Go to Step 6	Go to Diagnostic Aids

DTC 25 LF Wheel Speed Sensor Circuit Open				
Step	**Action**	**Value(s)**	**Yes**	**No**
6	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
7	Repair the open or high resistance in CKT 830 or CKT 873. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
8	Replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Front. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 26 LF Wheel Speed Signal Missing

Circuit Description

The wheel speed sensor coil emits an electromagnetic field. A toothed ring on the wheel passes by the wheel speed sensor and disrupts this electromagnetic field. The disruption in the field causes the wheel speed sensor to produce a sinusoidal (AC) voltage signal. The frequency and amplitude of the sinusoidal (AC) voltage signal are proportional to the speed of the wheel. The amplitude of the wheel speed signal is also directly related to the distance between the wheel speed sensor coil and the toothed ring. This distance is referred to as the air gap.

Conditions for Setting the DTC

- The left front wheel speed is less than 6 km/h (4 mph)
- All other wheel speeds are greater than 13 km/h (8 mph)
- No unexpected wheel acceleration/deceleration.
- Any condition that keeps the left front wheel speed sensor low while the vehicle is moving above 13 km/h (8 mph).

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled

DTC 26 is an Ignition Latched DTC, which indicates that the above actions remain true until the ignition is turned to OFF (even if the cause of the DTC is intermittent).

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool

Diagnostic Aids

Any of the following conditions may cause an intermittent malfunction:

- A poor connection
- Wire insulation that is rubbed through
- A wire breaks inside the insulation

Thoroughly check any circuitry that is suspected of causing the intermittent complaint for the following conditions:

- Backed out terminals
- Improper mating
- Broken locks
- Improperly formed or damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

If the customer says that the ABS indicator lamp is on only during humid conditions such as rain, snow, or vehicle wash, then thoroughly inspect all wheel speed sensor circuits for signs of water intrusion. Use the following procedure:

1. Spray the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water).
2. Drive the vehicle above 24 km/h (15 mph) for at least 30 seconds.

If the DTC returns, replace the suspected harness.

When inspecting a wheel speed sensor, inspect the sensor terminals and the harness connector for corrosion. If evidence of corrosion exists, then replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Front.

Test Description

The numbers below refer to the steps in the diagnostic table:

3. This step checks the resistance of the left front wheel speed sensor.
4. This step checks the voltage output of the left front wheel speed sensor.
5. This step checks for a short in the wiring between the left front wheel speed sensor circuits.
6. This step checks for a short to ground in the left front wheel speed sensor circuits.

DTC 26 LF Wheel Speed Signal Missing				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn the ignition to OFF. 2. Inspect the left front wheel speed sensor, sensor wire and the connectors for signs of damage or corrosion. 3. Inspect the wheel speed sensor and the toothed ring for looseness, paying particular attention to the toothed ring. Any deviation will affect the wheel speed sensor output signal. 4. Inspect the 24-way EBCM harness connector and harness for signs of damage or corrosion Is there evidence of physical damage?	—	Go to Step 8	Go to Step 3
3	1. Disconnect the left front wheel speed sensor harness connector from the wheel speed sensor. 2. Using a J 39200, measure the resistance between terminal A and terminal B of the left front wheel speed sensor pigtail connector. Is the resistance measurement within the specified range?	1500-2500 ohms	Go to Step 4	Go to Step 9
4	1. With the J 39200 still connected, select the A/C voltage scale. 2. Spin the wheel by hand while observing the voltage reading. Is the voltage measured equal to or greater than the specified value?	100 mV	Go to Step 5	Go to Step 9
5	1. Disconnect the 24-way EBCM harness connector from the EBCM. 2. Using a J39200, measure the resistance between terminal 11 and terminal 23 of the 24-way EBCM harness connector. Is the resistance measurement equal to the specified value?	OL	Go to Step 6	Go to Step 11

DTC 26 LF Wheel Speed Signal Missing				
Step	**Action**	**Value(s)**	**Yes**	**No**
6	1. Reconnect the left front wheel speed sensor. 2. Using a J39200, measure the resistance between terminal 11 of the 24-way EBCM harness connector and ground. Is the resistance measurement equal to the specified value?	OL	Go to Step 7	Go to Step 12
7	1. Inspect the 24-way EBCM harness connector terminals 11 and 23 for poor terminal contact or corrosion. 2. Inspect CKT 830 and CKT 873 for damage that could result in a shorted circuit. Repair any evident damage. 3. Replace the terminals if poor contact or corrosion exists. 4. Reconnect all the connectors. 5. Clear all DTCs using the Scan Tool. 6. Test drive the vehicle above 16 km/h (10 mph). Does the DTC 26 set as a current DTC?	—	Go to Step 10	Go to Diagnostic Aids
8	Make the necessary repairs. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
9	Replace the left front wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Front. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
10	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 26 LF Wheel Speed Signal Missing				
Step	**Action**	**Value(s)**	**Yes**	**No**
11	Repair the short between CKT 830 and CKT 873. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
12	Replace the short to ground in CKT 830 or CKT 873. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 27 LF Wheel Speed Signal Erratic

Circuit Description

The wheel speed sensor coil emits an electromagnetic field. A toothed ring on the wheel passes by the wheel speed sensor and disrupts this electromagnetic field. The disruption in the field causes the wheel speed sensor to produce a sinusoidal (AC) voltage signal. The frequency and amplitude of the sinusoidal (AC) voltage signal are proportional to the speed of the wheel. The amplitude of the wheel speed signal is also directly related to the distance between the wheel speed sensor coil and the toothed ring. This distance is referred to as the air gap.

Conditions for Setting the DTC

- An average wheel speed for all wheel speed signals greater than 40 km/h (25 mph).
- An average left front wheel speed greater than 40 km/h (25 mph).
- No speed signal input to the EBCM from the left front wheel speed sensor for 15 milliseconds.
- Anything which suddenly causes (intermittent) the left front wheel speed signal to drop to zero while the vehicle is moving greater than 40 km/h (25 mph).

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled.

DTC 27 is an Ignition Latched DTC, which indicates that the above actions remain true until the ignition is turned to OFF (even if the cause of the DTC is intermittent).

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

Any of the following conditions may cause an intermittent malfunction:

- A poor connection
- Wire insulation that is rubbed through
- A wire breaks inside the insulation

Thoroughly check any circuitry that is suspected of causing the intermittent complaint for the following conditions:

- Backed out terminals
- Improper mating
- Broken locks
- Improperly formed or damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

If the customer says that the ABS indicator lamp is on only during humid conditions such as rain, snow, or vehicle wash, then thoroughly inspect all wheel speed sensor circuits for signs of water intrusion. Use the following procedure:

1. Spray the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water).
2. Drive the vehicle above 24 km/h (15 mph) for at least 30 seconds.

If the DTC returns, replace the suspected harness.

When inspecting a wheel speed sensor, inspect the sensor terminals and the harness connector for corrosion. If evidence of corrosion exists, then replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Front.

Test Description

The numbers below refer to the steps in the diagnostic table:

2. This step checks the EBCM 24-way connector for looseness, corrosion, etc.
3. This step measures the resistance of the EBCM 24-way connector terminal 11 and terminal 23.
4. This step measures the resistance at the left front wheel speed sensor connector.
5. This step inspects the left front wheel speed sensor and the tone wheel for physical damage or excessive clearance.

DTC 27 LF Wheel Speed Signal Erratic				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn ignition to OFF. 2. Disconnect the 24-way EBCM harness connector from the EBCM. 3. Inspect the EBCM harness connector for signs of damage or corrosion. 4. Inspect the wheel speed sensor harness and the sensor harness connector for signs of damage or corrosion. Are all the connections clean and tight?	—	Go to Step 3	Go to Step 6
3	Using a J39200, measure the resistance between terminals 11 and 23 of the 24-way EBCM harness connector. Is the resistance measurement within the specified range?	1500-2400 ohms	Go to Step 5	Go to Step 4
4	1. Disconnect the wheel speed sensor from the wheel speed sensor harness pigtail connector. 2. Using a J39200, measure the resistance between terminal A and terminal B of the left front wheel speed sensor pigtail connector. Is the resistance measurement within the specified range?	1500-2400 ohms	Go to Step 7	Go to Step 8
5	1. Reconnect all the connectors. 2. Verify that the left front wheel speed sensor is securely mounted and that the tone wheel is in good condition. Are the wheel speed sensor and tone wheel in good condition?	—	Go to Diagnostic Aids	—
6	Make necessary repairs to the 24-way EBCM harness connector. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 27 LF Wheel Speed Signal Erratic				
Step	**Action**	**Value(s)**	**Yes**	**No**
7	Repair the open, high resistance or short in CKT 830 or CKT 873. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
8	Replace the left front wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Front. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 31 RR Wheel Speed Signal Circuit Open

Circuit Description

The wheel speed sensor coil emits an electromagnetic field. A toothed ring on the wheel passes by the wheel speed sensor and disrupts this electromagnetic field. The disruption in the field causes the wheel speed sensor to produce a sinusoidal (AC) voltage signal. The frequency and amplitude of the sinusoidal (AC) voltage signal are proportional to the speed of the wheel. The amplitude of the wheel speed signal is also directly related to the distance between the wheel speed sensor coil and the toothed ring. This distance is referred to as the air gap.

Conditions for Setting the DTC

- No output from the right rear wheel speed sensor for 1.0 second
- Excessive right rear wheel speed sensor resistance for 1.0 second

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled.

DTC 31 is an Condition Latched DTC, which indicates that the above actions remain true only as long as the condition persists.

