Antilock Brake System - Rear-Wheel Antilock (RWAL)

Specifications

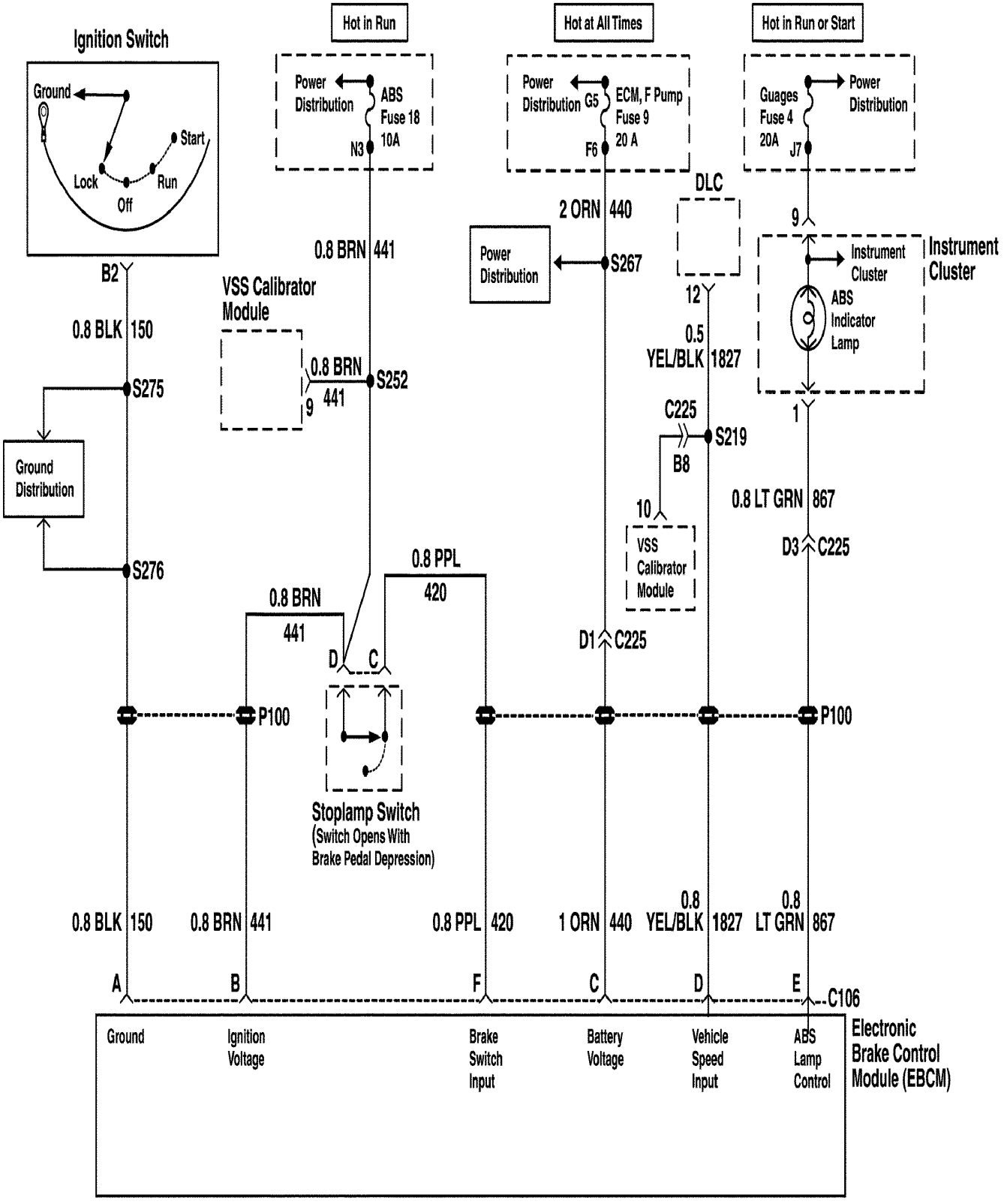
Fastener Tightening Specifications

Fastener Tightening Specifications	Specification	
Application	Metric	English
Antilock Pressure Valve (APV) Mounting Bolts	29 Nm	21 lb ft
Brake Pipe Fittings	24 Nm	18 lb ft

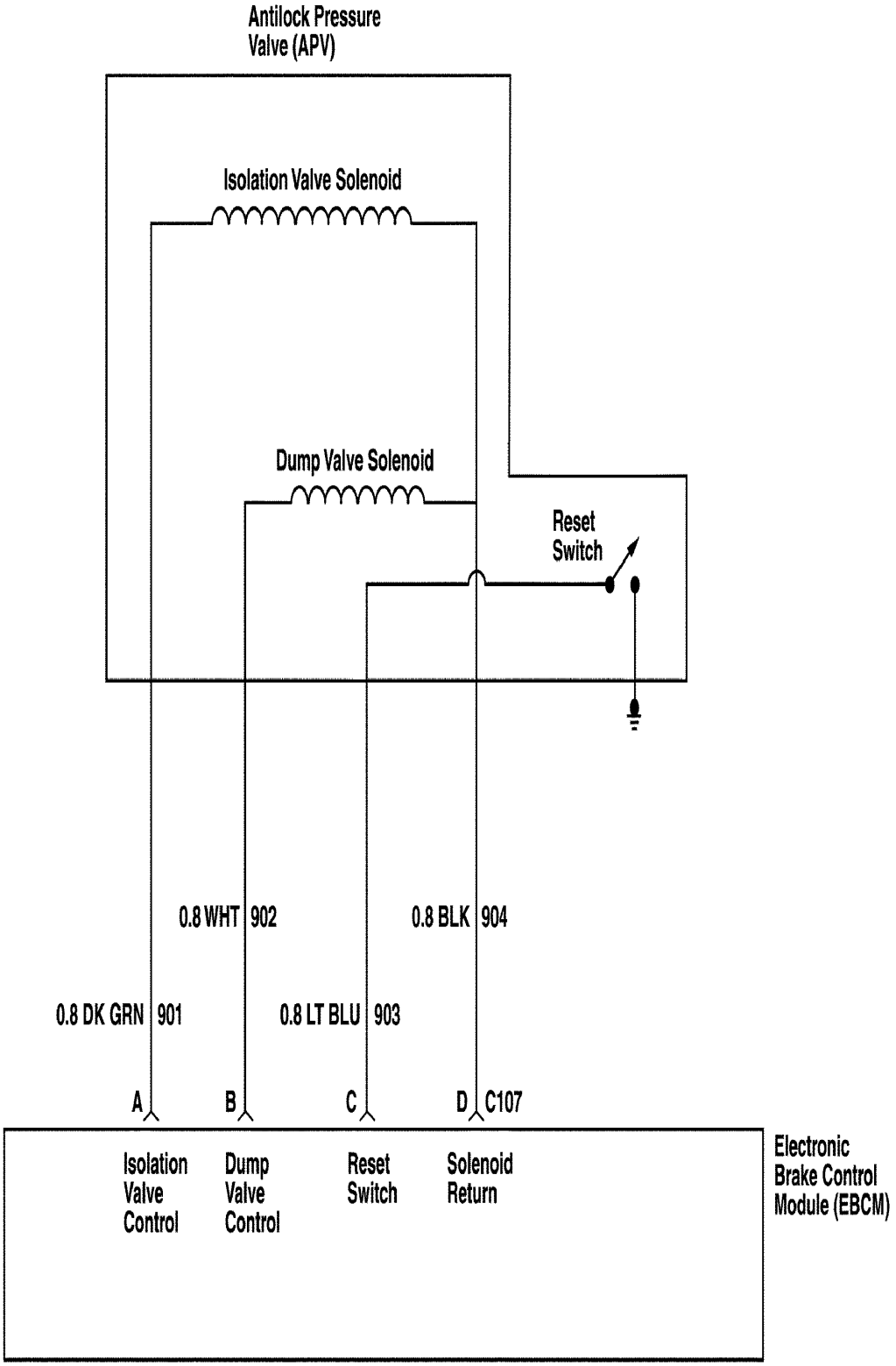
Schematic and Routing Diagrams

ABS Schematics

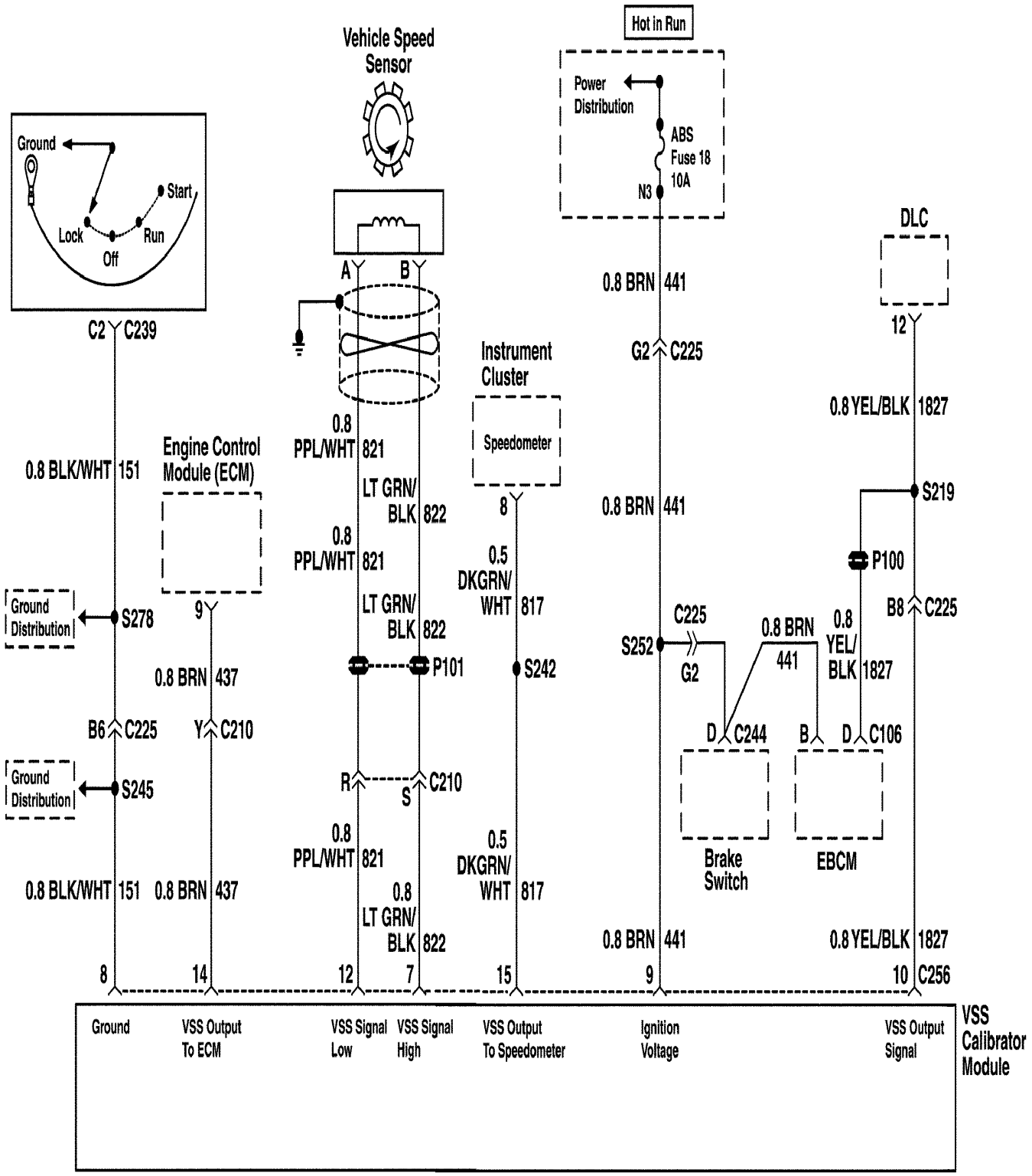
Power, Ground, ABS Indicator Lamp:



