Chapter 8 GM Testing

This chapter provides information and procedures for using the scan tool with the following control systems:

- Engine
- Transmission
- Airbag
- Antilock Brake System (ABS)

For additional information on GM vehicles, see the following sections:

- “GM Operations” on page 121
- “GM Data Parameters” on page 435
- “GM Communications Problems” on page 731

8.1 Testing Control Systems Tests (Except ABS)

Select ENGINE AND OTHER SYSTEMS from the System Selection menu to open the main testing menu for all GM systems except ABS (Figure 8-1).

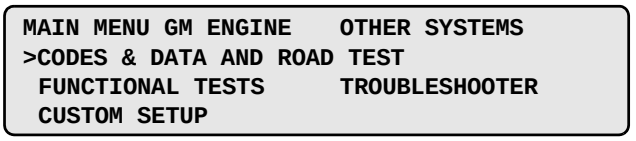

Figure 8-1 *Sample GM main menu for all systems except ABS*

To test GM vehicles, the scan tool must communicate with the vehicle electronic control module (ECM) and receive data over a serial data link. It does this through the ALDL connector. “Serial” means data parameters are transmitted one after the other, in series.

The scan tool operates at a speed that depends on the length of the serial data stream and on the baud rate of the vehicle ECM. Baud rate is the data transmission speed in digital bits per second. Typical GM engine baud rates are 80 for minimum-function systems, 160 for carbureted and early fuel-injected systems, 8192 for 1988–95 port fuel-injected engines, and 10,400 (10.4K) for 1996 and later, fuel-injected engines.

The baud rate determines how quickly the scan tool responds to an ECM and how fast data readings change on the screen. It also affects the length of time that it takes to record a movie. Data from a high-baud ECM may appear to change almost instantly. Data from a low-baud module appears to change much more slowly. This display speed, or “data update rate” depends on the ECM; it is not controlled by the scan tool.

8.1.1 Bidirectional Modules

Many late-model GM vehicles have bidirectional ECMs. This means that the ECM not only transmits data, but also accepts commands from the scan tool. Bidirectional ECMs transmit a complete data stream to the scan tool and provide many functional test capabilities.

The scan tool provides many of these bidirectional capabilities on late-model GM vehicles However, a few special test commands that override normal control module operation are restricted to GM test equipment. See “GM Communications Problems” on page 731 if the scan tool cannot communicate with the vehicle.

8.1.2 Scan Tool Communication

The CODES & DATA and FUNCTIONAL TESTS selections on the main menus require the scan tool to communicate with the selected ECM. The ignition must be on to establish communication. Select either CODES & DATA or FUNCTIONAL TESTS and a “waiting for module to communicate” message displays (Figure 8-2).

```
WAITING FOR MODULE TO COMMUNICATE WITH
SCANNER.  CONNECT ALDL CONNECTOR.
TURN KEY ON.
```

Figure 8-2 *Sample waiting for module to communicate message*

If communication is not established within five seconds, the screen updates to display a “no communication” message (Figure 8-3).

```
NO COMMUNICATION.  IS KEY ON?  IS ALDL
CONNECTED?  WAIT 15 SECONDS.  PRESS N TO
REENTER VEHICLE IDENTIFICATION, OR
SEE REFERENCE MANUAL “APPENDIX B”.
```

Figure 8-3 *Sample no communication message*

This message stays on the screen until communication is established, then the scan tool displays the selected function.

If communication is established, but it does not match what the scan tool is looking for, a “communication mismatch” message displays (Figure 8-4).

```
COMMUNICATION MISMATCH.
PRESS N TO REENTER VEHICLE ID.
OR PRESS Y TO CONTINUE.
```

Figure 8-4 *Sample communication mismatch message*

This generally occurs if the vehicle is improperly identified or if the selected module has the wrong PROM installed. It may also be due to undocumented midyear changes.

8.1.3 Codes & Data Selections

The Codes & Data selections for different vehicles vary, but each one, with or without road test, opens a data display screen that presents DTCs and onboard computer data. The Codes & Data test selections are:

- **CODES & DATA**—displays trouble codes and data stream information from the selected ECM. The vehicle should not be driven during this test.
- **ROAD TEST (C & D)**—allows the vehicle to be driven while displaying trouble codes and data stream information from the selected ECM.
- **ROAD TEST (No C & D)**—allows the vehicle to be driven with the scan tool connected, but no trouble codes or data display while driving.
- **CODES & DATA AND ROAD TEST**—displays trouble codes and data stream information from the selected ECM, whether or not the vehicle is being driven.
- **CODES**—displays trouble codes only, no data parameters.
- **CODES & DATA MENU**—accesses a submenu of data test selections that group similar data parameters together on smaller data lists for faster, more efficient testing.
- **CODE HISTORY**—displays code history information.
- **ADAPTIVE REPORT**—displays the adaptive, or learned, information that the transmission control module (TCM) uses to control shifting.

Codes & Data

Selecting CODES & DATA displays the data list and trouble codes for the selected module. Data for carbureted engines is slightly different than for fuel-injected engines, but both work the same (Figure 8-5 and Figure 8-6).

```
   RPM__1234  O2(mV)__689  MC DWL(°)__38
 **  DIAGNOSTIC MODE.  DO NOT DRIVE.  **
NO CODES PRESENT
O2 CROSSCOUNTS___08   OPEN/CLSD LOOP_OPEN
```

Figure 8-5 *Sample GM Codes & Data display for a carbureted engine*

```
   RPM__1234  O2(mV)__689  INTEGRATR__128
 **  DIAGNOSTIC MODE.  DO NOT DRIVE.  **
NO CODES PRESENT
O2 SENSOR B1_____05  O2 SENSOR B2_____06
```

Figure 8-6 *Sample GM Codes & Data display for a fuel-injected engine*

Data Lists

Some GM vehicles transmit slightly different data lists for different test functions. For example, certain models transmit a data list during some functional tests that is shorter than the data list transmitted in diagnostic mode. Some models do not transmit codes during a road test. However, many GM vehicles transmit the same data under all conditions.

On OBD-II vehicles, the scan tool displays the data parameters in as many as five separate data lists. Whether a vehicle transmits an identical data list or variable data lists for different test conditions affects some settings on the scan tool.

- Fix display lines or reassign LED functions for an ECM that always transmits the same data list and those settings stay in the scan tool memory until they are changed or a new vehicle ID is entered.
- Fix display lines or reassign LED functions for a vehicle that transmits variable data lists and those settings return to their preassigned functions when test selections are changed (when changing from Road Test to Diagnostic Testing mode, for example).

See the user's manual for the diagnostic tool you are using for instructions on reassigning LED functions.

Diagnostic Trouble Codes

On some vehicles, diagnostic trouble code (DTC) information appears as part of the data list (Figure 8-7).

```
   RPM__1234  O2(mV)__689  INTEGRATR__128
 **  ROAD TEST MODE.  OK TO DRIVE.  **
13 O2 SENSOR NOT WARM ENOUGH
15 COOLANT TEMP SIGNAL HIGH OR OPEN
```

Figure 8-7 *Sample codes present screen*

Most body control module (BCM) trouble codes include an alpha prefix. These BCM codes display alphanumerically.

Hard Codes and Soft Codes

On some 1995 and earlier models, DTCs may be classified as either "hard" or "soft." Most 1988 and later GM vehicle controllers separate soft codes from hard codes.

- **Hard codes**—indicate a problem that exists at the time of testing. These are referred to as "current codes" in the trouble code menu.
- **Soft codes**—indicate a problem that occurred in the past but is not present now. These are referred to as "history codes" in the trouble code menu.

To distinguish between hard and soft codes:

1. Clear the ECM memory and reenter Codes & Data.
2. Watch for codes to reappear:
   - A hard code reappears quickly—from immediately to a couple of minutes.
   - A soft code does not reappear until the problem that caused it reoccurs.

1995 and Earlier Cadillac Engine System Codes

Cadillac systems transmit hard codes for the engine. However, soft codes are available only from the Cadillac on-board diagnostic system, with the following exceptions:

- 1989 and earlier models transmit a soft code 52
- 1990–95 models transmit soft codes 52 and 109

Refer to Cadillac service procedures or the Fast-Track Troubleshooter Reference G074 for instructions on using the Cadillac system.

Diagnostic Trouble Codes Without Definitions

Some OBD-II GM vehicles output OBD-II style DTCs that have varying definitions. The correct DTC definition cannot be determined by the VIN characters entered during the vehicle ID sequence. In these instances, the display shows the DTC followed by a message that refers you to this manual. Use Table 8-1 and Table 8-2 to determine the DTC definition.

Table 8-1 *2001 and earlier passenger car DTCs with multiple definitions (sheet 1 of 2)*

DTCs with Multiple Definitions–Cars				
DTC	**YEAR**	**4th VIN**	**ENGINE**	**DEFINITION**
P1641	1996	B/D/Y	4.3/5.7	Fan relay #1 circuit fault
	1996–97	F	5.7	
	1996–99	Z	1.9	QDM “A” fault
	1996–2001	All others		MIL control circuit
	1998	W	3.8	A/C relay
	1999	All	3.8	
		N	3.4	
P1642	1996	A,L,N,W	3.1/3.4	Air pump relay circuit
		All others		Cooling fan relay 2 control circuit
		Y	5.7	Cooling fan relay 2 & 3 control circuit
	1996–97	F	5.7	
	1996–99	E/K	4.6	Vehicle speed output circuit
		G, Olds only	4.0	
	1997–98	All others		Driver 1 line 2
	1998–99	W	3.1	Change oil lamp circuit
	1999	N	3.4	
P1643	1996	B/D/Y	4.3/5.7	Engine speed output circuit
	1996–97	F	5.7	
	1996–98	All others		Fuel pump PWM circuit

Table 8-1 *2001 and earlier passenger car DTCs with multiple definitions (sheet 2 of 2)*

DTCs with Multiple Definitions–Cars				
DTC	**YEAR**	**4th VIN**	**ENGINE**	**DEFINITION**
P1652	1996	B/D/Y	4.3/5.7	Vehicle speed output circuit
		A/L/N/W	3.1	Fan relay #2 circuit fault
	1996–97	F	5.7	Vehicle speed output circuit
	1996–98	C/F/G/H	3.8	Fan relay #2 circuit fault
	1996–99	E/K	4.6	Lift/dive output circuit
		G	4.0	
	1997–2000	Y	5.7	Chassis pitch fault
	1999	C/H/W	3.8	Fan relay #2 circuit fault
	1999	W	3.1	Fan relay 2 & 3 circuit
		N	3.4	
	1999–2001	F	3.8	Ride control circuit
P1653	1996	E/K	4.6	A/C clutch control circuit
		All others		Low engine oil level lamp fault
	1996–98	C/G/H	3.8	TCS delivered torque output circuit
	1996–99	G	4.0	A/C clutch control circuit
	1998	F/W	3.1/3.8	Fuel level output fault
		F	5.7	Low engine oil level lamp fault
		F	3.8	TCS delivered torque output circuit
	1999	All others		Fuel level output or low oil level lamp circuit
	2000–01	All		Low engine oil level lamp fault
P1654	1996–99	E/K	4.6	Cruise control disable circuit fault
		G	4.0	
	1996–98	All others		A/C relay circuit fault
	1999	W	3.1	2nd gear start lamp circuit
		N	3.4	
	1999–2000	C/F/G/H/W	3.8	Reduced engine power lamp circuit