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

Any of the following conditions may cause an intermittent malfunction:

- A poor connection
- Wire insulation that is rubbed through
- A wire breaks inside the insulation

Thoroughly check any circuitry that is suspected of causing the intermittent complaint for the following conditions:

- Backed out terminals
- Improper mating
- Broken locks
- Improperly formed or damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

If the customer says that the ABS indicator lamp is on only during humid conditions such as rain, snow, or vehicle wash, then thoroughly inspect all wheel speed sensor circuits for signs of water intrusion. Use the following procedure:

1. Spray the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water).
2. Drive the vehicle above 24 km/h (15 mph) for at least 30 seconds.

If the DTC returns, replace the suspected harness.

When inspecting a wheel speed sensor, inspect the sensor terminals and the harness connector for corrosion. If evidence of corrosion exists, then replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Rear.

Test Description

The numbers below refer to the steps in the diagnostic table:

2. This step checks the resistance of the right rear wheel speed sensor circuit.
3. This step checks the resistance of the right rear wheel speed sensor wiring.
4. This step checks the resistance of the right rear wheel speed sensor.

DTC 31 RR Wheel Speed Signal Circuit Open				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn the ignition to OFF. 2. Disconnect the 24-way EBCM harness connector. 3. Using a J 39200, measure the resistance between terminals 8 and 20 of the 24-way EBCM harness connector. Is the resistance measurement within the specific range?	1500-2500 ohms	Go to Step 5	Go to Step 3
3	1. Disconnect the right rear wheel speed sensor harness connector from the wheel speed sensor pigtail.. 2. Using a J 36169-A, jumper terminal A and terminal B of the 2-way wheel speed sensor harness connector (chassis harness side). 3. Using a J 39200, measure the resistance between terminals 8 and 20 of the 24-way EBCM harness connector. Is the resistance measurement within the specific range?	0-2 ohms	Go to Step 4	Go to Step 7
4	Using a J 39200, measure the resistance between terminals A and terminal B of the right rear wheel speed sensor pigtail. Is the resistance measurement within the specific range?	1500-2500 ohms	Go to Step 5	Go to Step 8
5	1. Inspect the 24-way EBCM harness connector terminals 8 and 20 for poor terminal contact or corrosion. 2. Inspect CKT 882 and CKT 883 for damage that could result in an open circuit. Repair damage if evident. 3. Replace the terminals if poor contact or corrosion exists. 4. Reconnect all the connectors. 5. Using the Scan Tool, clear all DTCs. 6. Test drive the vehicle above 15 km/h (10 mph). Does DTC 31 set as a current DTC?	—	Go to Step 6	Go to Diagnostic Aids

DTC 31 RR Wheel Speed Signal Circuit Open				
Step	**Action**	**Value(s)**	**Yes**	**No**
6	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
7	Repair the open or high resistance in CKT 882 or CKT 883. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
8	Replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Rear. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 32 RR Wheel Speed Signal Missing

Circuit Description

The wheel speed sensor coil emits an electromagnetic field. A toothed ring on the wheel passes by the wheel speed sensor and disrupts this electromagnetic field. The disruption in the field causes the wheel speed sensor to produce a sinusoidal (AC) voltage signal. The frequency and amplitude of the sinusoidal (AC) voltage signal are proportional to the speed of the wheel. The amplitude of the wheel speed signal is also directly related to the distance between the wheel speed sensor coil and the toothed ring. This distance is referred to as the air gap.

Conditions for Setting the DTC

- The right rear wheel speed is less than 6 km/h (4 mph).
- All other wheel speeds greater than 13 km/h (8 mph).
- No unexpected wheel acceleration/deceleration
- Any condition that keeps the right rear wheel speed sensor low while the vehicle is moving above 13 km/h (8 mph).

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled.

DTC 32 is an Ignition Latched DTC, which indicates that the above actions remain true until the ignition is turned to OFF (even if the cause of the DTC is intermittent).

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

Any of the following conditions may cause an intermittent malfunction:

- A poor connection
- Wire insulation that is rubbed through
- A wire breaks inside the insulation

Thoroughly check any circuitry that is suspected of causing the intermittent complaint for the following conditions:

- Backed out terminals
- Improper mating
- Broken locks
- Improperly formed or damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

If the customer says that the ABS indicator lamp is on only during humid conditions such as rain, snow, or vehicle wash, then thoroughly inspect all wheel speed sensor circuits for signs of water intrusion. Use the following procedure:

1. Spray the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water).
2. Drive the vehicle above 24 km/h (15 mph) for at least 30 seconds.

If the DTC returns, replace the suspected harness.

When inspecting a wheel speed sensor, inspect the sensor terminals and the harness connector for corrosion. If evidence of corrosion exists, then replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Rear.

Test Description

The numbers below refer to the steps in the diagnostic table:

3. This step checks the resistance of the right rear wheel speed sensor.
4. This step checks the voltage output of the right rear wheel speed sensor.
5. This step checks for a short in the wiring between the right rear wheel speed sensor circuits.
6. This step checks for a short to ground in the right rear wheel speed sensor circuits.

DTC 32 RR Wheel Speed Signal Missing				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn the ignition to OFF. 2. Inspect the right rear wheel speed sensor wire and the connectors for signs of damage or corrosion. 3. Inspect the wheel speed sensor and the toothed ring for looseness, paying particular attention to the toothed ring. Any deviation will affect the wheel speed sensor output signal. 4. Inspect the 24-way EBCM harness connector and harness for signs of damage or corrosion. Is there evidence of physical damage?	—	Go to Step 8	Go to Step 3
3	1. Disconnect the right rear wheel speed sensor harness connector from the wheel speed sensor. 2. Using a J 39200, measure the resistance between terminal A and terminal B of the right rear wheel speed sensor pigtail connector. Is the resistance measurement within the specific range?	1500-2500 ohms	Go to Step 4	Go to Step 9
4	1. With the J 39200 still connected, select the A/C voltage scale. 2. Spin the wheel by hand while observing the voltage reading. Is the voltage measured equal to or greater than the specified value?	100 mV	Go to Step 5	Go to Step 9
5	1. Disconnect the 24-way EBCM harness connector from the EBCM. 2. Using a J 39200, measure the resistance between terminals 8 and 20 of the 24-way EBCM harness connector. Is the resistance measurement within the specific range?	OL	Go to Step 6	Go to Step 11

DTC 32 RR Wheel Speed Signal Missing				
Step	**Action**	**Value(s)**	**Yes**	**No**
6	1. Reconnect the right rear wheel speed sensor. 2. Using a J 39200, measure the resistance between terminal 8 of the 24-way EBCM harness connector and ground. Is the resistance measurement equal to the specified value?	OL	Go to Step 7	Go to Step 12
7	1. Inspect the 24-way EBCM harness connector terminals 8 and 20 for poor terminal contact or corrosion. 2. Inspect CKT 882 and CKT 883 for damage that could result in a shorted circuit. Repair any evident damage. 3. Replace the terminals if poor contact or corrosion exists. 4. Reconnect all the connectors. 5. Using the Scan Tool, clear all DTCs 6. Test drive the vehicle above 16 km/h (10 mph). Does DTC 32 set as a current DTC?	—	Go to Step 10	Go to Diagnostic Aids
8	Make necessary repairs. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
9	Replace the right rear wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Rear. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
10	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
11	Repair the short between CKT 882 or CKT 883. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
12	Replace the short to ground in CKT 882 or CKT 883. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 33 RR Wheel Speed Signal Erratic

Circuit Description

The wheel speed sensor coil emits an electromagnetic field. A toothed ring on the wheel passes by the wheel speed sensor and disrupts this electromagnetic field. The disruption in the field causes the wheel speed sensor to produce a sinusoidal (AC) voltage signal. The frequency and amplitude of the sinusoidal (AC) voltage signal are proportional to the speed of the wheel. The amplitude of the wheel speed signal is also directly related to the distance between the wheel speed sensor coil and the toothed ring. This distance is referred to as the air gap.

Conditions for Setting the DTC

- The right rear wheel speed is less than 6 km/h (4 mph).
- All other wheel speeds greater than 13 km/h (8 mph).
- No unexpected wheel acceleration/deceleration
- Any condition that keeps the right rear wheel speed sensor low while the vehicle is moving above 13 km/h (8 mph).

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled.

DTC 33 is an Igntion Latched DTC, which indicates that the above actions remain true until the ignition is turned to OFF (even if the cause of the DTC is intermittent).

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

Any of the following conditions may cause an intermittent malfunction:

- A poor connection
- Wire insulation that is rubbed through
- A wire breaks inside the insulation

Thoroughly check any circuitry that is suspected of causing the intermittent complaint for the following conditions:

- Backed out terminals
- Improper mating
- Broken locks
- Improperly formed or damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

If the customer says that the ABS indicator lamp is on only during humid conditions such as rain, snow, or vehicle wash, then thoroughly inspect all wheel speed sensor circuits for signs of water intrusion. Use the following procedure:

1. Spray the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water).
2. Drive the vehicle above 24 km/h (15 mph) for at least 30 seconds.

If the DTC returns, replace the suspected harness.

When inspecting a wheel speed sensor, inspect the sensor terminals and the harness connector for corrosion. If evidence of corrosion exists, then replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Rear.

Test Description

The numbers below refer to the steps in the diagnostic table:

3. This step checks the resistance of the right rear wheel speed sensor.
4. This step checks the voltage output of the right rear wheel speed sensor.
5. This step checks for a short in the wiring between the right rear wheel speed sensor circuits.
6. This step checks for a short to ground in the right rear wheel speed sensor circuits.