Antilock Pressure Valve (APV):



VSS Calibrator Module:

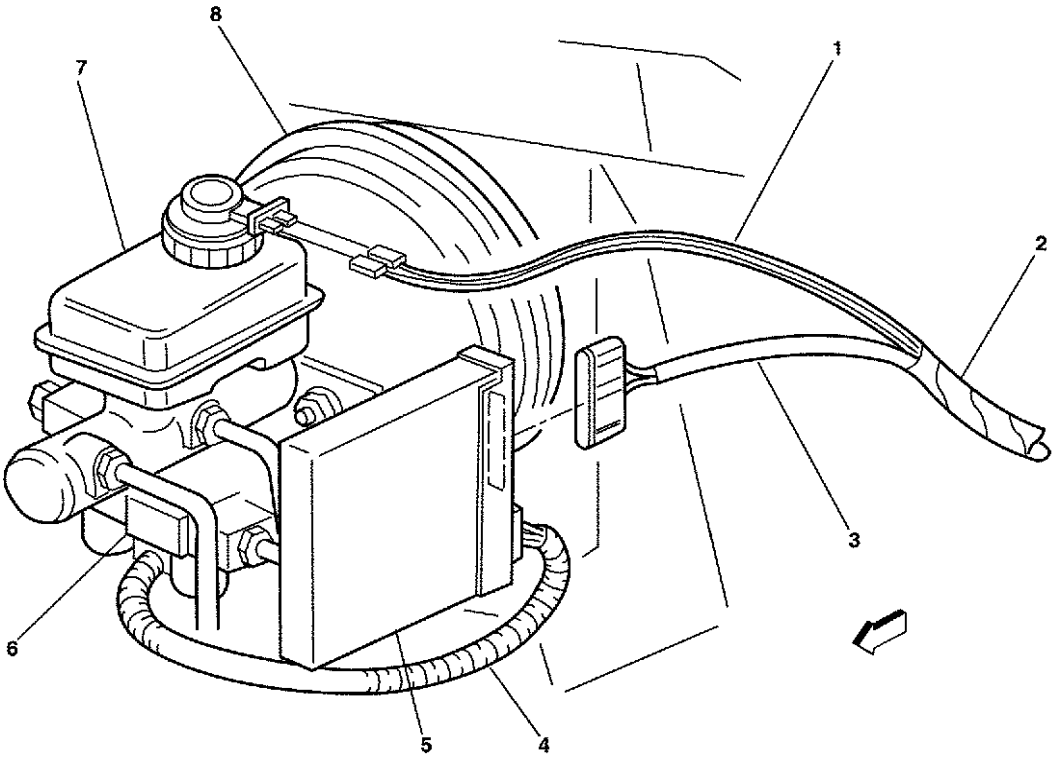


Component Locator

ABS Component Views

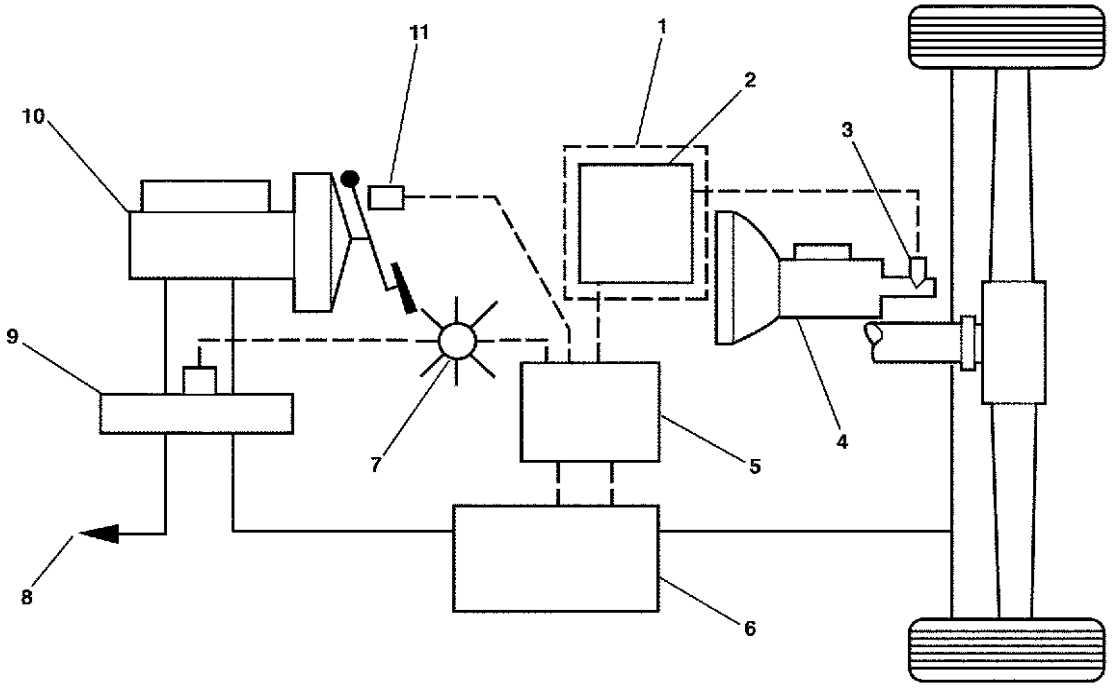
2001-S/T TRK (China)

Brake Control Module Location View:



1. Low Fluid Warning Harness
2. Dash Harness
3. Electronic Brake Control Module (EBCM) Harness Connector
4. Antilock Pressure Valve (APV) Harness Connector
5. Electronic Brake Control Module (EBCM)
6. Antilock Pressure Valve (APV
7. Master Cylinder
8. Brake Booster

Rear Wheel Antilock Brake System:



1. Right Side Instrument Panel
2. Vehicle Speed Sensor (VSS) Calibrator Module
3. Vehicle Speed Sensor
4. Transmission
5. Electronic Brake Control Module (EBCM)
6. Antilock Pressure Valve (APV)
7. ABS Lamp
8. To Front Brakes
9. Hydraulic Valve
10. Master Cylinder
11. Brake Pedal Switch

Component Locator

ABS Connector End Views

Electronic Brake Control Module (EBCM)

Connector Part Information		• 12129600 • 4-Way F Metri-Pack 280 Series (Gray)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	DK GRN	901	Isolation Valve
B	WHT	902	Dump Valve
C	LT BLU	903	Reset Switch
D	BLK	904	Solenoid Return

Electronic Brake Control Module (EBCM) 6–Way Connector

Connector Part Information		• 12110295 • 6-Way F Metri-Pack 280 Series (Gray)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BLK	150	Ground
B	BRN	441	Ignition Voltage
C	ORN	440	Battery Voltage
D	YEL/BLK	1827	VSS Input Signal
E	LT GRN	867	ABS Lamp Control
F	PPL	420	Brake Switch Input Signal

Vehicle Speed Sensor (VSS)

Connector Part Information		• 12124819 • 2-Way F Metri Pack 280 Series (Black)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	PPL/WHT	821	VSS Signal Low
B	LT GRN/BLK	822	VSS Signal High

Lamp Switch Connector

Connector Part Information		• 1204551 • 6-Way F Metri-Pack 480 Series (Gray)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	WHT	17	Brake Lamps
B	ORN	140	Battery Voltage
C	PPL	420	Brake Pedal Switch Signal to EBCM
D	BRN	441	Ignition Voltage Output
E	LT GRN/BLK	1135	Brake Transmission Shift Interlock Solenoid (4.3L Only)
F	DK GRN/WHT	275	Brake Transmission Shift Interlock Solenoid (4.3L Only)

Vehicle Speed Sensor (VSS) Calibrator Module

Connector Part Information		• 12066130 • 9-Way F Micro-Pack 100 Series (Natural)	
Pin	**Wire Color**	**Circuit No.**	**Function**
7	LT GRN/BLK	822	VSS Signal High
8	BLK/WHT	151	Ground
9	BRN	441	Ignition Voltage
10	YEL/BLK	1827	VSS Signal Output
11	—	—	Not Used
12	PPL/WHT	821	VSS Signal Low
13	—	—	Not Used
14	BRN	437	VSS Output to ECM
15	DK GRN/WHT	817	VSS Output to IP

Diagnostic Information and Procedures

Diagnostic Starting Point - Antilock Brake System

Before beginning the diagnosis on the RWAL system, you need a detailed description of when the condition occurred from the owner. This information can be useful in duplicating the condition. Always begin diagnosis with a visual inspection of all connectors, wiring, wire routing and retention, and the system components. Many times a disconnected or a loose connector, blown fuse, corroded terminal, or misrouted wire is the cause of a malfunction.

If a visual inspection does not reveal the cause of a malfunction, perform the Diagnostic System Check — ABS. This is a critical step in the quick and accurate diagnosis of any malfunction. It will direct you to the specific system area that is malfunctioning and verify that the diagnostic system is functioning properly.

Begin the system diagnosis with **"Diagnostic System Check - ABS"** . The Diagnostic System Check will provide the following information:

- The ability of the control modules to communicate through the serial data circuit.
- The identification of any stored diagnostic trouble codes (DTCs).
- Check fuse F9 and F18 for opens.

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

Diagnostic Information and Procedures

Diagnostic System Check - ABS

Test Description

The numbers below refer to the step numbers in the diagnostic table.