Table 8-2 *Truck DTCs with multiple definitions (sheet 1 of 2)*

DTCs with Multiple Definitions–Trucks				
DTC	**YEAR**	**5th VIN**	**ENGINE**	**DEFINITION**
P1641	2000	P	6.5	MIL control circuit fault
P1642	1996	U	3.4	Air pump relay
P1643	1997–2001	All	6.5	Wait to start circuit
P1652	1996	U	3.4	Fan relay #2 circuit fault
		Others	-	Vehicle speed output circuit
	2000	All	4.8/5.3/6.0	Powertrain induced chassis pitch circuit fault

Table 8-2 *Truck DTCs with multiple definitions (sheet 2 of 2)*

DTCs with Multiple Definitions–Trucks				
DTC	**YEAR**	**5th VIN**	**ENGINE**	**DEFINITION**
P1653	1996	All	4.3/5.0/5.7/7.4	Oil level lamp fault
	1996–97	All	6.5	EGR vent solenoid circuit fault
	1999–2000	All	6.5/7.4	EGR vent sol or EPR circuit
P1654	1996–2001	All	6.5/7.4	Service throttle soon circuit

Road Test (C&D)

Selecting ROAD TEST (C&D) from the MAIN MENU GM ENGINE initiates what some service manuals may call the “open” or “normal” mode because the scan tool does not place a load across the ALDL connector as it does in the diagnostic mode (Figure 8-8).

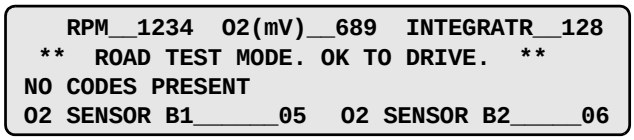

Figure 8-8 *Sample Road Test (C&D) mode screen*

Whether codes and data display in the Road Test mode depends on the PCM of the specific test vehicle. If codes and data are available in Road Test mode, the menu selection reads ROAD TEST (C&D). If not, the menu selection reads ROAD TEST (NO C&D).

Generally, the same codes and data information displays in Road Test (C&D) mode as those described for the Codes & Data mode, except for the following important differences:

- The scan tool does not place a resistive load on the ECM, and the engine operates normally under ECM control; it is safe to drive the vehicle for troubleshooting intermittent problems.
- Some vehicles do not display codes in the Road Test mode.
- The data list may differ from that of the list in Diagnostic mode. For example, some fuel-injected engines display a slightly shorter data list in Road Test mode.

Limited Data in Road Test

Some GM vehicles do not provide DTCs in Road Test mode, as indicated by a “no codes available in this mode” message. Most vehicles that do provide DTCs display a shorter list in Road Test mode. You will need to select CODES & DATA from the MAIN MENU GM ENGINE to view all DTCs available for these vehicles.

Road Test (No C&D)

Several GM engine ECMs, particularly on vehicles with carbureted engines, provide a Road Test mode but do not transmit data. For these vehicles, CODES & DATA and ROAD TEST are separate selections on the MAIN MENU GM ENGINE (Figure 8-9).

```
MAIN MENU GM ENGINE    [PRESS N FOR HELP]
>CODES & DATA          ROAD TEST (NO C&D)
 FUNCTIONAL TESTS      REVIEW MOVIE
 CUSTOM SETUP
```

Figure 8-9 *Sample main menu when data does not transmit during a Road Test*

The ROAD TEST (NO C&D) selection removes the resistive load the scan tool applies in Codes & Data mode and allows the vehicle to be safely driven with the scan tool connected. After selecting ROAD TEST (NO C&D), the following screen displays (Figure 8-10).

```
ROAD TEST MODE.  OK TO DRIVE.
ECM REMOVED FROM DIAGNOSTIC MODE.
NO CODES OR DATA AVAILABLE.
PRESS N FOR MAIN MENU.
```

Figure 8-10 *Sample ROAD TEST (NO C&D) screen*

Codes & Data and Road Test

Many 1986 and later GM vehicles provide only the Road Test mode, or “open mode,” for viewing the engine and transmission data. For these vehicles, CODES & DATA AND ROAD TEST displays on the MAIN MENU GM ENGINE (Figure 8-11).

```
MAIN MENU GM ENGINE    OTHER SYSTEMS
>CODES & DATA AND ROAD TEST <------
 FUNCTIONAL TESTS      REVIEW MOVIE
 CUSTOM SETUP
```

Figure 8-11 *CODES & DATA AND ROAD TEST selection*

This mode may be used for testing in the shop, as well as for road testing. Select this function and the second line of the display shows the vehicle may be driven (Figure 8-12).

```
   RPM__1234  O2(mV)__689  INTEGRATR__128
 **  CODES AND DATA.  OK TO DRIVE.  **
NO CODES PRESENT
O2 SENSOR B1_____05   O2 SENSOR B2_____06
```

Figure 8-12 *Sample “Codes and Data and Road Test” display*

Codes & Data Menu

Some vehicles have a CODES & DATA MENU selection (Figure 8-13), which is used to access data from various data groups.

```
MAIN MENU GM ENGINE    OTHER SYSTEMS
>CODES & DATA MENU <----
 FUNCTIONAL TESTS
 CUSTOM SETUP          TROUBLESHOOTER
```

Figure 8-13 *CODES & DATA MENU selection*

A data group combines similar data parameters into smaller data lists for faster, more efficient testing (Figure 8-14).

```
CODES & DATA MENU:
>CODES & DATA AND ROAD TEST
 SPARK DATA            CODES HISTORY
 ENGINE DATA 1         FUEL TRIM DATA
```

Figure 8-14 *Sample Codes & Data menu submenu*

Menu choices vary depending on the vehicle. As with other menus, only the items available for the specific test vehicle display. Codes & Data menu choices may include:

- Adaptive Report
- Codes
- Codes & Data and Road Test
- Code History
- EGR, EVAP, ACC
- EGR and Misfire Data
- Engine Data I
- Fuel Trim Data
- Idle and Cruise Data
- Misfire Data
- Spark Data

Codes

On OBD-II vehicles, selecting CODES from the CODES & DATA MENU opens a submenu that may include the following options:

- Freeze Frame/Failure Records
- History
- MIL, SVS, or Message Requested
- Last Test Failed
- Test Failed Since Code Cleared
- Failed This Ignition
- DTC Status
- Automatic Transfer Case (ATC) Codes

Some OBD-II vehicles offer an ALL POWERTRAIN CODES option. Selecting ALL POWERTRAIN CODES displays any DTC stored in the PCM.

Freeze Frame/Failure Records

Selecting FREEZE FRAME/FAILURE RECORDS displays freeze frame and failure records associated with a particular DTC. These records include stored values of selected data parameters at the time a DTC sets. Selecting this mode displays a list of all DTCs in PCM memory (Figure 8-15).

```
CHOOSE A FAILURE RECORD OR FREEZE FRAME:
>P1406 (FREEZE FRAME)
 P1406
 P1577
```

Figure 8-15 *Sample DTC display when Freeze Frame/Failure Records is selected*

A DTC followed by (FREEZE FRAME) indicates an emissions-related DTC that meets OBD-II freeze frame requirements. A DTC not followed by (FREEZE FRAME) indicates that the DTC is either non-emissions related or is emissions-related but has not yet met the OBD-II freeze frame requirements. The GM failure records may include more data than OBD-II freeze frames. The scan tool displays both a freeze frame and a failure record selection for emissions-related DTCs.

Selecting FREEZE FRAME/FAILURE RECORD displays a “please wait” message while the data is loading, then the freeze frame and failure record displays (Figure 8-16).

```
    FREEZE FRAME/FAILURE RECORD DATA
  **  CODES & DATA.  OK TO DRIVE.  **
P0201 CYLINDER 1 - INJECTOR CKT PROBLEM
ENGINE LOAD(%)_____0  COOLANT(°C)_____100
```

Figure 8-16 *Sample freeze frame and failure record display*

History

The HISTORY selection displays any history DTCs that are stored in PCM memory since the last time DTCs were cleared (Figure 8-17).

```
                CODE LIST
  **  CODES & DATA.  OK TO DRIVE.  **
P0122 TP SENSOR OR APP SENSOR 1 CKT SHRT
*** END OF LIST ***
```

Figure 8-17 *Sample history display when codes are present*

MIL SVS or Message Requested

The MIL SVS OR MESSAGE REQUESTED selection displays DTCs that are currently turning on the MIL, SVS lamp, or displaying a message on the message console.

Last Test Failed

The LAST TEST FAILED selection displays DTCs that were detected when the last test was run.

Test Failed Since Code Cleared

The TEST FAILED SINCE CODE CLEARED selection displays DTCs that set since the last time codes were cleared.

Failed This Ignition

The FAILED THIS IGNITION selection displays DTCs that set during the current ignition cycle.

DTC Status

The DTC STATUS selection offers a way to quickly check on the status of the OBD-II tests associated with a particular DTC and verify related repairs.

To check DTC status:

1. Select **DTC STATUS**.

   The display prompts you to enter the DTC (Figure 8-18).

```
                DTC STATUS
SCROLL IN DESIRED TROUBLE CODE TO TEST
              ***  P0000  ***
```

Figure 8-18 *Sample prompt to enter the DTC*

2. Select each correct number for the position indicated by the cursor.

   Once all characters are selected, the screen automatically updates to show the DTC status (Figure 8-19).

```
P0201 CYLINDER 1 - INJECTOR CKT PROBLEM
THIS IGNITION CYCLE__________RAN & FAILED
LAST TEST____FAILED    SINCE CLEAR__NOT RUN
HISTORY_____YES    MIL OR SVS REQ___YES
```

Figure 8-19 *Sample DTC status display*

If a DTC supported by the vehicle is entered, the first line of the display shows the DTC definition. The next three lines include five information fields:

- **THIS IGNITION CYCLE**—indicates the OBD-II test status related to the selected DTC. There are four possible results: RAN & FAILED, RAN & PASSED, NOT RUN, and RAN & INT. RAN & INT (intermittent) means the test was inconclusive and must be repeated.
- **LAST TEST**—indicates the results of the last DTC-related tests. The results are either PASSED or FAILED.
- **SINCE CLEAR**—indicates the test status since the DTC was last cleared. The results are PASSED, FAILED, or NOT RUN.
- **HISTORY**—indicates whether the PCM stored a history code. The display reads YES or NO. Typically, a freeze frame or failure record is available for a DTC when YES displays.
- **MIL OR SVS REQ**—indicates the PCM command status to the malfunction indicator lamp (MIL) or service vehicle soon request (SVS Req) lamp the last time the DTC set. The displays reads YES or NO. YES means the PCM commanded the lamp to turn on.