DTC 33 RR Wheel Speed Signal Erratic				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn the ignition to OFF. 2. Inspect the right rear wheel speed sensor, sensor wire and the connectors for signs of damage or corrosion. 3. Inspect the wheel speed sensor and the toothed ring for looseness, paying particular attention to the toothed ring. Any deviation will affect the wheel speed sensor output signal. 4. Inspect the 24-way EBCM harness connector and harness for signs of damage or corrosion. Is there evidence of physical damage?	—	Go to Step 8	Go to Step 3
3	1. Disconnect the right rear wheel speed sensor harness connector from the wheel speed sensor. 2. Using a J 39200, measure the resistance between terminal A and terminal B of the right rear wheel speed sensor pigtail connector. Is the resistance measurement within the specific range?	1500-2500 ohms	Go to Step 4	Go to Step 9
4	1. With the J 39200 still connected, select the A/C voltage scale. 2. Spin the wheel by hand while observing the voltage reading. Is the voltage measured equal to or greater than the specified value?	100 mV	Go to Step 5	Go to Step 9
5	1. Disconnect the 24-way EBCM harness connector from the EBCM. 2. Using a J 39200, measure the resistance between terminals 8 and 20 of the 24-way EBCM harness connector. Is the resistance measurement within the specific range?	OL	Go to Step 6	Go to Step 11

DTC 33 RR Wheel Speed Signal Erratic				
Step	**Action**	**Value(s)**	**Yes**	**No**
6	1. Reconnect the right rear wheel speed sensor. 2. Using a J 39200, measure the resistance between terminal 8 of the 24-way EBCM harness connector and ground. Is the resistance measurement equal to the specified value?	OL	Go to Step 7	Go to Step 12
7	1. Inspect the 24-way EBCM harness connector terminals 8 and 20 for poor terminal contact or corrosion. 2. Inspect CKT 882 and CKT 883 for damage that could result in a shorted circuit. Repair any evident damage. 3. Replace the terminals if poor contact or corrosion exists. 4. Reconnect all the connectors. 5. Using the Scan Tool, clear all DTCs 6. Test drive the vehicle above 16 km/h (10 mph). Does DTC 33 set as a current DTC?	—	Go to Step 10	Go to Diagnostic Aids
8	Make necessary repairs. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
9	Replace the right rear wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Rear. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
10	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 33 RR Wheel Speed Signal Erratic				
Step	**Action**	**Value(s)**	**Yes**	**No**
11	Repair the short between CKT 882 or CKT 883. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
12	Replace the short to ground in CKT 882 or CKT 883. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 35 LR Wheel Speed Signal Circuit Open

Circuit Description

The wheel speed sensor coil emits an electromagnetic field. A toothed ring on the wheel passes by the wheel speed sensor and disrupts this electromagnetic field. The disruption in the field causes the wheel speed sensor to produce a sinusoidal (AC) voltage signal. The frequency and amplitude of the sinusoidal (AC) voltage signal are proportional to the speed of the wheel. The amplitude of the wheel speed signal is also directly related to the distance between the wheel speed sensor coil and the toothed ring. This distance is referred to as the air gap.

Conditions for Setting the DTC

- No output from the left rear wheel speed sensor for 1.0 second
- Excessive left rear wheel speed sensor resistance for 1.0 second

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled.

DTC 35 is a Condition Latched DTC, which indicates that the above actions remain true only as long as the condition persists.

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

Any of the following conditions may cause an intermittent malfunction:

- A poor connection
- Wire insulation that is rubbed through
- A wire breaks inside the insulation

Thoroughly check any circuitry that is suspected of causing the intermittent complaint for the following conditions:

- Backed out terminals
- Improper mating
- Broken locks
- Improperly formed or damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

If the customer says that the ABS indicator lamp is on only during humid conditions such as rain, snow, or vehicle wash, then thoroughly inspect all wheel speed sensor circuits for signs of water intrusion. Use the following procedure:

1. Spray the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water).
2. Drive the vehicle above 24 km/h (15 mph) for at least 30 seconds.

If the DTC returns, replace the suspected harness.

When inspecting a wheel speed sensor, inspect the sensor terminals and the harness connector for corrosion. If evidence of corrosion exists, then replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Rear.

Test Description

The numbers below refer to the steps in the diagnostic table:

2. This step checks the resistance of the left rear wheel speed sensor circuit.
3. This step checks the resistance of the left rear wheel speed sensor wiring.
4. This step checks the resistance of the left rear wheel speed sensor.

DTC 35 LR Wheel Speed Signal Circuit Open				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn the ignition to OFF. 2. Disconnect the 24-way EBCM harness connector. 3. . Using a J 39200, measure the resistance between terminals 9 and 21 of the 24-way EBCM harness connector. Is the voltage measurement within the specified ranqe?	1500-2500 ohms	Go to Step 5	Go to Step 3
3	1. Disconnect the left rear wheel speed sensor harness connector from the wheel speed sensor pigtail. 2. Using a J 39169-A, jumper terminal A and terminal B of the 2-way wheel speed sensor harness connector (chassis harness side). 3. Using a J 39200, measure the resistance between terminals 9 and 21 of the 24-way EBCM harness connector. Is the resistance measurement within the specified ranqe?	0-2 ohms	Go to Step 4	Go to Step 7
4	Using the J39200, measure the resistance between the terminal A and terminal B of the left rear wheel speed sensor pigtail. Is the resistance measurement within the specified range?	1500-2500 ohms	Go to Step 5	Go to Step 8
5	1. Inspect the 24-way EBCM harness connector terminals 9 and 21 for poor terminal contact or corrosion. 2. Inspect CKT 884 and CKT 885 for damage that could result in an open circuit. Repair damage if evident. 3. Replace the terminals if poor contact or corrosion exists. 4. Reconnect all the connectors. 5. Using the Scan Tool, clear all DTCs. 6. Test drive the vehicle above 16 km/h (10 mph). Does DTC 35 set as a current DTC?	—	Go to Step 5	Go to Diagnostic Aids

DTC 35 LR Wheel Speed Signal Circuit Open				
Step	**Action**	**Value(s)**	**Yes**	**No**
6	Replace the EBCM. Refer to Electronic Brake Control Modules (EBCM) Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
7	Repair the open or high resistance in in CKT 884 or CKT 885. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
8	Replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Rear. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 36 LR Wheel Speed Signal Missing

Circuit Description

The wheel speed sensor coil emits an electromagnetic field. A toothed ring on the wheel passes by the wheel speed sensor and disrupts this electromagnetic field. The disruption in the field causes the wheel speed sensor to produce a sinusoidal (AC) voltage signal. The frequency and amplitude of the sinusoidal (AC) voltage signal are proportional to the speed of the wheel. The amplitude of the wheel speed signal is also directly related to the distance between the wheel speed sensor coil and the toothed ring. This distance is referred to as the air gap.

Conditions for Setting the DTC

- The left rear wheel speed is less than 6 km/h (4 mph).
- All other wheel speeds greater than 13 km/h (8 mph).
- No unexpected wheel acceleration/deceleration
- Any condition that keeps the right rear wheel speed sensor low while the vehicle is moving above 13 km/h (8 mph).

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled.

DTC 36 is an Ignition Latched DTC, which indicates that the above actions remain true until the ignition is turned to OFF (even if the cause of the DTC is intermittent).

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

Any of the following conditions may cause an intermittent malfunction:

- A poor connection
- Wire insulation that is rubbed through
- A wire breaks inside the insulation

Thoroughly check any circuitry that is suspected of causing the intermittent complaint for the following conditions:

- Backed out terminals
- Improper mating
- Broken locks
- Improperly formed or damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

If the customer says that the ABS indicator lamp is on only during humid conditions such as rain, snow, or vehicle wash, then thoroughly inspect all wheel speed sensor circuits for signs of water intrusion. Use the following procedure:

1. Spray the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water).
2. Drive the vehicle above 24 km/h (15 mph) for at least 30 seconds.

If the DTC returns, replace the suspected harness.

When inspecting a wheel speed sensor, inspect the sensor terminals and the harness connector for corrosion. If evidence of corrosion exists, then replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Rear.

Test Description

The numbers below refer to the steps in the diagnostic table:

3. This step checks the resistance of the left rear wheel speed sensor..
4. This step checks the voltage output of the left rear wheel speed sensor.
5. This step checks for a short in the wiring between the left rear wheel speed sensor circuits.
6. This step checks for a short to ground in the left rear wheel speed sensor circuits.