2. This step determines the condition of the ABS indicator lamp condition.

4. This step determines if the electronic brake control module (EBCM) or the engine control module (ECM) has set DTCs that may affect the operation of the antilock brake system

Step	Action	Yes	No
1	Install a scan tool. Does the scan tool power up?	Go to **Step 2**	Go to **"Scan Tool Does Not Power Up"** in Data Link Communications
2	1. Turn the ignition switch to the ON position without starting the engine. 2. Note the ABS inidcator lamp on the insturment cluster. 3. Turn the ignition switch to the OFF position. Does the ABS indicator lamp stay on continuously?	Go to **"ABS Indicator Always On"**	Go to **Step 3**
3	Turn the ignition switch to the ON position. Is the ABS indicator lamp flashing?	Go to **"ABS Indicator Flashing"**	Go to **Step 4**
4	Turn the ignition switch to the ON position. Did the ABS indicator lamp turn ON and then OFF after 2 seconds?	Go to **Step 5**	Go to **"ABS Indicator Inoperative"**
5	Does the speedometer work?	Go to **Step 6**	Go to **"DTC 6"** in this section for Dignosis of the VSS Cablibrator Module
6	1. Turn the ignition switch to the OFF position. 2. Install a scan tool. 3. Turn the ignition switch to the ON position. 4. Check for any stored DTCs in either the EBCM or the ECM. Are any DTCs stored in memory for any of the control modules?	Go to the appropriate DTC table	Go to **"Symptoms - Antilock Brake System"**

Diagnostic Information and Procedures

Scan Tool Output Controls

Refer to the Scan Tool Manual for complete scan tool operating instructions.

Scan Tool Special Functions	Additional Menu Selections	Description
Function Test	—	This test mode performs a function test of the system. The scan tool will simulate an acceleration and deceleration signal that causes the EBCM to cycle the RWAL system.
Brake Switch Test	—	This mode allows specialized testing of the brake switch.
VSS Monitor	—	This mode allows monitoring of the vehicle speed signal as the EBCM sees it.

Diagnostic Information and Procedures

Diagnostic Trouble Code (DTC) List

Diagnostic Trouble Code Check

The electronic brake control module (EBCM) turns on the antilock brake system (ABS) warning lamp when it detects a rear wheel antilock (RWAL) malfunction. In most cases, the EBCM also stores a diagnostic trouble code.The EBCM stores one code at a time, even though it may detect more than one fault condition. The first condition detected results in a stored code.

Depending on the nature of the system malfunction, the vehicle's diagnostic trouble code list may or may not require a diagnostic trouble code check.

Retrieving DTCs

You can retrieve the DTCs stored in the EBCM memory by the following two methods:

- **Important:** Soft fault codes 6, 9, or 10 can only be displayed with the scan tool.

  Use the scan tool connected to the Data Link Connector (DLC) to read the stored codes.

- **Important:** The ignition and the ABS lamp must be ON prior to connecting DLC terminals 12 and 5 together or a DTC 9 will set. After 20 seconds, the ABS lamp will begin flashing. Count the number of short flashes starting from the long flash. Include the long flash as a count. Sometimes the first count sequence will be short. Subsequent counts will be accurate, however.

  Manually connect together DLC terminals 12 and 5 and observe the sequence of the ABS lamp flashes. The ABS lamp will flash in accordance to the DTC stored in the EBCM memory.

Hard Codes and Soft Codes

Hard codes indicate an existing problem in the RWAL brake system. Soft codes indicate a problem that occurred in the past , or a History Code.

Once a DTC is stored in the EBCM memory, it will remain in the memory until the code is cleared.

Hard Codes

When a hard code is set, the following occurs:

- The ABS system is disabled.
- The DTC is stored in the EBCM memory.
- The ABS lamp remains illuminated until the vehicle is serviced.

Soft Codes

There are 2 types of soft codes: Ignition Latched and Condition Latched.

When an Ignition Latched code is set, the following occurs:

- The ABS system is disabled.
- The DTC is stored in the EBCM memory.
- The ABS lamp remains illuminated for the current ignition cycle.

When a Condition Latched code is set, the following occurs:

- The ABS system is disabled.
- The DTC is stored in the EBCM memory.
- The ABS lamp remains illuminated as long as the fault is present.

The following is a list of the types of codes as they appear on the DTC List:

- H = Hard Code
- IS = Ignition Latched soft code
- CS = Condition latched soft code

Clearing the DTCs

In order to clear a DTC from the EBCM memory, perform the following operation:

1. Turn the ignition switch OFF.
2. Remove the ECM F Pump fuse 9.
3. Wait for 30 seconds.
4. Reinstall the fuse.
5. Perform the Diagnostic System Check.

DTC	Diagnostic Procedures	DTC Types	Modules
2	DTC 2	IS	EBCM
3	DTC 3	IS	EBCM
4	DTC 4	IS	EBCM
5	DTC 5	H	EBCM
6	DTC 6	IS	EBCM/VSS/VSS Calibrator
7	DTC 7	IS	EBCM
8	DTC 8	IS	EBCM
9	DTC 9	IS	EBCM/VSS/VSS Calibrator
10	DTC 10	CS	EBCM
13	DTC 13–15	H	EBCM
14	DTC 13–15	H	EBCM
15	DTC 13–15	H	EBCM

Diagnostic Information and Procedures

DTC 2

Circuit Description

A DTC 2 relates to an open in the antilock pressure valve (APV) isolation valve circuit.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The EBCM did not detect the proper signal on the isolation valve circuit.

Action Taken When the DTC Sets

- The EBCM illuminates the ABS lamp when the diagnostic trouble code has been set.

- The ABS is disabled.
- The DTC is stored in memory.

Conditions for Clearing the DTC

Remove the ECM F pump fuse 9 and wait 30 seconds. Reinstall the fuse and verify that the DTC has been cleared.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the PCM. Look for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
- When diagnosing for an intermittent, short, or open condition, massage the wiring harness while watching the test equipment for a change.
- A DTC 2 will set if the 4–way connector is disconnected and the ignition switch is turned on, or the 6–way connector is plugged in before the 4–way connector with the ignition switch on.
- Do not pierce the electrical connectors, wires, seals, or insulation during testing. Doing so will break the seal and lead to corrosion and failure of the wiring and terminals.

Step	Action	Values	Yes	No
Schematic Reference: ABS Schematics				
1	Were you sent here from the Diagnostic System Check?	—	Go to **Step 2**	Go to **"Diagnostic System Check - ABS"**
2	1. Turn the ignition switch to the OFF position. 2. Disconnect the EBCM 4-way electrical connector. 3. Measure the resistance of the APV 4-way harness connector terminal A to terminal D. Is the resistance value more than the specified value?	3.0 6.0 O	Go to **Step 3**	Go to **Step 6**
3	Check for a poor connection at the EBCM 4-way connector terminal A and terminal D. Are the terminals in good condition?	—	Go to **Step 4**	Go to **Step 5**
4	Replace the antilock pressure valve. Refer to Antilock Pressure Valve Replacement. Is the replacement complete?	—	Go to **"Diagnostic System Check - ABS"**	—
5	1. Repair the 4-way EBCM electrical connectors as needed. Refer to **"Wiring Repairs"** in Wiring Systems. 2. Measure the resistance of the anti-pressure valve (APV) 4-way harness connector terminal A to terminal D. Is the resistance more than the specified value?	6.0 O	Go to **Step 4**	Go to **"Diagnostic System Check - ABS"**
6	1. Reconnect the EBCM 4-way electrical connector. 2. Clear the DTCs. 3. Turn the ignition switch to the ON position. 4. Note the ABS lamp on the instrument panel. Did the ABS lamp turn ON and stay ON?	?	Go to **Step 7**	Go to **Step 3**

Step	Action	Values	Yes	No
7	1. Turn the ignition switch to the OFF position. 2. Install a scan tool. 3. Check for stored DTCs. Is DTC 7 stored in memory?	—	Go to DTC 7	Go to **Step 8**
8	Is DTC 2 still stored in memory?	—	Go to **Step 9**	Go to **Step 10**
9	1. Turn the ignition switch to the OFF position. 2. Replace the EBCM. Refer to **"Electronic Brake Control Module (EBCM) Replacement"**. Is the replacement complete?	—	Go to **"Diagnostic System Check - ABS"**	—
10	The cause for the DTC 2 was a poor connection at the EBCM 4-way electrical connector. Is the EBCM 4-way electrical connector seated fully?	—	Go to **"Diagnostic System Check - ABS"**	—

Diagnostic Information and Procedures

DTC 3

Circuit Description

A DTC 3 relates to an open in the Antilock Pressure Valve (APV) dump valve circuit. The EBCM uses the dump valve to reduce fluid pressure in the brake lines when it senses the wheel is locking up. The fluid pressure is routed to an accumulator. An open solenoid prevents the EBCM from reducing the pressure and the wheel will continue to lock up.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The EBCM did not detect the proper signal on the dump valve circuit.

Action Taken When the DTC Sets

- The EBCM illuminates the ABS lamp when the diagnostic trouble code has been set.
- The ABS is disabled.
- The DTC is stored in memory.

Conditions for Clearing the DTC

Remove the ECM F pump fuse 9 and wait 30 seconds. Reinstall the fuse and verify that the DTC has been cleared.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the PCM. Look for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
- When diagnosing for an intermittent, short, or open condition, massage the wiring harness while watching the test equipment for a change.
- Do not pierce the electrical connectors, wires, seals, or insulation during testing. Doing so will break the seal and lead to corrosion and failure of the wiring and terminals.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step checks for continuity through the solenoid windings.

5. This step checks the resistance of the solenoid after the terminal repair to see if the repair corrected the open condition.