If you enter a DTC not supported by the vehicle, a message displays on-screen (Figure 8-20).

```
                DTC STATUS
SCROLL IN DESIRED TROUBLE CODE TO TEST
             ***  P1976  ***
THIS VEHICLE DOES NOT SUPPORT THIS DTC!!
```

Figure 8-20 *Sample screen when a DTC is not supported*

Automatic Transfer Case (ATC) Codes

The ATC CODES selection displays Automatic Transfer Case (ATC) DTCs (Figure 8-21). The ATC is optional equipment and this menu selection does not necessarily mean the vehicle is equipped with an ATC.

```
                CODE LIST
   **  CODES & DATA.  OK TO DRIVE.  **
C0323 T-CASE LOCK CIRCUIT LOW
*** END OF LIST ***
```

Figure 8-21 *Sample ATC code list*

If the vehicle does not have an ATC, or if there is a communication problem, a “no communication” message displays (Figure 8-22).

```
NO COMMUNICATION.  MAY NOT BE ATC
EQUIPPED.  VEHICLES WITH ATC HAVE
AUTO 4WD SWITCH ON DASH.
PRESS Y TO RETURN TO CODES & DATA MENU.
```

Figure 8-22 *Sample ATC no communication message*

Codes (Airbag)

Some older models display DTCs for the supplemental inflatable restraint (SIR), or airbag, system. However, the airbag control module does not display data parameters. Therefore, CODES is the only selection available on the MAIN MENU GM AIRBAG (Figure 8-23).

```
MAIN MENU GM AIRBAG
>CODES                OTHER SYSTEMS

 CUSTOM SETUP
```

Figure 8-23 *Sample early, pre-1994, airbag main menu*

Selecting CODES displays the airbag codes (Figure 8-24).

```
              AIRBAG CODES
  **  DIAGNOSTIC MODE.  DO NOT DRIVE  **
71 DEFECTIVE DERM
HC HISTORY CODES FOLLOW
```

Figure 8-24 *Sample early, pre-1994, airbag code display*

Any codes currently present display toward the top of the code list. When a current code is set, it gets added to the list of history codes.

See “Codes & Data Selections” on page 139 for 1994 and later models, and for 1993 and later Saturn airbag testing.

8.1.4 Functional Tests—1995 and Earlier

NOTE:
Operations described in this section are not available on all tool platforms.

All functional tests for 1995 and earlier models are described below. Not all tests are available for every model; only those tests available from each specific test vehicle display.

Following is a complete listing of functional tests for 1995 and earlier models:

- Field Service Mode
- Access Onboard Diagnostics
- AIR Solenoid (Force AIR to Exhaust)
- TPS Check and Adjustment Specifications
- Backup Fuel
- Full Lean (FL) Mixture
- Full Rich (FR) Mixture
- Backup Spark and Fuel
- Fixed 10° Spark

WARNING:
Do not enter any functional test while driving on a road test. During some functional tests, the PCM makes changes to ignition timing, fuel delivery, and other engine functions, which may affect engine operation and vehicle control.

Field Service

Selecting FIELD SERVICE on 1993 and earlier models grounds Pin B of the ALDL connector to enter Field Service mode. The PCM does not transmit data and the vehicle does not set new codes in Field Service mode (Figure 8-25). On some vehicles, field service is used to check or adjust ignition timing and the idle minimum air rate.

```
FIELD SERVICE MODE.
WITH KEY ON/ENGINE OFF, CE LAMP FLASHES
TROUBLE CODES, AND SOME ECM OUTPUTS ARE
EXERCISED.  PRESS N TO EXIT.
```

Figure 8-25 *Sample field service screen*

With the key on and the engine off, the check engine lamp flashes DTCs if any are present, or code 12 if there are no codes. The PCM also energizes all solenoids with the key on and the engine off, so Field Service mode may be used to test solenoid operation.

- On a carbureted engine running in the Field Service mode, the check engine lamp stops flashing code 12 and new trouble codes cannot set. The PCM also sets timing to a fixed degree of advance, which allows for checking and adjusting ignition timing for some engines. Field Service mode may also be used to conduct a system performance check on carbureted engines. See the vehicle service manual for details.
- On a fuel-injected engine running in the Field Service mode, the check engine lamp flashes rapidly when the engine is running in open loop and slowly when in closed loop. The length of the check engine lamp flash indicates whether the exhaust is rich or lean in closed loop. The flash is longer if rich.

Access On-board Diagnostics

The ACCESS ON-BOARD DIAGNOSTICS selection creates an open circuit between the ALDL diagnostic and ground pins, or pins A and B (Figure 8-26).

This selection is available on the following systems:

- 1981 and later Cadillac
- 1986 and later Buick Riviera, Buick Riatta, Oldsmobile Toronado and Oldsmobile Trofeo

```
ECM IS REMOVED FROM DIAGNOSTIC MODE TO
ALLOW ACCESS TO ON-BOARD DIAGNOSTICS.
REFER TO VEHICLE SERVICE MANUAL FOR
PROPER PROCEDURES.  PRESS N TO EXIT.
```

Figure 8-26 *Sample access onboard diagnostics screen*

This allows access to the onboard diagnostics without disconnecting the scan tool. Refer to GM service procedures to enter and use the onboard diagnostic program.

Air Solenoid

The AIR SOLENOID selection energizes the air switching solenoid to direct air into the exhaust manifold. Use this test to check the operation of the O2S and the response of the MC solenoid or the fuel integrator, block learn, and injector pulse width.

NOTE:
The engine must be warmed up and operating in closed loop for this test to be valid. The PCM must be directing air downstream to the catalytic converter. This test cannot be performed reliably when the PCM is directing the air-divert solenoid to route air to the atmosphere.

To perform an air solenoid test:

1. Select **AIR SOLENOID**.

   A caution message now displays (Figure 8-27).

```
CAUTION - THIS TEST DIVERTS AIR TO
EXHAUST MANIFOLD WHILE Y IS PRESSED.
MAX TIME=20 SECONDS.  PRESS Y TO ENTER
TEST.  THEN PRESS Y FOR AIR INJECTION.
```

Figure 8-27 *Sample air solenoid test caution*

2. Press **Y** to continue.

   The air solenoid test screen displays, which is the standard Codes & Data display.

3. Press and hold **Y** to activate the test and the air switching solenoid directs air to the exhaust manifold.

   With **Y** held, AIR appears on the left side of the top line (Figure 8-28).

```
AIR RPM__1234  O2(mV)__689  MC DWL(°)__38
     **  AIR TEST.  DO NOT DRIVE.  **
NO CODES PRESENT
O2 CROSSCOUNTS___08   OPEN/CLSD LOOP__OPEN
```

Figure 8-28 *Sample active AIR solenoid test screen*

   While the test is active, a timer counts how long the **Y** button is held. The scan tool automatically turns off air switching after 20 seconds of continuous operation.

The AIR switch solenoid parameter value on the screen does not simultaneously switch from off to on when the **Y** button is pressed. Be aware that the parameter on the screen is the PCM solenoid command. The **Y** button grounds the solenoid independently of the PCM.

TPS Check and Adjustment Specifications

The TPS CHECK AND ADJUSTMENT selection on the Functional Tests menu allows you to check and adjust the operation of the throttle position sensor.

The display varies for different vehicles, but each gives the current TPS reading and the test or adjustment specification. If engine speed is part of the adjustment specification, a live RPM reading appears on the top line of the display. If the TPS is not adjustable, the voltage should be measured at curb idle or closed throttle, and the scan tool displays allowable TPS voltage range.

IMPORTANT:
To avoid incorrect TPS adjustment or component damage, be sure to follow the on-screen instructions. Refer to a vehicle service manual for complete test or adjustment procedures.

To perform a TPS check and adjustment:

1. Select **TPS CHECK AND ADJUSTMENT**.

   The first screen of a caution message displays (Figure 8-29).

```
CAUTION - UNLESS NOTED OTHERWISE, CHECK
TPS WITH THROTTLE CLOSED, KEY ON, ENGINE
WARM, A/C OFF.  NEVER ADJUST WITH ENGINE
IDLING IN DIAGNOSTIC MODE.  PRESS Y.
```

Figure 8-29 *First screen of the caution message*

2. Press **Y** to continue with the message (Figure 8-30).

```
SOME TPS'S ARE NOT ADJUSTABLE OR ARE
SELF-CALIBRATING, IN WHICH CASE AN
ALLOWABLE SERVICE RANGE IS GIVEN.
PRESS Y TO CONTINUE, N TO EXIT.
```

Figure 8-30 *Second screen of the caution message*

3. Press **Y** to enter the test.

   Depending on engine calibration, one of three possible TPS test screens displays (Figure 8-31, Figure 8-32, or Figure 8-33).

```
CURRENT TPS (V):      0.58
ADJUSTMENT SPEC(V):   0.55 (+/-0.05)
ALLOWABLE RANGE(V):   0.35 TO 0.67
(NO ACTION REQUIRED IF WITHIN RANGE)
```

Figure 8-31 *Sample screen when the TPS can be adjusted*

```
CURRENT TPS (V):      0.58
ADJUSTMENT SPEC(V):   NOT ADJUSTABLE
ALLOWABLE RANGE(V):   0.45 TO 1.25
(NO ACTION REQUIRED IF WITHIN RANGE)
```

Figure 8-32 *Sample screen when the TPS is not adjustable*

```
TPS MUST BE SET AT SENSOR BECAUSE ECM
REPORTS ANGLE, NOT VOLTAGE.  WITH ENGINE
OFF & ISC RETRACTED, SET TPS TO READ 10%
OF REFERENCE VALUE AT SENSOR.
```

Figure 8-33 *Sample screen when TPS angle, not voltage, is reported*

Full Lean (FL) Mixture

The FULL LEAN (FL) MIXTURE selection on the Functional Tests menu is available only for a minimum-function system, which is used on carbureted T-body models:

- Chevette
- Acadian
- T-1000

In this mode, the PCM commands the MC solenoid to a fixed 54° dwell, or 90% duty cycle, condition (Figure 8-34). This mode is used to check O2S operation and other engine operating conditions while the fuel system is held in a full-lean condition.

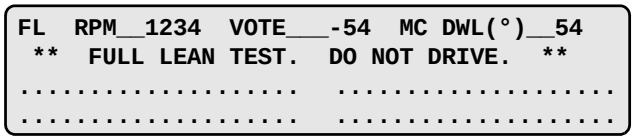

Figure 8-34 *Sample full lean (FL) mixture test*

During the full lean (FL) mixture test, the standard diagnostic data list for a minimum-function system displays.

- "FL" appears at the top left to indicate the system is in the Full Lean (FL) Mixture mode.
- The VOTE parameter, which indicates a rich or lean exhaust, should be negative during full-lean operation.
- The MC dwell reading should remain fixed at 54°.

The data list is the same list seen in the Codes & Data mode. The vehicle should not be driven while the test is active. Line 1 is fixed and displays the RPM, VOTE, and MC dwell.