DTC 36 LR Wheel Speed Signal Missing				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn the ignition to OFF. 2. Inspect the left rear wheel speed sensor, sensor wire and the connectors for signs of damage or corrosion. 3. Inspect the wheel speed sensor and the toothed ring for looseness, paying particular attention to the toothed ring. Any deviation will affect the wheel speed sensor output signal. 4. Inspect the 24-way EBCM harness connector and harness for signs of damage or corrosion. Is there evidence of physical damage?	—	Go to Step 8	Go to Step 3
3	1. Disconnect the left rear wheel speed sensor harness connector from the wheel speed sensor. 2. Using a J39200, measure the resistance between terminal A and terminal B of the left rear wheel speed sensor pigtail connector. Is the resistance measurement within the specified range?	1500-2500 ohms	Go to Step 4	Go to Step 9
4	1. With the J 39200 still connected, select the A/C voltage scale. 2. Spin the wheel by hand while observing the voltage reading.. Is the voltage measured equal to or greater than the specified value?	100 mV	Go to Step 5	Go to Step 9
5	1. Disconnect the 24-way EBCM harness connector from the EBCM. 2. Using a J 39200, measure the resistance between terminal 9 and terminal 21 of the 24-way EBCM harness connector. Is the resistance measurement within the specified range?	OL	Go to Step 6	Go to Step 11

DTC 36 LR Wheel Speed Signal Missing				
Step	**Action**	**Value(s)**	**Yes**	**No**
6	1. Reconnect the left rear wheel speed sensor. 2. Using a J 39200, measure the resistance between terminal 9 of the 24-way EBCM harness connector and ground. Is the resistance measurement equal to the specified value?	OL	Go to Step 7	Go to Step 12
7	1. Inspect the 24-way EBCM harness connector terminals 9 and 21 for poor terminal contact or corrosion. 2. Inspect CKT 884 and CKT 885 for damage that could result in a shorted circuit. Repair any evident damage. 3. Replace the terminals if poor contact or corrosion exists. 4. Reconnect all the connectors. 5. Using the Scan Tool, clear all DTCs. 6. Test drive the vehicle above 16 km/h (10 mph(. Does DTC 36 set as a current DTC?	—	Go to Step 10	Go to Diagnostic Aids
8	Make necessary repairs.	—	Go to ABS Diagnostic System Check	—
9	Replace the left rear wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Rear. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
10	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 36 LR Wheel Speed Signal Missing				
Step	**Action**	**Value(s)**	**Yes**	**No**
11	Repair the short between CKT 884 and CKT 885. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
12	Repair the short to ground in CKT 884 or CKT 885. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 37 LR Wheel Speed Signal Erratic

Circuit Description

The wheel speed sensor coil emits an electromagnetic field. A toothed ring on the wheel passes by the wheel speed sensor and disrupts this electromagnetic field. The disruption in the field causes the wheel speed sensor to produce a sinusoidal (AC) voltage signal. The frequency and amplitude of the sinusoidal (AC) voltage signal are proportional to the speed of the wheel. The amplitude of the wheel speed signal is also directly related to the distance between the wheel speed sensor coil and the toothed ring. This distance is referred to as the air gap.

Conditions for Setting the DTC

- An average wheel speed for all wheel speed signals greater than 40 km/h (25 mph).
- An average left rear wheel speed greater than 40 km/h (25 mph).
- No speed signal input to the EBCM from the left rear wheel speed sensor for 15 ms.
- Anything which suddenly causes (intermittent) the left rear wheel speed signal to drop to zero while the vehicle is moving greater than 40 km/h (25 mph).

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled.

DTC 37 is an Ignition Latched DTC, which indicates that the above actions remain true until the ignition is turned to OFF (even if the cause of the DTC is intermittent).

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

Any of the following conditions may cause an intermittent malfunction:

- A poor connection
- Wire insulation that is rubbed through
- A wire breaks inside the insulation

Thoroughly check any circuitry that is suspected of causing the intermittent complaint for the following conditions:

- Backed out terminals
- Improper mating
- Broken locks
- Improperly formed or damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

If the customer says that the ABS indicator lamp is on only during humid conditions such as rain, snow, or vehicle wash, then thoroughly inspect all wheel speed sensor circuits for signs of water intrusion. Use the following procedure:

1. Spray the suspected area with a 5 percent salt water solution (2 teaspoons of salt to 12 oz of water).
2. Drive the vehicle above 24 km/h (15 mph) for at least 30 seconds.

If the DTC returns, replace the suspected harness. When inspecting a wheel speed sensor, inspect the sensor terminals and the harness connector for corrosion. If evidence of corrosion exists, replace the wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Rear.

Test Description

The numbers below refer to the steps in the diagnostic table:

2. This step checks the EBCM 24-way connector for looseness, corrosion, etc.
3. This step measures the resistance of the EBCM 24-way connector terminal 11 and terminal 23.
4. This step measures the resistance at the left rear wheel speed sensor connector.
6. This step inspects the left rear wheel speed sensor and the tone wheel for physical damage or excessive clearance.

DTC 37 LR Wheel Speed Signal Erratic				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn the ignition to OFF. 2. Disconnect the 24-way EBCM harness connector from the EBCM. 3. Inspect the EBCM harness connector for signs of damage or corrosion. 4. Inspect the wheel speed sensor harness and the sensor harness connector for signs of damage or corrosion. Are all the connections clean and tight?	—	Go to Step 3	Go to Step 6
3	Using the J 39200, measure the resistance from terminals 9 and 21 of the 24-way EBCM harness connector. Is the resistance measurement within the specified range?	1500-2500 ohms	Go to Step 5	Go to Step 4
4	1. Disconnect the wheel speed sensor from the wheel speed sensor harness pigtail connector. 2. Using a J 39200, measure the resistance between terminal A and terminal B of the left front wheel speed sensor pigtail connector. Is the resistance measurement when the specific range?	1500-2500 ohms	Go to Step 7	Go to Step 8
5	1. Reconnect all the connectors. 2. Verify that the left rear wheel speed sensor is securely mounted and that the tone wheel is in good condition. Are the wheel speed sensor and the tone wheel in good condition?	—	Go to Diagnostic Aids	—
6	Make the necessary repairs to the 24-way EBCM harness connector. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 37 LR Wheel Speed Signal Erratic				
Step	**Action**	**Value(s)**	**Yes**	**No**
7	Repair the open or high resistance in CKT 884 or CKT 885. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
8	Replace the left rear wheel speed sensor. Refer to Wheel Speed Sensor Replacement – Rear. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 38 Wheel Speed Mismatch

Circuit Description

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal. The frequency and amplitude of the sinusoidal (AC) voltage signal are proportional to the wheel speed. The amplitude of the wheel speed signal is directly related to the distance between the wheel speed sensor coil and the toothed ring. This distance is referred to as the air gap. The EBCM can detect wheel speed signal malfunctions as they happen. An error in reported wheel speed can be compensated for by the EBCM up to a point. The error compensation will allow the EBCM to continue to function normally instead of setting a DTC. If the wheel speed mismatch increases beyond that point, the EBCM will set a DTC.

Conditions for Setting the DTC

- One mismatched wheel speed more than double or less than half the other four
- A vehicle speed greater than 19 km/h (12 mph)
- No unexpected wheel acceleration
- Anything that generates consistent differences between the wheel speed signals

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled.

DTC 38 is an Ignition Latched DTC, which indicates the above actions remain true until the ignition is turned to OFF (even if the cause of the DTC is intermittent).

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

Installing significantly different tires on the vehicle usually sets a DTC 38.

DTC 38 Wheel Speed Mismatch				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	Inspect the vehicle tires for a variation in tire size Are all four tire sizes the same?	—	Go to Step 3	Go to Diagnostic Aids
3	1. Install the Scan Tool, clear all DTCs. 2. While driving the vehicle, monitor and compare all the wheel speeds. Does the Scan Tool indicate a mismatch in wheel speeds?	—	Go to Step 4	Go to Diagnostic Aids
4	Does the Scan Tool indicate a mismatch with the right front wheel speed?	—	Go to DTC 23 RF Wheel Speed Signal Erratic	Go to Step 5
5	Does the Scan Tool indicate a mismatch with the left front wheel speed?	—	Go to DTC 27 LF Wheel Speed Signal Erratic	Go to Step 6
6	Does the Scan Tool indicate a mismatch with the right rear wheel speed?	—	Go to DTC 33 RR Wheel Speed Signal Erratic	Go to Step 7
7	Does the Scan Tool indicate a mismatch with the left rear wheel speed?	—	Go to DTC 37 LR Wheel Speed Signal Erratic	—

DTC 41-58 EBCM Control Valve Circuit

Circuit Description

The EBCM microprocessor will ground the indicated solenoid coil (RF dump/isolation, LF dump/isolation, or Rear dump/isolation) circuit to energize the solenoid coils whenever the solenoid valve is needed. Refer to Electronic Brake Control Module (EBCM) Replacement.

Conditions for Setting the DTC

OPEN CIRCUIT

- The ABS bulb check is complete
- Low voltage exists on the EBCM solenoid driver circuit when high voltage is expected (the solenoid is not energized)

SHORTED CIRCUIT

- The ABS bulb check is complete
- High voltage is present on the EBCM solenoid driver circuit when the voltage is expected to be low (solenoid energized).

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled.

DTCs 41-58 are Ignition Latched DTCs, which indicates the above actions remain true until the ignition is turned to OFF (even if the cause of the DTC is intermittent).

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

This DTC usually sets because of an open/shorted solenoid coil within the EBCM. The solenoid coil is located within the BPMV and is not serviceable. If the test does not repair the DTC, then replace the EBCM.

If this DTC sets with other DTCs, check for the following conditions:

- A poor EBCM power or signal ground
- A poor EBCM power or ignition feed

Test Description

The numbers below refer to the steps in the diagnostic table:

3. This step checks the resistance of the ground circuit.
4. This step checks the ignition voltage available to the EBCM.

DTC 41-58 EBCM Control Valve Circuit				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn the ignition to OFF. 2. Disconnect the 2-way EBCM harness connector from the EBCM. 3. Inspect the connector for damage or corrosion that could cause a loss of power to the EBCM. Is the connector in good condition?	—	Go to Step 3	Go to Step 11
3	Using a J 39200, measure the resistance between terminal 2 of the 2-way EBCM harness connector and ground. Is the resistance measurement within the specified range?	0-2 ohms	Go to Step 4	Go to Step 8
4	1. Turn the ignition to RUN. 2. Using a J 39200, measure the resistance between terminal 1 of the 2-way EBCM harness connector and ground. Is the voltage measured equal to or greater than the specified value?	10.0 V	Go to Step 6	Go to Step 5
5	Inspect the 60-amp fuse.. Is the fuse open?	—	Go to Step 10	Go to Step 11
6	1. Inspect the 2-way EBCM harness connector for poor terminal contact or corrosion. 2. Inspect CKT 142 and CKT 150 for damage that could result in a shorted circuit. Repair any evident damage. 3. Replace the terminals if poor contact or corrosion exists. 4. Reconnect all the connectors. 5. Using the Scan Tool, clear all DTCs. 6. Test drive the vehicle above 16 km/h (10 mph). Does the DTC set as a current DTC?	—	Go to Step 9	Go to Diagnostic Aids

DTC 41-58 EBCM Control Valve Circuit				
Step	**Action**	**Value(s)**	**Yes**	**No**
7	Repair the 2-way EBCM harness connector, if necessary. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
8	Repair the open or the high resistance in the CKT 150. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
9	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
10	Repair the short to ground in CKT 142. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
11	Repair the open or the high resistance in the CKT 142. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 65 or 66 EBCM Relay Circuit

Circuit Description

The pump motor relay supplies power to all eight solenoid coils (four isolation solenoid coils and four dump solenoid coils) and the pump motor when the ABS is required. The relay and the eight solenoid coils are located within the EBCM.