6. This step checks for a consistent DTC being set after clearing the DTC.

10. This step checks for corrosion or poor contact in the solenoid electrical terminals.

DTC 3 Step	Action	Values	Yes	No
Schematic Reference: ABS Schematics				
1	Were you sent here from the Diagnostic System Check?	—	Go to **Step 2**	Go to **"Diagnostic System Check - ABS"**
2	1. Turn the ignition switch to the OFF position. 2. Disconnect the EBCM 4-way electrical connector. 3. Measure the resistance of the antilock pressure valve (APV) 4-way harness connector terminal B to terminal D. Is the resistance value more than the specified value?	1.0? 3.0 O	Go to **Step 3**	Go to **Step 6**
3	Check for a poor connection at the EBCM 4-way connector terminal B and terminal D. Are the terminals in good condition?	?	Go to **Step 4**	Go to **Step 5**
4	Replace the antilock pressure valve. Refer to Antilock Pressure Valve Replacement. Is the replacement complete?	—	Go to **"Diagnostic System Check - ABS"**	—
5	1. Repair the EBCM 4-way electrical connectors as needed. Refer to Wiring Repairs **"Wiring Repairs"** in Wiring Systems. 2. Measure the resistance of the APV 4-way harness connector terminal B to terminal D. Is the resistance more than the specified value?	1.0? 3.0 O	Go to **Step 4**	Go to **"Diagnostic System Check - ABS"**
6	1. Reconnect the EBCM 4-way electrical connector. 2. Clear the DTCs. 3. Turn the ignition switch to the ON position. 4. Note the ABS lamp on the instrument panel. Did the ABS lamp turn ON and stay ON?	?	Go to **Step 7**	Go to **Step 3**
7	1. Turn the ignition switch to the OFF position. 2. Install a scan tool. 3. Check for stored DTCs. Is DTC 7 stored in memory?	—	Go to **Step 9**	Go to **Step 8**
8	Is DTC 3 still stored in memory?	—	Go to **Step 9**	Go to **Step 10**
9	1. Turn the ignition switch to the OFF position. 2. Replace the EBCM. Refer to **"Electronic Brake Control Module**	—	Go to **"Diagnostic System Check - ABS"**	—

DTC 3 Step	Action	Values	Yes	No
	(EBCM) Replacement ". Is the replacement complete?			
10	The cause for DTC 3 was a poor connection at the EBCM 4-way electrical connector. Is the EBCM 4-way electrical connector fully seated?	—	Go to **"Diagnostic System Check - ABS"**	—

Diagnostic Information and Procedures

DTC 4

Circuit Description

A DTC 4 relates to a grounded condition in the antilock pressure valve (APV) reset switch.The reset switch grounds pin C of the engine brake control module (EBCM) 4-way connector when there is a great enough difference in the inlet and outlet pressure in the antilock pressure valve (APV). An example of this is during a pressure decrease operation. With a grounded reset switch, the EBCM has no way of determining if pressure changes are occurring in the APV. The reset switch is constantly signalling when the pressure decrease has occurred.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The EBCM did not detect the proper valve reset switching.

Action Taken When the DTC Sets

- The EBCM illuminates the ABS lamp when the diagnostic trouble code has been set.
- The ABS is disabled.
- The DTC is stored in memory.

Conditions for Clearing the DTC

Remove the ECM F pump fuse 9 and wait 30 seconds. Reinstall the fuse and verify that the DTC has been cleared.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the PCM. Look for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
- When diagnosing for an intermittent, short, or open condition, massage the wiring harness while watching the test equipment for a change.
- Do not pierce the electrical connectors, wires, seals, or insulation during testing. Doing so will break the seal and lead to corrosion and failure of the wiring and terminals.

Test Description

The number below refers to the step number on the diagnostic table.

2. This step checks the voltage signal to the reset switch to see if the EBCM is operational.

DTC 4 Step	Action	Values	Yes	No
Schematic Reference: ABS Schematics				
1	Were you sent here from the Diagnostic System Check?	—	Go to **Step 2**	Go to **"Diagnostic System Check - ABS"**
2	1. Clear the DTCs. 2. Turn the ignition switch to the OFF position. 3. Disconnect the EBCM 4-way electrical connector. 4. Using the J 35616-A Connector Test Adapter Kit, connect terminals C and D of the EBCM to terminals C and D of the 4 way electrical	4.0-5.5 V	Go to **Step 3**	Go to **Step 4**

DTC 4 Step	Action	Values	Yes	No
	connector. 5. Connect DMM to terminal C and D at the 4-way electrical connector. 6. Turn the ignition switch to the RUN position. 7. Turn the ignition switch to the OFF position. Did the digital voltmeter (DMM) display at or above the specified value?			
3	Replace the antilock pressure valve. Refer to **"Brake Pressure Modulator Valve (BPMV) Replacement"** . Is the replacement complete?	—	Go to **Step 5**	—
4	Replace the EBCM. Refer to **"Electronic Brake Control Module (EBCM) Replacement"** . Is the replacement complete?	—	Go to **"Diagnostic System Check - ABS"**	—
5	Clear the DTCs. Are the DTCs cleared from memory?	—	Go to **"Diagnostic System Check - ABS"**	—

Diagnostic Information and Procedures

DTC 5

Circuit Description

A DTC 5 relates to a condition in which the electronic brake control module (EBCM) is cycling the dump valve too many times during an antilock stop. A mechanical locking condition in the rear brakes or powertrain can cause this DTC to set.

Conditions for Running the DTC

- The engine is running.
- Vehicle speed is indicated.

Conditions for Setting the DTC

The EBCM cycled the dump valve on and off over 16 times during an ABS actuation.

Action Taken When the DTC Sets

- The EBCM illuminates the ABS lamp when the diagnostic trouble code has been set.
- The ABS is disabled.
- The DTC is stored in memory.

Conditions for Clearing the DTC

Remove the ECM F pump fuse 9 and wait 30 seconds. Reinstall the fuse and verify that the DTC has been cleared.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the PCM. Look for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
- When diagnosing for an intermittent, short, or open condition, massage the wiring harness while watching the test equipment for a change.
- Do not pierce the electrical connectors, wires, seals, or insulation during testing. Doing so will break the seal and lead to corrosion and failure of the wiring and terminals.

Test Description

The number below refers to the step number on the diagnostic table.

2. This step checks if the rear brakes or powertrain are causing the problem.

DTC 5 Step	Action	Yes	No
1	Were you sent here from the Diagnostic System	Go to **Step 2**	Go to **"Diagnostic**

DTC 5 Step	Action	Yes	No
	Check?		**System Check - ABS"**
2	1. Turn the ignition switch to the OFF position. 2. Check for a mechanical locking condition in the rear brakes and/or the powertrain. Was a locking condition located?	Go to **Step 3**	Go to **Step 4**
3	Repair the locking condition as needed. Is the repair complete?	Go to **Step 5**	—
4	Replace the antilock pressure valve. Refer to **"Brake Pressure Modulator Valve (BPMV) Replacement"** . Is the replacement complete?	Go to **Step 5**	—
5	Clear the DTCs. Are the DTCs cleared from memory?	Go to **"Diagnostic System Check - ABS"**	—

Diagnostic Information and Procedures

DTC 6

Circuit Description

A DTC 6 is a soft fault. If the speed signal line to the EBCM drops out and returns often, this DTC is set in memory. The ABS lamp will illuminate when the DTC is set and turn off with the next igniton cycle. An erratic speed signal relates to a malfunction in either the vehicle speed sensor (VSS), the VSS calibrator module, or the speed signal circuit. This DTC can be set by a poor connection in the speed signal line.

Conditions for Running the DTC

The engine is running.

Conditions for Setting the DTC

The EBCM detects an erratic vehicle speed signal.

Action Taken When the DTC Sets

- The EBCM illuminates the ABS lamp when the diagnostic trouble code has been set. If the fault is not present on the next ignition cycle, the ABS lamp will not be illuminated, but the DTC will be in memory.
- The ABS is disabled.
- The DTC is stored in memory.

Conditions for Clearing the DTC

Remove the ECM F pump fuse 9 and wait 30 seconds. Reinstall the fuse and verify that the DTC has been cleared.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the PCM. Look for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
- Do not replace the EBCM to repair this DTC.
- If voltage readings are low or varying, the battery, charging system, or intermittent conditions could be the cause. Check these areas before replacing any components.
- This DTC is a soft fault and can be set while driving on ice.
- When diagnosing for an intermittent, short, or open condition, massage the wiring harness while watching the test equipment for a change.
- Do not pierce the electrical connectors, wires, seals, or insulation during testing. Doing so will break the seal and lead to corrosion and failure of the wiring and terminals.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step checks whether all systems are receiving an erratic speed signal or if the erratic signal is only affecting the rear wheel antilock system (RWAL).

8. This step checks for an open in the VSS signal high circuit.

DTC 6 Step	Action	Values	Yes	No

DTC 6 Step	Action	Values	Yes	No
Schematic Reference: ABS Schematics				
1	Were you sent here from the Diagnostic System Check?	—	Go to **Step 2**	Go to **"Diagnostic System Check - ABS"**
2	Road test the vehicle and note the operation of the speedometer. Was the speedometer erratic or did the speedometer drop out at low speeds or not work at all?	—	Go to **Step 4**	Go to **Step 3**
3	Was the rear wheel antilock system (RWAL) system activating at low speeds and light brake pedal force on dry pavement?	—	Go to **Step 4**	Go to **Step 5**
4	1. Turn the ignition switch to the OFF position. 2. Disconnect the vehicle speed sensor (VSS) 2-way electrical connector. 3. Measure the resistance of the VSS. Is the resistance at or between the specified value?	900 2000 O	Go to **Step 6**	Go to **Step 5**
5	Replace the vehicle speed sensor. Refer to **"Vehicle Speed Sensor (VSS)"** in Manual Transmission. Is the replacement complete?	?	Go to **Step 15**	?
6	1. Disconnect the VSS calibrator electrical connector. 2. Measure the resistance of CKT 821 from terminal B of the VSS harness connector to terminal 7 of the VSS calibrator harness connector. Is the resistance value more than the specified value?	10 O	Go to **Step 7**	Go to **Step 8**
7	Repair the open circuit or high resistance condition in CKT 821. Refer to **"Wiring Repairs"** in Wiring Systems. Is the open circuit or high resistance repair complete?	—	Go to **Step 15**	—
8	Measure the resistance of CKT 822 from terminal B of the VSS connector to terminal 7 of the VSS calibrator harness connector. Is the resistance value more than the specified value?	10 O	Go to **Step 9**	Go to **Step 10**
9	Repair the open circuit or high resistance condition in CKT 822. Refer to **"Wiring Repairs"** in Wiring Systems. Is the open circuit or high resistance repair complete?	?	Go to **Step 15**	?
10	1. Reconnect the VSS electrical connector and the VSS calibrator electrical connector. 2. Turn the ignition switch to the ON	8.0–15.0 V	Go to **Step 12**	Go to **Step 11**

DTC 6 Step	Action	Values	Yes	No
	position. 3. Measure the voltage from data link connector (DLC) terminal 12 to DLC terminal 5. 4. Turn the ignition switch to the OFF position. Did the DMM display the specified value?			
11	Check open circuit or high resistance condition in CKT 1827. Refer to **"Wiring Repairs"** in Wiring Systems. Was a problem found?	—	Go to **Step 15**	Go to **Step 16**
12	1. Disconnect the EBCM 6-way electrical connector. 2. Turn the ignition switch to the ON position. 3. Measure the voltage from EBCM 6-way harness connector terminal D to EBCM 6-way harness terminal A. 4. Turn the ignition switch to the OFF position. Did the DMM	8.0–15.0 V	Go to **Step 13**	Go to **Step 14**
13	Check for an intermittent connection in CKT 1827 and repair as needed. Refer to **"Wiring Repairs"** in Wiring Systems. Is the intermittent connection repair complete?	—	Go to **Step 15**	—
14	Repair the open circuit or high resistance condition in CKT 1827 between the DLC connector and the EBCM connector. Refer to **"Wiring Repairs"** in Wiring Systems. Is the open circuit or high resistance repair complete?	—	Go to **Step 15**	—
15	Clear the DTCs from memory. Are the DTCs cleared from memory?	—	Go to **"Diagnostic System Check - ABS"**	—
16	Replace the VSS calibrator module. Is action complete?	—	System OK	—

Diagnostic Information and Procedures

DTC 7

Circuit Description

A DTC 7 is set if the electronic brake control module (EBCM) detects a short in the isolation valve solenoid or circuit. With the isolation valve shorted, the EBCM cannot provide any of the pressure control functions. The short can be located in the antilock pressure valve (APV), EBCM, or in the circuits between them.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The EBCM does not detect proper isolation valve solenoid response.