If **N** is not pressed within two minutes of starting the test, the display automatically returns to the Functional Tests menu.

Full Rich (FR) Mixture

The FULL RICH (FR) MIXTURE selection on the Functional Tests menu is available only for a minimum-function system, which is used on carbureted T-body models:

- Chevette
- Acadian
- T-1000

In this mode, the PCM commands the MC solenoid to a fixed 6° dwell, or 10% duty cycle, condition (Figure 8-35). Use this mode to check O2S operation and other engine operating conditions while the fuel system is held in a full-rich condition.

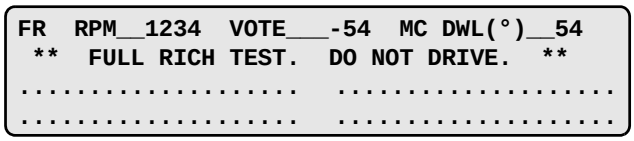

Figure 8-35 *Sample full rich (FR) mixture test*

During the full rich (FR) mixture test, the standard diagnostic data list for a minimum-function system displays.

- "FR" at the top left indicates the system is in the Full Rich (FR) Mixture mode.
- The VOTE parameter, which indicates a rich or lean exhaust condition, should be a positive, high number in full-rich mode.
- The MC dwell reading should remain fixed at 6°.

The data list is the same list seen in the Codes & Data mode. The vehicle should not be driven while the test is active. Line 1 is fixed and displays the RPM, VOTE, and MC dwell.

If **N** is not pressed within two minutes of starting the test, the display automatically returns to the Functional Tests menu.

Backup Fuel

The BACKUP FUEL selection on the Functional Tests menu lets you check the operation of the backup fuel program of the PCM on some fuel-injected vehicles. The backup fuel program is a fail-safe, or limp-in, program that sets a fixed injector pulse width. This allows the vehicle to be driven to a shop for repair in case of a major system failure.

The backup fuel test verifies that the PCM backup program is operational, but may also be used for checking the operation of the fuel injection system. If a vehicle with a driveability problem seems to run better in Backup Fuel mode than in normal operation, fuel metering and air intake parameters should be checked carefully.

Selecting BACKUP FUEL displays the Backup Fuel Active screen (Figure 8-36). No data is available during this test. The scan tool ends the test automatically after 120 seconds to avoid catalytic converter overheating and returns to the Functional Tests menu.

```
BACKUP SPARK & FUEL ACTIVE 120 SECONDS
ECM IS OPERATING IN “LIMP HOME” MODE.
NO DATA AVAILABLE.  TEST WILL END IN
2 MINUTES, OR PRESS N TO EXIT.
```

Figure 8-36 *Sample backup spark and fuel screen*

The backup fuel test for 1982–85 Cadillac models with onboard diagnostics is slightly different. Press and hold INST/AVG on the fuel panel to activate (Figure 8-37).

```
BACKUP FUEL TEST ENABLED.  ACTIVATE BY
HOLDING “INST/AVG” KEY ON FUEL PANEL.
NO DATA AVAILABLE.  AUTOMATIC EXIT AFTER
2 MINUTES.  PRESS N TO EXIT SOONER.
```

Figure 8-37 *Sample active backup fuel test screen*

Backup Spark & Fuel

The BACKUP SPARK AND FUEL selection on the Functional Tests menu checks operation of the PCM backup spark and fuel program on some fuel-injected vehicles. Backup spark and fuel is a fail-safe, or limp-in, program that sets base timing and a fixed fuel injector pulse width. This allows the vehicle to be driven in case of a major system failure.

This test verifies that the PCM backup program is operational, but may also be used to double-check the operation of the fuel injection system. If a vehicle with a driveability problem seems to run better in Backup Spark and Fuel mode than in normal operation, check fuel metering, ignition, and air intake parameters carefully.

Selecting BACKUP SPARK AND FUEL displays the Backup Spark and Fuel screen (Figure 8-36). The scan tool does not display data during this test. This is a timed test that automatically ends after 120 seconds to avoid catalytic converter overheating.

Fixed 10° Spark

The FIXED 10° SPARK selection on the Functional Tests menu is available on 1985 and later Cadillac C-body models with a 4.1L engine. In this test mode, the PCM sets a fixed 10° of spark advance, which is the base timing setting, and disables EGR. The following conditions must be met for the PCM to maintain 10° of spark advance during this test:

- Engine temperature must be above 85°C (185°F).
- Engine speed must be under 900 RPM.
- The transmission must be in park.

Selecting FIXED 10° SPARK displays the Fixed Spark screen (Figure 8-38). Follow instructions on the vehicle emission control information (VECI) decal to adjust timing.

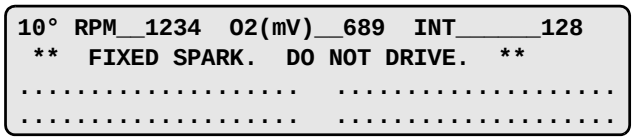

Figure 8-38 *Sample Cadillac fixed 10° spark screen*

When this test is active, the standard data list displays and 10° appears at the top left to indicate the system is in the Fixed 10° Spark mode, and the vehicle *should not* be driven.

8.1.5 Functional Tests—1996 and Later

NOTE:
Operations described in this section are not available on all tool platforms.

Beginning with the 1996 model year, interactive bidirectional functional tests were added to OBD-II vehicles. Because there are more than 250 of these tests, it is not practical to describe them all. However, they may be grouped into the following general categories:

- Adaptive memory resets
- Gauge, lamp, and relay on/off tests
- Engine operating mode tests (Loop Status and Cruise mode)
- Injector tests
- Spark, EGR, and timing tests
- Torque converter tests
- Transmission shift tests
- Valve and solenoid on/off tests

For bidirectional tests, the scan tool displays a message if a device control, or functional test, limit is exceeded. Device control limits are specific to each PCM, and to each test, making it impractical to list the limit criteria for all tests. For 2001 and earlier vehicles, a single message displays to fit all situations where a control limit is exceeded (Figure 8-39).

```
THE PCM EITHER TIMED OUT OR A
DEVICE CONTROL LIMIT WAS EXCEEDED
PRESS N TO RETURN TO FUNCTIONAL
TEST MAIN MENU.
```

Figure 8-39 *Exact device control limit exceeded message*

For 2002 and later vehicles, the device control limit message is specific to the conditions at the time the test was requested.

If a device control limit message displays while performing a functional test, it means the test aborted due to an internal function of the PCM. This does not indicate a problem with the scan tool. Safety limits are engineered into the PCM to prevent a functional test from enabling under inappropriate conditions, such as turning off a cooling fan relay when engine coolant temperature is hot enough to cause overheating.

Functional Test Selection

NOTE:
Operations described in this section are not available on all tool platforms.

Select FUNCTIONAL TESTS from a main menu displays one of the following menus (Figure 8-40 and Figure 8-41).

```
SELECT TEST MODE.     PRESS Y TO CONTINUE.
>CALIBRATION P/N
 VIN
 CANISTER PURGE DUTY CYCLE(%)
```

Figure 8-40 *Sample 1996–2001 Functional Tests menu*

```
>INJECTOR BALANCE
 CALIBRATION P/N
 VIN
 OUTPUT CONTROLS                  [MORE]
```

Figure 8-41 *Sample 2002 and later Functional Tests menu*

NOTE:
Selecting OUTPUT CONTROLS displays a list of component tests (Figure 8-42).

```
SELECT TEST MODE.  PRESS Y TO CONTINUE.
>A/C RELAY (ON/OFF)
 CRUISE INHIBIT (ON/OFF)
 DISABLE IDLE MODE SPARK (RESET)
```

Figure 8-42 *Sample Output Controls menu*

WARNING:
Do not enter a functional test while conducting a road test unless the road test requires it. The PCM makes changes to the ignition timing, fuel delivery, and other vehicle functions, which may affect engine operation and vehicle control.

Data Parameter Selection

Before beginning a functional test, select the data parameters to view during the test.

To select data parameters to view during a test:

1. Select **CHANGE DATA**.

   The last two lines display the data lists available for the test vehicle (Figure 8-43).

```
FUEL PUMP RELAY (ON/OFF)
>ON  OFF  CHANGE DATA  PRESS N TO EXIT
 DATA LIST 1          DATA LIST 2
 DATA LIST 3          DATA LIST 4
```

Figure 8-43 *Sample functional test data list selection screen*

2. Select a data list option.

   After a short pause, the first two lines of the new data display. Review the selected list to make sure the desired parameters are displayed. Press **Y** to exit the data list and return to the functional test. Data parameter selections may be changed during a test.

Functional Test Operation

Functional test operation varies depending on the test. There are four general types of functional test operation:

- **Information Tests**—These are read-only types of tests. For instance, select VIN from the functional tests and the scan tool displays the VIN number.
- **Toggle Tests**—These tests switch a component, such as a solenoid, relay, or switch, between two operating states. The terms “on/off,” “open/clsd” (open/closed),” “enab/disa” (enable/disable), “excd/norm” (exceeded/normal), “pass/fail,” “lean/rich,” “high/norm,” or “rev/fwd” (reverse/forward) may be used to name states.
- **Variable Control Tests**—These tests command a certain value for a system or component. For instance, the “delta spark retard(°)” test allows the scan tool to vary spark timing in one-degree increments up to ten degrees. Similarly, the “EGR(%)” test allows varying the EGR valve duty cycle from zero to 100 percent.
- **Reset Tests**—These tests reset the adaptive, or learned, values stored in the PCM.

The toggle tests, variable control tests, and reset tests all look very similar on the scan tool display (Figure 8-44).

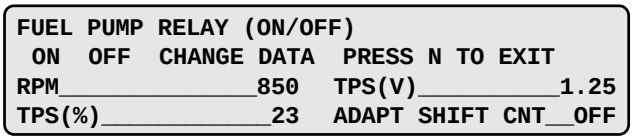

Figure 8-44 *Sample Fuel Pump Relay Functional Test*

Variable Control Test

Figure 8-45 is an example of a typical variable control test.

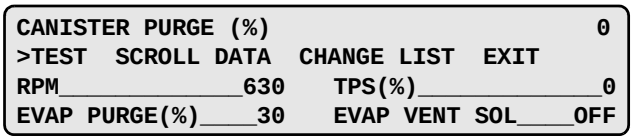

Figure 8-45 *Typical Canister Purge (%) functional test screen*

Selecting TEST from this screen changes the display to show the commanded duty cycle of the Canister Purge solenoid as a percentage, starting with zero (Figure 8-46).

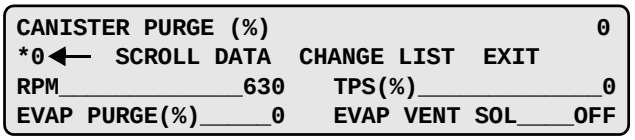

Figure 8-46 *Typical Canister Purge (%) functional test screen*

NOTE:
Some variable control tests, such as command gear, require a press of the **Y** button to confirm each variable value change request.