Conditions for Setting the DTC (DTC C0265)

- The EBCM microprocessor commands the relay on
- Low voltage exists on all eight solenoid driver circuits when high voltage is expected (the solenoid is not energized)

Conditions for Setting the DTC (DTC C0266)

- The ABS bulb check is complete
- High voltage exists on the pump motor driver circuits when all are expected to be low (the relay is not commanded on)

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled.

DTCs 65 and 66 are Ignition Latched DTCs, which indicates that the above actions remain true until the ignition is turned to OFF (even if the cause of the DTC is intermittent).

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids (DTC 65)

DTC 65 usually sets because of an open relay coil or non-closable relay contacts. The relay is located within the EBCM. The relay is not serviceable. If the test does not repair the DTC, then replace the EBCM.

If DTC 65 appears with other DTCs repair the other DTCs first. Clear all DTCs. Then run three function tests with the Scan Tool. Refer to this diagnostic chart if DTC 65 resets

Diagnostic Aids (DTC 66)

DTC 66 usually sets when the relay contacts are stuck closed. The relay is located within the EBCM. The relay is not serviceable. If the test does not repair the DTC, then replace the EBCM.

Test Description

The numbers below refer to the steps in the diagnostic table:

3. This step checks the resistance of the ground circuit.
4. This step checks the ignition voltage available to the EBCM.

DTC 65 or 66 EBCM Relay Circuit				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn the ignition to OFF. 2. Disconnect the 2-way EBCM harness connector from the EBCM. 3. Inspect the connector for damage or corrosion that could cause a loss of power to the EBCM Is the connector in good condition?	—	Go to Step 3	Go to Step 7
3	Using a J39200, measure the resistance between terminal 2 of the 2-way EBCM harness connector and the ground. Is the resistance measurement within the specified range?	0-2 ohms	Go to Step 4	Go to Step 8
4	1. Turn the ignition to RUN. 2. Using a J 39200, measure the resistance between terminal 1 of the 2-way EBCM harness connector and ground. Is the voltage measured equal to or greater than the specified value?	10.0 V	Go to Step 6	Go to Step 5
5	Inspect the 60-amp fuse.. Is the fuse open?	—	Go to Step 10	Go to Step 11
6	1. Inspect the 2-way EBCM harness connector for poor terminal contact or corrosion. 2. Inspect CKT 142 and CKT 150 for damage that could result in a shorted circuit. Repair any evident damage. 3. Replace the terminals if poor contact or corrosion exists. 4. Reconnect all the connectors. 5. Using the Scan Tool, clear all DTCs. 6. Test drive the vehicle above 16 km/h (10 mph). Does the DTC set as a current DTC?	—	Go to step 9	Go to Diagnostic Aids

DTC 65 or 66 EBCM Relay Circuit				
Step	**Action**	**Value(s)**	**Yes**	**No**
7	Repair the 2-way EBCM harness connector. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
8	Repair the open or the high resistance in the CKT 150. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
9	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
10	Repair the short to ground in CKT 142. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
11	Repair the open or the high resistance in the CKT 142. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 67 or 68 Pump Motor Circuit Open/Shorted

Circuit Description

The pump motor circuit is integral to the BPMV. The EBCM microprocessor energizes the relay within the EBCM in order to supply the battery voltage to the high side of the pump motor. The EBCM microprocessor grounds the low side of the pump motor when activation of the pump motor is required.

Conditions for Setting the DTC (67)

- The EBCM internal relay is on
- The pump motor is off
- Low voltage is present from the low side of the pump motor when high voltage is expected

Conditions for Setting the DTC (68)

- Vehicle speed is 13 km/h (8 mph)
- The EBCM internal relay is on
- The pump motor is commanded ON and then OFF
- High voltage exists from the low side of the pump motor for 100 milliseconds when the voltage is expected to be low

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled.

DTCs 67 and 68 are ignition latched DTCs, which indicates that the above actions remain true until the ignition switch is turned to OFF (even if the cause of the DTC is intermittent).

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

The pump motor is integral with the BPMV. Do not service the pump motor separately. A poor power/ground connection at the 2-way EBCM connector or the 2-way motor harness from the EBCM to the pump motor can cause a DTC 67. A seized pump motor, shorted pump motor windings or a poor power/ground at the 2-way EBCM connector can cause a DTC 68. Replace the EBCM or the BPMV if the following tests show that the pump motor EBCM internal circuits have failed.

IMPORTANT:

Reset the J 39200 test leads to zero prior to making any resistance measurements. Refer to the J 39200 in the user's manual.

Test Description

The numbers below refer to the steps in the diagnostic table:

3. This step checks for an open pump motor circuit. The pump motor circuit resistance should not be above the 0.3 ohms. Reset the J 39200 test leads to zero prior to making this low resistance measurement.
5. This step determines the resistance of the EBCM ground circuit.
7. This step determines the ignition voltage available to the EBCM.

DTC 67 or 68 Pump Motor Circuit Open/Shorted				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn the ignition to OFF. 2. Disconnect the 2-way pump motor pigtail connector from the EBCM. 3. Inspect the connector and the wiring for damage or corrosion that could result in an open circuit between the pump motor and the EBCM. Is the connector and the wiring in good condition?	—	Go to Step 3	Go to Step 10
3	Using a J 39200, measure the resistance between terminals 1 and 2 of the 2-way pump motor pigtail connector. Is the resistance within the specified range?	0.1-1.0 ohms	Go to Step 4	Go to Step 15
4	1. Turn the ignition to OFF. 2. Disconnect the 2-way EBCM harness connector from the EBCM. 3. Inspect the connector for damage or corrosion that could cause a loss of power to the EBCM. Is the connector in good condition?	—	Go to Step 5	Go to Step 9
5	Using a J 39200, measure the resistance between terminal 2 of the 2-way EBCM harness connector and the ground. Is the resistance within the specified range?	0-2 ohms	Go to Step 6	Go to Step 11
6	1. Turn the ignition to RUN. 2. Using a J 39200, measure the voltage between terminal 1 of the 2-way EBCM harness connector and the ground. Is the voltage equal to or greater than the specified value?	10.0 V	Go to Step 8	Go to Step 7

DTC 67 or 68 Pump Motor Circuit Open/Shorted				
Step	**Action**	**Value(s)**	**Yes**	**No**
7	Inspect the 60-amp ABS maxi-fuse. Is this fuse open?	—	Go to Step 13	Go to Step 14
8	1. Inspect the 2-way EBCM harness connectors for poor terminal contact or corrosion. Inspect CKT 142 and CKT 150 for damage that could result in an intermittent open circuit. Repair any evident damage. Replace the terminals if poor contact or corrosion exists. 2. Reconnect all the connectors. 3. Using the Scan Tool, clear all DTCs. 4. Test drive the vehicle above the 16 km/h (10 mph) Does the DTC set as a current DTC?	—	Go to Step 12	Go to Diagnostic Aids
9	Repair the 2-way EBCM harness connector if necessary. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
10	Repair the 2-way pump motor pigtail connector or wiring if necessary. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
11	Repair the open or the high resistance in the CKT 150. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
12	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
13	Repair short to ground in CKT 142. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 67 or 68 Pump Motor Circuit Open/Shorted				
Step	**Action**	**Value(s)**	**Yes**	**No**
14	Repair the open or the high resistance in CKT 142. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
15	Replace the BPMV. Refer to Brake Pressure Modulator Valve Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 69 or 74 Excessive Dump/Isolation Time

Circuit Description (DTC 69)

The EBCM microprocessor grounds the dump valve coil(s) to energize and open the dump valve, allowing fluid to be dumped into the LPA. This is done with very short activation pulses opening and closing the dump valve passageway. Brake pressure is lowered at the wheel and allows the affected wheel to begin rolling again. Each dump valve is opened independently to control the deceleration of the wheel.

Circuit Description (DTC 74)

The EBCM microprocessor grounds the isolation coil to energize and close the isolation valve. This will prevent any additional brake pressure applied by the driver from reaching the wheel. Further increases in brake pressure will be prohibited. Each isolation valve is closed independently to isolate each wheel. The EBCM microprocessor also uses a software subroutine to monitor for any ABS event which would initiate an isolation command. This subroutine is performed every 1.0 second.

Conditions for Setting the DTC (DTC 69)

Dump time (pressure reduction) exceeds 9 seconds, which can be caused from the following conditions:

- Locked rotors
- Excessively low road surface friction

Conditions for Setting the DTC (DTC 74)

Isolation time (pressure hold) exceeding 120 consecutive 1.0 second checks

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled.

DTCs 69 or 74 are ignition latched DTCs, which indicates that the above actions remain true until the ignition switch is turned to OFF (even if the cause of the DTC is intermittent).