Action Taken When the DTC Sets

- The EBCM illuminates the ABS lamp when the diagnostic trouble code has been set.
- The ABS is disabled.
- The DTC is stored in memory.

Conditions for Clearing the DTC

Remove the ECM F pump fuse 9 and wait 30 seconds. Reinstall the fuse and verify that the DTC has been cleared.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the PCM. Look for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
- When diagnosing for an intermittent, short, or open condition, massage the wiring harness while watching the test equipment for a change.
- Do not pierce the electrical connectors, wires, seals, or insulation during testing. Doing so will break the seal and lead to corrosion and failure of the wiring and terminals.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step checks the electronic brake control module's (EBCM) internal circuitry for the isolation valve solenoid.

4. This step checks the resistance of the isolation valve solenoid windings.

7. This step checks for a short to ground in the antilock pressure valve (APV).

DTC 7 Step	Action	Values	Yes	No
Schematic Reference: ABS Schematics				
1	Were you sent here from the Diagnostic System Check?	—	Go to **Step 2**	Go to **"Diagnostic System Check - ABS"**
2	1. Turn the ignition switch to the OFF position. 2. Disconnect the EBCM 4-way electrical connector. 3. Using the J 35616-A Connector Test Adapter Kit, connect DMM to terminals A and D of the EBCM 4-way connector. 4. Turn the ignition switch to the RUN position. 5. Monitor the voltage on the DMM. 6. Turn the ignition switch to the OFF position. Did the DMM display the specified value?	Below 2 Volts for 1 second, then above 11 Volts	Go to **Step 4**	Go to **Step 3**
3	Replace the EBCM. Refer to **"Electronic Brake Control Module (EBCM) Replacement"** . Is the replacement complete?	—	Go to **"Diagnostic System Check - ABS"**	—
4	Measure the resistance of the antilock pressure valve (APV) harness connector terminal D to terminal A. Is the resistance between the specified values?	3.0 6.0 O	Go to **Step 6**	Go to **Step 5**
5	Replace the antilock	?	Go to **Step 8**	—

DTC 7 Step	Action	Values	Yes	No
	pressure valve (APV). Refer to **"Brake Pressure Modulator Valve (BPMV) Replacement"** . Is the replacement complete?			
6	Check the connection at EBCM 4-way connector terminal D and terminal A at the harness and at the EBCM. Are the connections in good condition?	—	Go to **Step 5**	Go to **Step 7**
7	1. Repair the connections as needed Refer to **"Wiring Repairs"** in Wiring Systems. 2. Measure the resistance of the EBCM 4-way harness connector terminal A to the APV valve body. Does the J 39200 digital multimeter (DMM) display OL (infinite)?	? br>	Go to **Step 8**	Go to **Step 5**
8	Clear the DTCs from memory. Are the DTCs cleared from memory?	?	Go to **"Diagnostic System Check - ABS"**	?

Diagnostic Information and Procedures

DTC 8

Circuit Description

A DTC 8 is set if the electronic brake control module (EBCM) detects a short in the dump valve solenoid or circuit. With the dump valve shorted, the EBCM cannot allow a pressure decrease or relieve the brake fluid in the accumulator. This DTC can be caused by a short in the antilock pressure valve (APV), electronic brake control module (EBCM), or the circuits between them.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The EBCM does not detect proper dump valve solenoid response.

Action Taken When the DTC Sets

- The EBCM illuminates the ABS lamp when the diagnostic trouble code has been set.
- The ABS is disabled.
- The DTC is stored in memory.

Conditions for Clearing the DTC

Remove the ECM F pump fuse 9 and wait 30 seconds. Reinstall the fuse and verify that the DTC has been cleared.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the PCM. Look for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
- When diagnosing for an intermittent, short, or open condition, massage the wiring harness while watching the test equipment for a change.
- Do not pierce the electrical connectors, wires, seals, or insulation during testing. Doing so will break the seal and lead to corrosion and failure of the wiring and terminals.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step checks the resistance of the dump valve solenoid windings.

8. This step checks for a short to ground in the APV.

DTC 8 Step	Action	Values	Yes	No

DTC 8 Step	Action	Values	Yes	No
Schematic Reference: ABS Schematics				
1	Were you sent here from the Diagnostic System Check?	—	Go to **Step 2**	Go to **"Diagnostic System Check - ABS"**
2	1. Turn the ignition switch to the OFF position. 2. Disconnect the EBCM 4-way electrical connector. 3. Measure the resistance from the EBCM 4-way harness connector terminal B to terminal D. Is the resistance at the specified value?	1.0? 3.0 O	Go to **Step 3**	Go to **Step 6**
3	Measure the resistance of the EBCM 4-way harness connector terminal B to the APV valve body. Does the J 39200 digital multimeter (DMM) display OL (infinite)?	? br>	Go to **Step 4**	Go to **Step 5**
4	Replace the EBCM. Refer to **"Electronic Brake Control Module (EBCM) Replacement"** . Is the replacement complete?	—	Go to **"Diagnostic System Check - ABS"**	—
5	Replace the antilock pressure valve (APV). Refer to **"Brake Pressure Modulator Valve (BPMV) Replacement"** . Is the replacement complete?	—	Go to **Step 9**	—
6	Check the connection at EBCM 4-way connector terminal B and terminal D at the harness and at the EBCM. Are the connections in good condition?	—	Go to **Step 8**	Go to **Step 7**
7	1. Repair the connections as needed Refer to **"Wiring Repairs"** in Wiring Systems. 2. Measure the resistance of the EBCM 4-way harness connector terminal B to terminal D. Is the resistance at the specified value?	1.0 3.0 O	Go to **Step 9**	Go to **Step 5**
8	Measure the resistance from EBCM 4-way harness connector terminal B to the APV valve. Does the J 39200 DMM display the specified value?	? br>	Go to **Step 9**	Go to **Step 5**
9	Clear the DTCs from memory. Are the DTCs cleared from memory?	?	Go to **"Diagnostic System Check - ABS"**	—

Diagnostic Information and Procedures

DTC 9

Circuit Description

A DTC 9 is a soft fault. If the speed signal line to the electronic brake control module (EBCM) drops out and returns often, this DTC is set in memory. The ABS lamp will turn on when the DTC is set and turn off with the next igniton cycle. Do not replace the EBCM to repair this DTC. An open or grounded speed signal relates to a malfunction in the vehicle speed signal (VSS) calibrator module or the speed signal circuit. This DTC can be set by a poor connection in the speed signal circuit.

Conditions for Running the DTC

- The engine is running.
- Engine speed is indicated.

Conditions for Setting the DTC

The EBCM detects an open or short in the vehicle speed circuit.

Action Taken When the DTC Sets

- The EBCM illuminates the ABS lamp when the diagnostic trouble code has been set. If the fault is not present on the next ignition cycle, the ABS lamp will not be illuminated, but the DTC will be in memory.
- The ABS is disabled.
- The DTC is stored in memory.

Conditions for Clearing the DTC

Remove the ECM F pump fuse 9 and wait 30 seconds. Reinstall the fuse and verify that the DTC has been cleared.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the PCM. Look for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
- Do not replace the EBCM to repair this DTC.
- If voltage readings are low or varying, the battery, charging system, or intermittent conditions could be the cause. Check these areas before replacing any components.
- This DTC is a soft fault and can be set while driving on ice.
- When diagnosing for an intermittent, short, or open condition, massage the wiring harness while watching the test equipment for a change.
- Do not pierce the electrical connectors, wires, seals, or insulation during testing. Doing so will break the seal and lead to corrosion and failure of the wiring and terminals.

Test Description

The number below refers to the step number on the diagnostic table.

2. This step checks the voltage on the vehicle speed output circuit between the VSS calibrator module and the EBCM.

DTC 9 Step	Action	Values	Yes	No
Schematic Reference: ABS Schematics				
1	Were you sent here from the Diagnostic System Check?	—	Go to **Step 2**	Go to **"Diagnostic System Check - ABS"**
2	1. Turn the ignition switch to the ON position. 2. Measure the voltage from the data link connector (DLC) terminal 12 to DLC terminal 5. 3. Turn the ignition switch to the OFF position. Did the DMM display the specified value?	8.0–15.0 V	Go to **Step 4**	Go to **Step 3**
3	Repair the open circuit or high resistance condition in CKT 1827. Refer to **"Wiring Repairs"** in Wiring Systems. Is the open circuit or high resistance repair complete?	—	Go to **Step 7**	—
4	1. Disconnect the EBCM 6-way electrical connector. 2. Turn the ignition switch to the ON position. 3. Measure the voltage from EBCM 6-way harness connector terminal D to EBCM 6-way harness connector terminal A. 4. Turn the	8.0–15.0 V	Go to **Step 5**	Go to **Step 6**

DTC 9 Step	Action	Values	Yes	No
	ignition switch to the OFF position. Did the DMM display the specified value?			
5	Check for an intermittent connection in CKT 1827 and repair as needed. Is the intermittent connection repair complete?	—	Go to **Step 7**	—
6	Repair the open circuit or short to ground in CKT 1827. Refer to **"Wiring Repairs"** in Wiring Systems. Is the open circuit or short to ground repair complete?	—	Go to **Step 7**	—
7	Clear the DTCs from memory. Are the DTCs cleared from memory?	—	Go to **"Diagnostic System Check - ABS"**	—

Diagnostic Information and Procedures

DTC 10

Circuit Description

A DTC 10 relates to the stoplamp switch. The EBCM uses this circuit to prepare for a possible antilock braking condition. The stoplamp switch applies voltage to the EBCM terminal F when the brake pedal is not depressed. Once the vehicle operator depresses the brake pedal, the voltage supply to EBCM terminal F is removed. When the EBCM sees this voltage drop, the EBCM is ready to control the antilock pressure valve if ABS assistance is necessary.