During a variable control test, scroll to increase or decrease the variable control value. In the above example, scrolling instantaneously changes Canister Purge solenoid opening by varying the duty cycle in increments of 10%. The duty cycle commanded by the scan tool also appears in the upper right corner of the screen (Figure 8-47). Other variable control tests act similarly.

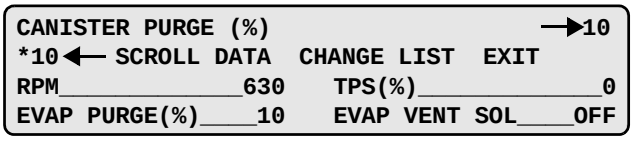

Figure 8-47 *Typical Canister Purge (%) functional test screen*

EGR Control

NOTE:
Since a proper Exhaust Gas Recirculation (EGR) system operation is crucial to preventing a vehicle from emitting high levels of NOx, the EGR control test is described in detail here.

This bidirectional functional test is available on some 1996 and later engines. In this mode, the scan tool commands the PCM to cycle the EGR valve. The EGR valve opens and closes at fixed intervals to provide a functional test of EGR system operation.

Tests vary slightly for each of the following three types of EGR valve:

- Integrated electronic EGR valve
- Digital EGR valve
- Linear EGR valve

Some engines that use these EGR valves do not have a PCM with the communication ability required to perform the functional test. The EGR control test selection only appears on the Functional Tests menu for those vehicles with the necessary capability.

The scan tool displays the standard Codes & Data list during the EGR control tests. However, there are slight differences. These differences are explained below.

Integrated Electronic EGR Valve

An integrated electronic EGR valve has a built-in solenoid controlled by the PCM. The solenoid opens and closes a vacuum vent for the valve. When the vacuum vent is opened, The EGR valve is closed. When the vacuum vent is closed, The EGR valve opens.

Selecting EGR CONTROL from the Functional Tests menu displays the EGR Control Test screen (Figure 8-48).

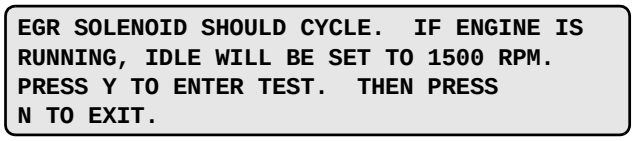

Figure 8-48 *Sample integrated electronic EGR control test*

On-screen instructions guide you to the EGR Control data list. While the test is active, the EGR valve cycles on and off at regular intervals, as indicated by OFF or ON in the upper left corner of the display (Figure 8-49).

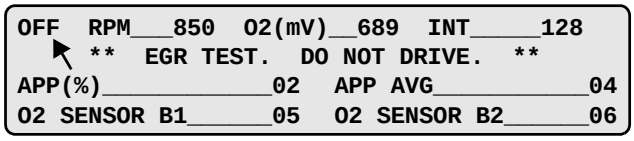

Figure 8-49 *Sample integrated electronic EGR control test data*

ON means the integral solenoid in the valve should be energized to close the vacuum vent, which opens the EGR valve. Engine speed should drop as the valve opens.

Digital EGR Valve

A digital EGR valve has three solenoids that open and close different sized orifices in the valve. This EGR control tests for these systems allows each of the solenoids to be operated independently.

To test the digital EGR valve solenoids:

1. Select **EGR CONTROL**.
   The EGR Control Test screen displays (Figure 8-50).

```
EGR SOLENOID SHOULD CYCLE.  IF ENGINE IS
RUNNING, IDLE WILL BE SET TO 1500 RPM.
PRESS Y TO ENTER TEST.  THEN PRESS Y
FOR NEXT SOLENOID.  PRESS N TO EXIT.
```

Figure 8-50 *Sample digital EGR control test*

2. Press Y to enter the test.
   A data list similar to that for Codes & Data displays (Figure 8-51).

```
ON1  RPM___850  O2(mV)__689  INT_____128
   **  EGR TEST.  DO NOT DRIVE.  **
APP(%)_____________02  APP AVG___________04
O2 SENSOR B1______05  O2 SENSOR B2______06
```

Figure 8-51 *Sample digital EGR control test data with solenoid one active*

   When the test begins, solenoid 1 cycles at regular intervals. The value in the upper left corner of the display changes between OFF and ON1 to indicate the status of solenoid one (Figure 8-51). ON indicates the solenoid is energized to open the first valve orifice. Engine speed should drop as the EGR valve opens in response to solenoid one.
3. Press **Y** to test the each following solenoid in succession.

Linear EGR Valve

A linear EGR valve is a single orifice valve with variable opening controlled by a stepper motor. The PCM controls the valve opening in 10% increments by commanding the stepper motor position.

A variable control test routine is used to test a linear EGR valve. See “Variable Control Test” on page 158 for testing information.

8.1.6 Clear Codes

Most GM vehicles allow clearing DTC records from the selected ECM memory through the scan tool. When available, CLEAR CODES can appear on the Codes menu or on the Exit menu. If the option is not available, the choice does not appear on the menu.

If code clearing was successful, a “no codes present” message appears. If code clearing fails for any reason, previous codes reappear when the display returns to the Data Viewing mode. In this case, repeat the code-clearing procedure.

8.2 Testing ABS Systems

Four-wheel antilock brake systems (4WAL) are available on most 1986 and later GM cars and trucks, and rear-wheel antilock (RWAL) brake systems are available on 1988–95 2-wheel drive light trucks.

On most 1988 and later systems, the antilock brake system (ABS) electronic brake control module/electronic brake traction control module (EBCM/EBTCM) lights an ABS indicator lamp on the instrument panel when a problem occurs.

Most systems store diagnostic trouble codes (DTCs) and either flash them on the warning lamp or transmit them to the scan tool. Most systems also transmit serial data, which is displayed by the scan tool.

8.2.1 ABS Codes & Data

The ABS CODES & DATA selection is available on the MAIN MENU GM ABS for most ABS systems. This ABS selection operates similarly to that for engine testing. In this mode, the scan tool reads DTCs and all data available on the ABS data stream.

The ABS Codes & Data displays and menus vary slightly depending on the system.

Communication With the ABS Module (EBCM)

The ABS CODES & DATA selection from the MAIN MENU GM ABS requires the scan tool to communicate with the EBCM through the ALDL connector. The following conditions must be met in order to establish communication:

- The scan tool must be connected to power.
- The data cable must be connected to the ALDL.
- The ignition switch must be on.

When ABS CODES & DATA is selected, the scan tool first displays a “waiting for communication” message (Figure 8-52).

```
WAITING FOR MODULE TO COMMUNICATE WITH
SCANNER.  CONNECT ALDL CONNECTOR.
TURN KEY ON.
........................................
```

Figure 8-52 *Sample waiting for communication message*

After about 3 seconds, “waiting for brake module to respond” should appear on the fourth line of the display. Then, a time counter appears at the end of the fourth line to count seconds as the scan tool establishes communication with the EBCM. The time required to establish communication depends on the EBCM, not on the scan tool. Communication can take up to 45 seconds on some systems. When the scan tool establishes communication, the ABS Codes & Data display appears.

If communication is not established, or if communication is interrupted during testing, a communication lost message displays (Figure 8-53). This might happen if the ALDL

connector is loosened or the ignition is switched off. If so, press **N** to check the vehicle ID. If the ID is correct, check the vehicle connector for damaged terminals and open wiring.

```
COMMUNICATION WITH BRAKE MODULE LOST.
TO ESTABLISH, CYCLE KEY OFF (5 SEC) THEN:
PRESS Y TO CONTINUE OR,
PRESS N TO REIDENTIFY SYSTEM.
```

Figure 8-53 *Sample communication lost message*

This message means the scan tool is not receiving data from the EBCM. In some cases, the message may indicate an ABS problem. However, other causes are more common.

ABS Codes & Data Communication Guidelines

To ensure efficient communication with the EBCM, follow these steps:

1. Be sure the ignition is switched off when entering the vehicle ID.
2. Switch the ignition on before selecting CODES & DATA.
3. Switch the ignition off when ABS Codes & Data testing is complete.
4. To test the engine control system, leave the ignition off while changing the ALDL test adapters, then enter the vehicle ID for engine testing.

Fault Codes

Diagnostic trouble codes (DTCs) may be “hard” codes, indicating a problem is continuous, or “soft” codes, indicating a problem that occurred in the past but is not present now. See “Hard Codes and Soft Codes” on page 140 for a complete explanation.

Diagnostic Trouble Codes with Multiple Definitions

A few 1996 and later GM vehicles output OBD-II style DTCs that have varying definitions. The correct DTC definition cannot be determined by the VIN characters entered during the vehicle identification sequence. In these instances, the display shows the DTC followed by a message that refers you to this manual. Use Table 8-1 to determine the DTC definition.

Table 8-3 *Passenger car DTCs with multiple definitions (sheet 1 of 2)*

DTCs with Multiple Definitions—Cars				
DTC	**YEAR**	**4th VIN**	**5th VIN**	**DEFINITION**
C1252	1998–99	E, K		ICCS2 data link left fault
		W, J, N	U, X	If ABS channel in release too long
		G		Right rear outlet valve circuit fault
	2000	E		ICCS2 data link left fault
		W, N		If ABS channel in release too long
	2000–01	K		Left front normal force circuit fault
	2001	W		If ABS channel in release too long

Table 8-3 *Passenger car DTCs with multiple definitions (sheet 2 of 2)*

DTCs with Multiple Definitions—Cars				
DTC	**YEAR**	**4th VIN**	**5th VIN**	**DEFINITION**
C1253	1998–99	E, K		ICCS2 data link right fault
		W, J, N	U, X	RF ABS channel in release too long
	2000	E		ICCS2 data link right fault
		W, N		RF ABS channel in release too long
	2000–01	K		RF normal force circuit fault
	2001	W		RF ABS channel in release too long
C1281	1997	H		Stabilitrac/active handling sensors uncorrelated
	1997	All others		RF solenoid circuit shorted to battery
	1997–99	Y		Steering sensors uncorrelated
	1998–99	G		Brake thermal model exceeded
		W, N, J	U, X	RF solenoid circuit shorted to battery
		E, K		Stabilitrac/active handling sensors uncorrelated
C1281 (cont)	2000	E		Stabilitrac/active handling sensors uncorrelated
		W, N		RF solenoid circuit shorted to battery
		H, C, K		Steering sensors uncorrelated
	2001	W		RF solenoid circuit shorted to battery
		H, G, Y, E, K, V, C		Steering sensors uncorrelated

Clearing Codes from ABS Codes & Data

The CLEAR ABS CODES selection appears on a menu only if the scan tool is able to clear codes from the system being tested.

After repairs are made, clear the codes and return to the previous ABS Codes & Data display. If the faults are repaired, the display indicates “no codes present.”

If the code-clearing operation fails for any reason, previous codes reappear in the ABS Codes & Data display. Press **N** to return to the exit menu and repeat the clear ABS codes operation.