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

If any other DTCs are set, repair those DTCs first. If there are no DTCs set, ensure the ABS is operating properly by performing Using the Scan Tool Function Test.

Test Description

The numbers below refer to the steps in the diagnostic table:

3. This step determines the resistance of the power ground circuit.
4. This step determines the ignition voltage available to the EBCM.

DTC 69 or 74 Excessive Dump/Isolation Time				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn the ignition to OFF. 2. Disconnect the 2-way EBCM harness connector from the EBCM. 3. Inspect the connector for damage or corrosion that could cause a loss of power to the EBCM. Is the connector in good condition?	—	Go to Step 3	Go to Step 7
3	Using a J39200, measure the resistance between terminal 2 of the 2-way EBCM harness connector and the ground. Is the resistance measurement within the specified range?	0-2 ohms	Go to Step 4	Go to Step 8
4	1. Turn the ignition to RUN. 2. Using a J 39200, measure the resistance between terminal 1 of the 2-way EBCM harness connector and ground. Is the voltage equal to or greater than the specified value?	10.0 V	Go to Step 6	Go to Step 5
5	Inspect the 60-amp ABS maxi-fuse. Is the fuse open?	—	Go to Step 10	Go to Step 11
6	1. Inspect the 2-way EBCM harness connector for poor terminal contact or corrosion. 2. Inspect CKT 142 and CKT 150 for damage that could result in a shorted circuit. Repair any evident damage. 3. Replace the terminals if poor contact or corrosion exists. 4. Reconnect all the connectors. 5. Using the Scan Tool, clear all DTCs. 6. Test drive the vehicle above 16 km/h (10 mph). Does the DTC set as a current DTC?	—	Go to Step 9	Go to Diagnostic Aids

DTC 69 or 74 Excessive Dump/Isolation Time				
Step	**Action**	**Value(s)**	**Yes**	**No**
7	Repair the 2-way EBCM harness connector. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
8	Repair the open or the high resistance in the CKT 150. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
9	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
10	Repair the short to ground in CKT 142. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
11	Repair the open or the high resistance in CKT 142. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 71-73 EBCM Malfunction

Circuit Description

The EBCM initializes a self-test when the ignition is turned to the RUN position. This internal self-test verifies that all ABS circuitry is operating correctly.

Conditions for Setting the DTC

Any condition within the EBCM which causes a memory error will set the DTC.

Action Taken When the DTC Sets

- The ABS indicator lamp turns on
- The ABS is disabled

These DTCs are Permanent Latched DTCs, which indicates that the above actions remain true until the DTC is cleared using a Scan Tool.

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

DTCs 71 -73 are EBCM internal diagnosis trouble codes. Replace the EBCM if these tests show that the EBCM circuitry has failed.

Test Description

The numbers below refer to the steps in the diagnostic table:

2. This step checks if the EBCM will Clear DTCs.
3. This step checks if the DTC was set previously.

DTC 71-73 EBCM Malfunction				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	Install the Scan Tool and attempt to clear the DTC's. Did the DTCs clear?	—	Go to Step 3	Go to Step 4
3	Check the history DTCs and the data. Was this the first time the DTC set?	—	Go to ABS Diagnostic System Check	Go to Step 4
4	Replace the EBCM. Refer to Electronic Brake Control Module Replacement Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 81 Brake Switch Circuit

Circuit Description

The Stop Lamp Switch is normally closed. With the ignition in the RUN position and the brake pedal not depressed, the EBCM will have ignition voltage present at terminal 15 of the 24-way EBCM connector. When the brakes are applied, the ignition voltage present at terminal 15 of the EBCM will be zero.

Conditions for Setting the DTC

- Vehicle above 56 km/h (35 mph) for 10 seconds, followed by vehicle at rest for 1 second
- Stop Lamp never switching during the above condition

Action Taken When the DTC Sets

- The ABS indicator lamp will not be illuminated
- The ABS will not be disabled

DTC 81 is advisory code only. the DTC is stored in memory, but the ABS indicator lamp will not light, and ABS will not be disabled.

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

DTC 81 can be set by a faulty Stop Lamp Switch, misadjusted Stop Lamp Switch or damage in power and ground circuits. Also, a driver who rides the brake at power-up through 24 km/h (15 mph) can set this DTC.

Thoroughly check any circuitry that is suspected of causing the intermittent complaint for the following conditions:

- Backed out terminals
- Improper mating
- Broken locks
- Improperly formed or damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

Test Description

The numbers below refer to the steps in the diagnostic table:

2. This step checks the functionality of the Stop Lamp Switch circuit using the Scan Tool.
3. This step checks the functionality of the Stop Lamp Switch circuit (including the Inverter Driving Module) using a J 39200.
4. This step checks the functionality of the Stop Lamp Switch circuit up to the Inverting Driving Module.
8. This step checks for a short to ground in the Stop Lamp Switch circuit between the Inverting Driver Module and the EBCM.
9. This step checks the resistance in the ground circuit to the Inverting Driver Module.
10. This step checks the ignition voltage at the Inverting Driver Module.

DTC 81 Brake Switch Circuit				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Install the Scan Tool. 2. Turn the ignition to RUN. 3. Using the Data List function of the scan tool, check the operation of the Stop Lamp Switch while applying and releasing the brake pedal. Does the scan tool indicate that the Stop Lamp Switch is opening and closing?	—	Go to Step 8	Go to Step 3
3	1. Turn the ignition to OFF. 2. Disconnect the 24-way EBCM harness connector. 3. Using a J 39200, measure the resistance between terminal 15 of the 24-way connector and ground while applying and releasing the brake pedal. Is the resistance measured switching between the specified range?	0 ohms - OL	Go to Step 8	Go to Step 4
4	1. Disconnect the Stop Lamp Switch harness connector from the Stop Lamp Switch. 2. Using a J 39200, measure the resistance between terminal 15 of the 24-way EBCM harness connector and terminal B. Is the resistance within the specific range?	0-2 ohms	Go to Step 5	Go to Step 10
5	1. Turn the ignition to RUN. 2. Using a J 39200, measure the resistance between terminal B of the Stop Lamp Switch harness connector and ground. Is the resistance within the specified range?	0-2 ohms	Go to Step 6	Go to Step 9
6	Check for properly adjusted Stop Lamp Switch. Is the Stop Lamp Switch adjustment correct?	—	Go to Step 7	Go to Step 11

DTC 81 Brake Switch Circuit				
Step	**Action**	**Value(s)**	**Yes**	**No**
7	Using a J 39200, measure the resistance between terminal B of the Stop Lamp Switch while applying and releasing the brake pedal. Is the resistance measured switching within the specified range?	0 ohms - OL	Go to Diagnostic Aids	Go to Step 12
8	1. Inspect the 24-way EBCM harness connector for poor terminal contact or corrosion. 2. Inspect CKT 848 for damage that could result in an open circuit. Repair any evident damage. 3. Replace the terminals if poor contact or corrosion exists. 4. Reconnect all the connectors. 5. Using the Scan Tool, clear all DTCs. 6. Test drive the vehicle above 16 km/h (10 mph). Does the DTC 81 set as a current DTC?	—	Go to Step 13	Go to Diagnostic Aids
9	Repair the short to ground in CKT 451 or 808. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
10	Repair the open or the high resistance in CKT 848. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
11	Repair the misadjusted Stop Lamp Switch. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
12	Replace the Stop Lamp Switch. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
13	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

DTC 86 ABS Indicator Lamp Circuit Shorted to B+

Circuit Description

The amber ABS indicator lamp operates in 2 modes; ormal and backup. In the normal mode, ignition voltage is supplied to the ABS indicator lamp through the IGN SW fuse. The indicator is normally on unless the EBCM switches the indicator off, by activating the ABS indicator lamp relay. If the EBCM senses that a fault has occurred, it will set a DTC and light the ABS indicator lamp by supplying a ground to the ABS indicator lamp relay. In the backup mode, the ABS telltale relay circuit will ensure that the ABS indicator lamp is lit if the 24-way connector is disconnected or poorly seated, or if the EBCM has failed during normal operation. If either of these fault conditions occur, the ABS telltale relay will de-energize, which connects an alternate ground path to the ABS indicator lamp circuit through terminal C2 and terminal C1 of the ABS indicator relay.

Conditions for Setting the DTC

- High voltage present on the ABS indicator lamp control circuit when low voltage is expected (lamp is turned on)
- Anything that keeps the ABS indicator lamp circuit high when the lamp circuit is expected to be on

Action Taken When the DTC Sets

- The ABS is not disabled

Conditions for Clearing the DTC

- Repair the conditions responsible for setting the DTC
- Use the Scan Tool Clear DTCs function

Diagnostic Aids

DTC 86 typically sets because of a shorted ABS indicator lamp. Yet DTC 86 can also set because of a short to voltage in the wiring between the ABS indicator lamp and the EBCM.

Test Description

The numbers below refer to the steps in the diagnostic table:

2. This step checks for normal operation of the ABS indicator lamp.
3. This step turns off the ABS indicator lamp with a J 36169-A.