Conditions for Running the DTC

- The engine is running.
- Vehicle speed is indicated.

Conditions for Setting the DTC

This DTC is set when vehicle speed reaches 56 km/h or more and there is no 12 volt signal from the stoplamp switch.

Action Taken When the DTC Sets

- The EBCM illuminates the ABS lamp when the diagnostic trouble code has been set. If the fault is not present on the next ignition cycle, the ABS lamp will not be illuminated, but the DTC will be in memory.
- The ABS is disabled.
- The DTC is stored in memory.

Conditions for Clearing the DTC

Remove the ECM F pump fuse 9 and wait 30 seconds. Reinstall the fuse and verify that the DTC has been cleared.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the PCM. Look for the following conditions:
  - A bent terminal
  - A backed out terminal
  - A damaged terminal
  - Poor terminal tension
  - A chafed wire
  - A broken wire inside the insulation
  - Moisture intrusion
- Do not replace the EBCM or APV to repair this DTC. An EBCM or APV malfunction will not cause this DTC to set.
- If voltage readings are low or varying, the battery, charging system, or intermittent conditions cuold be the cause. Check these areas before replacing any components.
- This DTC is a soft fault that turns on the ABS lamp until 12 volts is received from the stoplamp switch.
- When diagnosing for an intermittent, a short, or an open condition, massage the wiring harness while watching the test equipment for a change.
- Do not pierce the electrical connectors, wires, seals, or insulation during testing. Doing so will break the seal and lead to corrosion and failure of the wiring and terminals.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2. This step checks if voltage is available at the stoplamp switch.

4. This step checks if voltage is getting through the stoplamp switch with the brake pedal released.

6. This step checks if voltage is reaching terminal F of the EBCM, and if the ground circuit at terminal A of the EBCM is proper.

10. This step checks the operation of the stoplamp switch under actual driving conditions. This helps determine if the DTC is intermittent.

DTC 10 Step	Action	Values	Yes	No
Schematic Reference: ABS Schematics				
1	Were you sent here from the Diagnostic System Check?	—	Go to **Step 2**	Go to **"Diagnostic System Check - ABS"**
2	1. Turn the ignition switch to the ON position. 2. Measure the voltage at stoplamp switch terminal D without removing the stoplamp switch electrical connector. 3. Turn the ignition switch to the OFF position. Did the DMM display the specified value?	8.0–16.0 V	Go to **Step 4**	Go to **Step 3**
3	Repair the open circuit or short circuit condition in power feed circuit. Refer to **"Wiring Repairs"** in Wiring Systems. Is the open circuit or short circuit repair complete?	—	Go to **Step 13**	—
4	1. Turn the ignition switch to the ON position. 2. Measure the voltage at stoplamp switch terminal C without removing the stoplamp switch electrical connector. 3. Turn the ignition switch to the OFF position. Did the DMM display the specified value?	8.0–16.0 V	Go to **Step 6**	Go to **Step 5**
5	Replace the stoplamp switch. Refer to **"Stop Lamp Switch Replacement"** in Hydraulic Brakes. Is the replacement complete?	—	Go to **Step 13**	—
6	1. Disconnect the EBCM 6-way electrical connector. 2. Turn the ignition switch to the ON position. 3. Measure the voltage from the EBCM 6-way electrical connector terminal F to terminal A. 4. Turn the ignition switch to the OFF position. Did the DMM display the specified value?	9.0–16.0 V	Go to **Step 8**	Go to **Step 7**
7	Repair the open circuit or short circuit condition in CKT 420. Refer to **"Wiring Repairs"** in Wiring Systems. Is the open circuit or short circuit repair complete?	—	Go to **Step 13**	—
8	Check the terminal connections at the stoplamp switch Were the connections in good condition?	—	Go to **Step 10**	Go to **Step 9**
9	Repair the connections as needed. Refer to	—	Go to **Step 13**	—

DTC 10 Step	Action	Values	Yes	No
	"Wiring Repairs" in Wiring Systems. Is the connection repair complete?			
10	1. Perform the RWAL System Diagnostic Check using a scan tool. 2. Drive the vehicle above 72 km/h. 3. Turn the ignition switch to the OFF position. Have all of these steps been performed?	—	Go to **Step 12**	Go to **Step 11**
11	1. An intermittent condition exists in the stoplamp switch circuit. 2. Verify the stoplamp switch connections. 3. Drive the vehicle above 72 km/h. 4. Stop the vehicle. 5. Turn the ignition switch to the OFF position. Have all of these steps been performed?	—	Go to **Step 13**	—
12	Check if any DTCs are stored using a scan tool. Is any DTC other than DTC 10 stored in memory?	—	Go to the appropriate DTC table	Go to **Step 13**
13	Clear the DTCs from memory. Are the DTCs cleared from memory?	—	Go to **"Diagnostic System Check - ABS"**	—

Diagnostic Information and Procedures

DTC 13-15

Circuit Description

DTC 13, 14, and 15 will set if there is an internal fault with the electronic brake control module (EBCM). If the scan tool displays any of these DTCs, replace the EBCM. There is no test to perform, because these DTCs are internal to the EBCM.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

Any of these DTCs will set if there is an internal malfunction with the EBCM.

Action Taken When the DTC Sets

- The EBCM illuminates the antilock brake system (ABS) lamp when the diagnostic trouble code sets.
- The ABS is disabled.
- The DTC is stored in memory.

Conditions for Clearing the MIL/DTC

Remove the engine control module (ECM) fuse 9 and wait 30 seconds. Reinstall the fuse and verify that the DTC has been cleared.

Diagnostic Aids

Do not pierce the electrical connectors, wires, seals, or insulation during testing. Doing so will break the seal and lead to corrosion and failure of the wiring and terminals.

Test Description

The number below refers to the step number on the diagnostic table.

2. This step checks to verify that a DTC is stored in memory.

Step	Action	Yes	No
Schematic Reference "ABS Schematics"			
1	Were you sent here from the Diagnostic System Check?	Go to **Step 2**	Go to **"Diagnostic System Check - ABS"**
2	1. Verify that DTC 13, 14, or 15 is stored in memory using a scan tool. 2. Turn the ignition	Go to **Step 3**	Go to **"Diagnostic System Check - ABS"**

Step	Action	Yes	No
	switch to the OFF position. Is DTC 13, 14, or 15 stored in memory?		
3	Replace the EBCM. Refer to **"Electronic Brake Control Module (EBCM) Replacement"** . Is the replacement complete?	Go to **"Diagnostic System Check - ABS"**	—

Diagnostic Information and Procedures

Symptoms - Antilock Brake System

Important: The following steps must be completed before using the symptom tables:

1. Perform the ABS Diagnostic System Check before using the symptom tables in order to verify that all of the following are true:
   - There are no DTCs set.
   - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to **"ABS Description and Operation"** .

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the ABS. Refer to **"Checking Aftermarket Accessories"** in Wiring Systems.
- Inspect the easily accessible or visible system components for obvious damage or conditions that could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer **"Testing for Intermittent and Poor Connections"** in Wiring Systems.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- **"ABS Indicator Always On"**
- **"ABS Indicator Intermittent Illumination"**
- **"ABS Indicator Flashing"**
- **"ABS Indicator Inoperative"**

Diagnostic Information and Procedures

ABS Indicator Always On

Circuit Description

The instrument panel cluster (IPC) illuminates the ABS indicator by supplying ground to the lamp. The electronic brake control module (EBCM) sends A serial data messages to the IPC in order to command the indicator ON or OFF.

Diagnostic Aids

The malfunction must be present during diagnosis in order to prevent unnecessary parts replacement. Always begin diagnosis with **"Diagnostic System Check - ABS"** .

Test Description

The number below refers to the step number on the diagnostic table:

3. This step tests if the IPC is able to turn OFF the ABS indicator.

Step	Action	Yes	No
1	Were you sent here from the ABS Diagnostic System Check?	**Go to Step 2**	Go to **"Diagnostic System Check - ABS"**
2	1. Turn the ignition switch to the ON position. 2. Note the ABS indicator lamp on the insturment cluster. Did the ABS indicator lamp turn OFF after 2 seconds?	Go to **"Diagnostic System Check - ABS"**	**Go to Step 3**
3	1. Turn the ignition switch to the OFF position. 2. Install the scan tool. 3. Turn the ignition ON. Did the scan tool indicate any electronic brake control module (EBCM) DTCs set?	Go to the appropriate DTC table	**Go to Step 4**
4	1. Turn the ignition switch to the OFF position. 2. Disconnect the EBCM 6-way electrical connector.	**Go to Step 6**	**Go to Step 5**

Step	Action	Yes	No
	3. Turn the ignition switch to the ON position. Is the ABS indicator lamp OFF?		
5	Repair the short to ground in the ABS indicator lamp driver circuit between the EBCM and the ABS indicator lamp. Refer to **"Wiring Repairs"** in Wiring Systems. Is the action complete?	System OK	—
6	Check for short to ground in fuse F18 circuit to EBCM, and replace fuse if open. Refer to **"Wiring Repairs"** in Wiring Systems. Was a problem found?	System OK	**Go to Step 7**
7	Replace the EBCM. Refer to **"Electronic Brake Control Module (EBCM) Replacement"** . Is the action complete?	Go to **"Diagnostic System Check - ABS"**	—

Diagnostic Information and Procedures

ABS Indicator Inoperative

Step	Action	Yes	No
1	Were you sent here from the Diagnostic System Check?	Go to **Step 2**	Go to **"Diagnostic System Check - ABS"**
2	1. Turn the ignition switch to the ON position. 2. Note the antilock brake system (ABS) indicator lamp on the instrument cluster. Does the ABS lamp turn ON and then OFF after 2 seconds?	Go to **"Diagnostic System Check - ABS"**	Go to **Step 3**
3	1. Turn the ignition switch to the OFF position. 2. Disconnect the electronic brake control module (EBCM) 6-way electrical connector.	Go to **Step 6**	Go to **Step 5**
4	Repair the open circuit in the ABS lamp bulb or the ABS lamp circuit. Refer to **"Wiring Repairs"** in Wiring Systems. Is the action complete?	Go to **"Diagnostic System Check - ABS"**	—
5	1. Turn the ignition switch to the OFF position. 2. Connect the EBCM 6-way harness electrical connector terminal E to a known good ground. 3. Turn the ignition switch to the ON position. Did the ABS lamp turn ON?	Go to **Step 7**	Go to **Step 4**
6	Replace the EBCM. Refer to **"Electronic Brake Control Module (EBCM) Replacement"** . Is the action complete?	Go to **"Diagnostic System Check - ABS"**	—
7	Repair the open circuit condition in the EBCM ground. Refer to **"Testing for Intermittent and Poor Connections"** in Wiring Systems. Was a problem found?	Go to **"Diagnostic System Check - ABS"**	—