8.2.2 Bosch 2 Codes & Data—1990–97

An ABS Codes & Data mode is available for 1990 and later Bosch 2 systems. In this diagnostic mode, the antilock functions of the Bosch 2 system are disabled by the EBCM, and new trouble codes cannot be set. However, the service brakes operate normally and the vehicle can be driven safely for testing.

In ABS Codes & Data mode (Figure 8-54), the top line of the display is fixed and displays the EBCM part number and the current position of the brake light switch, followed by the test mode and the ABS Codes & Data list.

```
   ECU___BB 33599    BRAKE LIGHT SW___ON
 ** ABS BRAKING IS OFF!  OK TO DRIVE.  **
NO CODES PRESENT
LF WHEEL (MPH)____45  RF WHEEL (MPH)____45
```

Figure 8-54 *Sample Bosch 2 Codes & Data*

Select CODES & DATA on a Bosch 2 system and the EBCM enters a diagnostic state. The EBCM remains in the diagnostic state after exiting Codes & Data. The ABS is disabled until the ignition is switched off.

To restore the ABS to normal operation:

1. Switch the ignition off.
2. Disconnect the scan tool.

The Bosch 2 EBCM enters the diagnostic state only once for each ignition cycle. During ABS testing in Codes & Data mode, other vehicle components may seem to operate abnormally (i.e., the instrument panel may appear to stop working or the gauge readings may change randomly). This is normal and stops when the EBCM is taken out of the diagnostic state.

NOTE:
ABS testing may cause false DTCs to appear on the engine code list. After ABS testing, reenter vehicle ID for engine testing and check the engine code list. Clear any codes that may be present and recheck to be sure they were false.

Bosch 2 Trouble Codes

The 1992–94 Corvette uses a Bosch 2 ABS that provides code history information separately from the ABS data. For these vehicles, CODE HISTORY is a MAIN MENU GM ABS selection.

New codes cannot be set while the system is in diagnostic mode. If codes are present, the third line changes to read “scroll down for ABS codes.” Scrolling reveals a code number and description, along with certain conditions that relate to the code (Figure 8-55).

```
35 LEFT REAR WHEEL SPEED SENSOR
CONDITIONS AT TIME OF ABOVE FAULT CODE:
BRAKE SW________OPEN   STARTS SINCE CODE_16
ABS STATE_______OFF   VEH SPEED(MPH)____47
```

Figure 8-55 *Sample Bosch 2 display with codes*

When a code sets, the EBCM records three operating conditions:

- Brake switch state to indicate if the brakes were applied.
- ABS state to indicate if ABS was operational.
- Vehicle speed.

Additionally, the EBCM records the number of times the vehicle was started since the fault occurred. If the fault is an intermittent problem, or soft code, the EBCM counts the number of starts since the code last occurred. If the problem is continuous, a hard code, the code resets

each time the necessary conditions occur. The “strts since code” value is 0 if the code is present at the time of testing.

To determine whether a fault is continuous or intermittent:

- Clear the code.

  If the code reappears when the necessary conditions occur, the fault is continuous. The Clear Codes function appears on the ABS Codes & Data exit menu (see “Clear Codes” on page 160).

8.2.3 Bosch and Delco Bosch 5.0/5.3 Codes & Data—1995–2004

This section describes testing Bosch 5.0 and 5.3 ABS and Delco Bosch 5.0 and 5.3 ABS used on 1995–2004 models. Selecting CODES & DATA for these models displays a screen similar to Figure 8-56.

```
   ECU___BB 33599     BRAKE LIGHT SW___ON
 ** ABS BRAKING IS OFF!  OK TO DRIVE.  **
NO CODES PRESENT
LF WHEEL (MPH)____45  RF WHEEL (MPH)____45
```

Figure 8-56 *Sample Bosch or Delco Bosch 5.0 or 5.3 Codes & Data*

During ABS tests in Codes & Data mode, other vehicle components may seem to operate abnormally. The instrument panel may appear to stop working, gauge readings may change randomly, or LEDs may light up. This is normal and stops when the EBCM is taken out of the diagnostic state.

Bosch and Delco Bosch 5.0/5.3 Trouble Codes

Codes for these systems are viewed in one of three ways, depending upon the vehicle. The main menu selections are:

- Codes & Data
- Codes
- Code History

If the test vehicle has a CODES ONLY selection on the MAIN MENU GM ABS, the display appears similar to Figure 8-57.

```
  CODE LIST
     ** CODES ONLY.  OK TO DRIVE.  **
C0221 RF WHEEL SPEED SENSOR CKT OPEN
***  END OF LIST  ***
```

Figure 8-57 *Sample Bosch or Delco Bosch 5.0 or 5.3 code display*

If the CODE HISTORY selection is available, the DTC displays along with certain data parameters that reflect conditions present at the time the code set. Selecting CODE HISTORY places the EBCM in diagnostic mode, and new codes cannot be set.

The CODE HISTORY selection works the same for Bosch 5 and Delco Bosch 5 as it does for Bosch 2, described on “Bosch 2 Trouble Codes” on page 164.

8.2.4 Delco-Moraine III Codes & Data—1988–91

The Delco-Moraine III system is fully functional in the Codes & Data mode. If faults are present, the EBCM may disable either just front ABS operation, or the entire system. Because problems may be present at the time of testing, the second line of the display advises ABS braking is off. However, the service brakes operate normally and the vehicle may be driven. The system does set new codes in this mode. Full ABS braking is available if no problems have disabled the system.

On a Delco Moraine III system, the top line of the displays the current position of the brake light switch and the state of the ABS warning lamp when in the Codes & Data mode, followed by the test mode and the codes & data list (Figure 8-58).

```
   BRAKE SW_____OPEN  ABS LAMP______OFF
 ** ABS BRAKING IS OFF!  OK TO DRIVE.  **
NO CURRENT CODES PRESENT
LF WHEEL (MPH)____45   RF WHEEL (MPH)____45
```

Figure 8-58 *Sample Delco Moraine III Codes & Data*

NOTE:
Vehicle components may seem to operate abnormally during testing in Codes & Data mode. A digital instrument panel may appear to stop working or analog gauge readings may change randomly. This is normal and stops once the EBCM is out of the diagnostic state.

Delco-Moraine III Trouble Codes

The scan tool only displays codes for faults present at the time of testing for Delco-Moraine III systems. These are generally referred to as hard, or current, codes. The system does not display soft, or history, codes. When there are codes, or if a new code occurs during testing, the third line changes to display the code (Figure 8-59).

```
   BRAKE SW_____OPEN  ABS LAMP______OFF
 ** ABS BRAKING IS OFF!  OK TO DRIVE.  **
14 REAR RELEASE SOL OPEN OR SHORT TO GND
LF WHEEL (MPH)____45   RF WHEEL (MPH)____45
```

Figure 8-59 *Sample Delco Moraine III display with codes*

If no ABS problems occur within 50 ignition cycles, the EBCM clears any codes stored in its memory. The scan tool cannot be used to clear codes from the Delco-Moraine III system.

Capturing Intermittent Faults

The EBCM only displays intermittent faults that occurred during the current ignition cycle. If the ignition is turned off, codes for recent intermittent faults are lost and not displayed. Follow the procedure below for a vehicle with a Delco-Moraine III system with the amber “antilock” warning lamp on.

To view intermittent faults:

1. Do not turn the ignition off.
2. Connect the scan tool to the vehicle with the engine running.
3. Enter the vehicle ID.
4. Select ABS CODES & DATA from the MAIN MENU GM ABS.

8.2.5 Delco-Moraine VI Codes & Data—1991–2001

The ABS Codes & Data display for Delco-Moraine VI functions similarly to Delco-Moraine III systems. however, some of the displayed parameters differ. This system also provides code history data, or soft codes, in addition to the current code, or hard code, data.

The Delco-Moraine VI system data display includes:

- The last, or most recent, code that set
- The number of ignition cycles since the last code set
- The sensed vehicle speed at the time the last code set
- The first five codes set display from oldest to newest
- The number of times each code set
- The number of ignition cycles since each code last set
- The number of ignition cycles since each code first set

In addition, brake switch and the ABS stop data parameters also display. The last code set data is not updated by the ABS system unless vehicle speed exceeds 10 MPH (16 KPH).

Selecting CODE HISTORY from the MAIN MENU GM ABS displays a data list. This list is fairly long, so make sure to view the entire list. A complete list is shown in Figure 8-60.

```
                CODE HISTORY
** ABS BRAKING IS OFF!  OK TO DRIVE.  **
11 ABS WARNING LAMP OPEN OR SHORT TO GND
28 EXCESSIVE RR WHEEL ACCELERATION
LAST CODE SET_____28  VEHICLE SPEED_____47
BRAKE SWITCH______ON  BRAKE LAMP_______OFF
1ST CODE SET______11  NO. OF TIMES SET___2
 NO. OF IGN CYCLES SINCE LAST SET________7
 NO. OF IGN CYCLES SINCE FIRST SET______15
2ND CODE SET______28  NO. OF TIMES SET___5
 NO. OF IGN CYCLES SINCE LAST SET________7
 NO. OF IGN CYCLES SINCE FIRST SET______15
3RD CODE SET____NONE  NO. OF TIMES SET___0
 NO. OF IGN CYCLES SINCE LAST SET________0
 NO. OF IGN CYCLES SINCE FIRST SET_______0
4TH CODE SET____NONE  NO. OF TIMES SET___0
 NO. OF IGN CYCLES SINCE LAST SET________0
 NO. OF IGN CYCLES SINCE FIRST SET_______0
5TH CODE SET____NONE  NO. OF TIMES SET___0
 NO. OF IGN CYCLES SINCE LAST SET________0
 NO. OF IGN CYCLES SINCE FIRST SET_______0
```

Figure 8-60 *Complete Delco-Moraine code history*

In the sample list shown, code 28 is the last code set, and zero ignition cycles have occurred since it last set. This means the code 28 is a currently present hard code.

Code 11 is shown as the first code set. This code set twice, 7 ignition cycles occurred since it last set, and 15 ignition cycles occurred since it first set. This means code 11 is an intermittent fault not currently present.

The second code, code 28, set during five of the last five drive cycles, and zero ignition cycles occurred since it last set. This means code 28 is a currently present hard code. In the example, no other codes have set.

An intermittent problem that occurs before other codes may display as the last code set. This is the case if no other codes occurred since it set.

8.2.6 VCM 4WAL Codes & Data—1994–97

The 1994–97 Kelsey-Hayes Vehicle Control Module (VCM) 4-Wheel Antilock Brake (4WAL) system integrates ABS with the engine controls in the VCM on some vehicles.

This system has a red brake lamp and an amber antilock lamp on the instrument panel. When the ignition is turned on, both lamps light for about 2 seconds. The antilock lamp goes out if there are no ABS faults. If there is a fault, the lamp stays lit; or it lights when the fault occurs.