DTC 86 ABS Indicator Lamp Circuit Shorted to B+				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Turn the ignition to RUN. 2. Observe the amber ABS indicator lamp operation. Did the ABS indicator lamp turn on and then turn off after 3 seconds?	—	Go to Step 5	Go to Step 3
3	1. Turn the ignition to OFF. 2. Disconnect the 24-way EBCM harness connector from the EBCM. 3. Using a J 36169-A with a 10-amp fuse, connect terminal 2 of the 24-way EBCM harness connector to ground. Is the resistance measured switching between the specified range?	—	Go to Step 5	Go to Step 4
4	1. Turn the ignition to OFF. 2. Disconnect the ABS indicator relay. 3. Turn the ignition to RUN. 4. Using a J 39200, measure the voltage between terminal C2 and ground. Is the voltage equal to or greater than the specified range?	10 V	Go to Step 7	Go to Step 8
5	1. Inspect the 24-way EBCM harness connector for poor terminal contact or corrosion. 2. Inspect CKT 1899 for damage which may result in a shorted circuit. Repair any evident damage. 3. Replace the terminal if poor contact or corrosion exists. 4. Reconnect all the connectors. 5. Using the Scan Tool, clear all DTCs. 6. Test drive the vehicle above 16 km/h (10 mph). Does the DTC 86 set as a current DTC?	—	Go to Step 6	Go to Diagnostic Aids

DTC 86 ABS Indicator Lamp Circuit Shorted to B+				
Step	**Action**	**Value(s)**	**Yes**	**No**
6	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is repair complete?	—	Go to ABS Diagnostic System Check	—
7	Repair a short to voltage in CKT 1899. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
8	Replace the ABS indicator relay. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

ABS Indicator Lamp Off Constantly, No DTCs

Circuit Description

The ABS indicator lamp is normally on (voltage supplied through the normally closed contacts or the ABS indicator relay) unless the ABS indicator relay is switched off by the EBCM. This logic ensures that the ABS indicator lamp will always be turned on if there is an open or high resistance in CKT 1899 or a faulty EBCM. When the EBCM needs to turn the ABS indicator lamp off, it will ground CKT 1899 to energize the coil in the ABS indicator relay and open the relay contacts.

Diagnostic Aids

If the ABS indicator lamp is off constantly, there is an open or short to voltage in the lamp circuit between the instrument panel and the ABS indicator relay ground (this includes the ABS indicator relay contacts). Also check for an open instrument panel fuse or an open bulb.

Test Description

The numbers below refer to the steps in the diagnostic table:

2. This step checks for normal operation of the ABS indicator lamp.
3. Manually (with fused jumper) turn on ABS indicator lamp by bypassing the ABS indicator relay.
5. This step checks for a short to ground in CKT 1899.

ABS Indicator Lamp Off Constantly, No DTCs				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Disconnect the EBCM. 2. Turn ignition to RUN. Does the ABS indicator lamp turn on?	—	Go to Step 6	Go to Step 3
3	1. Turn the ignition to OFF. 2. Disconnect the ABS indicator relay. 3. Using a fused jumper wire, such as J 36169, connect terminal A7 (terminal C4 for B Models) of the relay center harness connector to ground. 4. Turn the ignition to RUN. Does the ABS indicator lamp turn on?	—	Go to Step 4	Go to Step 8
4	Using a J 39200, measure the resistance between relay center harness connector terminal B8 (terminal C3 for B Models) and ground. Is the resistance measurement within the specific range?	0-2 ohms	Go to Step 5	Go to Step 11
5	Using a J 39200, measure the resistance between relay center harness connector terminal A9 (terminal C2 for B Models) and ground. Is the resistance measurement within the specific range?	OL (infinite)	Go to Step 13	Go to Step 12

ABS Indicator Lamp Off Constantly, No DTCs				
Step	**Action**	**Value(s)**	**Yes**	**No**
6	1. Inspect the 24-way EBCM harness connector terminal 7 for damage which may result in a short to ground with the EBCM harness connector connected to the EBCM. 2. Inspect CKT 1899 for damage that could result in a short to ground. Repair any evident damage. 3. Reconnect all the connections. 4. Using the Scan Tool, clear all DTCs. 5. Test drive the vehicle above 16 km/h (10 mph). Is the ABS indicator lamp off constantly?	—	Go to Step 7	Malfunction is intermittent. Go to Diagnostic Aids
7	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
8	Check for an open ABS indicator lamp. Is the ABS indicator lamp open?	—	Go to Step 10	Go to Step 9
9	Repair the open or the high resistance in CKT 867. Is the repair complee?	—	Go to ABS Diagnostic System Check	—
10	Replace ABS indicator lamp. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
11	Repair the open or the high resistance in CKT 150. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
12	Repair short to ground in CKT 1899. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
13	Replace ABS indicator relay. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

ABS Indicator Lamp On Constantly, No DTCs

Circuit Description

The ABS indicator lamp is normally on (voltage supplied through the normally closed contacts or the ABS indicator relay) unless the ABS indicator relay is switched off by the EBCM. This logic ensures that the ABS indicator lamp will always be turned on if there is an open or high resistance in CKT 1899 or a faulty EBCM. When the EBCM needs to turn the ABS indicator lamp off, it will ground CKT 1899 to energize the coil in the ABS indicator relay and open the relay contacts.

Diagnostic Aids

If the ABS indicator lamp is on constantly, the EBCM is not capable of turning the lamp off or there is a short to ground in the circuit.

Test Description

The numbers below refer to the steps in the diagnostic table:

2. This step checks for normal operation of the ABS indicator lamp.
3. Manually (with fused jumper) turn on ABS indicator lamp by bypassing the ABS indicator relay.

ABS Indicator Lamp On Constantly, No DTCs				
Step	**Action**	**Value(s)**	**Yes**	**No**
1	Was the Diagnostic System Check performed?	—	Go to Step 2	Go to ABS Diagnostic System Check
2	1. Disconnect the 24-way EBCM harness connector. 2. Using a fused jumper wire, such as a J 36169, connect terminal 7 of the 24-way harness connector to ground. 3. Turn ignition to RUN. Does the ABS indicator lamp turn on?	—	Go to Step 6	Go to Step 3
3	1. Turn the ignition to OFF. 2. Remove the ABS indicator relay. 3. Turn the ignition to RUN. Does the ABS indicator lamp turn on?	—	Go to Step 4	Go to Step 7
4	Using a J 39200, measure the resistance between the ABS indicator relay harness connector terminal B7 (terminal C1 for B Model) and ground. Is the voltage measuremed equal to or greater than the specified value?	12 V	Go to Step 5	Go to Step 8
5	Using a J 39200, measure the resistance between relay center harness connector terminal A9 (terminal C2 for B Models) and the EBCM harness connector terminal 7.. Is the resistance measurement within the specific range?	0-2 ohms	Go to Step 9	Go to Step 10

ABS Indicator Lamp On Constantly, No DTCs				
Step	**Action**	**Value(s)**	**Yes**	**No**
6	1. Inspect the 24-way EBCM harness connector terminal 7 for poor terminal contact or corrosion. Replace terminals if poor contact or corrosion exists. 2. Inspect CKT 1899 for damage that could result in an open circuit. Repair any evident damage. 3. Reconnect all the connections. 4. Using the Scan Tool, clear all DTCs. 5. Test drive the vehicle above 16 km/h (10 mph). Is the ABS indicator lamp off constantly?	—	Go to Step 11	Malfunction is intermittent. Go to Diagnostic Aids
7	Repair short to ground in CKT 867. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
8	Repair the open or high resistance in CKT 38 (CKT 341 for B Model). Refer to Wiring Repairs. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
9	Replace ABS indicator relay. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
10	Repair the open or high resistance in CKT 1899. Is the repair complete?	—	Go to ABS Diagnostic System Check	—
11	Replace the EBCM. Refer to Electronic Brake Control Module Replacement. Is the repair complete?	—	Go to ABS Diagnostic System Check	—

REPAIR INSTRUCTIONS

ABS Bleed Procedure

IMPORTANT:

- Use the two-person bleed procedure under the following conditions:
  - Installing a new Electro-Hydraulic Control *Unit (EHCU) or Brake Pressure Modulator Valve (BPMV)*
  - Air is trapped in the valve body
- Do not drive the vehicle until the brake pedal feels firm
- Do not reuse brake fluid that is used during bleeding.
- Use the vacuum, the pressure and the gravity bleeding procedures only for base brake bleeding.

Two Person Procedure

1. Raise the vehicle in order to access the system bleed screws.
2. Bleed the system at the right rear wheel first.
3. Install a clear hose on the bleed screw.
4. Immerse the opposite end of the hose into a container partially filled with clean DOT 3 brake fluid.
5. Open the bleed screw 1/2 to one full turn.
6. Slowly depress the brake pedal. While the pedal is depressed to its full extent, tighten the bleed screw.
7. Release the brake pedal and wait 10–15 seconds for the master cylinder pistons to return to the home position.
8. Repeat the previous steps for the remaining wheels. The brake fluid which is present at each bleed screw should be clean and free of air.
9. This procedure may use more than a pint of fluid per wheel. Check the master cylinder fluid level every four to six strokes of the brake pedal in order to avoid running the system dry.
10. Press the brake pedal firmly and run the Scan Tool Function Test four times. Release the brake pedal between each test.
11. Bleed all four wheels again using steps 3–9. This will remove the remaining air from the brake system.
12. Evaluate the feel of the brake pedal before attempting to drive the vehicle.
13. Bleed the system as many times as necessary in order to obtain the appropriate feel of the pedal.

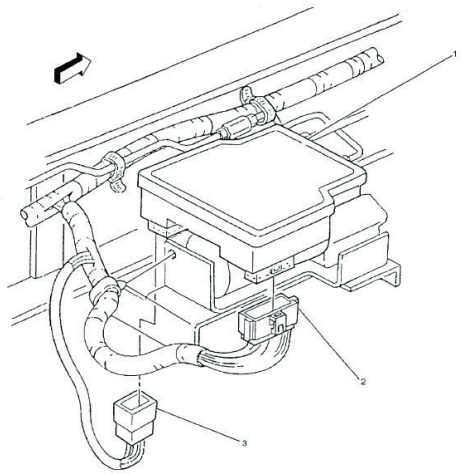
Electronic Brake Control Module Replacement

Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the four EBCM wiring harness connectors.
3. Remove the four T-25 Torx bolts (1) that fasten the EBCM to the BPMV.