Diagnostic Information and Procedures

ABS Indicator Flashing

Step	Action	Value	Yes	No
1	Were you sent here from the Diagnostic System Check?	—	Go to **Step 2**	Go to **"Diagnostic System Check - ABS"**
2	1. Turn the ignition switch to the OFF position.	—	Go to the appropriate DTC table	Go to **Step 3**

Step	Action	Value	Yes	No
	2. Install a scan tool. 3. Turn the ignition ON. 4. Check for any stored DTCs. Were any DTCs displayed on the scan tool?			
3	1. Turn the ignition switch to the ON position. 2. Using a DMM J 39200 connected to ground, probe terminal 12 of the data link connector (DLC). Did the DMM indicate the specified value?	8.0–15.0 V	Go to **Step 5**	Go to **Step 4**
4	Repair the short to ground in CKT 1827 between the electronic brake control module (EBCM) and the DLC terminal 12. Is the action complete?	—	Go to **"Diagnostic System Check - ABS"**	—
5	Does the ABS lamp flash what appears to be a DTC 1?	—	Go to **Step 6**	Go to **Step 7**
6	Repair the system power circuit to the EBCM. Is the action complete?	—	Go to **"Diagnostic System Check - ABS"**	—
7	Replace the EBCM. Refer to **"Electronic Brake Control Module (EBCM) Replacement"** . Is the action complete?	—	Go to **"Diagnostic System Check - ABS"**	—

Diagnostic Information and Procedures

ABS Indicator Intermittent Illumination

Step	Action	Yes	No
1	Were you sent here from the Diagnostic System Check?	Go to **Step 2**	Go to **"Diagnostic System Check - ABS"**
2	1. Turn the ignition switch to the OFF position. 2. Note the ABS indicator lamp on the instrument cluster. Does the ABS lamp turn ON and stay ON?	Go to **"ABS Indicator Always On"**	Go to **Step 3**
3	1. Turn the ignition switch to the OFF position. 2. Install a scan tool. 3. Turn the ignition switch to the ON position. 4. Check for any stored DTCs in the electronic brake control module (EBCM). Are any DTCs indicated?	Go to **Step 4**	Go to **Step 6**
4	Is DTC 5, 13, 14, or 15 set?	Go to the appropriate DTC table	Go to **Step 5**
5	1. Refer to the diagnostic table for the stored DTC. 2. Refer to the ABS Indicator Inoperative diagnostic table. The symptom is due to a dual problem with the RWAL system. Is the action complete?	Go to **"Diagnostic System Check - ABS"**	—
6	Check the RWAL system electrical connection for poor terminal contact. Refer to **"Testing for Intermittent and Poor Connections"** in Wiring Systems. Was a problem found?	Verify Repair	Go to **"Diagnostic System Check - ABS"**

Repair Instructions

ABS Automated Bleed Procedure

Bleed Procedure

Caution: Refer to Brake Fluid Irritant Caution in Cautions and Notices.

Tools Required

J 28434 Wheel Cylinder Bleeder Wrench

Important:

- Use this bleed procedure under the following conditions:
  - Installing a new combination pressure valve.
  - Air is trapped in the ABS system.
- Do not drive the vehicle until the brake pedal feels firm.
- Do not reuse brake fluid that is used during bleeding.

1. Install J 39177 on the combination valve.
2. Check the master cylinder reservoir fluid level and fill if needed.
3. Bleed the system at the right rear wheel first.
4. Install a clear hose on the bleed screw.
5. Immerse the opposite end of the hose in a container partially filled with clean DOT 3 brake fluid.
6. Slowly apply the brake pedal one time and hold down the pedal.
7. Open the bleed screw ½ to 1 full turn.
8. Tighten the bleeder screw. Slowly release the brake pedal.
9. Wait 15 seconds.
10. Repeat steps 6 through 9 until the air is purged from the wheel cylinder and caliper.
11. Repeat steps 6 through 9 at each wheel until the system is bled.
12. Turn the ignition on and do three function tests with the scan tool.
13. Bleed the rear brakes again.
14. Evaluate the brake pedal feel.
15. Repeat the bleed procedure, if needed.

Repair Instructions

Electronic Brake Control Module (EBCM) Replacement

Removal Procedure

Important: Thoroughly clean all contaminants from around the ECBM. The area around the EBCM must be free from loose dirt to prevent contamination of disassembled ABS components.

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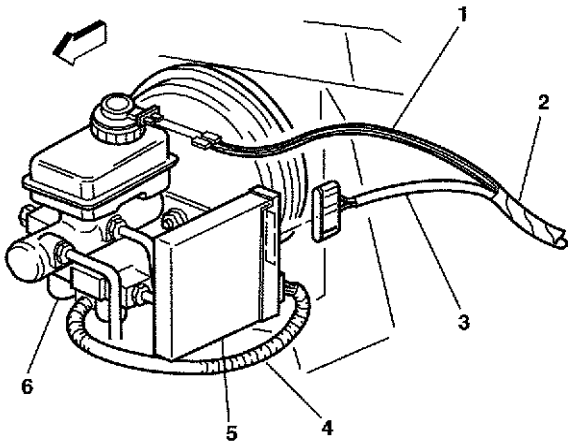

Notice: To prevent equipment damage, never connect or disconnect the wiring harness connection from the EBCM with the ignition switch in the ON position.

Disconnect the electrical connectors from the EBCM (3, 4).

▪ Remove the EBCM (5) by using a small screwdriver inserted between the retainer clip and the EBCM housing. Pry the retainer clip away from the EBCM and pull the EBCM from its mounting bracket towards the front of the vehicle.

Installation Procedure

Important: Do not reuse the old mounting screws. Always install new mounting screws with the new EBCM.

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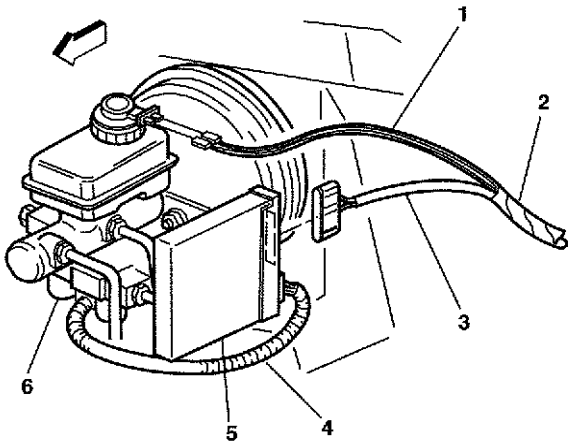


Important: Do not use RTV or any other type of sealant on the EBCM gasket or electrical connector mating surfaces.

Install the EBCM (5) to the mounting bracket.

- **Notice:** To prevent equipment damage, never connect or disconnect the wiring harness connection from the EBCM with the ignition switch in the ON position.

  Install the EBCM electrical connectors (3, 4).

- Perform the Diagnostic System Check. Refer to **"Diagnostic System Check - ABS"** .

Repair Instructions

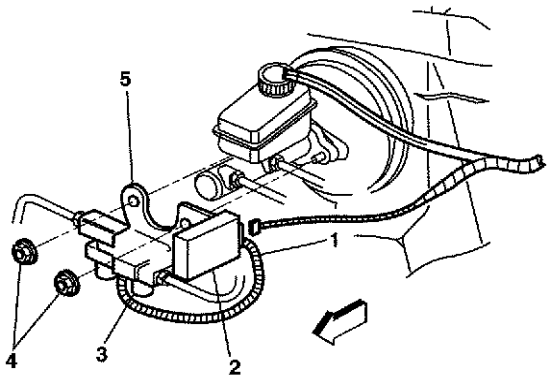
Brake Pressure Modulator Valve (BPMV) Replacement

Removal Procedure

Caution: Refer to ABS Component Handling Caution in Cautions and Notices.

Important: The antilock pressure valve (APV) is not serviceable. Replace the complete assembly when use of the DTC table determines the APV valve is the cause of the malfunction.

-



Turn the ignition switch to the OFF position.

- **Important:** Throroughly clean all contaminants from around the APV. The area around the APV must be free from loose dirt to prevent contamination of disassembled ABS components.

  Disconnect the brake pipes from the antilock pressure valve.

- **Notice:** To prevent equipment damage, never connect or disconnect the wiring harness connection from the EBCM with the ignition switch in the ON position.

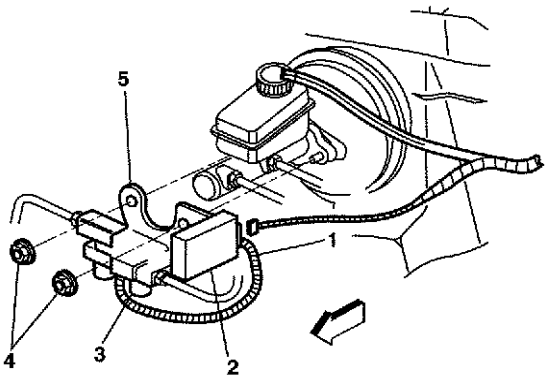
  Remove the 4-way electrical harness connector (1) from the electronic brake control module (EBCM) (2).

- Remove the antilock pressure valve mounting nuts (4).

- Remove the antilock pressure valve assembly from the vehicle.

Installation Procedure

-



Install the antilock pressure valve assembly to the brake booster.

- ***Notice:*** Refer to Fastener Notice in Cautions and Notices.

  Install the antilock pressure valve assembly mounting nuts.

  Tighten: Tighten the antilock pressure valve mounting nuts to 29 Nm (21 lb ft).

- **Notice:** To prevent equipment damage, never connect or disconnect the wiring harness connection from the EBCM with the ignition switch in the ON position.

  Install the 4–way electrical harness connector (1) to the electronic brake control module (2).

- Install the brake pipes to the antilock pressure valve (3).

  Tighten: Tighten the brake pipe fittings to 24 Nm (18 lb ft).

- Bleed the system. Refer to **"ABS Automated Bleed Procedure"** .

- Perform the Diagnostic System Check. Refer to **"Diagnostic Starting Point - Antilock Brake System"** .