The Codes & Data display for the VCM 4WAL brake system used on 1994 and later trucks and vans is shown in Figure 8-61.

```
    ABS LAMP_____ON   BRAKE SW____OPEN
 **  ABS BRAKING IS OFF!  OK TO DRIVE. **
NO CODES PRESENT
LF WHEEL__________60   RF WHEEL__________60
```

Figure 8-61 *Sample Kelsey-Hayes VCM 4WAL Codes & Data*

8.2.7 4WAL Codes & Data—1990 and Later

The Codes & Data display for the Kelsey-Hayes Four-Wheel Antilock (4WAL) brake system used on 1990 and later trucks and vans is shown in Figure 8-62.

```
    ABS LAMP_____ON   BRAKE SW____OPEN
LF WHEEL__________0   RF WHEEL__________0
LR WHEEL__________0   RR WHEEL__________0
BRAKE LAMP CMD___OFF   BRAKE LAMP SW____OFF
```

Figure 8-62 *Sample Kelsey-Hayes 4WAL Codes & Data*

Kelsey-Hayes 4WAL has both a red brake indicator lamp and an amber antilock indicator lamp on the instrument panel. When the ignition is turned on, both lamps light for about 2 seconds. The antilock lamp goes out if no ABS faults are present. If an ABS fault is present, the antilock lamp stays lit; or it lights as the ABS fault occurs.

The 4WAL EBCM recognizes both current, hard, and intermittent faults and stores soft codes in memory for intermittent problems. The 4WAL EBCM transmits current codes and up to three history, or soft, codes in the Codes & Data mode. Data parameters for wheel speed sensors, brake switches, and other operating data are also provided.

The MULTI-1 universal adapter is required for testing the Kelsey-Hayes 4WAL system with the 12-pin ALDL. Connect the adapter as shown in Figure 8-63.

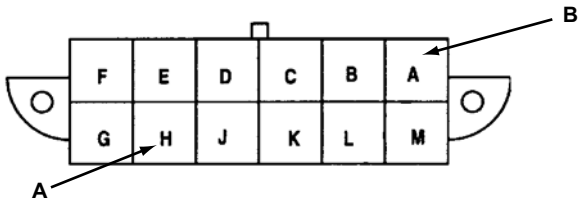

Figure 8-63 *MULTI-1 adapter wire color codes for 4WAL testing*

A—Green

B—Black

For Kelsey-Hayes 4WAL systems with the 16-pin DLC, use the OBD-II connector (see “Connecting to the Vehicle” on page 132). Use the CLEAR ABS CODES selection on the Exit menu to erase codes from the 4WAL system.

8.2.8 Rear-Wheel Antilock (RWAL) Brakes

Some 1993–95 trucks and vans transmit data over a serial data stream. On these vehicles, ABS CODES & DATA is an available menu selection.

The Kelsey-Hayes RWAL brake system used on 1988 and later trucks and vans has a red brake indicator lamp that acts as a warning lamp for both the basic brake system and the RWAL system. The lamp lights for about 2 seconds when the ignition is turned on. It then goes off unless the parking brake is applied. The brake lamp remains on if the parking brake is applied or a if hydraulic brake problem exists.

The RWAL EBCM recognizes both current, or hard, and intermittent, or soft, faults and stores codes in memory for intermittent problems. In normal operation, the brake lamp is off if no faults are present. If a RWAL problem exists, the brake lamp stays on solidly or flashes a steady on-off sequence with no apparent code pattern.

Selecting DISPLAY ABS CODES causes the brake lamp to begin flashing codes. The codes are displayed on the lamp in a distinct pattern of long and short flashes.

To read codes:

- Select DISPLAY ABS CODES mode and count the first long flash and all short flashes.

  For example, one long flash followed by five short flashes is code 6. The long flash indicates that a code number is starting or repeating.

The RWAL system flashes only one code at a time in the display ABS codes mode, but repeats that one code as long as the scan tool remains in this test mode. If multiple codes are present, the first code must be repaired before any other codes display.

NOTE:
If no codes are present and the brake lamp is not lit, reading codes in the Display ABS Codes mode sets a false code 9, vehicle speed signal. RWAL systems do not display a system pass code.

A code 9 is set if there are no other codes present in the system. This happens because the speed sensor circuit is the diagnostic circuit for the RWAL EBCM, and the RWAL EBCM receives an abnormal speed signal when in the diagnostic mode. Clear code 9 and any other codes. See “Display ABS Codes—RWAL & Teves II” on page 174 for more information.

Clearing RWAL Codes

To clear codes from the RWAL system, except on vehicles that transmit ABS Codes & Data, switch the ignition off and disconnect the main connector at the RWAL EBCM. Refer to “Clearing Codes from ABS Codes & Data” on page 163 for information on clearing codes on vehicles with ABS Codes & Data.

8.2.9 Rear-Wheel Antilock (RWAL) Codes & Data—Some 1993–95

The RWAL electronic control module for some 1993–95 trucks and vans monitors various brake and 4WD switch inputs to determine whether to prepare for ABS braking control. The

RWAL EBCM operates the control valve assembly during antilock braking based on comparisons of data parameter values and programmed values stored in RWAL EBCM memory. The RWAL EBCM monitors system-related conditions and takes corrective action when necessary.

A complete Codes & Data display for the Kelsey-Hayes RWAL system, used on 1993 and later S and T trucks, is shown in Figure 8-64.

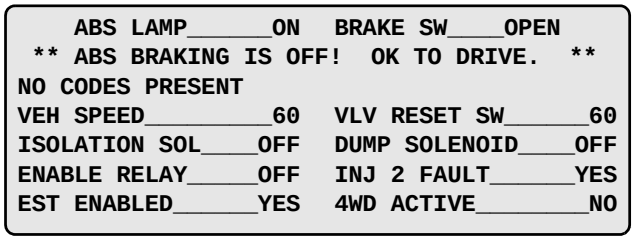

Figure 8-64 *Complete Codes & Data display for Kelsey-Hayes RWAL*

8.2.10 Teves II ABS Codes & Data—1986–91

The Teves II ABS displays codes by flashing the amber “antilock” indicator lamp on the instrument panel.

These vehicles have both a red brake indicator lamp and an amber antilock indicator lamp on the instrument panel. The lamps light in various combinations to indicate normal and abnormal brake system conditions. Additionally, models with driver information center panels display warning messages as described in the following paragraphs.

Normal Startup Messages and Lamp Operation

On models without a driver information center, the brake and antilock lamps both light for 4 to 5 seconds when the ignition is first turned on. Both lamps go out while the engine is cranking. As the engine starts and the key returns to the run position, the antilock lamp may stay on for 3 or 4 seconds. If the vehicle was parked for a long period, such as overnight, both the brake and antilock lamps may stay lit for up to 30 seconds while the ABS pump recharges the system to normal pressure.

When a model with a driver information center is started, the brake and antilock lamps both light as well, plus “antilock disabled” and “traction disabled” messages appear for a few seconds. The lamps turn off, and the messages change to “antilock OK” and “traction OK” once the ABS pump recharges the system to normal pressure. Again, if the vehicle was parked for a long time, such as overnight, the lamps may stay lit and the disabled messages may appear for up to 30 seconds.

The antilock lamp should go out after no more than 30 seconds if there are no ABS faults present. If an ABS fault is present, the antilock lamp stays lit; or it lights when an ABS fault occurs. The brake lamp stays on if the parking brake is applied or if a basic hydraulic brake problem, such as low brake fluid level, exists.

In normal operation, the antilock lamp should be off when no faults are present. It should light continuously whenever a fault is present. The EBCM/EBTCM recognizes both current, or

hard, and intermittent, or soft, faults. The EBCM/EBTCM stores codes in memory for intermittent problems.

Reading Teves II ABS Codes

The DISPLAY ABS CODES selection on the scan tool causes the antilock lamp to flash codes. The lamp flashes up to seven codes that are currently present or stored in memory. However, the lamp flashes only one code at a time. To proceed to the next code, exit and then reenter the display ABS codes selection.

If the antilock lamp is off before entering Display ABS Codes, any code that displays indicates an intermittent, or soft, fault. If the antilock lamp is on before entering Display ABS Codes, one or more displayed ABS codes indicate a current, or hard, fault. If two or more codes are present, there is no way to distinguish hard codes from soft codes.

To read the codes:

1. Switch the ignition on and allow the pump to establish system pressure. Note whether the antilock lamp turns off in 30 seconds or less.
2. With the scan tool connected, switch the ignition off.
3. Select **DISPLAY ABS CODES**.
4. Switch the ignition on and watch the antilock lamp.
   - If the lamp turns on and then off in about 4 seconds, no codes are present. The system does not have a “system pass” code.
   - If the lamp turns on for 4 seconds and then starts flashing, codes are present.
5. If the lamp flashes, count the flashes until there is a 3-second pause. This is the first digit of the code. Count flashes after the 3-second pause, this is the second digit. Count only the number of times the lamp turns on and off for the second digit. After the second digit, the lamp lights constantly. Do not count this as a code digit.
6. After the antilock lamp stops flashing the code and stays on, press **N** to exit from display ABS codes. Without switching the ignition off, press **Y** to reenter and read any additional codes.
7. Enter codes flashed by the antilock lamp into the scan tool as previously explained in the “How To Enter Codes” section.

   The antilock lamp remains on continuously in display ABS codes mode once all codes have been displayed.

Clearing Teves II Codes

The Teves II EBCM/EBTCM does not allow codes to be cleared until repairs have been made. Therefore, do not attempt to clear codes until repairs are complete. Disconnecting the battery or the EBCM/EBTCM connector does not clear Teves II ABS codes from the EBCM/EBTCM. After repairs, clear codes by driving at a speed above 18 MPH (29 KPH). Then repeat the code-reading sequence to make sure that all ABS problems were corrected.

8.2.11 Teves IV ABS Codes & Data—1990–99

The ABS Codes & Data display for Teves IV systems provides trouble code information only; data parameters are not displayed (Figure 8-65).

```
                TEVES IV
 ** ABS BRAKING IS OFF!  OK TO DRIVE.  **
23 RF WHEEL SPEED IS 0 MPH
***  END OF LIST  ***
```

Figure 8-65 *Sample Teves IV ABS Codes & Data*

In the ABS Codes & Data mode, the antilock functions of the Teves IV system are disabled by the EBCM. Be aware, new codes cannot be set in this mode, even if fault conditions are present. The service brakes operate normally and the vehicle can be driven safely for testing.

When you select ABS CODES & DATA for the Teves IV system, the scan tool establishes communication with the EBCM and puts the module in a diagnostic state. During ABS Codes & Data testing, the amber ABS lamp on the instrument panel flashes once per second. The EBCM returns to normal operation once **N** is pressed to exit ABS Codes & Data. Unlike Bosch systems, the ignition does not need to be cycled or the scan tool disconnected to restore ABS functions.

With Teves IV ABS, testing may cause false ECM codes to appear on the engine code list. After ABS testing, reenter the vehicle ID for engine testing and check for engine codes. Clear any codes that may be present and recheck to be sure they were false.

If no codes are present in the system, a “no codes present” message displays on the third line. New codes cannot be set because the system is in diagnostic mode. If codes are present, the third line displays the code number and title.