NOTICE:
Do not use a tool to pry the EBCM from the BPMV. Excessive force will damage the EBCM.

4. Remove the EBCM (2) from the BPMV (4). Removal may require a light amount of force.
5. Clean the BPMV with a clean, dry cloth.



Installation Procedure

IMPORTANT:

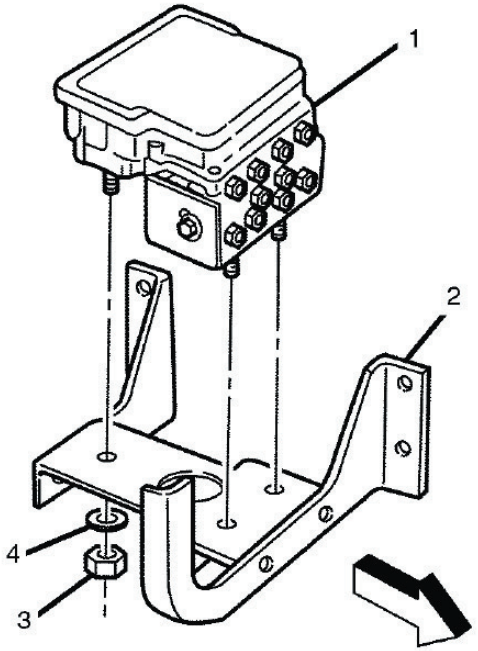
- After installation, calibrate the new EBCM to the tire size that is appropriate to the vehicle. Refer to ABS System Description.
- If the EBCM mounting bolts are corroded or damaged, do not reuse the old mounting bolts. Install new EBCM mounting bolts with the new EBCM.
- Do not use RTV or any other type of sealant on the EBCM to BPMV mating surface.

1. Install EBCM (2) to BPMV (4).
2. Install the four EBCM bolts (1) and tighten the four bolts to 5 N•m (39 lb in) in an X-pattern.
3. Connect the four electrical connectors to the EBCM.
4. Connect the negative battery cable.
5. Revise the tire calibration using the scan tool.
6. Return to Diagnostic System Check. Refer to ABS Diagnostic System Check.

Brake Pressure Modulator Valve (BPMV) Replacement

Removal Procedure

1. Disconnect the negative battery cable
2. Remove the EBCM. Refer to Electronic Brake Control Module (EBCM) Replacement.
3. Remove the combination valve electrical connector.
4. Remove the five brake lines from the BPMV.
5. Remove the three BPMV mounting bracket nuts (3) and washers (4).
6. Remove the BPMV (4) from the EHCU mounting bracket (2).
7. If necessary, remove the combination valve and tube adapters.
8. Clean the BPMV (1) with a clean, dry cloth.



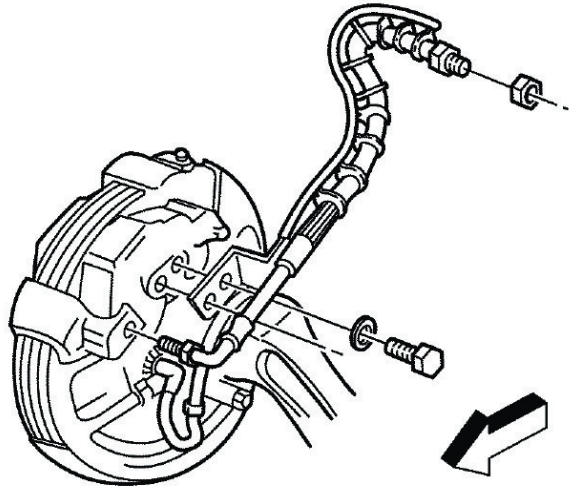
Installation Procedure

1. Install the BPMV (1) onto the EHCU mounting bracket (2).
2. Install the BPMV to mounting bracket washers (4) and nuts (3) and tighten the three BPMV mounting nuts (3) to 9 N•m (7 lb ft).
3. Install the three tube adapters, if removed and tighten the tube adapters to 31 N•m (23 lb ft).
4. Install the combination valve onto the BPMV, if removed.
5. Install the three combination valve fastening bolts, if removed and tighten the three Allen bolts firs to 8 N•m (6 lb ft) and then to 16 N•m (12 lb ft).
6. Connect the five brake lines to the combination valve and tighten the five brake lines to 30 N•m (22 lb ft).
7. Install the combination valve electrical connector.
8. Install the EBCM. Refer to Electronic Brake Control Module (EBCM) Replacement.
9. Connect the negative battery cable.
10. Bleed the brake system Refer to Automated Bleed Procedure.
11. Return to Diagnostic System Check. Refer to ABS Diagnostic System Check.

Wheel Speed Sensor Replacement – Front

Removal Procedure

1. Disconnect the electrical connector.
2. Remove the nylon straps retaining the sensor wire to the brake line. Note the location of the straps.
3. Remove the wheel speed sensor from the bore.
4. Remove the speed sensor retaining clip. The clip may come out with the wheel speed sensor or stay in the bore. If the sensor retaining clip is still functioning correctly, save it for reinstallation. If the sensor retaining clip is not functioning correctly, replace the sensor retaining clip.



Installation Procedure

IMPORTANT:
You may have to use the wire retainers from the old wheel speed sensor wire on the new sensor. Do not damage the new wire when installing the retainers.

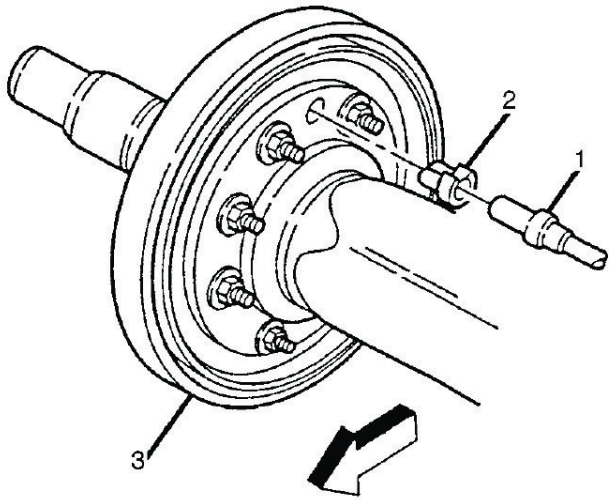
IMPORTANT:
When the wheel speed sensor is fully installed in the block bore, it contacts the tone ring which is attached to the wheel hub. Normal bearing play between the sensor tip and tone ring in the wheel hub will move the sensor tip away from the tone ring. This automatically establishes the proper air gap.

1. Install the wheel speed sensor retaining clip completely into the bore. The clip should stop at the retaining tabs. Insert the wheel speed sensor into the clip. The wheel speed sensor should contact the tone ring.
2. Secure the sensor wire to the brake line with a wire tie in the location noted during removal.
3. Connect the electrical connector.

Wheel Speed Sensor Replacement – Rear

Removal Procedure

1. Disconnect the electrical connector.
2. Remove the nylon straps retaining the sensor wire to the brake line. Note the location of the straps.
3. Remove the wheel speed sensor (1) from the bore.
4. Remove the speed sensor retaining clip (2). The clip may come out with the wheel speed sensor or stay in the bore. If the sensor retaining clip is still functioning correctly, save it for reinstallation. If the sensor retaining clip is not functioning correctly, replace the sensor retaining clip.



Installation Procedure

IMPORTANT:
You may have to use the wire retainers from the old wheel speed sensor wire on the new sensor. Do not damage the new wire when installing the retainers.

IMPORTANT:
When the wheel speed sensor is fully installed in the block bore, it contacts the tone ring which is attached to the wheel hub. Normal bearing play between the sensor tip and tone ring in the wheel hub will move the sensor tip away from the tone ring. This automatically establishes the proper air gap.

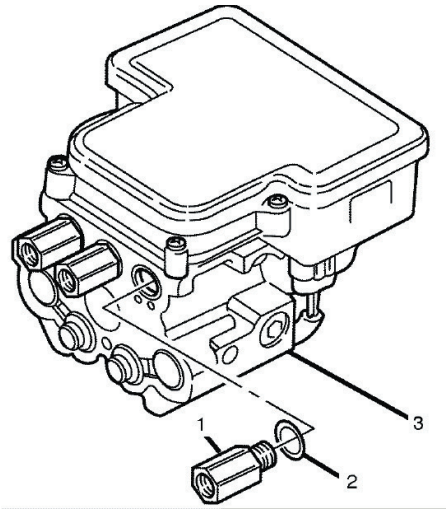
1. Install the wheel speed sensor retaining clip (2) completely into the bore. The clip should stop at the retaining tabs. Insert the wheel speed sensor (1) into the clip. The wheel speed sensor should contact the tone ring.
2. Secure the sensor wire to the brake line with a wire tie in the location noted during removal.
3. Connect the electrical connector.

Tube Adapter Replacement

Removal Procedure

IMPORTANT:
If you must remove more than one tube adapter at one time, stamp the BPMV with a number (1, 2 or 3) in order to indicate the number of grooves cut into the tube adapters. This procedure will aid proper reassembly.

1. Remove the appropriate brake line from the tube adapter.
2. Remove the tube adapter (1).



Installation Procedure

1. Install the new tube adapter (1) and tighten the tube adapter to 31 N•m (23 lb ft).
2. Install the brake line and tighten the brake line to 30 N•m (22 lb ft).
3. Bleed the system. Refer to Automated Bleed Procedure.