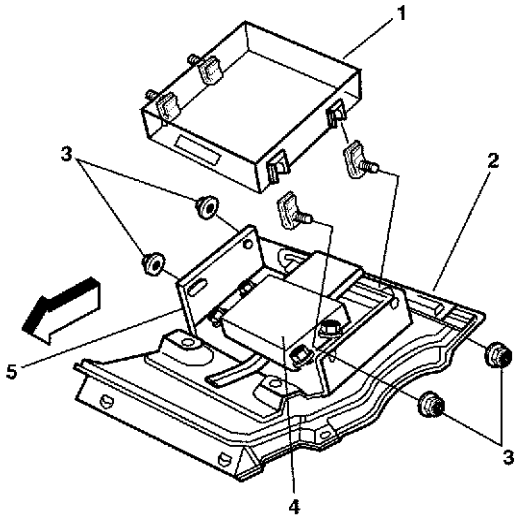
Repair Instructions

Vehicle Speed Sensor Calibrator Module Replacement

Removal Procedure

1. **Notice:** In order to prevent internal damage to the PCM, the ignition must be OFF when disconnecting or reconnecting the PCM connector.

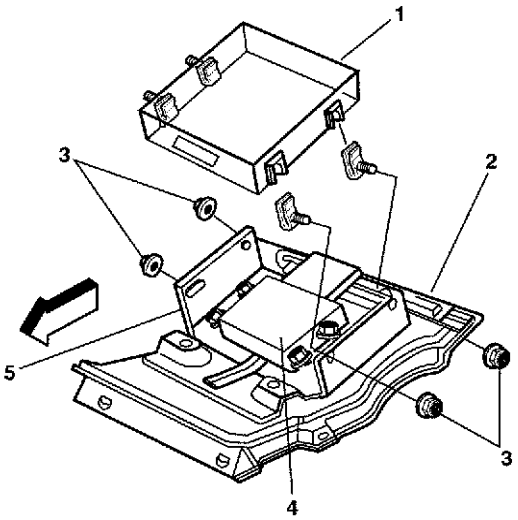
   Turn the ignition switch to the OFF position.

- 

  Remove the mounting screws from the trim panel (2) below the glove compartment.

- Remove the engine control module (ECM) retainer nuts (3).
- Remove the ECM (1) from the mounting bracket (5).
- Remove the ECM (1) harness connector.
- Remove the vehicle speed sensor (VSS) calibrator module (4) attaching screws.
- Remove the VSS calibrator module (4) harness connector.
- Remove the VSS calibrator module (4).

Installation Procedure

- 

  Install the VSS calibrator module (4).

  Install the VSS calibrator module (4) harness connector.

  Install the vehicle speed sensor (VSS) calibrator module (4) attaching screws.

- Install the ECM (1) harness connector.
- Install the ECM (1) to the ECM mounting bracket (5).
- Install and tighten the engine control module (ECM) (1) retainer nuts (3).
- Install the dash trim panel (2) below the glove compartment.
- Install and tighten the dash trim (2) panel mounting screws.
- Perform the Diagnostic System Check. Refer to **"Diagnostic Starting Point - Antilock Brake System"** .

Description and Operation

ABS Description and Operation

System Operation

The purpose of the rear wheel antilock (RWAL) brake system is to maintain vehicle stability under severe braking conditions on most road surfaces. The RWAL system monitors the speed of the rear wheels during a braking maneuver. The electronic brake control module (EBCM) processes these values to produce command controls to prevent the rear wheels from locking.

Base Braking Mode

During normal braking, the EBCM receives a signal from the brake stoplamp switch and begins to monitor the vehicle speed signal. The isolation valve is open and the dump valve is seated. This allows fluid under pressure to pass through the antilock

pressure valve (APV) and travel to the rear brake channel. The reset switch does not move because hydraulic pressure is equal on both sides.

Antilock Braking Mode

During a brake application the EBCM compares the vehicle speed to an internal program. When the EBCM senses a rear wheel lockup condition, the EBCM operates the APV to keep the rear wheels from locking up. To do this, the EBCM uses a three step cycle:

- Pressure Maintain
- Pressure Decrease
- Pressure Increase

Pressure Maintain

During the Pressure Maintain cycle, the EBCM energizes the isolation solenoid to stop the flow of fluid from the master cylinder to the rear brakes. The reset switch moves when the difference between the master cylinder line pressure and the rear brake channel pressure becomes great enough. If this happens, the reset switch grounds the EBCM logic circuit.

Pressure Decrease

During the Pressure Decrease cycle, the EBCM keeps the isolation solenoid energized and energizes the dump solenoid. The dump valve moves and the fluid under pressure moves into the accumlator. This action reduces rear pipe pressure preventing rear lockup. The reset switch grounds to tell the EBCM that pressure decrease has taken place.

Pressure Increase

During the Pressure Increase cycle, the EBCM deenergizes the dump and isolation solenoids. The dump valve resets and holds the stored fluid in the accumulator. The isolation valve opens and allows the fluid from the master cylinder to flow past and increase pressure to the rear brakes. The reset switch moves back to the original position by spring force. This action signals the EBCM that pressure decrease has ended and driver applied pressure resumes.

Accumulator Bleed Down

When the brake pedal is released, the accumulator spring and piston push the stored brake fluid back to the master cylinder past a lip seal on the dump valve.

System Self-Test

When the ignition switch is turned ON, the EBCM performs a system self-test. The EBCM checks all internal and external circuits and performs a function test by cycling the isolation and dump valves. The EBCM then begins normal operation if no malfunctions are detected.

Brake pedal pulsation and occasional rear tire chirping are normal during RWAL operation. The road surface and severity of the braking manuever determines how much pulsation and chirping will occur. Since the RWAL systems only control the rear wheels, the front wheels may still lock up during certain severe braking conditions.

Tires, RWAL, and Speedometer

Replacement Tire

Tire size can affect the performance of the RWAL system. Replacement tires must be the same size, load range, and construction on all 4 wheels.

Spare Tire

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

Speedometer Calibration

The vehicle speed sensor (VSS) calibrator module must be replaced when the rear axle ratio or tire size is changed. The VSS calibrator module is a solid state device that is used to convert the AC signal from the VSS to a DC square-wave signal. The VSS calibrator module will change the signal from the speed sensor to a signal containing 6,437 pulses per kilometer (PPK), or 4,000 pulses per mile (PPM) for the instrument cluster. The VSS calibrator module is matched to the final drive and tire size of the vehicle. If the final drive or tire size is changed for any reason, the calibrator module also must be changed to continue to produce an accurate speedometer reading. An incorrect calibration module will also affect the RWAL brake system.

ABS Indicator Lamp Operation

ABS Indicator Lamp

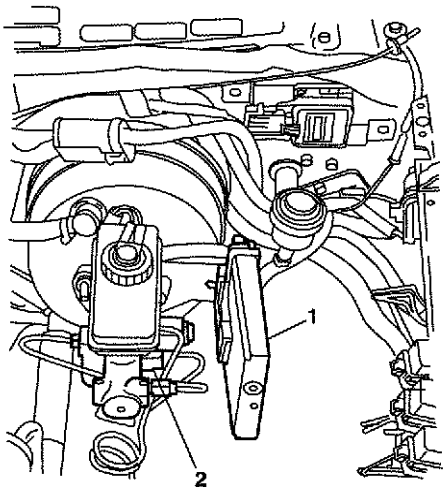
The RWAL system turns ON the ABS indicator lamp in the instrument cluster to indicate system operation and malfunction.

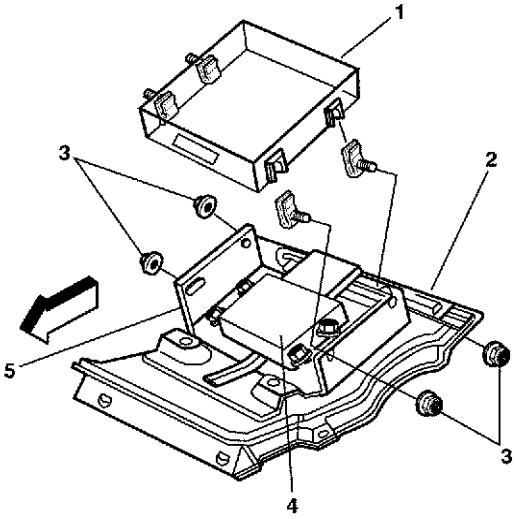
Normal ABS Indicator Lamp Operation

A bulb check occurs each time the ignition switch is turned ON. The ABS indicator lamp will turn ON, remain ON for 2 seconds, then turn OFF. When the EBCM detects a malfunction in the RWAL system, the EBCM will send a command signal to turn ON the ABS indicator lamp. In most cases, the ABS indicator lamp will stay on until the malfunction is corrected.

Installing a scan tool to the data link connector (DLC) allows the repair facility to read any diagnostic trouble codes (DTCs) that are stored in the EBCM's memory.

System Components





Electronic Brake Control Module (EBCM)

The EBCM (1) mounts to a bracket next to the master cylinder. The EBCM contains a microprocessor and the software for a system operation. During a severe brake application, the EBCM controls the antilock pressure valve (APV) to prevent the rear wheels from locking up. The EBCM receives input signals from the vehicle speed sensor (VSS) calibrator module and the stoplamp switch.

Antilock Pressure Valve (APV)

The APV (2) mounts to the combination valve under the master cylinder. The APV has an isolation valve to maintain or increase hydraulic pressure, a dump valve to reduce hydraulic pressure, and an accumulator to store brake fluid during the dump cycle. The EBCM uses the APV to control hydraulic pressure in the rear brake pipes.

Vehicle Speed Sensor (VSS)

The VSS is located in the left rear of the transmission. The VSS produces an AC voltage signal that varies in frequency according to the transmission output shaft speed. The resistance value of the VSS winding should be 900–2000 ohms.

Vehicle Speed Sensor (VSS) Calibrator Module

The vehicle speed sensor (VSS) sends a signal to the VSS calibrator module (4) located behind the instrument panel storage compartment. The VSS calibrator module changes the AC sine-wave signal to a DC square-wave signal. If the axle ratio or tire size is changed, replace the VSS calibrator module to reflect the new axle or tire size.

Special Tools and Equipment

Special Tools

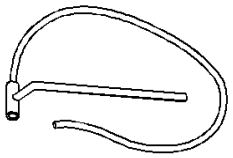
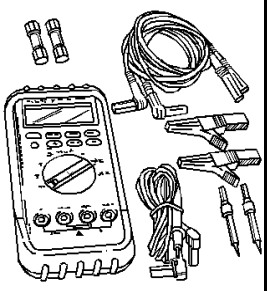
Illustration	Tool Number/ Description
	J 28434 Wheel Cylinder Bleeder Wrench
	J 39200 Digital Multimeter
	J 35616-A Connector Test Adapter Kit

Illustration	Tool Number/ Description