8.2.12 Delphi Brake Controller 7 (DBC 7) Codes & Data—1999–2004

The DBC 7 brake system is used on some 1999–2004 models. This system does not flash codes on an instrument panel lamp. Codes must be read on the scan tool display.

The DBC 7 system has a red brake indicator lamp and an amber ABS warning lamp on the instrument panel. The DBC 7 system does not light the brake lamp. It is only lit by the base braking system.

The DBC 7 electronic control module monitors various brake inputs to determine whether to prepare for antilock braking. The ABS and traction control operations are combined in a single control unit, the Electronic Brake Traction Control Module (EBTCM), on DBC 7 systems.

During ABS braking, the EBTCM operates the Electronic Brake Pressure Modulator Valve (BPMV) assembly based on the comparison of data parameter values to the programmed values stored in memory. The EBCM/EBTCM also monitors system-related conditions and takes corrective diagnostic action when necessary.

ABS Warning Lamp Operation

Under normal conditions, the ABS lamp lights for several seconds as a bulb check when the ignition is first switched on. If there are no ABS faults present, the lamp turns off while the engine is cranking. If an ABS fault is present, the lamp stays lit during cranking. When an ABS fault occurs while driving, the ABS lamp lights.

The brake lamp lights only in the presence of a hydraulic failure or when the parking brake is applied.

DBC 7 Main Menu Options

The DBC 7 system offers several main menu options for displaying information. The following menu choices are available:

- Codes & Data
- Codes
- Data only

In Codes & Data mode, any codes stored in memory display followed by a data list of ABS parameters. In Codes mode, a list of any codes in memory displays (Figure 8-66). Data parameters do not display.

```
  CODE LIST
 ** CODES & DATA.  OK TO DRIVE. **
C0221 RF WHEEL SPEED SENSOR CKT OPEN
***  END OF LIST  ***
```

Figure 8-66 *Sample DBC 7 codes*

Similarly, in Data Only mode, the screen displays data parameters only (Figure 8-67). Codes do not display in this Data Only mode.

```
     IGN(V)_____12.4  VEH SPEED_____10
      ** DATA ONLY.  OK TO DRIVE **
(NO CODES AVAILABLE IN THIS MODE)
LF WHEEL_____10  LR WHEEL_____10
```

Figure 8-67 *Sample DBC 7 data only*

8.2.13 Display ABS Codes—RWAL & Teves II

The DISPLAY ABS CODES selection on the MAIN MENU GM ABS provides a way to read codes flashed on the ABS warning lamp for these systems that cannot communicate with the scan tool. After reading the codes, enter the codes into the scan tool to get a code description and to record the codes for reference or printing.

The Display ABS Codes function provides easy and quick access to code definitions, faster than looking them up in a service manual. If troubleshooter tips are available for the system being tested, DISPLAY ABS CODES fills in the code summary line that appears at the top of the troubleshooter menu.

Before using the Display ABS Codes function, be sure to read the “Read This First” instructions on the scan tool if working with a specific GM antilock brake system for the first time, or if it is a system worked on infrequently. See “Read This First (Instructions)” on page 179 for details.

When Pin H of the ALDL is grounded, the indicator lamp on the instrument panel flashes codes. Codes display differently for RWAL and Teves II systems. How codes display is explained for each specific system. How each system indicates normal operation, or no faults present, is also explained.

To display ABS codes:

1. Switch the ignition on.
2. When instructed, select **DISPLAY ABS CODES**.

   Pressing the **Y** button here causes the scan tool to ground the ABS diagnostic terminal, Pin H, of the ALDL connector and displays a code summary screen (Figure 8-68).

```
CODE SUMMARY:  NO CODES ENTERED YET
BRAKE LIGHT FLASHES CODES IF IGNITION ON
SCROLL & PRESS Y TO MARK OR UNMARK CODES.
  12 OPEN LEFT FRONT WHEEL SENSOR
```

Figure 8-68 *Sample code summary*

3. Select the code flashed by the ABS lamp.

   An asterisk appears on the code line and the code number appears in the code summary on the top line (Figure 8-69). Pressing **Y** again deselects a selected code.

```
CODE SUMMARY: 14
 12 OPEN LEFT FRONT WHEEL SENSOR
*14 OPEN RIGHT FRONT WHEEL SENSOR
 16 OPEN LEFT REAR WHEEL SENSOR
```

Figure 8-69 *Code summary screen with a code selected*

4. Continue through the code list and enter all codes flashed by the ABS lamp.
5. Press **N** to exit the code summary display and return to the code list.

   The code list contains all codes possible for the system being tested.

Enter and exit the Display ABS Codes mode to mark or unmark codes as often as necessary when diagnosing a specific system. The selected codes are stored in scan tool memory until the list is changed, or until a new vehicle or system ID is entered.

Clearing Codes From Display ABS Codes

When available, the clear ABS codes selection for display ABS codes erases the records from the ABS module memory. It does not clear code selections from code summary line of the display ABS codes screen.

After the display returns to ABS codes mode, manually unmark code selections as explained in earlier in this chapter.

8.2.14 Functional Tests—Delco-Moraine III Brake Bleeding

NOTE:
Operations described in this section are not available on all tool platforms.

A FUNCTIONAL TESTS selection is available for bleeding the Powermaster III electronic hydraulic control unit (EHCU) solenoids on Delco-Moraine III ABS (Figure 8-70). GM manuals refer to this as “ABS solenoid bleed and checkout test.”

```
MAIN MENU GM ABS       READ THIS FIRST
>ABS CODES & DATA
 FUNCTIONAL TESTS      (EXIT & RE-ID)
 CUSTOM SETUP
```

Figure 8-70 *MAIN MENU GM ABS for Delco-Moraine III*

CAUTION:
Failure to follow proper brake bleeding procedures may result in improper brake system operation, or brake system failure.

NOTE:
This procedure bleeds only the Powermaster III solenoids, not the base brake system or lines. Refer to GM service manuals for additional information.

To bleed Powermaster III solenoids:

1. Open the Delco-Moraine III Functional Tests menu (Figure 8-71).

```
SELECT TEST MODE.  PRESS Y TO CONTINUE.
>BLEED POWERMASTER SOLENOIDS
```

Figure 8-71 *Delco-Moraine III Functional Tests menu*

2. Switch the key on with the engine off.
3. Select **BLEED POWERMASTER SOLENOIDS**.
   The first instructional screen displays (Figure 8-72).

```
DEPRESS BRAKE PEDAL HALF WAY DURING
ENTIRE PROCEDURE
WARNING:  WHEELS MUST NOT ROTATE!
PRESS Y TO CONTINUE.
```

Figure 8-72 *First Delco Moraine III brake bleeding instruction*

4. Apply medium pressure to the pedal and press **Y**.
   The next bleeding instruction displays (Figure 8-73).

```
SOLENOID BLEED PROCEDURE:  NOW CYCLING
SOLENOIDS TO RELEASE TRAPPED AIR.
 IN PROGRESS...
```

Figure 8-73 *Second Delco Moraine III brake bleeding instruction*

The scan tool cycles the solenoids on and off several times, and after a few seconds, the following screen displays (Figure 8-74).

```
SOLENOID BLEED PROCEDURE COMPLETE.
DURING NEXT PROCEDURE, BRAKE PEDAL
SHOULD BE FIRM & NOT DROP EXCESSIVELY.
PRESS Y FOR SOLENOID CHECKOUT PROCEDURE.
```

Figure 8-74 *Delco Moraine III solenoid bleed complete*

5. Continue applying pressure on the pedal and press **Y**.
   The solenoid checkout screen displays (Figure 8-75).

```
SOLENOID CHECKOUT PROCEDURE:  NOW
CYCLING EACH CHANNEL.  IF PEDAL DROP
EXCESSIVE, SUSPECT SOLENOID “O” RINGS.
 IN PROGRESS...
```

Figure 8-75 *Delco-Moraine III solenoid checkout procedure*

If the brake pedal suddenly drops during this portion of the test, suspect faulty solenoid O-rings. After a few seconds, the following screen displays (Figure 8-76), which indicates that the EBCM self-test verified the integrity of the system, and that it is now safe to bleed the Powermaster solenoids.

```
SOLENOID CHECKOUT PROCEDURE COMPLETE.
IF PEDAL DID NOT DROP EXCESSIVELY, OK TO
BLEED AIR FROM INBOARD SIDE BLEEDER
SCREW ON POWERMASTER UNIT.
```

Figure 8-76 *Delco-Moraine III solenoid checkout procedure complete*

6. Bleed air from the inboard side bleeder screw (Figure 8-77). Some units also have an outboard side bleeder screw. If so, bleed it too.

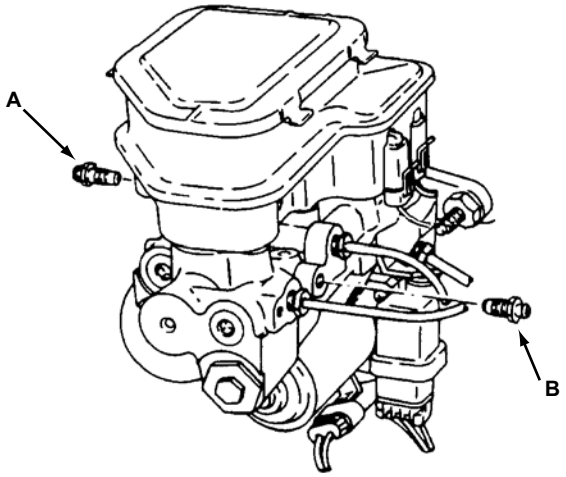

Figure 8-77 *Powermaster III bleed screws*

A—Inboard bleed screw
B—Outboard bleed screw

Error Messages

If the brake pedal is released at any time during the bleed sequence, the functional test procedure aborts and a warning displays (Figure 8-78).

```
WARNING:  BRAKE PEDAL MUST BE DEPRESSED
HALF WAY DURING ENTIRE PROCEDURE!

PRESS N FOR FUNCTIONAL TESTS MENU.
```

Figure 8-78 *Test aborted due to brake pedal release message*

Attempt to drive the vehicle at any time during the bleeding procedure, and test procedure aborts and a warning displays (Figure 8-79).

```
WARNING:  PROCEDURE CANNOT BE RUN WHILE
WHEELS ARE MOVING!

PRESS N FOR FUNCTIONAL TESTS MENU.
```

Figure 8-79 *Test aborted due to vehicle movement message*

In addition, pressing the **N** button at any time during the procedure aborts the functional test and the scan tool displays a warning (Figure 8-80).

```
USER ABORTED PROCEDURE.

PRESS N FOR FUNCTIONAL TESTS MENU.
```

Figure 8-80 *Test aborted by operator message*

8.2.15 Read This First (Instructions)

NOTE:
This selection should always be opened and read before working with any GM antilock brake system for the first time.

This selection contains specific information about ABS identification, control module communication, and reading and clearing codes. These instructions provide a reference for testing a new system or for reviewing facts for a system you work on infrequently.